Feb. 23, 1954 L. J. NAUROTH 2,669,852

REFRIGERATING APPARATUS FOR PRODUCING FROZEN CONFECTIONS

Filed July 27, 1951

2 Sheets-Sheet 1

Fig. 1

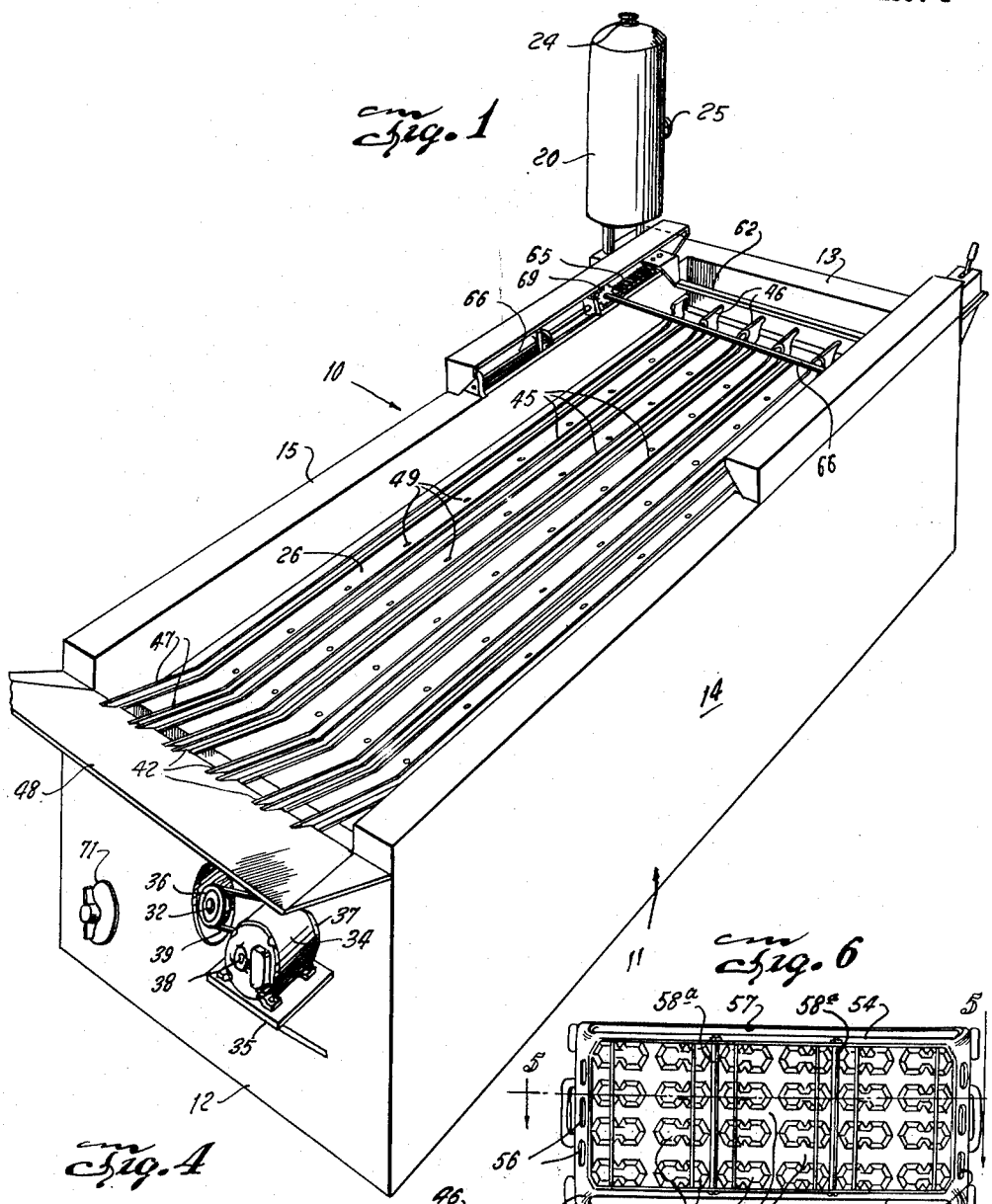
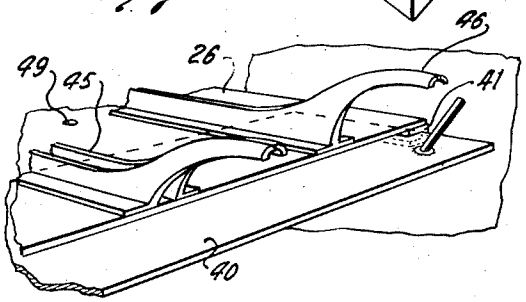


Fig. 6

Fig. 4



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2 Sheets-Sheet 2

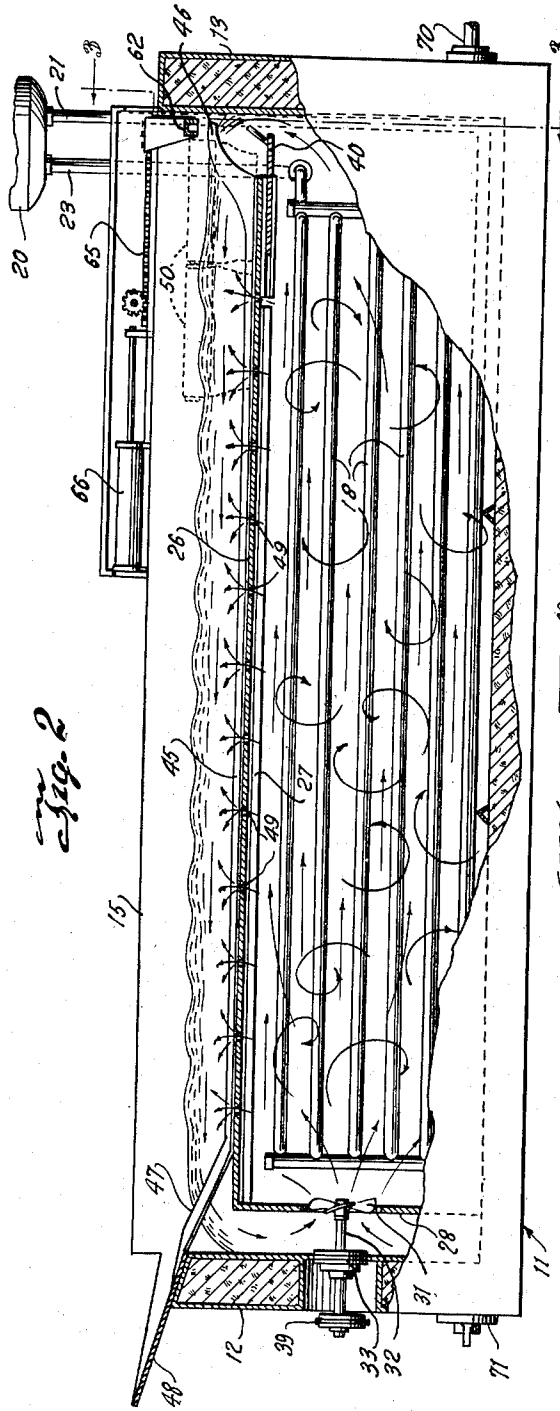


Fig. 2

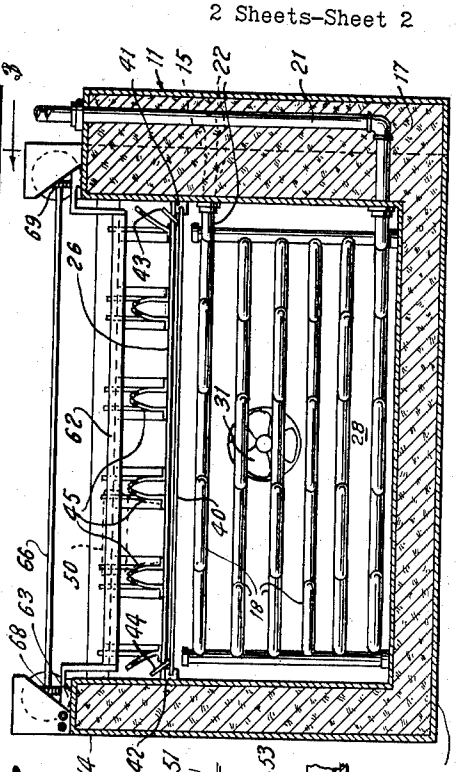


Fig. 3

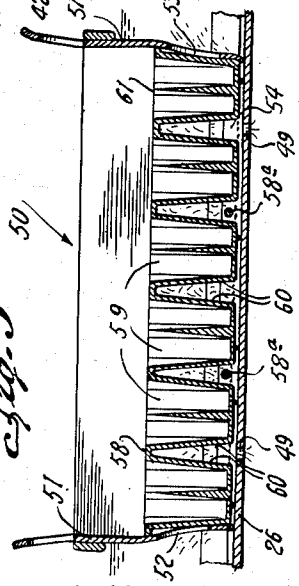


Fig. 5

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REFRIGERATING APPARATUS FOR PRODUCING FROZEN CONFECTIONS

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Application July 27, 1951, Serial No. 238,867

4 Claims. (Cl. 62—114)

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This invention relates to refrigerating apparatus and more particularly to a refrigerating apparatus for cooling or freezing liquids contained in molds.

In many applications it is desirable to cool or freeze a liquid contained in a mold. For example, stick confections are frozen in molds and the refrigerating apparatus for cooling such molds and freezing the liquid contained in the molds must be capable of cooling rapidly and simultaneously a plurality of molds. The apparatus must be capable of continuous operation so that as molds whose contents are frozen are removed from one end of the apparatus, molds containing liquid may be inserted in the opposite end of the apparatus. In order that a maximum rate of production be obtained, the cooling liquid in which the molds are usually immersed must be thoroughly circulated around the molds as they are moved through the apparatus to absorb heat of the molds and their contents.

Accordingly, it is an object of the invention to provide a new and improved refrigerating apparatus.

It is another object of the invention to provide a new and improved refrigerating apparatus for cooling molds to freeze the contents thereof.

It is still another object of the invention to provide a new and improved refrigerating apparatus for cooling molds with a refrigerant liquid in which the molds are immersed.

It is a further object of the invention to provide a new and improved refrigerating apparatus wherein a refrigerating liquid is circulated about molds whose contents are to be cooled or frozen.

It is a still further object of the invention to provide a new and improved refrigerating apparatus provided with means for thoroughly circulating a refrigerating liquid about molds immersed in the liquid.

Briefly stated, the new and improved refrigerating apparatus for cooling molds immersed in a refrigerating liquid includes an elongate rectangular heat insulated cabinet in which are disposed the cooling coils of a conventional refrigerating system. A horizontal deck extends over the cooling coils between the inner side walls of the cabinet. The opposite sides of the deck abut the inner side walls of the cabinet but the opposite ends of the deck are spaced from the adjacent inner ends of the cabinet. A vertical partition extends from one end of the deck to the bottom of the cabinet and is provided with a pump for circulating a refrigerating liquid

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from one end of the cabinet beneath the deck and over the cooling coils. The deck is provided with a plurality of spaced longitudinal guide rails which serve to guide molds along the surface of the deck and maintain the molds in alignment thereon. The deck is provided with a plurality of rows of longitudinally spaced apertures, each row being located between a pair of adjacent guide rails in order that refrigerating liquid driven by the pump will be forced upwardly through the apertures against the molds as the molds pass over the deck from one end thereof to the other. A valve or gate is slidably and adjustably mounted underneath the deck to vary the opening between one end of the deck and the adjacent interior end wall of the cabinet to regulate the rate of flow of the refrigerating liquid through the apertures in the deck.

For a better understanding of the invention reference may be had to the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the drawing,

Figure 1 is a perspective view of a refrigerating apparatus for cooling or freezing liquids contained in molds;

Figure 2 is a side view, with portions of the apparatus broken away, of the apparatus shown in Figure 1 illustrating the circulation of the refrigerating liquid in the cabinet;

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

Figure 4 is a fragmentary perspective view of the valve or gate for controlling the rate of flow of the refrigerating liquid through the apertures in the deck;

Figure 5 is a longitudinal sectional view, taken along the line 5—5 of Figure 6, of a mold on the deck of the refrigerating appartus; and,

Figure 6 is a bottom plan view of a mold.

Referring now to the drawing, the refrigerating apparatus 10 includes an elongate rectangular insulated tank 11 having end walls 12 and 13, side walls 14 and 15, and a bottom 16. All walls are of double construction and filled with a heat insulating material 17. A plurality of cooling coils 18 are mounted in the cabinet in any conventional manner and a liquified refrigerant gas is admitted to the cooling coils through header 19 which is connected to a conventional surge drum 20 through a pipe 21. The gas leaves the cooling coils through a header 22 which is connected to the surge drum through a pipe 23. The surge drum is connected in the conventional

manner to a compressor, not shown, and has a fitting 24 which is connected to the suction line of the compressor and a fitting 25 which is connected to the liquid return line of the compressor. Since the operation of the refrigerating system which supplies a liquified refrigerant gas, such as ammonia, to the header 19 and exhausts the gas from the header 22 is conventional and well known, it will not be described in detail.

A horizontal support or deck 26 is secured to the side walls of the tank in any conventional manner as by an angle iron 27 mounted on each side wall 14 and 15 by welding or other conventional means. The angle iron 27 mounted on the wall 15 can be seen in Figure 2. The deck 26 is shorter in length than the inner length of the tank 11, its opposite ends being spaced from the end walls 12 and 13. A vertical end partition 28 is secured to the end of the deck adjacent the end wall and extends downwardly to the bottom 16 of the tank 11. The vertical partition 28 also extends from one side wall of the tank to the other so that liquid from the space 29 between the end wall 12 and the partition can flow to the cooling coils beneath the deck only through an aperture 30 provided in the partition. A pump or propeller 31 is disposed in the aperture 30 and is mounted on a shaft 32 which extends through a stuffing box 33 mounted on the end wall 12. The stuffing box forms a liquid tight seal between the end wall 12 and the shaft. The shaft 32 is rotated by an electric motor 34 mounted on a bracket 35 secured to the end wall 12 in any conventional manner. The pulleys 36 and 37 on the shaft 32 and the shaft 38 of the motor, respectively, are connected by the belt 39 so that rotation of the motor shaft 38 causes rotation of the shaft 32 and the propeller 31. The propeller 31 causes the refrigerating liquid in the tank to circulate with considerable turbulence both below and above the deck in the manner indicated by the arrows and which has been found to promote a more rapid and efficient refrigeration.

A valve or gate 40 is secured to the end of the deck 26 opposite the partition 28 by means of channels 41 and 42 secured to the underside of the deck by welding. The ends of the gate slide in the channels so that the gate may be adjusted to vary the opening between the gate and the end wall 13 for a purpose to be described below. The gate may be provided with upwardly projecting handles 43 and 44.

A plurality of spaced guide rails 45 extend longitudinally on the top surface of the deck 26 and are secured to it by welding or other conventional means. The guide rails in effect form a plurality of longitudinal channels. The ends of the guide rails adjacent the wall 13 terminate in upwardly extending ends 46 which facilitate the loading of molds between each pair of guide rails. The opposite ends of the guide rails have upwardly inclined portions 47 which rest on the drain pan 48 mounted on the end wall 12. It will be apparent that molds resting between and on each pair of adjacent guide rails may be easily pulled or pushed up the inclined portions 47 to the drain pan 48.

The deck 26 is provided with a plurality of longitudinal rows of spaced apertures 49, each row of apertures being aligned between adjacent guide rails 45 of the deck. The apertures 49 facilitate the circulation of the refrigerant liquid, usually brine, contained in the tank about the

undersides of the mold assemblies 50 which are positioned between each pair of guide rails and moved from the end wall 13 along the guide rails to the drain pan 48. Each mold assembly includes a rectangular mold frame or carrier 51 having downwardly and inwardly tapered end walls 52 and 53, and inwardly tapered side walls 54 and 55. The end walls are provided with a plurality of apertures 56 while the side walls are provided with slots 57. The apertures 56 and slots 57 are provided to allow a free circulation of the refrigerating fluid about the undersides of the mold 58 which is seated in the carrier or frame 51. The side walls 54 and 55 and transverse members 58a are provided to prevent outward spreading of the side walls. The mold has a plurality of cups 59 in which individual stick confections may be frozen. The walls 60 of adjacent cups 59 converge upwardly leaving vertical spaces 61 between individual cups through which the refrigerating liquid may circulate to cool all sides of each cup.

It will now be apparent that as each mold travels over the apertures 49 between a pair of guide rails, the refrigerating liquid expelled upwardly through the apertures 49 will flow into the spaces 61 between the cups 59 and will convey heat away from the cups and the liquid contained therein. A certain proportion of the refrigerating liquid will also flow up through the aperture between the gate 40 and the end wall 13 of the tank and then over the deck 26 and between the spaced rows of molds between the guide rails. Some of this refrigerating liquid will also, of course, flow through the spaces 61 between the cups 59 of individual molds. The provision of the rows of apertures 49, however, greatly increases the circulation of the refrigerating fluid about the individual cups 59 of the molds so that the liquid in the cups is very quickly chilled and frozen. The rate of production of the stick confection by the refrigerating apparatus is substantially increased by the provision of the apertures 49 in the deck since the period of time each mold must remain in the refrigerating apparatus is reduced appreciably.

The tank 11 may be provided with a conventional mold pusher 62 whose opposite ends 63 and 64 are connected to gear racks 65, one of which can be seen in Figures 1 and 2. The gear racks are actuated by a pneumatic or hydraulic ram assembly 66 and are longitudinally slidable on the side walls 15 and 14 of the tank 11. A transverse rod 67 rotatably mounted on the side walls is provided with gears 68 and 69 which mesh with the gear racks 63 and 64, respectively to insure that the pusher 62 will be moved perpendicularly with respect to the side walls. The pusher and the pneumatic or hydraulic drive therefore being conventional and well known in the art, they are not decribed in detail.

In use, the tank 11 is filled with a refrigerating liquid such as brine through the inlet 70 in the end wall 13 until the liquid covers the deck 26 to a depth of three or four inches. The refrigerating system connected to the cooling coils 18 is then started, the liquid refrigerant gas is evaporating and expanding in the cooling coils absorbing heat from the refrigerant liquid thus cooling the liquid well below 0° centrigrade. The motor 34 drives the propeller 31 causing the refrigerant liquid to circulate through the aperture 30 in the partition 28, over the cooling coils 18 and up through the apertures 49 in the deck 26 as well as between the gate 40 and the end wall 13. The

rate of flow of liquid propelled through the apertures 49 is controlled by adjusting the position of the gate 40 with respect to the end wall 13. The closer the gate 40 is placed to the end wall 13, the greater will be the rate of flow of the liquid through the apertures 49.

A transverse row of molds 50, one between each pair of guide rails, is then placed on the deck 26 adjacent the end wall 13. The pusher 62 is then moved by the pneumatic or hydraulic assembly 66 to push the mold one length toward the end wall 13. The pusher is then returned to its original position. A second transverse row of molds is placed on the deck 26 between the first row and the end wall 13, the pusher is again actuated to push both rows of molds forward one length and so on until the deck 26 is covered with rows of molds. During the movement of the molds toward the end wall 12, the refrigerant liquid flows over the deck 26 between the longitudinal rows of molds which are spaced by the guide rails 45. The flow of the refrigerant liquid coming up between the gate 40 and the end wall 13 and over the deck 26 would not be sufficient to provide proper thorough circulation between the wall 60 of the individual cups 59 of the molds being restricted somewhat by the frame or carrier 51 of each mold and in addition tending to flow only in a longitudinal direction through the spaces 61 between the cups. The flow of refrigerant liquid through apertures 49, however, causes a sufficient circulation of liquid between the cups not only in a longitudinal direction but also in transverse directions with respect to the molds. This more complete and thorough circulation of the cold refrigerant liquid quickly removes heat from the molds and the liquid in the cups freezes. When the fluid in the cups of the row nearest the end wall is frozen, the pusher is again actuated and the first transverse row of molds moves up the inclined portions 47 of the guide rails and can then be pulled up on the drain 48 and removed from the apparatus. Another transverse row of molds is then placed adjacent the wall 13. The freezing process then becomes continuous, a transverse row of molds on the inclined portion 47 of the guide rails being removed as another transverse row is placed on the deck adjacent the wall 13.

The brine may be drained from the tank through a drain outlet 71 in the end wall 12.

It will be seen now that a refrigerating apparatus has been provided in which a refrigerating liquid is circulated over a deck 26 on which rows of molds are positioned to quickly cool the molds. It will also be seen that the deck is provided with apertures through which the refrigerant liquid is expelled against the underside of the molds to promote more thorough circulation of the liquid about the molds and hasten the freezing of liquid contained in the molds.

The refrigerant liquid is circulated over the deck in the same direction as the movement of the mold in order to avoid the formation of excessive amounts of foam, but because of the turbulence created in the brine more rapid freezing of the confection is attained.

If desired, the partition 28 may be dispensed with and vertically driving pump or propeller could be installed adjacent the end wall 12. The horizontally driving pump or propeller 28 is preferred since it does not tend to produce foaming of the refrigerating liquid.

It will be apparent to those skilled in the art that various changes and modifications can be made without departing from the invention and it is intended therefore in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A confection refrigerating apparatus comprising a tank adapted to contain a refrigerant liquid and having insulated side and end walls; a perforate deck disposed under the surface of the liquid in said tank and spaced at its ends from the end walls of said tank to form liquid circulating passageways at both ends of the deck; means disposed in the tank below the deck for cooling said refrigerant liquid, a vertical partition depending into said tank from one end of said deck between said refrigerant cooling means and one end of said tank to define one of said passageways, said vertical partition having an opening therein, a series of transversely spaced guides disposed longitudinally on the deck for progressively receiving articles to undergo heat exchange; and means in the opening of said vertical partition for circulating the refrigerant liquid from above the deck through one of said passageways below the deck and upwardly through the other of said passageways and the perforations of said deck to above said deck and into contact with the undersides of the articles on said guides.

2. A refrigerating apparatus comprising an elongate open topped tank adapted to contain a refrigerant liquid and having insulated side and end walls; an elongate perforate deck disposed longitudinally in said tank and having its ends spaced from said end walls to form liquid circulating passageways at both ends of the deck; a vertical partition defining the passageway at one end of said deck, said partition having an opening therein; means disposed in the tank below the deck for cooling said refrigerant liquid, a plurality of transversely spaced guides disposed longitudinally on the deck from end to end thereof for slidably receiving articles for freezing; means operable in the opening of said vertical partition for circulating the refrigerant liquid from above the deck through said opening to below the deck and upwardly through the passageway at the opposite end of said deck and upwardly through the perforation in said deck into contact with the undersides of said articles; and means for adjustably varying the passageway opposite said vertical partition to vary the rate of flow of said refrigerant liquid through said apertures.

3. A refrigerating apparatus comprising a tank adapted to contain a refrigerant liquid and having insulated side and end walls; a perforate deck disposed in said tank from side to side thereof and having its ends spaced from the ends of said tank forming at one end of said deck an upward passageway for liquid refrigerant, a vertical partition at the opposite end of said deck having an opening therein and defining an upward passageway through which the liquid refrigerant is circulated by way of said opening over and under said deck and upwardly through said upward passageway and through the perforations in said deck, means disposed in the tank below the deck for cooling said refrigerant liquid; elongate transversely spaced guides disposed longitudinally on the deck for progressively receiving articles to undergo heat exchange; means in the opening of said vertical partition for circulating the refrigerant liquid through said passageways and said deck perfora-

tions and into contact with the undersides of said articles; and means for adjustably varying said upward passageway to vary the rate of flow of said refrigerant liquid through the perforations of said deck.

4. A confection refrigerating apparatus comprising an elongate tank containing a refrigerant liquid; a longitudinal horizontal deck disposed within the upper portion of the tank under the liquid level therein and having a plurality of longitudinally spaced perforations, a series of longitudinal channels on said deck adapted to slidably receive containers for the confection to be refrigerated, said deck being spaced at one end from an end of said tank to define a downward passage for liquid and spaced at its opposite end from the opposite end of said tank to define an upward passage for said liquid; means operable in the opening of said partition for circulating said refrigerant liquid in the tank below and above said deck through said downward and upward liquid passages and the perforations of said deck and along said channels in intimate contact with confection containers supported thereon, a plurality of cooling coils within the cabinet below said deck; and means for varying said upward liquid passage to adjust the rate of flow of said refrigerant liquid through the perforations of said deck.

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