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REFRIGERATION APPARATUS

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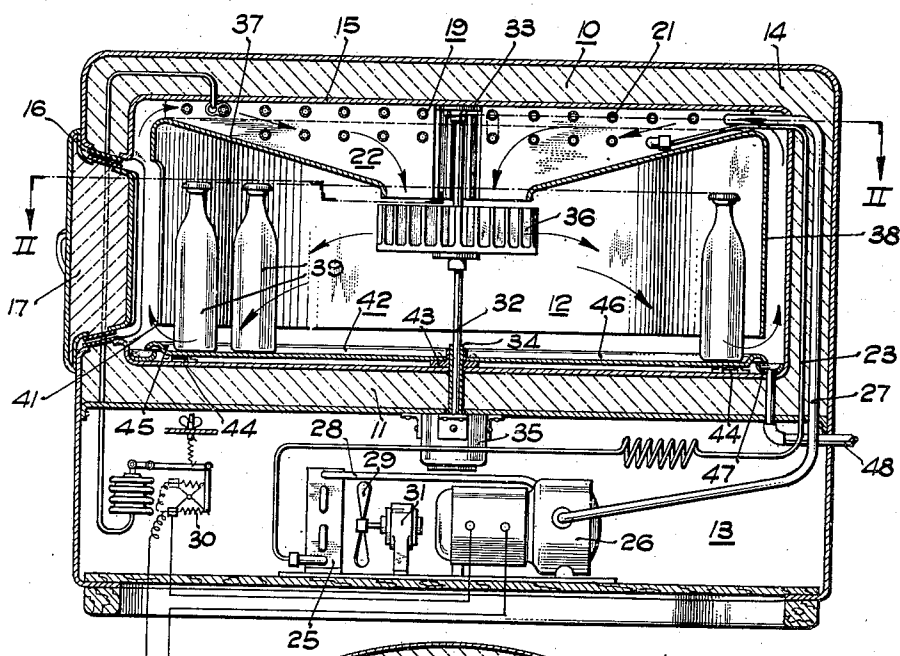


FIG. 1.

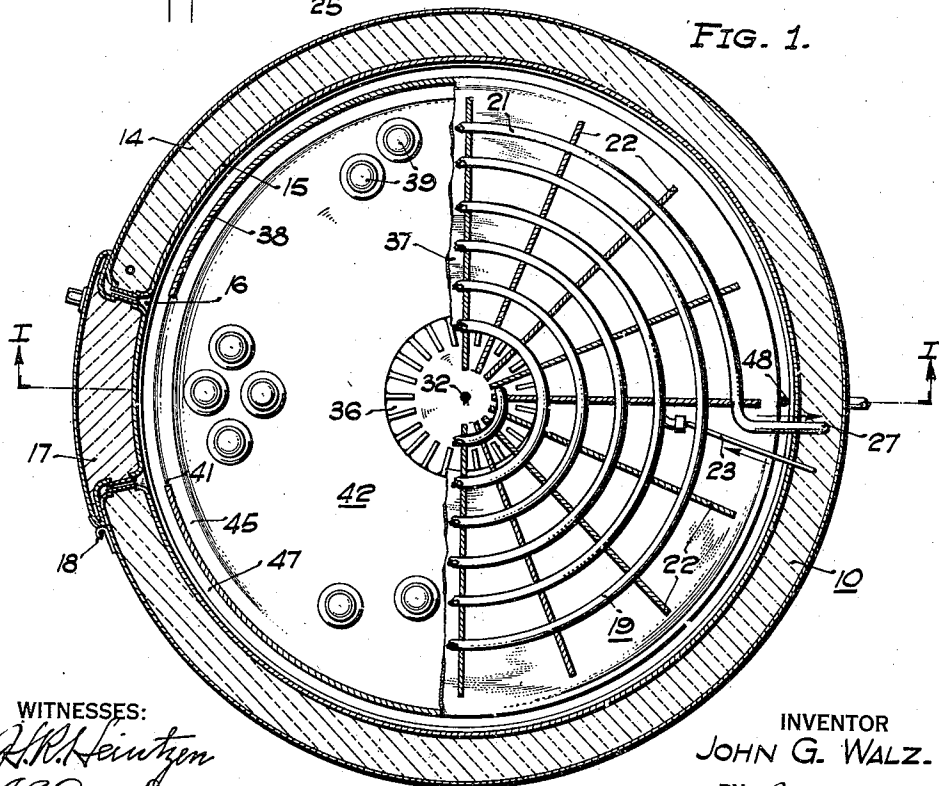


FIG. 2.

WITNESSES:

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REFRIGERATION APPARATUS

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9 Claims. (Cl. 62-104)

This invention relates to refrigerating apparatus, and more particularly to apparatus adapted to cool articles which are to be dispensed at frequent intervals.

One object of the invention is to provide a refrigerator in which the articles to be cooled are progressively carried therethrough.

Another object of the invention is to provide a refrigerator for cooling articles by passing a chilled current of air containing a chilled spray of liquid over the articles.

A further object is to provide a refrigerator for spraying the articles to be refrigerated with a chilled liquid and thereafter evaporate the liquid from the articles to cool the same.

Another object of the invention is to provide an improved bottled beverage cooler and particularly to provide for adequate cooling at times of heavy load with a refrigerating mechanism that is of sufficient capacity to handle only average loads.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a vertical section of the apparatus of this invention taken on the line I—I of Fig. 2; and,

Fig. 2 is a horizontal section of the apparatus taken on the line II—II of Fig. 1.

Referring specifically to the drawing for a detailed description of the invention, the reference numeral 10 represents a circular cabinet having a horizontal partition 11 therein to divide the cabinet into an upper storage chamber 12 and a lower machine compartment 13. The storage chamber 12 is lined with insulating material 14 and provided with an inner metallic lining 15. The side of the chamber 12 is provided with an entrance opening 16 and a door 17 therefor adapted to spring horizontally on hinges 18.

A cooling unit 19 is provided in the upper portion of the insulated chamber 12 and comprises a spirally wound tube 21 and radial fins 22 on said tube 21. The upper edges of the fins 22 are welded or otherwise secured to the upper wall of the inner liner and the fins 22 support the tube 21. The cooling unit 19 is preferably of the evaporative type and is supplied with liquid refrigerant through the capillary tube 23 from the refrigerant condensing machinery located in the lower compartment 13.

The refrigerant condensing machinery comprises a condenser 25 and a motor driven re-

frigerant pump (not shown) in a sealed casing 26. The refrigerant pump withdraws the evaporated refrigerant from the cooling unit 19 through a suction tube 27, compresses it, and conducts the compressed refrigerant through the tube 28 to the condenser 25. A fan 29 driven by a motor 31 circulates air through the condenser 25 and passes it over the sealed casing 26 to cool the same. The temperature of the refrigerator may be regulated by a control 30 actuated by the temperature of the tube 21, as is well known in the art.

A vertical shaft 32 in the center of the cabinet is journaled in an upper bearing 33 and a lower bearing 34. The lower bearing 34 extends through the bottom wall 11 of the refrigerated chamber 12 to a motor 35 secured to the lower surface of this wall, which motor drives the shaft 32. A centrifugal fan 36 is secured on the shaft 32 below the cooling unit 19 and a conical shroud 37 is positioned below the cooling unit 19 and above the fan 36 to guide the air circulated by the fan 36 through the cooling unit 19. The shroud 37 is welded or otherwise secured to the lower edges of the fins 22 and drains the condensate dripping from the cooling unit 19 onto the fan 36, which sprays the condensate through the storage chamber 12. An outer rim portion 38 of the shroud 37 is carried downwardly and is spaced from the side walls of the chamber and terminates at a distance above the bottom wall of the chamber to provide an air circulating path which commences at the fan 36, passes radially outward through the storage chamber 12, downwardly beneath the outer edges of the shroud 37, then upwardly through the space between the outer rim portion 38 of the shroud 37 and the side wall of the chamber 12 and then through the cooling unit 19 to the fan 36. The rim portion has an opening 41 adjacent the door opening 16.

The refrigerator, as thus far described, operates as follows: As air in the storage chamber 12 is drawn through the cooling unit 19, some of the air is ordinarily chilled below its dew point and moisture is condensed on the cooling unit. The moisture condensed will drip from the cooling unit 19 and run down the conical portion of the shroud 37 to the fan 36, which sprays it over the bottles 39 or other articles stored in the chamber 12. The bottles 39 will normally be at a higher temperature than either the air or the water, so that the moisture adhering to the bottles 39 will be warmed and will then again evaporate in the stream of air and be redeposited

on the cooling unit 19. The bottles 39 in the chamber 12 are therefore cooled in three distinct ways, first, by the cold air blown over them, secondly, by the cold water sprayed over them, and thirdly, by the evaporation of the water on the bottles. This materially reduces the time of cooling warm bottles over that of a cooler wherein cold air alone is circulated.

The orderly cooling of the articles in the storage chamber is facilitated by a rotatable platform 42 adjacent the bottom of the chamber 12 which platform 42 is secured at its center to a ring-shaped bearing 43 journaled on a projecting portion of the bearing 34 so that the platform 42 rotates thereupon. The platform 42 is further supported at its edges by rollers 44 affixed to the bottom of the chamber 12. The outer edge 45 of the rotating platform 42 is beaded upwardly to define a shallow storage basin 46 for water which may drip from the bottles 39. Excessive amounts of water overflow the storage basin 46 over the beaded edge 45 and flow into a circular trough 47 below the edge 45 of the rotating platform 42 and out of the cabinet 10 through a drain pipe 48. The water in the shallow basin 46 replenishes the water vapor in the storage chamber 12 of the refrigerator when its vapor content becomes too low.

In the operation of the refrigerator, the bottles 39 which are to be chilled are inserted through the opening 16 and placed on the adjacent portion of the platform 42. The platform 42 is then rotated slightly and additional bottles 39 are inserted and this procedure repeated until the entire platform 42 is loaded with bottles. When the refrigerated bottles 39 are to be dispensed, they are withdrawn through the opening 16, warm bottles put in their place and the platform 42 rotated slightly to bring a new supply of cold bottles adjacent the opening 16 for the next dispensation.

The refrigerator may be operated to provide an ice booster effect during peak loads of short duration. To secure this effect, the control 30 is set to operate the cooling unit 19 at a temperature low enough to freeze the condensate on the cooling unit 19 into ice during light and normal loads. The water in the storage basin 46 will provide sufficient water vapor for this purpose. During peak loads, such as when large numbers of warm bottles are inserted in the storage chamber at one time, the temperature of the chamber 12 will rise, some or all of the ice on the cooling unit 19 will melt and the melted ice water will be sprayed on the bottles 39. Some of this water will again be reevaporated, as previously described, and the remainder will drain into the storage basin 46.

It will be apparent from the above that this invention provides a refrigerator for cooling articles progressively. The apparatus is further adapted to chill articles rapidly by means of the combined action of a chilled current of air, of a chilled spray of water, and by the evaporation of the water sprayed thereon. It is also adapted to provide auxiliary refrigeration during peak loads by the melting of ice formed during less than peak loads.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior

art or as are specifically set forth in the appended claims. The refrigerator is adapted to cool articles not affected by the water sprayed thereupon, such as bottles, as well as articles which are affected by the water, such as fresh fruits and vegetables.

What I claim is:

1. In a refrigerator, the combination of an insulated chamber providing a storage space for the articles to be refrigerated, a cooling unit in said chamber, and a motor driven fan for circulating the air of said chamber through said cooling unit and over said articles, said fan also being adapted to spray moisture condensing on said cooling unit over said articles.

2. In a refrigerator, the combination of an insulated chamber providing a storage space for the articles to be refrigerated, a cooling unit in said chamber, a motor driven fan at a level below said cooling unit, and a shroud for conducting the condensate formed on the cooling unit to the fan, said fan being arranged to circulate the air in said chamber through the cooling unit and over the articles to be refrigerated and to spray the moisture conducted to it by the shroud over said articles.

3. In a refrigerator, the combination of an insulated chamber providing a storage space for articles to be refrigerated, a cooling unit in said chamber, a motor-driven fan at a level below said cooling unit, a shroud for conducting the condensate formed on the cooling unit to the fan, and a water storage pan in said chamber, said fan being arranged to circulate the air in said chamber through the cooling unit and over the articles to be refrigerated and to spray the moisture conducted to it by the shroud over such articles, said pan being in position to collect the excess moisture.

4. In a refrigerator, the combination of an insulated chamber providing a storage space for articles to be refrigerated, a cooling unit in said chamber adapted to condense moisture from the air in said chamber, to freeze said moisture during light and normal loads, and to permit said frozen moisture to melt during heavy loads, a motor-driven fan at a level below said cooling unit, a shroud for conducting moisture dripping from the cooling unit to the fan, and a water storage pan in said chamber, said fan being arranged to circulate the air in said chamber through the cooling unit and over the articles to be refrigerated and to spray the moisture conducted to it by the shroud over such articles, said pan being in position to collect the excess moisture.

5. In a refrigerator, the combination of an insulated chamber providing a storage space for the articles refrigerated, a cooling unit in the top of said chamber, a centrifugal fan revolving on a substantially vertical axis and located below said cooling unit and substantially centrally in said chamber, a motor for driving said fan, and a shroud for guiding air and condensate from said cooling unit to said fan, said fan being arranged to blow said air and condensate substantially radially through said chamber and across the articles stored therein, the condensate on the articles evaporating in said air to additionally cool said articles.

6. In a refrigerator, the combination of a circular insulated chamber providing a storage space for the articles to be refrigerated, a cooling unit in the upper portion of said chamber, a fan below said cooling unit, a shroud for con-

ducting the condensate of said cooling unit to said fan, a rotatable platform in said chamber for supporting the articles to be refrigerated, an access opening in the side wall of said chamber, and a door for said opening, said rotatable platform being arranged to convey articles stored thereon adjacent said access opening, said fan being arranged to circulate the air of said chamber through the cooling unit and across the articles to be refrigerated and to spray the condensate of said cooling unit over said articles.

7. In refrigerating apparatus, the combination of a cabinet including a storage chamber adapted to contain articles to be cooled, means for affording access to the interior of said chamber from the outside thereof, mechanism including a cooling element in said chamber for abstracting heat from air circulating therein, a device for controlling the operation of said mechanism, and means for forcibly circulating the air in said chamber over the cooling unit and said articles, the setting of said device being so correlated with the capacity of the cooling unit that the normal operation thereof will cause water vapor in the air circulated in said cabinet to freeze on the cooling element during light-load periods and melt during heavy-load periods and means for directing the meltage from said cooling element into the air of said cabinet before the forcible circulation of the mixture of the air and meltage over said articles occurs.

8. In refrigerating apparatus, the combination of a cabinet including a storage chamber adapted to contain articles to be cooled, means for

affording access to the interior of said chamber from the outside thereof, mechanism including a cooling element in said chamber for abstracting heat from air circulating therein, a device for controlling the operation of said mechanism, and means for forcibly circulating the air in said chamber over the cooling unit and said articles, the setting of said device being so correlated with the capacity of the cooling unit that the normal operation thereof will cause water vapor in the air circulated in said cabinet to freeze on the cooling element during light-load periods and melt during heavy-load periods and means for directing the meltage from said cooling element into the air stream flowing over said articles.

9. In refrigerating apparatus, the combination of a cabinet including a storage chamber adapted to contain articles to be cooled, means for affording access to the interior of said chamber from the outside thereof, mechanism including a cooling element in said chamber for abstracting heat from air circulating therein, a device for controlling the operation of said mechanism, the setting of said device being so correlated with the capacity of the cooling unit that the normal operation thereof will cause water vapor in the air circulated in said cabinet to freeze on the cooling element during light-load periods and melt during heavy-load periods and means for forcibly circulating air over the cooling unit and said articles and for directing the meltage from said cooling element over said articles.

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