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S. O. MORRISON

2,597,744

TUBE-IN-TUBE HEAT TRANSFER UNIT

Filed July 20, 1948

Fig. 1.

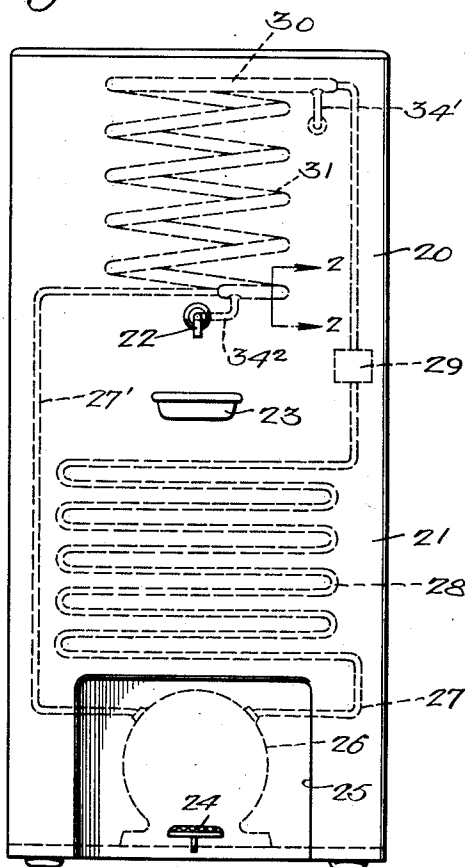


Fig. 2.

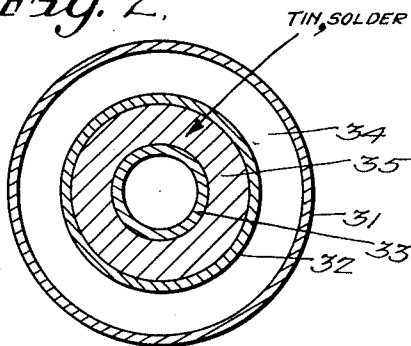


Fig. 4.

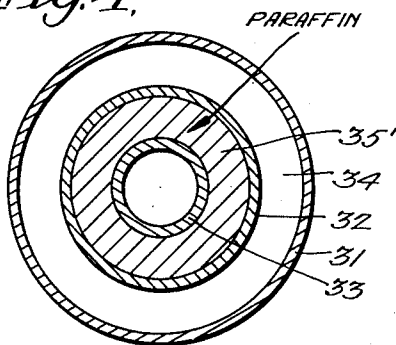


Fig. 5.

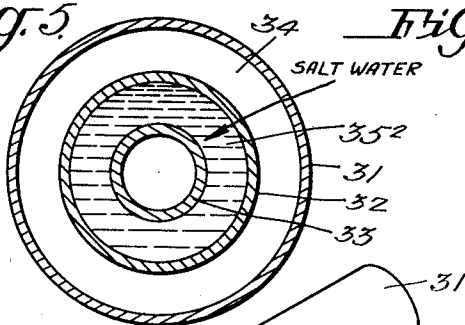


Fig. 6.

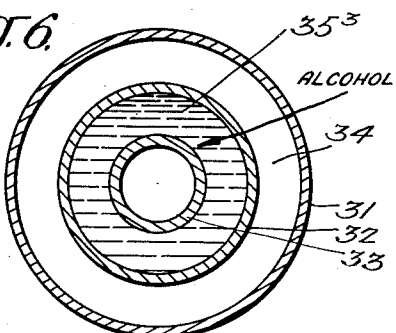
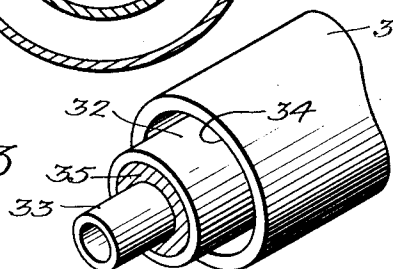


Fig. 3.



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UNITED STATES PATENT OFFICE

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TUBE-IN-TUBE HEAT TRANSFER UNIT

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1 Claim. (Cl. 257—246)

1

My invention relates to a water cooler or drinking fountain which is artificially refrigerated.

A purpose of my invention is to protect against the introduction of dangerous ingredients in drinking water due to cross connection or leakage in a water cooler.

A further purpose is to provide against possible contamination of drinking water through corrosion or other failure in a tube-in-tube heat transfer unit.

A further purpose is to employ double metallic separating walls between the refrigerant and the water in a tube-in-tube heat transfer unit without serious loss in heat transfer efficiency.

Further purposes appear in the specification and in the claim.

In the drawings I have chosen to illustrate a few only of the embodiments in which my invention may appear, choosing the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a diagrammatic front elevation of a water cooler to which my invention has been applied.

Figure 2 is a section of a tube-in-tube heat transfer unit on the line 2—2 of Figure 1.

Figure 3 is a fragmentary sectional perspective of the tube-in-tube heat transfer unit of Figures 1 and 2.

Figures 4 to 6 inclusive are sections corresponding to Figure 2 showing variations.

In the drawings like numerals refer to like parts throughout.

In water coolers heat transfer has been accomplished by tube-in-tube units consisting of an inner tube surrounded by an outer tube and usually made into a coil, the refrigerant often occupying the space within the inner tube and the water occupying the space between the tubes. It has been recognized that such units may possibly cause contamination of the water if the inner tube leaks either due to corrosion or other causes.

Efforts have been made by the present inventor to correct this difficulty by including an extra protective tube between the drinking water and the refrigerant, but this has been subject to the serious difficulty that heat transfer is thereby greatly impaired.

In accordance with the present invention a protective tube is employed without serious harm to the heat transfer effectiveness of the tube-in-tube unit.

Figure 1 illustrates a drinking fountain or water

2

cooler 20 having a cabinet 21 provided with a drinking water dispenser 22, a drip basin 23 and a foot pedal operating valve 24 for the dispenser set in a recess 25 near the bottom of the cabinet.

The refrigeration system suitably comprises a compressor 26, which is conveniently a hermetic motor and compressor unit, which on the pressure side supplies refrigerant, suitably Freon, through a pipe 27 to a condenser 28, cooled in any suitable manner not shown, and connecting to a constrictor 29 (which may be of the capillary tube or expansion valve type). From the constrictor the refrigerant passes to a tube-in-tube heat transfer unit 30 which has separate passages for water and refrigerant to be described. Leaving the tube-in-tube heat transfer unit the refrigerant is carried by a pipe 27' back to the suction side of the compressor.

As best seen in Figures 2 and 3 the tube-in-tube heat transfer unit of the present invention comprises an outer tube 31, an intermediate tube 32 and an inner tube 33, suitably of copper, bronze, brass or other alloy. The refrigerant preferably passes through the interior of the inner tube 33. The water preferably passes through the space 34 between the outer tube 31 and the intermediate tube 32. Water inlet to this space is provided at 34' and water outlet to the dispenser is shown at 34².

It will be evident that in order for the water in the space 34 to be cooled by refrigerant inside the inner tube 33, heat transfer must occur between the tubes 32 and 33. This space is accordingly filled with a heat transfer medium which is preferably permanently sealed in place. The heat transfer medium 35 may be a metal such as tin or solder as shown in Figure 2, may be paraffin as shown at 35' in Figure 4, may be brine as shown at 35² in Figure 5 or may be alcohol as shown at 35³ in Figure 6. The heat conductivities of the metals are distinctly higher than those of the non-metallic solids and liquids and accordingly the metals are much preferred except from the standpoint of introduction into the space which involves melting at a high temperature in the case of the metals, and in the case of paraffin can be done at much lower temperature, while the salt water and alcohol can be introduced at room temperature. Any suitable plug connections not shown can be employed for inserting the medium 35 into the space between the intermediate and the inner tube.

It will be evident that by the invention a much

3

safer heat transfer unit is obtained since it is necessary for leakage to occur through the tube 32 and also through the tube 33 before there can be contamination of the water. In the form of Figures 1 to 3 it is also necessary for the leakage to penetrate the metal 35 before there can be contamination.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claim.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

A water cooler cooling unit having an inner metallic tube, an intermediate metallic tube and an outer metallic tube one surrounding the other,

4

solid heat transfer metal in the space between the inner metallic tube and the intermediate metallic tube, the tubes one within another all being coiled together, and connections for a water dispensing system and for a refrigerating unit, one to the space inside the inner tube and the other to the space between the intermediate tube and the outer tube.

SAMUEL O. MORRISON.

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