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APPARATUS FOR COOLING SYSTEMS

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2 Sheets-Sheet 1

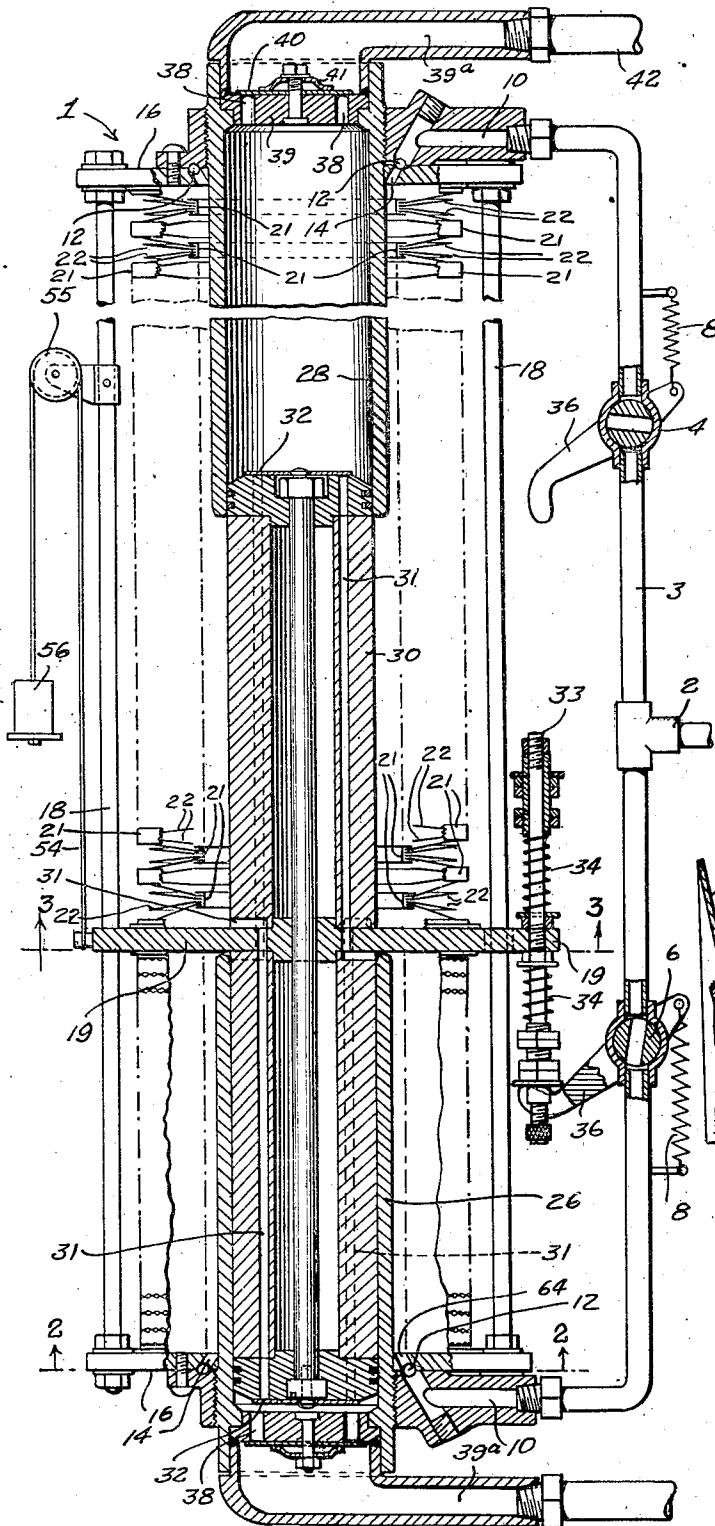


Fig. 1.

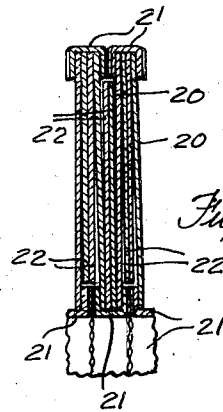


Fig. 4.

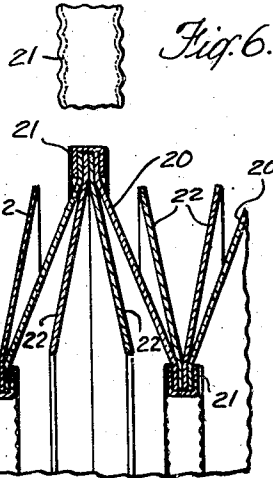


Fig. 5.

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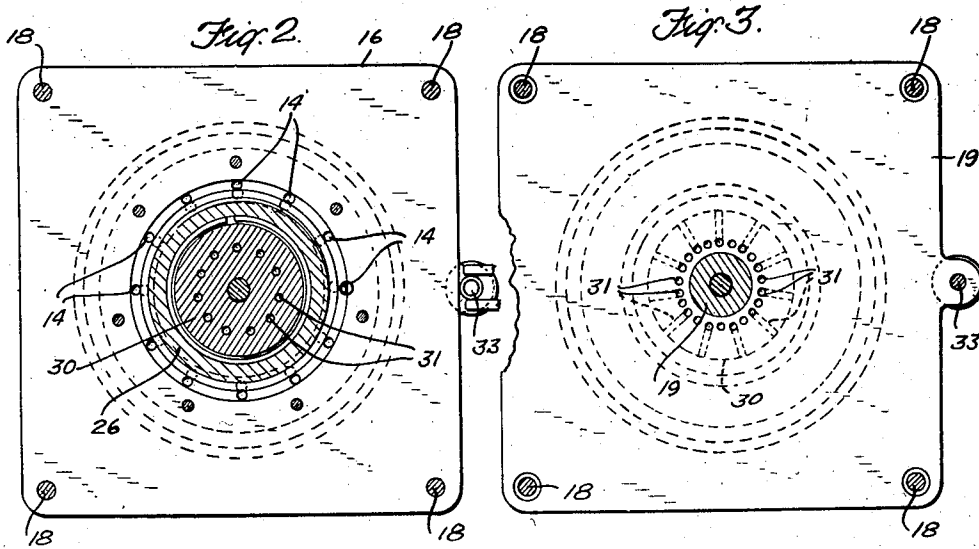
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2 Sheets-Sheet 2



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APPARATUS FOR COOLING SYSTEMS

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8 Claims. (Cl. 62—126)

This invention relates to a cooling system adapted more particularly for air conditioning.

An object of the invention is the utilization of the vapor pressure produced by the evaporation of a refrigerating medium evaporating at relatively low temperatures to perform a number of functions.

Another object of the invention is to more effectively dehumidify the air to be utilized in cooling.

A further object of the invention is the production of a heat absorber utilizable both as an evaporator and a mover of the refrigerating gases.

With these and other objects in view an important feature of the invention resides in a heat absorber for a cooling system having an expansible and collapsible casing into which the refrigerating medium is introduced and in which it is vaporized.

Another feature of the invention relates to an evaporator having a casing which is expansible by the pressure of the vapors produced from the evaporation of the refrigerating medium.

Another feature of the invention relates to an evaporator having a casing divided into expansible and collapsible compartments with provision for introducing the refrigerating medium mostly in liquid form into the compartments alternately and passing the vapors alternately into cylinders.

Another feature of the invention relates to an evaporator having an expansible and collapsible casing with provisions for squeezing out the water of condensation which may have collected on the outer surfaces from the surrounding air, during each collapse of the casing thereby increasing the effectiveness of dehumidification.

Further features and advantages will become apparent from the following description and claims when taken in connection with the accompanying drawings in which:

Figure 1 is a sectional view of one unit of my improved heat absorber.

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 detail on an enlarged scale showing the collapsed condition of the casing, such condition being shown in the lower portion of Figure 1.

Figure 5 is a similar view with the casing expanded.

Figure 6 is an elevational view in detail of one

of the connections for the expansion plates or rings.

Before describing the apparatus in detail it may be pointed out that the system is primarily designed for air conditioning and refrigeration but where extremely low temperatures are not required.

The refrigerant used may be any of the well known varieties although I prefer to use a refrigerating medium sold under the trade name of "Freon".

The heat absorbers to be described may be used in multiple units depending on the capacity required and may therefore be made in standard sizes.

Referring to Figure 1 the reference character 1 designates generally a heat absorber constituting one unit of my system. The refrigerating medium is conducted from a suitable receiver along a pipe 2 to a distributing pipe 3 and enters the heat absorber at either end thereof under control of an upper valve 4 and a lower valve 6. Springs 8 normally tend to hold the valves in closed position but they are alternately opened for the admission of the liquid refrigerant and held open for a definite time interval. The refrigerant is led from the distributing pipe 3 to an outlet 10 located at each end of the heat absorber from which it passes to a circular conduit 12 and through a series of holes 14 in a plate 16, there being one of these plates at each end of the heat absorber connected by rods 18 forming the supporting frame work.

Evaporation takes place in a bellows-like casing formed by joining the outer and inner edges of a series of plates or rings 20, Figure 5, the upper and lower portions of which casing may alternately expand and collapse. A plate 19 is connected to the casing midway thereof and serves to divide the casing into two compartments. The plate 19 is suitably apertured and is guided by the rods 18. The plates or rings 20 are joined at their inner and outer edges by U-shaped members 21 as shown in Figures 5 and 6, each of these members being provided with corrugations at their upper and lower faces for a purpose to be later referred to. Extending outwardly from the inner members 21 and extending inwardly from the outside members 21 are a plurality of fins 22 which fins act to increase the heat absorbing capacity of the casing.

In Figure 1 the lower compartment of the casing is shown in its collapsed state at which time the plates 20 lie substantially parallel as indicated in Figure 4. The heat absorber may be

located in an insulated chamber and the air to be cooled may be forced in contact therewith by means of a fan operated by a motor. As evaporation of the refrigerant proceeds at a rapid pace, pressure of the resulting vapors acting upon the plate 19, tend to move the same upwardly to collapse the upper compartment of the bellows-like casing, as the lower compartment is being expanded by the evaporated refrigerant.

Within the casing is a lower cylinder 26 and upper cylinder 28 there being sufficient clearance between the cylinder walls and the inner members 21 of the casing to permit the entry of the refrigerant into the casing. The refrigerant may also enter between the plates 20 by reason of the corrugated surfaces of the inner members 21.

A piston 30 connected to the plate 19 extends on either side of said plate and into the cylinders 26 and 28. In the position shown in Figure 1 the upper piston head is in the lower portion of the cylinder 28 while the lower piston head is in the lower portion of cylinder 26.

As the lower compartment of the casing expands, it tends to move the piston upwardly in the cylinder 28. Any vapors within the upper compartment are by-passed through ports 31 in the piston, said ports leading from the upper compartment through the plate 19 and through the piston 30 beneath the lower head thereof and similar ports 31 lead from the lower compartment to the space above the upper cylinder head. Each piston head is provided with a valve 32 which readily opens when the piston is moving in one direction to permit the passage of the gases into a cylinder above one piston head or below the other piston head but which valve closes when the piston is moving in the opposite direction.

In the position of the parts as shown in Figure 1, the valve 6 is in the open position and remains open for a substantial part of the stroke of the piston so that pressure on the plate 19 is maintained.

This plate also carries two rods 33 projecting from opposite sides thereof and a spring 34 surrounds each rod. The tension of each spring may be adjusted through the usual lock-nut devices.

As the plate 19 with the piston 30 reaches substantially the end of its stroke in the upward direction, the end of the rod 33 having moved away from an arm 36 on the valve 6 permits the spring 8 to close said valve. The rod 33 on the upper side of the plate 19 contacts the arm 36 of the valve 4 and when the spring 34 has been sufficiently compressed the valve 4 is opened and the refrigerant is permitted to enter the upper compartment of the casing.

It will be obvious that the vapor which has been used in expanding one compartment of the casing is passed in advance of the piston head of the cylinder of the other compartment. In other words the cylinder 28 at the stage shown in Figure 1 will be full of vapor. As the piston moves upwardly in the cylinder 28 the vapor is ejected from the cylinder through the ports 38 in a plate 39, these ports being normally closed by a valve 40 held in its seat by a spring 41 of suitable tension, to permit the valve to open at the proper time. From the ports 38 the gases pass to an outlet 39a.

Referring now to the dehumidifying features

of the invention it will be noted that when one section of the casing is in its expanded condition, the outwardly projecting fins 22 (Figure 5) are exposed to the air of the chamber in which the heat absorber is located and moisture present in this air will be condensed on the outside of the plates 20 and on both sides of the external fins 22. When, however, this section of the casing is in collapsed condition the condensed moisture if in sufficient quantity will be squeezed out and pass through the corrugations in the members 21. In this way the moisture is more readily removed from the surfaces upon which it has been condensed leaving these surfaces in condition to more effectively receive additional condensations.

With the construction above described the heat absorption from the air space surrounding the heat absorber increases as the casing expands so that the evaporation is rapid. On the other hand as the refrigerant is evaporated in either compartment of the casing the vapors resulting from such evaporation are passed to a region less exposed to the heated air. In other words as each compartment of the casing collapses the vapors contained therein are passed to the cylinders 26 and 28 alternately. During the collapsed condition, therefore, the cylinder is more or less insulated from the outside air.

The inner fins 22 not only act as heat absorbers but they take up space within the bellows-like casing and decrease the volume thereof so that the capacity of each compartment of the casing is substantially the same or less than the capacity of the cylinders 26 and 28. This permits the effective area of the plate 19 to be greater than the area of the piston heads.

Since each absorber is placed in a vertical position the weight of the plate 19, piston and other associated movable parts are counter-poised through means of cables 54 attached to the plate 19 which cables pass over pulleys 55 and to the other end of which weights 56 are attached.

The heat absorber above described may be used in place of the usual evaporator coil in cooling systems at present in use and the conduits 39a at the upper and lower ends of the heat absorber may be connected to the usual compressor and thence pass to the usual condenser.

What I claim is:

1. A device of the class described comprising a pair of expansible and collapsible compartments, and means for introducing a refrigerating medium into said compartments alternately.

2. A device of the class described comprising a collapsible casing, a plate separating said casing into two compartments, a cylinder within each compartment of said casing, and a piston common to both cylinders.

3. An evaporator having an expansible and collapsible casing, a plate separating the casing into two compartments, a cylinder within each compartment and a piston operably connected to said plate and movable in said cylinders, and means for introducing a refrigerating medium alternately into said compartments and exhausting the vapors thereof into each cylinder alternately.

4. An evaporator having an expansible and collapsible casing, a plate separating the casing into two compartments, a cylinder within each compartment and a piston operably connected to said plate and movable in said cylinders, and valves controlled by said plates to permit a re-

frigerating medium to enter each compartment alternately.

5 5. A device of the class described having an expansible and collapsible casing, said casing on its expansion presented an increasing area for the condensation of atmospheric moisture, said casing acting on its collapsing movement to expel the condensed water.

10 6. A device of the class described having an expansible and collapsible casing, a plate separating said casing into two compartments, a cylinder within each compartment of said casing, and a piston connected to said plate and common to both cylinders, said plate being movable to expand and collapse the casing.

15 7. A heat absorber for a cooling system, said absorber having a casing with alternately expansible and collapsible compartments, means

for introducing a refrigerating medium into the collapsed compartment to thereby expand said compartment and collapse the other compartment.

8. A heat absorber for a cooling system, said absorber having an expansible and collapsible casing, a plate connected to the casing and separating it into two compartments, a cylinder within each compartment of the casing, a piston connected to said plate and common to both cylinders, means for introducing a refrigerating medium into a collapsed compartment to expand the same, and means for passing the gases from the expanded compartment into the cylinder of the collapsed compartment during the expansion of the expanding compartment.

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