May 22, 1956 B. KATZENBERGER ET AL 2,746,259

AIR-CONDITIONING AND WATER-COOLING APPARATUS

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Fig. 1

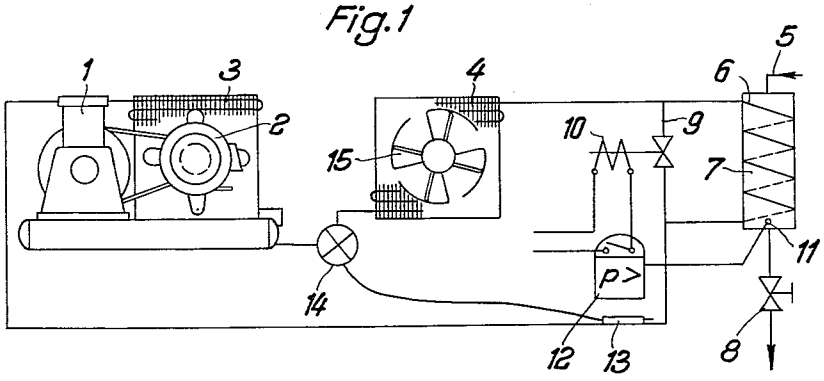


Fig. 2

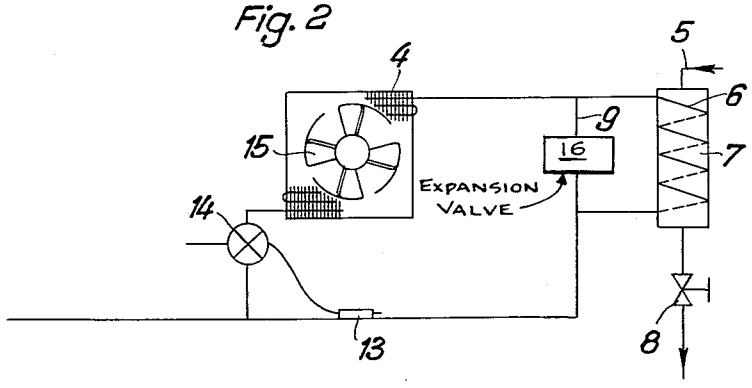
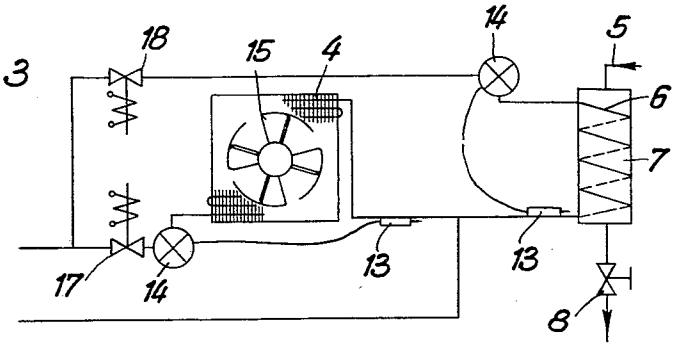


Fig. 3



Inventors:

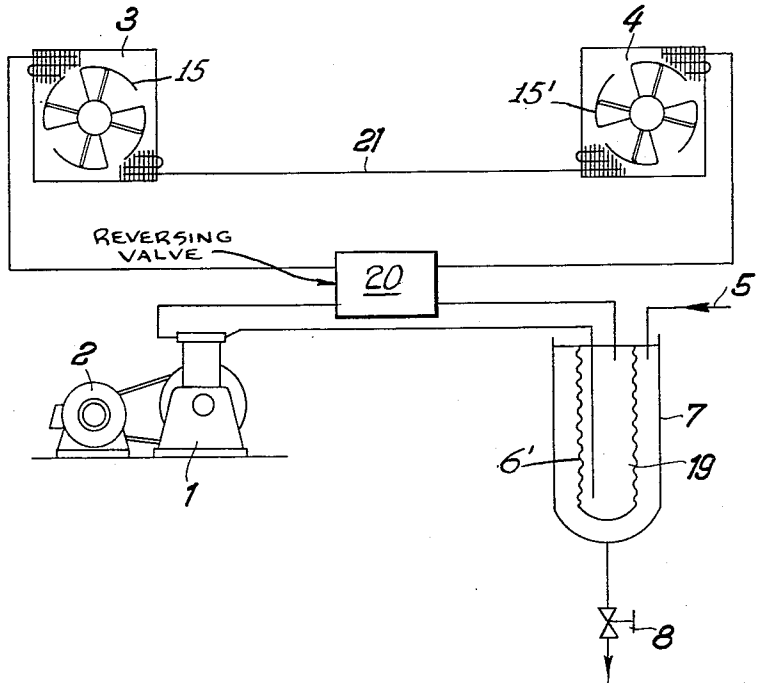
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Fig. 4



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AIR-CONDITIONING AND WATER-COOLING APPARATUS

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Claims priority, application Germany March 3, 1953

2 Claims. (Cl. 62—3)

The control of room temperatures is often accomplished by air conditioning or refrigeration units, the size of which depends on the size of the rooms being air-conditioned. It is typical in smaller refrigeration units for the refrigeration machine, which produces the necessary cold, to be located in the cooler itself, either extending outwardly or inside the unit, and the whole unit is placed in the room to be cooled.

Sometimes the refrigeration machine part of the air conditioner is installed in a separate room to avoid being inconvenienced by its noise. All these coolers have in common that the cold is generated by direct evaporation of the refrigerant in evaporators consisting of ribbed tube coils, the respective temperatures of evaporation being about +5° to +10° C.

In the cases of bigger equipment, especially when the machines are located within the room to be cooled, the refrigeration units have often a water cooled condenser. They consequently have connection to a water pipe.

The use of all such refrigeration units is not limited to the process of cooling the air of one or more rooms, but the condenser of the unit can at the same time be used as a source of heat. There are units in existence in which the closed cycle of circulation of the refrigerant can be reversed in such a way that the heat exchanger placed in a room can be used either as an evaporator or a condenser, while a second heat exchanger in the closed cycle has the respective counter functions (condenser or evaporator).

Air conditioning is used principally in tropical or subtropical climates, where at the same time the climate causes an increased demand for drinking water. As a rule such drinking water, which is preferably as cold as possible, cooled in special drinking water fountains, located at suitable places (in office buildings, e. g., on the different floors, in restaurants, etc.).

The use of heat pumps, too, which are alternatively to heat or to cool rooms, is generally limited to public buildings, schools or industrial plants, in which often the demand for cooled drinking water is rather high.

This invention avoids the use of two different refrigeration units, each of which requires an individual refrigeration machine, and it combines the functions of influencing the room temperature and cooling of drinking water in one unit. This is readily possible since the desired cooling temperatures and evaporator temperatures are identical in both cases.

The drinking water can be cooled very efficiently by use of a drier coil following the tube-coil-evaporator, which drier coil cooler is preferably in the form of coils of tubing passing through the container for the drinking water.

Fundamentally such a combination of the two evaporators is independent of whether a refrigeration cabinet, a cooler for room temperatures with a ventilator, an oversized refrigeration plant or a heat pump is to be used.

In the latter case it has been previously proposed to place a capillary tube between the two heat exchangers

as an expansion member and, at the suction side of the compressor, a low pressure tank. In this case it is possible to use the low pressure tank which is at the same time a drier coil, to cool the drinking water.

Further details and features of the invention will be apparent from attached drawings, wherein:

Figs. 1 to 3 show various embodiments, respectively, of the combination of a unit to cool room temperatures with an adjustable cooler for drinking water.

Fig. 4 shows a reversible heat pump combined with a cooler for drinking water.

Fig. 1 shows a refrigeration machine **1** with its motor **2** and a condenser **3**, connected through a thermic expansion valve **13**, **14** to an evaporator **4**. This evaporator serves together with a ventilator **15** as a cooler for the room temperature.

Into the closed cycle of the refrigerant a cooling coil **6** to act as a drier coil has been placed behind the actual evaporator **4** and this drier coil is coiled around a container for drinking water (**7**) which is filled from the top by a pipe **5** with uncooled drinking water. It can be drained as cooled drinking water by a cock **8** at the bottom of the container.

To prevent too low a temperature of the drinking water or even freezing, the embodiment illustrated provides a thermostat **11**, **12** for the drinking water. Its sensitive part **11** extends into the cooled drinking water container **7** and the thermostat part **12** opens a by-pass path **9** through a magnetic stop valve **10** if and when the temperature of the water drops below a fixed limit.

Two devices are therefore necessary to control the temperature of the drinking water, i. e. the thermostat **11**, **12** and the magnet valve **10**. Alternatively an automatically controlling expansion valve **16** can be used (see Fig. 2). This valve opens at the suction side at a particular pressure determined by preadjustment of the valve according to the desired temperature of the cooling water. If the evaporator temperature in the cooling coil **6** drops, the expansion valve **16** opens the by-pass **9** so that the drinking water is not cooled any further.

The equipments described above have one common handicap, i. e., that the drinking water is cooled only as long as the other cooling equipment is in operation. As soon as the refrigeration machine for the principal cooling purpose has been stopped, the circulation of the refrigerant comes to a standstill, so that the drinking water is not cooled any longer. This shortcoming is avoided in the embodiment of the invention illustrated in Fig. 3. By automatic temperature controls **13**, **14**, **13'**, **14'** or hand-operated switches, magnet valves **17**, **18** can be controlled alternatively, which permit the actual evaporator for the cooling equipment and the drinking water cooler to be operated independently of each other.

Fig. 4 shows an arrangement in which a unit for the heating and cooling of the room temperature is combined with a drinking water cooler. The low pressure tank **19** of the equipment for cooling and heating room temperatures is in this case a double tank. The inner container **6'** holds the refrigerant and the outer container **7** the water to be cooled. The circulation of the refrigerant can be reversed so that the refrigerant passes through the heat exchangers **3** and **4** in the desired direction by means of a reversing valve **20**. Between the two heat exchangers **3** and **4** is a capillary tube **21** serving as the expansion member.

The surface of the low pressure collector tank **19** is corrugated to obtain a greater surface and a greater stability at the same time. This equipment, which, of course, can be furnished with devices for the control of temperatures according to the previously described embodiments, e. g., with an automatically controlled by-pass for the low pressure tank **19**, has the further advantage that the evap-

orator proper can be used either as an evaporator or as a condenser while at the same time the drinking water can be cooled in either case.

We claim:

1. An air-conditioning and water-cooling apparatus, comprising a refrigerant compressor having a drive motor, a condenser, an air-conditioning device having an evaporator, refrigerant conduit means serially interconnecting said compressor and said condenser and said evaporator and forming together therewith a refrigerant circulation system, a water cooler having a cooling conduit and having controllable water supply means in heat-exchanging connection with said cooling conduit, said cooling conduit being serially interposed between said evaporator and said compressor in said system, a by-pass connected across said cooling conduit, and condition-responsive control means in said by-pass for controlling the flow of refrigerant through said cooling conduit to limit the cooling of the water.

2. An air-conditioning and water-cooling apparatus, comprising a refrigerant compressor having a drive motor, a condenser, an air-conditioning device having an evaporator, refrigerant conduit means serially interconnecting said compressor and said condenser and said evaporator

and forming together therewith a refrigerant circulation system, a water cooler having a cooling conduit and having controllable water supply means in heat-exchanging connection with said cooling conduit, said cooling conduit being serially interposed between said evaporator and said compressor in said system, a by-pass connected across said cooling conduit, a normally closed valve connected in said bypass, and temperature-responsive control means thermally connected with said water cooler and in operative connection with said valve for controlling said valve to open when the water temperature drops below a desired minimum value.

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