METHOD AND APPARATUS FOR COOLING LIQUIDS

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ABSTRACT

A valve for mixing two separate liquids, in which a discontinuous conduit provides a separably adjustable nozzle and seat, the seat forming the upstream end of a Venturi, and means for lateral entry into the conduit at the discontinuity. In a pair of separate containers for housing the liquids, one of the containers holds liquid under pressure and is connected with the conduit while the other container has a spigot connected with the lateral entry means. In a method and apparatus for cooling the liquids within different temperature ranges a closed refrigerant circuit includes coils encompassing the containers, throttling means preceding each coil, and temperature sensing means for each liquid, the temperature of the first liquid in the series controlling the operation of the fan of the condenser and the temperature of the second liquid controlling the overall operation of the circuit.

10 Claims, 4 Drawing Figures
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METHOD AND APPARATUS FOR COOLING LIQUIDS

The present invention relates to a method and apparatus for mixing and dispensing two separate liquids, such as juice concentrate and water, and for cooling such liquids.

It is presently the practice in restaurants to dispense certain types of drinks such as juices by mixing a concentrate with tap water. Both the concentrate and the water are held, and chilled if desired, in separate containers in a dispensing unit, and the water pressure is used to mix the concentrate and the water and to dispense the mixture. An example of this type of unit is shown in U. S. Pat. No. 2,920,579 granted Jan. 12, 1960 in the name of Phillip R. Grim, assignor to the Dole Valve Company. A disadvantage of the Dole dispensing unit is that it is designed to accommodate a disposable juice concentrate container and the Venturi proportioner leaves a residual amount of concentrate which is lost when the container is replaced. Also the range of adjustability of the Dole proportioner is limited and the ratio between the concentrate and the water cannot be extended to deliver 100 percent water. Again as the mixture in the Dole device is being dispensed the ratio of concentrate to water varies as the concentrate container is drained because of the varying head of concentrate in the upstanding suction tube.

Also in the Dole device water initially comes out of the dispenser, i.e., there is no instant mix, and the operator has to watch for the mix to emerge from the faucet before filling a glass.

It is an object of the present invention to provide a mixing and dispensing unit for two liquids having a fixed container for both liquids, one of which is self-cleaning.

It is another object of the invention to provide an adjustable mixer or proportioner which will give substantially 100 percent of one liquid.

It is a further object of the invention to provide an adjustable proportioner which when set will give a consistent mix.

Still another object of the present invention is to provide a device for drawing instant mix from a dispenser.

It is sometimes desired to refrigerate two separate bodies within different temperature ranges, for example juice concentrate and water in a juice dispenser where the concentrate could advantageously be chilled below the freezing point of the water. In juice dispensers presently on the market, however, a single refrigerant circuit is used for economy and size, and the temperature of the circuit must be kept above the freezing point of the water being cooled.

It is another object of the present invention to provide a single refrigerant circuit for use in cooling two separate bodies within separate temperature ranges.

In the accompanying drawings, which illustrate example embodiments of the invention:

FIG. 1 is a view in perspective, broken away, showing a cooling, mixing and dispensing unit for juice;
FIG. 2 is a view in elevation, partly in cross-section showing a mixing valve;
FIG. 3 is a schematic diagram of a refrigerant circuit; and
FIG. 4 is a schematic diagram of the electrical circuit associated with the refrigerant circuit of FIG. 3.
In the electrical circuit shown in FIG. 4 of the drawings a line 112 connects the motor 114 of compressor 20 between the terminals L1 and L2 of an electrical power source. A line 116 connects solenoid valve 38 across line 112 in parallel with motor 114, and between line 116 and motor 114 a further line 118 connects fan motor 83 across line 112 in parallel with both the solenoid valve and the compressor motor. Normally open pressure switch 42 is connected in series with solenoid valve 38 in line 116, bellows switch 104 is connected in series in line 118 with motor 83 of fan 82 bellows switch 110 is connected in series with compressor motor 114 in line 112 between lines 116 and 118, and a master or control switch 120 is connected in series with control motor 114 in line 112 between terminal L1 and line 116.

In the operation of the embodiment shown in the drawings, potable water is introduced under pressure through conduit 32 into sealed lower container 26, the pressure being controlled by regulator 34. Juice concentrated is poured into upper container 28. The liquids in containers 26 and 28 are chilled as described below. As seen in FIG. 2, the juice concentrate in container 28 flows through outlet 48 and bore 45 of mixing valve 40 to form a head 122 in Venturi passage 66 of spout 41, nozzle 60 being spaced from seat 68 of passage 66 to allow lateral passage of the juice concentrate circumferentially into the passage. When solenoid valve 38 is opened by pressure switch 42, as by placing a cup beneath end 72 of spout 41 and against the switch, chilled water under pressure flows through nozzle 60 and through Venturi passage 66, mixing in divergent passage 70 with juice concentrate which flows into Venturi passage 66 by hydrostatic pressure and by carriage with the water. The resultant mixture flows under pressure from end 72 of spout 41 into the cup being held against switch 42 and when the cup is filled it is withdrawn to open switch 42 and close valve 38. If desired, the liquid mixture dispensed from spout 41 may be aerated by use of bleed valve 54.

The proportion of juice concentrate and water dispensed from spout 41 is governed by the gap between nozzle 60 and seat of Venturi passage 66, and to vary this proportion, nozzle 60 is adjustable in relation to seat either by turning the nozzle in threaded bore 56 or by turning shank 64 in threaded bore 58. Thus a more diluted drink may be obtained by decreasing the gap between nozzle 60 and seat 68 until, when the nozzle is seated, only water is dispensed from spout 41.

In the operation of the refrigerating circuit, compressor 20 pumps vaporized refrigerant under high pressure through feed tube 80 into condenser 22 where the operation of fan 82 draws off heat and liquefies the refrigerant. In passing next through capillary tube 86 the pressure of the liquid is decreased, the capillary tube acting as a throttling device. Subsequent expansion of the refrigerant in coils 88 and 98 draws heat from containers 26 and 28 to lower the temperature of the pressurized water and the juice concentrate in those containers. Capillary tube 94 drops the pressure of the refrigerant between cooled pipes 88 and 98, acting as a throttler to maintain a differential of temperature drop between the two coils. The gaseous refrigerant is then returned by suction tube 99 through accumulator 92 to compressor 20.

Thermostat 100 senses the temperature in lower container 26 and when that temperature drops to a predetermined minimum (say 34°F) switch 104 is opened to electrically disconnect or de-actuate motor 83 of fan 82. Gaseous refrigerant instead of liquid refrigerant then enters coil 88 and heat is transferred to container 26 from the coil, thus raising the temperature of the water in the container. When the water in the container reaches a predetermined maximum (say 40°F), thermostat 100 closes switch 104 to electrically connect motor 83 and restart fan 82 whereupon heat is again drawn from container 26 to lower the water temperature. Capillary tube 94 isolates coil 98 from the reversing operation of coil 88 and coil 98 acts only to lower the temperature of container 28. Thermostat 106 senses the temperature in coil 98 and actuates switch 110 to operate motor 114 of compressor 20 and keep the temperature of the juice concentrate in container 28 within a predetermined range (say 26°Fto 28°F).

It will be appreciated that fluid thermostats 100 and 106 may be conveniently located in any position to measure accurately the temperature fluctuations of the liquids within containers 26 and 28, for example against the containers themselves or immersed within the liquids.

It will be seen that the refrigerating circuit of the invention enables two separate bodies of liquid to be chilled within separate controlled temperature ranges with the use of a single compressor and condenser. In the example embodiment this allows the water to be kept above freezing while the juice may be maintained at a lower temperature, avoiding undue temperature fluctuations which affect the proportioning of the mixture in valve 40 and the temperature of the dispensed drink.

The structure of container 28 and valve 40 enables the container to be substantially self-cleaning and allows the container together with the valve, to be cleaned by removing cleanout plug 52 and flushing the container through the valve.

I claim:

1. A method of cooling two separate bodies within separate temperature ranges using a single closed refrigerating containing circuit having serially connected therein a compressor, a fan operated condenser, first and second refrigerant coils one associated with each body, and refrigerant throttling means between the condenser and the first coil and between the first and second coils, comprising the steps of:

sensing the temperature in the first coil or body;
sensing the temperature in the second coil or body;
actuating the compressor and the condenser fan above a predetermined sensed upper temperature limit of the second coil or body, and de-actuating the compressor and the condenser fan below a predetermined sensed lower temperature limit of the second coil or body; and

separately de-actuating the condenser fan below a predetermined sensed lower temperature limit of the first coil or body, the actuation of the condenser fan within the temperature range of the first coil or body being subservient to the actuation of the compressor and condenser fan within the temperature range of the second coil or body.

2. A method as claimed in claim 1 in which the lower temperature limit of the first coil or body is above the upper temperature limit of the second coil or body.
3. A method as claimed in claim 2 in which the temperature range of the first coil or body lies above 32°F and the temperature range of the second coil or body lies below 32°F.

4. A method as claimed in claim 3 in which the temperature range of the first coil or body is 34°-40°F and the temperature range of the second coil or body is 26°-28°F.

5. An apparatus for separately cooling a first body and a second body within two separate temperature ranges, comprising:
   serially connected in order in a closed refrigerant containing circuit, a compressor, a condenser with a fan, a first refrigerant throttling means, a first coil encompassing the first body, a second refrigerant throttling means, and a second coil encompassing the second body;
   means for sensing the temperature of the second coil or body and adapted to actuate the compressor and the condenser fan above a predetermined sensed upper temperature limit and to deactivate the compressor and condenser fan below a predetermined sensed lower temperature limit; and
   means for sensing the temperature of the first coil or body and adapted to de-actuate the condenser fan below a predetermined sensed lower temperature limit and to re-actuate the fan above a predetermined sensed upper temperature limit, the actuation of the condenser fan by the sensing means of the first coil being subservient to the actuation of the compressor and the condenser fan by the sensing means of the second coil.

6. An apparatus as claimed in claim 5 in which the lower temperature limit of the first coil or body is above the upper temperature limit of the second coil or body.

7. An apparatus as claimed in claim 5 in which the temperature range of the first coil or body lies above 32°F and the temperature range of the second coil or body lies below 32°F.

8. An apparatus as claimed in claim 5 in which the means for sensing the temperature of each coil or body comprises a separate fluid actuated, normally open bellows switch.

9. A device for storing, cooling, mixing and dispensing two separate liquids, comprising:
   a first container adapted to hold liquid under pressure and having a conduit leading therefrom, the conduit being discontinuous to form a tapered nozzle and a seat, a Venturi passage in the conduit, the seat forming the upstream converging passage of the Venturi, the nozzle and seat being separably adjustable, and valve means operable to control the passage of liquid under pressure through said conduit;
   a second container having an outlet spigot projecting from the bottom portion thereof, means connected with said outlet spigot to guide a second liquid laterally of the conduit to circumscribe said nozzle and seat;
   a closed refrigerant circuit having serially connected therein a compressor, a fan-cooled condenser, a first refrigerant throttling means, a first coil encompassing said first container, a second refrigerant throttling means, and a second coil encompassing said second container;
   means for sensing the temperature of the second coil or container and adapted to actuate the compressor and the condenser fan above a predetermined sensed upper temperature limit and to de-actuate the compressor and condenser fan below a predetermined sensed lower temperature limit; and
   means for sensing the temperature of the first coil or container and adapted to de-actuate the condenser fan below a predetermined sensed lower temperature limit and to re-actuate the fan above a predetermined sensed upper temperature limit, the actuation of the condenser fan by the sensing means of the first coil being subservient to the actuation of the compressor and the condenser fan by the sensing means of the second coil.

10. A device as claimed in claim 9 in which the means for sensing the temperature of each coil or container comprises a separate fluid actuated, normally open bellows switch, the compressor being connected in series with the bellows switch sensing the temperature of the second coil, the condenser fan being connected in series with the bellows switch sensing the temperature of the first coil, the series connected bellows switch and condenser fan being connected in parallel with the compressor.

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