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S. D. MURPHY ETAL
ICE MAKING MACHINE

3,175,369

Filed Nov. 12, 1963

2 Sheets-Sheet 1

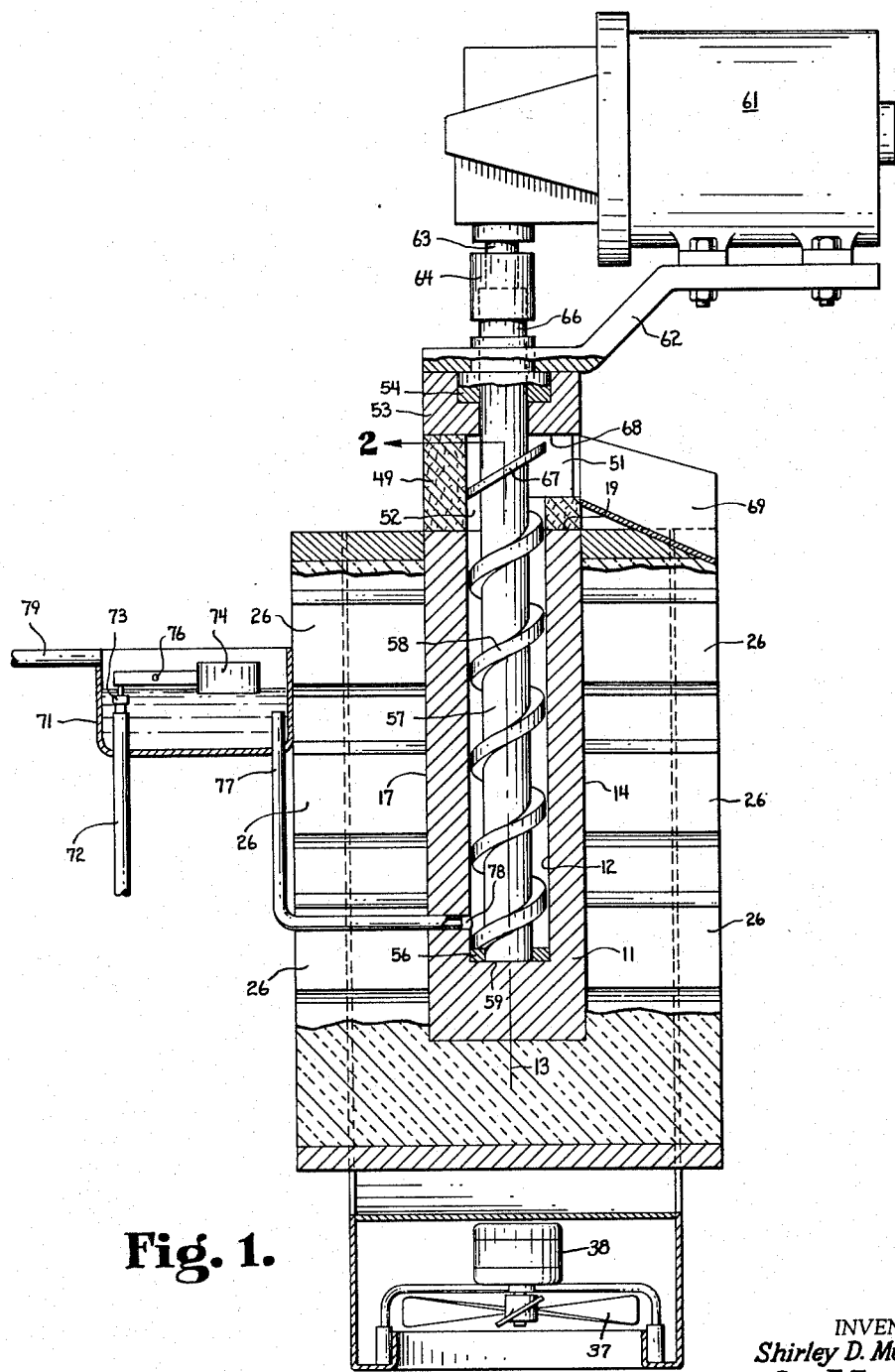


Fig. 1.

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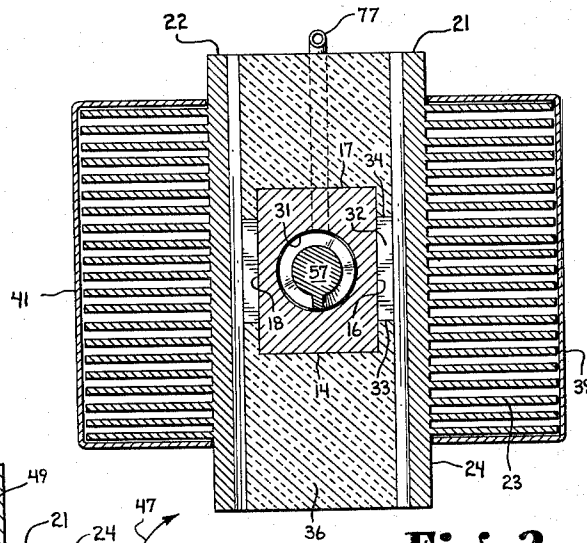


Fig. 3.

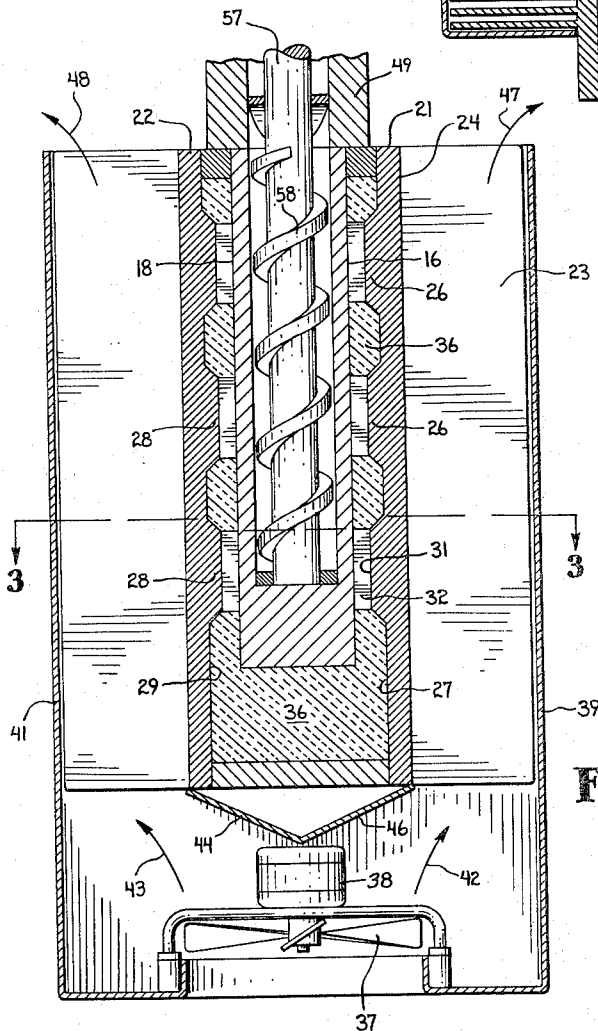


Fig. 2.

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ICE MAKING MACHINE

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3 Claims. (Cl. 62—3)

This invention relates generally to refrigerating devices and more particularly to machines for making ice in a crushed or flaked form.

A number of ice making machines are known in the art. They have frequently been characterized by large size. Also they have incorporated refrigerating equipment including coils, compressors, motors, valves, and other complex and comparatively expensive equipment.

It is, therefore, a general object of the present invention to provide an ice making machine requiring very little space.

A further object is to provide an ice making machine of comparatively simple and reliable construction.

A further object is to provide an ice making machine using thermoelectric refrigerating principles.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is an elevational view, the majority of which is shown in section to illustrate interior details of a typical embodiment of the present invention.

FIG. 2 is a fragmentary section through the machine of FIG. 1, taken along the line 2—2 in FIG. 1 and viewed in the direction of the arrows.

FIG. 3 is a cross section through the machine taken along the line 3—3 in FIG. 2 and viewed in the direction of the arrows.

Referring to the drawings in detail, the machine includes a freezing chamber 11 having an elongated cylindrical bore 12 therein which is symmetrical about the axis 13. In a typical embodiment, and as shown best in FIG. 3, the outer walls 14, 16, 17, and 18, are planar and define a rectangle. The bore 12 extends to the upper end 19 of the freezing chamber member. This member is usually made of a noncorrosive metallic material having a high thermal conductivity.

Two heat sink plates 21 and 22 are disposed in parallel, horizontally spaced relationship to the vertical exterior walls 16 and 18 of the freezing chamber, respectively. Each of the sink plates has a plurality of up-standing radiating fins extending outwardly from the outer surface thereof. An example is the fins 23 extending outwardly from the outer surface 24 of the heat sink plate 21.

A plurality of horizontally extending ribs 26 is provided on the inner face 27 of the heat sink plate 21. Identical ribs 28 are provided on the inner face 29 of heat sink plate 22. Each of these ribs has a flat surface 31 facing the flat wall of the freezing chamber and horizontally spaced therefrom. A thermoelectric refrigerating unit 32 is disposed in the horizontal space between the faces of the wall and the horizontal ribs of the heat sink plates. Each of the refrigerating units is in direct contact with both of these faces thereby causing the contacting wall of the freezing chamber member to be cold and the contacting wall 31 of the heat sink plate to be hot. Such thermoelectric refrigerating units are well known to those skilled in the art.

In the illustrated example, six such refrigerating units are shown and each extends only for a portion of the total width of the freezing chamber wall which it contacts. For example, the unit 32 has the margins 33 and 34 as its lateral margins. These units need not be any wider than this because sufficient cooling effect is de-

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rived at the wall of the bore 31, without extending the units the total width of the walls 16 and 18. Thermal insulating material 36 is provided entirely around and under the freezing chamber member and is in contact with the outer walls and bottom thereof at all points except where the thermoelectric units are in contact with the outer walls thereof.

The whole assembly described to this point is disposed above a fan 37 driven by the motor 38. Suitable shrouding material 39 and 41 is provided to direct the air flow from the fan upwardly as indicated by arrows 42 and 43. The deflector plates 44 and 46 cause the air to move upwardly through the spaces between the fins and out the top as indicated by the arrows 47 and 48. This air flow removes the heat generated by the thermoelectric units and conducted to the heat sink and from there to the heat sink fins 23.

An exit block 49 is mounted at the top of the freezing chamber member and is made of an insulating material. This block has an aperture 51 therein opening into the bore 52 thereof which is in alignment with the bore 12 of the freezing chamber member.

A bearing and cutter mount block 53 is mounted on top of the exit block 49 and has a bearing 54 therein. This bearing together with the bearing 56 in the bottom of the bore in the freezing chamber member provides radial support for the auger shaft 57. This auger shaft has a spiral rib 58 extending throughout the major portion of its length from its bottom. The bottom 59 of the shaft rests on the bottom of the bore of the freezing chamber member.

A drive motor 61 is mounted to the bearing block 53 by the bracket 62. The motor shaft 63 is connected by a suitable coupling 64 to the upper end portion 66 of the auger shaft.

The cutter blade 67 may be mounted to the lower face 68 of the block 53 or to block 49. As the motor drives the auger in a clockwise direction (FIG. 3), ice which is formed in the freezing chamber member is moved upwardly in its bore and engages the knife 67 which proceeds to break it up and move it out the aperture 51 in the exit block 49. From there it enters the chute 69 for discharge into a bin or other receptacle.

The water supply is provided by the reservoir 71. Feed water enters by way of the pipe 72 which is controlled by the valve 73 which is, in turn, controlled by the float 74. The float pivots on the pin 76 which extends between vertical walls of the reservoir 71.

Water is free to leave the reservoir 71 by way of the conduit 77 which extends into the bore of the freezing chamber member at 78. Thus, when the machine begins to operate, the water in the bore of the freezing chamber member can reach the elevation established by the float 74. Overflow from the reservoir can leave by the pipe 79.

This entire ice making machine can be built to occupy a very small space. By way of example only, a unit in which the freezing chamber bore is only one and one-quarter inches in diameter and six and three-quarter inches in length has been found quite effective. Typical dimensions for the auger in such a unit is a three-quarter inch shaft diameter with a three-sixteenth inch wide spiral rib and one and one-quarter inches between adjacent turns of the rib, both of these dimensions being measured parallel to the auger shaft axis. The bearing 56 is typically made of bronze whereas the exit block 49 is typically made of a fibrous material.

The above examples for materials and dimensions should be understood to be exemplary only as other materials and dimensions can also be incorporated readily.

Therefore, while the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. An ice making machine comprising: a vertically elongated and upstanding one piece freezing chamber member having a vertical longitudinal axis and a cylindrical bore, the axis of the bore being colinear with the longitudinal axis of said freezing chamber member, said freezing chamber member having planar exterior surfaces disposed along its length and parallel to its axis, and said freezing chamber member having an open upper end and closed lower end; first thermal insulating means extending entirely across the said lower end of said freezing chamber member; a pair of parallel plates, each plate of the pair being disposed in parallel and horizontally spaced relationship to planar surfaces of said freezing chamber member with one of said plates being disposed at one side of said member and the other of said plates being disposed at the opposite side of said member, each of said plates having a plurality of horizontal ribs with planar vertical surfaces disposed in spaced relationship to and facing the planar surfaces of said freezing chamber member; a plurality of vertical fins extending from each of said plates in a direction away from said freezing chamber member; a plurality of thermoelectric elements, said thermoelectric elements being disposed in the space between the facing planar surfaces of said freezing chamber member and said horizontal ribs, and said thermoelectric elements being disposed in contiguous relationship to said planar surfaces whereby the planar surfaces of the freezing chamber member provide cold terminals for said elements and the planar surfaces of said plates provide hot terminals for said elements whereby said plates provide a heat sink for said thermoelectric elements; additional thermal insulating means disposed between the second member and portions of said freezing chamber member other than the said planar portions thereof; an insulated exit member disposed at the open end of said freezing chamber member and having a bore therein aligned and communicating with the bore in said freezing chamber member, and said exit member having an aperture in a wall thereof to accommodate discharge of ice therefrom; a cutter blade disposed in the bore of said exit member and communicating with the wall aperture thereof to cut ice into flakes for discharge through said aperture; a spiral auger in the said bore; a motor above said exit member and rotating said spiral auger in said freezing chamber bore to impart motion of the contents of said freezing chamber bore in a direction toward the aperture in said exit member; water supply means mounted to one of said members, said water supply means including a reservoir, a water inlet, a float operated valve on said inlet, and a water outlet coupled to the freezing chamber member and communicating with the bore thereof, said float and valve being arranged to admit water from said reservoir to said freezing chamber and disposed to establish a predetermined maximum possible elevation of water in said freezing chamber member; a shroud extending around the pluralities of fins to provide vertical passageways between the fins; and blower means associated with said shroud and said fins to provide a forced air flow upwardly through said passageways to remove heat from the heat sink.

2. An ice making machine comprising: a vertically elongated and upstanding one piece freezer chamber member having a vertical longitudinal axis and a cylindrical bore, the axis of the bore being colinear with the longitudinal axis of said freezer chamber member, said freezer chamber member having planar exterior sur-

faces disposed along its length, and having an open upper end and closed lower end; first thermal insulating means extending entirely across the said lower end of said freezer chamber member; a second member, said second member having a plurality of planar surfaces disposed in horizontally spaced relationship to and facing the planar surfaces of said freezer chamber member; a plurality of fins extending on the exterior surface of said second member; a plurality of thermoelectric elements, said thermoelectric elements being disposed in the space between the facing planar surfaces of said freezer chamber member and said second member and being disposed in contiguous relationship to said planar surfaces whereby the planar surfaces of the freezer chamber provide cold plates for said elements and the planar surfaces of said second member provide hot plates to establish a heat sink for said thermoelectric elements; additional thermal insulating means disposed between the second member and portions of said freezer chamber member other than the said planar portions thereof; an exit member disposed at the open end of said freezer chamber member and having a bore therein aligned and communicating with the bore in said freezer chamber member, and said exit member having an aperture in a wall thereof to accommodate discharge of ice therefrom; a cutter blade disposed in the bore of said exit member and communicating with the wall aperture thereof to cut ice into flakes for discharge through said aperture; a spiral auger in the bore of said freezer chamber member; means rotating said spiral auger in said freezer chamber bore to impart motion of the contents of said freezer chamber bore in a direction toward the aperture in said exit member; water supply means mounted to one of said members, said water supply means including a reservoir, a water inlet, a float operated valve on said inlet, and a water outlet coupled to the freezer chamber member and communicating with the bore thereof, said float and valve being arranged to admit water from said reservoir to the bore of said freezer chamber member; and blower means associated with said second member and said fins to provide a forced air flow through said plurality of fins to remove heat from the heat sink.

3. An ice making machine comprising: a generally elongated freezing chamber member having a cylindrical bore therein with a closed lower end and thermal insulating means below the entire lower end and in contact therewith, said freezing chamber member having planar exterior surfaces parallel to the axis of said bore; a heat sink member having a plurality of planar surfaces disposed in spaced relationship to and facing the planar surfaces of said freezing chamber member; a plurality of fins extending on the exterior surface of said heat sink member; a plurality of thermoelectric cooling elements, said thermoelectric elements being disposed in the spaces between the facing planar surfaces of said freezing chamber member and said heat sink member and being disposed in contiguous relationship to said planar surfaces of said freezing chamber member and said heat sink whereby the planar surface of the freezing chamber member provides cold terminals for said elements and the planar surfaces of said heat sink member provide hot terminals for said thermoelectric elements; thermal insulating means disposed between the heat sink member and portions of said freezing chamber member other than the portions contacting said thermoelectric elements; an exit member having a discharge aperture communicating with the bore in said freezing chamber member, to accommodate discharge of ice therefrom; cutter means disposed to cut ice into flakes for discharge through said aperture; an auger in said bore; means above said aperture and driving said auger to impart motion of the contents of said freezing chamber bore in a direction toward

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said aperture in said exit member; water supply means mounted to one of said members, said water supply means including a valve and a water outlet coupled to the freezing chamber member and communicating with the bore thereof, said valve being arranged to control admission of water to said freezing chamber bore; and blower means associated with said heat sink member and the said fins to provide a forced air flow through said fins to remove heat from the heat sink member.

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