March 19, 1935. H. A. M. GRASSO 1,994,948

ROTARY COOLING DRUM

Filed March 18, 1931

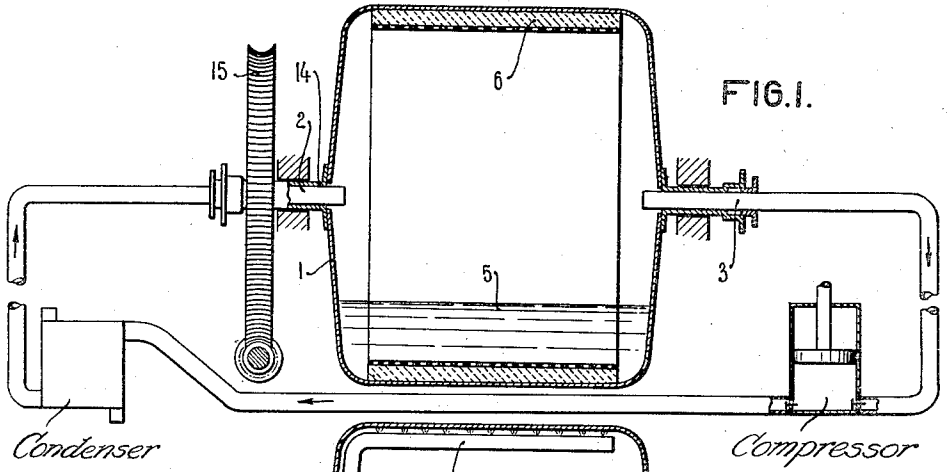


FIG.1.

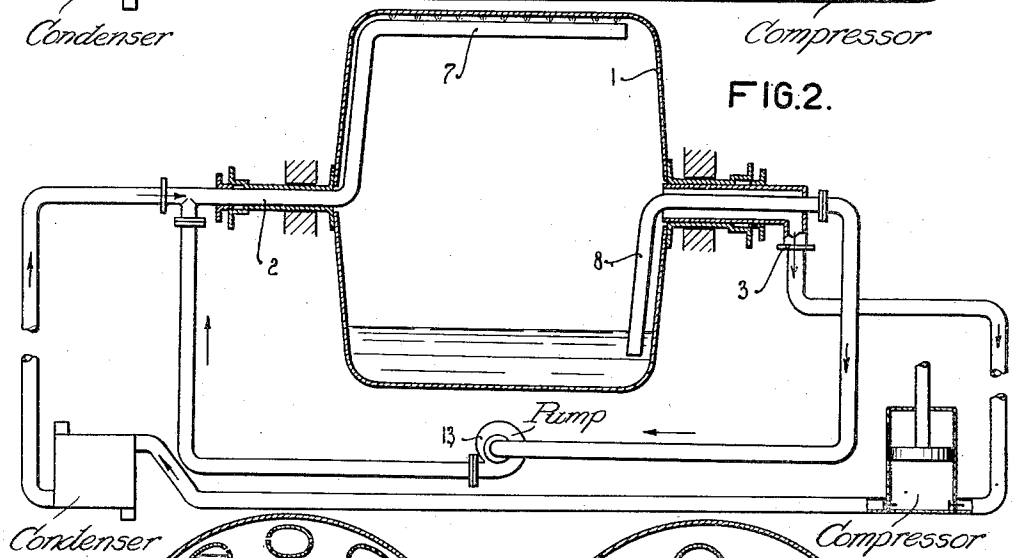


FIG.2.

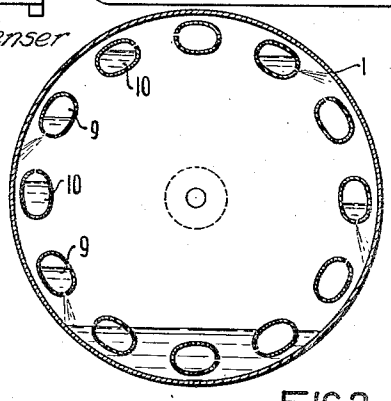


FIG.3

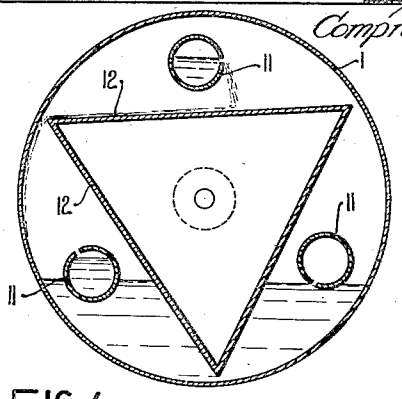


FIG.4.

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ROTARY COOLING DRUM

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5 Claims. (Cl. 62—114)

Rotary cooling drums consisting of a double walled cylinder are customary in the margarine industry. A liquid cooling agent is introduced through a tube through the hollow shaft on one side. Within the drum this tube branches into a plurality of tubes arranged in star formation and terminating at their outer ends in the space between the two cylindrical walls at one end of the drum. The cooling medium thus introduced into this space travels axially towards the other end and abstracts considerable heat from the fat which is in a thin layer on the drum and leaves the drum, wholly or for the greater part in the form of vapour, through the hollow shaft at the other end. The cooling action on the drum can be increased or reduced by controlling the speed of supply of the cooling medium.

A drum of this nature is of comparatively complex construction and is in consequence expensive; in view of the extreme excess pressure the inner wall of the drum must be very strongly constructed; the various points of soldering or welding can give rise to leaks and are difficult of access for repair.

According to the invention the above mentioned disadvantages are overcome in that the drum is constructed with a single wall so that the entire interior of the drum is available for the cooling medium which is partly liquid and partly in the form of vapour. The liquid cooling medium collects in the bottom of the rotary drum, the wall of which continuously carries a thin layer of the liquid upwardly. Whether or not this thin layer is entirely or partially vaporized before a new layer of the medium is taken up depends upon the temperature of the cooling medium, the speed of rotation of the drum and the quantity of heat which is to be absorbed. The drum is preferably rotated by means of a toothed wheel secured to the hollow shaft surrounding the supply pipe for the cooling liquid.

If the layer is completely vaporized then no appreciable cooling action would be exerted by the portion of the drum which had become dry on the inner surface. This defect can be obviated by filling the drum to a sufficient degree. If the liquid level rises above the hollow shaft then the tube for the discharge of the vapour which is disposed within the hollow shaft can be extended within the drum and bent upwardly in such manner that its end is above the surface of the liquid. The vapour from the cooling medium can then be led off without difficulty.

For the purpose of economy in cooling medium the interior of the drum may be coated with a suitable material such as metal gauze or a corresponding porous material which takes up the cooling liquid and readily permits the passage of the vapour. In this way a larger quantity of the cooling medium can be applied to the wall of the drum. Further the tube through which the cooling liquid is introduced through the hollow shaft may, according to the invention, be given such a form within the drum that it passes along the upper side of the drum closely adjacent the wall and is provided with apertures through which the cooling liquid can be sprayed against the wall. The arrangement may be such that the liquid flows over the wall along one or both sides. For the purpose of increasing the cooling action the liquid cooling medium may be pumped out of the drum and again supplied to the drum through a similar tube. The drum may also be provided with scoop devices and if desired with suitable guide members which raise the cooling liquid and during the rotation of the drum gradually transfer it to the walls.

Certain embodiments of the invention are shown by way of example in the accompanying drawing.

Figs. 1 and 2 show longitudinal sections through cooling drums according to the invention and Figs. 3 and 4 show transverse sections through modified forms of such drums.

The cooling liquid is supplied to the cooling drum 1 (Fig. 1) through a pipe 2 which is disposed in the hollow shaft 14 and is sealed by a stuffing box. To said shaft 14 is secured a gear wheel 15 for driving the drum. The vapour from the cooling medium is led off at the other side through a pipe 3 disposed in similar manner, the drum being filled with liquid up to approximately the level 5.

The inner surface of the drum is coated with a layer 6 consisting preferably of a good heat conductor and serving to increase the effective inner surface.

In the construction according to Fig. 2 the supply pipe is extended within the drum and bent upwardly so that a portion 7 thereof extends along the wall of the drum. The outer side of this portion is provided with narrow apertures and the pipe is closed at its end. The supply pipe may be of a branched construction and be provided with two or more limbs such as 7.

For the purpose of increasing the cooling action the cooling medium may be circulated by means of a pump 13 in that it is drawn out of the drum through a pipe 8 and returned to the

drum through a pipe 7 either alone or mixed with cooling liquid from the compressor. The vapour from the cooling liquid is in this case drawn off through a pipe 3 which surrounds the pipe 8 and is conveyed to the refrigerator for compression and liquefaction. In this way a very effective cooling can be effected.

In the embodiments shown in Figs. 3 and 4 scoop devices are provided on the interior of the drum. In Fig. 3 these members are in the form of tubular members of oval cross section provided with a plurality of rows of narrow apertures disposed in such manner that the members 9 discharge during their upward motion the liquid which they have taken up whereas the liquid from the members 10 is discharged against the wall of the drum during the downward motion. To permit of the passage of the vapour during filling and emptying the tubular members must also be provided with the narrow apertures requisite for this purpose. In the construction shown in Fig. 4 the tubular members 11 co-operate with the guide surfaces 12 which receive the liquid which pours out of the tubular members 11 and direct it against the wall of the drum.

What I claim is:—

1. Cooling apparatus for liquids having a low solidifying point, comprising a slowly rotatable single-walled cooling drum serving as an evaporator in the circuit of a cooling agent and having an additional liquid pump the suction pipe of which opens into the drum near the bottom thereof and the supply pipe of which partly extends along the upper side of the drum, and which is closed at its end and is provided with apertures facing said side.

2. In a cooling apparatus for liquids having a low solidifying point and including a compressor and a condenser, a slowly rotatable, single-walled cooling drum serving as an evaporator in the circuit of a cooling agent, and an additional liquid pump having a suction pipe opening into the drum near the bottom thereof and a supply pipe extending at least partly along the upper side of the drum and which is closed at its end and is provided with apertures facing the upper side of the drum, the said supply pipe opening into the main supply pipe for the liquid cooling agent from the condenser.

3. Cooling apparatus for liquids having a low solidifying point, comprising a slowly rotatable single-walled cooling drum acting as an evaporator in the circuit of a cooling agent, and scoop members adapted to raise the liquid cooling agent and to gradually discharge it against the wall of the drum said scoop members being constrained to rotate with the drum and are so arranged that the liquid discharged thereby flows down over the inner wall of the drum.

4. Cooling apparatus for liquids having a low solidifying point, comprising a slowly rotatable single-walled cooling drum acting as an evaporator in the circuit of a cooling agent, scoop members adapted to raise the liquid cooling agent and to gradually discharge it against the wall of the drum, and guide walls adapted to receive the liquid cooling agent discharged by said scoop members and to direct it against the wall of the drum so as to flow down over the inner wall of the drum.

5. Cooling apparatus for liquids having a low solidifying point, comprising a slowly rotatable, single-walled cooling drum serving as an evaporator in the circuit of a cooling agent, and means for raising the liquid cooling agent above the refrigerant level within the evaporator and for discharging it directly upon the inner wall thereof, to cool and solidify the liquid, said means being so disposed that the cooling liquid raised thereby flows down over the said inner wall of the drum.

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