

Dec. 6, 1960

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2,962,878

MEANS FOR DISCHARGING ICE CHIPS

Filed Jan. 14, 1959

3 Sheets-Sheet 1

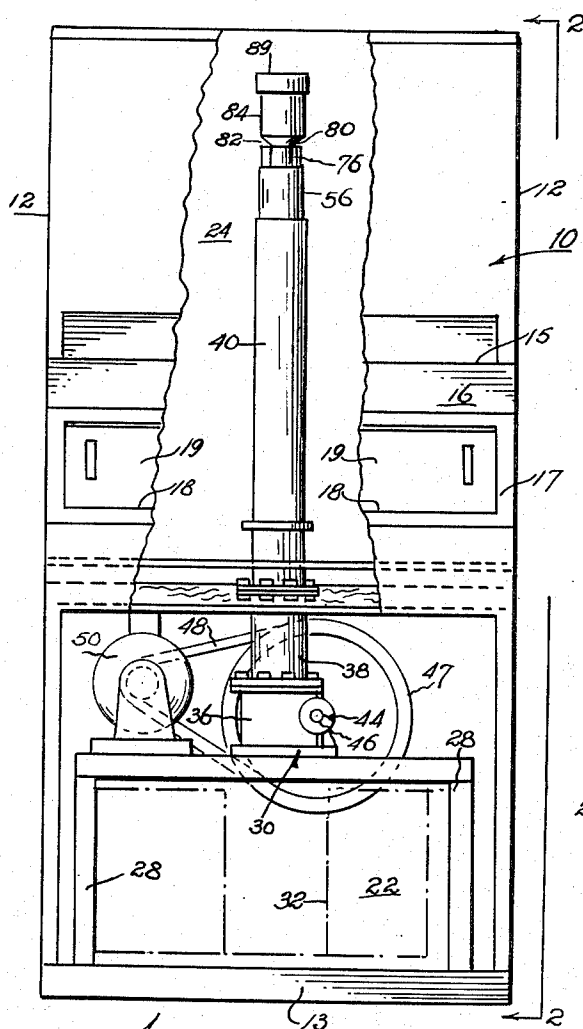


Fig. 1.

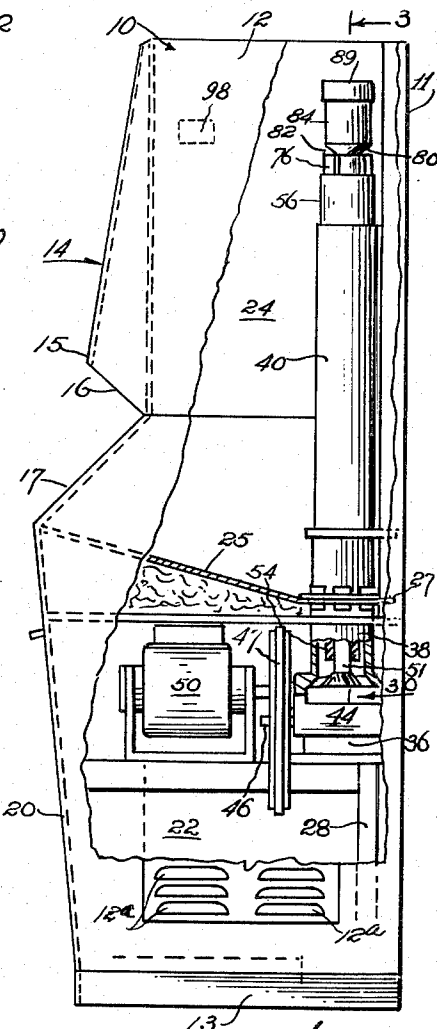


Fig. 2.

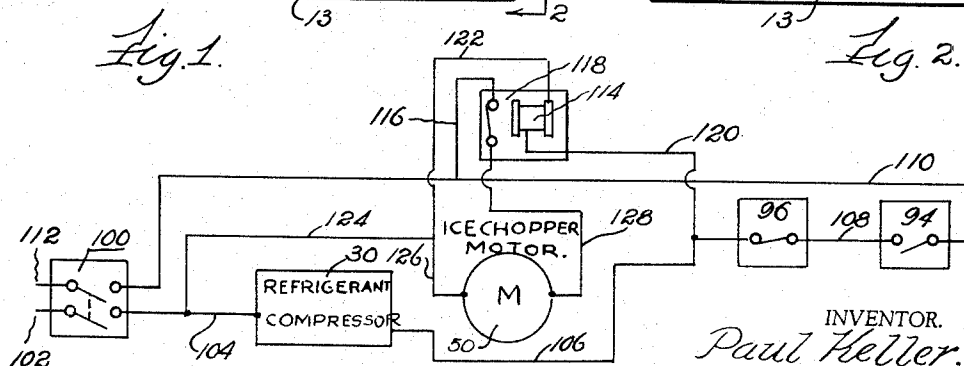


Fig. 6.

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Fig. 3.

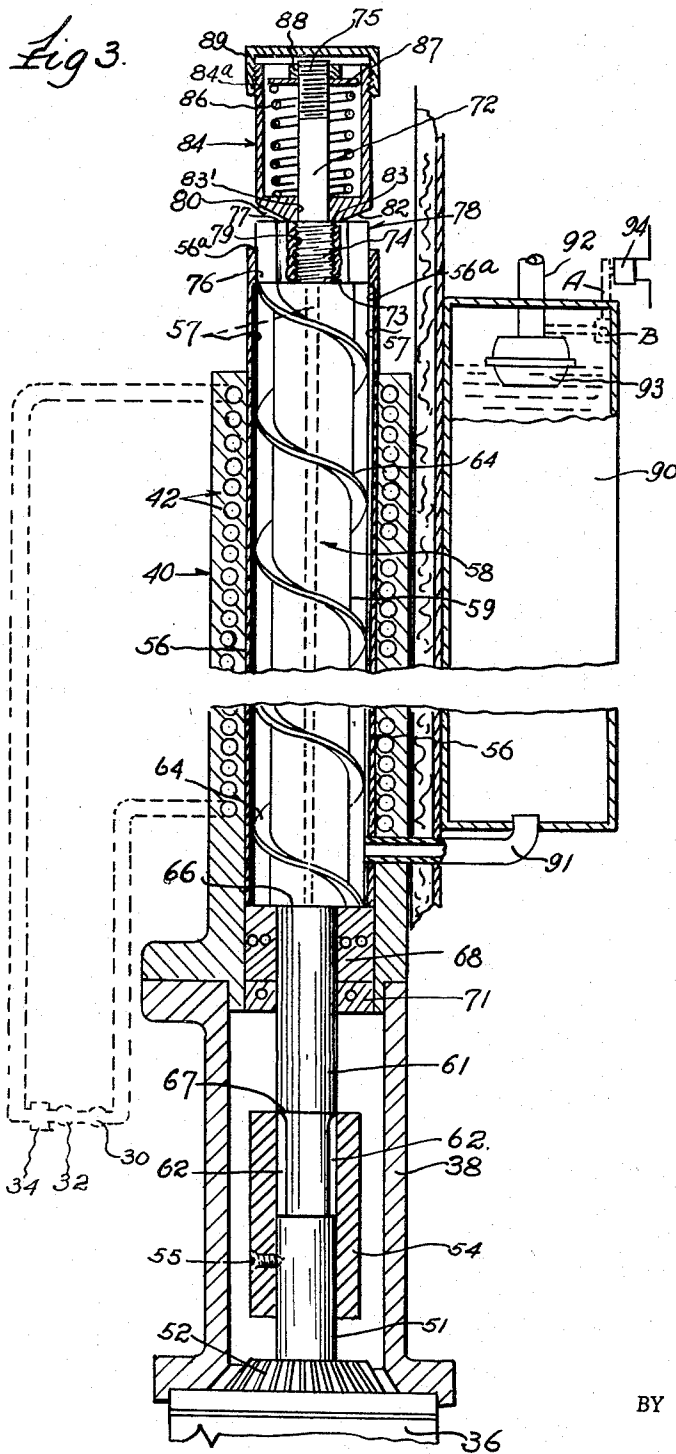


Fig. 4.

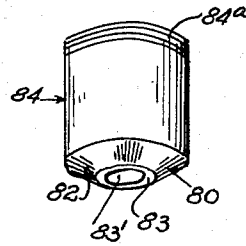


Fig. 5.

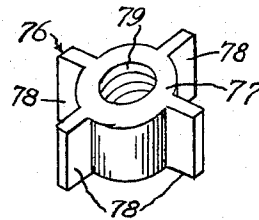


Fig. 5a.



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Fig. 7.

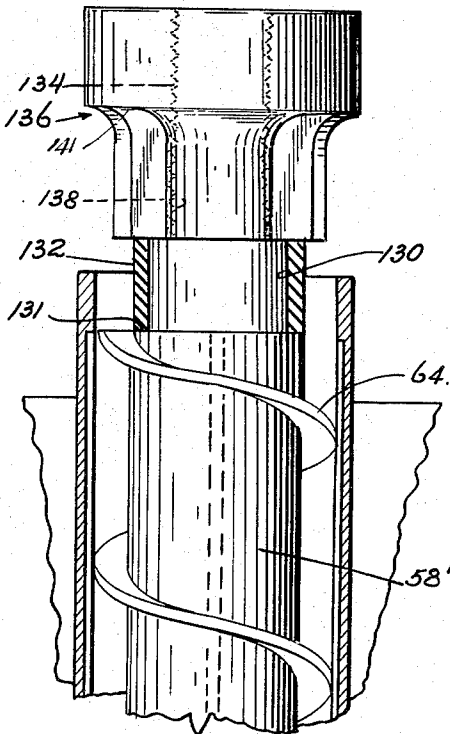


Fig. 8.

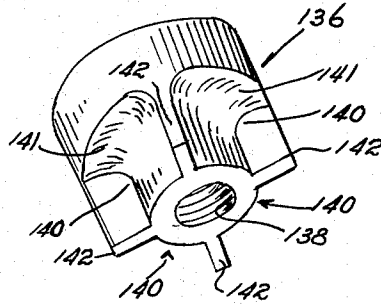


Fig. 9.

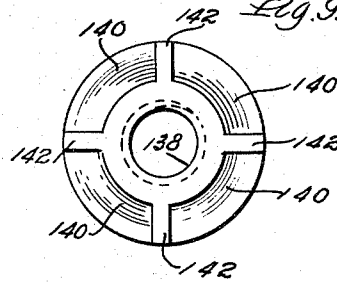


Fig. 10.

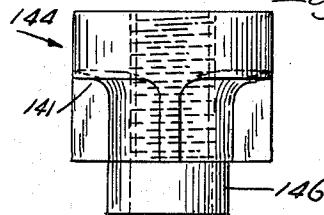
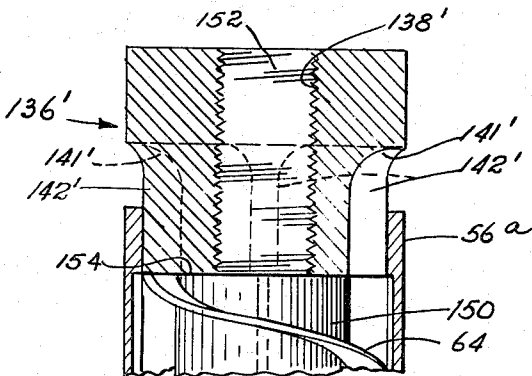


Fig. 11.



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MEANS FOR DISCHARGING ICE CHIPS

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10 Claims. (Cl. 62—320)

This invention relates to new and improved means for discharging ice chips.

One of the objects of this invention is to provide new and improved means in an ice forming machine for forming the ice and for discharging the ice from the freezing chamber.

Another object of this invention is to provide means associated with the upper open end of a freezing column for uniformly discharging and distributing the ice formed in the freezing column.

Another object of this invention is to provide means associated with the discharge end of the freezing column whereby the pressure exerted by the advancing ice may be automatically relieved. Another object is to provide for an adjustment of said means.

Another object of this invention is to provide means of the foregoing character positioned at the upper open end of a freezing column which may be readily installed and removed in a minimum of time and with minimum effort.

Another object of this invention is to provide an ice forming machine having a screw shaft or auger formed of nylon material.

Other objects will become apparent as this description progresses.

In the drawings:

Figure 1 is a front view of the machine with a portion broken away to show the interior of same.

Figure 2 is a view taken on line 2—2 of Figure 1.

Figure 3 is a view partially in cross-section taken on lines 3—3 of Figure 2.

Figure 4 is an enlarged perspective view of one of the members forming this invention.

Figure 5 is an enlarged perspective view of the cutter.

Figure 5A shows a sectional view of a modified arm or blade of the cutter.

Figure 6 is a schematic view of the electrical circuit.

Figure 7 is an enlarged view of the upper portion of the column showing a modified cutting member.

Figure 8 is a perspective view of the cutting member shown in Figure 7.

Figure 9 is a bottom plan view of the cutting member shown in Figures 7 and 8.

Figure 10 is a view of a modified cutter, and

Figure 11 is a view of a modified cutter generally similar to the cutter shown in Figure 8, except that a portion of the arms of the cutter rotate within the upper end of the freezing column.

The cabinet generally indicated at 10, and best shown in Figures 1 and 2 is of the upright shape, having a rear 11, sides 12, base 13, and a front generally indicated at 14. One of the sides is provided with louvers 12a. The upper front portion of the cabinet inclines forwardly as at 15 and then rearwardly as at 16. The midsection inclines forwardly as at 17 and is provided with a pair of rectangular spaced openings 18 into which are fitted sliding doors 19 for access into the interior of the cabinet.

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The lower front section then inclines inwardly as at 20 toward the base.

The interior of the cabinet is divided into a lower compartment 22 and an upper compartment 24 by a partition 25 which forms the bottom wall for the flaked ice compartment 24. The partition 25 includes downwardly from adjacent the lower end of the midsection to a horizontal position as at 27 adjacent the rear wall 11. The flaked ice, as will be subsequently explained, piles up in the upper compartment 24 on the partition 25 and is readily removable therefrom by opening the doors 19. The midsection of the cabinet which is accessible through the doors 19 permits a person in standing upright position to remove the ice very readily and easily without stooping or bending. Furthermore, the ice is scooped up from the bottom, thus the old ice is used up first.

A supporting frame generally indicated at 28 is suitably secured to the base 13 of the cabinet in the lower compartment 22 and a conventional refrigerant compressor 30, condenser 32 and expansion valve 34, all hermetically sealed, are enclosed within the frame.

Supported and secured on the top of the frame 28, centrally and rearwardly thereof, is a tubular member 36 on which is secured a riser block 38, best shown in Figures 1 and 3, which extends upwardly through an opening in the partition 25 and into the upper compartment 24. Supported on the riser block 38 is a tubular insulated freezing column 40 which supports a freezing coil or evaporator 42 which is connected at the lower end through suitable pipes (shown diagrammatically in Figure 3) to the compressor 30 and to the expansion valve 34. The compressor 30, condenser 32 and expansion valve 34 are connected in series, as is well understood in the art and as is best shown in Figure 3.

The tubular member 36 supports a speed reducer generally indicated at 44. The speed reducer shaft 46 carries a pulley 47 which is driven by a belt 48 in turn driven by an electric motor 50 mounted on top of the frame 28. The speed reducer 44 drives the screw shaft, to be presently described. Supported within the tubular member 38 is a rotatable post 51 supporting a gear 52 which is driven by the speed reducer 44. The post 51 supports a coupling sleeve 54 which is secured to the post 51 by a set screw 55. A sleeve 56 is stationarily supported in the column 40. The sleeve 56 extends upwardly above the freezing column portion and said upwardly extending sleeve portion is designated at 56a.

The inside wall of sleeve 56 and sleeve extension 56a is provided with a plurality (preferably four) of equally spaced vertically extending grooves 57 which start on the inside surface of the sleeve slightly below where the arms of the ice cutting member (to be described) engage the sleeve wall. These grooves continue downwardly and may extend to the bottom of said sleeve. This increases the friction tension of the ice toward the sleeve wall and facilitates the discharge of the ice from the freezing column. The grooves 57 should not extend around the sleeve wall surface which is engaged by the rotating arms of the ice cutting member.

A screw shaft or auger generally indicated at 58 is confined in said tubular column 40 and supported on the post 51. The lower end of screw 58 has a cylindrical body 61 which has opposed flat sides 62 confined in the coupling sleeve 54. A flexible coupling may be used in lieu of the coupling sleeve shown. A spiral fin 64 is formed integrally with said main body portion 59 of the screw shaft. The screw shaft 58 has a shoulder 66 and a shoulder 67, with the latter shoulder resting on the top of the coupling sleeve.

A bearing block 68 is secured inside the lower end of the freezing column 40 adjacent the shoulder 66 and

the lower end of the column is closed with a seal 71 adjacent the bearing block. As best shown in Figure 3, the upper end of the screw shaft or auger 58 has a reduced shank 72 providing a shoulder 73. The lower portion of shank 72 is threaded as at 74. The upper end of shank 72 is also threaded as at 75.

While the screw shaft 58 may be made of steel or the like, I have found that a screw shaft made of nylon material will produce the best results due to the self-lubricating qualities of the nylon material. The ice produced is of better quality, wear between the spiral fin 64 and the inner wall of the sleeve 56 of the freezing column is practically eliminated, and the ice in the freezing column moves freely and is easier to discharge.

In addition to the use of a nylon screw or auger, this invention is particularly directed to the features of construction shown in Figures 3, 4 and 5. The upper end of the freezing column 40, which includes the sleeve 56a, is open at the top thereof and the major portion of shank 72 of screw shaft 58 extends upwardly thereof and is adapted to receive an ice cutting member generally indicated at 76, best shown in Figure 5.

The ice cutting member 76 comprises an annular body or boss portion 77 provided with a plurality (preferably four) of spaced radially extending arms 78. The annular body or boss portion is internally threaded as at 79. The threads 74 of the shaft and the internal threads 79 of the ice cutting member are such that as the screw shaft 58 rotates counterclockwise the ice cutting member will tighten on the shaft against the shoulder 73 of the shaft. The ice cutting member 76 rotates with the shaft 58 and a portion of the arms 78 of the ice cutting member is confined within the upper end of the sleeve 56 of the freezing column to rotate therewithin, and a portion of said arms extends outwardly of the sleeve 56.

The ice cutting member 76 is made preferably of nylon material. I have found that by the use of such material, wear on the arms 78 against the inside wall of the sleeve surface is eliminated due to the self-lubricating qualities of nylon.

Figure 5A shows a modification of the lower portions of arms 78. In this modification the lower portion of each of the arms 78 is cut at an angle to provide a knife-like lower cutting edge 78a.

Mounted on shank 72 of the screw shaft 58 is an ice deflecting member generally indicated at 80, best shown in Figure 4, which has an inclined surface 82 and a bottom flat surface 83, which surface rests on ice cutting member 76. The lower end of member 80 just described and shown in the drawings is generally of an inverted truncated cone shape and serves to direct and deflect the ice uniformly outwardly as it moves upwardly out of the top of the freezing column. I have found that the angle of inclination of the surface 82 need not be as great as shown in the drawings but that the surface 82 may be inclined approximately ten degrees and that effective results will be obtained.

The ice deflecting member 80 is provided with a central opening 83' whereby the deflecting member is positioned on the shank 72 of the shaft for sliding movement thereon. The ice deflecting member 80 is provided with an annular shell-like body 84 which extends upwardly of the inclined surface 82. The ice deflecting member 80 may be made of nylon material if desired.

A coil spring 86 surrounds the shank 72 and is confined inside the shell-like body 84 on member 80. A washer 87 and a threaded nut 88 is secured to the threaded portion 75 of the shank for retaining the coil spring 86. The nut 88 is adjustable and it will be seen that the spring 86 may be compressed by tightening the nut 88 which thereby places the ice deflecting member 80 under greater pressure. Thus, the pressure exerted against the ice deflecting member 80 may be varied as desired by tightening and loosening the nut 88. A

threaded cap 89 engages the threaded end 84a of the shell-like body 84 for enclosing the parts. The ice deflecting member 80 rotates with the screw shaft 58, as does the ice cutting member 76.

As the ice formed in the freezing column 40 moves upwardly through the open end of the sleeve 56a, it will be first engaged by the arms 78 of the rotating cutter 76 which severs the ice from the ice strip and as the ice moves upwardly against the inclined surface 82 of the rotating ice deflecting member 80, the ice will be directed simultaneously outwardly of the column to drop into the ice storage bin 24. The ice moving out of the freezing column 40 is uniformly discharged and distributed in the storage bin 24 around the freezing column by virtue of the construction of the rotating ice cutting member 76 and the deflecting member 80. Also, any undue pressure of the ice moving upwardly against the ice deflecting member 80 will cause the ice deflecting member to slide or move upwardly against the pressure of the coil spring 86 and release and compensate for the pressure of the ice. By virtue of applicant's construction the cutting member 76 and the ice deflecting member 80 are readily accessible for removal. The parts are fully enclosed for sanitary purposes.

Supported adjacent the rear of the cabinet is a water tank 90 which has an outlet pipe 91 at the bottom thereof leading into the interior of the tubular freezing column 40 adjacent the lower end of the screw portion of the screw shaft. An inlet pipe 92 leading into the tank is connected to a suitable source of water supply. A water level float 93 is contained within the tank 90. The float is connected so that when the float drops below a certain prescribed level it will open the electrical circuit to prevent operation of the machine. Any conventional means may be used for said purpose. For example, an L shaped arm A is pivotally supported as at B in the tank 90. The upper end of the arm extends through an opening in the top of the tank to operate the shutoff switch 94 to open the electrical circuit to the refrigerant compressor 30 to arrest operation of the refrigerant compressor. Normally, the shutoff switch 94 is closed so that the refrigerant compressor will operate; however, when the float 93 drops, the arm A will pivot to open the switch in the shutoff 94, shutting off the refrigerant compressor. The shutoff switch is connected in the circuit as described in connection with Figure 6.

The thermostatic shutoff 96 is used for the purpose of controlling the electrical circuit to operate the refrigerant compressor 30. Any conventional means may be used for operating the thermostatic shutoff and same is shown diagrammatically in Figure 2 and indicated by the numeral 98. The said means is positioned inside the upper portion of the upper compartment of the cabinet so that when the upper compartment is filled with ice the thermostat will be operated to open the electrical circuit to the refrigerant compressor to arrest operation of said compressor. Normally the switch in the thermostatic shutoff 96 is closed.

The freezing column 40 will be filled with water equal to the level of that in the water tank 90. After the refrigerating unit is in operation, the water in the freezing column will be frozen to a semi-solid form and with the rotation of the screw shaft 58 will be advanced upward into engagement with the rotating ice cutting member 76 and then with the inclined surface 82 of the ice deflecting member 80, as previously described, to be discharged into the bin.

Due to the uniform and even distribution and ejection of the ice by virtue of applicant's construction, the speed of ejection is increased as contrasted to structures employing a single opening in the sleeve. Also, any pressure or thrust against the screw shaft 58 is equalized on all sides thereof, which provides for a truer bearing surface for the screw shaft and prevents unnecessary wear or binding of the rotating parts. Furthermore, the

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ice is ejected evenly and uniformly all around the freezing column and piles up evenly in the storage bin.

The schematic view shown in Figure 6 will now be described.

Assuming that the thermostatic shutoff 96 and low water pressure shutoff 94 are closed, the manually operated double pole starting switch 100 when closed will permit the current to flow through line 102 through conductor 104 to operate the refrigerant compressor 30 through conductor 106 to the thermostatic shutoff 96, through conductor 108 to the lower water pressure shutoff 94 through conductor 110 to starting switch 100 to line 112. The thermostatic shutoff 96 and low water pressure shutoff 94 are connected in series with the refrigerant compressor 30. The above comprises the compressor circuit and places the compressor 30 in operation. Opening of the switch in either the thermostatic shutoff 96 or the lower water pressure shutoff 94 will open the circuit through the conductors 106 and 108 leading from the refrigerant compressor 30 and shut off the refrigerant compressor.

The relay 114 is connected in shunt through conductors 112 and 116 to conductors 110 and 106 of the compressor circuit and the relay 114 is energized to close switch 118, the current flowing from line 102 through conductors 106, 120 through relay 114, conductors 122, 124 and back to line 102. When the switch 118 is closed the motor 50 will be operated by current flowing through line 102, through conductors 124 and 126 to the motor 50, conductor 128, switch 118, conductor 116, conductor 110 and back to line 112. The relay 114 will hold the switch 118 closed for a predetermined interval even though the thermostatic shutoff 96 opens to open the compressor circuit and shut off the refrigerant compressor. The motor 50 operates the screw shaft 58.

Briefly described, the motor 50 continues to operate screw shaft 58 for a period of time after the refrigerant compressor 30 has been shut off to allow all the ice in the freezing column to be discharged, thus, no ice is formed or left in the freezing column. Also, when either the switch of the thermostatic shutoff 96 or the switch of the low water pressure shutoff 94 is open, the refrigerant compressor 30 ceases to operate, although the motor 50 for operating the screw shaft 58 continues to operate.

The modification shown in Figures 7, 8 and 9 will now be described.

The upper end of the screw shaft 58' has a reduced diameter 130 to provide a shoulder 131. A spacing sleeve 132 surrounds the shaft portion 130 and rests on the shoulder 131. The screw shaft above the reduced diameter portion 130 is further reduced in diameter and is externally threaded as at 134 to receive a combined ice cutting and deflecting member generally indicated at 136 and best shown in Figure 8.

Member 136 is provided with a central threaded bore 138 adapted to engage the threaded portion 134 of the screw shaft. The lower portion of member 136 is provided with a plurality of spaced sections generally indicated at 140. Each section 140 has a generally umbrella shaped surface 141 which is provided with radially extending arms 142 which merge into the surface 141 and form the sections 140. The threads 134 of the screw shaft and those of the member 136 are so arranged that rotation of the shaft will tend to tighten member 136 on said shaft. The shape of the surfaces 141 of the sections 140 may be modified and same may be shaped to an inclined angle like surface 82 shown in Figure 4, with radially extending arms 142.

Figure 10 is a view of a modified combined ice cutting and deflecting member which is similar to member 136 shown in Figures 7 to 9 inclusive, except that said member 144 includes an extension 146 formed integrally with the member 144 which serves as a spacing sleeve

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in lieu of the spacing sleeve 132 heretofore described. The deflecting surface of Figure 10 may be like the surface 82 described in connection with Figure 4.

In the construction shown in Figures 7 to 10 inclusive, the ice cutting and deflecting member 136 or 144 rotates with the shaft and as the ice moves upwardly out of the column it is engaged by the arms 142 which act to cut the ice, and as the ice continues to move upwardly it moves the surfaces 141 which direct it laterally away so that it is discharged uniformly and evenly into the storage bin 24.

Figure 11 is a sectional view of a modified combined ice cutting and deflecting member 136' which is similar to member 136 shown in Figure 8, except that a portion of the blades or arms rotate within the top of the ice freezing column. In view of this, member 136' should be made preferably of nylon material.

The upper end of the screw shaft 150 has a reduced threaded shank 152 which provides a shoulder 154. The ice cutting and deflecting member generally indicated at 136' is similar to member 136 shown in Figure 8. The ice cutting and deflecting member 136' has a threaded bore 138' and is secured to the threaded shank 152 of the screw shaft so that rotation of the screw shaft will tend to tighten member 136' on said shaft. Member 136' is so positioned on the screw shaft that a portion of the blades or arms 142' thereof are confined to rotate within the upper end 56a of the freezing column 56 and also serve as a bearing for the screw shaft. A portion of said arms 142' extends upwardly or out of the freezing column. As the ice moves upwardly it is first engaged by the rotating blades 142' and then the ice moves against the deflecting surfaces 141' which direct it outwardly into the storage chamber. While the deflecting surface of member 136' is shown as of umbrella shape, the surface may be inclined like surface 82 shown in Figure 4.

It will be understood that various changes and modifications may be made from the foregoing without departing from the spirit and scope of the appended claims.

I claim:

1. In means positioned adjacent the upper open end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means adapted to be secured to the upper end of the rotating auger to rotate therewith, said means having an ice disintegrating member and an ice deflecting member outwardly of said ice disintegrating member all in the path of the moving ice from said auger so that the ice is first disintegrated and then expelled from said freezing column.

2. In means positioned adjacent the upper open end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means comprising an ice disintegrating member and an ice deflecting member, said ice disintegrating member having a plurality of arms positioned inside said freezing column to rotate adjacent the discharge end of the freezing column, said ice deflecting member being positioned above said ice disintegrating member and exteriorly of said freezing column to uniformly distribute the ice after same has passed the ice disintegrating member.

3. In an ice producing machine including a freezing column and a rotatable auger therewithin, said auger being formed of nylon material, an ice disintegrating member secured to the outer end of said auger to be engaged by the ice as it moves outwardly of said auger.

4. In a structure defined in claim 3 in which said disintegrating member means include a plurality of arms formed of nylon material.

5. In a structure defined in claim 3 in which there is a deflecting member positioned on the auger outwardly of said disintegrating member.

6. In means positioned adjacent the discharge end of a freezing column of an ice producing machine, which

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freezing column is provided with a rotating auger, said means comprising a rotatable ice disintegrating member having radially extending arms in the path of the moving ice from said auger so that said ice is first disintegrated and then expelled uniformly from said freezing column, said arms of the ice disintegrating member being formed of nylon material to provide a bearing surface for supporting the upper end of the rotating auger.

7. In means positioned adjacent the discharge end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means comprising a rotatable ice disintegrating member having a central boss portion with arms extending radially therefrom, said member rotating inside the discharge end of the freezing column and rotating in the path of the moving ice from said auger so that said ice passes between the arms and outwardly thereof as same is rotating so that the ice is first disintegrated and then expelled uniformly from said freezing column, said rotatable ice disintegrating member engaging the inside wall of the freezing column and forming a support for supporting the upper end of the rotating auger.

8. In means positioned adjacent the discharge end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means comprising a rotatable ice disintegrating member having a central boss portion with arms extending radially therefrom, said member rotating inside the discharge end of the freezing column and rotating in the path of the moving ice from said auger so that said ice passes between the arms and outwardly thereof as same is rotating so that the ice is first disintegrated and then expelled uniformly from said freezing column, said rotatable ice disintegrating member engaging the inside wall of the freezing column and forming a support for supporting the upper end of the rotating auger, said rotatable ice disintegrating member being formed of material which provides a self-lubricant for the bearing surface.

9. In means positioned adjacent the discharge end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means comprising a rotatable ice disintegrating member

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having a central boss portion with means extending radially therefrom, said rotatable ice disintegrating member secured to the auger to rotate therewith inside the discharge end of the freezing column immediately adjacent the end of the auger and in the path of the moving ice from the auger so that said ice passes between the radially extending means and outwardly thereof as same is rotating so that the ice is first disintegrated and then expelled uniformly from said freezing column, said rotatable ice disintegrating member engaging the inside wall of the freezing column and providing a bearing support for the upper end of the rotating auger.

10. In means positioned adjacent the discharge end of a freezing column of an ice producing machine, which freezing column is provided with a rotating auger, said means comprising a rotatable ice disintegrating member having a central boss portion with means extending radially therefrom, said rotatable ice disintegrating member secured to the auger to rotate therewith inside the discharge end of the freezing column immediately adjacent the end of the auger and in the path of the moving ice from the auger so that said ice passes between the radially extending means and outwardly thereof as same is rotating so that the ice is first disintegrated and then expelled uniformly from said freezing column, said rotatable ice disintegrating member engaging the inside wall of the freezing column and providing a bearing support for the upper end of the rotating auger, said ice disintegrating member being formed of a material which provides a self-lubricant for the bearing surface.

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