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F. W. TOPPING
CRUSHED ICE DISPENSER

2,556,510

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2 Sheets-Sheet 1

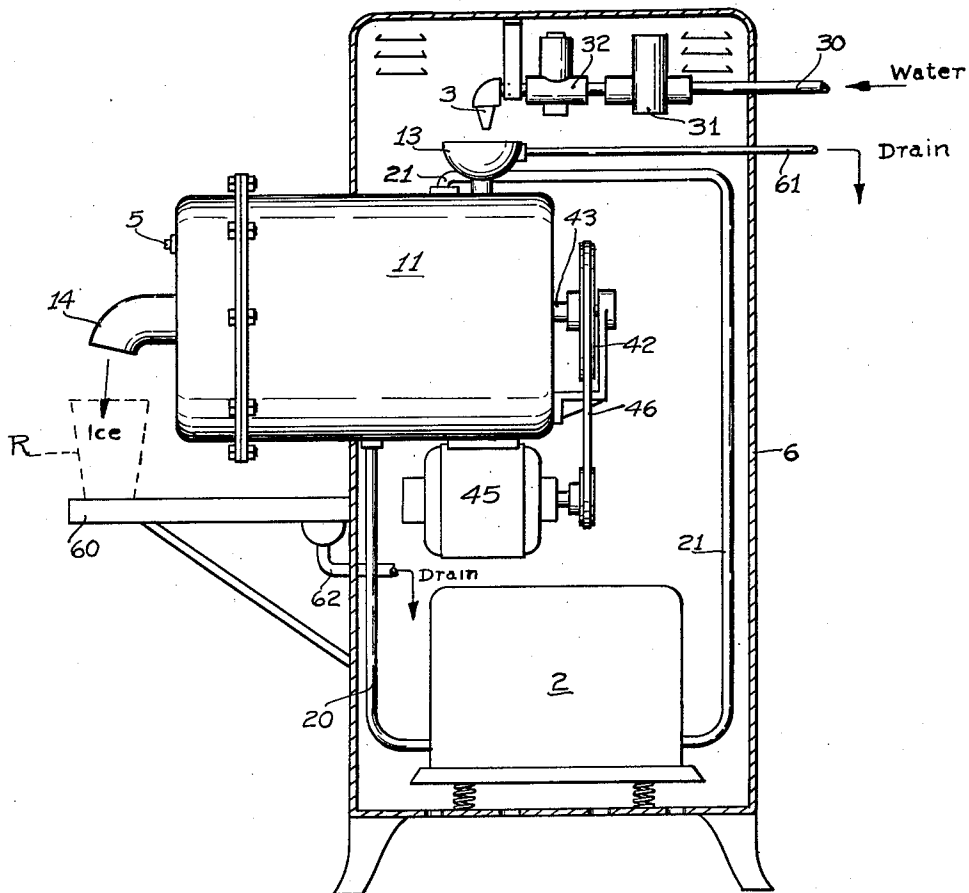


Fig. 1

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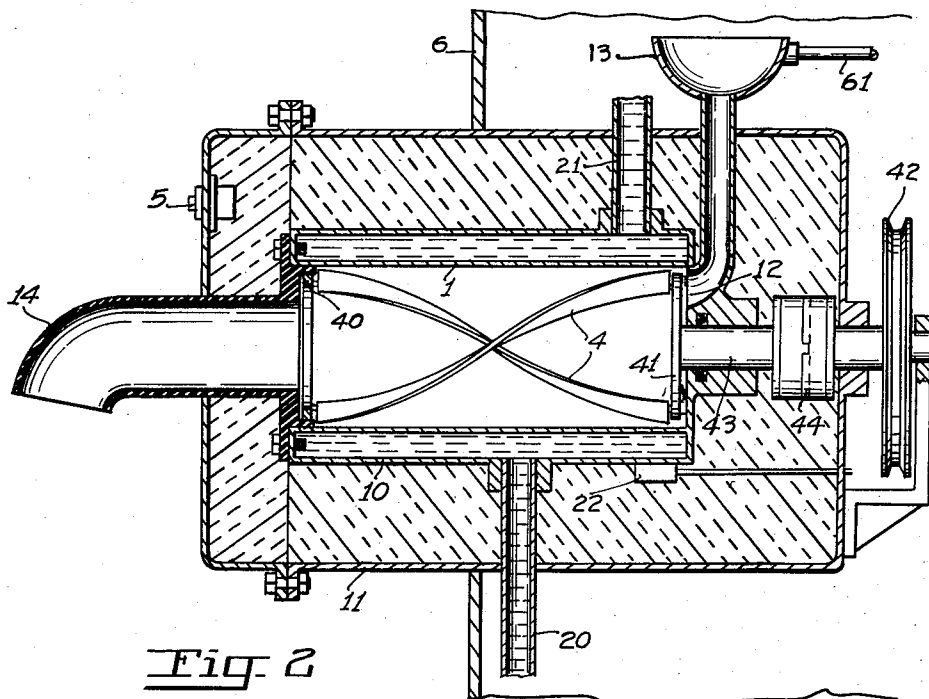


Fig. 2

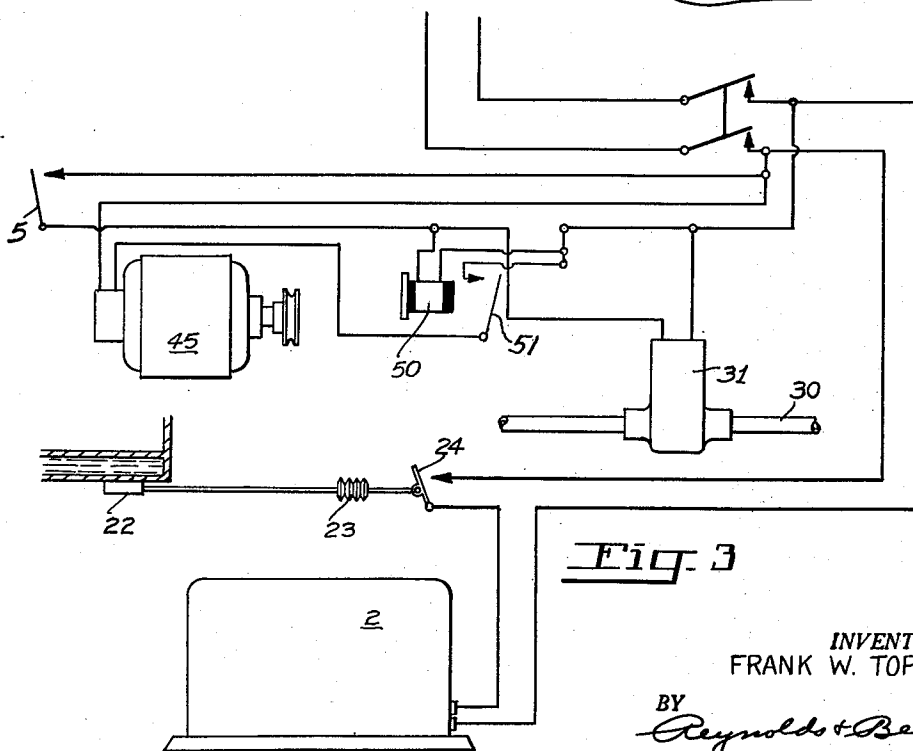


Fig. 3

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CRUSHED ICE DISPENSER

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7 Claims. (Cl. 62-105)

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In restaurants, bars, hospitals, and the like there is a large demand for crushed ice. Normally a large block of ice, supplied by a commercial refrigerating concern, is broken up, held in refrigerated compartments until needed, and is then further broken up, chipped or shaved off, or crushed, and is placed in tubs or in glasses for serving. This involves the necessity of large refrigerated storage capacity for the ice in its several forms (blocks, chunks, and crushed), and the necessity of several handlings. Not only is the labor of so handling the ice, and effecting its progressive diminution in size, somewhat expensive, but there is also the possibility of its becoming dirty or contaminated as a result. There is, too, an appreciable loss from melting and from shattering and flying off. All these considerations, and various others, urge a change in the methods of supplying crushed ice for such volume uses.

Accordingly, it is the primary object of the present invention to provide "crushed" ice, in adequate volume to supply such needs, yet by means which avoid or eliminate the present objections, such as those outlined above. More specifically, it is an object of the present invention to provide means and a method whereby ice can be frozen, "crushed" (in the sense that it is broken into pieces of small size from a larger piece or sheet), and delivered in the amounts and at the times it is needed, from water, and by substantially automatic and immediately available means.

It is a further object to provide against the contingency that ice will collect upon the freezing surface, and to that end to insure that operation of the ice crushing and delivering means continues for a sufficient time after termination of the water supply to the freezing surface, that all ice is removed, and the freezing surface is left clear and ready for the next operation.

It is also an object to carry out the objects indicated above by means of a machine of simple, rugged, and dependable construction, and capable of being built in a compact, convenient, and attractive form.

Various other objects, and in particular those which pertain more especially to the mechanical features of the invention, will be ascertainable as this specification (including the claims) proceeds, or can be determined by inspection of the drawings.

The invention comprises the novel mechanism, and the novel method, illustrated in the accompanying drawings in a representative form, and

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as will be hereinafter more particularly described and defined.

Figure 1 is a general elevational view of the device, in somewhat diagrammatic form, and with the outer casing shown in section.

Figure 2 is an enlarged axial sectional view of the freezing chamber and associated parts.

Figure 3 is a diagram of the electrical circuit and controls.

The method is extremely simple, and involves in essence the maintenance of a freezing surface or chamber, preferably of cylindrical form, upon or into which water is supplied when and only in the amounts needed. The water promptly freezes upon contacting such surface, and coincidentally with its contact mechanism is set in operation, to dislodge the ice as it forms, and to break it up into small bits. Such mechanism may also be formed or operated in such manner as to advance the bits of ice towards a discharge spout, whence all of it is delivered into a glass or other receptacle placed to receive it, and in which it is to be used or consumed. The method is thus analogous to the dispensing, in restaurants, of water from the faucet directly into the consumer's glass, except that now ice, instead of liquid water, is supplied to the glass. By suitable controls, and if the form of the freezing surface so requires, it can be insured that the delivery action continues automatically, so that all the water supplied is delivered as ice, and so that no ice remains upon the freezing surface to obstruct subsequent operation of the device.

The freezing chamber 1, preferably in the form of a cylinder, disposed substantially horizontally, is surrounded by a jacket 10 for the circulation of refrigerant, and is enclosed within a housing 11 between which and the jacket is an insulating space filled with insulating material 15. The chamber 1 has a water inlet aperture 12, near its upper portion at one end, leading to which from the exterior is a funnel 13. At its opposite end the chamber has a discharge spout 14, which preferably is made of material which is of low heat conductivity.

Refrigerant is circulated through the jacket 10, by the tubing 20, 21, by means such as the conventional refrigeration unit 2 including a compressor driven by a self-contained motor (not shown). Suitable control means insure such operation of the refrigerating mechanism as will maintain the freezing chamber 1, or its lower wall, at a low enough temperature to effect quick-freezing of water deposited thereupon. As an example of such control means, a thermio-sensi-

tive element 22 is exposed, directly or indirectly, to the temperature prevailing within the chamber 1, and through a bellows 23 closes a switch 24 in the circuit 25 of the compressor motor to initiate circulation of refrigerant, say at 14° F. (assuming the master switch 59 has been closed), or opens such switch 24 when the chamber's temperature is sufficiently low, say at 8° F.

Water is supplied to the funnel 13 for delivery to the interior of the chamber from a supply nozzle 3 in the water supply line 30. The nozzle 3 is arranged above and out of thermal contact with the funnel 13 and chamber 1. Thus, it is thermally divorced from the freezing chamber, and any residue of water left in the nozzle after the supply is cut off will not freeze and obstruct emission of water when next needed. Supply of water is controlled by a normally closed valve 31, which preferably is solenoid-operated. Opening of the valve is effected by closure of a normally open control switch 5. Also, since service pressures in the line will vary in different localities, and this would affect the quantity of water supplied during each opening of the valve 31, it is preferable to include in the water supply line 30 a pressure reducing valve 32, which in a sense becomes a metering valve to limit the quantity of water supplied during a valve opening of given duration.

Within the freezing chamber 1 are scraper means, typified by the rotary blades 4, for scraping and dislodging the ice from the chamber's surface as it forms, for breaking up the ice into small bits of more or less uniform size, and for advancing the broken or crushed ice towards the spout 14. The blades are inclined, and are rotated in the proper sense, to accomplish the latter end. They may be rotatively supported by the ring and plate 40, 41, or in any other suitable manner, and their rotation is effected from the pulley 42 through the two-part shaft 43, the parts whereof are mechanically joined, but thermally separated, by the clutch or coupling 44. A driving motor 45 drives the pulley 42 relatively slowly through the belt 46.

As has already been stated, the valve 31 is normally closed, is self-closing, and is opened only when, and to the extent that ice is desired. Similarly, the blades 4 need be rotated only when ice is required. Since the operation of the valve 31 and of the blades 4 is coincidental, they may be set in operation substantially simultaneously by a common control, in the form of the same normally open control switch 5. By reference to Figure 3 it will be seen that closure of the switch 5 will energize the solenoid of the valve 31, to open that valve, and by energization of the solenoid 50 will close switch 51 in the branch circuit 54 that controls the motor 45, and the motor will be and remain energized so long as the switch 51 remains closed. The motor 45 is removed from the immediate control of the main switch 5 in order that it be not deenergized immediately upon opening of the switch 5, but rather continue in operation for a time thereafter. A time-delay mechanism, incorporated in the relay 50, holds the switch 51 closed for a time after the switch 5 reopens and thereby insures this continued operation of the motor 45, and hence the ice expulsion means, the purpose of which is to insure that all water admitted to the chamber 1 be immediately frozen, dislodged, and preferably expelled from the chamber. Thus it cannot stick to the chamber's walls, and obstruct subsequent operation of the blades 4.

The entire mechanism, or the major part thereof, can be enclosed within a suitable and attractive casing or cabinet 6. The latter may be provided with a shelf 60, whereon glasses to be filled may be placed, beneath the spout 14. Suitable drains 61 and 62 may be provided, leading from the funnel 13 to control overflow, and from the shelf 60, to convey away any drippings.

It is believed that the operation will be obvious. When ice is required, a glass or other receptacle R is disposed beneath the spout, the switch 5 is pressed or closed, and held closed for a period of time which corresponds to the amount of ice desired. Water, supplied only so long as switch 5 is closed and the valve 31 is open, is delivered into and forms a pool within the interior of the chamber 1, which is automatically maintained at a quick-freezing temperature by independent, automatic control of circuit 25. There the water is soon frozen, and by operation of the blades 4 is removed and expelled from the spout 14 directly into the waiting glass R. Operation of the blades 4 continues, after cutting off of the water supply by opening of the switch 5, until the time delay relay 50 permits the switch 51 to reopen, and for a sufficiently long time to insure that substantially all of the admitted water has been delivered in the form of ice. The control switch 5 might, incidentally, be incorporated in the form of or associated with such a valve handle as commonly controls restaurant water faucets, to be closed by the positioning of the glass beneath the spout, and to be opened by removal of the glass.

While it is preferred to deliver only ice, and to supply water, if desired, from another source and by a separate operation, it is not outside the scope of this invention to supply ice and water simultaneously, and from the same spout. For example, and as one means of so doing, water may be supplied through the valve 31 and nozzle 3 in amounts in excess of the capacity of the freezing chamber to convert it promptly into ice. Excess water would run directly through the receptacle R, while a certain proportion of the water would be frozen, broken up, and delivered as ice. However, this would cause fluctuations in the temperature of the chamber 1, and might lessen its capacity for delivering an adequate quantity of ice immediately thereafter, hence, as already indicated, it is preferred that the device be used only for the purpose of providing bits of ice, as and to the extent needed, without any intermediate handling.

I claim as my invention:

1. A dispenser of individual batches of "crushed" ice, comprising a freezing chamber, normally deenergized means to supply liquid water thereto upon energization, for prompt conversion into ice, normally deenergized means energizable to break up and expel from the chamber the ice so formed, control means operable under control to energize the water supply means and the ice breaking means substantially simultaneously, and so long as said control means is operated, and means operable during a predetermined period after discontinuance of operation of said control means and of consequent deenergization of the water supply means, to continue energization of and then to deenergize automatically the ice breaking and expelling means.

2. A dispenser as in claim 1, including a normally inactive actuating means for the water supply means, a separate normally inactive and self-inactivating actuating means for the ice-break-

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ing and expelling means, the control means being operatively connected to both thereof for energization of the two actuating means, and a time delay means operatively connected to the actuating means for the ice breaking and expelling means, to delay inactivation of the latter for a predetermined time after deenergization of the control means.

3. An ice dispenser comprising a chamber, means including a refrigeration unit operable to maintain said chamber normally at a temperature suitable for quick-freezing of water, means, including a normally closed solenoid valve, for supplying water to said chamber as needed, mechanical scraper means located within said chamber to break up and expel therefrom ice formed therein, an electric motor for driving said mechanical scraper means, and an electric circuit, including switch means, operable by closure of said switch means, to energize said motor for operation of said scraper, and said solenoid valve for opening thereof, simultaneously, said circuit further including time-delay relay means operable by and during closure of said switch means to energize said motor, and further operable automatically to continue energization of said motor for a predetermined period following opening of said switch means.

4. An ice dispenser comprising a chamber, means including a refrigeration unit operable to maintain said chamber normally at a temperature suitable for quick-freezing of water, means, including a normally closed solenoid valve, for supplying water to said chamber as needed, mechanical scraper means located within said chamber to break up and expel therefrom ice formed therein, an electric motor for driving said mechanical scraper means, and an electric circuit, including switch means, operable by closure of said switch means, to energize said motor for operation of said scraper, and said solenoid valve for opening thereof, simultaneously, said circuit further including time-delay relay means operable by and during closure of said switch means to energize said motor, and further operable automatically to continue energization of said motor for a predetermined period following opening of said switch means.

5. An ice dispenser comprising a container having a freezing surface, an ice delivery outlet formed in one wall of said chamber adjoining said freezing surface, water supply means operable to deliver water into said container and upon said freezing surface, mechanical scraper means operable to break ice formed on said surface and when freed from said surface to move it progressively toward said outlet for delivery through the same

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in a continuous operation, control means to operate said water supply means and energize said scraper means simultaneously, and time delay means cooperating with said control means and operable to continue energization of said scraper means for a predetermined period following termination of said water supply means.

6. An intermittently operable dispenser for supplying ice in crushed form only when and to the extent required, comprising an elongated and generally horizontally disposed freezing chamber, a discharge aperture at one end thereof, means at its opposite end, including a valve biased to close, to supply liquid water to the interior of said chamber, means within said chamber for agitating admitted water and breaking up the resultant ice during its formation, and for advancing the ice particles to the discharge aperture, normally deenergized drive means for said agitating, breaking, and advancing means, control means energizable at will and during any desired period, operatively connected to said water supply valve to open and to maintain the same open so long as said control means is energized, and likewise operatively connected to said drive means to energize the same during the same period, and means to delay deenergization of the drive means for a predetermined period following deenergization of the control means, whereby continued operation of the ice advancing means can clear the chamber of ice resulting from the water admitted during such energization.

7. An ice dispenser as in claim 6, wherein the agitating, ice breaking and advancing means are constituted by relatively narrow helical blades rotative about and spaced from a generally horizontal axis, and wherein the chamber is of the shape of a body of revolution the inner wall whereof conforms generally to the peripheral locus of the blade's outer edges.

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