

March 11, 1941.

O. JURASEK
REFRIGERATOR

2,234,306

Filed Dec. 3, 1938

2 Sheets-Sheet 1

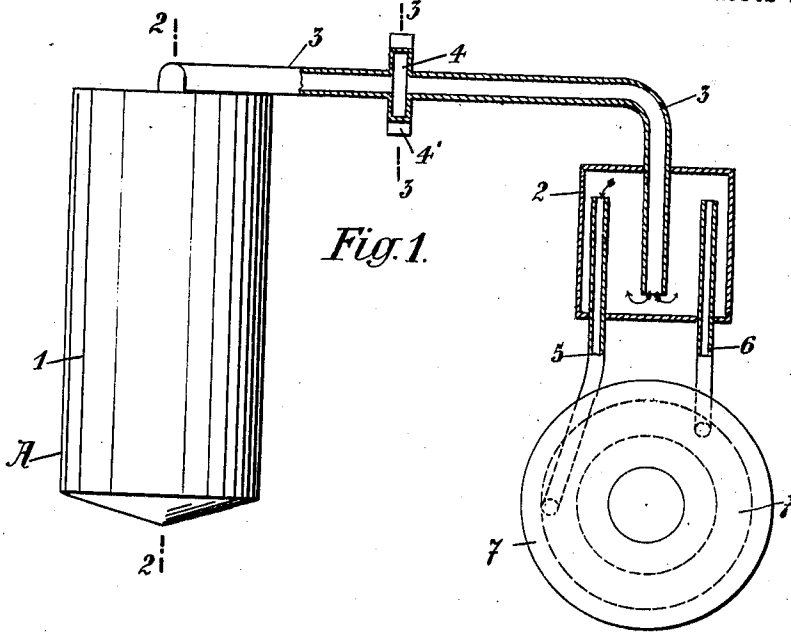


Fig. 2.

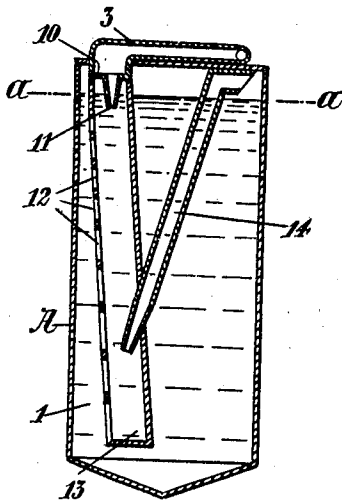


Fig. 3.

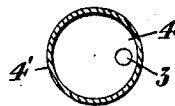
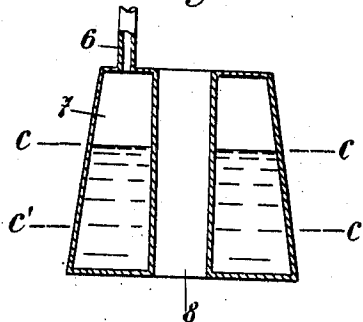


Fig. 8.



Inventor
Othmar Jurasek
by J. H. H. H.
Att'y.

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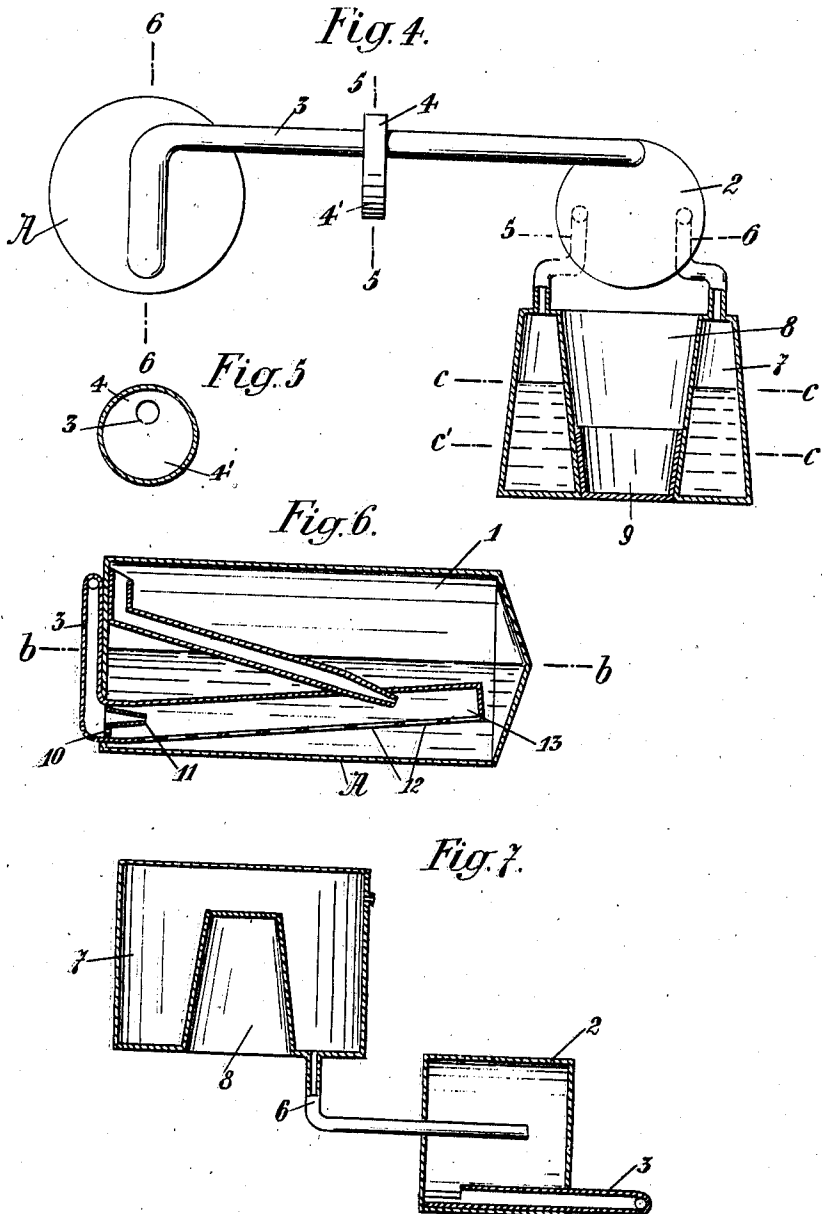
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REFRIGERATOR

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2 Sheets-Sheet 2



Inventor:
Othmar Jurasek

By *J. Swire*
Att'y.

UNITED STATES PATENT OFFICE

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REFRIGERATOR

Othmar Jurasek, Vienna, Germany

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In Germany June 23, 1938

4 Claims. (Cl. 62—120)

This invention relates to absorption refrigerators, and more particularly to periodically acting absorption refrigerators of the type in which the cooling action is initiated by tilting or otherwise transferring the refrigerator from a boiling position into a cooling position through an angle of about 90°. Refrigerators of this type, which consist of a boiler-absorber, a condenser-evaporator, and if desired or necessary a water separator, have the drawback that the refrigerating action is not uniform, while the elimination of water from the condenser-evaporator is generally a complicated procedure.

According to the present invention these drawbacks are obviated by the following features:

1. The provision, in the communicating pipe between the boiler-absorber and the water separator, of an expanded portion forming a chamber.

2. Providing, at the end of the communicating pipe between the boiler-absorber and the water separator which extends into the boiler-absorber a nozzle connected into an inclined absorption tube.

3. Providing in the boiler-absorber a nozzle tube the nozzle of which extends into the absorption tube and of which the second, open, end is disposed above the level of liquid in the boiler-absorber when the refrigerator is in the cooling position.

A further feature of the invention consists in so shaping the condenser-evaporator that, as evaporation proceeds, the area of the surface of the liquid in the condenser-evaporator increases at approximately the same rate as the velocity of absorption decreases owing to progressive enrichment of the absorption liquid in the boiler-absorber.

A still further feature of the invention consists in establishing communication between the condenser-evaporator and the water separator by means of two tubes connected into the top of the condenser-evaporator and extending almost up to the top of the water separator, and arranging for the communicating pipe between the boiler-absorber and the water separator to terminate at the lowest point in the water separator when the machine is in the draining position.

The invention will now be described in greater detail with reference to the accompanying drawings in which:

Figure 1 is a view in elevation, partly in section, showing the absorption refrigerator constructed in accordance with the invention, and in the boiling position;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a section on the line 3—3 of Figure 1;

Figure 4 is a view of the absorption refrigerator in elevation and partly in section, showing the same in cooling position;

Figure 5 is a section on line 5—5 of Figure 4;

Figure 6 is a section on line 6—6 of Figure 4;

Figure 7 is a section on line 7—7 of Figure 1, the machine being shown in dephlegmating position with the condenser-evaporator of somewhat modified construction;

Figure 8 is a view in section showing a further modification of the condenser-evaporator.

Referring to the drawings the boiler-absorber 1 communicates through the pipe 3 with the water separator 2, the pipe 3 being so connected into the water separator 2 that its discharge orifice is disposed at the lowest point in the water separator when the refrigerator is in the draining position, that is to say is stood up on the surface B of the water separator. The end of the communicating pipe 3 which discharges into the boiler-absorber 1 is fitted with a nozzle 11 extending into the inclined absorption tube 13. In addition to the nozzle 11 an aperture 10 is also provided in the nozzle flange. When the refrigerator is in the cooling position, that is to say when the apparatus is stood on the surface A of the boiler-absorber, the absorption tube 13 is so disposed that the apertures 12 are on its under side which apertures 12 increase in size towards the open end of the tube 13. In the boiler-absorber 1 there is further provided a nozzle tube 14 the nozzle of which discharges into the absorption tube 13, and of which the second, open, end is disposed above the surface b—b of the liquid in the boiler-absorber when the refrigerator is in the cooling position. In the communicating pipe 3 there is provided an expanded chamber 4 which is so eccentrically arranged that when the refrigerator is in the cooling position the larger portion 4 of this chamber lies below the communicating pipe 3. The line a—a indicates the level of the liquid in the boiler-absorber when in the boiling position.

Communication between the water separator and the condenser-evaporator 7 is established by means of two pipes 5, 6 which discharge through the top of the condenser-evaporator and which extend with their other ends to a point close beneath the top of the water separator 2.

When the refrigerator is in the cooling position the surface C of the condenser-evaporator

is undermost. Some or all of the outside walls of the condenser-evaporator 7 are so sloped that as the surface of the cooling medium falls the area of this surface increases. The outside walls of the condenser-evaporator are inclined at a slope of about 1 in 10, which corresponds approximately to the ratio at which the rate of absorption in the boiler-absorber decreases with progressive enrichment of the absorption liquid. Water is used in a known manner as the absorption liquid contained in the boiler-absorber, while gaseous ammonia is used as the cooling agent.

The machine is first brought into the generation position (Figure 1) and the generator-absorber 1 heated to about 100° C. During this procedure the condenser-evaporator dips into a cooling vessel filled with water. During the generation, the ammonia vapors dissolved in the water in the generator-absorber are driven out and pass through the apertures 12 and the pipe 13 and through the apertures 10 into the connecting pipe 3 and through the water separator 2, in which the water particles carried off separate, through the higher situated mouth of the pipes 5 and 6, into the condenser-evaporator 7 where they are condensed into liquid ammonia.

If the machine is brought into the position shown in Figure 4 by swinging through an angle of 90° and if the generator-absorber is cooled in known manner, an intensive ammonia vapor development begins in the condenser-evaporator 7, the difference in pressure between the generator-absorber and the condenser-evaporator becomes so great that the water which has penetrated into the connecting pipe 3 is forced back until the apertures 10 are free, with the result that the ammonia vapors pass through the injector nozzle 11 into the water in the generator-absorber and are greedily absorbed thereby, resulting in an increase in the difference of pressure and temperature between the generator-absorber and the condenser-evaporator, and consequently an acceleration of the evaporation. During this process, ammonia vapor collects in the space 4, when the evaporation was intense and is greater than the ammonia quantity which was absorbed during this time in the generator-absorber. If, however, a very weak stressing of the condenser-evaporator and consequently a lower ammonia vapor development then takes place, the vapor present in the space 4 is drawn off for replenishing and passes into the generator-absorber compelling this to operate more strongly, so that irregularities in the normal cold development are avoided.

If the vapors passing into the absorption water are not completely absorbed, the unabsorbed particles of vapor pass through the absorption water in upward direction and, as they would otherwise detrimentally influence the water pressure in the absorber, are returned into the absorption water through the nozzle pipe 14 and the pipe 13, so that damming of the vapor quantities entering the nozzle 11 is avoided.

To enable in any case the water carried into

the condenser-evaporator 7 to be removed therefrom, the machine is thrown over in the position of Figure 7. In this position the end of the connecting pipe 2 is very low so that no dead spaces can form in which water might collect, whereas, owing to the pipes 5 and 6, the ammonia vapors present in the condenser-evaporator flow off to the water separator during the tipping of the machine, that is before the off-flow of water takes place, and consequently these vapors cannot interfere with the off-flow of the water.

I claim:

1. A periodically acting absorption refrigerator, comprising a boiler-absorber, a condenser-evaporator, a water separator interposed between and communicating through a pipe with said boiler-absorber and condenser-evaporator, an expanded portion forming a chamber in the communicating pipe between said boiler-absorber and said water separator, an inclined tube in said boiler-absorber, a nozzle on the end of said communicating pipe discharging into said tube, and a nozzle tube in said boiler-absorber, said nozzle tube being so arranged that its nozzle end discharges into the said tube while its other end lies above the surface of the liquid in the boiler-absorber when the refrigerator is in the cooling position.

2. A refrigerator as claimed in claim 1, in which the said expanded portion in the communicating pipe between said boiler-absorber and water separator is eccentrically disposed relatively to said communicating pipe, the larger part of the chamber formed by the eccentric expanded portion being disposed beneath the pipe when the refrigerator is in the cooling position.

3. In a periodically acting absorption refrigerator a boiler-absorber, a condenser-evaporator, a water separator interposed between and communicating through a pipe with said boiler-absorber and condenser-evaporator, and an expanded portion forming an eccentric chamber in the communicating pipe between said boiler-absorber and said water separator, the eccentricity being such that the greater part of said chamber is disposed beneath said pipe when the refrigerator is in the cooling position, the said condenser-evaporator being so shaped that as evaporation proceeds the area of the surface of the liquid in the condenser-evaporator increases at approximately the same rate as the rate of absorption decreases owing to progressive enrichment of the absorption liquid.

4. A refrigerator as claimed in claim 1, in which communication is established between said condenser-evaporator and said water separator through two pipes discharging into the top of said condenser-evaporator and extending almost to the top of said water separator, and in which the communicating pipe between said boiler-absorber and said water separator terminates at the lowest point in said water separator when the refrigerator is in the draining position.