Aug. 3, 1954 R. WAGNER 2,685,177

CONGELATING LIQUIDS

Filed Aug. 15, 1950

3 Sheets-Sheet 1

FIG. 1

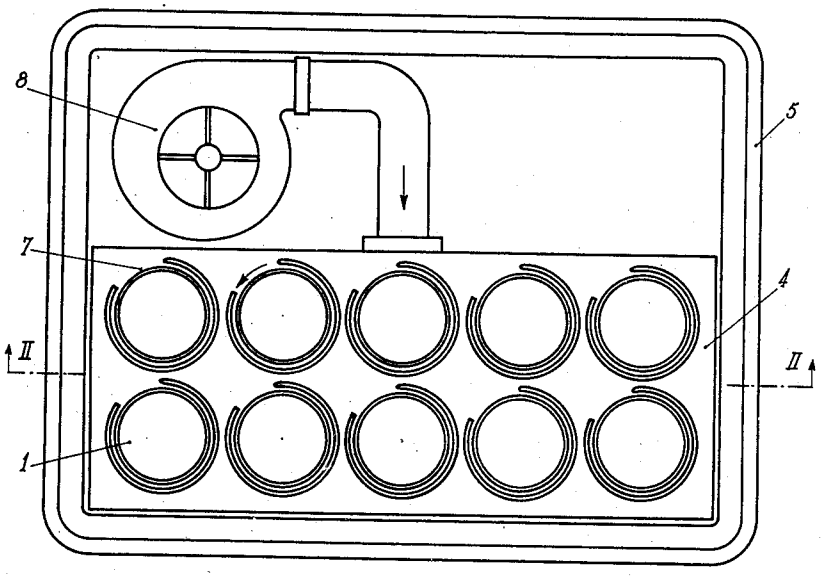
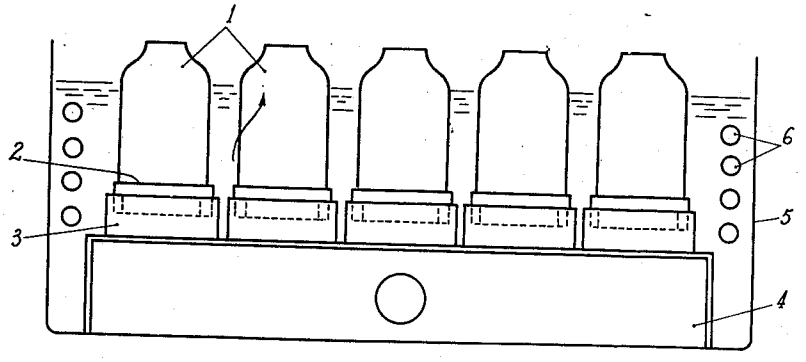


FIG. 2



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FIG. 4

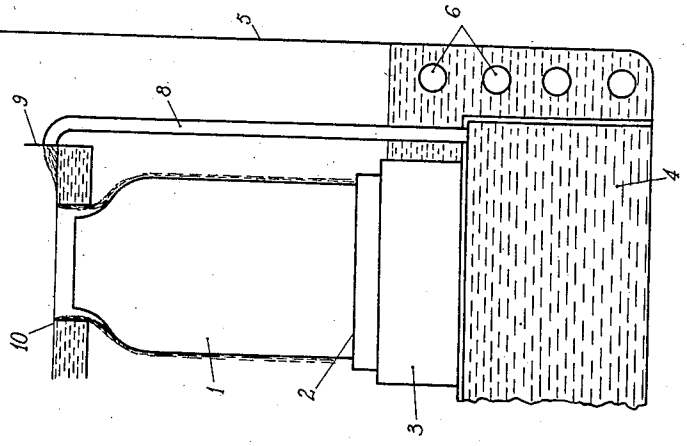
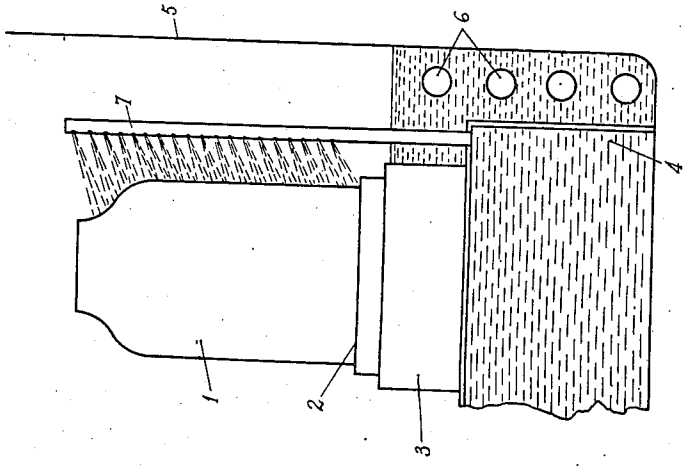


FIG. 3



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FIG. 5

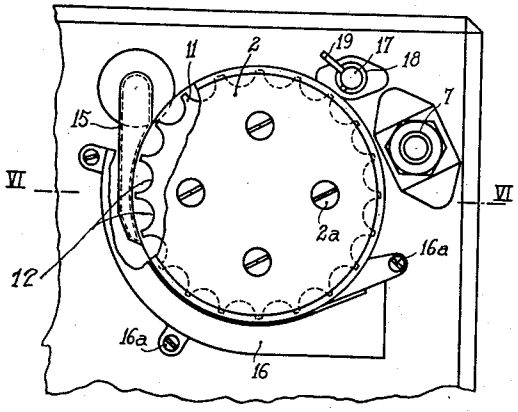


FIG. 6

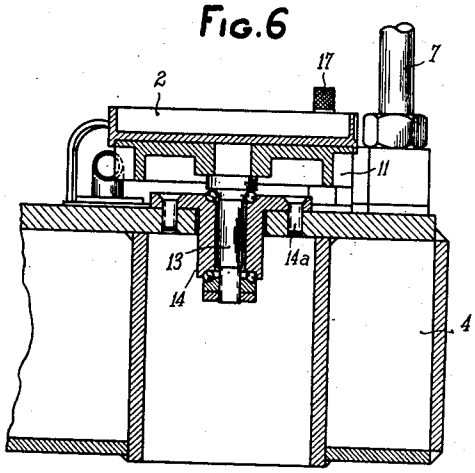
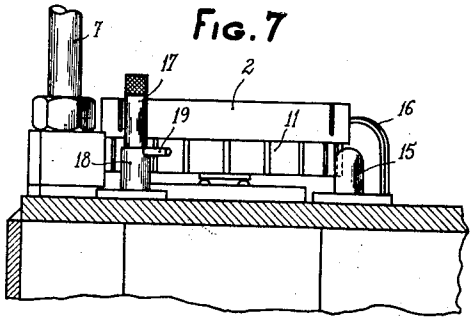


FIG. 7



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UNITED STATES PATENT OFFICE

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CONGELATING LIQUIDS

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Application August 15, 1950, Serial No. 179,495

Claims priority, application France November 24, 1949

1 Claim. (Cl. 62—114)

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This invention relates to liquid congelating or freezing processes, and more particularly to an improved method of congelating liquids, especially physiological fluids, in the form of a thin film coating the walls of a container.

It is known how to freeze a liquid in the form of a thin film coating the wall surface of the container in which the liquid is placed, by imparting a fast movement of rotation to the container about its axis, while cooling the container externally by means of a suitable cooling medium. Heretofore the container was driven in rotation by a suitable mechanical drive.

It is an object of this invention to provide a method and means for congelating a liquid into a thin frozen film coating the walls of a container, which are simpler and more efficient in that no additional mechanical drive is required to impart rotation to the container.

Another object is to provide such method and apparatus in which the pressure of the external cooling medium is utilized to impart the required rotation to the containers.

The invention will now be described as embodied in a few specific but not restrictive forms of apparatus construction, illustrated in the accompanying drawings wherein:

Fig. 1 is a plan view of one form of apparatus embodying the invention.

Fig. 2 is a vertical section on line II—II of Fig. 1.

Fig. 3 is a fragmentary vertical section of another embodiment.

Fig. 4 relates to a modification of the embodiment of Fig. 3.

Fig. 5 is a plan view of a turbine usable in any of the foregoing embodiments shown in greater detail.

Fig. 6 is a transverse section on line VI—VI of Fig 5, and

Fig. 7 is a section on a plane at right angles to Fig. 6.

The invention will be described for illustrative purposes as applied to the freezing of blood plasma. The plasma is contained in a number of jars 1 each placed on the top of a rotary disc 2. Each disc 2 is connected for rotation with the rotor of a small turbine or Pelton wheel, having a stator indicated in external outline at 3 in the drawings. A suitable form of turbine is described in greater detail hereinafter. The stators 3 of the respective turbines are mounted on a false bottom which defines a bottom chamber 4 near the base of a common tank or container 5.

The tank 5 contains a body of cooling fluid, such as alcohol, and is provided with a cooling

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coil 6 through which a suitable refrigerating fluid is caused to expand to generate cold adapted to cool the said cooling fluid. As shown in Fig. 1 the alcohol is contained in the tank 5 up to a level somewhat below the necks of the jars.

As shown in Fig. 1, the false bottom 4 extends over part only of the horizontal area of the tank 5, so as to provide in the tank a free space outside the chamber 4; immersed in the alcohol in this free space is a centrifugal pump 8 disposed with its axis vertical and driven for example from an electric motor (not shown). The pump 8 draws in alcohol directly from the tank 5 and delivers it under pressure into the chamber 4 whence the alcohol flows into the turbine intakes to actuate the rotors thereof. The alcohol is discharged out of the turbine stators at 7 tangentially to the jars and cools the external surfaces of said jars. Effective heat transfer is obtained because of the residual velocity of the cooling fluid.

As shown in Figs. 3 and 4, the cooling fluid in the tank 5 only reaches a level somewhat beneath the bottom of the jars 1, rather than submerging said jars almost completely as in Figs. 1 and 2. The cooling effect in either of the embodiments of Figs. 3 and 4 is obtained by causing the fluid to flow over the walls of the jars on its way into the tank. Thus, in Fig. 3, there is a vertical tube 7 adjacent to each of the jars 1 mounted on top of the compartment 4 and communicating with the bottom chamber or compartment. The tubes 7 are sealed at their top ends and are formed with perforations spaced over their vertical length through which the cooling liquid is sprayed on to the outer surface of the related revolving jar 1.

In the modification of Fig. 4, the arrangement comprises an upper tray 9 suitably mounted in the tank and having its bottom formed with apertures corresponding in position and size to the necks of the jars 1 to allow said necks to project upwardly therethrough as shown. The top of each aperture provides an overflow weir 10. A riser tube 8 connects the chamber 4 with the upper tray or container 9, and the cooling liquid flowing up said tubes fills the tray 9 and then flows over the sides of the apertures therein in the form of a cooling sheet of liquid over the sides of each of the revolving jars 1.

The advantage of the embodiments just described in connection with Figs. 3 and 4 is that the power requirements for the pump are considerably reduced since the rotation of the jars is no longer retarded by the presence of the sur-

rounding cooling medium, as in the construction of Figs. 1 and 2. Heat exchange is improved because of reduced entrainment of the cooling liquid in the rotation of the jars.

Figs. 5 and 7 illustrate in greater detail one suitable construction of a turbine of the Pelton wheel type usable in the aforedescribed apparatus according to the invention.

Referring to Figs. 5 to 7, each Pelton wheel comprises a disc 11 in the periphery of which are formed spaced semi-circular notches 12 providing buckets. The disc 11 is provided with a depending central journal 13 (Fig. 6) mounted for rotation in ball bearings in a bushing 14 extending through the top wall of the compartment 4 and resting on said top wall through a flange secured to said top by screws 14*a* or the like. Secured to the top of the rotor 11 with screws 2*a* is the previously-mentioned disc 2 on which the related revolving jar 1 is mounted.

The freezing liquid is discharged under pressure from out of the chamber 4 through the nozzle 15 the outlet of which extends laterally adjacent to the periphery of the rotor 11 over an angular extent corresponding to a suitable number of the notches therein. A deflector member 16 secured to the top of the chamber 4 with screws 16*a* surrounds part of the periphery of the rotor 11 from the opening of the nozzle 15 to a point considerably therebeyond, its function being to guide the exhaust flow of the fluid. The remainder of the periphery of the rotor wheel 11 is left uncovered. Adjacent to a suitable point of this uncovered section, the top of the chamber 4 is provided with a latch member in the form of a vertical rod 17 mounted for rotation in a fixed bushing 18 and having a radially extending finger 19 projecting therefrom (Figs. 5 and 7). The finger rides in a cutout or recess formed in the top of the bushing 18 over part of the circumference thereof. In the position shown in Fig. 5, the latching finger 19 is spaced from the rotor wheel 11. If the rod is rotated counterclockwise to its opposite end position, the finger will engage a notch of the rotor wheel 11 and block it. This latching action is useful particularly when desired to put the jars 1 in place on, and remove them from, the mounting discs 2.

It will of course be understood that the invention is not restricted to the specific details of embodiment illustrated and described, and that many variations may be made therein. As the cooling liquid, alcohol may of course be replaced by any other suitable liquids having a low freezing point.

What I claim is:

An apparatus for congealing liquids in the form of a film on the inner periphery of a rotating vessel which vessel is submitted to the external action of a refrigerating fluid, comprising at least one fluid actuated rotary engine the rotor of which supports a rotating vessel, a tank containing the refrigerating fluid, pumping means for drawing in said fluid at a predeterminated pressure, means for supplying the compressed fluid to said engine, outlet means for the same fluid from the engine to said tank in which the level of said refrigerating fluid is maintained below the bottom of the vessel, and sprinkling means consisting of a tray, the bottom of which is formed with apertures corresponding in position and size to the neck of the vessel, the top of each aperture providing an overflow weir, and compressed refrigerating fluid supplying means for said tray.

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