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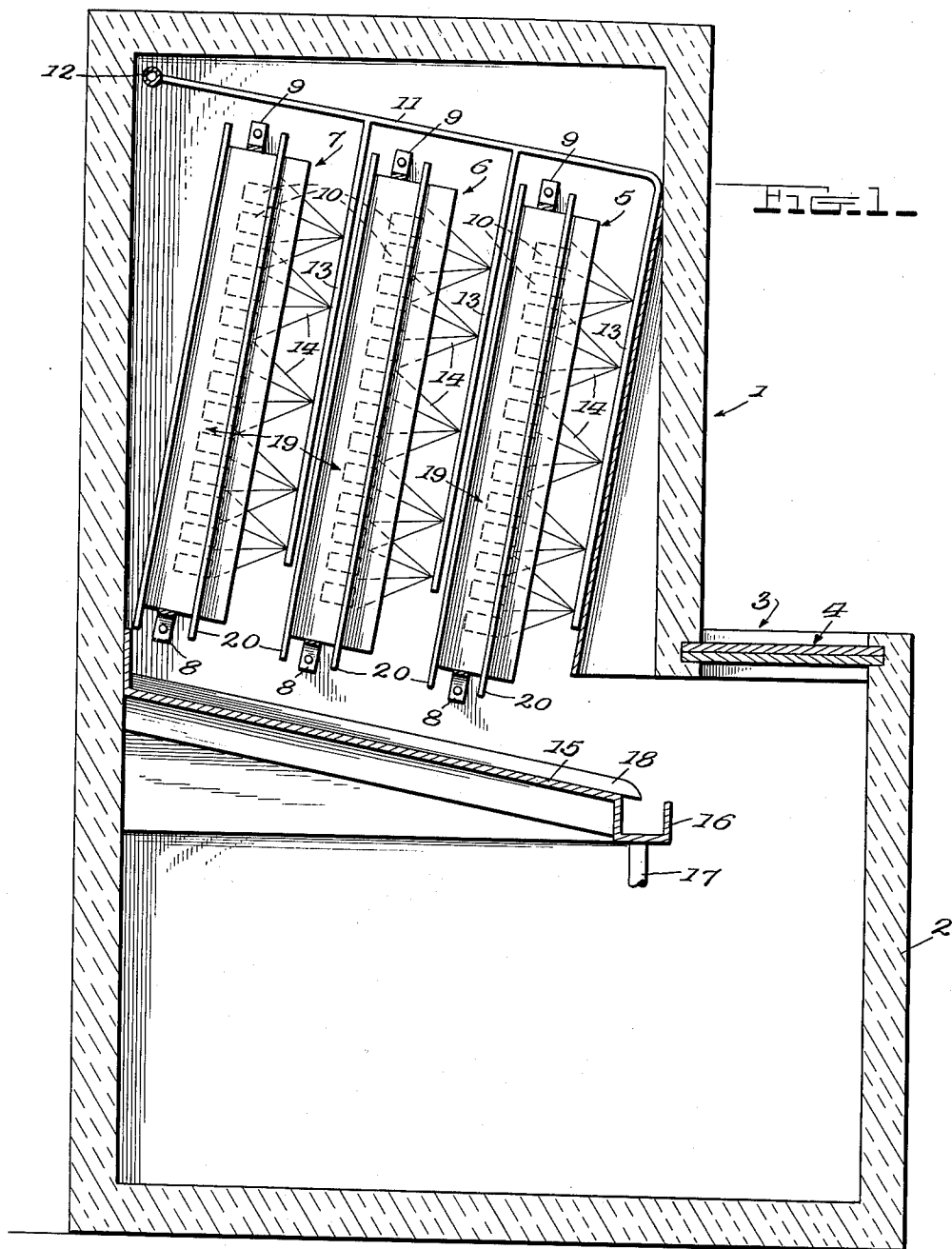
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2,723,536

APPARATUS FOR FORMING ICE CUBES

Filed March 18, 1953

4 Sheets-Sheet 1



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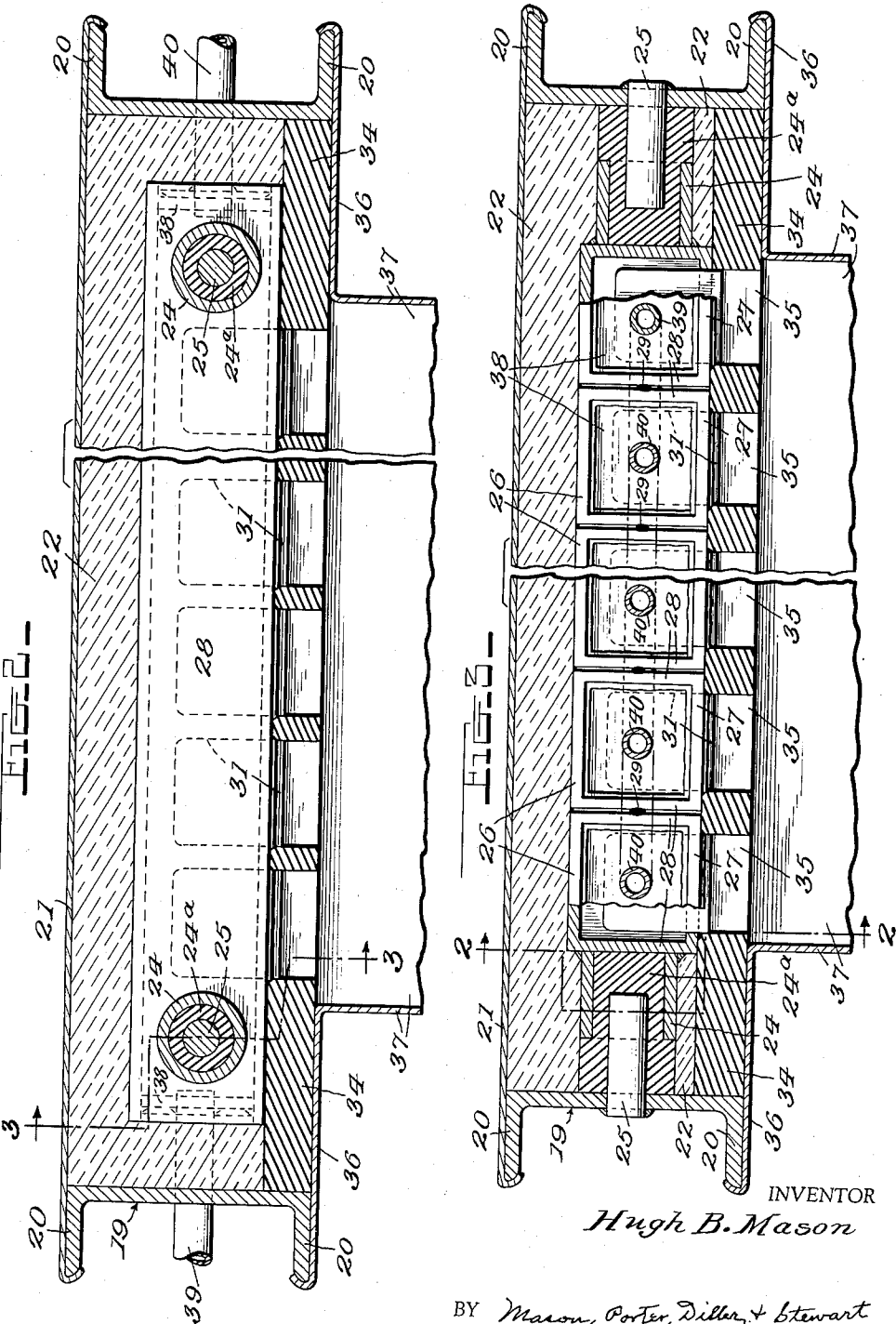
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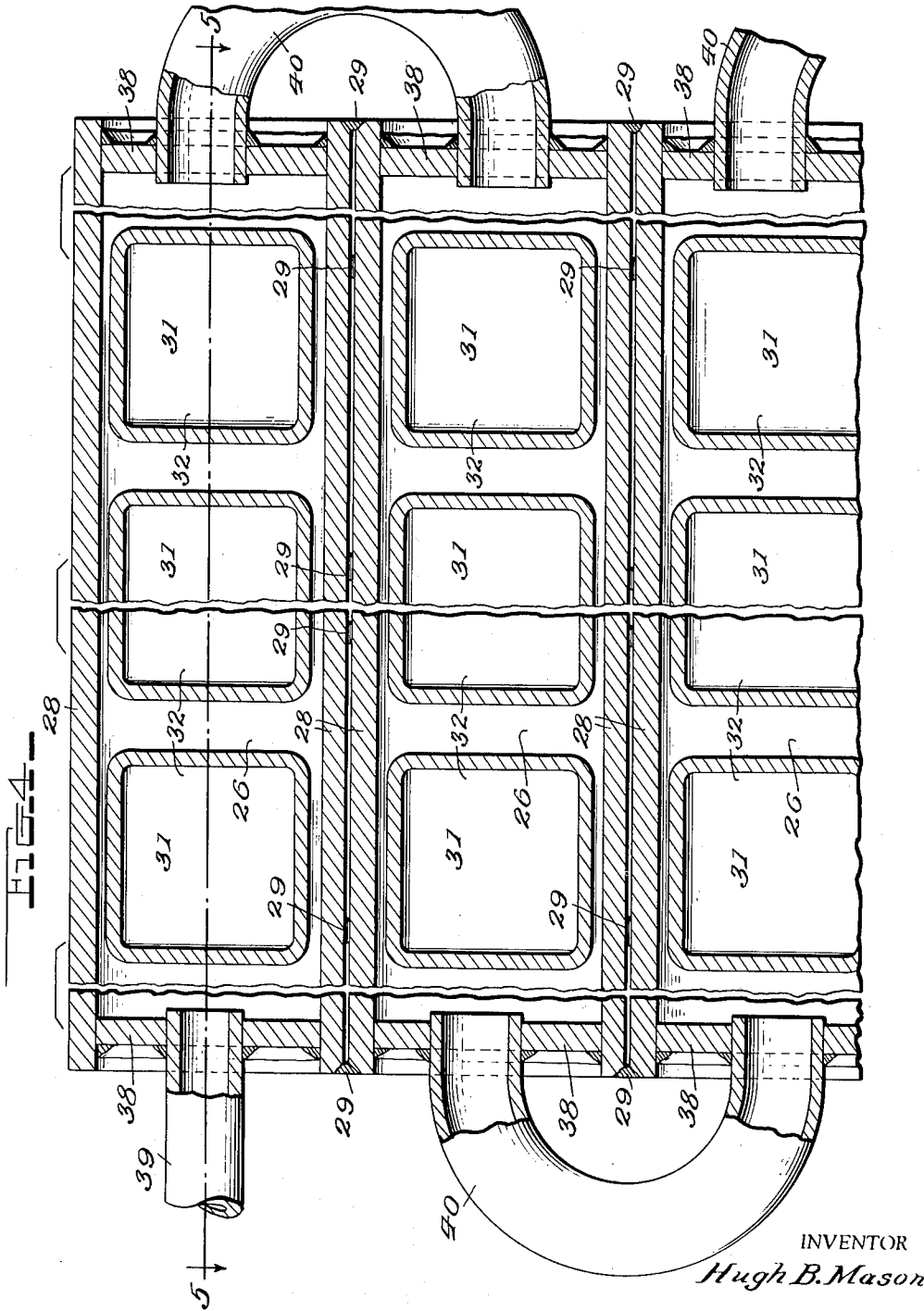
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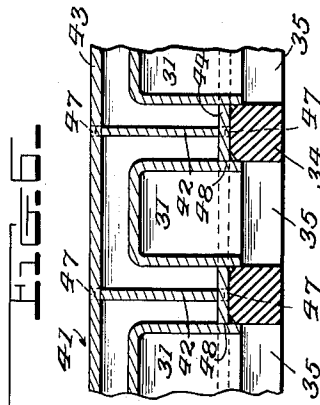
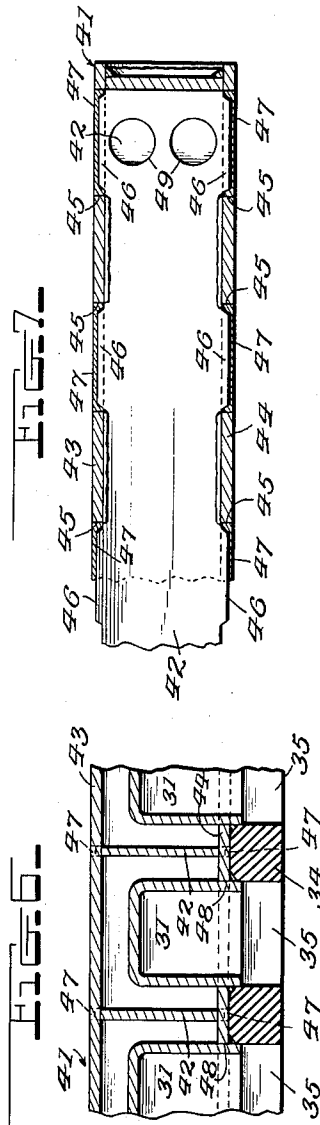
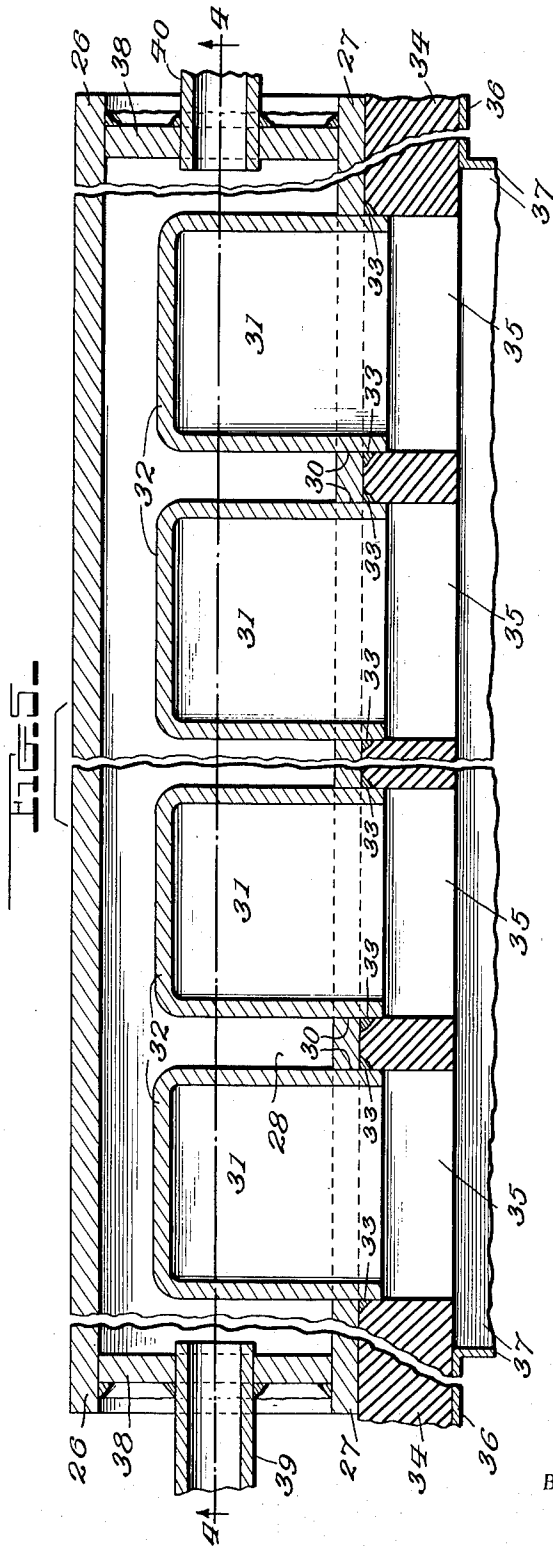
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APPARATUS FOR FORMING ICE CUBES

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4 Sheets-Sheet 4



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## APPARATUS FOR FORMING ICE CUBES

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Application March 18, 1953, Serial No. 343,035

6 Claims. (Cl. 62—107)

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

In my copending application Serial No. 247,156, filed September 18, 1951, now Patent No. 2,677,249 I have shown and described a method of forming small ice blocks and an apparatus for carrying out the method. The freezing units are arranged in a cabinet one above another and each unit includes a series of rows of molds in which the ice blocks are formed. The molds are set in tubes through which the refrigerant circulates and directly contacts the molds. The molds project some distance from the outer face of the tubes and provide sufficient space for insulating material at the open ends of the molds and there is a metal plate covering this insulation.

An object of the present invention is to provide an apparatus wherein the freezing units are placed side by side in a cabinet and extending at a sufficient angle to the vertical to cause the excess freezing liquid to flow from the molds and the ice blocks to slide freely from the molds when completed and released by the substitution of a heating medium circulating through the tubes.

Another object of the invention is to provide a cover for the face side of the freezing units from a material which will not corrode when contacted by the liquid spray and wherein the extent to which the molds project from the tubes is only sufficient to facilitate the welding of the molds to the tubes and wherein the length of the molds may be reduced to substantially the size of the ice blocks being formed.

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

In the drawings:

Figure 1 is a vertical sectional view showing more or less diagrammatically a cabinet containing the improved apparatus.

Figure 2 is a sectional view of a portion of one of the units, said view being taken longitudinally through a freezing unit along one side of a tube, on the line 2—2 of Figure 3.

Figure 3 is a transverse sectional view through one of the freezing units taken on the line 3—3 of Figure 2 and with pipe connections between the tubes omitted.

Figure 4 is an enlarged sectional view through three of the tubes on the line 4—4 of Figure 5 showing the position of the molds therein and the space surrounding the molds through which the refrigerant or heat exchange medium passes.

Figure 5 is an enlarged sectional view extending longitudinally of one of the tubes on the line 5—5 of Figure 4 and showing the manner of positioning and supporting the molds in the tube.

Figure 6 is a view through a portion of one of the freezing units showing a modified form of construction of tubes for supporting the molds.

Figure 7 is an enlarged sectional view taken longitudinally through one of the modified forms of unit.

2

The invention has to do with the forming of relatively small ice blocks which are especially adapted for use in cooling beverages or the like. The blocks may be cubical in shape or they may be cylindrical in shape. For the purpose of illustration they are shown as shaped to form ice cubes.

In the drawings there is a cabinet 1, the walls of which may be of any suitable insulating material. The lower portion of the front wall 2 is extended forwardly to give more space within the lower part of the cabinet and the horizontal wall section 3 is provided with a sliding door 4 which gives access to the lower part of the cabinet. Mounted in the cabinet are three freezing units indicated respectively at 5, 6 and 7. These units are carried by supporting brackets 8 attached to the cabinet and on which the lower ends of the units rest. There are brackets 9 at the upper end which are carried by the cabinet and support the units at the upper ends. These units are inclined at a small angle relative to the vertical. Each freezing unit is provided with molds 10 which will be described more in detail later. A pipe 11 is connected to a header 12 which in turn is connected to a pump. The pump supplies liquid to be frozen to the header and from the header to the pipe 11. There are several of these branch pipes and extending off from the branch pipe 11 are spray pipes 13, 13, 13. These pipes 13 are each provided at spaced intervals with nozzles from which sprays 14 are directed onto the front face of the freezing unit and into the freezing molds. The mold inclines downwardly toward its free end sufficiently to cause the excess spray liquid to drain from the mold onto the drain board 15 and from the drain board into a trough 16 to which a pipe 17 is connected for conveying the liquid from the trough back to the supply tank and from the supply tank liquid passes to the pump. Mounted on this drain board are bars 18. After the ice cubes have been completed, a heating medium is substituted for the refrigerant and this will release the cubes so that they will slide out of the molds by gravity and drop onto these bars, slide down the bars and over the trough into the lower part of the cabinet where they are stored until they are desired for use.

In Figure 2 there is shown a longitudinal section through one of the freezing units, and in Figure 3 a transverse section. The freezing unit includes a frame structure 19 which extends all the way around the unit. The frame structure has outwardly extending flanges 20, 20 which give strength to the frame. A metal plate 21 extends across what might be referred to as the back side of the unit and the edges of the plate are folded about the flange. This plate is preferably formed of galvanized iron. Within the frame 19 next to the plate 21 is an insulating material 22 of any suitable character. Also within the frame is the freezing block which consists of a series of tubes placed side by side and spot welded together. These tubes extend from a point adjacent the surrounding frame 19 at one side of the unit to a point adjacent the other side thereof. Sufficient tubes are provided so as to extend transversely substantially all the way across the freezing unit, leaving only sufficient space between the tubes and the frame structure 19 to provide for supporting devices for the block of tubes and insulating material. The supporting devices for the block of tubes in the freezing unit is shown in Figures 2 and 3. Each device includes a metal sleeve 24 which is welded to the outer tubes of the block near the ends thereof. A block 24a of rubber or neoprene extends into the sleeve and outward therefrom into contact with the frame 19. A metal lug 25 which extends through the frame 19 is welded thereto. This lug extends into the rubber plug and into the sleeve but does not contact with the sleeve. This makes a very rigid support for the freezing block

tubes. Around these rubber plugs and at each side of the block of tubes is insulating material similar to that indicated at 22.

Referring to Figures 4 and 5 where the tubes and associated molds or cells are shown more in detail each tube includes a rear wall 26, a front wall 27 and side walls 28, 28. The adjacent side walls of tubes are placed in contact and are spot welded at intervals as indicated at 29. This holds the tubes together in a solid block. The front wall 27 at closely spaced intervals is provided with openings 30, 30. Fitting in each opening is a mold or cell 31. This mold or cell is drawn from metal and has side walls and a bottom wall 32 which are all formed integral. The mold or cell is opened at the front end thereof. The mold may be square in cross section or it may be circular. Whatever the shaping of the mold may be the opening 30 in the front wall of the tube is shaped to conform to the mold so that the mold fits tightly in the opening and projects only a sufficient distance from the outer face of the tube to permit the mold being welded to the tube to provide a sealed connection between the mold and the tube. The weld is indicated at 33. The tubes are set inwardly from the front face of the frame a sufficient distance so as to provide a space for a sheet 34 of rubber or neoprene. This sheet is preformed and is provided with openings 35 which are shaped to fit around the projecting ends of the molds. This sheet is vulcanized to the front walls 27 of the tubes. The rubber sheet extends all the way to the frame. At the front of the frame is a metal plate 36 which is folded around the flange 20 and extends inwardly to a point adjacent the molds. The sheet then extends outwardly away from the freezing unit as indicated at 37.

This outwardly extending portion 37 of the sheet serves as a guard to confine the spray. As shown in Figures 4 and 5 there is a header 38. This header is inserted in the tube and is welded in place. At one of the outer tubes is a pipe 39 which extends through the header. This pipe is connected to a fluid supply or heat exchange medium. The tubes at alternate ends are connected by a U-shaped pipe 40. For a freezing operation the refrigerant passes into the tube block through the pipe 39 and contacts all sides of the molds including the bottom as it passes along the tube. It passes out of the other end of the tube and into the next adjacent tube and then back through said tube and so on until all of the tubes are subjected to the refrigerant after which it passes out of the block through a tube which leads to the system for cooling the refrigerant. It is to be noted that the molds only project beyond the outer face of the tube sufficiently for welding purposes and practically all of the mold will be directly contacted with by the refrigerant.

The apparatus shown is particularly adapted for freezing water to form ice cubes. It may, however, be used for freezing or congealing other types of liquid such as fruit and vegetable juices and concentrates and beverage syrups with or without water or other liquids added.

When freezing ice blocks the 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. Then a heating medium is substituted for the refrigerant and is used to thaw the ice cubes loose from the molds. The ice cubes then dropped by gravity from the molds onto the bars 13 will slide along the bars and over the edge of the trough into the compartment or suitable receptacles therefor in the bottom of the cabinet.

The advantage of the rubber or neoprene sheet is that it is impervious to the liquid and may be placed substantially in front of the molds with openings leading to

the mold. This enables the greater portion of the mold to extend into the tube where it is contacted by the refrigerant. Furthermore, the ice cube when completed substantially fills the mold.

In Figures 6 and 7 there is shown a modified form of freezing block. In the form of the invention illustrated in Figures 6 and 7 there is a frame 41 consisting of side members and end members which are welded together at the corners. Extending from one end to the other of this frame at spaced intervals are partitions 42. Extending across the entire frame is a back plate 43. Also extending across the entire frame is a front plate 44. These plates are slotted as indicated at 45 in Figure 7, and the partition is provided with keys 46 which extend into the slots and the keys are welded to the back and front plates as indicated at 47. The front plate 44 has a series of openings 48 and the molds or cells 31 are shaped to conform to these openings and project through the openings only to a sufficient extent to permit the welding of the cell to the plate. Between the front and back plates and the partitions is a tubular conduit through which the refrigerant or heat exchanging medium passes.

Vulcanized to the front wall 44 of the block is a sheet of rubber or neoprene 34 having openings 35 as described above.

Pipes pass through the end walls of the frame and permit a refrigerant to be directed into the tubular members and from one member to another through holes 49, 49 formed in the partitions at opposite ends thereof.

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

I claim:

1. An apparatus for forming ice blocks comprising a series of freezing units each including a rectangular supporting frame, a plate attached to and closing the back of the frame, a freezing block disposed in said frame and spaced away from the frame and the back plate, insulating material filling said space, said freezing block having a series of connected tubular channels through which a refrigerant is circulated, each tubular channel having front, rear and side walls, the front wall having spaced openings therein, a series of individual molds each having integral sides and bottom walls with the front end open, said molds being disposed in said channels and with the open end of the molds projecting through the openings in the front wall and welded to said front wall, and a sheet of impervious insulating material secured to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

2. An apparatus for forming ice blocks comprising a series of freezing units each including a rectangular supporting frame, a plate attached to and closing the back of the frame, a series of tubes placed side by side and welded together to form a freezing block, said block being disposed in said frame and spaced away from the frame and back plate, insulating material filling said space, said tubes being connected so that a refrigerant can be circulated through the tubes, each tube having front, rear and side walls, the front wall having spaced openings therein, a series of individual molds each having integral sides and bottom walls with the front end open, said molds being disposed in said tubes with the open end of the molds projecting through the openings in the front wall and welded to said front wall and a sheet of impervious insulating material secured to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

3. An apparatus for forming ice blocks comprising

5

a series of freezing units each including a rectangular supporting frame, a plate attached to and closing the back of the frame, a freezing block disposed in said frame and spaced away from the frame and the back plate, insulating material filling said space, said freezing block having a series of connected tubular channels through which a refrigerant is circulated, each channel having front, rear and side walls, the front wall having spaced openings therein, a series of molds each having integral sides and bottom walls with the front end open, said molds being disposed in said tubes with the open ends projecting through the openings in the front wall thereof and welded to said front wall and a sheet of rubber vulcanized to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

4. An apparatus for forming ice blocks comprising a series of freezing units each including a rectangular supporting frame, a plate attached to and closing the back of the frame, a series of tubes placed side by side and welded together to form a freezing block, said block being disposed in said frame and spaced away from the frame and back plate, insulating material filling said space, said tubes being connected so that a refrigerant can be circulated through the tubes, each tube having front, rear and side walls, the front wall having spaced openings therein a series of molds each having integral sides and bottom walls with the front end open, said molds being disposed in said tubes with the open ends thereof projecting through the openings in the tubes and a sheet of rubber vulcanized to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

5. An apparatus for forming ice blocks comprising a cabinet, a plurality of freezing units arranged in said cabinet side by side and at a sufficient angle to the vertical to permit excess liquid sprayed into the molds of the freezing unit to drain therefrom, each unit including a rectangular supporting frame, a plate attached to and closing the back of the frame, a freezing block disposed in said frame and spaced away from the frame and the back plate, insulating material filling said space, said freezing

6

block having a series of connected tubular channels through which a refrigerant is circulated, each channel having a front, rear and side wall, the front wall having spaced openings therein, a series of individual molds each having integral sides and bottom walls with the front end open, said molds being disposed in said tubular channels with the open ends thereof projecting through said openings in the front wall and welded to said front wall, and a sheet of impervious insulating material secured to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

6. An apparatus for forming ice blocks comprising a cabinet, a plurality of freezing units arranged in said cabinet side by side and at a sufficient angle to the vertical to permit excess liquid sprayed into the molds of the freezing unit to drain therefrom, each unit including a rectangular supporting frame, a plate attached to and closing the back of the frame, a series of tubes placed side by side and welded together to form a freezing block, said block being disposed in said frame and spaced away from the frame and back plate, insulating material filling said space, said tubes being connected so that a refrigerant can be circulated through the tubes, each tube having a front, rear and side wall, the front wall having spaced openings therein, a series of individual molds each having integral sides and bottom walls with the front end open, said molds being disposed in said tubes with the open ends thereof projecting through the openings in the front wall of the tubes and welded thereto, and a sheet of rubber vulcanized to the front side of said ice forming block, said sheet being disposed within said frame and closing the front side thereof, said sheet having openings conforming to the open ends of the molds whereby the liquid to be frozen may be sprayed into the open ends of said molds.

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