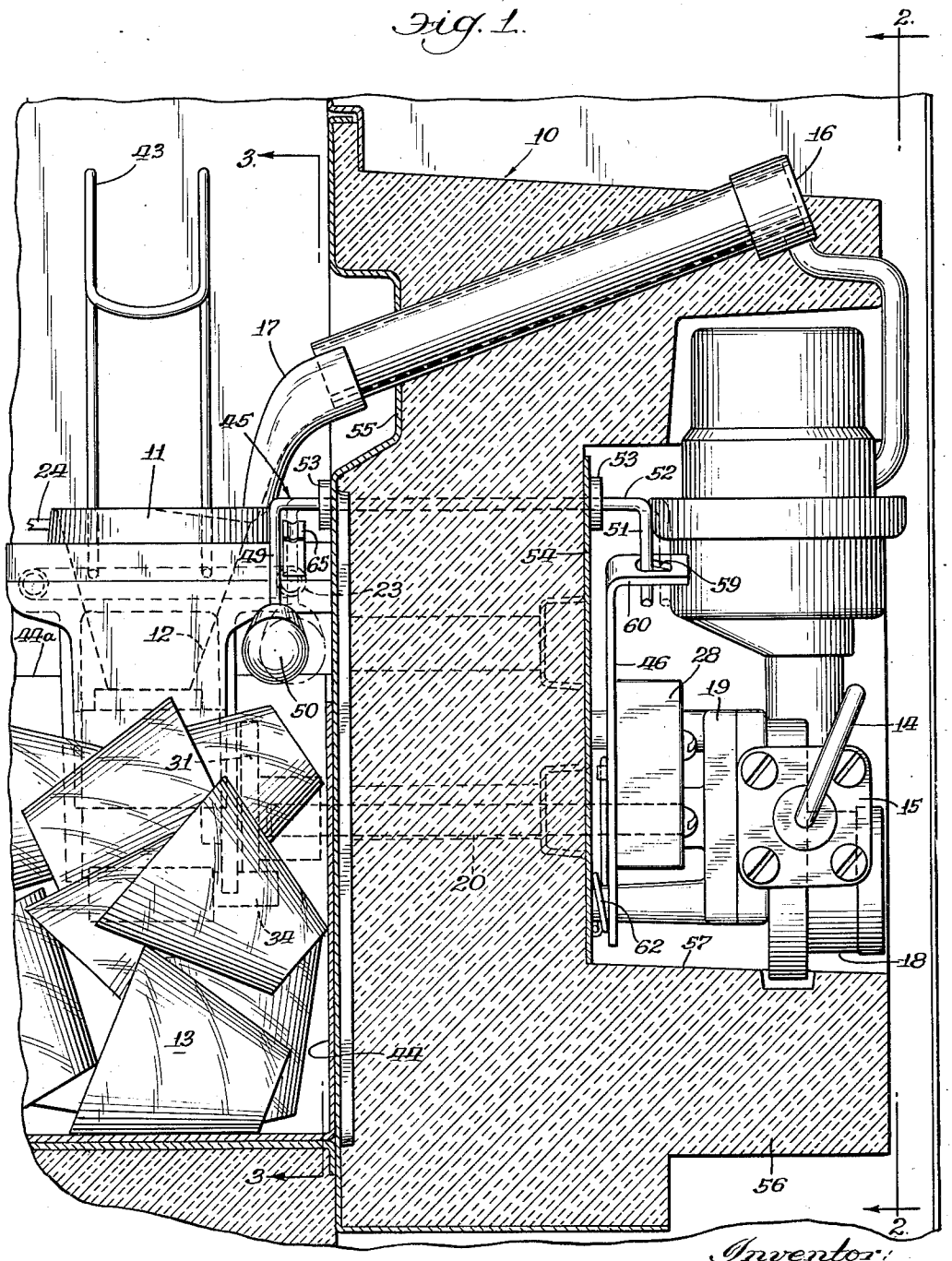
June 26, 1962 W. J. LINSTROMBERG 3,040,542

PRODUCT LEVEL CONTROL FOR ICE MAKER

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Fig. 1.



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PRODUCT LEVEL CONTROL FOR ICE MAKER

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Fig. 2.

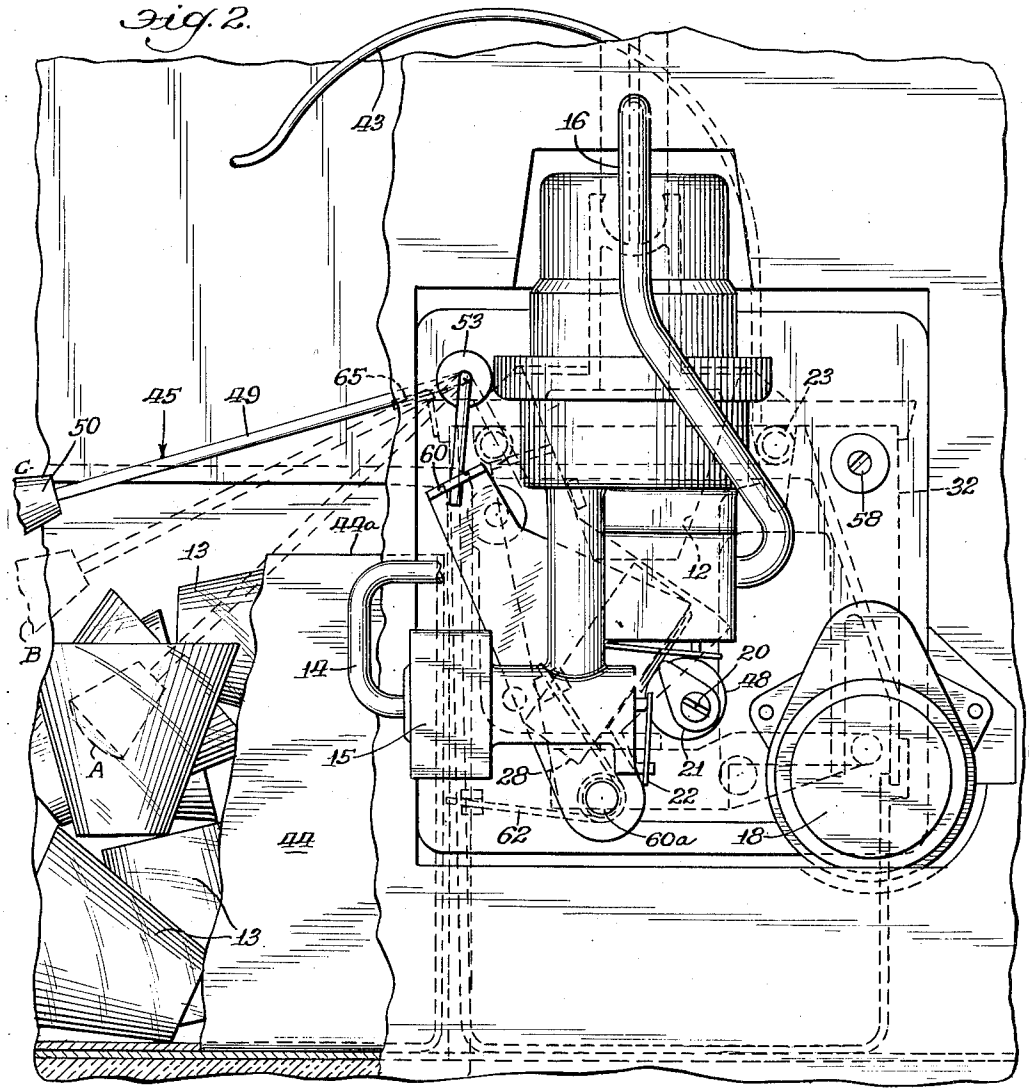
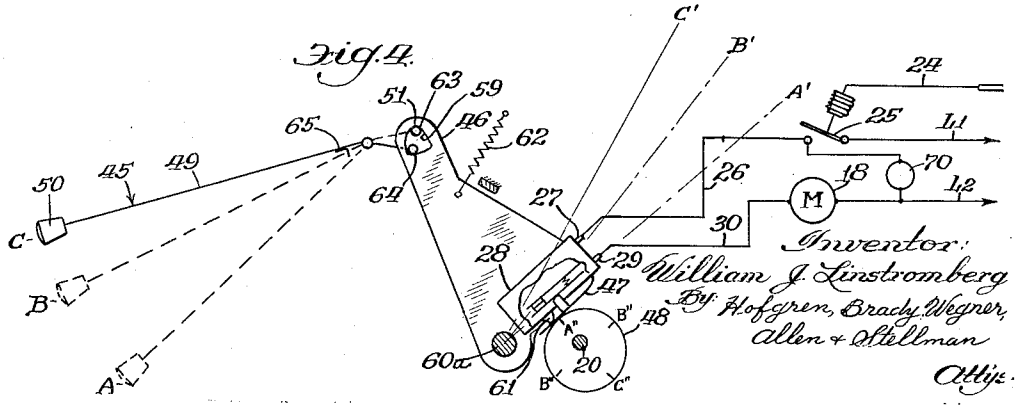


Fig. 4.



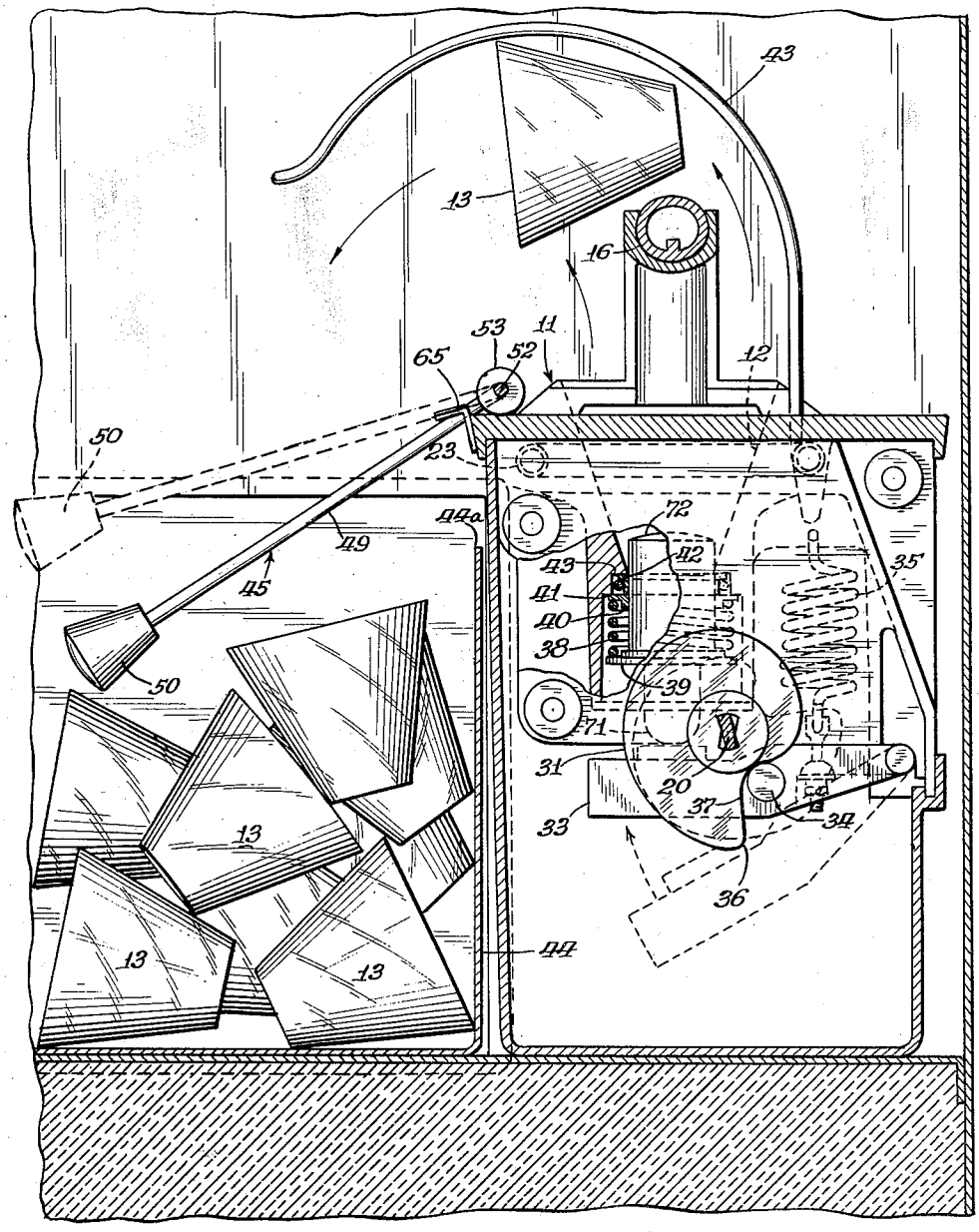
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PRODUCT LEVEL CONTROL FOR ICE MAKER

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Fig. 3.



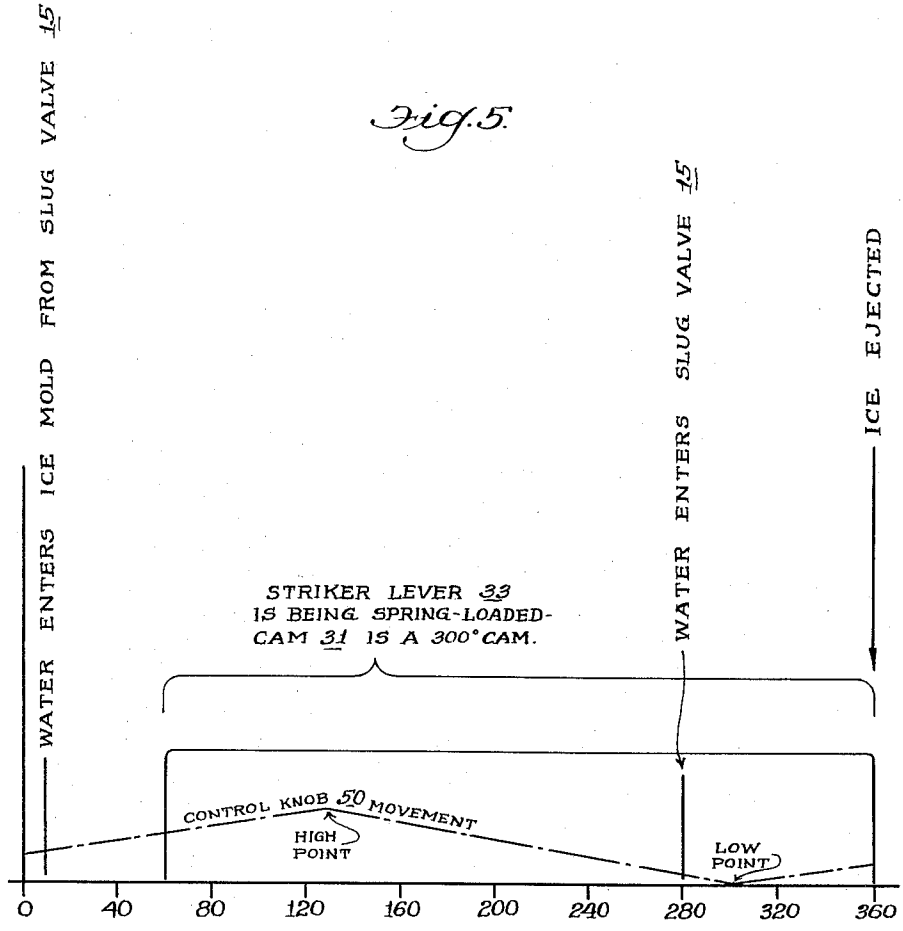
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PRODUCT LEVEL CONTROL FOR ICE MAKER

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Fig. 5.



DEGREES REVOLUTION OF SHAFT 20

TIME IS APPROX. 18⅓ MIN.

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United States Patent Office 3,040,542 Patented June 26, 1962

3,040,542

PRODUCT LEVEL CONTROL FOR ICE MAKER

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Filed Feb. 2, 1959, Ser. No. 790,557
6 Claims. (Cl. 62—137)

This invention relates to ice makers and in particular to apparatus for controlling the operation of an automatic ice body maker.

In an ice body maker, such as that disclosed in copending Robert W. Fink application, Serial No. 609,623, filed September 13, 1956, now Patent No. 2,981,079 and owned by the common assignee, a body of ice is formed in a frusto-conical cavity of a freezing mold and, when frozen, is injected therefrom to be collected in a suitable container. The ejection of the ice body is effected by a spring-urged block which is cam operated to snap against a plunger defining the lower boundary of the cavity. The cam is rotated by a suitable motor which is operated normally only when the compressor runs.

The instant invention is concerned with a new and improved means for controlling the operation of the above indicated motor so that only a predetermined level of ice bodies is permitted in the container, wheerupon further operation of the ice body making mechanism is discontinued until such time as the level is lowered in the container, as by withdrawing the same from the device and removing the ice bodies therefrom.

The principal feature of the instant invention is the provision of a new and improved means for controlling an ice body maker.

Another feature of the invention is the provision of such control means utilizing a single switch for use with an ice body level detector means to effect the desired control of the associated operating motor.

A further feature is the provision of such control means provided with means for retaining the ice body level detector in a suitable position to maintain the motor inoperative as desired.

Still another feature of the invention is the provision of such control means wherein the retaining means is arranged to hold the ice body level detector in an out-of-the-way position relative to the space normally occupied by the ice body collecting holder.

Other features and advantages of the invention will be apparent from the following description, taken in connection with the accompanying drawing, wherein:

FIG. 1 is a view of the ice body maker embodying the invention, with portions thereof broken away and with portions thereof shown in vertical section;

FIG. 2 is a section taken approximately along the line 2—2 of FIG. 1;

FIG. 3 is a section taken approximately along the line 3—3 of FIG. 1 (at the instant of ice ejection);

FIG. 4 is a schematic and diagrammatic view of the control means thereof; and

FIG. 5 is a chart illustrating the functioning of the ice body maker, provided for clarifying the description of the operation.

As best seen in FIGS. 1 through 3 of the drawing, an ice maker apparatus, generally designated 10, is provided with a freezing mold 11 having a frusto-conical cavity 12 in which are frozen seriatim a plurality of ice bodies 13. Water is delivered to cavity 12 from a supply line 14, through a slug valve 15, through a conduit 16, and through a chute 17. Slug valve 15 is operated automatically to fill cavity 12 by means of a motor 18 which, through a gear device 19, rotates a shaft 20. On shaft 20 is a cam 21 which engages suitable actuating means 22 associated with valve 15 to deliver a predetermined quantity of water to cavity 12.

Mold 11 is refrigerated by a refrigerant-carrying evaporator tube 23 to freeze the water in cavity 12. In the illustrated embodiment, the freezing of the water is effected in approximately 18 minutes. To assure that the water is in cavity 12 at least that long, motor 18 and gear device 19 are arranged to effect one complete revolution of shaft 20 in approximately 18⅓ minutes. Motor 18 is arranged to be energized concurrently with the operation of the refrigerator compressor 70. More specifically, the refrigerator thermostat element 24 is arranged to close a switch 25 (FIG. 4) connecting one power lead L1 to a lead 26 connected to a terminal 27 of a snap switch 28. The other terminal 29 of the snap switch 28 is connected through a lead 30 to one side of motor 18 and the other side of motor 18 is connected to the other power supply lead L2 to complete the circuit to motor 18. Compressor 70 is connected between lead 26 and power supply lead L2.

Also carried on shaft 20 is a cam 31. Pivotally mounted on a support 32, with which mold 11 may be integrally cast, is a striker lever 33. Lever 33 is provided with a cam follower pin 34 which is urged into engagement with the peripheral surface of cam 31 by a tension spring 35 having one end connected to the support 32 and the other end connected to the lever 33. As cam 31 is rotated to the point where edge 36 thereof moves beyond cam follower pin 34, a radial peripheral portion 37 of the cam permits block 34 to move suddenly inwardly and cause the lever to move from the dotted line position of FIG. 3 to the full line position thereof. As the lever reaches the full line position, it strikes a plunger 71 having an inner end portion 72 defining the lower end surface of cavity 12. Plunger 71 is normally biased downwardly by a spring 38 acting between a collar 39 on the plunger and a retainer 40 held against the shoulder 41 on the mold 11. The sudden striking of plunger 71 by lever 33 causes the inner end of the plunger 71 to move quickly upwardly and eject the ice body 13 upwardly from cavity 12. To preclude leakage of water from cavity 12 downwardly along plunger 71, an annular seal 42 is provided to seal the plunger to the mold 11 between a shoulder 43 of the mold and retainer 40.

When the ice body 13 is ejected from mold 12, it is deflected by a guide 43 laterally of mold 11 to fall into a receptacle 44 through an open upper end thereof. When a sufficient number of ice bodies 13 has been thus formed and delivered to container 44 to substantially fill the same, it is desirable to preclude automatically further ice body ejection. As best seen in FIGS. 1, 2 and 4, the means for effecting this automatic control includes a control arm 45 arranged to detect the level of ice bodies in container 44 and, in accordance with the detected level, effect a control of a pivot link 46 carrying switch 28. Depending on the position of pivot link 46, an actuating means 47 of switch 28 is engaged or alternatively not engaged by an eccentric cam 48 also fixed on shaft 20. When actuating means 47 is engaged by cam 48, switch 28 remains closed permitting the control of motor 18 to be solely by cabinet thermostat switch 25. When, however, pivot link 46 is held so that actuating means 47 may no longer be engaged by cam 48, switch 28 is opened, thereby precluding further operation of motor 18. The relationship of control arm 45, pivot link 46, and cam 48 is such that this will occur whenever the level of ice bodies 13 within container 44 reaches a preselected level, or when the arm is manually moved to a lockout position.

More specifically, control arm 45 includes a first portion 49 provided with a knob 50 at its outer end adapted to pivot from an innermost position A (FIG. 4) to an outermost position C. Intermediate positions A and C, is control arm position B, which represents the position

of the arm when knob 50 is at the preselected level of ice bodies in container 44. Position C is the position of the outermost travel of knob 50 during its normal movement as controlled by cam 48. The normal movement of control knob 45 is effected by the pivotal movement of a second opposite end portion 51 of the control arm. End portion 51 is connected to end portion 49 by a mid-portion 52 of the control arm extending perpendicularly between the two end portions, as seen in FIG. 1. Mid-portion 52 is axially rotatable in a pair of annular supports 53 carried respectively on a support plate 54 which carries the valve 15 and motor 18, and a housing plate 55 which carries a body of insulatiang material 56 provided with a recess 57 in which the valve and motor are disposed. Support 32 is secured to support plate 54 by means of a plurality of bolts 58 extending therebetween.

End portion 51 of control arm 45 extends through an aperture 59 in a right angularly turned end portion 60 of pivot link 46. The width of aperture 59 is correlated with the pivotal movement of end portion 51 to permit knob carried on end portion 49 to move independently of the pivot link a distance equal to the distance between positions A and B as seen in FIG. 4. Thus, end portion 51 has a lost motion connection with the pivot link 46 permitting a preselected amount of movement of the control arm without affecting the disposition of the pivot link.

The pivot link is pivoted at its mid-portion on a support 60*a* by a cam 48 which engages the switch actuating means 47 and urges it against a portion 61 of the pivot link. A spring 62 biases the pivot link in a clockwise direction, as seen in FIG. 4, permitting the above described action of cam 48. Thus, as long as the movement of control arm 45 is unrestricted, cam 48 engages actuating means 47 and urges it against link portion 61 to pivot the pivot link in a counterclockwise direction to the C′ position (FIG. 4) when the high point C″ of the cam confronts the actuating means 47, and permits the spring 62 to pivot the pivot link in a clockwise direction to the A′ position when the low point A″ of the cam confronts the actuating means. The weight of control arm 45 maintains an engagement of arm end portion 51 with one end 63 of aperture 59. Thus, as the portion of the cam 48 confronting the actuating means changes from low point A″ to high point C″, the counterclockwise pivoting of link 46 pivots control arm 45 to the C position. In this position, knob 50 is raised above the open top of the container 44 free of engagement with the ice bodies 13 therein. As cam 48 continues to rotate beyond this position spring 62 pivots the pivot link in a clockwise direction and the control arm 45 pivot in a counterclockwise direction to lower knob 50 towards its extreme lowered position A. When the knob 50 strikes on the body 13 in the container, further downward movement of knob 50 is prevented. As indicated above, preselected level of ice bodies in container 44 corresponds to a position B of control arm 45. If the level of the ice bodies is below the preselected level, the downward movement of the arm will not be prevented until knob 50 is below the position B. However, while control arm 45 is prevented from further downward movement, pivot link 46 may continue to be pivoted in a clockwise direction, as end portion 51 of the control arm will have no effect on the clockwise pivoting of the pivot link until the pivot link pivots sufficiently to cause engagement of end portion 51 with an opposite end 64 of aperture 59. As indicated above, the amount of movement of pivot link 46, which may occur between engagement of end portion 51 with end 63 and with end 64 of aperture 59 is equal to the pivotal movement between the control arm positions A and B. Thus, as long as knob 50 may reach the position B, the lost motion connection effected by aperture 59 permits the pivot link to pivot fully to the normal clockwise extreme of its movement and actuating means 47 maintains switch 28 closed. However, should the level of ice bodies in container 44 be above the preselected level, the downward movement of knob 50 will be stopped upwardly of position B and the lost motion connection will be insufficient to permit the pivoting of pivot link 46 fully to its clockwise extreme position A′ whereupon the engagement of the end portion 51 with end 64 of aperture 59 holds link 46 and prevents cam 48 from retaining switch 28 closed.

The opening of switch 28 prevents further operation of motor 18 and, thus, prevents further ejection of ice bodies 13 until the level thereof within the container is lowered. The ice bodies 13 may be removed from container 44 as desired. To facilitate this removal, the entire container 44 is removed from association with apparatus 19, permitting the container to be turned upside-down and all of the ice bodies discharged therefrom as desired.

To hold control arm portion 49 out of the path of movement of the container 44 during such removal, a grooved catch 65 is secured to mold 11 slightly to the right of the path of normal vertical movement of arm portion 49, as seen in FIG. 1. Aperture 59 of link end portion 60 is elongated perpendicularly to the plane of the path of movement of arm portion 49 and mid-portion 52 of the control arm is slidable through support 53 to permit disposition of opposite end portion 51 alternately at the opposite ends of the aperture. As seen in FIG. 1, when arm portion 51 is at the left end of the aperture, arm portion 49 clears catch 65 and the above described automatic operation of the control arm is permitted. However, when desired, the operator may grasp knob 50, lift arm portion 49 to the C position thereof, and slide the control arm to the right (FIG. 1) until portion 51 is at the right end of aperture 59 whereupon arm portion 49 overlies catch 65. Catch 65 will maintain arm portion 49 in this uppermost position thereby providing clearance for the container 44 and holding pivot link 46 in the C position thereby preventing further operation of motor 18. To restore the control arm and motor to their normal functioning, arm portion 49 is moved to the left (FIG. 1) until it clears catch 65.

Summary of Operation

As best seen in FIG. 5, in one revolution of shaft 20, slug valve 15 delivers a predetermined quantity of water to cavity 12, control arm 45 is operated to detect the level of ice bodies in container 44, striker lever 33 is cocked, slug valve 15 is operated to receive another such predetermined quantity of water, and the ice body 13 is ejected automatically from cavity 12. The detection of the level of ice bodies in container 44 is effected by rotation of cam 48 to change the engagement thereof with actuating means 47 from the A″ point of the cam to the C″ point thereof, whereby control arm 45 is raised from the A position to the C position. Further rotation of cam 48 beyond the C″, point back toward the A″ point permits the control arm portion 49 to drop within the container 44 until knob 50 strikes the uppermost ice body 13 therein. If the uppermost ice body is above the preselected level, the control arm does not drop below position B of FIG. 4. Cam 48 continues to rotate, and pivot link 46 continues to pivot in a clockwise direction sufficiently to cause engagement of control arm end 51 with aperture end 64. As the control arm cannot be moved against the resistance of the ice body, further pivoting of pivot link 46 in a clockwise direction is prevented. Thus, as cam 48 continues to move to the position wherein point A″ confronts the actuating member 47, the cam surface moves away from the actuating member, allowing switch 28 to open. This prevents further operation of motor 18 until such time as the level of ice in container 44 is reduced, such as by emptying the container. When the container 44 is to be removed, or at any time as desired, control arm 45 may be locked in an upper, out-of-the-way position on

catch **65** to permit free access to the space normally occupied by the container.

After the container has been emptied and returned to its normal position below control arm end **49**, the control arm may be released from its raised position by a slight movement to the left to remove it from catch **65**, whereupon pivot link **46** is pivoted by spring **62** to effect engagement of actuating means **47** with cam **48** and permit the above-described automatic operation to be resumed.

While I have shown and described one embodiment of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Apparatus for controlling electrical drive means of an ice body maker as a function of the level of ice bodies accumulated in a receptacle therein, comprising: a switch for continuously controlling the electrical energization of the drive means; means carrying said switch movable to and from a preselected position; a control arm for sensing the level of ice bodies in the receptacle, said control arm being operatively associated with the switch carrying means for movement thereby from a first position corresponding to a preselected level of the ice bodies in the receptacle to a second position above said first position as a result of movement of the switch carrying means away from said preselected position; means biasing the control arm in a direction away from said second position toward said first position; and means operated by the drive means for bodily positioning the switch, said switch positioning means permitting the switch to de-energize the drive means when the control arm is precluded from being moved in said direction beyond said first position.

2. The apparatus of claim 1 wherein said switch carrying means includes a link having an aperture and the control arm includes an end portion having a lost motion connection with the link in said aperture.

3. The apparatus of claim 1 wherein the switch positioning means comprises a cam operatively associated with the switch carrying means for controlling movement thereof from and to the preselected position.

4. Apparatus for controlling electrical drive means of an ice body maker as a function of the level of ice bodies accumulated in a receptacle therein, comprising: a switch for continuously controlling the electrical energization of the drive means; means carrying said switch movable to and from a preselected position; a control arm for sensing the level of ice bodies in the receptacle, said control arm separably engaging the switch carrying means for movement thereby from a first position corresponding to a preselected level of the ice bodies in the receptacle to a second position above said first position as a result of movement of the switch carrying means away from said preselected position; means biasing the control arm in a direction away from said second position toward said first position; and means operated by the drive means for bodily positioning the switch, said switch positioning means arranging the switch to de-energize the drive means when the control arm is precluded from being moved in said direction beyond said first position.

5. Apparatus for controlling an electrical motor of an ice body maker as a function of the level of ice bodies accumulated in a receptacle therein, comprising: a switch assembly including a pivotally movable mounting member and a control switch on the mounting member electrically associated with the motor, said switch being biased to de-energize the motor; cam means rotated by the motor; a control arm operatively associated with the switch assembly for pivotal movement to sense the level of ice bodies accumulated in the receptacle; and means biasing the switch assembly against the cam means to overcome the bias of the switch and thereby energize the motor; rotation of said cam means causing movement of the control arm upwardly from a first position to a second position, the switch opening as a result of rotation of the cam means when the control arm is held above a position corresponding to a preselected level of ice bodies in the receptacle.

6. Apparatus for controlling an electrical motor of an ice body maker as a function of the level of ice bodies accumulated in a receptacle therein, comprising: a switch assembly including a pivotable mounting member and a normally open control switch on the mounting member electrically associated with the motor, cam means rotated by the motor; a control arm connected to said mounting member for movement to sense the level of ice bodies accumulated in the receptacle; and means baising the switch assembly against the cam means to close the switch and thereby energize the motor, movement of said cam means causing movement of the control arm upwardly from a first position to a second position, the switch opening as a result of movement of the cam means when the control arm is held above a position corresponding to a preselected level of ice bodies in the receptacle.

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