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Utter et al.

[11] **3,863,463**

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[54] **ICE MAKING APPARATUS**

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[52] **U.S. Cl.** **62/354,** 62/137

[51] **Int. Cl.** **F25c 1/14**

[58] **Field of Search** 62/354, 137, 344

[56] **References Cited**

UNITED STATES PATENTS

3,220,204	11/1968	Adler et al.	62/354 X
3,402,562	9/1968	Menzel	62/306 X
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[57] **ABSTRACT**

An ice making apparatus comprising a tubular housing member defining an ice forming chamber and providing an inner surface on which thin layers of ice are formed, auger means rotatably mounted in the ice forming chamber and having a generally cylindrical main body portion and a helical blade extending outwardly therefrom and terminating adjacent the inner surface of the tubular housing member, an ice compacting chamber at one end of the ice forming chamber, a conduit system for transmitting ice from the ice forming chamber to an ice storage bin or other location where ice may be used, a discharge spout mounted on the housing member for communicating ice from the compacting chamber to the conduit system, and means including an electrical switch connected with the electrical circuitry of the apparatus and responsive to a predetermined condition within the conduit system for controlling operation of the apparatus.

18 Claims, 4 Drawing Figures

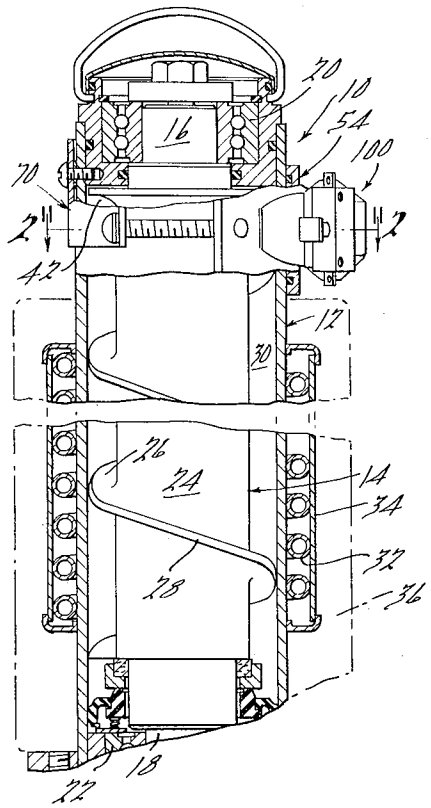

Fig. 1.

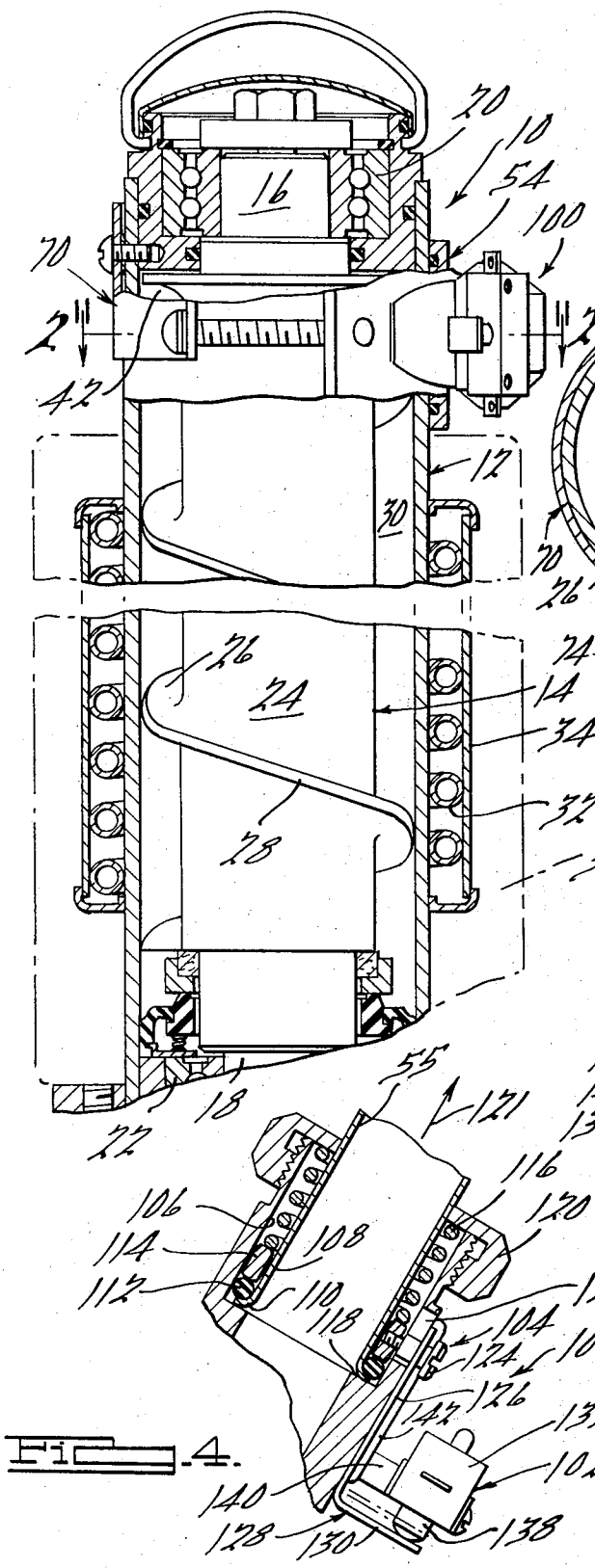

Fig. 2.

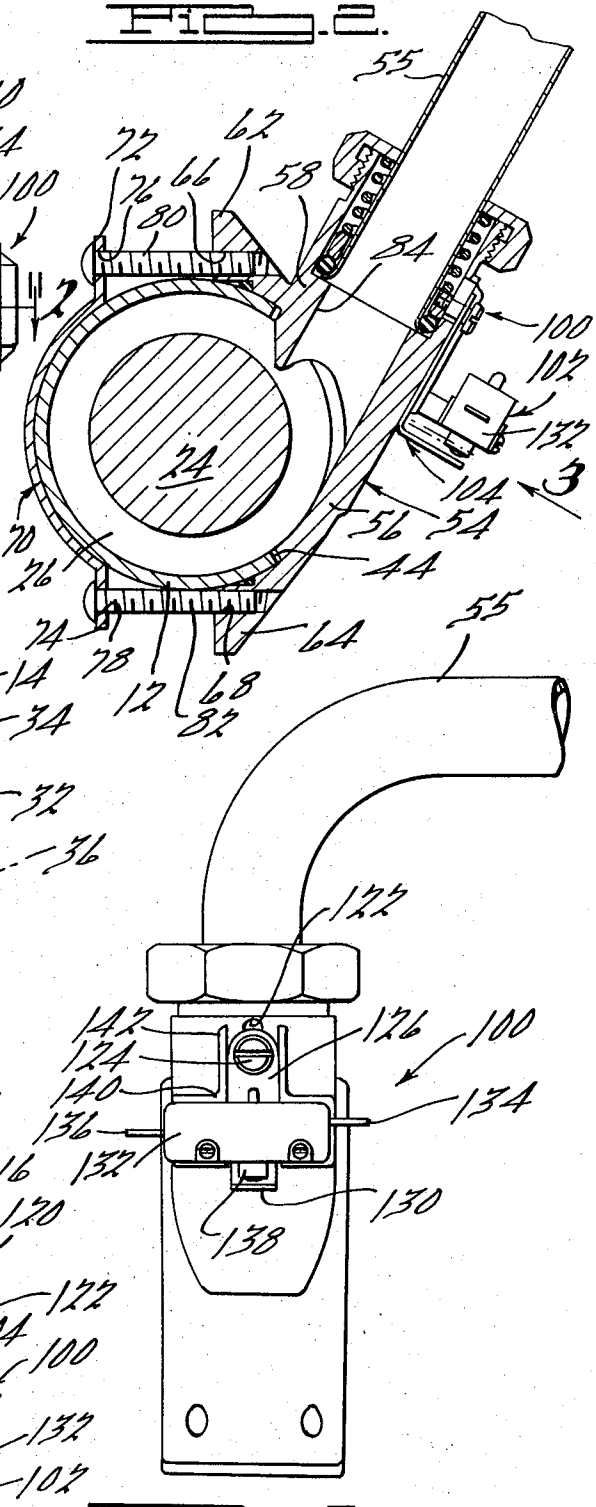

Fig. 4.

Fig. 3.

ICE MAKING APPARATUS

SUMMARY OF THE INVENTION

Generally speaking, the present invention is directed toward a new and improved ice making apparatus of the type comprising a tubular housing member defining an ice forming chamber and providing an inner surface on which thin layers of ice are formed. The ice is removed by a rotatable auger disposed within the housing member and which causes ice to be transferred upwardly toward a discharge opening from where the ice is removed. This type of ice making apparatus is generally shown in the U.S. Pat. Nos. 3,283,529 and 3,371,505, both of which disclose the use of an ice discharge spout for communicating ice from an ice compacting or forming chamber toward a conduit or other means for transmitting the ice toward an ice storage chamber or other location where such ice may be stored or used. Modern applications of such ice making apparatus frequently require that the actual ice making machine be located remote from the ice storage bin or area of use of the ice. This in turn, has necessitated the use of some type of conduit or the like for communicating the ice making machine with the remote storage bin or area of use, and it has been found that the lengths of such conduits are directly related to the force required to transmit the ice from the machine to the outlet end of the conduit. It has been found that under certain operating conditions, particularly when relative long and/or circuitous ice transmitting conduits are utilized for communicating ice from the aforesaid type ice making machines, the level of back pressure created by the ice moving through the conduit system may become excessive and inhibit efficient operation and possibly damage the associated ice making apparatus. In general, the present invention is directed toward an ice discharge spout for the aforesaid types of ice making machines, which spout embodies a back pressure responsive means for controlling operation of the apparatus under adverse back pressure conditions so as to positively prevent damage thereto. More particularly, the present invention resides in a novel spout design which incorporates a back pressure responsive switch that is connected with the electrical circuitry of the associated ice making apparatus and is operable in response to a predetermined back pressure condition in the conduit system to shut off the apparatus so as to prevent any damage thereto, as will hereinafter be described in detail.

Accordingly, a general object of the present invention is to provide a new and improved ice making apparatus.

It is a more particular object of the present invention to provide a new and improved ice making apparatus which utilizes a novel means for preventing damage thereto in the presence of an excessive back pressure condition in the ice delivery conduit system thereof.

It is still another object of the present invention to provide an ice making apparatus which embodies certain improved features over the machines shown in U.S. Pat. Nos. 3,283,529 and 3,371,505.

It is a more particular object of the present invention to provide a new and improved discharge spout arrangement which minimizes to the extreme the possibility of damage to the apparatus due to any back pressure or resistance to the ice flow through the associated delivery conduit system.

It is a further object of the present invention to provide a new and improved ice making apparatus, as above described, which is provided with an electrical switch in the electrical circuitry thereof that is responsive to a predetermined back pressure condition in the conduit system for deenergizing the apparatus and thus assuring against any damage thereto as a result of the ice flow back pressure.

It is still another object of the present invention to provide a new and improved ice making apparatus, as described above, which is of a relatively simple design, is economical to manufacture and that will have a long and effective operational life.

Other objects and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a longitudinal cross-sectional view, partially broken away, of a portion of an ice making machine incorporating the principles of the present invention;

FIG. 2 is a transverse cross-sectional view taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a side elevational view of a portion of the ice making machine shown in FIGS. 1 and 2, as seen in the direction of the arrow 3 of FIG. 2, and

FIG. 4 is an enlarged fragmentary view of a portion of the structure shown in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, an ice forming apparatus **10**, in accordance with one preferred embodiment of the present invention is shown generally as comprising an elongated hollow cylindrical or tubular housing member **12** having auger means in the form of an elongated rotatable auger **14** disposed interiorly thereof. The auger **14** is formed with reduced diameter upper and lower end portions **16** and **18**, respectively, which are suitably journal supported by means of upper and lower bearing assemblies **20** and **22** that are located adjacent the upper and lower ends of the housing member **12**. The auger **14** comprises an elongated central body section **24** that is formed with an integral helical ramp **26** which defines a helical ice shearing edge **28** disposed closely adjacent the inner periphery of the tubular housing **12**. The outer periphery of the auger **14** and the inner periphery of the tubular housing member **12** define an ice forming chamber **30** about which a refrigeration coil **32** is disposed. The coil **32** is disposed within a shroud or enclosure **34** which is in turn located interiorly of a suitable layer of insulation or the like, representatively designated by the numeral **36**. A supply of water is adapted to be communicated to the ice forming chamber **30** through suitable conduits or the like (not shown), whereupon energization of the refrigeration coil **32** results in a thin layer of ice being continuously formed around the inner periphery or surface of the tubular member **12**. As is well known in the art, upon rotation of the auger **14** by means of a suitable drive motor or the like (not shown), the aforesaid layer of ice is transferred axially upwardly by the helical ramp **26** on the auger **14** to a position where such ice is discharged in the manner hereinafter to be described.

Disposed adjacent the upper and end of the body section 24 of the auger 14 is an ice compacting chamber 42 into which the ice formed in the chamber 30 is transferred by means of the ramp 26 of the auger 14 preparatory to said ice being discharged from the apparatus 10. In order to remove ice displaced into the compacting chamber 42, a discharge opening 44 is provided in the housing member 12 in generally axial or longitudinal alignment with the chamber 42. The discharge opening 44 is of a generally rectangular configuration and is cooperable with an ice discharge spout, generally designated by the numeral 54, for communicating ice from the apparatus 10 to an associated ice delivery conduit system which is representatively designated by the numeral 55. Generally speaking, the discharge spout 54 comprises a mounting section 56, which is adapted for attachment to the outer periphery of the housing member 12, and a discharge section 58 which is adapted to communicate ice toward a suitable conduit or other ice conveying mechanism, as will be described. The opposite ends of the mounting section 56 are formed with a pair of outwardly projecting flanges or ears 62 and 64 that are provided with interiorly threaded openings or bores 66 and 68, respectively. The flanges 62, 64 are cooperable with an arcuate retaining plate, generally designated by the numeral 70, which is mounted on the diametrically opposite side of the housing member 12 from the discharge spout 54 and is formed with a pair of outwardly projecting flanges or ears 72 and 74 which are disposed in confronting relationship with the flanges 62, 64. The flanges 72, 74 are formed with openings or bores 76, 78 which are respectively aligned with the openings 66, 68, whereby suitable screws, bolts or similar fastening elements 80 and 82 may be inserted through the openings 76, 78 and be threadably engaged with the bores 66, 68 to positively secure the discharge spout 54 in the operative position shown in FIGS. 1–3. It will be appreciated, of course, that the discharge spout 54 may be fixedly secured to the apparatus 10 in a variety of alternative ways; however, the above described cooperation of the spout 54 with the retaining plate 70 and fastening means 80, 82 has been found to be highly satisfactory and preferable.

As best illustrated in FIG. 2, the discharge section 58 of the spout 54 is formed with a cylindrical discharge passage 84 which, along with the section 58, is oriented at an angle to the axis of the auger 14 and housing member 12 such that the axis of the passage 84 is arranged generally tangential to the compacting chamber 42 and auger 14. The passage 84 is adapted to be communicable at its inner end with the compacting chamber 42 and at the outer end thereof with the conduit system 55 which is intended to carry ice produced by the apparatus 10 to some destination where the same may be conveniently used. The outer end of the discharge section 58 is formed with an externally threaded end portion 88 for purposes hereinafter to be described.

In accordance with the principles of the present invention, the ice making apparatus 10 is provided with a back pressure shut-off assembly, generally designated by the numeral 100, which is associated with the discharge spout 54 and is operable to automatically cease operation of the apparatus 10 at such time as a predetermined back pressure condition exists in the conduit system 55. The assembly 100 includes an electrical switch assembly 102 and an actuating assembly 104, which assemblies 102, 104 are operatively mounted directly adjacent the discharge section 58 of the spout 54, as best seen in the drawing. With reference now to FIG. 4, it will be seen that the outer end of the discharge passage 84 is formed with an enlarged diameter counterbore 106 within which the terminal or inner end 108 of the conduit system 55 is operatively disposed. The extreme inner end 108 is formed with a generally radially outwardly disposed flange or swaged portion 110, the outer diameter of which is slightly larger in diameter than the discharge passage 84. Disposed circumjacent the swaged portion 110 is an O-ring sealing element 102 which is adapted to provide a fluid-tight seal between the inner periphery of the counterbore 106 and the outer periphery of the conduit system 55. Disposed axially outwardly from the O-ring sealing element 102 is an annular actuating collar 114 which extends around the conduit system 55 between the outer periphery thereof and the inner periphery of the counterbore 106. Both the collar 114 and the end section 108 are adapted to be longitudinally or axially slidable within the counterbore 106, with the collar 114 being resiliently urged away from the outer end of the discharge spout 54 by means of a helical coil spring 116 which is disposed around the outer periphery of the conduit end section 108. As shown, the spring 116 operates to resiliently bias the collar 114 and O-ring 112 axially inwardly, thereby urging the swage portion 110 into abutting engagement with the generally radially disposed shoulder 118 at the inner end of the counterbore 106. The outer end of the coil spring 116 bears against the underside of a threaded collar member 120 which is threadably secured to the outer end of the discharge section 58. As will be appreciated by those skilled in the art, the swage portion 110 of the terminal end section 108 of the conduit system 55 is normally resiliently biased into abutting engagement with the shoulder 118 under the influence of the spring 116; however, at such time as a back pressure condition of a predetermined magnitude occurs within the conduit system 55, the conduit system 55 will tend to move axially outwardly relative to the discharge spout 54, whereupon the end section 108 will move axially in the direction of the arrow 121 in FIG. 4, resulting in concomitant movement of the collar 114 and compression of the spring 116. At such time as the back pressure within the conduit system 55 drops below the aforesaid magnitude, the conduit 55 will be biased by means of the spring 116 back to the orientation or position shown in FIGS. 2 and 4.

As best seen in FIG. 4, one side of the discharge section 58 of the discharge spout 54 is formed with an elongated axially extending slot or aperture 122 through which a suitable fastening element, such as a screw or the like 124 extends. The inner end of the screw 124 is threadably engaged with the collar 114, while the outer end of the screw 124 extends through and is secured to an elongated arm section 126 of an L-shaped actuating bracket, generally designated by the numeral 128. The bracket 128 includes a relatively short arm section 130 which is integrally connected to the arm section 126 and extends at a right angle thereto. The elongated arm section 126 of the bracket 128 extends generally parallel to the axis of the discharge section 58 of the spout 54 and by virtue of the inner connection between the bracket 128 and the col-

lar 114 via the screw 124, the bracket 128 is adapted to move axially of the discharge section 58 simultaneously with movement of the collar 114 within the counterbore 106.

The switch assembly 102 includes a switch housing 132 which is provided with a pair of electrical terminals 134 and 136 that are adapted to be connected to the electrical circuitry of the associated ice making apparatus 10. Disposed interiorly of the assembly 102 is a suitable electrical switch mechanism which is adapted to be actuated to open and close a circuit between the terminals 134, 136 in a manner well known in the art. Means for actuating such switching device within the assembly 102 is provided by an actuating element 138 which extends outwardly from one side of the switch housing 132 at a position adjacent the arm section 130 of the actuating bracket 128. It will be appreciated, of course, that the switch assembly may be of any one of a number of suitable constructions; however, in accordance with one preferred form of the present invention, the assembly 102 is constructed such that the electrical circuit is completed between the terminals 134 and 136 when the actuating element 138 is in a fully extended position. At such time as the element 138 is biased toward the switch housing 132 or in the general direction of the arrow 121 in FIG. 4, the aforesaid circuitry between the terminals 134, 136 is intended to be opened or broken. The switch assembly 102 may be operatively connected to the electrical system of the associated ice making machine 10 in a variety of different ways, whereby to effect energization and deenergization thereof in response to the occurrence of a back pressure condition created within the conduit system 55 as a result of ice being transmitted therethrough. For example, the terminals 134, 136 may be operatively connected with the electric motor which functions to effect rotation of the auger 14, whereupon the motor will become deenergized at such time as the aforesaid back pressure condition exists within the conduit system 55. Additionally, if desired, the switch assembly 102 may also be operatively connected with the associated refrigeration system, whereby to deenergize the entire refrigeration system associated with the cooling coils 32. It will be appreciated, of course, that the present invention is in no way intended to be limited to either of such exemplary methods of operatively connecting the switch assembly 102 with the associated refrigeration system.

The switch assembly 102 is adapted to be operatively mounted upon the discharge spout 54 by means of a suitable mounting bracket or the like, representatively designated by the numeral 140. The bracket 140 is preferably provided with a guideway means 142 which extends generally parallel to the discharge section 58 of the spout 54 and is adapted to support the L-shaped bracket 128 for longitudinal movement between the solid and phantom line positions shown in FIGS. 2 and 4, whereby the arm section 130 of the bracket 128 is adapted for selective engagement with the actuating element 138 of the switch assembly 102. More particularly, the switch assembly 102 is oriented relative to the actuating bracket 128 such that the arm section 130 thereof is normally held in a position disengaged from the actuating element 138; however, at such time as the collar 114 moves axially outwardly in the direction of the arrow 121 in FIG. 4, the actuating bracket 128 will move from the solid line position in FIG. 4 to the phantom line position, whereupon the actuating element 138 of the switch assembly 102 will actuate the assembly 102 to open or break the circuit between the terminals 134 and 136, thereby effecting deenergization of the associated ice making machine 10. At such time as the back pressure condition within the conduit system 55 is alleviated, the spring 116 will cause the end section 108 of the conduit system 55 to move axially inwardly, i.e., in the opposite direction from the arrow 121 in FIG. 4, whereupon the collar 114 and actuating bracket 128 will move from the phantom line position in FIG. 4 to the solid lie position, thereby line the actuating element 138 to move to its extended position, resulting in closing of the circuit between the terminals 134, 136, whereby to effect deenergization of the ice making machine 10.

While it will be apparent that the preferred embodiment illustrated herein is well calculated to fulfill the objects above stated, it will be appreciated that the present invention is susceptible to modification, variation and change without departing from the scope of the invention.

We claim:

1. An ice making apparatus comprising a housing member defining an ice forming chamber and providing an inner surface on which thin layers of ice are formed,

auger means rotatably mounted in the ice forming chamber and having a helical blade extending outwardly therefrom and terminating adjacent the inner surface of the tubular housing member,

means on the housing member and defining an ice discharge passage,

conduit means communicable with said last mentioned means for transferring ice from the apparatus to some predetermined location remote therefrom, at least a portion of said conduit means and said last mentioned means being movable relative to one another, and

means operable in response to relative movement between said conduit means and the said last mentioned means for opening and closing an electrical circuit communicating the apparatus with a source of electrical energy.

2. The invention as set forth in claim 1 wherein said means operable in response to said relative movement comprises switch means actuable in response to movement of said conduit means relative to said last mentioned means.

3. The invention as set forth in claim 1 wherein said apparatus includes a discharge spout defining said discharge passage, and wherein said portion of said conduit means is mounted generally coaxially of said discharge passage and is movable relative thereto.

4. The invention as set forth in claim 3 wherein said switch means is mounted on one side of said discharge spout and includes an actuating element for opening and closing a circuit between first and second switch terminals.

5. The invention as set forth in claim 3 wherein one end of said conduit means is nestingly received within said discharge passage, which includes spring means resiliently biasing said one end of said conduit means toward a first position within said discharge passage, and which includes actuating bracket means movable concomitantly with movement of said one end of said

conduit means toward a second position for actuating said switch means.

6. The invention as set forth in claim 5 which includes guideway means for supporting said actuating bracket means for movement generally axially of said discharge passage.

7. The invention as set forth in claim 5 which includes an annular collar member disposed within said discharge passage circumjacent said one end of said conduit means, and which includes connecting means operatively connecting said collar member with said actuating bracket means.

8. The invention as set forth in claim 4 which includes electrical circuit means connecting said terminals of said switch means with a source of electrical energy and with said apparatus, and wherein said switch means is operable to open and close said circuit to selectively interrupt the supply of electrical energy from said source thereof to said apparatus.

9. The invention as set forth in claim 1 wherein said conduit means is movable relative to the said last mentioned means.

10. The invention as set forth in claim 9 wherein the portion of said conduit means adjacent the said last mentioned means is generally cylindrical in shape and wherein said portion is movable relative to the last mentioned means in a direction parallel to the axis of said cylindrical conduit portion.

11. An ice making apparatus comprising a housing member defining an ice forming chamber and providing an inner surface on which thin layers of ice are formed,

auger means rotatably mounted in the ice forming chamber and having a helical blade extending outwardly therefrom and terminating adjacent the inner surface of the housing member,

means defining an ice discharge passage,

means communicable with said passage and defining an interior surface along which ice moves away from said housing,

one portion of said surface being movable relative to another portion of said surface, and

means operable in response to relative movement between said surface portions for opening and closing an electrical circuit communicating a portion of the apparatus with a source of electrical energy.

12. The invention as set forth in claim 11 wherein said first surface portion is defined by conduit means and is movable relative to said second surface portion.

13. The invention as set forth in claim 12 wherein said apparatus includes a discharge spout defining said discharge passage, and wherein said portion of said conduit means is mounted generally coaxially of said discharge passage and is movable relative thereto.

14. The invention as set forth in claim 13 wherein said switch means is mounted on one side of said discharge spout and includes an actuating element for opening and closing a circuit between first and second switch terminals.

15. The invention as set forth in claim 13 wherein one end of said conduit means is nestingly received within said discharge passage, which includes spring means resiliently biasing said one end of said conduit means toward a first position within said discharge passage, and which includes actuating bracket means movable concomitantly with movement of said one end of said conduit means toward a second position for actuating said switch means.

16. The invention as set forth in claim 15 which includes guideway means for supporting said actuating bracket means for movement generally axially of said discharge passage.

17. The invention as set forth in claim 15 which includes an annular collar member disposed within said discharge passage circumjacent said one end of said conduit means, and which includes connecting means operatively connecting said collar member with said actuating bracket means.

18. The invention as set forth in claim 14 which includes electrical circuit means connecting said terminals of said switch means with a source of electrical energy and with said apparatus, and wherein said switch means is operable to open and close said circuit to selectively interrupt the supply of electrical energy from said source thereof to said apparatus.

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