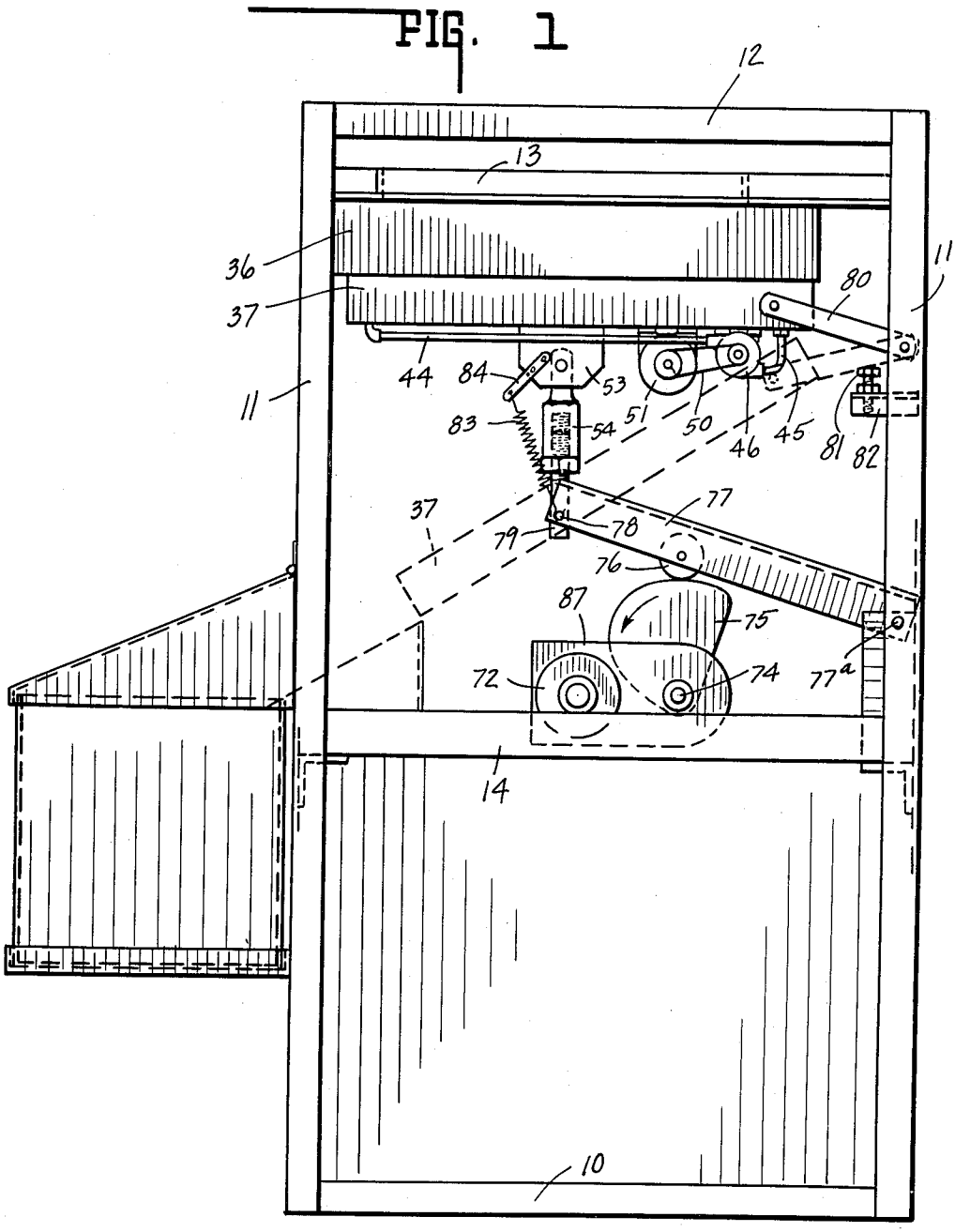
Dec. 13, 1955 T. C. CAPEHART ET AL 2,726,514

ICE MAKING MACHINE

Filed Aug. 29, 1951 2 Sheets-Sheet 1

FIG. 1



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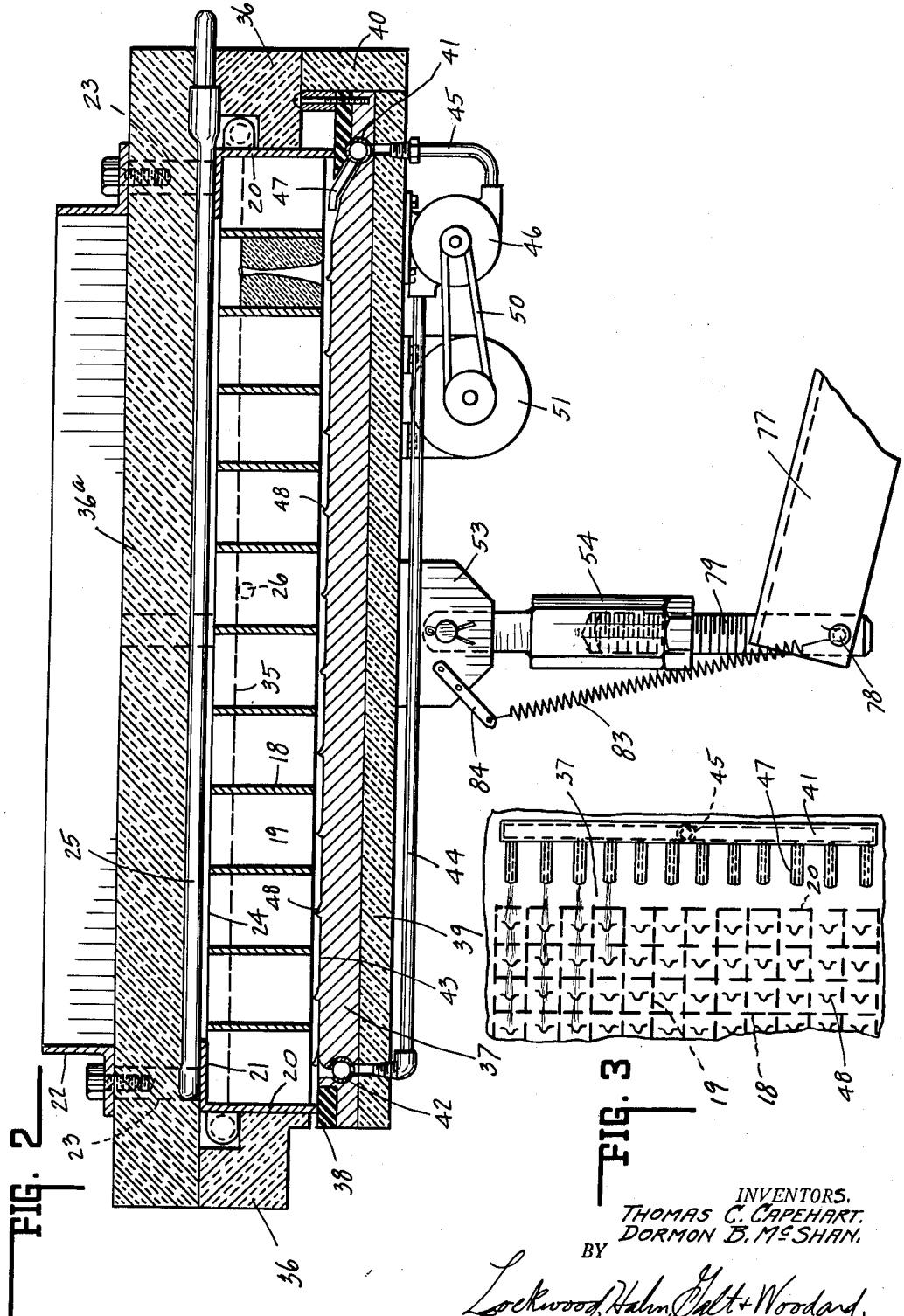

FIG. 2

FIG. 3

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ICE MAKING MACHINE

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Application August 29, 1951, Serial No. 244,151

6 Claims. (Cl. 62—106)

This invention relates to a machine for manufacturing and delivering ice cubes automatically wherein a number of individual ice cubes are simultaneously frozen and thereupon automatically released from their freezing cells for discharge to a delivery chute, as generally disclosed in Letters Patent of John R. Bayston, No. 2,563,093, issued August 7, 1951, for Ice Making Machine.

One object of the invention is to provide a structure and mechanism applicable to a machine of this general type for subjecting liquid during the freezing cycle to just sufficient agitation and washing action as to prevent incorporation of impurities within the ice being formed, to thereby produce substantially clear ice cubes as distinguished from cubes generally referred to as cloudy.

The above is accomplished, according to this invention, by directing a stream of water discharged under pressure immediately below and adjacent the group of open bottom cells within the freezing unit, which stream of water by reason of its rapid flow will create a turbulence of the water within the cells to effect agitation thereof sufficiently to cause separation and precipitation of impurities as the ice film forms, and carry away from deposit such impurities to leave clear ice frozen in the cells.

In this connection reference is made to the above entitled application and more particularly to Letters Patent of Gustav F. Erickson and Dormon B. McShan granted January 22, 1952, No. 2,583,294, entitled Ice Making Machine, each of which embodies a movable platen for sealing the group of open bottom cells in the evaporator or freezing unit, and which platen is movable therefrom after the freezing cycle and for the duration of a defrosting cycle to permit defrosted frozen ice cubes to drop from the cells on the platen for discharge.

According to this invention the platen carries a water circulating system including a force pump and is so formed as to cause a stream of water to be discharged to provide a rapid flow of current between the adjacent surfaces of the platen and the group of open bottom cells, and provision in the platen for directing the stream of water back to the force pump.

Another feature of the invention resides in the provision of baffle-like ridges formed over the surface of the platen and so arranged relative to the cells as to effect a turbulence of the water approximately at the center of each cell.

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

Fig. 1 is a side elevation of the ice making machine with parts broken away and parts removed.

Fig. 2 is an enlarged vertical section through the evaporator, cells and platen.

Fig. 3 is a schematic illustration of the water stream discharge and flow immediately below the group of open bottom cells.

This invention is adapted to be applied to the machine shown in the above-mentioned Erickson and McShan application, reference being had thereto in respect to structural details and automatic operation, there being disclosed

herein merely a water stream agitator substituted for the agitating plate of said application. With this exception similar parts disclosed herein bear corresponding identifying numbers to said application, and the refrigerating, defrosting and automatic control structure more particularly described in said application is made a part hereof.

For illustration of the present invention there is shown herein that portion of an ice cube producing machine having a supporting frame structure including a bottom frame member **10**, uprights **11**, top frame member **12** and cross frame members **13** and **14**. In the lower compartment of the frame setructure and below the frame member **14** there may be housed a suitable refrigerating apparatus of any well known make, not shown herein.

In the upper section of the frame structure there is provided a freezing unit or evaporator including a plurality of individual cube forming cells open at their top and bottom as shown in Fig. 2. Said cells are in the form of square sleeves defined by the partition walls **18** crossed by transversely extending partition walls **19**, all of which are surrounded by the outer walls **20** of greater depth. The outer walls **20** are formed with inwardly extending top flanges **21** upon which the supporting frame **22** is bolted and spaced by the spacing sleeves **23**.

Each of the partition walls **19** of the cells is formed with the top flange **24** extending approximately half way to the next adjacent wall to partially close the top of each cell, but primarily to provide a heat exchange support for the circuitous refrigerant coils **25**. Said coils provide the passageway through which refrigerant is caused to flow during the freezing cycle and serve as defrosting elements during the defrosting cycle. They are preferably in the form of flattened tubes secured in intimate contact and substantially coextensive with the flanges **24** of the cell walls **19** to provide a sufficient heat exchange therebetween.

The liquid such as water to be frozen is discharged into the freezing unit through the tube **26** below, but adjacent the liquid level **35**. Said tube **26** is connected with a source of water supply, not shown, which is automatically controlled in the manner described in said last mentioned application. Liquid flowing through the tube **26** will be distributed to each of the cells within the outer walls **20** to flow below the cell partitions **18** and **19**.

Surrounding the freezing unit there is a wall of insulating material *36* covered by a top layer of insulating material *36a*. For closing and sealing the unit from the bottom there is provided a platen **37** having a rubber sealing gasket **38** adjacent its edges adapted to engage the outer walls **20**. Said platen carries over its lower surface a layer of insulating material **39** and about its sides and rear edges outer insulating strips **40** which are adapted to engage the walls **36** to provide an insulated closure for the freezing unit and platen when the latter is in its closing and sealing position as shown in Figs. 1 and 2.

Said platen carries within the sealing gasket **38** adjacent what may be termed the rear end thereof, a discharge header **41**, and at the other end thereof (which may be called the forward end) an outlet header **42**. Said headers extend transversely of the platen slightly below the upper face thereof indicated at **43**. The face **43** of the platen is only slightly spaced below the lower edges of the open bottom cells sufficiently to permit water distribution from cell to cell as well as a forced stream of water caused to flow from the discharge header **41** to the outlet header **42**. Said headers are connected at their central portions by a return flow pipe **44**, **45** having a force pump **46** interposed therein. The discharge header **41** is provided with a series of spaced nozzles **47** arranged to discharge jets of water over the face **43** of the platen under such force as to cause a rapid current to be set up and flow toward the outlet header. The nozzles **47** gen-

erally increase in diameter and capacity from the central intake portion of the discharge header outwardly toward each end thereof, and are preferably arranged in spaced relation so that each nozzle is in line with the center of a row of cells as shown in Fig. 3.

The upper face 43 of the platen may be provided with a series of turbulent producing baffles 48 so arranged relative the cells as to induce a maximum turbulence centrally thereof.

With the cells filled with water to be frozen, the space above the platen as well as the headers and pump will be filled whereupon the rapid flow of the stream induced by the pump transversely of the open bottom of the cells will create such a turbulence as to be transmitted upwardly into the cells to cause agitation of the water therein and a washing action such as to wash away impurities from the ice film as it freezes with the result that clear ice will be formed.

The pump 46 is driven through the belt 50 by a motor 51 secured to the underside of the platen which motor may be energized only during the freezing cycle, or if desired, operated continuously for pumping the platen free of water to remove all impurities therefrom during the defrosting and discharging operation when the platen is in its lowered position.

Secured to the underside of the platen midway thereof there is provided a bracket 53 to which there is pivotally connected an adjustable coupling link 54. The platen is raised to its sealed closed position during a refrigerating cycle, or lowered to its discharge position as shown in dotted lines through the operation of a cam motor 72 supported on the cross frame member 14. Said cam motor is connected through reduction gears with the cam shaft 74 which operates the cam 75 in the direction of the arrow. Said cam is engaged by the cam follower 76 mounted on the cam lever 77 having one end thereof pivoted at 77*a* to the upright frame member 11. The free end of the lever 77 is pivotally connected at 78 with the link 79 extending downwardly and adjustable relative to the link coupling 54. The platen is hingedly connected to the uprights 11 by a pair of hinge straps 80 limited in their downward drop by the adjustable stop screws 81 carried by the brackets 82.

When the cam 75 is in the position shown in Fig. 1, with the follower 76 engaging its extending face, it holds the platen in its closed sealing engagement with the freezing unit. Upon rotation of the cam in the direction of the arrow the follower rides over the reduced portion of the cam permitting the platen to be lowered to its ice discharge position shown by dotted lines in Fig. 1. Said platen is lowered to an inclined position for discharging the ice cubes that are released from the cells upon the thawing or defrosting action resulting from the reverse flow of hot refrigerant through the coils 25. However, upon initial release both by the action of said cam and the thawing of the ice, the platen is slightly tilted by a spring 83. Said spring has one end connected to an arm 84 secured to the bracket 53 and the other end is secured to the pivot connection 78. As the spring is off center toward the forward end of the platen, it will cause the platen to first tilt downwardly to discharge excess liquid from the platen. Further movement of the cam 75 with further lowering of the platen causes its free end to move downwardly to the limit of movement of the hinge straps 80 at which position the platen will first be arrested in its downward movement in substantial parallel relation to the freezing unit and then be tilted further downwardly as shown in dotted lines for complete discharge of ice cubes received thereon as well as the water and sediment accumulated in the platen during the agitating and washing action of the liquid stream. Said cam thereupon raises the lever 77 and the platen to its closed sealing position ready for the next refrigerating cycle. This is accomplished through the driving action of the motor 72 which drives the cam shaft 74 through suitable reduction gears mounted within the gear housing 87 and circuit control switches as more particularly set forth and described in the last mentioned pending application.

The invention claimed is:

1. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for inducing a stream of liquid over the surface of said closure plate directly under the open bottom of said cells and transversely thereof, said stream moving at sufficient velocity to create a turbulence and agitation of the liquid in the cells for washing and carrying off impurities from the ice being formed therein, and a series of baffles formed on the upper face of said closure plate projecting into the stream of liquid for increasing the turbulent and agitating effect thereof.

2. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, said plate having an upper surface spaced from but closely adjacent the open bottom of said cells extending in parallel transverse relation thereto, a discharge header embedded in one end thereof, an outlet header embedded in said plate at the opposite end thereof, discharge apertures spaced along said discharge header for directing liquid therefrom over the face of said plate in a stream terminating in said outlet header, a return liquid conduit from said discharge header, and a pressure pump in said conduit for effecting a rapid and forced circulation of the liquid between said headers and the continuous flow of the liquid stream a sufficient velocity for effecting a turbulent agitation of the liquid in said cells during the freezing cycle.

3. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, said plate having an upper surface spaced from but closely adjacent the open bottom of said cells extending in parallel transverse relation thereto, a discharge header embedded in one end thereof, an outlet header embedded in said plate at the opposite end thereof, discharge apertures spaced along said discharge header for directing liquid therefrom over the face of said plate in a stream terminating in said outlet header, a return liquid conduit from said discharge header, a pressure pump in said conduit for effecting a rapid and forced circulation of the liquid between said headers and the continuous flow of the liquid stream at sufficient velocity for effecting a turbulent agitation of the liquid in said cells during the freezing cycle, and a series of baffles extending from the face of said plate in the path of the liquid stream arranged relative to the respective centers of said cells to induce and localize the turbulence centrally thereof.

4. In an ice making machine, the combination of a freezing unit having a plurality of open bottom cells for receiving the liquid to be frozen and a removable closure therefor, means for inducing a stream of liquid over the surface of said closure directly under the open bottom of said cells and transversely thereof, said stream moving at sufficient velocity to create a turbulence and agitation of the water in the cells for washing and carrying off impurities from the ice being formed therein, and a series of baffles formed on the upper face of the closure projecting into the stream of liquid for increasing the turbulent and agitating effect thereof.

5. In an ice making machine, the combination of a

freezing unit having a plurality of open bottom cells for receiving the liquid to be frozen and a removable closure therefor, said closure having an upper surface spaced from but closely adjacent the open bottom of said cells extending in parallel transverse relation thereto, a discharge header embedded in one end thereof, an outlet header embedded in said closure at the opposite end thereof, discharge apertures spaced along said discharge header for directing liquid therefrom over the face of said closure in a stream terminating in said outlet header, a return liquid conduit from said discharge header, and a pressure pump in said conduit for effecting circulation of the liquid between said headers and the continuous flow of the liquid stream for effecting a turbulent agitation of the liquid in said cells during the freezing cycle.

6. In an ice making machine, the combination of a freezing unit having a plurality of open bottom cells for receiving the liquid to be frozen and a removable closure therefor, said closure having an upper surface spaced from but closely adjacent the open bottom of said cells extending in parallel transverse relation thereto, a discharge header embedded in one end thereof, an outlet header embedded in said closure at the opposite end

thereof, discharge apertures spaced along said discharge header for directing liquid therefrom over the face of said closure in a stream terminating in said outlet header, a return liquid conduit from said discharge header, a pressure pump in said conduit for effecting circulation of the liquid between said headers and the continuous flow of the liquid stream for effecting a turbulent agitation of the liquid in said cells during the freezing cycle, and a series of baffles extending from the face of said closure into the path of the liquid stream arranged relative to the respective centers of said cells to induce and localize the turbulence centrally thereof.

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