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APPARATUS FOR FORMING ICE CUBES

Filed Sept. 18, 1951

2 Sheets-Sheet 1

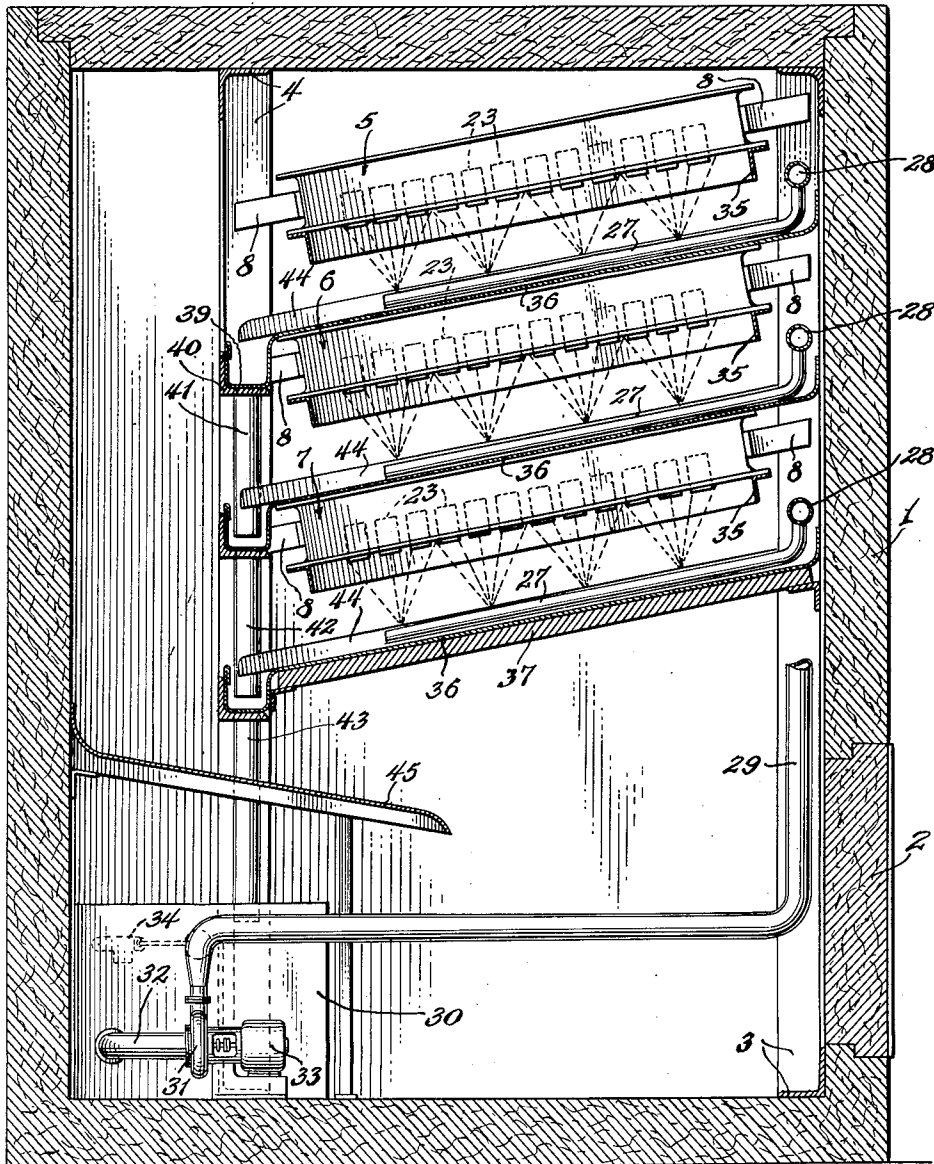


*Fig. 1.*

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*Fig. 2.*

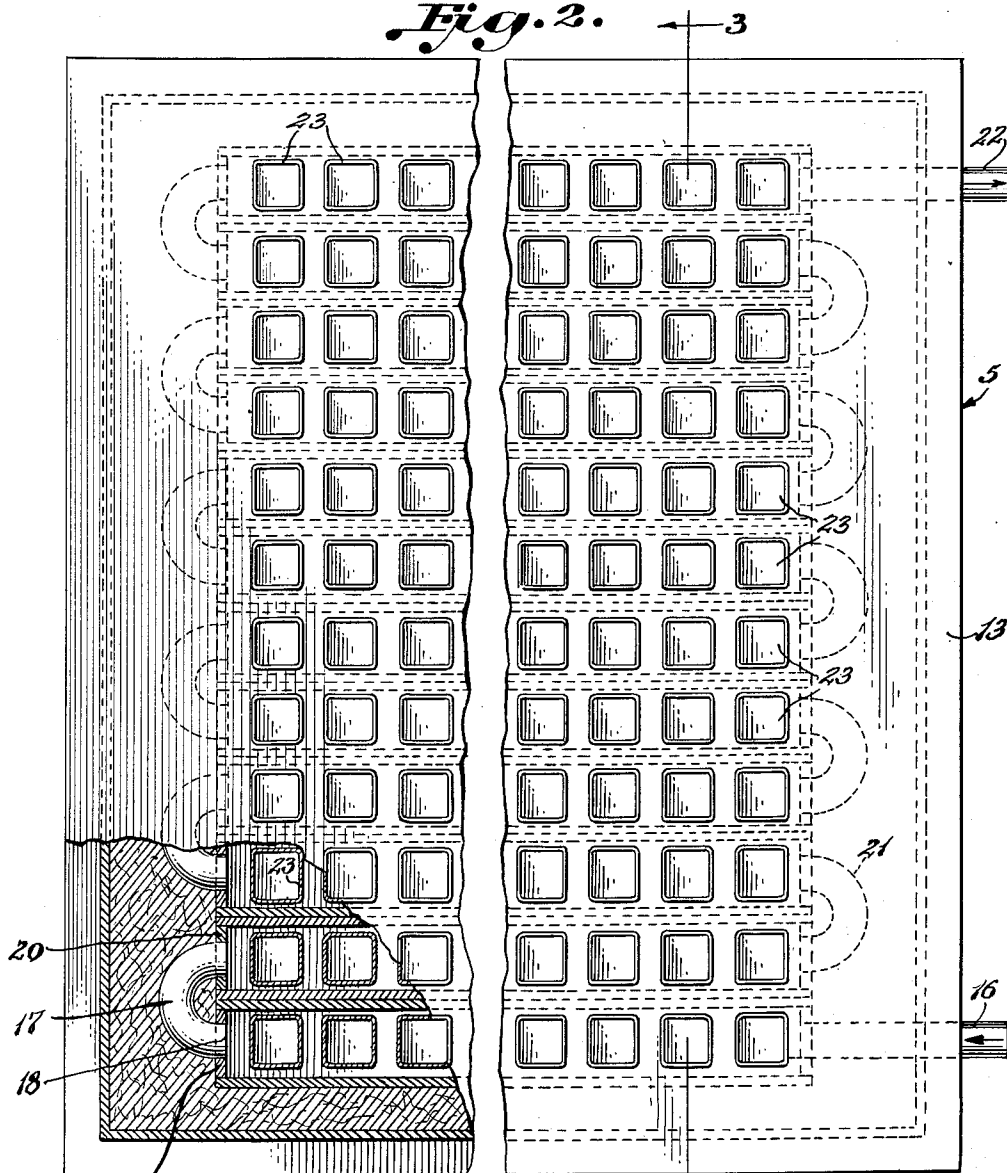
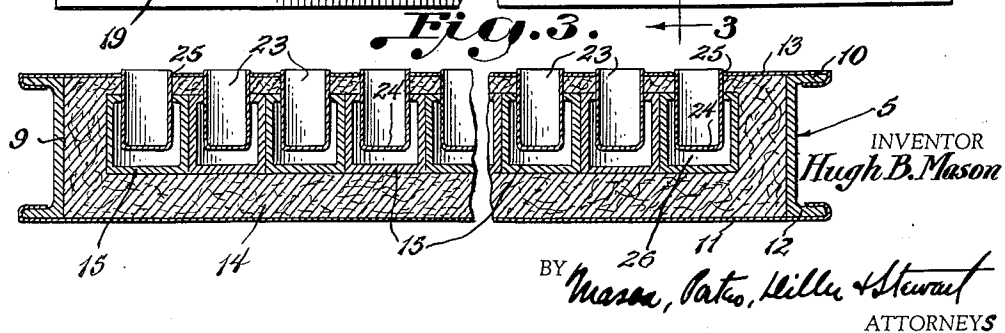


*Fig. 3.*



## UNITED STATES PATENT OFFICE

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## APPARATUS FOR FORMING ICE CUBES

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5 Claims. (Cl. 62-107)

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The invention relates to new and useful improvements in a method of forming relatively small ice blocks adapted for use in drinking containers and the like and in an apparatus for carrying out said method.

An object of the invention is to provide an apparatus wherein clear solid ice blocks are formed in individual molds having one end closed and with the open end facing downwardly by subjecting the outer surface of the molds to a refrigerant at a temperature sufficient to freeze water in a flowing film on the inside of the molds and directing sprays of water into the individual molds from beneath the same in an amount sufficient to gradually form ice blocks therein and cause a film of water to flow over the freezing surface to remove air and foreign matter clinging thereto.

A further object of the invention is to provide an apparatus of the above type wherein the molds are subjected to a heating medium after the blocks are formed, sufficient to loosen the blocks from the molds so that the blocks will drop by gravity from the molds.

A still further object of the invention is to provide an apparatus wherein the individual molds are arranged in banks with the open ends facing downwardly and means is provided for subjecting the outer faces of the sides and one end of the molds to a heat transferring medium and means disposed beneath the molds is provided for directing sprays of water into the molds.

A still further object of the invention is to provide an apparatus of the above type wherein means is provided for receiving the ice blocks when they drop from the molds and directing the same into a collecting receptacle therefor.

These and other objects will in part be obvious and will in part be hereinafter more fully disclosed.

In the drawings, which show by way of illustration one embodiment of apparatus for carrying out the invention,

Figure 1 is a vertical sectional view through a cabinet containing the improved apparatus;

Figure 2 is a view partly in bottom elevation and partly in section showing one of the freezing units;

Figure 3 is a sectional view on the line 3, 3 of Figure 2.

The invention has to do with the forming of relatively small ice blocks which are especially adapted for use in drinking containers and the like. The blocks may be cubicle in shape or they may be cylindrical in shape. For the purpose

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of illustration they are shown as shaped to form ice cubes.

In the drawings there is shown a cabinet indicated at 1 wherein the walls may be made of any suitable insulated material. In one of the side walls there is an opening which is closed by a door 2. Extending from the bottom to the top of the cabinet are frame members 3 and 4. These frame members also extend across the top and bottom of the cabinet and are L-shaped in cross section. Mounted on the frame members within the cabinet are freezing units 5, 6 and 7. As illustrated there are three units. These may be increased to give the desired capacity of the freezing apparatus. Each freezing unit is supported by brackets 8, 8 secured to the frame structure.

In Figure 2 there is shown a bottom plan view of one of the freezing units with a portion of the bottom broken away and the unit sectioned to show more clearly the construction of the heat transferring devices in which the individual molds are mounted. This freezing unit includes a frame structure 9 extending all the way around the unit. The frame structure has outwardly extending flanges 10, 10 to give strength thereto. A metal plate 11 extends across one side of the unit and has the edge portions 12 thereof folded about one of the flanges on the frame. There is a metal plate 13 extending across the other side of the unit and the edges of this plate are likewise folded about the other flange. Within this freezing unit is insulating material 14 of any suitable character. Imbedded in the insulating material of the unit are tubes 15. These tubes are rectangular in cross section as illustrated. However, they may be otherwise shaped as, for example, they may be circular in cross section preferably with a flat face extending along one side of the tube. The rectangular tubes, as illustrated, are placed side by side with their side walls in contact. The tube at the lower side of Figure 2 is connected to an intake pipe 16. The end of this tube is closed except for the connection of the pipe 16. At the other end of the lowermost tube in Figure 2 is a U-shaped pipe 17. The end 18 thereof is connected with the lowermost tube and associated with this tube 17 is a closing head 19. The other end of this U-shaped tube is connected to the next adjacent tube which likewise is closed by a head 20. This next adjacent tube is connected by a U-shaped tube 21 indicated in dotted lines in Figure 2. The tubes are all thus connected at their alternate ends to the next adjacent tube and the

uppermost tube is connected to an outlet pipe 22. By the arrangement just described a heat transferring medium may be directed into the lowermost tube to the pipe 16 and it would flow through all of the tubes and finally out through the outlet pipe 22.

Associated with each tube is a series of molds 23. These molds have flat sides as illustrated and a closure end 24 which completely closes the end of the mold. The other end of the mold 23 is open. These molds extend through rectangular openings 25 in the plate 13 and also through rectangular openings in the side of the tube which is adjacent the plate 13. The molds are preferably welded to the tubes. The molds extend into the tubes so as to leave a space 26 which extends along the sides of the molds and across the closed end. The tubes 15 are imbedded in the insulating material 14 so that a portion of the insulating material will lie between the tubes and the plate 13 and fit closely around the molds 23.

This freezing unit when placed in the cabinet is inverted so that the open ends of the molds face downwardly. Located beneath each freezing unit are spray pipes 27 having a series of spray nozzles, which nozzles are so arranged that sprays of water are directed into each mold. These spray pipes are connected to transverse tubes 28 which in turn are connected to a supply tube 29.

In the lower part of the cabinet is a tank 30 in which water is stored for use in the forming of the ice cubes. Adjacent the tank is a pump 31 connected by a pipe 32 extending from the intake of the pump through the wall of the tank to the interior thereof. Associated with the pump is a motor 33 for operating the same. Also associated with the tank is a float controlled valve mechanism 34 for maintaining a given level of water in the tank. The supply pipe 29 is connected to the outlet side of the pump 31. Thus it is that sprays of water will be directed from the spray pipes 27 into the molds. When it is desired to cut off the spray, then the motor is stopped.

Depending from each freezing unit is a skirt 35. Associated with each spray pipe is a drain board 36. The drain board for the uppermost unit rests on the upper side of the freezing unit just beneath the same. The drain board for the lowermost unit rests on a supporting plate 37. These drain boards are thin metal sheets. It is noted that all of the freezing units, the spray pipe and the drain board are inclined downwardly from right to left as shown in Figure 1, and any water accumulating on the drain board will run down the same into a receiving trough 39 which is shown as formed as a part of the drain board. The trough is supported by angle bars 40 which in turn are supported by the frame structures 4. There is a pipe 41 extending from the uppermost trough downwardly into the trough beneath the same. Water accumulating in the trough will drain through this pipe 41 into the trough beneath the same. Water collecting in the intermediate trough will drain down through the pipe 42 into the trough beneath the same and the pipe 43 associated with the lowermost trough will drain into the tank 30. Associated with each drain board are closely spaced bars 44 of any suitable material and these bars extend above spray pipes and over the trough so that ice cubes dropping from the molds onto the bars will slide along the same and over the edge of the trough onto

the inclined shelf 45 and be discharged therefrom into a suitable receptacle in the bottom portion of the cabinet.

The improved apparatus just described includes the admitting of a refrigerant through the pipe 16 into the tubes so that all of the tubes will be contacted with by the refrigerant. The refrigerant will be held at a temperature sufficient to freeze water in a flowing film on the inside of the molds. Water is directed from the sprays into the molds and the amount of water will be regulated so that it is only sufficient to gradually form the ice block in the mold and cause a film of water to flow over the freezing surface so as to remove air and any foreign matter clinging to the freezing surface. When the ice block is built up to the proper size then the spray water is cut off by the stopping of the pump. The stopping of the flow of water preferably occurs when a cubicle block is formed in the mold and in the section of the mold which is surrounded at the sides by the refrigerant. After the water supply has been shut off and the freezing step completed then high temperature and pressure discharge gas, from the compressor of the refrigerating unit, is piped to the liquid inlet of the tube circuits and is used to thaw the ice cubes loose from the molds. The ice cubes when released drop by gravity from the molds onto the bars 44 and slide down the bars and are discharged onto the shelf and then into the receiving receptacle therefor.

By the apparatus above described wherein the ice blocks are gradually formed by freezing a flowing film of water while permitting some of the water to flow over the freezing surface and remove air bubbles and any other foreign matter clinging to the freezing surface, a very clear solid ice cube can be formed. As has already been noted, the particular shape of the ice block is immaterial so far as the freezing method is concerned. It may be cubicle or it may be cylindrical in shape. While the molds are shown as uniform in cross sectional shape it will be understood that the side walls of the mold may gradually taper outwardly from the upper end to the lower end in order to facilitate the discharge of the ice blocks from the molds when loosened therefrom by the heating medium.

It will be understood that many changes may be made in the details of construction of the apparatus without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. An apparatus for forming relatively small clear solid ice blocks comprising a freezing unit including a supporting frame, plates at each side thereof, an insulating material in the chamber between the plates, tubes completely embedded in said insulating material placed side by side and connected at alternate ends, means for circulating a heat transferring medium through said tubes, a series of molds associated with each tube, each mold having one end closed and the other end open, each tube having closely spaced openings shaped to conform to the molds, the side plate adjacent said tube openings having similar openings, said molds being inserted in said openings and welded to said tube with the open ends projecting from the side plate, means for supporting said freezing unit with the open ends of the molds facing downwardly, and spray pipes disposed beneath and spaced from said

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molds having nozzles arranged so as to direct water into each mold.

2. An apparatus for forming relatively small clear solid ice blocks comprising a freezing unit including a supporting frame, plates at each side thereof, an insulating material in the chamber between the plates, tubes completely embedded in said insulating material placed side by side and connected at alternate ends, means for circulating a heat transferring medium through said tubes, a series of molds associated with each tube, each mold having one end closed and the other end open, each tube having closely spaced openings shaped to conform to the molds, the side plate adjacent said tube openings having similar openings, said molds being inserted in said openings and welded to said tube with the open ends projecting from the side plate, means for supporting said freezing unit in an inclined position with the open ends of the molds facing downwardly, spray pipes disposed beneath and spaced from said molds having nozzles arranged to direct water into each mold and an inclined drain board disposed beneath said spray pipes for collecting excess water draining from said molds.

3. An apparatus for forming relatively small clear solid ice blocks comprising a cabinet, a plurality of freezing units arranged one above the other in said cabinet, each freezing unit including a supporting frame, plates at each side thereof, an insulating material in the chamber between the plates, tubes embedded in said insulating material placed side by side and connected at alternate ends, means for circulating a heat transferring medium through the tubes, a series of molds associated with each tube, each mold having one end closed and the other end open, each tube having closely spaced openings shaped to conform to the molds, the side plates adjacent said tube openings having similar openings, said molds being inserted in said openings and joined to said tubes with the open ends projecting from the side plate, a frame within said cabinet on which said freezing units are mounted so as to incline from one side thereof downwardly to the other, spray pipes located beneath the units and having nozzles for directing sprays of water into each mold, a water supply tank, means for directing the water of the tank to the spray pipes to the nozzle, a drain board beneath each freezing unit and devices associated therewith whereby excess water is collected on the drain board and returned to the supply tank, and means associated with each drain board for collecting the ice cubes discharged from the molds.

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4. An apparatus for forming relatively small clear solid ice blocks comprising a freezing unit including a supporting frame, said frame having a backing and sides forming a chamber, an insulating material in the chamber, tubes completely imbedded in said insulating material and arranged in parallel relation to each other, means for circulating a heat transferring medium through the tubes, a series of molds having sides with one end closed and the other end open, each tube having closely spaced openings shaped to conform to the molds, said molds being inserted in the openings and welded to said tubes with their open ends facing outwardly, spray pipes spaced from said molds and disposed relative to the freezing unit so as to direct sprays of water into the open end of each mold.

5. An apparatus for forming relatively small clear solid ice blocks comprising a cabinet, a plurality of freezing units disposed in said cabinet, each freezing unit including a supporting frame having a backing and side walls forming a chamber, insulating material disposed in said chamber, tubes imbedded in said insulating material, said tubes being placed in parallel relation and connected at alternate ends, means for circulating a heat transferring medium through the tubes, a series of molds associated with each tube, each mold having one end closed and the other end open, each tube having closely spaced openings shaped to conform to the molds, said molds being inserted in said openings so that the open end projects from the tube, means for forming a sealed connection between the molds and the tubes, a frame within the cabinet on which the freezing units are mounted, spray pipes having nozzles for directing sprays of water into the open end of each mold, a water supply tank, means for directing water from the tank to the spray pipes, drain board and pipes associated therewith whereby excess water is collected on the drain board and returned to the supply tank, and means associated with each drain board for collecting the ice cubes discharged from the molds.

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