Nov. 10, 1970 V. FEOLA 3,538,720

ICE CUBE MAKER ASSEMBLY

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Fig. 1.

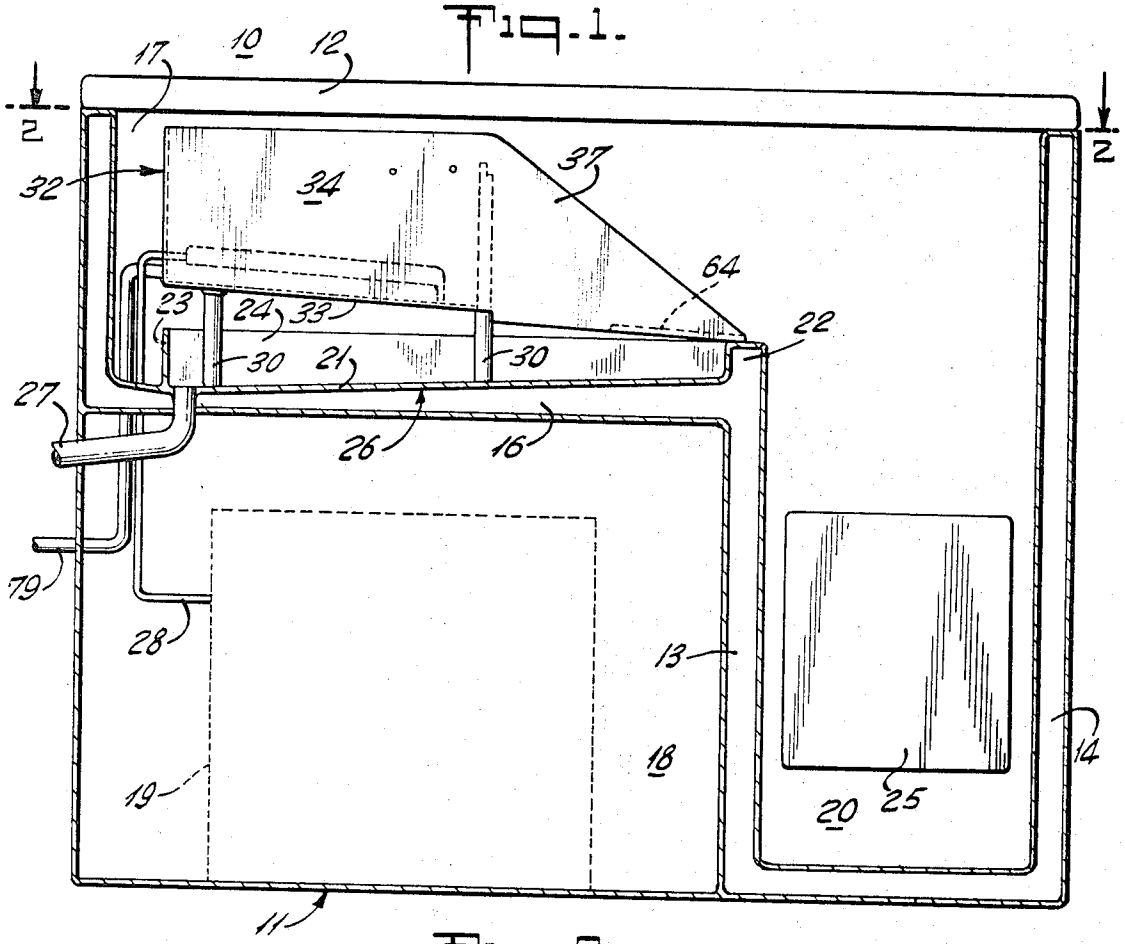
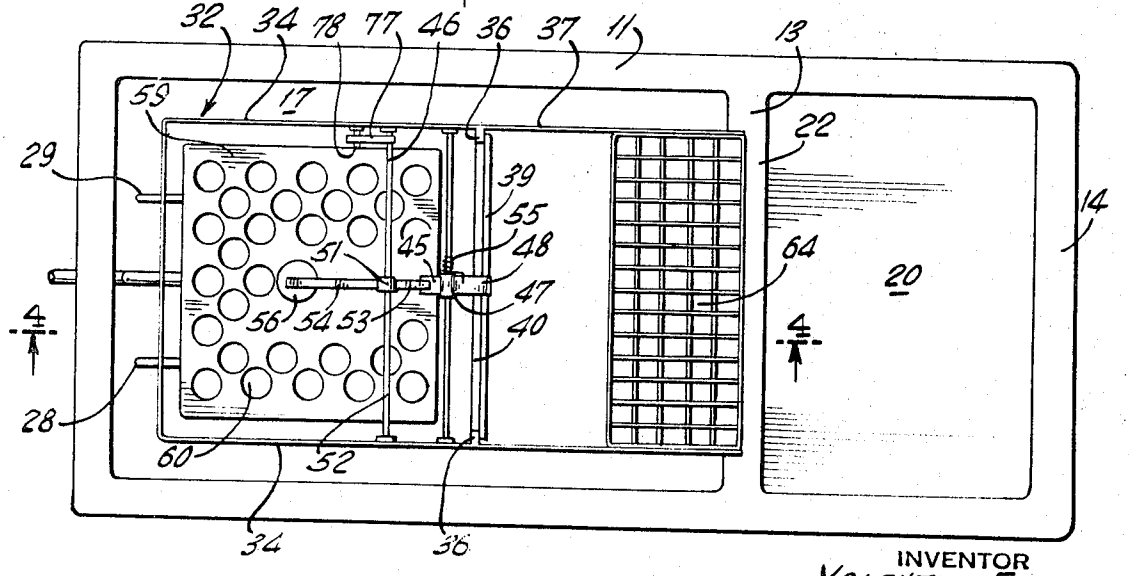


Fig. 2.



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Fig. 3.

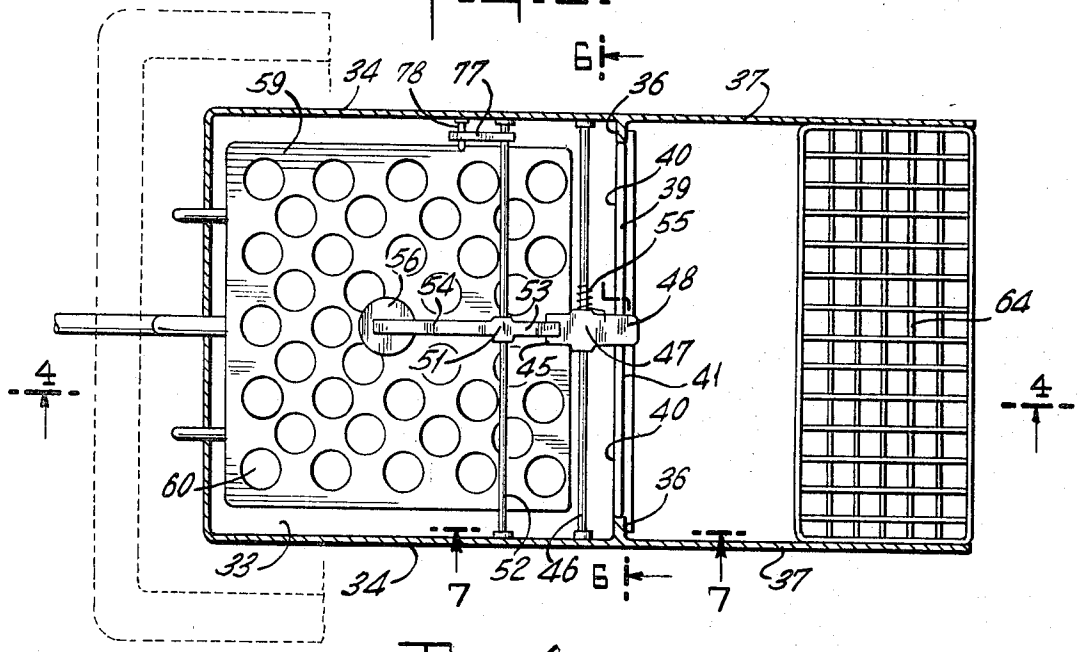


Fig. 4.

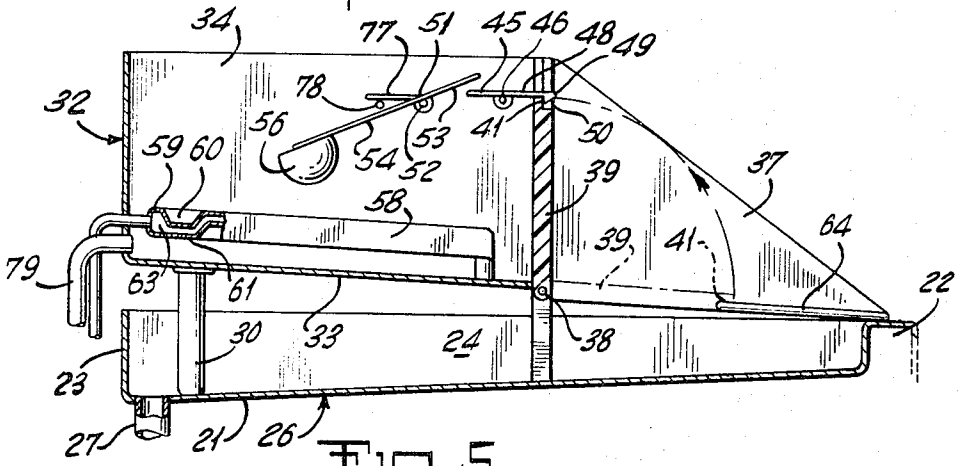
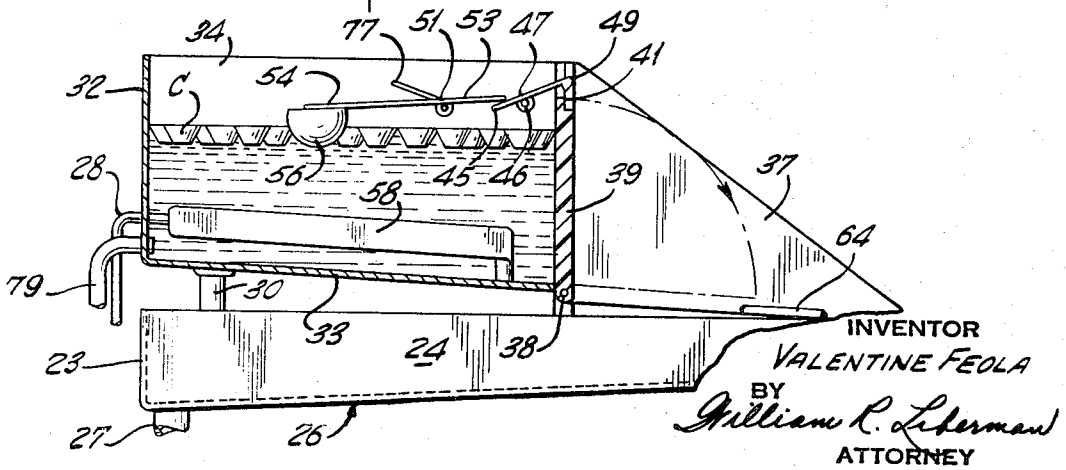


Fig. 5.



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Fig. 6.

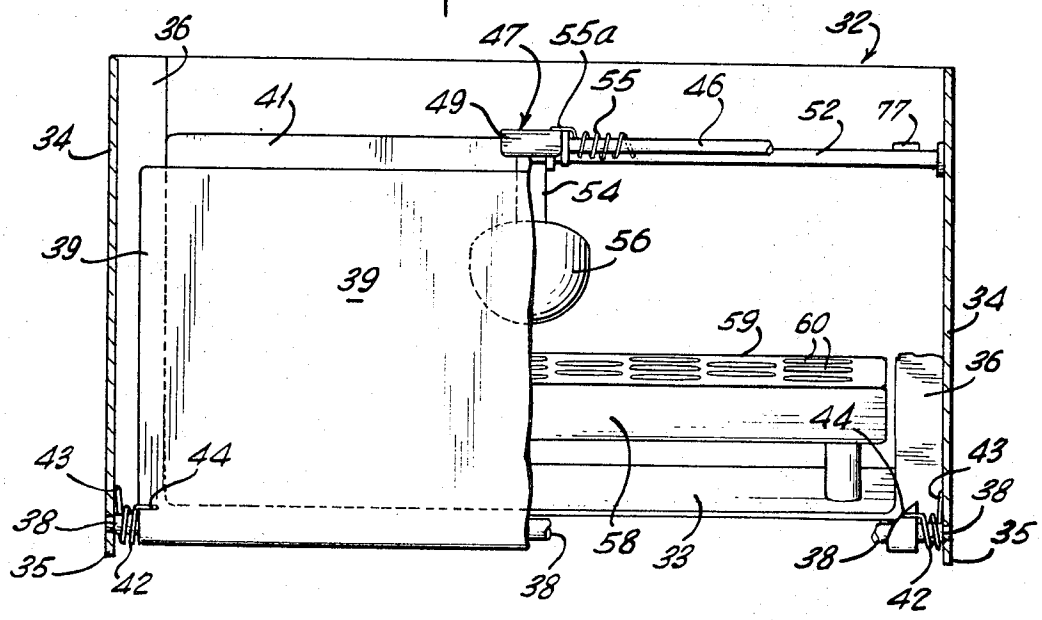
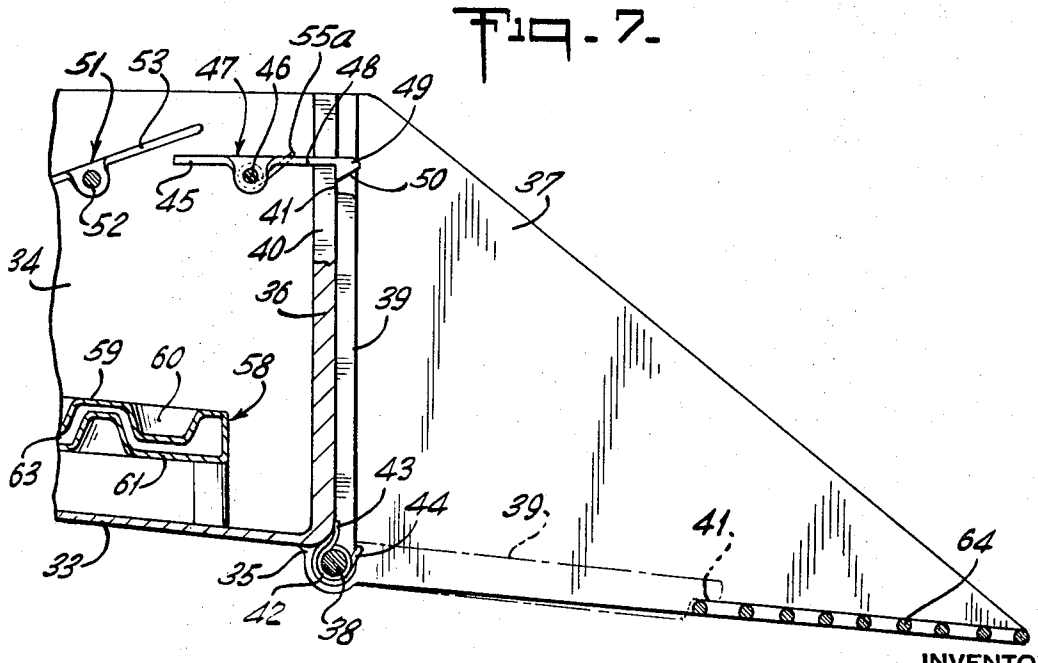


Fig. 7.



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ICE CUBE MAKER ASSEMBLY

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U.S. Cl. 62—352 10 Claims

ABSTRACT OF THE DISCLOSURE

An ice cube producing apparatus includes a tank having an end wall swingable along its bottom edge to an open position in alignment with a forwardly extending perforate drain plate and urged to and releasably latched in closed position. A float in the tank releases the front wall to open position under tank water pressure. A jacketted compartmented freezing tray is located proximate the tank bottom and defines an expansion chamber through which an evaporable refrigerant is circulated. Upon freezing and solidifying of the ice cubes, water is fed into the tank to separate the cubes from and to refill the tray, trip the latch and release the tank water which floats the separated ice cubes along the drain plate.

BACKGROUND OF THE INVENTION

The present invention relates generally to improvements in ice making machines and it relates particularly to an improved apparatus for the production and separation of ice cubes.

The conventional procedure for producing ice cubes includes the steps of freezing water in a compartmented open topped tray or in ice molds and then separating the individual ice cubes from the tray or molds mechanically by distorting the tray compartment or mold walls to break the interface and bond between the ice cubes and walls. This procedure is highly inconvenient and unreliable.

Various mechanisms have been employed and proposed for separating the ice cubes from the ice cube mold cavities in automatic ice cube producing machines but these mechanisms are of complicated and expensive construction and require frequent servicing, and otherwise leave much to be desired.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide an improved ice cube producing mechanism.

Another object of the present invention is to provide an improved automatic ice cube producing mechanism in which the ice cubes are discharged in a separated condition and the freezing molds are automatically filled with water.

Still another object of the present invention is to provide an improved ice cube producing mechanism of simple, rugged and inexpensive construction and of reliable operation, and which is characterized by high versatility and adaptability.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawings which illustrate a preferred embodiment thereof.

In a sense, the present invention contemplates the provision of an apparatus for the production of ice cubes comprising a tank, a freezing tray located in said tank, means for cooling said tray to freeze water contained therein to ice, and means for introducing water into said tank to above the level of said freezing tray to separate and float the ice from said tray.

According to a preferred form of the improved apparatus the freezing tray includes spaced top and bottom walls

defining an evaporator chamber, the top wall being provided with ice mold cavities or wells and the evaporator chamber being connected to a refrigerator unit.

The tank includes an end wall hinged at its bottom and spring urged to and releasably locked in a closed position by a tank float-controlled latch. A perforated plate is located forward of the tank at about the level of the base thereof with its trailing border underlying the open end wall so that upon opening of the latch released end wall under the influence of the water in the tank the separated ice cubes are floated over the plate, the water passing therethrough into an underlying drain. Upon freezing of the ice cubes the tank is flooded with water to separate and float the ice cubes and refill the ice cube mold cavities.

The improved apparatus is simple and rugged and reliable in operation and is highly adaptable and versatile.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical longitudinal sectional view of an improved ice cube making machine embodying the present invention;

FIG. 2 is a sectional view thereof taken along line 2—2 of FIG. 1;

FIG. 3 is a top plan view of the ice cube freezing and separating section of the machine;

FIG. 4 is a sectional view taken along line 4—4 in FIG. 3;

FIG. 5 is a view similar to FIG. 4 showing the tank in a flooded condition;

FIG. 6 is a partial sectional view taken along line 6—6 in FIG. 3; and

FIG. 7 is a sectional view taken along line 7—7 in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings which illustrate a preferred embodiment of the present invention, reference numeral **10** generally designates the improved ice making machine which includes a suitably insulated rectangular cabinet **11** provided with an insulated top lid **12** to provide access to cabinet **11**. The cabinet is divided by a vertical insulated transverse partition **13** extending from the cabinet base at a point rearwardly of the front insulated wall **14** thereof to a point below the top of cabinet **11** and a horizontal partition **16** extending rearwardly from partition **13** below its top edge to cabinet rear wall, into an upper rear ice cube freezing and separating compartment **17**, a lower rear compartment **18** which houses a refrigerator unit **19**, and a front ice cube receiving and storage compartment **20**.

The upper wall **21** of partition **16** is rearwardly downwardly inclined and with the lip defining upper border **22** of partition **13**, a transversely extending upright rear wall **23** and side walls **24** define an open-topped drain pan **26** which is connected to a suitable outlet by a water discharge pipe **27** extending down drain pan **26** at the rear bottom thereof. A door **25** of suitable construction is positioned in the cabinet lower side wall and provides access to the storage compartment **20** for the removal therefrom of ice cubes. The refrigerator unit **19** is of any well known conventional construction and includes an outlet pipe **28** for the cooled liquid refrigerant from the unit condenser and a return pipe **29** for the vaporized refrigerant.

Located in compartment **17** and mounted above drain pan **26** by depending legs **30** resting on the drain pan base **21** is an open-topped tank **32** including a forwardly downwardly inclined base wall **33** and vertical longitudinal side walls **34** which terminate at their forward edges in

inwardly transfersely projecting coplanar flanges or lips **36**. Vertical, parallel triangular guide plates **37** are coplanar and integral with side walls **34** and project forwardly thereof, the forward bottom corners of plates **37** rest on the partition lip **22**. Depending from the rear bottom corners of plates **37** adjacent side walls **34** are a pair of parallel ears **35** which support between them a transversely extending hinge rod **38**.

The front wall of tank **32** is defined by a plate **39** which is engaged by hinge rod **38** along the bottom edge of plate **39** so as to be swingable about the longitudinal axis of rod **38** between an upright closed position abutting the front faces of lips **36** and a forwardly projecting open position. Plate **39** is provided along its rear face with a rearwardly projecting section **40** extending between the inner edges of lips **36** when plate **39** is in closed position and is provided along its top edge with an upright lip **41** coplanar with section **40**.

A pair of helical torsion springs **42** encircle opposite ends of hinge rod **38** between ears **35** and the respective confronting lower ends of plate **39**. Each spring **42** includes an outer upright leg **43** bearing on the front face of a respective lip **36** and an inwardly projecting opposite leg **44** bearing on the front face of plate **39** normally to resiliently urge the unloaded plate **39** to its upright closed position.

A transverse horizontal rod **46** extends between and is affixed to opposite side walls **34** shortly rearwardly of the upper edge of plate **39**. A latch member **47** is swingably medially supported by rod **46** and includes a rearwardly projecting arm **45** and a forwardly projecting arm **48** terminating in a depending latch element or leg **49** having a vertical rear edge and a forwardly upwardly inclined bottom cam edge **50**. A helical spring **55** encircles rod **46** and includes one end leg **55***a* bearing upon the top face of forward arm **48** and an opposite end leg secured to rod **46** normally to resiliently urge arm **48** to swing downwardly to its lower position with latch element **49** engaging end plate lip **41** whereby releasably to lock plate **39** in closed position.

A float controlled latch release lever **51** is affixed between its ends to a transverse rod **52** extending between and rotatably supported by side walls **34** rearwardly and at the level of rod **46**. Lever **51** includes a forward arm **53** overlying latch arm **45** and a rear arm **54** carrying at its free end a buoyant float **56**. Also affixed to transverse rod **52** adjacent a side wall **34** is a rearwardly projecting arm **77** movable into engagement with a stop member **78** mounted on side wall **34** and located in the path of arm **77** to limit the downward swinging of arm **54** with float **56**. A pipe **79** connects the lower part of tank **32** to a suitable source of water (not shown), the source delivering to tank **32** through pipe **79** water at an adjustable rate and in predetermined volume sufficient at least to raise float **56** sufficiently to release plate **39** to its open position as will be hereinafter described. The water is advantageously automatically periodically fed to tank **32** at predetermined intervals following freezing of the ice cubes or the feed may be manually controlled.

A freezing tray **58** is suitably positioned in tank **32** preferably a short distance above tank base **33**, and includes a top wall **59** having a plurality of ice cube mold cavities or wells **60** formed therein. Tray **58** also includes a bottom wall **61** disposed below top wall **59** and connected to it along their respective peripheries to form a refrigerant expansion chamber **63** connected to the refrigeration unit **19** by refrigerant feed and return pipes **28** and **29**. The freezing tray **59** is forwardly downwardly inclined.

A perforated drain plate or grid **64** is suitably supported between the forward bottom edges of guide plate **37** with its front border resting on lip **22**. The rear border of drain plate **64** registers with the underface of closure plate lip **41** when plate **39** is in its open position, plate **39** in its open position being inclined and substantially coplanar with drain plate **64**. The openings in drain plate **64** are sufficiently smaller than mold cavities to restrain the passage of the ice cubes therethrough while permitting the free drainage of water.

Considering now the operation of the improved ice cube machine **10**, freezing tray cavities **60** are initially filled with water in any suitable manner, such as by flooding tank **32** and then draining the tank in the manner hereinafter set forth. The water in cavities **60** is frozen by reason of the cooling of the water consequent to the evaporative cooling effected by the volatile liquid refrigerant evaporated in the tray chamber **61** in the known manner. After the water in cavities **60** has been frozen into ice cubes water is fed into tank **32** through pipe **79** and since the temperature of the water is well below freezing it will be effective to thaw or melt the interfaces of the ice cubes and the walls of cavities **60** thereby to float the ice cubes from the cavities **60**, by reason of the lower densities of the ice cubes than water. Simultaneously with the floating of the ice cubes from cavities the said cavities **60** are filled with the water flooding the tank **32**.

As the water level in tank **32** rises it carries with it float **56** to swing lever **54** clockwise as viewed in the drawings. With the swinging of lever **54**, lever arm **53** bears on and depresses lever arm **45** thereby to raise latch element **49** and release hinged wall **39**. Wall **39**, under the pressure of the water in tank **32**, is swung outwardly against the urging of springs **42** to its fully open position as shown by broken line in FIGS. 4, 5 and 7. With the swinging of wall **39** to its fully open position, the water and ice cubes floating in tank **32** flow rapidly from tank **32** along inclined open wall **39** and along drain plate **64**. The ice cubes flow over drain plate **64** and lip **22** into storage compartment **20** where they may be withdrawn for use, and the water passes through the drain plate **64** into the underlying drain pan **26** from which it flows through discharge pipe **27**.

After the water and ice cubes have been discharged from tank **32** the pressure on wall **39** is relieved and float **56** drops to permit the spring lowering of latch element **39**. Thereupon wall **39** is swung to its upright tank closing position under the influence of springs **42**, wall lip **41** in the closing movement of wall **39** striking latch element cam edge **50** momentarily to raise latch element **49** and permit the swinging of wall **39** to a fully closed and latched position. The machine is now ready for a repetition of the above ice cube producing cycle which may be automatically periodically performed in any suitable manner.

While there has been illustrated and described a preferred embodiment of the present invention, it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. An apparatus for the production of ice pieces comprising a tank, a freezing tray located in said tank, means for cooling said tray to freeze water contained therein in ice, means for introducing water into said tank to above the level of said freezing tray for thawing the interface of said tray and said ice to separate and float the ice from said tray, and means for discharging said water and said floating ice from said tank said freezing tray being spaced from the tank so that the thawing water makes contact with the side and bottom portions of the freezing tray thereby loosening the bond between the ice and the tray.

2. The apparatus of claim **1**, including means for separating said ice from said discharged water.

3. The apparatus of claim **1**, wherein said discharging means includes an end wall of said tank swingable between an upright closed position and a horizontally extending open position and means responsive to the level of water in said tank for releasing said wall to said open position.

4. The apparatus of claim **3**, comprising latching means for releasably locking said end wall in a closed position,

said wall releasing means including a float member located in said tank and means for coupling said float to said latching means, and means urging said end wall toward said closed position.

5. The apparatus of claim 3, comprising an ice piece separating and water drain member positioned forwardly of said tank proximate the outer edge of said swingable end wall when in open position.

6. The apparatus of claim 3, comprising a perforated plate extending forwardly of said tank and having a rear section underlying the outer edge of said swingable end wall when in open position and a water drain basin underlying said perforated plate.

7. The apparatus of claim 1, wherein said freezing tray has a plurality of open topped ice piece freezing compartments formed therein.

8. The apparatus of claim 7, wherein said freezing tray is jacketted to provide a refrigerant expansion chamber and comprising means for circulating an evaporable refrigerant through said chamber.

9. The apparatus of claim 1, wherein said tank includes a forwardly downwardly inclined bottom wall and said discharging means includes a front wall hinged to the forward edge of said bottom wall and swingable between a closed upright position and a forwardly extending open position, means urging said front wall to a closed position, a latching element releasably locking said front wall

in its closed position, a float member located in said tank for moving said latching element to a wall releasing position when water in said tank reaches a predetermined level, means for separating the ice pieces from said water including a perforated plate extending forwardly from a point proximate the forward edge of said front wall when in an open position, and means for receiving water passing through said perforate plate.

10. The apparatus of claim 9, wherein said freezing tray includes a top wall provided with a plurality of freezing wells formed therein and a bottom wall positioned below said top wall and sealed thereto and delineating therewith an expansion chamber, and said cooling means includes means for circulating an evaporable refrigerant through said expansion chamber.

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U.S. Cl. X.R.

62—73