Aug. 8, 1961 J. H. BREEDING 2,995,017

APPARATUS FOR MAKING SUNDERED ICE

Filed Feb. 6, 1959 2 Sheets-Sheet 1

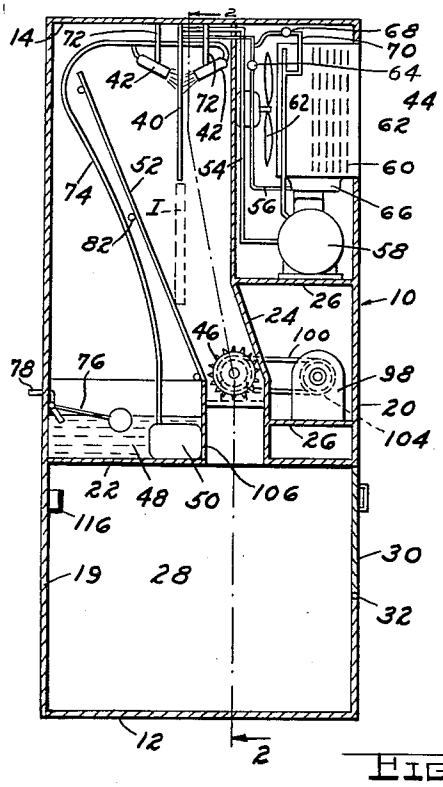

FIG. 1

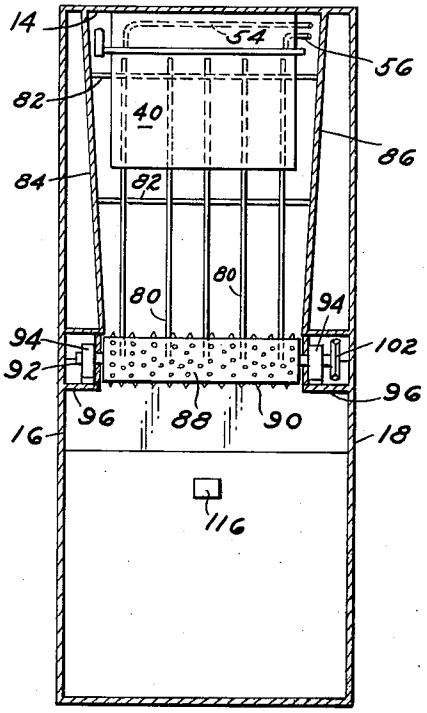

FIG. 2

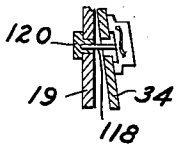

FIG. 5

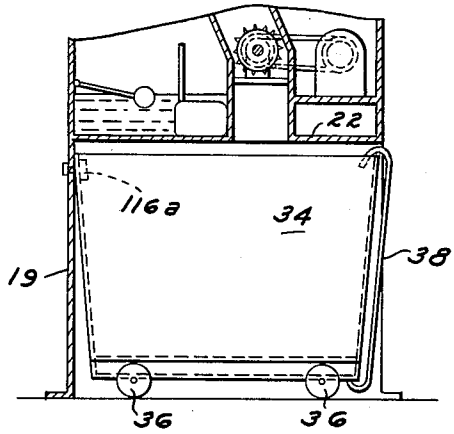

FIG. 3

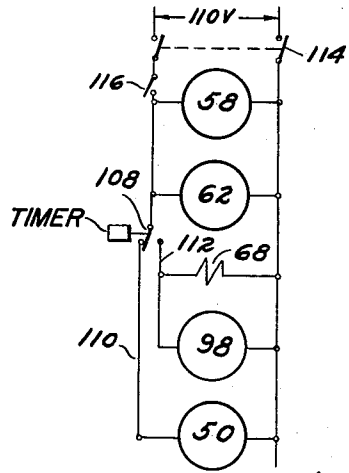

FIG. 4

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FIG. 6

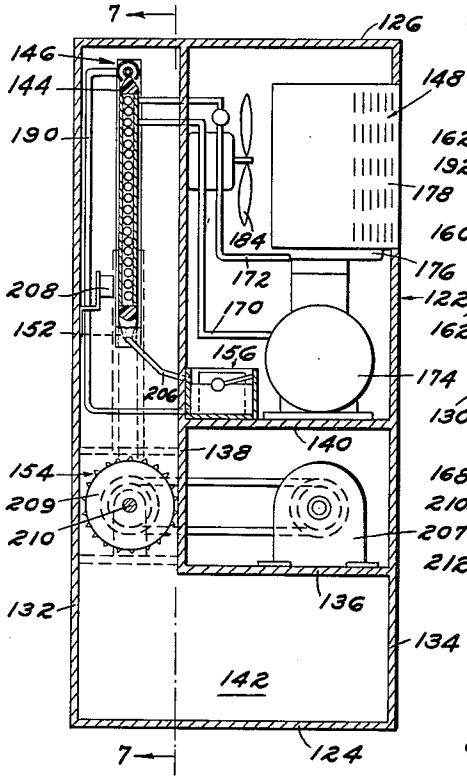


FIG. 7

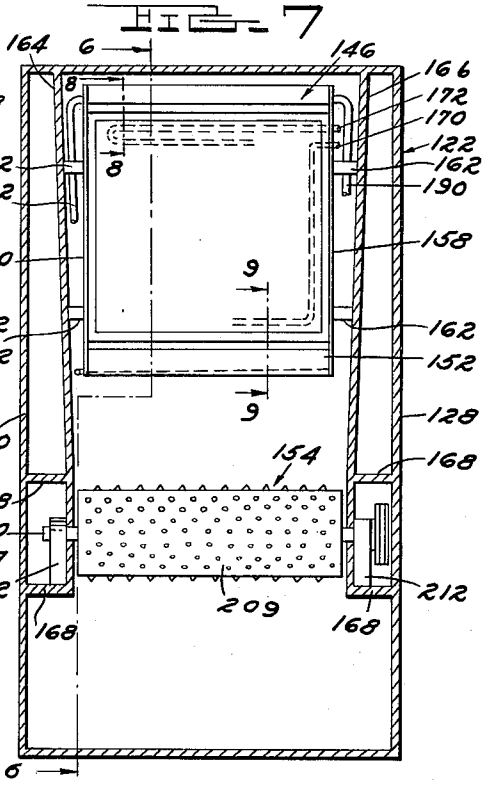


FIG. 8

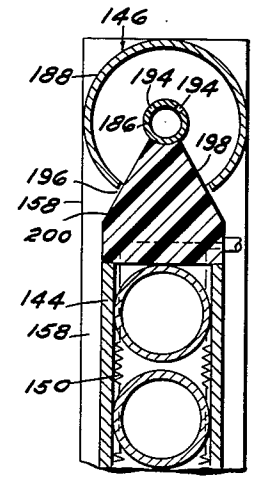
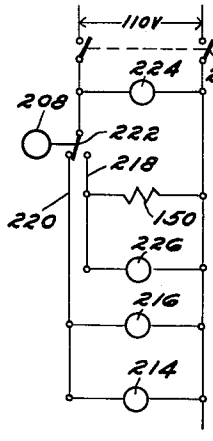
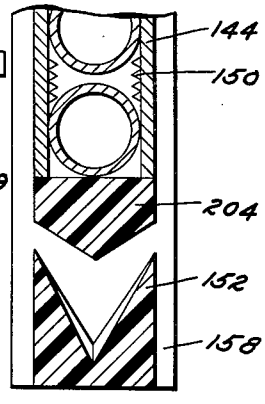


FIG. 10





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APPARATUS FOR MAKING SUNDERED ICE

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Filed Feb. 6, 1959, Ser. No. 791,648

8 Claims. (Cl. 62—157)

This invention relates to a method of and apparatus for making ice, particularly crushed, cubed, powdered, or the like. This application is a continuation-in-part of my copending U.S. application Serial No. 693,761, filed October 31, 1957, and now abandoned.

An object of the invention is the provision of a method for automatically continuously making ice, which includes the steps of applying water to opposite sides of an upright evaporator plate to form a film or curtain of water on each side of the plate and on which the water freezes, catching and re-applying on the plate any water running therefrom, thereafter temporarily defrosting the plate sufficiently to allow the ice to drop therefrom, catching the ice in sundering mechanism or other means which will render the ice in the desired form for final use, and thereafter depositing the ice temporarily in a storage receptacle.

While the ice is herein described as being crushed, it will become apparent to those skilled in the art that the ice instead of being crushed may be cubed, flaked, or otherwise handled, and crushed ice is spoken of as merely representative of one form of the final product.

An object of the invention, as disclosed in the original application, is the provision of an ice-making machine which includes an upright evaporator plate with a plurality of spray nozzles, fed by a sump pump, disposed to spray water on opposite sides of the plate, and with means disposed beneath the plate to catch and guide ice falling from the plate, with such means permitting water dropping from the plate to be returned to the sump pump.

Another object of this invention, as disclosed in the original application, is the provision of an ice-making machine which includes freezing means upon which water is sprayed to be frozen, a sump for collecting water dropping from the freezing means, a pump for spraying water from the sump onto said freezing means, and a refrigeration system connected to the freezing means to cool the same for one period of time and thereafter warm the same to permit the ice thereon to drop therefrom.

Another object of the invention is the provision of a crushed ice-making machine which is compact in construction and arrangement, durable, and capable of manufacture at a low cost, and adapted to be installed on the premises of the ice consumer, such as in hotels, hospitals, and the like.

The invention comprises, in general, a unit having at the bottom a storage receptacle for crushed ice, and which receptacle may be removable from the unit in one form of the invention or in the alternative may be fixed in the unit and provided with an access door. Disposed within the unit above the receptacle is an ice crusher from which crushed ice drops directly into the receptacle. In the embodiment of the invention disclosed in the original application, a plurality of nozzles supplied with water by a sump pump are disposed to spray on opposite sides of a vertically disposed evaporator plate with water freezing on opposite sides of the plate. A refrigeration system connected to the plate is adapted to reverse its cycle temporarily to sufficiently defrost the plate to cause ice formed thereon to drop therefrom. Means are disposed below the evaporator plate to guide ice dropping therefrom into the crusher. Water dripping from the plate passes through such means back into a

sump from which it is pumped to the spray nozzles. A time switch or the like controls the operation of the refrigeration system such that it freezes the water on the evaporator plate for, say, twenty minutes, and defrosts the plate for, say five minutes. The sump pump operation is stopped during the defrosting cycle so that the ice may freeze dry. The crusher operates only during the defrosting cycle, which cycle is long enough to cause the ice to drop from the evaporator plate and be crushed by the crusher.

In the embodiment of the invention forming the new subject matter for this continuation application it is an object to provide an ice-making machine which includes an upright evaporator plate with a water feed pipe and a water deflection shield disposed at the upper edge of said plate to cause a uniform curtain of water to flow on opposite sides of the plate, and with means disposed along the lower edge of the plate to catch and return excess water to a sump pump by which the water is recirculated to the feed pipe and shield.

Another object of the new modification of the invention is the provision of an ice-making machine which has electrical means associated with the evaporator plate to readily defrost the plate causing ice formed thereon to release and drop from said plate into crushing means.

Another object of the new modification of the invention is the provision of an ice-making machine which is of a construction that tends toward compactness. The unique arrangement and construction make it possible to install the machine in a relatively small area which lends great adaptability to the machine.

The embodiment comprising the subject matter added to the disclosure of application Serial No. 693,761 includes an ice-making machine in which the evaporator plate is in an upright position. Disposed at the upward edge of said plate is a water feed pipe which is provided with a plurality of upwardly directed holes through which water is sprayed. Positioned over the feed pipe is a hollow cylinder or shield against which water is sprayed from the feed pipe. The shield is provided with a longitudinally extending T slot which is adapted to permit the shield to be received over the upper tapered non-freezing edge of the evaporator plate with the edges of the slot spaced slightly from the tapered sides of the evaporator plate. As a result, water sprayed from the feed pipe impinges on the inside of the shield and flows from the shield onto downwardly and outwardly inclined surfaces at the upper edge of the plate and forms a uniform curtain of water on opposite sides of said plate. The bottom edge of the plate is tapered and thus directs the flow of excess water into a catch basin disposed beneath the plate. A thermostat or the like controls the operation of the refrigeration system such that it freezes the water to any desired thickness, say, one-fourth inch, activates means to interrupt the circulation of water, activates the electrical defrosting means, and sets in operation the ice crusher. The crusher operates only during the defrosting cycle, which cycle is long enough to cause the ice to drop from the evaporator plate and be crushed by the crusher.

Other objects, advantages, and meritorious features will more fully appear from the following specification, attached claims, and accompanying drawings, wherein:

FIG. 1 is a side view of a unit embodying my invention as described in the original application;

FIG. 2 is a cross sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a side view of the lower half of FIG. 1 showing a modified form of the ice storage receptacle;

FIG. 4 is a schematic wiring diagram of the control circuit for the refrigeration system, the sump pump motor, and ice crusher;

FIG. 5 is a schematic view of the disconnect plug for

the thermostat control of the movable storage bin shown in FIG. 3;

FIG. 6 is a side view of the new embodiment of my invention taken along line 6—6 of FIG. 7;

FIG. 7 is a cross sectional view taken along line 7—7 of FIG. 6;

FIG. 8 is a cross sectional view taken along line 8—8 of FIG. 7 showing clearly the structural relationship of the shield, feed pipe, and the upper end of the evaporator plate;

FIG. 9 is a cross sectional view taken along line 9—9 of FIG. 7 showing the lower end of the evaporator plate and the catch basin disposed beneath; and

FIG. 10 is a schematic wiring diagram of the control circuit for the new embodiment of my invention.

As shown in FIGS. 1 and 2, the invention includes a unit having a housing generally indicated at **10**. The housing is provided with a bottom wall **12**, a top wall **14**, side walls **16** and **18**, a back wall **19**, and a front wall **20**. Interiorly of the housing is a horizontally extending partition **22** and a generally vertically extending partition **24**. A pair of vertically spaced-apart partitions **26** extend between the partition **24** and the front wall. Partition **22**, together with back wall **19**, bottom wall **12**, and front wall **20**, comprises an ice storage receptacle **28**. The receptacle may be suitably insulated in a well known manner. An access door **30** in front wall **20**, hinged as at **32**, will permit access to the storage receptacle for the removal of ice therefrom.

As shown in FIG. 3, the bottom of the unit may have front wall **20** cut away beneath partition **22** to permit the reception of an ice storage cart generally indicated at **34** and provided with wheels **36**. The cart includes a drain hose **38** for the purpose of emptying water therefrom. The cart, upon filling with ice, would be removed to wherever crushed ice is needed in the establishment in which the machine is installed. If desired, the space within the unit receiving the cart may be provided with a door and the compartment and cart suitably insulated.

Disposed in the unit **10** above the ice storage receptacle is the apparatus for making the sundered ice. The word "sundered" is considered generic and covers crushed ice as well as ice cubes. This apparatus includes, in general, an upright evaporator plate **40**, a plurality of water spray nozzles **42**, a refrigeration system indicated generally at **44**, an ice sunderer **46** which is shown as an ice crusher but might also be a hot wire grid for making ice cubes, a sump **48**, and sump pump **50**. Water is sprayed onto the vertically extending evaporator plate **40** by means of the nozzles **42** and water freezing on the plate is dropped therefrom into the crusher **46**. The apparatus also includes means **52** for guiding ice dropping from the evaporator plate into the crusher.

More particularly the evaporator plate is shown in FIG. 2 as being connected in any suitable manner to the top **14** of the unit to depend therefrom. Gas suction line **54** and liquid pressure line **56** communicate with the evaporator plate and are connected respectively with the compressor **58** of the refrigeration system and the condenser sump **66** of the condenser **60**. The evaporator plate, which is of conventional and well known construction, and need not be shown in detail, comprises a pair of spaced-apart walls between which meander a refrigerant line connected at opposite ends to pipes **54** and **56**. As the refrigerant in the meandering line evaporates, the walls of the plate are cooled below the freezing point of water such that water sprayed on them will freeze.

The refrigeration system of the apparatus is of conventional construction and in addition to the evaporator, condenser, and compressor, includes a fan **62** creating a draft across the condenser, and an expansion valve in the liquid pressure line **56**.

A solenoid-operated valve **68** in a condenser by-pass line **70** serves, when open, to cause the discharge from the compressor to pass directly back to the evaporator rather than first passing through the condenser. In this way the heat of compression is given up to the evaporator to defrost the same to permit ice formed thereon to drop therefrom.

The nozzles **42** are suspended by means of brackets **72** from the top **14** of the unit and water lines **74** connect the nozzles with the sump pump **50**. The sump pump **50** includes an electric motor for driving the same (not shown). A float-controlled valve generally indicated at **76** is adapted to control the entry of fresh water into the sump through the inlet line **78**. The inlet line is connected to a source of fresh water under pressure. The sump pump motor is connected in the electrical circuit, shown in FIG. 4, to be controlled as hereinafter described, by the electric timer, such that at the commencement of the defrosting cycle of the refrigeration system, the sump pump is stopped.

Disposed below the evaporator plate is the means for guiding ice dropping from the evaporator plate into the crusher. Such means includes a plurality of ice-guiding rods **80** which extend at an angle with respect to the plate downwardly toward the ice crusher **46**. The rods are supported on cross braces **82** which are secured at opposite ends upon the inclined downwardly extending partitions **84** and **86**. The rods are spaced apart as shown in FIG. 2 such that water dripping from the evaporator plate **40** may pass between the rods and drop into the sump **48**.

The crusher may be of conventional construction, but is shown herein as including a cylinder **88** provided with a plurality of sharp prongs or the like **90**. The cylinder is mounted on a shaft **92** supported at opposite ends in bearings **94** in turn supported on ledges **96**. An electric motor **98** mounted on the wall **26** drives the crusher by means of the transmission **100** entrained over the pulleys **102** and **104**, respectively, on the crusher and motor. The prongs **90** of the crusher are disposed closely adjacent the upwardly extending walls **24** and **106** such that during rotation of the cylinder **88** the ice will be ground and crushed between the cylinder and such walls.

It will be noted that the evaporator plate **40** is disposed above the sump **48** such that any water failing to freeze on the plate as the water is sprayed thereon by the nozzles **42** will drop directly into the sump. With the sump pump motor operating, such water is re-circulated by line **74** to the nozzles and again sprayed on the plate. It will also be noted that the evaporator plate is disposed above the guide rods **80** a distance just exceeding the vertical freezing dimension of the evaporator plate such that the slab of ice dropping from the plate may clear the lower edge thereof in falling against the rods. A slab of ice just leaving the evaporator plate and engaging the rods is indicated at I in FIG. 1.

The electrical control system for the operation of the unit is shown schematically in FIG. 4 and includes a timer T connected to a double-pole single-throw switch **108**. The various electric motors of the unit are indicated in FIG. 4 as follows: the compressor motor at **58**, the condenser fan motor at **62**, the crusher motor at **98**, and the sump pump motor at **50**. It will be noted that the compressor motor and condenser fan are electrically connected in parallel, and that the crusher motor and sump pump motor are alternatively selectively connected in parallel with the compressor and condenser fan motors through the switch **108**. The solenoid valve **68** is shown as electrically connected in parallel with the crusher motor **98**.

The timer T may be set to hold the throw of switch **108** against the sump pump motor lead **110** for, say, an interval of 20 minutes and thereafter shift the throw to connect lead **112** to energize the solenoid valve **68** and the crusher motor **98**. With the off-on switch **114** closed, the motors of the compressor and condenser fan are continuously operative while switch **108** will selectively control the

operation of the solenoid valve and the crusher and sump pump motors.

With the throw of switch 108 in contact with lead 110 and with the off-on switch 114 closed, the unit operates to cool the evaporator plate 40 and spray water thereonto through nozzles 42. Following the interval of time determined by the timer T, the sump pump motor is de-energized as the throw of switch 108 moves to contact lead 112 and the solenoid valve 68 and crusher motor are energized. With solenoid valve 68 energized, it bypasses the warm liquid refrigerant directly from the compressor into the evaporator without first passing through the condenser. As a result the evaporator is warmed and defrosted with the result that the slab of ice formed thereon drops therefrom. With the crusher motor 98 in operation, the ice is crushed or ground up and discharged into the storage compartment or cart 34, as the case may be. The length of the defrosting cycle is determined by the timer T and upon expiration the timer moves the throw of switch 108 back into contact with lead 110 and the freezing cycle repeats. These cycles may continue indefinitely with crushed ice being removed from the storage compartment whenever needed by the consumer.

Means is provided for discontinuing operation of the machine when the ice storage compartment has been filled with ice. Such means comprises a thermostat schematically shown in FIG. 1 at 116 mounted on the back wall 19 of the storage compartment and connected in the electrical circuit as shown in FIG. 4. When the ice fills the storage compartment and lies against the thermostat the thermostat opens an electrical contact thereby de-energizing the electrical components of the machine and preventing further operation thereof. Because the thermostat is of conventional construction, it need not be further described. In the embodiment shown in FIG. 3, the thermostat is indicated at 116a and is mounted on a wall of the cart near the upper edge thereof and functions in the same manner as thermostat 116. Because the cart is removable from below the ice-sundering apparatus the thermostat makes an electrical connection with the electrical apparatus of the machine by way of a disconnect plug comprising a pair of prongs 118 (only one of which is shown) removably received in a socket 120 secured to the back wall 19 of the machine housing. The plug is connected in any suitable fashion in the electrical circuit shown in FIG. 4. When the cart is removed from the housing the electrical circuit is broken thereby de-energizing all electrical apparatus of the machine. When the cart is pushed into the housing and the prongs 118 enter the socket, the thermostat controls operation of the machine as described in connection with thermostat 116.

The machine shown in FIGS. 6 and 7 is a modification of the invention disclosed in the original application. It includes a unit having a housing generally indicated at 122. The housing is provided with a bottom wall 124, a top wall 126, side walls 128 and 130, a back wall 132, and a front wall 134. Interiorly of the housing is a horizontally extending partition 136 and a vertically extending partition 138 which is attached to the top wall and end of partition 136. Another partition 140, vertically spaced from partition 136, is provided to support the compressor. Partition 136, together with back wall 132, bottom wall 124, front wall 134, and side walls 128 and 130, comprises an ice-storage receptacle 142. The receptacle may be suitably insulated in a well known manner and an access door or the like provided.

Disposed in the unit 122 above the ice-storage receptacle is the apparatus for making the sundered ice. This apparatus includes, in general, an upright evaporator plate 144, a water feed pipe with a shield adapted to be received over the pipe indicated generally at 146, a refrigeration system indicated generally at 148, and electrical defrosting means 150, a catch basin or trough 152, an ice sunderer 154 which is shown as an ice crusher but might also be a hot wire grid for making ice cubes and a sump and sump pump unit indicated generally at 156. Water is supplied to the feed pipe which causes the water to impinge on the shield and flow onto the vertically extending evaporator plate 144 and ice forming on the plate is dropped therefrom into the crusher 154.

More particularly, the evaporator plate, feed pipe, shield, and catch basin are supported by vertically extending frame members 158 and 160. It should be mentioned that the frame members are formed of wood, plastic, or suitable material which has a lower heat conductivity than the evaporator plate to avoid the forming of ice on said members during the freezing cycle. The frame members are attached, as shown in FIG. 7, by members 162, to downwardly extending partitions 164 and 166. Horizontal partitions 168 in vertical spaced relation are provided to give added support to the slightly inclined partitions 164 and 166. During the defrosting cycle, downwardly extending partitions 164 and 166 serve to guide the ice into the crusher.

As illustrated in FIG. 6, gas suction line 170 and liquid pressure line 172 communicate with the evaporator plate and are connected respectively with the compressor 174 of the refrigeration system and the condenser sump 176 of the condenser 178. The evaporator plate, which is shown in detail in FIGS. 8 and 9, comprises a pair of spaced-apart walls between which meanders a refrigerant line connected at opposite ends to pipes 170 and 172. As the refrigerant from the condenser passes through the meandering line and thereby evaporates, the walls of the plate are cooled below the frezing point of water such that water running on them will freeze. In addition, a fan 184 is provided to create a draft across the condenser. During the defrosting cycle, the compressor is shut off and consequently the circulation of the refrigerant interrupted. Upon completion of the defrosting cycle, the compressor is automatically started and circulation of the refrigerant resumed.

Defrosting means consisting of a resistance wire 150 is disposed along the interior side of each wall of the evaporating plate. An alternate arrangement from that shown in FIGS. 8 and 9 is to contain the resistance wire 150 within the walls of the plate and near the outer surface thereof.

Provided at the upper edge of the evaporator plate is a longitudinal extending tapered member 202 shaped substantially like an isosceles triangle with the base of said triangle flush with the outer side of the walls of the evaporator plate as shown in FIG. 8. The inclined surfaces 198 and 200 of the tapered member are at an angle sufficient to cause the water to flow onto the walls of the evaporator plate in a uniform curtain. As shown in FIG. 9, the lower edge of the evaporator plate is provided with a tapered member 204 which causes the water that did not freeze to the plate to flow into a catch basin 152 disposed below the plate. Necessarily, members 202 and 204 provided at the upper edge and lower edge of the plate, respectively, are formed of a material such as plastic or wood which has a low heat conductivity. An alternate arrangement would be to have the above members formed from the plate itself and provide the inclined surfaces with some suitable insulation.

The catch basin 152 is inclined downwardly toward the sump and connected thereto is a pipe 206 to direct the water dripping from the inclined surfaces at the lower edge of the plate into the sump whereupon it is recirculated through line 190 to the feed pipe. It is important to note that the exterior sides of the catch basin and evaporator plate are in vertical alignment as shown in FIG. 9. This feature is made possible by the aforementioned inclined surfaces provided at the lower edge of the plate which will guide the water into the trough or catch basin instead of letting it fall freely

which would necessitate the provision of a wider trough. Thus, the slabs of ice, shown in dotted outline in FIG. 6, can fall unobstructed into ice sundering means disposed beneath the plate. It should be apparent that this permits the machine to be in a compact unit taking up relatively little space.

The water feed pipe **186** and shield **188** are disposed vertically above the evaporator plate and between support frame members **158** and **160**. The shield is detachably secured to the frame members in order that access may be had to the feed pipe for cleaning purposes. Water lines **190** and **192** connect the feed pipe with the sump unit **156** which is of the same construction and operation as heretofore described. As shown in FIG. 8, the feed pipe is positioned at the upper end of the upright evaporator plate. It is provided with a plurality of upwardly directed holes **194** through which water is sprayed onto the shield. Disposed over the feed pipe is a hollow cylinder or shield which is provided with a longitudinally extending slot which is adapted to permit the shield to be received over the upper end of the evaporator plate with the edges of the slot spaced slightly from the tapered portion of the plate as at **196**. As a result, water spraying from the feed pipe impinges on the inner side of the shield and flows from the shield onto the inclined surfaces of the evaporator plate forming a uniform curtain of water on each wall of the plate. The excess water then flows along the tapered member **204** into the catch basin whereupon it flows to the sump unit and is recirculated.

The ice-sundering means is of the same construction and operation as described in my original application. Briefly, see FIGS. 6 and 7, the motor **207** is mounted on partition **136** and the cylinder **209** is mounted on a shaft **210** supported at opposite ends in bearing **212** in turn supported on partitions **168**. Upon rotation of cylinder **209** the ice is ground and crushed between the cylinder and wall **132** and partition **138**.

Secured to the back wall of the machine, see FIG. 6, or some suitable position, is a "pancake" thermostat **208** which is connected to a double-pole single-throw switch **222**. It is placed a predetermined distance from the evaporator plate which is dependent upon the desired thickness of ice. The various electric motors of the unit are indicated in FIG. 10 as follows: the compressor motor at **214**, the sump pump motor at **216**, the ice crusher motor at **226**, and the condenser fan motor at **224**. It will be noted that the sump pump motor and the compressor motor are electrically connected in parallel, and that the ice crusher motor and the resistance wire or heater coil at **150** are alternatively selectively connected in parallel with the sump pump motor and the compressor motor through the switch **222**. The condenser fan motor at **224** is shown as electrically connected to be operable during both cycles.

With the off-on switch **219** closed, the condenser fan motor is continuously operative while switch **222** will selectively control the operation of the compressor motor, sump pump motor, crusher motor, and resistance wire.

With the throw of switch **222** in contact with lead **220** and with the off-on switch **219** closed, the unit operates to cool the evaporator plate **144** and to deliver water to the feed pipe **186**. With water flowing thereon in a uniform curtain, a sheet of ice builds up on each side of the evaporator plate. When the ice builds up to a sufficient thickness, the extremely cold water contacts thermostat **208** which causes switch **222** to move from lead **220** to lead **218**. As a result, the sump pump and compressor motors are stopped and the resistance wire **150** and crusher motor are energized. With the resistance wire energized, the evaporator plate is warmed to a degree sufficient to defrost the plate with the result that the slabs of ice formed thereon drop therefrom into the crusher whereupon the crushed ice is deposited in the storage receptacle. During the defrosting cycle, the thermostat will be adjusting to a pre-selected temperature, such temperature being higher than that of the cold water running over the plate, which will cause switch **222** to move from lead **218** to lead **220** and the freezing cycle repeats. These cycles may continue indefinitely with crushed ice being removed from the storage receptacle whenever needed by the consumer.

What I claim is:

1. An ice-making machine comprising: a closed housing, an ice storage receptacle at the bottom of the housing having an ice-receiving opening at the top thereof, a refrigeration system in the housing including an upright evaporator plate disposed in vertical alignment with and spaced above said opening, ice-sundering mechanism between the evaporator plate and said opening of storage receptacle to catch and sunder ice dropping from the plate and deposit the sundered ice in the receptacle, a water sump in the housing, water catch means extending along the lower marginal edge of the plate and in discharge communication with the sump to receive water draining off the plate, a pump in communication with the sump, and water discharge means extending along the upper edge of said plate and communicating with the discharge of the pump and having a water discharge outlet disposed to direct the pump discharge onto opposite sides of the plate in thin sheets to form a slab of ice on each side of said plate.

2. In an ice-making machine: a refrigeration system including a vertically disposed evaporator plate having non-freezing tapering surfaces along the upper and lower edges, a re-circulating water system including a sump and sump pump, means extending along the upper edge of the plate to direct water upon the tapering surfaces of the upper edge and communicating with the pump, a trough extending along the lower edge of the plate and coplanar therewith and below the tapering surfaces of the lower edge of the plate and communicating with said sump, said tapering surfaces at the upper edge of the plate causing the water flowing thereon to form a uniform curtain of water over opposite sides of said plate, said tapering surfaces at the lower edge of the plate guiding water inwardly from said plate into said trough, and an ice sunderer disposed vertically below said plate to receive ice dropping therefrom.

3. In an ice-making machine: a refrigeration system including a vertically disposed evaporator plate, said plate having spaced-apart walls, a recirculating water system including a sump and sump pump with means connected to the pump for directing water pumped from said sump onto the evaporator plate, defrosting means including a resistance wire disposed between the walls of said plate, a catch basin disposed vertically below said plate to deliver excess water from the plate to the sump, said means for directing water onto the plate including a water feed pipe within a shield, said plate having non-freezing tapering surfaces along the upper and lower edges, said feed pipe disposed vertically above and adjacent to the upper tapering surfaces, said shield provided with a longitudinally extending slot adapted to be received over the feed pipe, said feed pipe provided with a plurality of holes through which water is sprayed against the interior of said shield and said longitudinally extending slot having its edges spaced from said tapering surfaces to allow water to flow onto said plate.

4. In an ice-making machine: a refrigeration system including a vertically disposed evaporator plate, a re-circulating water system inculding a sump and sump pump, means provided along the upper edge of the plate to direct water upon opposite sides of said plate and communicating with the pump, said plate having tapering surfaces along the lower edge, a trough extending along the lower edge of the plate and coplanar therewith and below said tapering surfaces and communicating with the sump, said tapering surfaces along the lower edge of the plate guiding the water inwardly from said plate

into said trough, and an ice sunderer disposed vertically below said plate to receive ice dropping therefrom.

5. The invention as defined by claim 1 characterized in that said water catch means includes a trough extending along the lower edge of said plate and having a width not greater than the thickness of said plate, and said marginal edge of the plate immediately above the trough having downwardly converging non-freezing surfaces to lead the water inwardly toward the center line of the trough before dropping into the trough.

6. In an ice making machine: a refrigeration system including a vertically disposed evaporator plate having an upper edge and a lower edge, means in communication with a source of water under pressure and disposed adjacent the upper edge of the plate to direct water upon opposite sides of the plate adjacent the upper edge thereof, said plate having downwardly and inwardly tapering surfaces along the lower edge, a water collecting trough extending along the lower edge of the plate co-planar with the plate and disposed below said tapering surfaces,

means in water receiving relation with the trough to remove water from the trough, and said tapering surfaces along the lower edge of the plate being disposed at an angle such that water clings to the surfaces and is guided inwardly from the sides of the plate to drop into said trough.

7. The invention as defined in claim 6 characterized in that said tapering surfaces at the lower edge of the plate are non-freezing surfaces.

8. The invention as defined in claim 6 characterized in that said trough is secured to the plate at opposite ends of the trough.

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