Dec. 4, 1962 A. J. ROSS 3,066,500

APPARATUS FOR PRODUCING AND STORING ICE

Filed April 12, 1960 3 Sheets-Sheet 1

Fig. 1

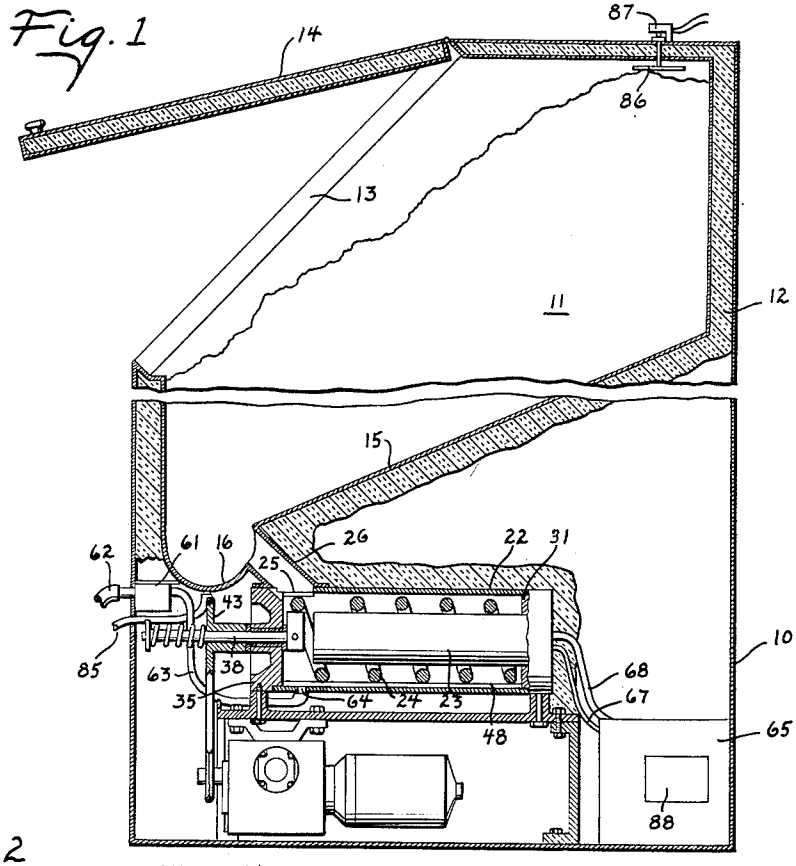
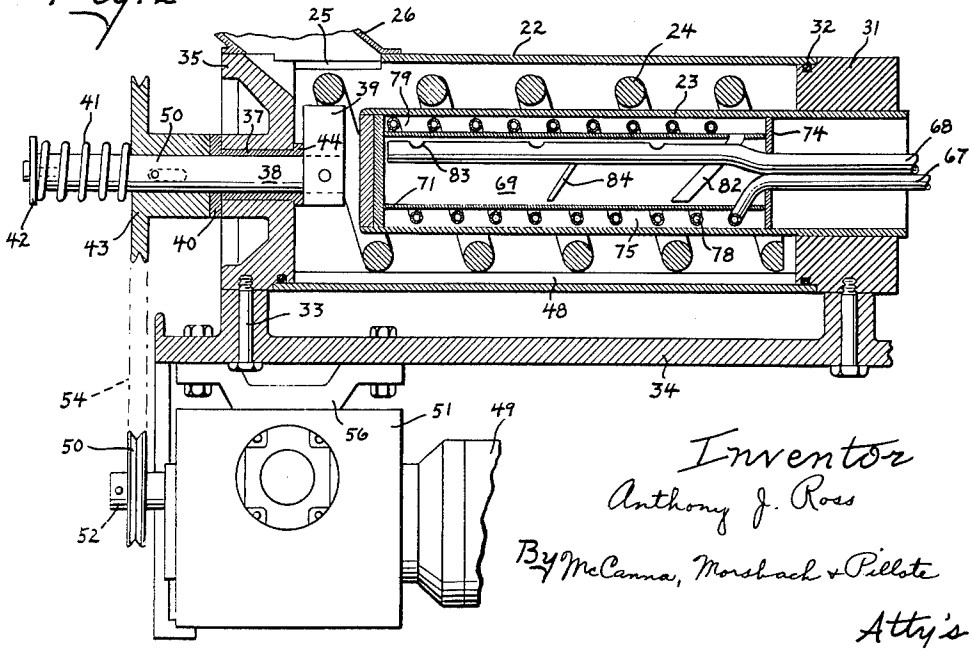


Fig. 2



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Fig. 3

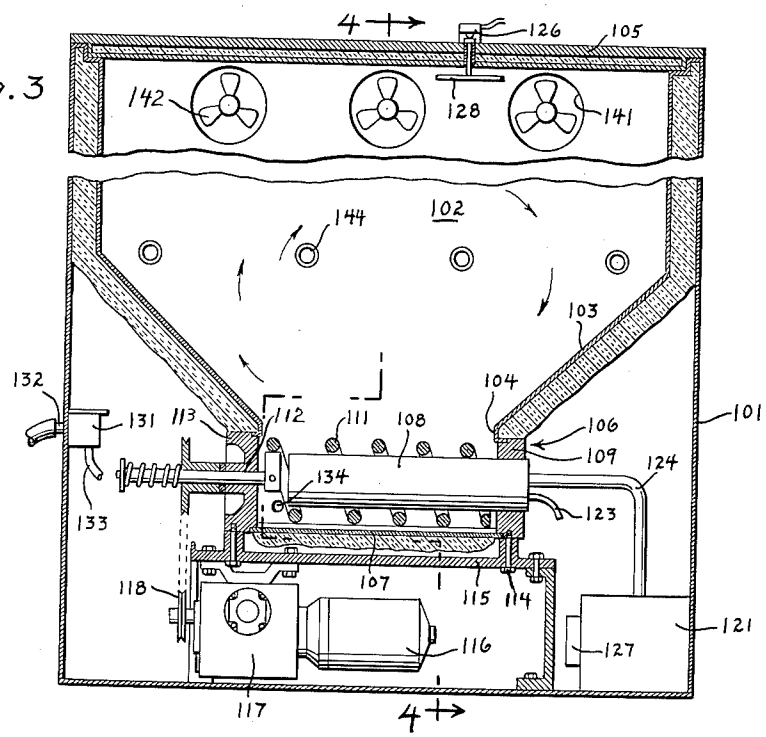
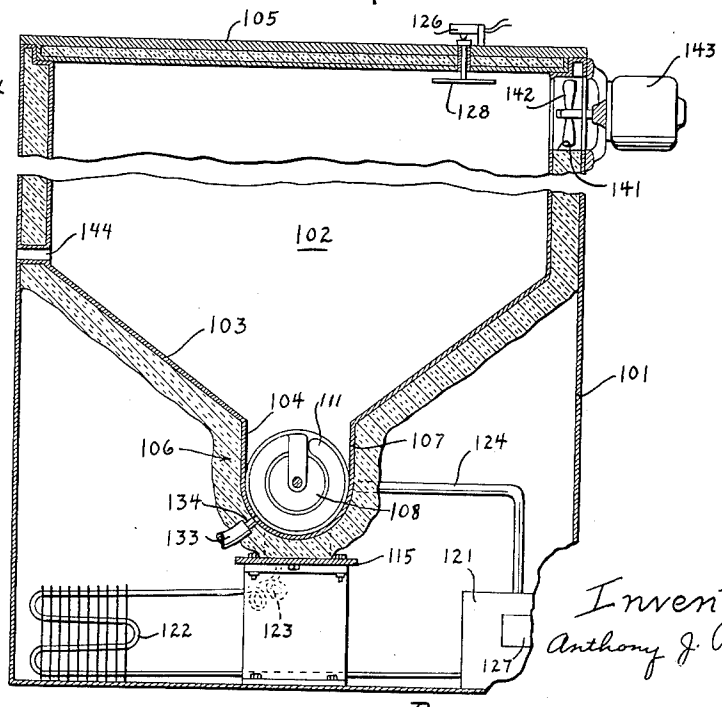


Fig. 4



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Fig. 5

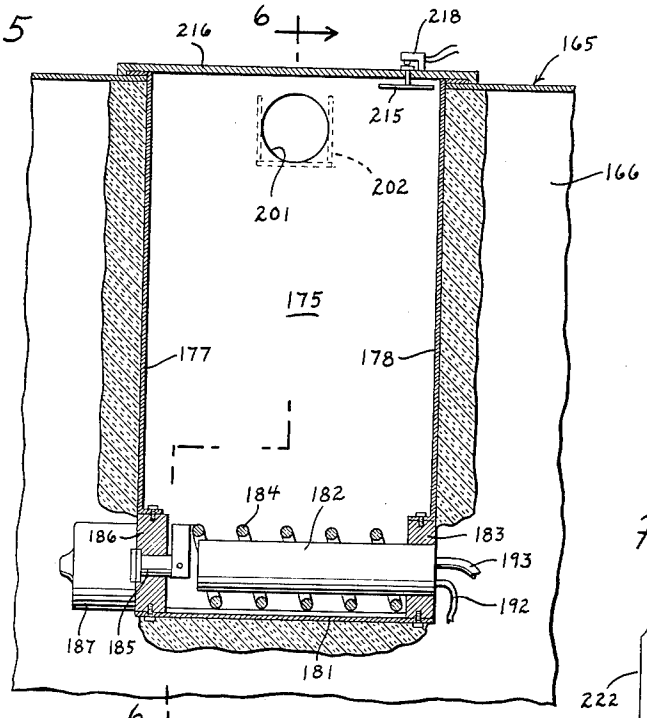


Fig. 6

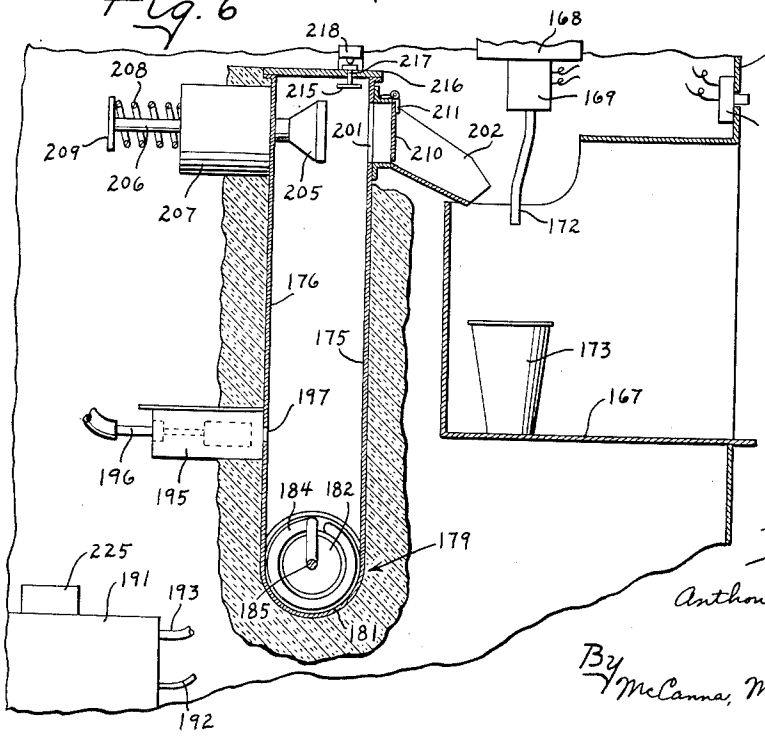
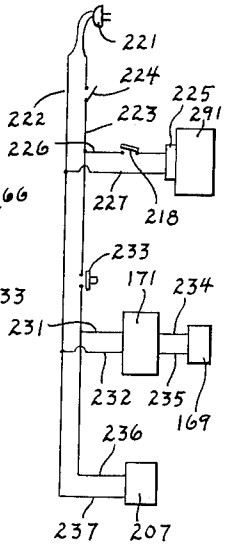


Fig. 7



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APPARATUS FOR PRODUCING AND STORING ICE

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Filed Apr. 12, 1960, Ser. No. 21,688

13 Claims. (Cl. 62—344)

This invention relates to improvements in apparatus for producing and storing ice.

An important object of this invention is to provide an improved apparatus for producing and storing flake ice in which the flake ice is fed into the lower part of a bin and forced upwardly therein to a discharge opening adjacent the upper end of the bin to thereby advance the older flake ice in the bin to the discharge opening and older ice is consumed first.

Another object of this invention is to provide an improved apparatus for producing and storing flake ice in which the liquid which melts and drains back from the bin is refrozen and returned to the bin to thereby eliminate the necessity of an external drain for the ice storage bin.

A further object of this invention is to provide an ice producing and storing apparatus having an improved arrangement for controlling operation of the ice producing apparatus to automatically stop the same when the bin is filled to a preselected level.

Yet another object of this invention is to provide an ice producing and storing apparatus having an improved arrangement for dispensing measured quantities of flake ice from the storage bin.

These, together with various ancillary objects and advantages of this invention will be more readily appreciated as the same becomes better understood by reference to the following detailed description when taken in connection with the accompanying drawings wherein:

FIGURE 1 is a vertical sectional view through an ice producing and storing apparatus;

FIG. 2 is an enlarged sectional view through the flake ice producing head;

FIG. 3 is a vertical sectional view through a modified form of ice producing and storing apparatus used for cooling air;

FIG. 4 is a sectional view taken on the plane 4—4 of FIG. 3;

FIG. 5 is a fragmentary vertical sectional view through a further modified form of ice producing and storing apparatus used in a vending machine;

FIG. 6 is a fragmentary sectional view taken on the plane 6—6 of FIG. 5, and

FIG. 7 is a schematic wiring diagram of the electrical controls for the apparatus of FIGS. 5 and 6.

Reference is now made more specifically to FIGS. 1 and 2 of the drawings wherein there is shown a cabinet 10 having an ice storage bin 11 therein. The bin is suitably insulated as indicated at 12 to minimize melting of the flake ice therein and has an access opening 13 adjacent its upper end through which the ice is removed as needed. A suitable door 14 is hinged or otherwise attached to the cabinet 10 to close the opening in the upper end of the bin. The bottom wall 15 of the bin is preferably sloped downwardly toward a sump 16 to convey a liquid which melts and drains from the flake ice in the bin back to the sump.

It has heretofore been the practice in flake ice apparatus of the above type to produce the flake ice and introduce the same into the top of the bin. This arrangement was not entirely satisfactory since the fresh ice was always located at the top and was, consequently, the first to be removed through the discharge opening 13. During periods when the rate of consumption of the flake ice is low, only the top relatively fresh ice is removed and

the older ice in the lower portion of the bin remains undisturbed. However, when the flake ice is allowed to stand for prolonged periods, its texture and flavor are adversely affected so that when the older ice was eventually removed from the bottom of the bin, it did not always have the same quality as the ice removed from the top. In accordance with the present invention, provision is made for producing the flake ice and for feeding the ice into the lower portion of the bin and upwardly therein so that the fresh ice is at the bottom of the bin and the older ice is advanced upwardly in the bin toward the discharge opening to thereby assure a continuous turnover of the ice in the bin.

The ice making head 21 is of the type disclosed and claimed in my co-pending application, Serial No. 822,516, filed June 24, 1959, and includes an outer casing or jacket 22 and an inner drum-shaped evaporator casing 23 forming a freezing wall. A helical spring type ice removing device 24 extends around the evaporator casing and is rotatable relative thereto to remove the liquid as it freezes on the evaporator wall and to feed the liquid to a discharge opening 25 in the casing 22. In the form shown in FIGS. 1 and 2, the discharge opening 25 is located in the side of the casing 22 adjacent one end thereof and connects with a chute 26 communicating with the storage bin 11 adjacent its lower end.

The evaporator 23 has an enlarged end wall 31 at one end formed with a peripheral recess for receiving the outer casing 22 and is sealed thereto by O-rings 32. An end wall 35 is also provided at the other end of the casing and has a peripheral recess for receiving the other end of the casing and an O-ring 36 for sealing the interface therebetween. The end walls 31 and 35 are detachably secured to a support base 34 by fasteners 33 to enable removal of the end walls for cleaning and repair. The end wall 35 has a bearing 37 for rotatably supporting a drive shaft 38 connected through an arm 39 with one end of the ice removing coil 24. As described more fully in the aforementioned application, the coil 24 is axially expansible and contractible to apply a yieldable pressure in a direction axially of the evaporator wall 23 to remove the ice therefrom in large flakes and, preferably, the shaft 38 is also supported for limited axial sliding movement to permit limited axial shifting movement of the entire helical ice removing screw relative to the evaporator when the coil 24 is rotated in a direction to advance the frozen liquid in a direction to the left as viewed in FIG. 2, the shaft 38 will tend to move to the right and a spring 41 is interposed between a collar 42 on the shaft 38 and a drive pulley 43 to yieldably oppose axial movement of the shaft 38. The pulley 43 is slidably but non-rotatably connected to the shaft by a key 50 and a thrust bearing 40 is disposed between the drive pulley 43 and the head. A thrust collar 44 is disposed around the shaft 38 between the arm 39 and the head 35 to space the arm from the head and maintain a working clearance therebetween. A plurality of strips 48 of wear-resistant material such as nylon are attached to the inner wall of the casing 22 and engage the periphery of the ice removing screw 24 to radially support the same while permitting free axial movement of the screw. As shown, the screw is driven from a motor 49 through a gear reducer 51, the output shaft 52 which has a pulley 53 connected through a belt 54 to the pulley 43 on the shaft 38. The motor and gear reducer are conveniently supported at the underside of the base 34 by a bracket 56.

Liquid is supplied to the outer casing 22 under the control of a float valve 61 having an inlet 62 and an outlet connected through a tube 63 to a fitting 64 on the outer casing. The float valve is adjusted to maintain a liquid

level in the outer casing above the evaporator 23 so that liquid freezes on the evaporator walls substantially uniformly therearound. Refrigerant is supplied to the evaporator from a refrigerating mechanism diagrammatically indicated at 65 and which includes the conventional compressor, condenser, and expansion control such as the capillary tube 67. Liquefied refrigerant is supplied from the capillary tube 67 to the interior of the evaporator casing 23 and the gaseous refrigerant is returned from the evaporator through a return conduit 68 to the refrigerating mechanism 65.

As shown in FIG. 2, an accumulator chamber 69 is mounted within the evaporator casing 63. The accumulator 69 includes a tubular shell 71 which abuts at one end against a thermal insulating disk 72 of rubber or the like which underlies the end wall 23*a* of the evaporator casing. The disk 72 minimizes the cooling of the end wall 23*a*, to prevent freezing of the liquid thereon, and also seals the end of the accumulator chamber 69. The other end of the accumulator chamber has a disk 74 attached thereto and sealed to the walls of the evaporator casing 23 to separate the accumulator chamber 69 from the surrounding freezing chamber 75. The liquefied refrigerant from the capillary tube 67 flows through a helical tube 78 disposed between the accumulator shell 71 and the casing 23, and the tube has a plurality of discharge openings 79 adjacent its other end to pass the liquefied refrigerant into the freezing chamber 75. The refrigerant passing out through the opening 79 flows in a helical path between the convolutions of the coil 78 to a point adjacent the right hand end of the freezing chamber. The refrigerant from the refrigeration chamber 75 then passes through a tube 82 into the accumulator chamber 69 and preferably to a point adjacent the lower side thereof as shown in FIG. 2 to agitate the liquid in the accumulator chamber and prevent the oil from settling out. The return line 68 has a plurality of openings 83 at longitudinally spaced points therealong and which communicate with the interior of the accumulator chamber adjacent its upper side to return the gaseous refrigerant back to the refrigeration mechanism. An aspirator tube 84 is preferably connected to the return line and has it inlet opening adjacent the underside of the accumulator chamber to return any oil which collects therein. Thus, when the refrigerating mechanism 65 is operated, the evaporator casing 23 is refrigerated and cooled substantially uniformly therealong.

In the embodiment shown in FIGS. 1 and 2, the discharge opening 26 communicates with the ice storage bin 11 adjacent the bottom thereof, but at a point spaced somewhat above the bottom of the sump 16. With this arrangement, substantially all of the liquid which drains from the ice in the bin 11 will flow back to the sump 16 and will not be returned to the freezing head 21. A drain line 85 is arranged to communicate with the sump 16 and extends to an external drain. This arrangement is suitable for those applications in which contamination may be introduced into the ice in the bin, as by the user when he scoops out ice through the bin opening 13. The contaminated liquid can flow back to the sump 16 and will not pass into the freezing head. However, in those applications where contamination of the ice in the bin is avoided, it is preferable to communicate the freezer head 21 with the lowermost portion of the bin so that the liquid which melts and drains back from the ice in the bin can be refrozen. Since this water is at substantially 32°, the refreezing of the water which melts increases the overall efficiency of the machine. More importantly, however, it eliminates the necessity of a separate external drain such as 85.

An improved apparatus is provided for controlling the operation of the refrigerating apparatus 65, when the ice in the bin reaches a preselected upper level. As previously described, the flake ice is forced upwardly in the bin by the ice producing apparatus and the refrigeration control is arranged to contact the ice in the bin and to be pushed upwardly thereby when the ice reaches a preselected level. As shown in FIG. 1, the control includes an ice contacting blade or plate 86 disposed in the bin 11 adjacent its upper end and which is operated by the pressure exerted by the ice in the bin as the ice is forced upwardly by the freezing head. The blade contacts the upper level of the ice and operates a control switch 87. The control switch 87 is connected to a conventional control relay 88 to stop the refrigerating mechanism 65 when the switch 87 is actuated. As the ice is consumed from the bin, it falls away from the blade 86 and deactuates the switch to allow the refrigeration mechanism to restart.

A modified form of apparatus suitable for cooling and humidifying air is shown in FIGS. 3 and 4 and includes a cabinet 101 having a flake ice storage bin 102 therein. The bottom wall 103 of the bin converges to an elongated opening 104 and a cover 105 overlies the top of the bin.

The refrigerating head 106 may conveniently be of the same general type as shown in FIGS. 1 and 2 and includes a casing 107 having circular ends and an elongated opening along one side thereof communicating with the bottom opening 104 in the bin. The evaporator casing 108 is supported on an end wall 109 at one end of the casing 107 and the helical ice removing screw 111 is rotatably supported in a bearing 112 on an end wall 113 located at the other end of the casing 107. As in the preceding embodiment, the end walls 109 and 113 are detachably secured by fasteners 114 on a base 115 and the screw is driven by a motor 116 through a gear reducer 117 and drive 118. Refrigerant is supplied to the evaporator casing 108 from a refrigeration apparatus including a compressor 121, the output of which is connected to a condenser 122 (FIG. 4). The liquefied refrigerant from the condenser passes through an expansion control device such as a capillary tube 123 to the evaporator and the gaseous refrigerant from the evaporator is returned to the compressor through a return line 124. As in the preceding embodiment, the refrigerating mechanism is also preferably controlled by a pressure operating switch 126 connected to a control relay 127 for the compressor. The switch has an ice engaging blade 128 arranged to be contacted by the ice when it reaches a preselected upper level to actuate the switch 126 and stop the compressor. Liquid is supplied to the outer casing 107 under the control of a float valve 131 having an inlet 132 and an outlet 133 connected to an opening 134 (FIG. 4) in the outer casing 107. Preferably, the liquid level maintained by the float 131 is just above the top of the evaporator casing 108.

The arrangement shown in FIGS. 3 and 4 for feeding the flake ice to the bin has advantages in certain installations over that shown in the embodiment of FIGS. 1 and 2. In the embodiment of FIGS. 3 and 4, the casing 107 communicates with the underside of the bin 102 so that the ice which melts and drains back from the bin 102 is conveyed to the freezer head and is refrozen and returned to the bin. In addition, the use of the elongated opening in the side of the casing 107 enables the ice which is removed from the evaporator wall 108 to pass more rapidly out of the liquid in the outer casing to produce a somewhat drier type flake ice than can be achieved when the ice is fed only from the end of the casing. More importantly, the helical ice removing screw 111 is exposed along the upper side thereof to the ice in the bin 102 and this materially enhances the feeding of the flake ice upwardly into the bin. In practice it has been found that when the screw 111 is rotated in a direction to advance the ice along the evaporator wall 108 in a direction to the left as viewed in FIG. 3, the ice mass in the bin will slowly circulate upwardly in the bin in a generally clockwise direction as indicated by the arrows

in FIG. 3 with the helical screw functioning somewhat in the manner of a worm gear driving a worm wheel.

The apparatus shown in FIGS. 3 and 4 is specifically designed for use in cooling railroad cars and trucks which are used for hauling vegetables and the like. In such applications, it is desired to provide a cool moist atmosphere for the vegetables to maintain the vegetables fresh and prevent dehydration of the vegetables. This is achieved by the provision of one or more openings 141 in the side of the bin preferably adjacent its upper end and each having a fan 142 disposed therein and driven as by a motor 143. Air inlet openings 144 are provided at spaced points around the bin. When the fan motors 143 are energized, the fans draw air through the mass of flake ice in the bin 102 to cool and moisturize the air. The flake ice melts and drains back to the freezing head 106. In order to augment the moisture in the car or truck, the fans 142 can be so arranged as to contact the ice mass in the bin 142 and feed small particles of ice with the air drawn through the bin. The control 128 and switch 126 are advantageously mounted so as to maintain the ice level in the bin above the openings 141 to assure proper cooling of the air as it passes through the bin.

A further modified form of the apparatus is shown in FIGS. 5–7. This apparatus is shown applied to a drink vending machine 165 of any suitable construction and which includes a housing 166 having a dispensing compartment 167 at one side. The drink may be dispensed into the compartment in any suitable manner and, as shown in FIGS. 6 and 7, is dispensed from a reservoir 168 through a solenoid operated valve 169 controlled by a timer 171. The timer is arranged to energize the solenoid 169 and dispense a measured quantity of liquid through the tube 172 into a cup 173 at the dispensing station 167.

The ice producing and storing apparatus is arranged to dispense measured quantities of ice into the cups 173. The machine includes a bin having spaced side walls 175 and 176 and end walls 177 and 178. The ice making head 179 includes a semi-cylindrical outer casing 181 which communicates with the bottom of the bin, and as herein shown, formed integrally therewith. The evaporator casing 182 is supported by a head 183 on one end wall 178 and a helical spring-type ice removing screw 184 is rotatably supported on a shaft 185 carried by a head 186 mounted in the other end wall 177. A drive motor 187 is attached to the head 186 and is connected to the shaft 185 to rotate the screw relative to the evaporator casing. The evaporator casing 182 is cooled by a conventional refrigerating mechanism 191 having the usual compressor, condenser and expansion control and which is connected to the evaporator casing through inlet and return conduits 192 and 193 respectively. Liquid is supplied to the outer casing 181 under the control of a float valve 195 having an inlet 196 and an outlet 197. The float valve maintains the liquid level in the casing at a level somewhat above the evaporator casing 182 to immerse the latter in the liquid to be frozen.

As the screw 184 rotates relative to the evaporator 182, it strips the ice off the evaporator and feeds the ice upwardly into the bin. Since the side of the outer casing 181 is open throughout the length of the screw 184, the screw contacts the ice mass in the bin and tends to cause the mass to rotate. When the screw is rotated in a direction to advance the ice toward the left as shown in FIG. 5, the ice mass is given a clockwise rotation in the bin. A discharge opening 201 is formed in one side 175 of the bin at a point spaced above the freezer head 179 and a chute 202 communicates with the opening for conveying the frozen liquid to the cup 173 at the dispensing station 167. Measured quantities of ice are dispensed by a plunger 205 which is mounted on a rod 206 for reciprocation crosswise of the bin toward and away from the discharge opening 201. As shown, the plunger is extended by means of a solenoid 207 and is retracted by a spring 208 interposed between the solenoid housing and a cap 209 on the shaft 206. When the plunger is extended, a cylindrical plug of ice in advance of the plunger is pushed out of the bin and into the chute 202. The amount of ice dispensed is thus controlled by the spacing between the plunger 205 and the discharge opening and may be selectively increased or decreased as desired. As the plunger is retracted, it engages the ice mass around the periphery of the plunger sufficient to agitate the same and allow the ice to fall into the open void in front of the plunger. Consequently, the plunger can be operated for a succeeding dispensing operation shortly after the completion of one dispensing cycle. A gate 210 is advantageously provided adjacent the outlet opening 201 and yieldably urged to a position closing said opening by gravity, or by a spring such as 211. The "plug" of ice advanced by the plunger 205 through the discharge opening moves the gate to an open position. However, the gate functions as a yieldable abutment and the ice "plug" is compressed somewhat between the gate and the plunger to form a relatively compact mass which readily slides down the chute into the cup 173.

As in the preceding embodiments, provision is made for automatically controlling operation of the refrigeration mechanism in accordance with the level of ice in the bin. A blade 215 is disposed within the bin to engage the ice therein and is mounted for vertical sliding movement in a cover 216 on the bin. A head is provided at the outer end of the rod 217 to engage the switch 218. This switch is connected to the refrigeration mechanism in a manner described more fully hereinafter to interrupt operation of the refrigeration mechanism when the bin is filled, and to automatically restart the refrigeration mechanism when the ice level in the bin drops away from the blade 215. Preferably, the blade 215 is positioned closely adjacent the discharge opening 201 so that the refrigeration mechanism is automatically restarted when the plunger is retracted and the ice around the plunger drops into the void in advance of the plunger.

The electrical controls for the vending machine shown in FIGS. 5 and 6 is diagrammatically indicated in FIG. 7. As shown in FIG. 7, the machine is arranged for connection to a suitable source of power as by an electrical connector 221 and power is supplied to the power conductors 222 and 223 through a main switch 224. The control relay 225 of the refrigeration apparatus 191 is connected through conductors 226 and 227 and normally closed control switch 218 to the power conductors 222 and 223 to energize the refrigeration apparatus when the ice in the bin is below a preselected level. The dispenser control timer 171 is connected to the power conductors through conductors 231 and 232 and normally open dispense switch 233. The timer is operated in response to closing of the dispense switch 233 and energizes the dispense solenoid 169 through conductors 234 and 235 for a time interval determined by the timer to thereby dispense a measured quantity of liquid into the cup 173. The flake ice dispense solenoid 207 may also conveniently be connected through conductors 236 and 237 in parallel with the timer 171 so as to be energized when the dispense switch 233 is closed. This operates the solenoid 207 to discharge a preselected quantity of ice from the bin and through the chute 202 into the cup 173.

From the foregoing it is thought that the operation and construction of the device will be readily understood. In general, the helical ice removing screw is operative to remove the ice from the evaporator casing and, since the ice making head communicates with the bin adjacent its lower end, the flake ice is forced from the ice making head upwardly in the bin to feed the older ice to the top of the bin. Where, as in the forms shown in FIGS. 3 and 5, the ice making head communicates with the lowermost portion of the bin, the liquid which melts in the bin

and drains back is refrozen by the head and returned to the bin.

I claim:

1. A flake ice producing and storing apparatus comprising a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head including an outer casing located below said bin and having a discharge opening communicating with the bin adjacent the lower end thereof for the passage of frozen liquid from the freezing head to the bin and for the return flow of liquid which melts and drains from the bin, said freezing head including a drum-shaped evaporator shell in said casing and a helical axially expansible and contractible ice removing coil surrounding the evaporator shell, means for supplying liquid to be frozen to the outer surface of said shell and for maintaining the liquid level above said freezing wall and substantially below said outlet opening in the bin to allow the liquid on the flake ice in the bin to drain therefrom, means for refrigerating said shell to freeze a layer of liquid thereon, and means for rotating said helical coil relative to said evaporator shell to remove the frozen liquid therefrom and force the frozen liquid out through said discharge opening and upwardly into said bin.

2. An air cooling apparatus comprising, a bin for receiving frozen liquid, said bin having inlet and outlet openings therein, a freezing head including an outer casing located below said bin and having a discharge opening communicating with the lower end of the bin for the passage of frozen liquid from the freezing head to the bin and for the return flow of liquid which melts and drains back from the bin, said freezing head including a drum-shaped freezing wall in said casing and a helical axially expansible and contractible ice removing coil surrounding said freezing wall, means for maintaining a preselected liquid level in said casing, means for refrigerating said freezing wall to freeze a layer of liquid thereon, means for rotating said helical ice removing coil relative to said evaporator to remove the frozen liquid therefrom and to force the frozen liquid out through said discharge opening and upwardly into the bin, and means including a fan for forcing air from said air inlet through the frozen liquid in the bin and out through said air outlet opening.

3. The combination of claim 2 wherein said freezing head is disposed horizontally and said discharge opening extends along the side of said casing.

4. A flake ice producing, storing and dispensing apparatus comprising, a bin for receiving and storing a quantity of flake ice, said bin having an outlet opening therein spaced above its lower end, a freezing head including an outer casing located below the bin and having a discharge opening communicating with the lower end of the bin for the passage of frozen liquid from the freezing head to the bin and for the return flow of liquid which melts and drains back from the bin, said freezing head including a drum-shaped freezing wall in said casing and a helical axially expansible and contractible ice removing coil surrounding said freezing wall, means for supplying liquid to said freezing wall and for maintaining the liquid level substantially below said outlet opening in the bin to allow liquid in the bin to drain therefrom, means for refrigerating said freezing wall to freeze a layer of liquid thereon, means for rotating said ice removing coil to remove the flakes of ice from the freezing wall and to force the flake ice out through said discharge opening and upwardly into said bin, and means for dispensing preselected quantities of flake ice from said bin out through said outlet opening.

5. A flake ice producing, storing and dispensing apparatus comprising, a bin for receiving and storing a quantity of flake ice, said bin having an outlet opening therein spaced above its lower end, a freezing head including an outer casing located below the bin and having a discharge opening communicating with the lower end of the bin for the passage of frozen liquid from the freezing head to the bin and for the return flow of liquid which melts and drains back from the bin, said freezing head including a drum-shaped freezing wall in said casing and a helical axially expansible and contractible ice removing coil surrounding said freezing wall, means for supplying liquid to said freezing wall and for maintaining the liquid level substantially below said outlet opening in the bin to allow liquid in the bin to drain therefrom, means for refrigerating said freezing wall to freeze a layer of liquid thereon, means for rotating said ice removing coil to remove the flakes of ice from the freezing wall and to force the flake ice out through said discharge opening and upwardly into said bin, and means including a plunger in said bin movable toward and away from said outlet opening for dispensing measured quantities of ice from said bin.

6. The combination of claim 5 including means extending crosswise of said outlet opening for yieldably opposing movement of ice therethrough to thereby compress the ice dispensed through said opening by said plunger.

7. The combination of claim 5 including switch means in said bin operated in response to the pressure exerted by the flake ice when the latter reaches a level above said outlet opening for interrupting operation of said refrigerating means.

8. An apparatus for producing and storing flake ice comprising, a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head having a flake ice discharge opening communicating with said bin adjacent the lower end thereof, said freezing head including a drum shaped freezing wall and a rotary ice removing device mounted for rotation relative to said wall, means for refrigerating said wall, means for supplying liquid to be frozen to said wall and for maintaining the upper liquid level above said freezing wall and substantially below said outlet opening in said bin to allow the liquid in the flake ice to drain therefrom, means for rotating said rotary ice removing device relative to said freezing wall to remove frozen liquid therefrom and to force the separated flake ice out of the discharge opening and upwardly into said bin.

9. An apparatus for producing and storing flake ice comprising, a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head having a flake ice discharge opening communicating with said bin adjacent the lower end thereof, said freezing head including a drum shaped freezing wall and a rotary ice removing device mounted for rotation relative to said wall, means for refrigerating said wall, means for supplying liquid to be frozen to said wall and for maintaining the upper liquid level above said freezing wall and substantially below said outlet opening in said bin to allow the liquid in the flake ice to drain therefrom, means for rotating said rotary ice removing device relative to said freezing wall to remove frozen liquid therefrom and to force the separated flake ice out of the discharge opening and upwardly into said bin, switch means controlling operation of said refrigeration means, means including a movable ice engaging element positioned in said bin adjacent the upper end thereof and operative in response to the pressure exerted thereon by the flake ice as it moves upwardly in the bin for operating said switch to stop said refrigerating means when the flake ice reaches a preselected upper level in the bin.

10. An apparatus for producing and storing flake ice comprising, a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head having a flake ice discharge opening communicating with said bin adjacent the lower end thereof, said freezing head including a drum shaped freezing wall and a rotary ice removing device mounted for rotation relative to said wall, means

for refrigerating said wall, means for supplying liquid to be frozen to said wall and for maintaining the upper liquid level above said freezing wall and substantially below said outlet opening in said bin to allow the liquid in the flake ice to drain therefrom, means for rotating said rotary ice removing device relative to said freezing wall to remove frozen liquid therefrom and to force the separated flake ice out of the discharge opening and upwardly into said bin, and means for dispensing measured charges of flake ice through said outlet opening, said dispensing means including a flake ice pusher in said bin movable toward and away from said outlet opening, and selectively operable means for moving the flake ice pusher toward said opening to move a quantity of flakee ice in front of said flake ice pusher from the bin and through said opening.

11. An apparatus for producing and storing flake ice comprising, a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head having a flake ice discharge opening communicating with the lowermost portion of said bin whereby melted ice in the bin drains back to the freezing head to be refrozen, said freezing head including a drum shaped freezing wall and a rotary ice removing device mounted for rotation relative to said wall, means for refrigerating said wall, means for supplying liquid to be frozen to said wall and for maintaining the liquid level above said freezing wall and substantially below said outlet opening in the bin to allow liquid in the flake ice to drain therefrom, means for rotating said rotary ice removing device relative to said freezing wall to remove frozen liquid therefrom and to force the flake ice out of the discharge opening and upwardly into said bin.

12. The combination of claim 11 wherein said freezing head including said drum shaped freezing wall and said rotary ice removing device is disposed generally horizontally and said discharge opening is located adjacent one end of said freezing head.

13. The combination of claim 11 wherein said freezing head including said drum shaped freezing wall and said rotary ice removing device is disposed generally horizontally and said discharge opening extends along the side of said freezing head throughout a major portion of the axial length of said rotary ice removing device.

14. The combination of claim 13 wherein said rotary ice removing device has a helical configuration.

15. An apparatus for producing and storing flake ice comprising, a freezing head including a drum shaped casing having a discharge opening in one side thereof, a drum shaped evaporator shell in said casing defining a chamber therebetween, a bin connected to said casing around said discharge opening and extending upwardly therefrom for receiving and storing a quantity of flake ice, said bin having an outlet opening therein spaced above the bottom thereof, a rotary ice removing device extending around said evaporator shell and mounted for rotation relative thereto, means for refrigerating said evaporator shell, means for supplying liquid to be frozen to said evaporator shell and for maintaining the liquid level in the bin above said shell and substantially below said outlet opening in the bin to allow liquid in the flake ice in the bin to drain therefrom, means for rotating said rotary ice removing device relative to said shell to remove frozen liquid therefrom and to force the frozen liquid through the discharge opening and upwardly into said bin.

16. An apparatus for producing, storing and dispensing flake ice comprising, a bin for receiving and storing a quantity of flake ice, said bin having an outlet opening at one side thereof, a freezing head having a flake ice discharge opening communicating with said bin for feeding flake ice thereto, said freezing head including a freezing wall and an ice removing device for removing layers of frozen liquid from said wall, means for refrigerating said wall, means for supplying water to be frozen to said wall, means for driving said ice removing device to remove frozen liquid from the wall and to feed the flake ice to the bin, and means for dispensing measured quantities of flake ice from said bin, said dispensing means including a flake ice pusher in said bin movable toward and away from said discharge opening, and selectively operable means for moving said flake ice pusher toward said opening to move a charge of flake ice from the bin through said outlet opening.

17. An apparatus for producing, storing and dispensing flake ice comprising, a bin for receiving and storing a quantity of flake ice, said bin having an outlet opening at one side thereof, a freezing head having a flake ice discharge opening communicating with said bin for feeding flake ice thereto, said freezing head including a freezing wall and an ice removing device for removing layers of frozen liquid from the wall, means for refrigerating said wall, means for supplying water to be frozen to said wall, means for driving said ice removing device to remove frozen liquid from the wall and to feed the flake ice to the bin, means for dispensing measured quantities of flake ice from the bin, said dispensing means including a flake ice pusher in said bin movable toward and away from said discharge opening, selectively operable means for moving said pusher toward said opening to move a charge of flake ice from the bin through said outlet opening, and a gate extending across said outlet opening and yieldably movable to a position uncovering said outlet opening in response to pressure exerted thereon by an ice charge advanced by said pusher whereby to compact the ice charge as it moves out of said outlet opening.

18. An apparatus for producing and storing flake ice comprising, a bin for receiving and storing a quantity of flake ice and having an outlet opening spaced above the bottom thereof, a freezing head including an outer casing having a flake ice discharge opening communicating with said bin adjacent the lower end thereof, said freezing head including a drum-shaped freezing wall in said casing and a helical ice removing coil surrounding said freezing wall and mounted for rotation relative to said wall, means for refrigerating said wall, means for supplying liquid to be frozen to said wall and for maintaining the upper liquid level above said freezing wall and substantially below said outlet opening in said bin to allow the liquid in the flake ice to drain therefrom, means for rotating said helical ice removing coil relative to said wall to remove frozen liquid therefrom and to force the separated flake ice out of the discharge opening and upwardly into said bin, said casing being disposed generally horizontally, and a plurality of strips extending generally longitudinally of said casing and engaging the outer periphery of said ice removing coil to radially support the same.

References Cited in the file of this patent

UNITED STATES PATENTS

2,340,721	Whitney	Feb. 1, 1944
2,374,997	Hill	May 1, 1945
2,639,594	Watt	May 26, 1953
2,724,949	Kattis	Mar. 29, 1955
2,877,632	Chaplik	Mar. 17, 1959

FOREIGN PATENTS

220,263	Australia	Feb. 12, 1959
409,499	Great Britain	May 3, 1934

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,066,500 December 4, 1962

Anthony J. Ross

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 7, line 26, after "having" insert -- air --; column 9, line 15, for "flakee" read -- flake --.

Signed and sealed this 21st day of May 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents