

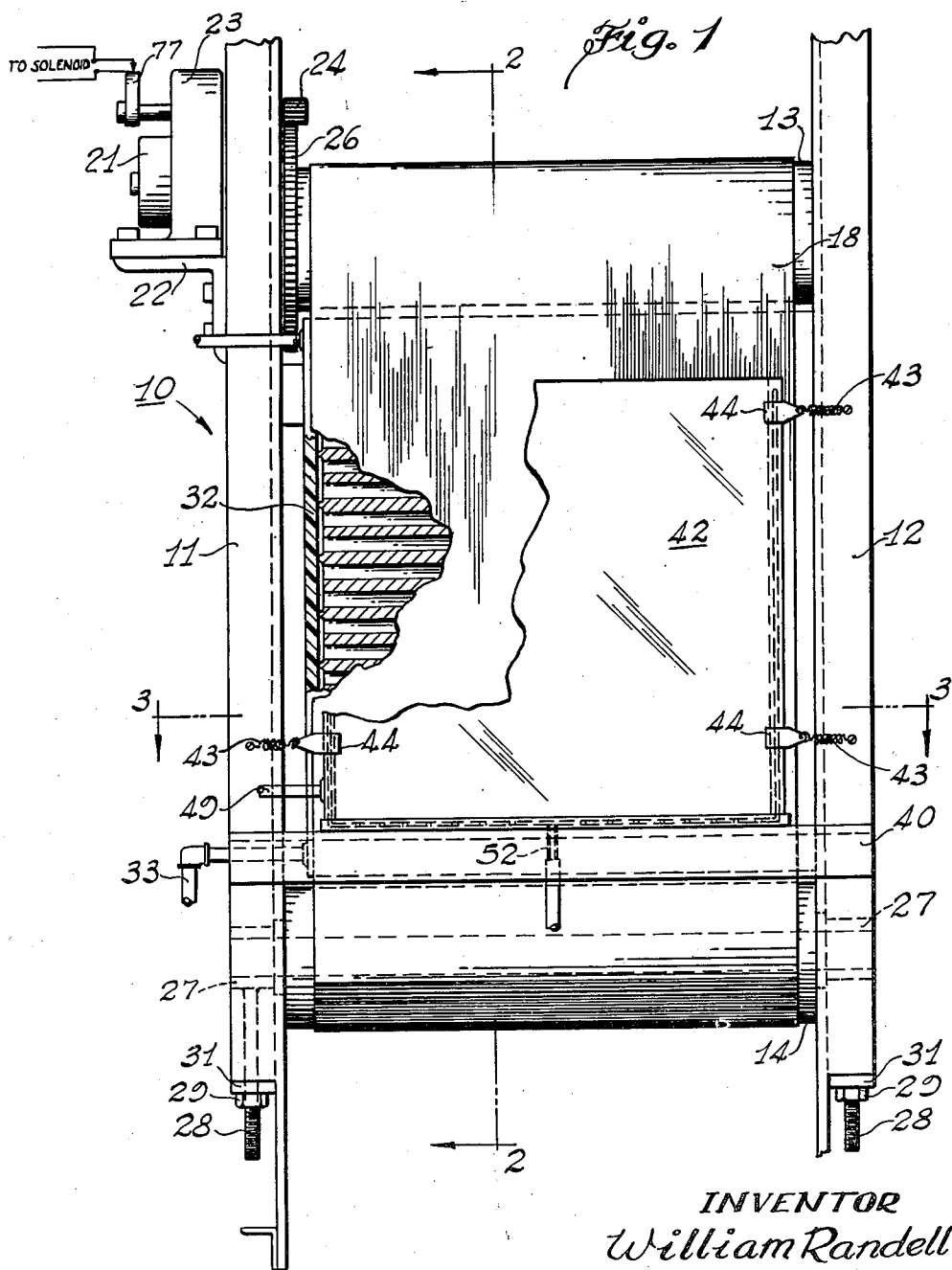
July 8, 1952

W. RANDELL
ICE-MAKING MACHINE

2,602,304

Filed July 14, 1949

2 SHEETS—SHEET 1



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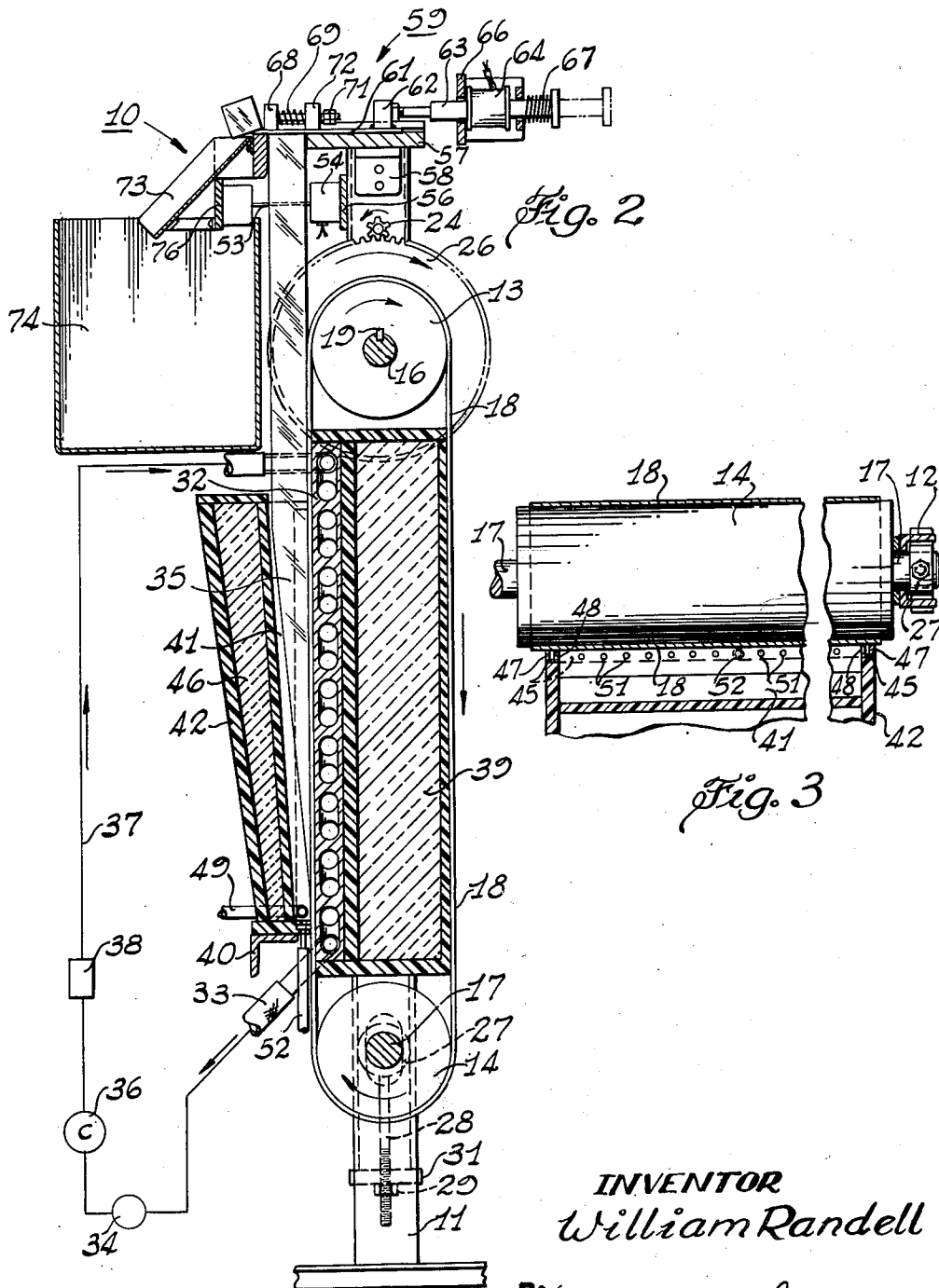
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UNITED STATES PATENT OFFICE

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ICE-MAKING MACHINE

William Randell, Chicago, Ill.

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3 Claims. (Cl. 62-105)

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This invention relates generally to ice making machines and relates particularly to improvements in machines for making ice by a continuous process in sizes suitable for beverages.

The making of cube ice for beverage purposes has heretofore entailed the use of water holding trays which have been divided into small compartments according to the size of the ice cube desired. In some cases the ice has been frozen in such compartments in a process entailing conveying of the tray past the evaporator and then removing the ice in cube form by distorting the tray and storing the ice in a compartment for subsequent use.

According to the present invention, the ice is formed by crystal growth on a moving belt having good heat conductive properties, one surface of the belt being in contact with a reservoir of water and the opposite surface being in contact with an evaporator or other refrigerant circulating means. The size of the ice crystals formed is governed by the speed of the belt and the capacity of the evaporator. The water in the reservoir is aerated and kept in motion by small bubbles of air traveling upward through the water which free the ice mass from all traces of cloudiness. The moving belt then conveys the ice crystals in the form of a solid, clear mass of ice out of the water reservoir where the mass can be cut into convenient sizes and stored in a compartment for subsequent use.

With the foregoing considerations in mind it is a principal object of the invention to manufacture cube ice by a continuous process without the necessity of first forming the ice in molds.

Another object is to form ice in sizes suitable for beverage purposes and to regulate the size of the ice formed as may be required by the use to which the ice is put.

Still another object is to provide a machine for the formation of a continuous mass of ice by crystal growth on a moving conveyor placed in contact with a reservoir connected to a supply of water and in proximity to an evaporator of a refrigeration system, and to agitate the water contained in the reservoir by means of a plurality of orifices in the bottom thereof connected to a supply of air under pressure, the air so supplied to the reservoir insuring that the ice mass formed in the conveyor is clear and free from cloudiness.

Yet another object is to form a mass of ice by a continuous process, the ice being formed on and conveyed by a belt in heat exchange relationship with a supply reservoir of water and an evaporator or other refrigerant circulating means.

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of a refrigeration circuit, and the ice mass so formed being divided into convenient sizes by a cutting mechanism and then deposited in a storage compartment for subsequent use.

Other objects and important features of the invention will be apparent from a study of the following description taken together with the drawings which show a preferred embodiment of the invention and what is now considered to be the best mode of applying the principles thereof. While the invention is described in terms of a preferred embodiment, its scope is not intended to be limited in terms of the embodiment shown, nor otherwise than by the scope of the claims subjoined.

In the drawings:

Figure 1 is a front elevation view showing an ice making machine constructed in accordance with the present invention;

Figure 2 is a transverse section taken along the line 2-2 in Figure 1, and looking in the direction of the arrows; and

Figure 3 is a section taken along the line 3-3 of Figure 1 looking in the direction of the arrows and showing details of the water supply reservoir, the means for sealing the reservoir to the ice conveyor, and the means for aerating the water within the supply reservoir to produce a clear mass of ice.

Referring now to the drawings, the improved ice making machine according to the present invention is indicated generally at 10 and includes a pair of supports 11 and 12 which support a pair of rollers 13 and 14 mounted respectively on shafts 16 and 17. An endless belt 18 is trained around the rollers 13 and 14 and is formed of material having the qualities of good heat conduction and ability to withstand flexure strains, such as stainless steel, beryllium-copper or thin phosphor-brass or bronze.

The roller 13 is connected to the shaft 16 by a key 19 and is adapted to be driven by a motor 21 mounted on a bracket 22 secured to the standard 11. The motor 21 is connected to a speed reducer 23 and drives a pinion 24 which mates with a gear 26 fast to the shaft 16 to drive the roller 13.

Means are provided to adjust the tension on the endless belt 18 and to prevent slipping on the drive roller 13, and accordingly, the ends of the shaft 17 are mounted in movable journals 27 formed with a threaded adjusting member 28 which is positioned properly by an adjusting nut 29 abutting a stop 31 struck out from each of the standards 11 and 12.

One side of the endless belt 18 moves in heat

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exchange relationship with an evaporator or other refrigerant circulating device 32 supported on the standards 11 and 12 in any convenient manner. The evaporator 32 is connected in a refrigeration circuit comprising a return line 33 to a motor driven compressor 34 which in turn delivers compressed refrigerant to a cooling condenser 36. The condenser 36 is connected by a line 37 through an expansion valve 38 to the inlet side of the evaporator 32.

The evaporator 32 is provided with an insulation jacket 39 which lies between the return run of the belt 18 and which prevents the transfer of heat to the back side of the evaporator 32.

The belt 18 forms a partition between the evaporator 32 and a reservoir of water 41 held between the belt 18 and a water supply housing 42 supported on a bracket 40 secured at its ends to the supports 11 and 12 and held against the belt 18 by spring retainers 43 fastened at one end to clips 44 on the housing 42 and at the other end to the supports 11 or 12.

The housing 42 is made from plastic or resilient material such as rubber and includes an insulating jacket 46. The periphery of the housing 42 is in sealing contact with the moving belt 18 and is provided with double lips 47 and 48, as seen particularly with reference to Figure 3, which bear against the moving belt 18 to provide a seal against the escape of water from the reservoir 41. The space 45 between the lips 47 and 48 is subjected to a slight amount of air pressure, by means as will be presently described, to provide a pressure overcoming the pressure from the water and thus prevent the leakage of the water past the lips 47 and 48.

The reservoir 41 is supplied with water by an inlet pipe 49, the level of the water being controlled in any convenient manner by means forming no part of the present invention and therefore not described in detail.

As the belt 18 moves past the reservoir 41 in heat exchange relationship with the evaporator 32, a growth of ice crystals 35 will form on the belt 18 which will increase in size as the belt 18 moves slowly past the reservoir 41.

Means are provided to give a slight amount of turbulence to the water in the reservoir 41 and to aerate the water therein. This slight turbulence and aeration results in the formation of an ice mass 35 which is free from cloudiness and is crystal clear. To this end, the bottom wall of the housing 42, see Figure 3, is provided with a plurality of orifices 51 which intersect the space or passage 45. The passage 45 is connected to an air inlet pipe 52 which provides air under pressure for the passage 45 and the orifices 51. The air escaping through the orifices 51 bubbles upward through the water in the reservoir 41 and thereby eliminates any possibility of the ice mass 35 becoming cloud.

The ice mass 35 is moved by the belt 18 out of the water reservoir 41 as a continuous mass of dimension according to the size of the reservoir, the capacity of the evaporator and the speed of the belt 18. It will be understood, of course, that the mechanism thus far described lies within an ambient at the freezing point so that the ice mass 35 will adhere to the belt 18.

However, as the belt 18 begins to turn around the driving roller 13, the belt 18 will separate from the ice mass 35. The ice mass 35 will be conveyed upward as seen in Figures 1 and 2 by the ice mass forming continuously thereunderneath.

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The ice mass 35 is separated along its width by a plurality of electrical heater elements 53 which are heated by resistance elements held within a housing 54 secured conveniently to the standards 11 and 12 by a bracket 56. The heater elements 53 may be spaced as desired to give a continuous strip of ice of any desired width.

In order to sever the strips of ice at intervals as desired, the supports 11 and 12 are provided with a cross support 57, mounted on angles 58, which supports a severing mechanism indicated generally at 59.

The severing mechanism 59 comprises a shearing knife 61 which has a lug 62 extending therefrom which is connected to a movable armature 63 of a solenoid 64. The solenoid 64 is secured by a bracket 66 to the supports 11 and 12 in any convenient manner. The armature 63 is normally biased to the dotted line position shown in Figure 2 by a spring 67 when the solenoid 64 is deenergized.

The shear knife 61 is provided with a pusher member 68 which is adapted to move with respect to the knife 61 against the bias of a spring 69 encircling a slide rod 71 supported for movement with respect to a stop 72. One end of the spring 69 abuts the pusher member 68, and the other end abuts the stop 72. It will be seen that as the shear knife advances through the strips of ice, a load will be placed on the spring 69, and that when the load on the spring 69 is great enough to overcome the resistance afforded by the ice strip, that the ice strip will be snapped off.

The solenoid 64 is energized by a timing circuit including a cam 77 which is driven from the speed reducer 23. The cam 77 is of such a contour and is so timed with relation to the belt 18 that the solenoid 64 is energized only after a suitable dimension of ice strip extends above the shear knife 61 and for a period sufficient for the shear knife 61 to cut through the ice strip 35. When the cam 77 has rotated to a position to deenergize the solenoid 64, the shear knife 61 is returned by the spring 67.

The ice cube so severed then falls down a chute 73 and into a storage compartment 74 which are supported by a bracket 76 to the supports 11 and 12.

According to the speed at which the belt 18 is operated an ice strip of any desired thickness may be formed. Also, according to the timing of the cam 77 the length of the ice fragment may be suitably varied as desired.

It will be seen from the foregoing description that a construction has been afforded for making ice by a continuous process in sizes suitable for beverage purposes. Depending upon the adjustment of the machine according to the present invention it is possible to form cubes, chips, or elongated pieces of rectangular cross-section as desired according to the needs of the user. By the arrangement above described there is no need for first forming the ice in cube trays or the like and then removing them from such cube trays prior to use.

While the invention has been described in terms of a preferred embodiment thereof, it is not intended to be limited in terms of the embodiment shown nor otherwise than by the terms of the appended claims.

I claim:

1. In a machine for making ice by a continuous process, an evaporator, a housing providing a reservoir of water, an endless moving belt forming

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a partition between said reservoir and said evaporator to provide heat exchange between said reservoir and said evaporator for the growth of a mass of ice on said endless belt as it moves with respect to said water reservoir and said evaporator, and means forming a seal between said housing and said endless belt comprising a pair of resilient spaced lips formed along the periphery of said housing, said means including means for subjecting the space between said lips to gaseous pressure.

2. In an ice making machine, means providing circulation of a refrigerant, a reservoir for water in heat exchange relationship with said refrigerant circulating means, an endless belt movable with respect to said reservoir and said refrigerant circulating means, said reservoir being formed with walls in sealing contact with said belt, said endless belt and the walls of said reservoir forming the sole means of separating the water within said reservoir from said refrigerant circulating means, said endless belt providing a movable wall of said reservoir and a surface for the growth of an ice mass thereon while moving with respect to said reservoir and said refrigerant-

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ant circulating means, and the walls of said reservoir being formed with resilient spaced lips in sealing contact with said endless belt.

3. The invention as defined in claim 2 wherein the space between said resilient lips is subjected to gaseous pressure.

WILLIAM RANDELL.

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