Aug. 23, 1960 M. M. REDDI 2,949,749

AUTOMATIC ICE CUBE MAKER

Filed Sept. 6, 1956 2 Sheets-Sheet 1

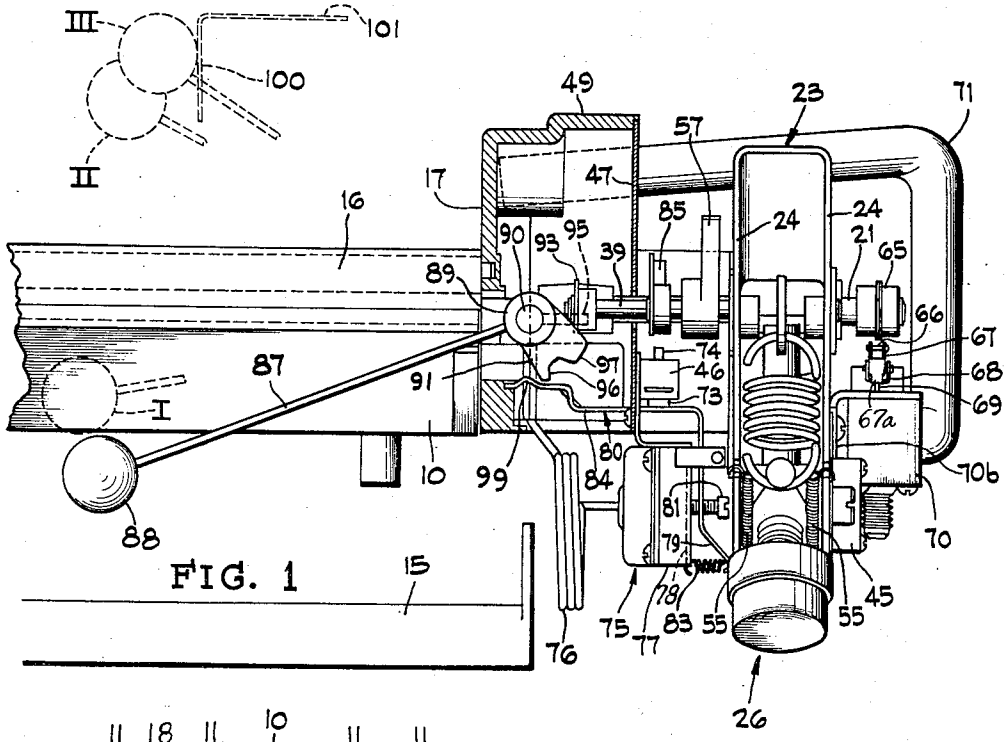


FIG. 1

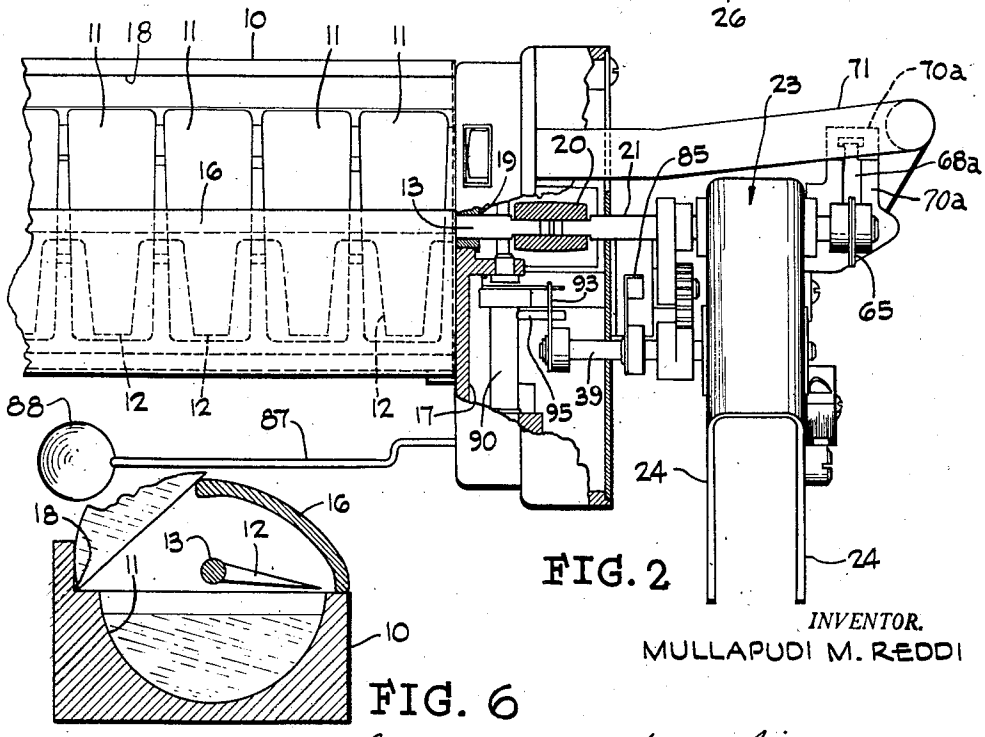


FIG. 2

FIG. 6

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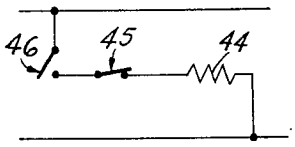
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AUTOMATIC ICE CUBE MAKER

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FIG. 7



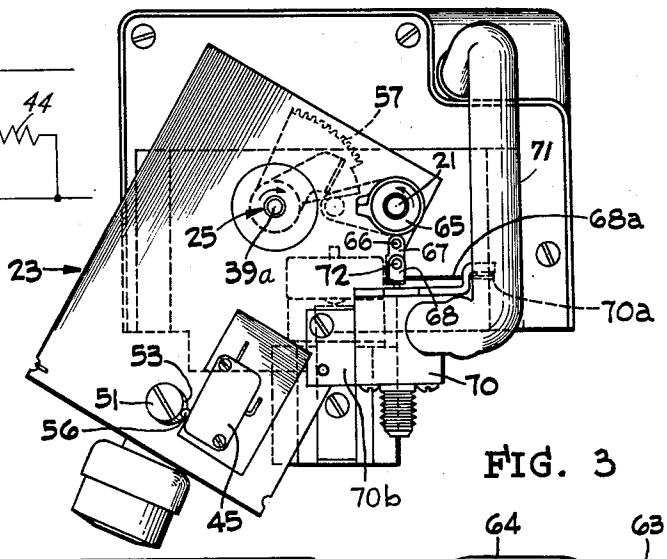


FIG. 3

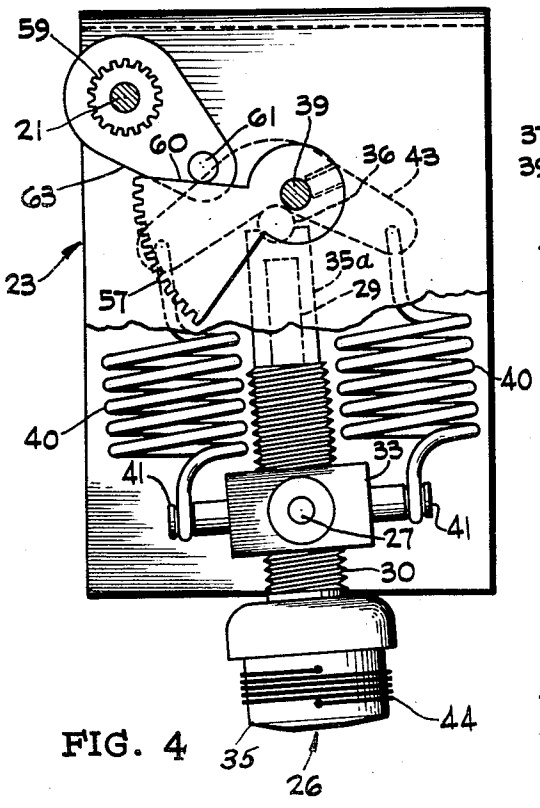


FIG. 4

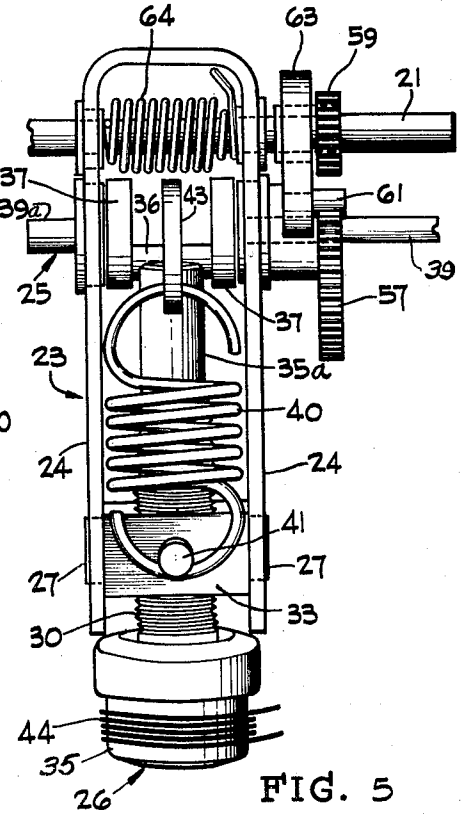


FIG. 5

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2,949,749

AUTOMATIC ICE CUBE MAKER

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Filed Sept. 6, 1956, Ser. No. 608,380

14 Claims. (Cl. 62—137)

This invention relates to improvements in automatic ice cube makers and more particularly relates to an improved drive and cyclic control therefor.

A principal object of the invention is to provide a simplified and improved automatic ice cube maker in which the power means for ejecting the ice cubes also serves as a cyclic timer to time the cycle of operation of the ice cube maker.

A further object of the invention is to provide a simplified and improved drive and control means for an automatic ice cube maker in which a periodically heated thermal element effects the drive means for ejecting ice cubes from the ice cube tray, and also times the operation of filling the tray with water and the termination of heating of the thermal element.

A further object of the invention is to provide a simplified form of ice cube maker to be contained within a household refrigerator and to eject the ice cubes when frozen, having a novel drive and control means therefor arranged with a view toward utmost simplicity in construction and operation.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a fragmentary view in side elevation of an ice maker constructed in accordance with the invention, with certain parts broken away and certain other parts shown in vertical section;

Figure 2 is a fragmentary plan view of the ice maker shown in Figure 1 with certain parts broken away and certain other parts shown in horizontal section;

Figure 3 is an end view of the ice maker;

Figure 4 is an enlarged view in side elevation of the heat motor for operating the ice maker, with certain parts thereof broken away;

Figure 5 is an end view of the heat motor shown in Figure 4;

Figure 6 is a transverse sectional view taken through the ice cube tray and

Figure 7 is a schematic diagram of a wiring circuit such as might be employed to control energization of the heat motor for operating the ice maker.

In the embodiment of the invention illustrated in the drawings, the ice making apparatus includes generally a tray 10 which may be located in heat exchange relation with respect to the evaporator or freezing chamber of a refrigerator (not shown). The tray 10 has a plurality of cavities 11 therein opening to the top thereof and forming molds for freezing water in the form of individual cubes of ice when the tray is contained within a refrigerator. The cavities 11 may have the usual concave arcuate bottoms to enable the cubes or blocks of ice to be turned from the tray by ejector paddles 12, extending from an ejector shaft 13 to one side of the axis of said shaft to sweep the ice cubes from the cavities 11 upon

pivotal movement of said ejector paddles within and across said cavities.

A deflector 16, shown in Figure 6 as being arcuate in form, is secured to one side of the tray 10 and extends over said tray to a position adjacent the center thereof and terminates into a terminal edge extending along and spaced above the tray 10 adjacent the center line thereof. The paddles 12, sweeping or turning the ice cubes from the cavities 11, invert said cubes to engage the terminal edge of the deflector 16 and initially push the cubes upwardly along said terminal edge. As the ejector paddles 12 reverse their direction of travel, the ice cubes engaging the terminal edge of the deflector 16 will slide downwardly along said terminal edge into engagement with an abutment 18 extending along the opposite side of the ice cube tray from the deflector 16. The ice cubes will then remain in the inverted position shown in Figure 6 until the freezing and ejection of a next succeeding batch of ice cubes from the cavities 11. The next succeeding ice cubes ejected from the cavities 11 will then push the inverted ice cubes over the deflector 16 into a storage bin 15, as the paddles push the next succeeding ice cubes from the cavities 11.

The shaft 13 is journaled in one end wall 17 of the tray on bearings 19 and is journaled in the opposite end wall (not shown) in a similar manner. A coupling 20 on one end of the shaft 13 is provided to couple said shaft to a varying torque output shaft 21 of a heat motor 23.

The ice cube tray 10 may be heated by suitable heating means such as a Calrod unit extending along the outer margins of the cavities 11 to free the ice cubes from their cavities. The cavities may also be lined with a stainless steel clad copper, having a highly polished stainless steel surface in contact with the ice cubes, to facilitate the freeing of the ice cubes from their molds without heating the molds, and to enable the ejector paddles 12 to free the ice cubes by the direct pushing action of said ejector paddles thereon.

The heat motor 23 for driving the shaft 21, may be a varying torque heat motor providing a relatively high torque for freeing the ice cubes from the cavities 11 and then providing a lower torque for turning the cubes from their cavities as in an application Serial No. 575,093 filed by me on March 30, 1956. The heat motor is shown as including a housing generally U-shaped in end view and having parallel side plates 24 connected together at their upper ends and having a crankshaft 25 journaled therein, and rotatably driven by a thermal element 26. The thermal element 26 is rockingly carried in the side plates 24 for rocking movement about an axis parallel to the axis of the crankshaft 25, on trunnion pins 27 rockingly mounted in said side plates, as in my aforementioned application Serial No. 575,093.

The thermal element 26 is shown as being a so-called power or high motion solid fill type of thermal element, such as is shown and described in the Vernet Patent No. 2,368,181, dated January 30, 1945. This thermal element has been selected for its compactness and simplicity, as well as its high power and the relatively long range of extensible movement of a power member or piston 29 of the thermal element from a cylinder 30 of the thermal element, as the temperature increases to the operating temperature of the thermal element. In such types of thermal elements, a thermal medium (not shown) in the form of a fusible material is contained within a casing 35 for the thermal element and reacts against a membrane or deformable member (not shown), to extend the power member or piston 29 with respect to the cylinder 30, as the thermal medium reaches its fusion point. The cylinder 30 is shown as being threaded

within a spider 33 from which the trunnion pins 27 extend to afford a means for adjusting the angular movement of the crankshaft 25.

The power member 29 extends within a piston extension 35*a* abutting the top or outer side of the cylinder 30, when the thermal element is cool. The piston extension 35*a* has bearing engagement at its outer end with an eccentric shaft 36 of the crankshaft 25. The eccentric shaft 36 is shown as being carried in disks 37 at its opposite ends secured to the inner ends of coaxial output shafts 39 and 39*a* of the crankshaft 25.

The crankshaft 25 and power member 29 are moved in a return direction upon cooling of the thermal element 26 by spaced tension springs 40 hooked at their lower ends to diametrically opposed pins 41, extending from the spider 33 at right angles with respect to the trunnion pins 27. The springs 40 are hooked at their opposite ends to opposite ends of a yoke 43, shown as being in the form of a modified or flat angled V having slidable bearing engagement with the eccentric shaft 36 of the crankshaft 25, at the underside of the apex thereof.

The casing of the thermal element is shown as being heated by a resistor heater 44 encircling said casing. It should be understood however, that while I have shown a resistor heater encircling the casing of the thermal element, that the heater may extend within the casing of the thermal element in contact with the fusible material therein and that the thermally expansible material within the thermal element may also serve as a resistor heater.

The resistor heater 44 may be energized through a safety switch 45 under the cyclic control of a cyclic switch 46, herein shown as being mounted on the outside of an end plate 47 of a housing 49, extending outwardly and shown as being formed integrally with the end wall 17 of the ice cube tray 10. The safety switch 45 may be operated by an extension 51 of a trunnion shaft 27 extending through a slot 53 in an associated side wall 24 of the casing for the heat motor. Tension springs 55 (Figure 1) are provided to bias the trunnion pins 27 toward the opposite ends of the slots 53, from the safety switch 45, and to yield upon predetermined overload conditions, to accommodate the extension 51 to engage a button 56 of the safety switch 45 to operate said switch to deenergize the resistance heater 44 upon predetermined overload conditions, such as may be occasioned by stalling of the shaft 13 and ejector paddles 12, as shown and described in my application Serial No. 570,342, filed March 8, 1956, and no part of the present invention so not herein shown or described further.

The drive to the output shaft 21 includes a gear sector 57 (Figure 4) secured to a shaft 39 of the crankshaft 25 and meshing with a pinion 59 on the output shaft 21 upon a predetermined cycle of rotation of the crankshaft 25. The gear sector 57 is shown as having a plane camming face 60, slidably engaging a pin 61 on a crank or lever arm 63, secured to the output shaft 21 inwardly of the pinion 59. The pin 61 is maintained in sliding engagement with the plane face 60 of the gear sector 57 by a torsion spring 64, encircling the output shaft 21 between the side plates 24 and fixed to said output shaft at one end and abutting the casing between the side plates 24 at its opposite end.

When the resistor heater 44 is energized, the application of heat to the thermal element 26 will effect extensible movement of the power member 29 with respect to the cylinder 13 and rotate the crankshaft 25 an angular distance determined by the setting of the spider 33 on the cylinder 30. This will rotatably move the gear sector 57 and initially turn the output shaft 21 by engagement of the face 60 of said gear sector with the pin 61, to provide a relatively high torque at the output shaft 21, to rotate the shaft 13 and ejector paddles 12 with sufficient power to free ice cubes from the cavities 11. As the ice cubes are freed from their cavities the teeth of the gear sector 51 will come into mesh with the teeth of the pinion 59 and step up the speed of rotation of the output shaft 21 and ejector shaft 13, with a resultant reduction in torque output of the shaft 13.

When the resistor heater 44 is deenergized and the thermal element 26 cools, the return springs 40 acting on the eccentric shaft 36 of the crankshaft 25 through the yoke 43 will return the gear sector 57 and power member 29, it being understood that after the teeth of the gear sector 57 come out of mesh with the teeth of the pinion 59, the torsion spring 64 will maintain the pin 61 in engagement with the plane face 60 of the gear sector 57 and return the output shaft 21 and ejector paddles 12 into position to again free the frozen ice cubes from the cavities 11.

The output shaft 21 extends outwardly from the outer side plate 24 of the heat motor 23 and has a cam 65 secured thereto for operating a cold water valve 70, to open said valve and fill the cavities 11 with water as the ejector paddles return into an initial position to eject ice cubes from the cavities 11 as the water therein is frozen. The cam 65 is engageable with a pin or roller 66 mounted between the furcations of a pivoted yoke 67, as said cam turns in either of its directions of rotation. The yoke 67 is pivotally mounted between the furcations of a forked support member 68 which rests on a stem 69 for the cold water valve 70. The support member 68 in turn is mounted on the free end of a leaf spring 68*a*, shown in Figure 3 as extending to one side of the valve 70 and as being mounted on its end remote from said valve on an upper end portion 70*a* of a bracket 70*b*, which also serves as a support bracket for the valve 70 on the outer side plate 24. The yoke 67 is provided with a depending projection 67*a* on its side opposite from the leaf spring 68*a*, which is engageable with the support member 68, upon rotation of the cam 65 in a direction, which is Figure 3 is a clockwise direction.

Thus upon rotation of the cam 65 in the direction indicated by the arrow in Figure 3, the yoke 67 will be pivoted about its axis of pivotal connection to the support member 68 and the cam 65 will have no effect on the valve 70. Upon rotation of said cam in an opposite direction, however, the depending projection 67*a* of the yoke 67 will come into engagement with the support member 68 and prevent pivotal movement of the yoke 67 with respect to the yoke 68. This will result in a depression of the stem 69 of the cold water valve 70, to effect opening of said valve and supply water to the cavities 11 as the ejector paddles 12 are moved in a return direction by the return springs 40.

A conduit 71 leads from the valve 70 in an upward direction and extends through the housing 49 and terminates in a position to supply water to the cavities 11 upon opening of the valve 70. The timing of the open period of the valve 70 by operation of the cam 65 is such that the cavities 11 will be filled to the correct level as the ejector paddles 12 are returned to the position shown in Figure 1.

The switch 46 may be a well known form of limit switch in which a circuit is made when a button 73 of the switch is depressed and in which the circuit is broken when an oppositely extending button 74 is depressed. The button 73 is depressed to effect energization of the resistor heater 44 by operation of an ice bank or mold thermostat 75. The thermostat 75 may be of a well known form and may have a bulb (not shown) recessed within the tray 10 to sense the temperature of the ice in the cavities 11 and having a capillary tube 76 leading therefrom, connected with a casing 77 of the thermostat. The fluid in the capillary tube 76 may act against

a diaphragm 78 closing the outer end of the casing, to extend the diaphragm and flex a depending arm 79 of a spring arm 80. The depending arm 79 is shown as having an adjusting screw 81 threaded therein bearing against the diaphragm and biased into engagement with the diaphragm by a tension spring 83 connected at one end to the casing 77 and at its other end to the free end of the depending arm 79. The spring arm 80 is shown as being rigidly secured at its end opposite the arm 79 to the end wall 17 of the mold. The spring arm 80 extends horizontally from the wall 17 and has a downwardly stepped portion 84 extending beneath the switch button 73. Thus, as the temperature of the ice in the mold reaches a predetermined level which may be approximately 26° F., the adjusting screw and depending arm 79 will be flexed outwardly. This will in turn flex the stepped portion 84 of the spring arm toward the switch button 73 to depress said switch button and close an energizing circuit to the resistor heater 44, to start operation of the heat motor to rotate the ejector paddles to first free and then push the ice cubes from the cavities 11.

The resistor heater 44 is deenergized by operation of a cam 85 on the output crankshaft 39, shown as being spaced inwardly of the gear sector 57. The cam 85 comes into engagement with the push button 74 at the termination of the ejecting operation and depresses said push button to deenergize the resistor heater 44 and allow the thermal element 26 to cool. The springs 40 will then retractibly move the power member 29 within the cylinder 30 and return the crank and output shaft 21, ejector shaft 13 and paddles 12 into position to eject a next succeeding batch of ice cubes from the cavities 11 at the termination of the next succeeding freezing operation.

The spring arm 80 is depressed and held in a depressed position to prevent the ice mold thermostat from operating the push button 73 to energize the resistor heater 44, when the bin 15 is over filled with ice cubes by means of an overfill arm 87, shown as having a ball 88 on the free end thereof and mounted on and extending from a collar 89 secured to a transverse shaft 90 suitably journaled in housing 49. The collar 89 is shown as having a cam 91 extending therefrom and having engagement with the spring arm 80 to hold said spring arm from movement in a direction to depress the push button 73 when the level of ice cubes in the bin 15 is sufficient to raise the overfill arm 87 to the solid line position shown in Figure 1.

The overfill arm 87 and ball 88 are raised out of the way of ice cubes in the ice bin 15, as they are ejected from the tray 10 by means of a cam 93 on the end of the output crankshaft 39, engaging a pin 95 on the shaft 90 (see Figure 2). Thus during the ejecting operation as the power member 29 is extended from the cylinder 30, the cam 93 engaging the pin 95 will raise the overfill arm 87 from the solid line position shown in Figure 1 through position I up to the dotted line position II shown in this figure to accommodate ejection of the ice cubes along the deflector 16 to the bin 15, without interfering with said overfill arm. Upon return movement of the cam 93 the overfill arm 87 will move downwardly by gravity. During upward movement of the overfill arm 87, peaks 96 and 97 of the cam 91 will successively pass over a peaked portion 99 of the spring arm 80 to depress said spring arm. Since, however, a circuit is made to the resistor heater 44 upon the initial depression of the push button 73 by operation of the mold thermostat 75, the resistor heater 44 will remain energized and the power member 29 will move to the full end of its stroke.

The overfill arm 87 is shown in Figure 1 in position III which may be attained by engaging said arm with a slot not shown in a depending slotted portion 100 of a cover 101 for the ice maker. When the overfill arm is in this position the spring 80 is depressed and the thermostat 75 will be ineffective to energize the resistor heater 44 to start operation of the ice maker.

In operation of the ice maker, where there are no ice cubes in the storage bin 15 and water in the ice cube tray 10 is frozen, the mold thermostat 75 will move the depending arm 79 of the spring arm 80 outwardly against the tension spring 83, as the water is completely frozen to ice cubes. This will move the arm 84 upwardly and depress the button 73 of the switch 46, and complete an energizing circuit to the heater coil 44. As the thermal element 26 is heated by the resistor heater 44, the power member 29 will be extensibly moved from the cylinder 30 to rotate the crank 25 in a direction, which in Figure 3 is shown as being in a clockwise direction. This in turn will effect rotation of the output shaft 21, the ejector shaft 13 and ejector paddles 12 in a counterclockwise direction, to first free and then eject ice cubes from the cavities 11 over the shield 16 into the storage bin 15.

At the same time, the cam 93 will engage the pin 95 and lift the overfill arm 87 to the position II shown in Figure 1. The cam 85 will then come into engagement with the switch button 74, to depress said switch button and deenergize the resistor heater 44 and allow the thermal element 26 to cool. The springs 40 will then return the crank 25 and ejector paddles 12 to the position shown in Figures 2 and 6.

During movement of the shaft 21 and ejector paddles 12 in a direction to free ice cubes from the cavities 11, the peak of the cam 65 will pass by the yoke 67, pivoting said yoke in a clockwise direction. During cooling of the thermal element 26, however, and return movement of the cam 65 the peak of said cam will engage and depress the yoke 67 and open the water fill valve 70 and maintain said valve open a sufficient time to measure sufficient water to the ice cube tray to fill said tray 10. The ice cube maker is then in condition to start a next successive freezing and ejecting operation.

When there are sufficient ice cubes in storage in the storage bin 15 after an ejecting operation the ball 88 of the overfill arm 87 will drop on the ice cubes in said storage bin. The level of ice cubes in said bin will raise the arm 87 to a position between the solid line position shown in Figure 1 and the dotted line position shown in this figure and depress the spring lever 84 by engagement of the peak 96 of the cam 91 with the peak 99 of said spring lever. The mold thermostat 75 will then be incapable of flexing the spring arm 80 to depress the switch button 73 and energize the resistor heater 44. When, however, ice cubes are removed from the storage bin 15, the ball 88 and overfill arm 87 will drop down and the cam peak 96 will be released from the peak 99 of the spring arm 80 and accommodate depression of the switch button 73, by flexing of said spring arm to start a next succeeding ice cube ejecting operation. In this condition it is assumed that the ice cubes are frozen in their cavities and that the mold thermostat 75 has biased the depending arm 79 in an extended position with respect to said mold thermostat, to effect depression of the push button 73 as soon as the cam 91 is released from the spring arm 80.

It will be understood that various modifications and variations of the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In an ice maker, an ice tray having ice molds therein, electrically energizable means for ejecting ice cubes from said molds, means energizing said electrically energizable means to initiate the ejection of ice cubes from said tray comprising a mold thermostat responsive to the temperature of the frozen ice cubes in said molds, a movable member operated by said thermostat upon freezing of the ice cubes in said tray to effect the energization of said electrically energizable means, and means

for preventing operation of said movable member to effect the energization of said electrically energizable means regardless of the frozen condition of ice cubes in said tray and the operative condition of said mold thermostat comprising a movable ice overfill arm and means on said arm engageable with said movable member to prevent operation thereof to energize said electrically energizable means upon the positioning of said overfill arm in a predetermined elevated position.

2. In an ice cube maker, an ice tray having ice molds therein, electrically energizable means for ejecting ice cubes from said molds, means energizing said electrically energizable means to initiate the ejection of ice cubes from said tray comprising a mold thermostat responsive to the temperature of the frozen ice cubes in said molds, a yieldable member fixed at one end and extending outwardly from said tray to a position adjacent said mold thermostat, means on said yieldable member engaging said mold thermostat to effect the flexing of said yieldable member upon freezing of the ice cubes in said tray as sensed by said thermostat, and means for preventing the flexing of said yieldable member to effect the energization of said electrically energizable means regardless of the frozen condition of the ice cubes in said mold comprising an overfill arm and a cam on said arm having engagement with said member and operable to prevent operation thereof upon the positioning of said overfill arm in a predetermined elevated position.

3. In an automatic ice maker, a tray having ice molds therein, a shaft extending over said tray and having ejector paddles thereon for engaging the frozen cubes of ice in said molds and freeing and turning the ice cubes therefrom, a heat motor comprising a thermal element having an extensible piston and electrical energizable means for heating said thermal element to effect extensible movement of said piston, a drive connection from said extensible piston to said shaft, spring means returning said shaft and piston upon deenergization of said electrically energizable means, a thermostat in heat association with said tray, a switch operated by said thermostat and actuatable to a closed circuit position for completing an energizing circuit to said electrically energizable means, an overfill arm preventing the closing of said switch and the energization of said electrically energizable means, and common operating means for said switch connected between said thermostat and said overfill arm and operative to prevent closure of said switch in certain predetermined elevated positions of said overfill arm and to effect operation of said switch as said overfill arm drops to a predetermined lowered position.

4. In an ice maker, a tray having ice molds therein, a shaft extending over the top of said tray, ejector paddles on said shaft movable within said ice molds, a heat motor for turning said shaft comprising a thermal element having an extensible power member and electrically energizable means for heating said thermal element to effect extensible movement of said power member, a drive connection from said power member to said shaft for rotating said shaft in one direction upon heating of said thermal element, spring means for returning said power member upon cooling of said thermal element and rotating said shaft in an opposite direction, an energizing circuit for said electrical energizing means comprising a switch, a mold thermostat, a spring arm fixed at one end and extending in juxtaposition to said switch and flexed by said thermostat to effect operation of said switch to heat said thermal element and move said shaft and ejector paddles in an ejecting direction, and means preventing flexing of said spring arm to effect operation of said switch, upon the depositing of a predetermined level of ice cubes.

5. In an ice maker, a tray having ice molds therein, a shaft extending over the top of said tray, ejector paddles on said shaft movable within said ice molds, a heat motor for turning said shaft comprising a thermal element having an extensible power member and electrically energizable means for heating said thermal element to effect extensible movement of said power member, a drive connection from said power member to said shaft for rotating said shaft in one direction upon heating of said thermal element, spring means for returning said power member upon cooling of said thermal element and rotating said shaft in an opposite direction, an energizing circuit for said electrical energizing means comprising a switch, a mold thermostat, a spring arm fixed at one end and extending in juxtaposition to said switch and flexed by said thermostat to effect operation of said switch to heat said thermal element and move said shaft and ejector paddles in an ejecting direction, and means preventing flexing of said spring arm to effect operation of said switch, upon the depositing of a predetermined level of ice cubes in said container, comprising a pivoted overfill arm resting on the ice cubes in said tray, a cam operated by said overfill arm and movable into engagement with said spring arm upon upward movement of said overfill arm, to prevent the flexing of said spring arm by said thermostat as the ice cubes discharged from said tray reach a predetermined level.

6. In an ice maker, a tray having ice molds therein, a shaft extending over the top of said tray and having ejector paddles thereon for engaging ice cubes in said molds and turning the cubes therefrom, a heat motor for turning said shaft comprising a casing, a crank journaled in said casing, a thermal element rockingly mounted in said casing and having a power member engageable with said crank for turning the same in one direction effected by extensible movement of said power member upon predetermined increases in temperature, a varying leverage drive connection from said crank to said ejector shaft for driving said shaft in an ejecting direction upon extensible movement of said power member, a spring for returning said power member, crank and ejector shaft upon cooling of said thermal element, electrically energizable means for heating said thermal element, a thermostat in heat association with said tray, switch means operated by said thermostat for energizing said electrically energizable means upon freezing of ice cubes in said tray, and cam means operated by said shaft for operating said switch to deenergize said electrically energizable means at the termination of an ice cube ejecting operation.

7. In an ice maker, a tray, a shaft extending along the top of said tray and having ejector paddles projecting therefrom for freeing and pushing ice cubes from said tray, a valve for supplying water to said tray to fill the same, a heat motor for driving said shaft comprising a casing having a thermal element rockingly mounted therein having an extensible piston, a crank journaled in said casing and having engagement with said piston and rotated thereby upon extensible movement thereof, a spring returning said power member and crank, a varying torque drive connection from said crank to said shaft, a thermostat sensing the temperature of the ice in said tray for effecting the heating of said thermal element, an ice overfill arm, an interlocking connection between said thermostat and ice overfill arm to prevent the heating of said thermal element upon the discharge of ice cubes to a predetermined level, means operated by said crankshaft for effecting the cooling of said thermal element and the return of said ejector paddles, and means for operating said valve to fill said tray at the termination of an ice cube ejecting operation, comprising a cam driven by said shaft and a one way drive connection between said cam and said valve, to effect opening of said valve only during return movement of said shaft and paddles.

8. In an ice maker, a tray having ice molds therein, a shaft extending along the top of said tray and having ejector paddles projecting therefrom for engaging and freeing and turning ice cubes from said tray, a valve for supplying water to fill said stray at the termination of

an ice cube ejecting operation, a heat motor for driving said shaft comprising a casing having a thermal element rockingly mounted therein having an extensible power member, a crank journaled in said casing, an operative connection between said power and said crank, electrical energizable means energizable to heat said power member and effect extensible movement thereof, spring means for returning said power member, a varying torque drive connection from said crank to said shaft for driving the same, cam means operated by said crank, a one way operative connection between said cam means and valve for opening said valve only upon return movement of said crank and paddles, a thermostat sensing the temperature of ice in said molds, a spring arm operated by said thermostat for effecting the energization of said electrically energizable means, an overfill arm sensing the level of ice cubes discharged from said tray, and a cam on said overfill arm engageable with said spring arm on upward movement of said overfill arm, to prevent operation of said spring arm to effect energization of said electrical energizable means upon the discharge of a predetermined amount of ice cubes from said tray.

9. In an ice cube maker, an ice tray having molds therein, a heat motor for effecting the ejecting of ice cubes from said tray and comprising a thermal element having an extensible power member, a crank operated by extensible movement of said power member, electrically energizable means for heating said thermal element, a timer cam operated by said crank, a switch electrically connected with said electrically energizable means for effecting energization thereof, a thermostat sensing the temperature of the ice in said mold for operating said switch to energize said electrically energizable means, a switch operated by said timer cam to deenergize said electrically energizable means, an ice overfill arm, and a cam operated by said ice overfill arm to prevent operation of said first mentioned switch to energize said electrically energizable means upon the ejection of a predetermined level of ice cubes from said tray.

10. In an ice cube maker, an ice tray having ice molds therein, a heat motor for effecting the ejection of ice cubes from said molds, said heat motor comprising a casing, a thermal element rockingly mounted in said casing having an extensible power member, a resistor heater energizable to effect extensible movement of said power member, a crank operated by extensible movement of said power member, spring means returning said crank and power member upon cooling of said thermal element, a switch having a depressible switch button, depressible to effect energization of said electrical energizable means and heating of said thermal element, a thermostat responsive to the temperature of the frozen ice cubes in said molds, a spring arm fixed at one end and having engagement with said thermostat adjacent its opposite end and operated by said thermostat to depress said switch button and effect energization of said electrical energizing means, and means for preventing operation of said spring arm to depress said switch button regardless of the frozen condition of ice cubes in said mold, upon the ejection of a predetermined level of ice cubes from said mold comprising an ice overfill arm, a cam on said arm having engagement with said spring arm and operable to prevent said spring arm from operating said switch button upon the positioning of said overall arm in a predetermined elevated position.

11. In an automatic ice maker, a tray having ice molds therein, a shaft extending along the top of said tray and journaled for pivotal movement with respect thereto and having paddles projecting therefrom for freeing and turning ice cubes from said molds, a valve supplying water to said tray to fill the same, a thermal element having an extensible power member, a crank engaged by said power member and rotated thereby upon extensible movement thereof, spring means returning said crank and power member, a resistance heater for heating said thermal element, a switch for energizing said heater, means for operating said switch comprising an ice mold thermostat sensing the temperature of ice in said tray, a spring arm fixed to said tray at one end and extending outwardly therefrom into a position adjacent said switch and thermostat and flexed by operation of said thermostat to operate said switch, a varying moment arm drive connection between said crankshaft and said ejector shaft, and a timer cam directly driven by said cam shaft for operating said switch to deenergize said heater.

12. In an automatic ice maker, a tray having ice molds therein, a shaft extending along the top of said tray and journaled for pivotal movement with respect thereto and having paddles projecting therefrom for freeing and turning ice cubes from said molds, a valve supplying water to said tray to fill the same, a thermal element having an extensible power member, a crank engaged by said power member and rotated thereby upon extensible movement thereof, spring means returning said crank and power member, a resistance heater for heating said thermal element, a switch for energizing said heater, means for operating said switch comprising an ice mold thermostat sensing the temperature of ice in said tray, a spring arm fixed to said tray at one end and extending outwardly therefrom into a position adjacent said switch and thermostat and flexed by operation of said thermostat to operate said switch, a varying moment arm drive connection between said crankshaft and said ejector shaft, a timer cam directly driven by said crank shaft for operating said switch to deenergize said resistor heater, a second cam operated by said varying moment arm drive connection, and a one-way operative connection between said second cam and said water fill valve, for operating said water fill valve to fill said cavities at the end of return movement of said ejector paddles and power member.

13. In an automatic ice maker, a tray having ice molds therein, a shaft extending along the top of said tray and journaled for pivotal movement with respect thereto and having paddles projecting therefrom for freeing and turning ice cubes from said molds, a valve supplying water to said tray to fill the same, a thermal element having an extensible power member, a crank engaged by said power member and rotated thereby upon extensible movement thereof, spring means returning said crank and power member, a resistance heater for heating said thermal element, a switch for energizing said heater, means for operating said switch comprising an ice mold thermostat sensing the temperature of ice in said tray, a spring arm fixed to said tray at one end and extending outwardly therefrom into a position adjacent said switch and thermostat and flexed by operation of said thermostat to operate said switch, a varying moment arm drive connection between said crankshaft and said ejector shaft, a timer cam directly driven by said crank shaft for operating said switch to deenergize said resistor heater, a second cam operated by said varying moment arm drive connection, and a one-way operative connection between said second cam and said water fill valve, for operating said water fill valve to fill said cavities at the end of return movement of said ejector paddles and power member, a pivoted overfill arm sensing the level of ice cubes discharged from said tray, and a cam operated by pivotal movement of said overfill arm for engaging said spring arm to hold said spring arm in position to prevent operation of said switch by said thermostat regardless of the temperature of ice cubes in said tray.

14. In an automatic ice maker, a tray having ice molds therein, a shaft extending along the top of said tray and journaled for pivotal movement with respect thereto and having paddles projecting therefrom for freeing and turning ice cubes from said molds, a valve supplying water to said tray to fill the same, a thermal element having an extensible power member, a crank engaged by said power member and rotated thereby upon extensible movement

thereof, spring means returning said crank and power member, a resistance heater for heating said thermal element, a switch for energizing said heater, means for operating said switch comprising an ice mold thermostat sensing the temperature of ice in said tray, a spring arm fixed to said tray at one end and extending outwardly therefrom into a position adjacent said switch and thermostat and flexed by operation of said thermostat to operate said switch, a varying moment arm drive connection between said crankshaft and said ejector shaft, a timer cam directly driven by said crankshaft for operating said switch to deenergize said resistor heater, an overfill arm pivoted for movement about a horizontal axis and sensing the level of ice cubes discharged from said molds, a cam operated by upward movement of said overfill arm and having engagement with said spring arm to prevent operation thereof by said thermostat regardless of the temperature of the ice cubes in said tray, and a second cam

on said crankshaft raising said overfill arm above said tray upon extensible movement of said power member and during each ice cube ejecting operation and lowering said overfill arm to rest on the ice cubes discharged from said tray at the termination of an ice cube ejecting operation.

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