Feb. 6, 1962 W. J. JAEGER 3,019,612

ICE CUBE MAKING MACHINE

Filed Dec. 9, 1957 4 Sheets-Sheet 1

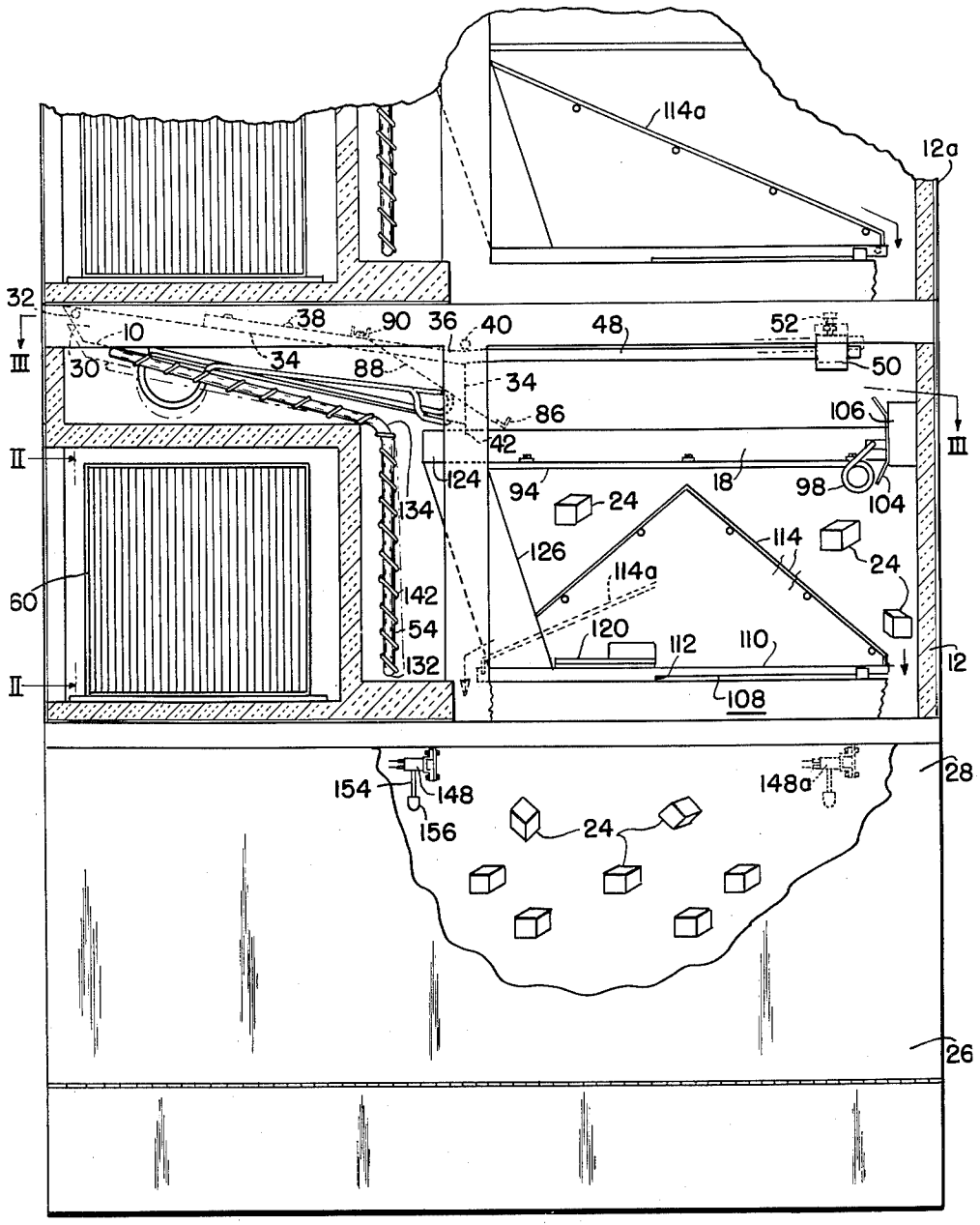


Fig. 1

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ICE CUBE MAKING MACHINE

Filed Dec. 9, 1957 4 Sheets-Sheet 2

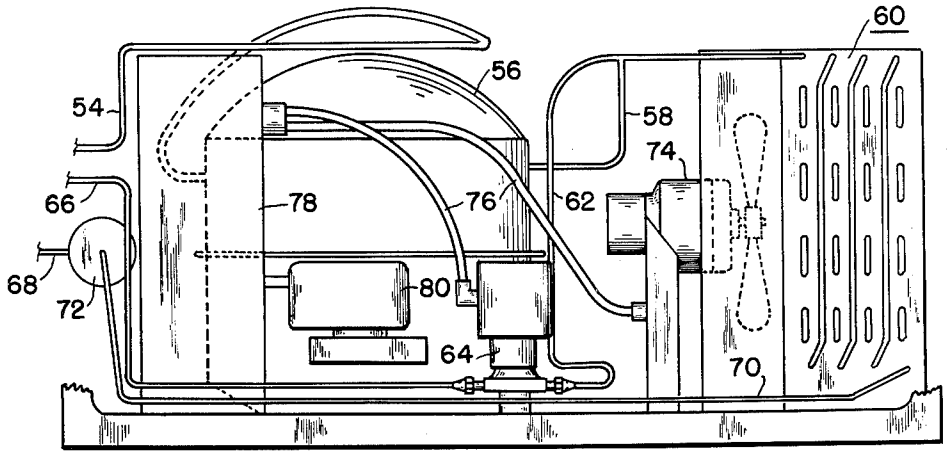


Fig. 2

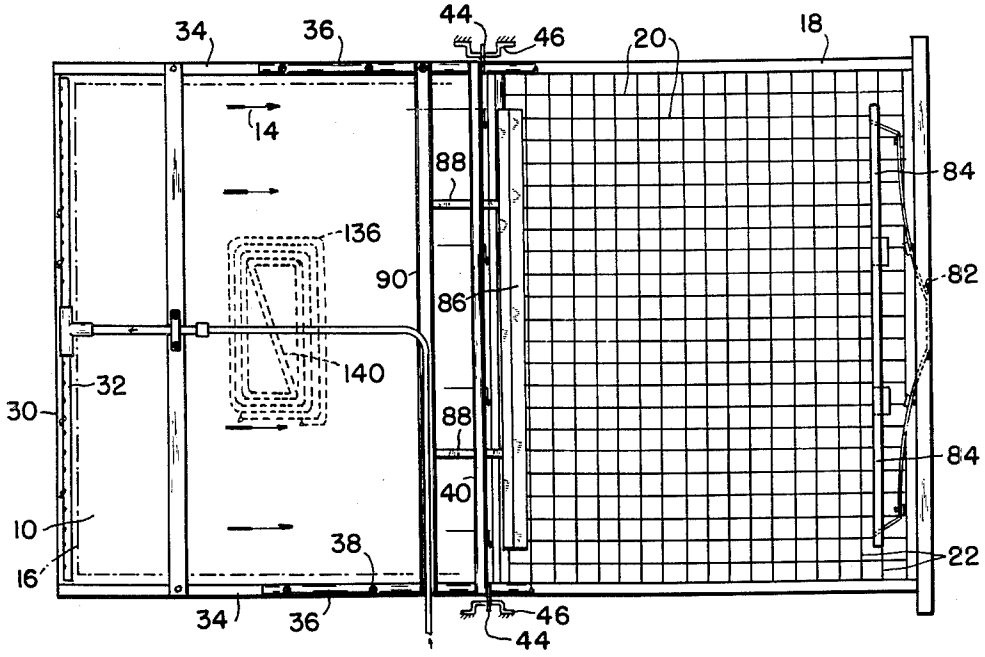


Fig. 3

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Feb. 6, 1962 W. J. JAEGER 3,019,612

ICE CUBE MAKING MACHINE

Filed Dec. 9, 1957 4 Sheets-Sheet 3

Fig. 4

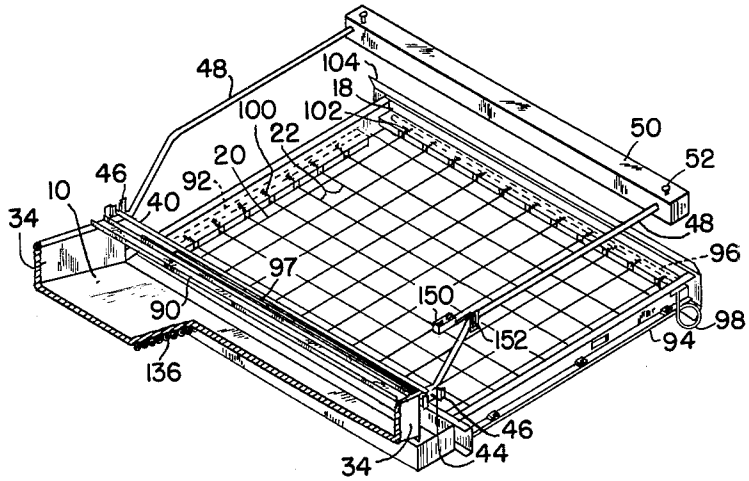
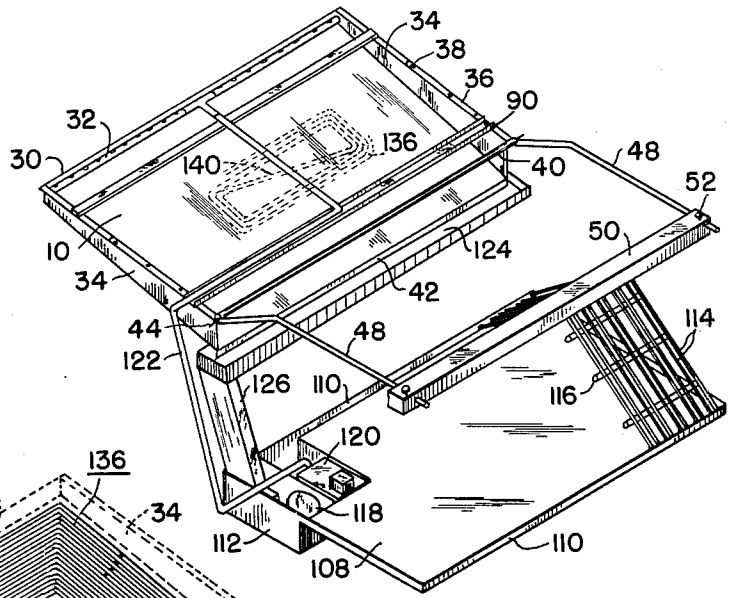


Fig. 5



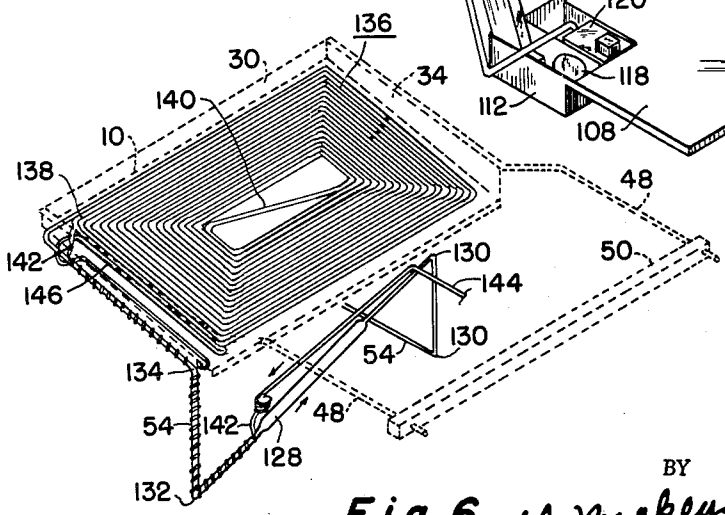


Fig. 6

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Feb. 6, 1962 W. J. JAEGER 3,019,612

ICE CUBE MAKING MACHINE

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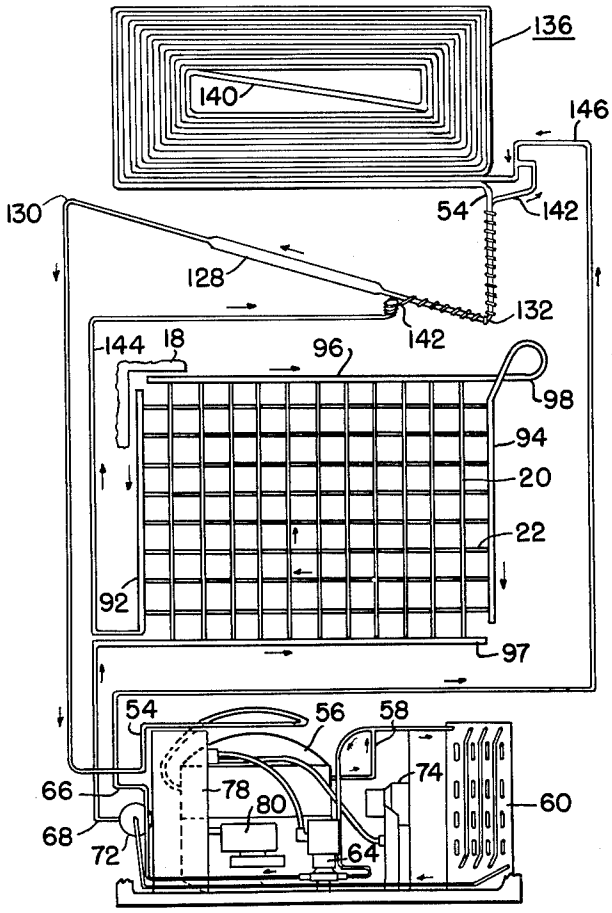


Fig. 7

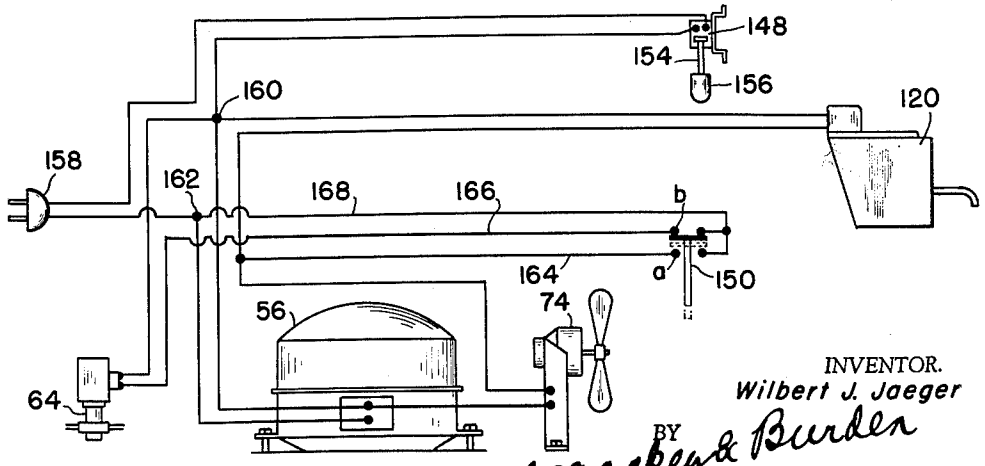


Fig. 8

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United States Patent Office

3,019,612
Patented Feb. 6, 1962

3,019,612

ICE CUBE MAKING MACHINE

Wilbert J. Jaeger, Orange, Calif., assignor to Carbonic Dispenser, Inc., of California, Norwalk, Calif., a corporation of California

Filed Dec. 9, 1957, Ser. No. 701,587
19 Claims. (Cl. 62—66)

This invention relates to an ice cube making machine, and more particularly, to an ice cube machine in which the cubes undergo three steps in the making thereof: first, the step of formation of an ice slab to be cubed, second, the step of dividing the ice slab into cubes, and third, the step of depositing the cubes in a storage bin, all steps being performed automatically and repetitively.

Hitherto known ice freezing and ice cube making machines conventionally employ a series of cooperating components principally consisting of a reservoir tank in which water to be frozen is relieved of dissolved gases, a chilled evaporator plate across which the deaerated water is pumped to build into an ice slab, a cube former which usually involves a grid of hot cutter elements for dividing the slab into separate cubes, and finally, an insulated bin in which the resulting cubes are stored. One or several distinct disadvantages are present in the usual ice cube making apparatus, and as applies to certain types which sense proper thickness of the slab indirectly, they do so in a difficult manner by means of a spot test whereby a thermostat bulb detects the ice thickness at one fixed point only by making direct contact with the growing slab of ice. They accomplish the recycling by making the controls dependent on the chilling of the bulb but this manner of doing so is an indirect way at best to detect the ice and there is no assurance that the ice detected has generalized thickness overall. Moreover, after the formed ice is thawed to break the bond adhering it to the freezing plate, conventional machines employ a relatively large pull-down time to rechill the plate on reinitating each freezing cycle and thus the freezing cycle is proportionately longer with no attempt being made to short cut or reduce that temporarily overloaded condition of the apparatus as it labors incident to the temperature pull-down reqpirement.

Also, the fact must be taken into account that with conventional machines, this appreciable pull-down period follows a preliminary delay period during which the thermostat bulb must reheat and restart the refrigerating cycle, but this thermostat bulb lag accounts for a finite period of time lag even where artificially heated to reduce that lag. Finally, conventional grid type cutters are usually externally heated from a source of electric power and the power is wasted and never recovered during the cycle and furthermore, the cutters are usually left energized so that during the refrigerating cycle they shine on the stored ice cube and are actually using the waste power as a detriment.

The present invention provides a novel arrangement for ice making apparatus which substantially eliminates or materially reduces each of the foregoing disadvantages. More particularly, a conventional compressor and condenser are employed in this apparatus in which, in addition, a freezer plate that receives refrigerant therefrom and a cube cutter are also provided so as to occupy their

usual mutually laterally offset relationship, but in which according to this novel arrangement, the plate is capable of limited movement to adjust to the ice mass being formed. Therefore, there is available a tangible mechanical motion for directly actuating and defrosting the plate in dependence on the physical quantity of ice directly carried thereby. It is worthwhile to note that this direct acting control avoids the tendency toward sticking switches and avoids the need for precise initial adjustment and repeated attention in service characteristic of some indirect controls of the type referred to.

According to an important feature provided by the invention, the condenser is connected to the plate through a hot tube cutter and, therefore, each time that the unit recycles itself after freeing a slab so as to require rechilling the empty plate, the cutter acts as heat receiver in the system for the temporary overload heat and, thus, the pull-down time is materially reduced because of the excess heat being dissipated by the ice being cut. The advantages of a system of this general approach are discussed in detail in copending Jaeger application, Serial No. 511,674, filed May 27, 1955 and now U.S. Patent No. 2,834,189.

The noted overload heat in the instant apparatus, does not persist materially past the point at which the ice is completely dissected, and by way of one distinction to the system in the application just referred to, I herein provide a type of forced cooling means which under sustained operation in the refrigeration cycle then effectively begins to abstract all heat from the refrigerant in the condenser and, therefore, shortly after dissection cool refrigerant starts entering the cutter. Taking advantage of this characteristic that the cutter is normally not a hot body, I am able to satisfactorily enclose, in one compact, insulated cabinet chamber, all components of my refrigeration system except the heat radiating compressor and the heat dissipating condenser. In addition, this cabinet encloses an entire water circulation system which I also provide and, in addition, I provide an ice path which is similarly enclosed in the cabinet chamber and which is composed of a plurality of ice slides properly conforming to the inside of the cabinet.

One ice slide just referred to is defined between the laterally spaced plate and cutter units and is interrupted at a midpoint in its length to enable water resulting each time an ice slab is thawed loose, to be captured in a small catch tray and restored directly to the water circulating system. Another ice slide intervening between the cutter and a larger area catch tray which I provide therebelow, has interruptions therein to enable melted water resulting from the cubing operation of the cutter to be captured and restored directly to the system. This latter slide separately diverts the cubed ice into a drop path which is laterally offset from the tray and the path leads the cubes in the desired manner into a storage bin therebelow. Thus, the water, once refrigerated and deaerated, is prevented from being lost to the system and, more importantly, the separation thereof from the cubes prevents the storage of "wet" ice cubes which would tend to refreeze together.

A further feature of the invention is that my machine is open-bottomed so as to provide the drop path referred to and the compact arrangement thereof enables more than one of these ice makers to be stacked with their bottom openings aligned over a common bin and used to increase

ice making capacity two-fold or more as the user's business and ice cube requirements increase. This feature is a particular convenience to the user inasmuch as he requires no further floor space to be sacrificed and no freezer trade-in in order to acquire the larger machine, but simply the addition of another ice maker installed on the existing unit.

Further features, objects and advantages will either be specifically pointed out or become apparent when for a better understanding of the invention reference is taken to the following description taken in conjunction with the accompanying drawings which show a preferred embodiment.

In the drawings:

FIGURE 1 is a cross-sectional view in front elevation showing the general arrangement of an ice cube maker embodying the present invention and having an essentially duplicate ice cube maker stacked thereon;

FIGURES 2 and 3 are side elevational and top plan views taken along the lines II—II and III—III of FIGURE 1;

FIGURE 4 is an isometric view taken in a direction looking away from the freezing plate;

FIGURE 5 is an isometric view looking toward the freezing plate but with the showing of FIGURE 4 omitted;

FIGURE 6 is an isometric view taken in the direction of FIGURE 5 but with the showing of FIGURE 5 omitted;

FIGURE 7 is a schematic refrigeration diagram; and

FIGURE 8 is a schematic electrical diagram of the system.

In FIGURES 1–4 of the drawings, a sloping flat plate **10** of stainless steel is refrigerated within the freezing compartment of an ice maker cabinet **12** to freeze a film of water thereon flowing in the direction of the arrows **14** of FIGURE 3 into a generally rectangular slab **16** of ice which builds in thickness to a desired point at which it is separated from the plate by a defrosting process. The slab **16** then slides by gravity from the sloping plate in said compartment into position on the gridwork of a hot tube cutter framework **18** supported in the same compartment. The cutting elements of the gridwork consist of an upper series of longitudinally extending tubes **20** which slice the slab **16** into longitudinal strips, and a lower series of transverse tubes **22** which subdivide the strips into cubes **24** of the size desired. They are preferably made of stainless steel tubing of a relatively small size (0.048" I.D.) which is of satisfactory slenderness to reduce waste in melting the dissection lines through the ice. A storage bin **26** supports the cabinet **12** so as to register with an open bottomed position thereof and collect the falling cubes **24** and it has a hinged access door **28** for withdrawing the cubes from storage in the quantity desired.

More particularly, the plate **10** has a generally vertically extending outer end wall **30** which confronts a line of water jet openings in a water circulation header **32** and which deflects the individual jets into an even film of water for making the ice slab **16** uniform in thickness. A tapered pair of opposed side walls **34** on the plate **10** gradually increases in height to a maximum at the inner end thereof. Two longitudinally disposed extension members **36** made fast by screws **38** to the plate walls **34** are rigidly secured to a cross tube **40**. The cross tube **40** is vertically aligned with a lower discharge lip **42** on the plate **10** and carries trunnion pins **44** at the opposite ends which journal the plate for limited pivoting movement at the bottoms of slots formed in a fixed pair of spaced bearing brackets **46**. The free ends of the longitudinal extension members **36** provide a parallel pair of cantilevered arms **48** which, relative to the trunnion pin axis, extend horizontally in the opposite direction from the plate **10**. The weight of the pivoted plate **10** is countered by a gravity weight **50** consisting of a solid rectangular counterbalance bar slidably related at each end to the arm **48** at that end and secured in adjustably selected positions thereto by means of bores having a pair of set screws **52** intersecting them.

Upon temporarily releasing the set screws **52** and readjusting the gravity weight **50** to produce different moment arms on the arms **48**, a considerable variance in ice cube size can be effected by the user. For example, a one-inch slab thickness can be prearranged to trip the freezing mechanism hereinafter described for cubes appropriately one inch in size whereas thicknesses of one-half inch can be prearranged to trip the mechanism for producing the so-called half-inch tall nugget size of ice cube.

Besides participating as an essential element in the foregoing mechanical movement, the plate **10** forms part of a closed refrigeration system and refrigerant vaporizes therein in removing heat to freeze ice upon the plate and after being evaporated it is delivered into a compressor suction line **54** (FIGURE 2) for recompression and recirculation by a compressor **56**. The compressor **56** delivers hot, compressed refrigerant through an outlet **58** which splits into one branch that is connected to a conventional condenser **60**. A second branch **62** from the outlet passes through a solenoid valve **64** and is controlled to form a condenser bypass line **66**. However, in the normal operation the bypass is closed and an adjacent cendensed refrigerant line **68** is supplied with a continuous flow of refrigerant which is primarily, if not entirely, in the liquid state, and which is conducted thereto from the condenser **60** through a condenser discharge line **70** and a generally cylindrical accumulator drier **72** connected in series therewith.

Forced cooling is employed to take the heat of condensation from refrigerant in the condenser **60**, and for this purpose the latter may preferably be water-cooled but, as shown, it is sufficient if an electric circulating fan **74** be provided to force cooling air to flow across the condenser coils. Separate electric leads **76** connect the solenoid of the valve **64** and the electric fan **74** to a box of electrical components **78** with which another electrical component box **80** cooperates to control an electric drive motor (not shown) included in conventional way within the structure of the compressor **56**.

A flat spring strip which is spot welded at **82** to the outer side of the cutter framework **18** supports an ice slab bumper **84** at a point slightly above the upper series of cutting tubes **20** and a recoil bumper **86** is supported by means of recoil springs **88** in a manner cooperating with the bumper **84** to trap and hold each formed ice slab solidly in position while cutting is undertaken. The recoil springs **88** are cantilevered to the underside of a cross channel **90** which is secured to the plate structure adjacent the cross tube **40**. The transverse lower series of cutting tubes **22** spans between a parallel pair of liquid refrigerant headers **92** and **94** which they interconnect in series and similarly the upper series of longitudinally extending tubes **20** connects another parallel pair of headers **96** and **97**.

The headers **94** and **96** of the respective pairs are interconnected by means of a tube coil **98** at their adjacent corner so as to transfer the refrigerant from one series of tubes to the other. The lower series **22** is coiled at one end where each connects to the header **92** and this coiled end is placed under tension by means of a coil tension spring **100** disposed in a set composed of similar springs between the header and the adjacent side of the cutter framework **18**. Similarly, another set of coil springs **102** places the longitudinally extending tubes **20** under tension and each set prevents the tubes from sagging when they lengthen during operation. A framework attachment flange **104** presenting diagonally directed deflector flanges above and below the header **96** is mounted in spaced relation to the adjacent wall of the cabinet **12** by means of two or more spacer brackets **106** providing for ice drop clearance adjacent the wall.

A shallow catch tray 108 having substantially identical dimensions with the framework 18 and having a vertically aligned disposition therebelow is provided with a continuous upstanding wall 110 in accordance with FIGURES 1 and 5 and collects and deposits melted water from the cutting operation into a reservoir well structure 112 disposed in the floor of the cabinet 12. The tray 108 supports a gable-shaped ice slide formed from a spaced series of approximately sixty V-bent wire elements 114 held together by cross reinforcing rods 116 and serving to deflect falling ice cubes laterally from the inner and outer side walls 110 of the tray 108. The deflected cubes fall through appropriate drop chute openings formed in the open bottom of the cabinet 12 adjacent its walls.

The well structure 112 includes a float and float valve means 118 for replenishing water continuously being consumed during the freezing operation and also to make up the water either periodically or continuously being purged by other means (not shown) in keeping down the concentration of minerals in the reservoir in the usual way. The well structure 112 further contains a circulating pump 120 which draws water from the well and forces it through a flexible hose 122 connected to the water header 32 (FIGURES 1 and 5). A portion of the hose 122 rests within the channel 90 so as to be close to the cross tube 40 and the trunnion pins 44 about which the plate 10 pivots, so as to minimize movement. The close relationship between the cross tube 40 and the vertically aligned plate discharge lip 42 is for the same reason of minimizing the effects in accommodating to plate movement.

Excess water flowing from the slab being frozen spills from across the plate and down the lip 42 into a narrow elongated catch tray 124 which is transversely disposed and at one end discharges into a rectangular shaped reservoir spillway 126 for conducting the water back into the well structure 112. It is thus apparent that the lip 42 forms an interruption midway of the ice slab slide path between the plate and cutter framework 18 and further that there are interruptions or gaps between the spaced elements 114 in the lower catch tray 108 which together provide for the return of all melted water to the well thus preventing unnecessary wastage of the refrigerated deaerated water already on hand.

In FIGURES 6 and 7, the compressor suction line 54 includes therein a cylindrical accumulator portion 128 of enlarged diameter connected at one end to the compressor 56 through a series of right angle tubing bends 130 and connected at the opposite end through another series of right angle bends 132 and 134 to a uniplanar freezing coil 136 sweated to the underside of the plate 10 for refrigerating it. The latter bend 134 passes close to the cross tube 40 so as to minimize deflection when the plate 10 moves and it cooperates with the remainder of the bends noted in preventing concentration of the distortion or fatigue of the tubing at any one of the bends. The refrigerant line 54 has one or more bends (not shown) passing similarly close to the cross tube for this same reason and is connected to form the outlet for an outspiraling outlet coil portion which is arranged with corresponding coil portions side by side and touching the inspiraling portions of an inlet portion 138 with which it joins, to complete the coil 136, at their innermost end by means of a common S-shaped portion 140.

A capillary tube 142 which is supplied from a cutter connected line 144 is wrapped in good heat transfer relationship about the portion of the compressor suction line 54 connected between the accumulator 128 and the plate 10. Normally, the capillary tube introduces a continuous flow of refrigerant into the inspiraling inlet coil portion 138 to refrigerate the plate due to the refrigerant vaporizing and abstracting heat therefrom. It is noted that another inlet tube 146 which can first be extended around all four sides of the plate 10, if desired, joins the capillary tube 142 to mutually form the inspiraling inlet portion 138 therewith and it is used for a defrosting purpose hereinafter described.

In FIGURE 7 in the normal operation of the instant ice maker machine, the condensed refrigerant line 68 leading from the condenser 60 supplies one header 97 in the cutter framework 18 with liquid refrigerant which passes through the next two headers 96 and 94 and their interchange coil 98 in proceeding from the internal passages of one series of cutter tubes to the other and thence it is discharged from the remaining header 92 in the framework 18 through the cutter-connected line 144 leading through the capillary tube 142 into the freezing plate coil 136. Refrigerant evaporated in the freezing coil 136 returns through the compressor suction line 54 and is recompressed by the compressor 56. When the system is initially started or restarted in the refrigeration cycle following a defrost period, return refrigerant in the suction line 54 contains considerably more than usual heat due to the warmth of the plate and upon being compressed in the compressor 56 has sufficient heat added to it that while it nevertheless condenses into liquid in the condenser 60, the fan 74 is yet unable to cool that liquid. However, in entering the tube passages in the cutter 18 the condensed refrigerant is further cooled because of the cutter abstracting heat therefrom by applying it to the ice being dissected.

Due to the combined loss of heat both in the cutter and in the condenser 60 due to the operation of the fan 74, the coil 136 eventually rechills after this condition of temporary overload on the refrigerating machinery and vapor in the suction line 54 begins to enter the compressor 56 in relatively cool state enabling the compressor and the condenser 60 to deliver cool, liquid refrigerant through refrigerant line 68 to the cutter. The cutter chills and the cool liquid discharged thereby is, in fact, further chilled in the capillary tube 142 due to its heat transfer relationship as coiled about the suction line 54. As hereinafter described in connection with its automatic controls for the operating cycle, this system requires both the condenser 60 and its circulation fan 74 to remain idle during part of their cycle. When restarted, the fan restores the air circulation over the hot condenser which for a separate reason immediately acquires a higher temperature due to the temporary overload condition of the compressor 60 in placing the condenser and its series connected idle lines leading to the capillary tube under recompression. Therefore, the fan 74 operates in the outset stage requiring assistance from the cutter for a period necessary to dissipate the excess heat but it thereafter continues its operation for a second-stage period several times as long in which it is of self-sufficient capacity to make liquid refrigerant from the condenser available in pre-cooled state for passage through the cutter.

A bin thermostatic switch 148 shown in FIGURE 1 and an arm actuated microswitch 150 shown in FIGURE 4 form part of an exceedingly simplified but effective control system for automatically cycling the present apparatus and repeating the cycle as often as necessary. More particularly, the microswitch 150 is motion sensitive by reason of carrying a slotted actuator arm 152 with which an adjustably mounted plate on the adjacent cantilever arm 48 cooperates to trip the refrigeration control system after approximately one-half inch of arm travel. Conversely, in the untripped position the microswitch 150 restores the refrigeration cycle to freezing.

The bin thermostatic switch 148 (FIGURE 1) just referred to stops these cycles from repeating at the point at which the ice cubes reach a sufficient depth in the bin 26. For this purpose the switch is connected through a tube 154 to a thermostat bulb 156 and the latter is charged with suitable fluid and then sealed to form a temperature responsive unit whereby when the bulb 156 is contacted

directly by ice it chills so as to trip the switch 148 and stop the freezing operation of the apparatus.

It is an important feature of the present invention that one or more similar ice maker units 12*a* may be installed by stacking them one above another upon the open-bottomed cabinet 12 according to FIGURE 1 and together therewith the units are supported by the common bin 26. In such instance an additional bin thermostatic switch 148*a* will be necessary for each unit added and the cabinets are arranged with their open bottoms concentric and side walls suitably superimposed so that the drop chutes for ice cubes will clear the sides of each of the vertically aligned catch trays 108. Each machine, therefore, performs independently of the other but they commonly contribute to the single supporting bin 26 therebelow. It is preferable in this case that the ice slide elements 114*a* be arranged with each series confined to a single plane and, therefore, the next upper cabinet 12*a* will, for instance, discharge ice cubes in a direction sloping downwardly and to the right as viewed in FIGURE 1 so as to enter through the drop chutes by passing alongside the outer wall of the cabinets. Similarly, within the lowermost cabinet 12 the ice slide elements 114*a* will slope leftwardly and downwardly as viewed in FIGURE 1 so as to discharge in the opposite direction at a point centrally of the common ice bin 26.

In FIGURE 8, a plug-in electric service cord 158 is connected by conductors through the thermostat bin switch 148 to first and second conductor junction points 160 and 162 from which current flows to cause the compressor 56 to continue running at all times except when the bulb 156 is chilled by contact with ice. The first junction point 160 through appropriate conductors supplies energizing current to the water-circulating pump 120 and air-circulating fan 74, which form electrically parallel circuits with their common return wire 164 being connected to a normally closed set of lower contacts *a* located in the motion-sensitive microswitch 150. When the microswitch is moved from the normally closed position shown in dotted lines in FIGURE 8 into the tripped solid line position in which it closes the normally open upper set of contacts *b* thereof, it trips open the fan and circulating pump circuits to discontinue the refrigeration cycle and simultaneously completes a circuit leading from the first junction point 160 through the solenoid valve 64 and then through a pair of conductors 166 and 168 leading through the switch contacts back to the second junction point 162 so as to energize and open the solenoid valve 64. This valve 64 immediately bypasses the condenser by means of the low pressure bypass line 66 as referred to hereinbefore and after a suitable defrost period ending when the ice slab thaws loose, the switch 150 resumes its original dotted line position shown in FIGURE 8. The solenoid valve, therefore, recloses and blocks the bypass so as to force refrigerant through the more restricted higher pressure line 68 and the circulation fan 74 and circulation pump 120 resume operation so as to cooperate with the compressor 56 in rechilling the plate. The refrigeration cycle continues until the ice reaches the point of acquiring its preset thickness at which the switch 150 trips again and repeats the cycling operation.

It is apparent that, due to the rapidity with which the plate 10 defrosts, it is never permitted within one cycle to delay long in its defrosting ice delivering position as shown in dotted lines in FIGURE 1 and even at a point before the separated ice slab stops sliding, the weight thereof has manifestly shifted enough to enable the upraised gravity weight 50 to start down and move the pivoted plate 10 clockwise as viewed in FIGURE 1 into its operative ice freezing position as shown in solid lines. Suitable stops (not shown) constrain pivoting movement of the plate to the limited degree illustrated by FIGURE 1 and in each position it has a slope which as a permanent matter is considerably more than the given angle of repose for wet ice on metal. The attendant movement of the portion of the suction line 54 between its solid line and dotted line positions shown is actually greatly exaggerated for illustrative purposes and in practice is barely perceptible, if at all.

The gravity means 50 effectually utilizes the weight of the ice slab both after it accumulates initially and after that weight shifts when it thaws and initially slides, so as to perform all physical work necessary to handle friction losses as well as overcome inertia of the plate in pivoting it at the right times. In this manner two automatically timed operations are performed without a timer and purely under the pull of gravity without outside power. That is to say, the gravity weight 50 is forced to rise from the solid line idle position in the first instance and then it returns under gravity to force the plate to reset itself to the original freezing position. This absolute weight control is not only believed to be a novel feature thereof but becomes a particularly important feature as arranged herein because of requiring little or no service adjustments inasmuch as no load springs or other prestressed devices are employed which might tend to slip, lose tension, or otherwise come out of adjustment.

Variations within the spirit and scope of the invention described are equally comprehended by the foregoing description.

I claim:

1. A recycling ice maker comprising a laterally spaced pair of slab freezing and cutter units arranged in a common compartment with the cutter in slab receiving position, means following a sequence in each operating cycle effective for maintaining said cutter idle while heating said plate to break the bond of adherence enabling the slab to slide into the received position aforesaid, effective to rechill said plate while heating said cutter, and effective to continue chilling said plate in the next slab forming cycle while the cutter is actually rechilling, and control means sensitive to characteristics of the physical weight of the slab as it forms and separates onto the cutter to control the first said means.

2. A recycling ice maker comprising a laterally spaced apart pair of slab freezing and cutter units arranged in a common compartment with the cutter in slab receiving position, means following a sequence in each operating cycle effective for maintaining said cutter idle while heating said plate to break the bond of adherence enabling the slab to slide into the received position, effective to rechill said plate while heating said cutter, and effective to continue chilling said plate while the cutter is actually rechilling, and control means sensitive to the accumulation and shift in weight of each transferred slab carried by said units for selectively controlling the sequence of operation of the first said means.

3. An ice maker for making slabs to be cubed comprising vertically and laterally spaced apart freezing plate and cube cutter units, operating means to intermittently heat said plate for a period and thaw the bond of adherence enabling the slab to separate from the plate, second operating means effective to supply energy to said cutter during portions of said cycles but in each of which for another portion it is rendered relatively ineffective from being so energized, and control means sensitive to separation of the weight of the ice slab from the plate for causing operation of said second operating means.

4. An ice cube maker comprising vertically and laterally spaced apart freezing plate and cube cutter units, said plate being in an inclined disposition so as to permanently slope, means for moving the plate a limited amount in a curved path to adjust to the weight of each ice slab being formed thereon, operating means sensitive to a characteristic of the ice slab being formed to heat said plate for a period and thaw the bond of adherence enabling the slab to separate from the plate, second operating means effective to intermittently supply heat energy to said cutter during portions of said cycles but in each of which for

another portion it is prevented from being so energized, said second operating means comprising a condenser having forced cooling means adapted for deactivation during part of each cycle, and control means adjusted by said plate as it moves to cause the deactivation and resumed operation of said second operating means.

5. In combination, spaced apart freezing plate and cutter units, said units having passaged portions adapted to transmit refrigerant, means forming a supply circuit for refrigerant for refrigerating said plate unit including the respective passage portions of the cutter and plate units serially arrange in that order relative to one another, means forming a slide path between the units for transferring frozen liquid from the freezing plate unit to the cutter unit so as to absorb cutting heat from the refrigerant, a catch tray disposed at a point of interruption in said slide path and effective to recover all melted refrigerated liquid resulting in said slide path incident to freeing the frozen liquid for transfer from the freezing plate, and another catch tray disposed below the cutter to recover the melted refrigerated liquid resulting in the cutter incident to cutting the frozen liquid.

6. In combination, spaced apart freezing plate and cutter units, said units having passaged portions and said cutter unit having the passaged portions thereof adapted to transmit refrigerant, means forming a supply circuit for refrigerant for refrigerating said plate unit including the respective passaged portions of the cutter and plate units serially arranged in that order relative to one another, means forming a slide path between the units for transferring frozen liquid on the freezing plate unit to the cutter unit so as to absorb cutting heat from the refrigerant, a catch tray disposed at a point of interruption in said slide path and effective to recover all melted refrigerated liquid resulting in said slide path incident to freeing the frozen liquid for transfer from the freezing plate, another catch tray disposed below the cutter to recover the melted refrigerated liquid resulting in the cutter incident to cutting the frozen liquid, means for normally circulating water across said plate, and a water reservoir common to said catch trays for introducing the recovered liquid in the circulating water for recirculation.

7. In combination, refrigerant means comprising a freezing plate unit and a cutter unit having passaged portions, said cutter unit having the passage portions thereof adapted to transmit and cool the refrigerant at a rate depending on said cutter unit temperature, a freezing compartment common to said units and supporting them in spaced apart relationship, means forming a supply circuit for the refrigerant for refrigerating the plate including the respective passaged portions of the cutter and said freezing plate units serially arranged in that order relative to one another, means forming a refrigerant return circuit from the plate and having a portion following a generally common path with a portion of said supply circuit between said cutter and plate units, means forming a slide path between said units for transferring frozen liquid on the freezing plate unit to the cutter unit so as to abstract cutting heat from the refrigerant, said portions conforming to said common path in a manner in which for its major portion they are operatively disposed in heat transfer relationship enabling the returning refrigerant to abstract further available heat from and chill the supply flow for its subsequent use as a refrigerant, and a catch pan disposed at a point of interruption in said slide path and effective to recover all melted refrigerated liquid resulting in said slide path incident to freeing the frozen liquid for transfer from the freezing plate unit.

8. An ice maker comprising in combination a freezing plate, means for circulating water over said plate, means for heating said plate and for heating a hot tube cutter at different times, a freezing chamber common to said plate and said cutter, means including a condenser and the cutter connected in that order forming a flow path for refrigerant to refrigerate the plate and freeze a mass of ice from the water thereon, said cutter having a normally low temperature during the freezing cycle, controls comprising a control part effective to render said plate heating means effective while maintaining said plate freezing means ineffective, further control means substantially concurrently starting said water circulating means, rendering said plate heating means ineffective to heat said plate, and rendering said cutter heating means effective by reactivating said refrigerant flow path from said condenser to the plate in a manner for placing it under a condition of temporary overload, and forced cooling means to remove the heat of condensation from refrigerant in the condenser and effective after a short contemporaneous period of sustained operation in the refrigeration cycle to cool the condensed refrigerant substantially toward a normal point as the cutter ceases function as a heat receiver while undergoing rechilling to its normal temperature.

9. In an ice maker having a mechanical compression type refrigeration system, the combination of a freezing plate, air circulating means to provide forced cooling for the compressed refrigerant, means for heating said plate and for heating a hot tube cutter at different times, a freezing chamber common to said plate and said cutter, means including the cutter and a condenser forming a path for circulating refrigerant to the plate to refrigerate it and freeze water thereon into a mass of ice, said cutter having a normally low temperature during the refrigeration cycle, a control part effective to render said refrigerating means ineffective while maintaining said plate heating means effective, other control means substantially concurrently starting said air circulation means, rendering said plate heating means ineffective to heat said plate, and rendering said cutter heating means effective by reactivating the refrigerant flow path from said condenser to the plate in a manner placing it under a condition of temporary overload, said air circulation means being arranged to remove the heat of condensation from refrigerant in the condenser and effective after a short contemporaneous period of sustained operation in the refrigeration cycle to cool the condensed refrigerant to a further point eliminating the need of the cutter functioning as a heat receiver while undergoing rechilling to its normal temperature.

10. An ice maker comprising in combination, a refrigerated plate, means for supplying a flow of water across the plate, a condenser arranged with forced cooling means to remove the heat of condensation from plate-supplied refrigerant, means for heating said plate and for heating a hot tube cutter at different times, a freezing chamber common to said plate and said cutter, means including said cutter and said condenser forming a flow path for refrigerant to refrigerate the plate and freeze ice from the water thereon, said cutter having a normally low temperature during the refrigeration cycle, control means comprising a control part effective to render said plate freezing means ineffective while maintaining said plate heating means effective, additional control means substantially concurrently starting said forced cooling means and said water supplying means, rendering said plate heating means ineffective to heat the plate, and rendering said cutter heating means effective by reactivating the refrigerant flow path from said condenser to the plate in a manner placing it under a condition of temporary overload, said forced cooling means removing the heat of condensation from refrigerant in the condenser and effective after a short period of sustained operation in the refrigeration cycle to cool the condensed refrigerant to a further point eliminating the need of the cutter functioning as a heat receiver while undergoing rechilling to its normal temperature.

11. An ice maker according to claim 10 wherein said plate is movably mounted to adjust to the weight of ice thereon, and wherein said control means are operated in response to adjusted positions taken by the plate.

12. An ice cube maker according to claim 4 wherein said plate is mounted on a fixed pivot axis and extends in one lateral direction from said pivot axis, horizontal arms cantilevered at one end to the plate and extending in the opposite direction from said axis to counter the weight of the plate, gravity means slidably related to said arms, and means to retain the gravity means in different predetermined positions on the free end of said arms to vary the quantity of ice necessary to be carried downwardly by the plate whereby torque leverage of the plate developed about said axis will effectively force the gravity means to rise.

13. An improved method of operating a tubular cutter type cubing machine in which in the normal ice freezing cycle the cutter tubes are for the most part altogether vacant of ice to be cut and effective to provide at least part of a condenser function for delivering expansible refrigerant in cooled state from a condenser proper to a refrigerator plate in the machine for freezing ice slabs thereon, comprising the steps of defrosting the refrigerator plate so as to separate a frozen slab therefrom, reinitiating the freezing cycle of the refrigerator plate so as to reduce the temperature thereof and freeze more ice, substantially simultaneously hot cutting the previously separated slab within the cutter so as to reduce the temperature reduction time of the refrigerator plate due to the increased capacity occurring in the cutter while concurrently utilizing the waste heat to cut the slab therein, sustaining forced cooling of the condenser proper for ultimately cooling the condensed refrigerant to a point in the normal freezing cycle, and meantime re-chilling and keeping the cutter chilled.

14. An improved method of operating a tubular cutter type cubing machine in which in the normal freezing cycle the cutter tubes provide at least part of the condenser function for delivering expansible refrigerant in a condensed state to a refrigerator plate in the machine for freezing liquid into ice slabs on the same, comprising the steps of heating the refrigerator plate so as to separate a frozen slab therefrom, recovering the chilled melted liquid to refreeze same, subsequently concurrently reinitiating the freezing cycle of the refrigerator plate so as to reduce the temperature thereof and freeze more ice, hot cutting the previously separated slab within the tubular cutter due to the increased capacity occurring in the cutter while concurrently utilizing the waste heat to cut the slab therein, and recovering the chilled melted liquid from the cutter to refreeze the same.

15. An improved method of operating a hot cutter tube type cubing machine in which in the normal freezing cycle the hot cutter tubes are idle but at all times form at least part of the condenser function for delivering expansible refrigerant in a condensed state from a condenser proper to a refrigerator plate in the machine for freezing liquids into ice slabs on the same, comprising heating the refrigerator plate so as to separate a frozen slab therefrom, substantially concurrently reinitiating the freezing cycle of the plate so as to reduce the temperature and freeze more ice, hot cutting the previously separated slab within the hot tube cutter so as to reduce the temperature reduction time of the refrigerator plate due to the increased capacity occurring in the hot tube cutter while concurrently utilizing the waste heat to cut the slab therein, sustaining forced cooling of the condenser proper for ultimately cooling the condensed refrigerant to a point in the normal freezing cycle, meantime re-chilling and keeping the idle cutter chilled, and effecting further heat transfer relationship by flowing refrigerant from the plate and flowing incoming refrigerant delivered by the cutter, through portions of a common interchange path so as to enable the returning refrigerant to abstract additional available heat from and chill the incoming flow for immediate use in the refrigerator plate.

16. Ice making apparatus made of discrete units which when stacked one above another impart added ice making capacity to the apparatus, said apparatus comprising, in combination, a base supported, ice cube maker power unit, a base bin unit supporting said ice cube maker power unit and defining a storage bin therebelow, said ice cube maker power unit comprising a catch reservoir and having a floor in which a bottom opening is formed to discharge ice cubes and which for its major portion is covered by said catch reservoir, said ice cube maker power unit carrying a self-contained operating mechanism comprising a compressor, a power delivering motor for applying electric power to operate said compressor, a freezing plate, ice dissection means for dissecting ice frozen by said plate, and an add-on ice cube maker power unit which is separate from but substantially identical with said base supported ice cube maker power unit and which carries its own self-contained compressor, motor, plate, and ice dissection means so as to be independently operable, said units being arranged with their side walls superimposed and with the operating mechanism of said power units inwardly spaced with respect to at least one of the aforesaid side walls thereof, and means between the ice dissection means and the catch reservoir of each power unit so as to intervene and to deflect the dissected ice cubes into a space so as to travel freely downwardly with respect to the wall and through the open bottom and intervening space into the common bin defined by said space bin unit.

17. Ice making apparatus made of discrete units which when stacked one above another impart added ice making capacity to the apparatus, said apparatus comprising, in combination, a base supported, ice cube maker power unit, a base bin unit supporting said power unit and defining a storage bin therebelow, said ice cube maker power unit comprising a catch reservoir and having a floor in which a bottom opening is formed to discharge ice cubes and which for its major portion is covered by said catch reservoir, said ice cube maker power unit carrying a self-contained power operating mechanism comprising a refrigerant compressor, a power delivery compressor motor for applying electric power to operate said compressor, a freezing plate, a hot tube cutter for dissecting ice frozen by said plate and being vertically and laterally spaced apart from said freezing plate, means forming a slide path between the freezing plate and cutter for transferring frozen liquid from the freezing plate to the cutter so as to absorb cutting heat from the refrigerant, means forming a path for refrigerant leading from the refrigerant compressor and including the hot tube cutter and freezing plate serially arranged in that order relative to one another, and an add-on ice cube maker power unit which is separate from but substantially identical to said base supported, ice cube maker power unit and which carries its own self-contained refrigerant compressor, compressor motor, freezing plate, hot tube cutter, and path forming means as above described, said units having their side walls superimposed and with the power operating mechanism of the power units being inwardly spaced with respect to at least one of the aforesaid side walls thereof, and means between the hot tube cutter and water reservoir of each power unit to deflect the dissected ice cubes into a space beside said wall thereof so as to travel freely downwardly with respect to the wall and through the open bottom and intervening space into the common bin defined by said space bin unit.

18. Ice making apparatus comprising, in combination, a cabinet, vertically and laterally spaced apart freezing plate and cube cutter units therein, said cube cutter unit consisting of a gridwork of slender cutting elements arranged so that when heated they operate to cube ice received from the plate onto the gridwork by slicing the ice due to their warmth, a catch reservoir unit adapted to serve as a well below said cube cutter unit, said cabinet receiving said catch reservoir unit immediately below said cutter unit and having a floor in which a bottom opening

is formed to discharge ice cubes and which for its major portion is covered by said catch reservoir unit.

19. In ice making apparatus, vertically and laterally spaced apart freezing plate and cutter units, said cutter unit consisting of a gridwork of slender cutting elements arranged so that when heated they operate to cube ice received from the plate onto the grid work by slicing the ice due to their warmth, an insulated cabinet forming a common enclosure for said units, said cabinet adapted to receive a drip catch reservoir below said cutter unit and having a floor in which a bottom opening is formed and which for its major portion is covered by said drip catch reservoir, and deflector means between the cutter unit and said reservoir to bypass said reservoir in a manner diverting cubes of ice into the bottom opening.

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