Nov. 10, 1942. H. K. JOHNSON ET AL 2,301,283

COOLER

Filed March 17, 1939

Fig. 1

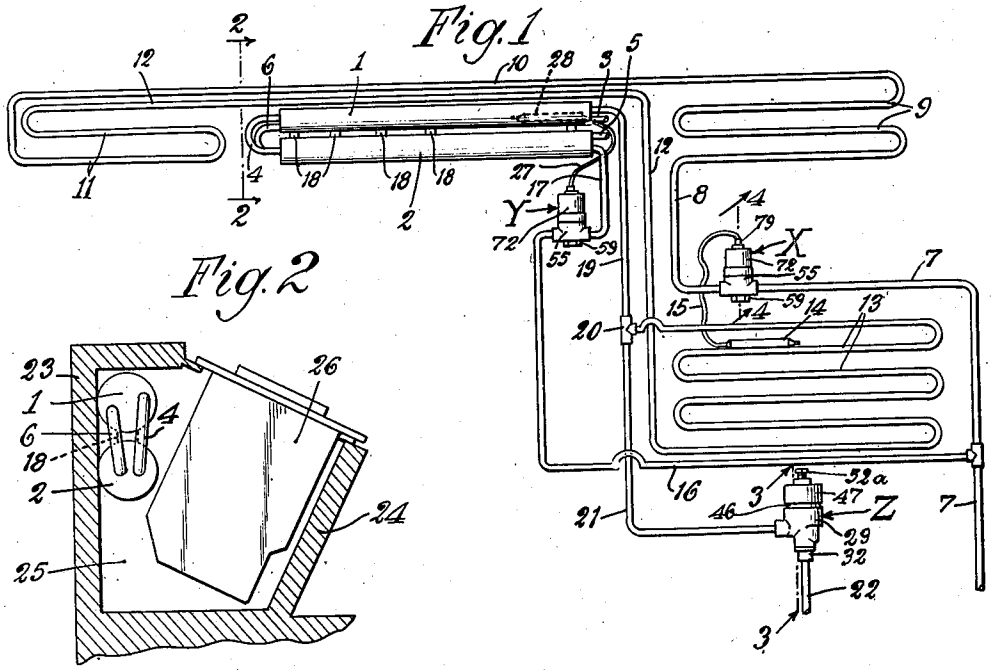


Fig. 2

Fig. 3

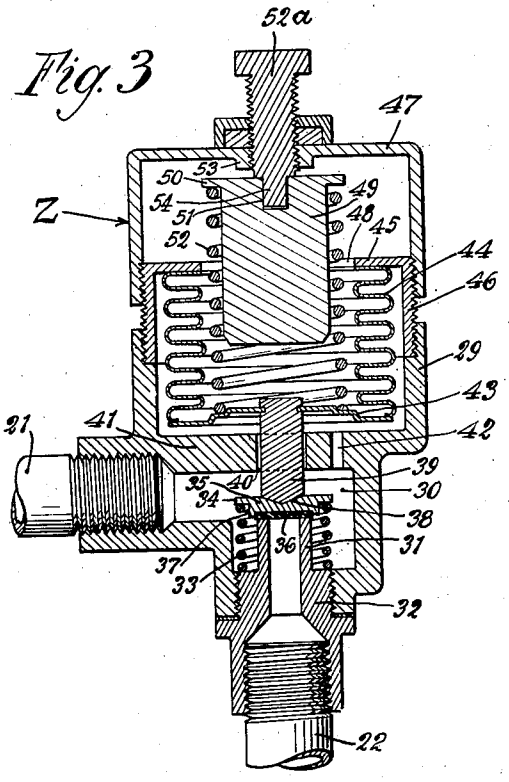
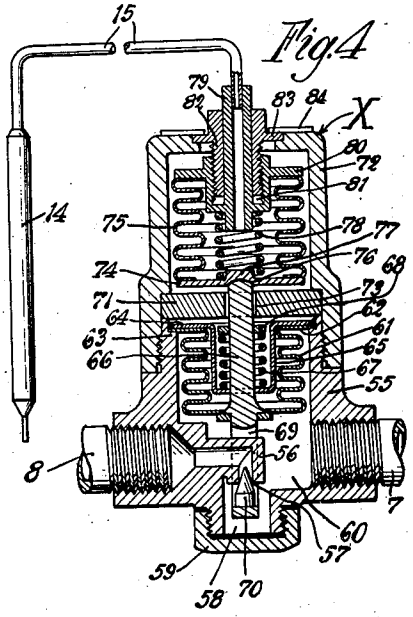


Fig. 4



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COOLER

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10 Claims. (Cl. 62—3)

This invention relates to a refrigerating means and mechanism for a soda fountain or cooling cabinet, and has for one object to provide a cooler element of such size and shape that it may readily be inserted in a constricted space within said fountain without diminution of its efficiency. Another object is to provide a quick operating cooler element for use in cooling beverages. Another object is to provide means for mounting such a cooler element in parallel with one or more refrigerating or expansion coils within said fountain.

Other objects will appear from time to time throughout the specification and the claims.

The invention is illustrated more or less diagrammatically in the accompanying drawing, wherein:

Figure 1 is a diagrammatic view illustrating an assembly of one form of the device;

Figure 2 is a vertical, sectional view taken at line 2—2 of Figure 1 and showing additional parts of the syrup rail;

Figure 3 is a longitudinal, sectional view through one of the control valves taken on an enlarged scale at line 3—3 of Figure 1;

Figure 4 is a longitudinal, sectional view through another control valve taken on a large scale at line 4—4 of Figure 1.

Like parts are designated by like characters throughout the specification and the drawing.

The cooler or cooler element, as shown, comprises an upper section 1 and a lower section 2. The exact details of this cooler element are not shown herewith as they form no essential part of the invention. The cooler element details are shown and claimed in our co-pending application Serial No. 245,125. In general, the cooler element comprises an upper and a lower housing, as mentioned, and connections through which refrigerant enters and leaves and, also, connections for the passage of liquids such as carbonated water and sweet water. As shown, sweet water may enter through a pipe 3 into the upper section 1 of the cooler element and pass by an elbow 4 into the lower section 2 of the cooler element and leave the cooler element through the pipe 5. If carbonated water, also, passes through the cooler, its entering and leaving pipes are concealed respectively by the pipes 3 and 5. The elbow through which it passes to the upper and lower cooler is indicated at 6. The details of the carbonated and sweet water connections are omitted to avoid confusion in the small scale figure.

Liquid refrigerant is carried from any suitable source by a pipe 7. A valve X controls the flow of the liquid refrigerant from the source of supply to the coils. A pipe 8 carries the refrigerant to a coil or cooling coil 9, which is of such size and shape as to fit conveniently into the syrup rail or rail compartment of a soda fountain. A pipe 10 communicates with a cooling coil 11 at the opposite end of the system from which a return coil 12 brings the refrigerant fluid back to the cooling coil 13 within the storage compartment. For convenience in description and identification the coil 13 may be termed the storage or storage compartment coil. 14 is a thermostatically responsive device connected by a tube 15 to the valve X for opening and closing such valve. The details of this valve will be described below. The thermostatically responsive element is mounted at a point to be affected by the temperature of the storage or storage cooling coil 13 and, thus, to control the flow of refrigerant to the coils 9 and 11 in response to variations of temperature in the storage coil.

A branch pipe or conduit 16 leads from the inflowing liquid conduit 7 and is controlled by a valve Y which is preferably a valve similar to or identical with the valve X. Refrigerant passes from the valve Y through a pipe 17 into the jacket of the lower cooler section 2. It passes thence upwardly through pipes or conduits 18, 18 into the jacket or housing of the upper section 1 of the cooler element, and is returned through a return pipe 19 to the storage compartment, joining the storage coil at an elbow 20.

Running from the elbow 20 or from any other suitable connection with the storage coil is a suction pipe 21 which is controlled by a pressure regulating valve Z. From the valve Z runs a suction pipe 22.

As shown in Figure 2, the cooler element, including the sections 1 and 2, is situated in the syrup rail compartment of a soda fountain. This compartment includes the enclosing members 23 and 24 which, together with end sections, not shown, enclose a space 25. Syrup jars or containers 26 may be removably positioned in this space and, as shown, are close to the cooler.

It is to be understood that the expansion valve Y is considered as being identical with the valve X and hence only one is shown and described in detail. The valve Y is connected through a pipe 27 with a thermostatically responsive member 28 which, in the form here shown, is positioned in the upper section 1 of the cooler element although it might be positioned on or in

either cooler section or between the two. The invention is not limited to the specific location of the thermostat 28.

As shown in Figure 3, the valve assembly Z comprises a housing 29 which is provided with a chamber 30 into which the suction pipe 21 extends and with which it is connected. A valve seat 31 is also formed in the chamber 30, and it may, as in the particular form here shown, comprise a separate and removable member 32 into which is threaded the suction pipe 22.

Positioned about the seat member 31 is a spring 33 which bears against a flange 34 on a valve closing member 35. On its lower or seating face, this member may have a seating portion 36 which may be secured to the valve member in any manner desired. As here shown, it fits within an annular flange 37. On its face, the valve member 34 is provided with a depression 38 to receive an operating pin 39. This latter extends through an opening 40 in a partition member 41 which forms a part of the housing 29. An additional passage 42 extends through the partition 41.

A disc-like member 43 is secured to the valve operating pin 39 and forms the bottom of a Sylphon bellows 44. At its upper end, this bellows bears against a shoulder 45 of an outside section 46 which is exteriorly threaded and is in threaded engagement with the housing 29. It is, also, in threaded engagement with the housing section 47. A clearance 48 is provided past the shoulder 45 and within this clearance is positioned a weight 49 provided with a shoulder 50 and a perforation 51 in its upper surface. A spring 52 is positioned within the Sylphon, bears at one end upon the bottom 43 and at the other end is in contact with the flange 50. An adjusting pin 52a is in threaded engagement with an enlargement 53 of the housing section 47 and is reduced as at 54 to fit into the perforation or depression 51 in the member 49.

The valve X comprises a housing member 55 provided with a threaded opening to receive the pipe 7 and another threaded opening to receive the pipe 8. Between these two openings is formed a member 56 which has a downwardly facing valve seat 57. The housing itself may have a bottom opening as at 58 which is closed by a cap 59. Within the housing 55 is a space 60 and positioned in this space is a Sylphon or bellows 61 which at its upper end is provided with a lateral flange 62 resting as at 63 upon the upper end of the housing 55. The shoulder 64 of a cup-like member 65 rests upon the flange 62 and the shoulder 63. The shaft portion 66 of a valve operating means passes through the Sylphon and the cup and has about it and within the cup a spring 67 which at one end rests upon the bottom of the cup and at the other end abuts upon a pin or collar 68. At its lower end, the member 66 is provided with a yoke portion 69 which carries an upwardly projecting valve point 70 which is adapted to be seated in the valve seat 57 and by its movement to control the latter.

71 is a partition member seated on the upper end of the housing 55 and held in place by an upper housing section 72 which is threadedly engaged with the housing section 55. A perforation 73 is formed in the partition 71 and through it the member 66 passes. This member receives on its upper end a member 74 which forms the bottom of a Sylphon tube 75. The bottom 74 may have a depression 76 to receive the pin 68 and may on its upper face carry a boss 77 about which the lower end of a spring 78 is seated. The spring is positioned at its upper end about a hollow member 79. Made preferably integrally with the member 79 is a flange 80 which overlies the upper end of the Sylphon tube 75. Between the flange 80 and the portion 79 is an annular space 81 into which a tube 82 is threaded. This tube carries a laterally disposed flange 83 which is held in place by a member 84 on the top of the housing section 72. Connected to the interior of tubular member 79 is the tube or pipe 15 which is connected to the thermostatically responsive member which itself lies upon or is close to the storage cooler 13.

In general, the apparatus shown operates as follows:

A refrigerant under pressure is supplied to the pipe 7 and flows through it, through the valve X and the pipe 8 to the coil 9, expansion takes place in this coil and cooling occurs. The refrigerant thereafter returns through the pipe 12 to the coil 13 in the storage compartment. The flow of refrigerant is largely controlled by the expansion valve X which operates in response to the temperature conditions in the storage coil 13 since the thermostatically responsive element 14 is mounted in or near the storage coil, close enough to it to be affected by its temperature conditions and variations.

The cooler 1, 2, which is preferably a so-called "instant" cooler because of its rapidity of operation in response to flow of material through it, may be, as in the case here shown, mounted in parallel with the storage coil and the coils 9 and 11 connected to it.

Conditions in the cooler are particularly controlled, however, by the valve Y, which is itself controlled by the thermostatically responsive element 28. This is mounted in or near the cooler and preferably at a point close to inflowing liquid so that when liquid such, for example, as carbonated water or sweet water or some other liquid is drawn through the cooler, any temperature variations caused by this movement promptly affect the element 28 and through it promptly affect the valve Y. This valve thereupon causes the necessary flow of refrigerant to and through the cooler to effect the desired cooling conditions in the cooler.

The total suction discharge both from the cooler and the other coils occurs through and is controlled by the valve Z. When pressure is relatively high within the system and, particularly within the suction pipe 21, the Sylphon tube 44 may be substantially collapsed and the valve element 36 may be raised from its seat by the spring 33 to permit discharge through the pipe 22. When pressure is relatively low in the suction pipe 21, the valve will remain seated. Adjustment of the valve Z to control the pressure at which it will open and close is accomplished by adjustment of the adjusting screw 52a.

Adjustment in the valves X and Y may be accomplished by relative movement of the part 80 with respect to the part 82, these two parts being threaded together. Adjustment of the spring 67 might be accomplished by moving the member 68 so as to compress the spring. This member has been referred to as a pin, and it might be a pin or collar. If a collar, it might be threaded upon the shaft or member 66 which would in that case be correspondingly threaded to permit a ready adjustment of the member 68.

As shown in Figure 2, the collar is mounted within the syrup rail compartment of a soda

fountain. If the rail compartment is of sufficient length, the coils 9, 10, 11 and 12 would, also, be mounted in the syrup rail compartment. They would be arranged somewhat differently; that is to say, the loops of the coil 9 and of the coil 12 might be to some degree nested so as to occupy a little less space. Of course, the pipes 10 and 12 would lie somewhere adjacent the sections 1 and 2 of the cooler element and might instead of being above them, as shown in Figure 1, lie alongside them in the space, shown in Figure 2, between the cooler section 1 and the syrup jars 26.

Of particular importance is the location of the water inlet in the total system. The water inlet pipe 3 is located in the upper cooler tube 1 and the thermostatic bulb 28 is located close to it. Therefore, when water, either sweet or carbonated, flows through the system, the temperature of the incoming water very promptly affects the thermostatic valve 28. Consequently, even though the system may have been inactive for some time, when it is again used, the thermostat valve opens promptly. In practical use, it has been shown that where the system was shut down for hours and was then again used, only the first glass of water will be at all warm. Very close temperature control is accomplished and even after a long shut down, the second glass drawn will be down to the temperature for which the system has been set. Consequently, in the operation of the invention, a very close control is accomplished and water at satisfactory temperature is available at all times.

In its operation, particularly with respect to cooling the jar enclosure and the storage compartment, the system accomplishes satisfactory control without building up ice formation on the coil. This result is due largely to the fact that the suction line 19, 21 is connected to the pressure control valve Z and because of this arrangement, adequate cooling is accomplished promptly and, particularly, a predetermined, uniform temperature is maintained in the different compartments without building up ice formation on the coils and, in the main, without the use of an expansion coil in the jar enclosure and in the storage box. Heretofore, it has been thought necessary to use an expansion coil in the jar enclosure or in the storage box, or both, and apparatuses of this type embodying such expansion coils so located have in use resulted in the formation of considerable quantities of ice. Among other unsatisfactory results from this formation of ice is the necessity of defrosting. Ordinarily, the operator of such devices must watch them closely and defrost them by positive manual manipulation. Because the applicant's device achieves uniform pressures in this coil, the formation of ice is avoided, and it is unnecessary to watch the device with great care and unnecessary to carry out manual defrosting.

Although there is shown an operative form of the device, it will be understood that many changes in the form, shape and arrangement of parts might be made without departing from the spirit of this invention; and it is wished that this showing be taken as in a sense diagrammatic.

We claim:

1. In a cooling system for soda fountains having a syrup rail compartment, syrup jars therein and means defining a storage compartment, the combination of a water cooling element mounted in said syrup rail compartment and in cooling relation to said syrup jars, cooling coils mounted in said rail compartment, said coils and said water cooling element being connected in parallel, a cooling coil mounted in said storage compartment, said last-mentioned coil being connected in series with said first-named coils, a single refrigerant supply conduit for a refrigerant fluid for said system, a single suction or discharge connection for said system, thermostatically controlled valves for admitting refrigerant fluid from said conduit to said coils and element, and a single pressure regulating valve in said suction connection posterior to said coils and water cooling element for preventing and for controlling the flow of the refrigerant fluid through said suction connection.

2. In combination in a soda fountain, a syrup rail compartment, syrup jars therein, means defining a storage compartment, a water cooling element mounted in said syrup rail compartment and in cooling relation to said syrup jars, means for conducting one or more liquids through said element for cooling the same, cooling coils mounted in said rail compartment in parallel with said water cooling element, a cooling coil mounted in said storage compartment, said last-mentioned coil being connected to said first-named coils in series, means for controlling the admission of a refrigerant to said coils and element, a single refrigerant supply connection for said coils and cooling element and a single suction or discharge connection for said coils and element, and a single pressure regulating valve positioned in said discharge connection posterior to all of said coils and water cooling element and adapted to control the discharge of all of the refrigerant through said discharge connection.

3. In combination in a soda fountain, a syrup rail, syrup jars therein, means defining a storage compartment, a water cooling element mounted in said syrup rail and in cooling relation to said syrup jars, cooling coils mounted in said rail in parallel with said water cooling element, a cooling coil mounted in said storage compartment, said last-mentioned coil being directly connected to said first-mentioned coils in series, said water cooler element being connected in parallel with said storage coil, an expansion valve positioned ahead of said first-mentioned coils, a thermostatic element connected to said valve and positioned to be affected by temperature variations of said storage coil and to control said expansion valve, a second expansion valve positioned ahead of said water cooler element to control the flow of refrigerant through said water cooler element, a thermostatic element connected to said second valve and positioned adjacent said water cooler element adapted to be affected by temperature variations therein, a single refrigerant supply connection for supplying refrigerant to the cooling system, a single suction or discharge connection for said system, and a single pressure regulating valve in said suction connection posterior to said coils and water cooling element in the direction of flow of the refrigerant, for controlling the flow of all of the refrigerant through said suction connection.

4. In combination in a soda fountain cooling system, a syrup rail, syrup jars therein, means defining a storage compartment, a water cooler element mounted in said syrup rail and adjacent said syrup jars, cooling coils mounted in said rail separate from said water cooling element, a cooling coil mounted in said storage compartment,

said last-mentioned coil being directly connected to said first-named coils in series, said water cooler element being connected in parallel with said first-named coils, an expansion valve positioned ahead of said first-mentioned coils, a thermostatic element connected to said valve and positioned to be affected by temperature variations of the cooling coil for the storage compartment to control said expansion valve, a second expansion valve positioned to control said water cooler element, a thermostatic element connected to said second valve and positioned adjacent said water cooler element adapted to be affected by temperature variations therein, a single refrigerant supply connection for the system and a single suction connection for said system, and a single pressure regulating valve positioned in said discharge posterior to said coils and adapted to entirely control the flow of refrigerant through said valve and through said suction connection.

5. In combination in a cooling system employing a volatile refrigerant as a cooling agent, a water cooler element, a plurality of separate cooling coils positioned adjacent to said water cooler element, a cooling coil for a storage compartment, means connecting said coil for the storage compartment and said separate cooling coils in series, said water cooler element being connected in parallel with the cooling coil for said storage compartment, a single refrigerant supply connection for said system, an expansion valve in said connection, a single suction or discharge connection for said system, and a single pressure regulating valve in said suction connection posterior to said coils and water cooling apparatus for controlling the flow of all the refrigerant flowing through said discharge connection.

6. In combination in a cooling system employing a refrigerant as the cooling agent, a water cooler element, a plurality of separate cooling coils, a cooling coil, means connecting said cooling coil and said first-named coils, said water cooler element alone being connected in parallel with said cooling coil, a single refrigerant supply connection for said system, means for controlling the flow of refrigerant through said connection, a single suction or discharge connection for said system, and a single pressure regulating valve positioned in said suction line posterior to one of said coils and water cooler element and adapted to control the passage of the refrigerant through said pressure regulating valve and suction connection.

7. In combination in a cooling system employing a volatile refrigerant as the cooling agent, a water cooler element, a cooling coil positioned adjacent thereto, a storage compartment cooling coil, means connecting said storage compartment cooling coil and said first-named cooling coil, said water cooler element being connected in parallel with said storage compartment cooling coil, a single refrigerant supply connection for said system and a single suction connection for said system, an expansion valve positioned in said system ahead of said first-named cooling coil in the line of refrigerant flow, a thermostatically responsive element positioned adjacent said storage compartment cooling coil and connected to said expansion valve and adapted to cause movement of said valve in response to temperature variations in said storage compartment cooling coil, a second expansion valve positioned adjacent said water cooler element in the line of refrigerant flow thereto, and a thermostatically responsive element positioned with the anterior portion of said water cooler element and connected to and adapted to move said second expansion valve to control the flow of refrigerant to said water cooler element, and a single pressure regulating valve positioned in said suction line posterior to said water cooler element and adapted to control the withdrawal of all of the refrigerant from said system.

8. In combination in a refrigerating system, a source of refrigerant, a plurality of cooling coils, connecting means joining said coils to each other, a storage compartment cooling coil, a connection between said storage compartment cooling coil and said other coils, a water cooler element in parallel with said storage compartment cooling coil, a connection from said water cooler element to said source of refrigerant, a suction connection for refrigerant return, connections between said suction connection and said water cooler element and said storage compartment cooling coil, and a single pressure regulating valve in said suction connection posterior to all of said cooling coils and water cooling element for controlling the flow of all of the refrigerant through said suction connection.

9. In combination in a refrigerating system, a source of refrigerant, a plurality of cooling coils, connecting means joining said coils to each other in series, a storage compartment cooling coil, a connection between said storage compartment cooling coil and said other coils, a quick acting water cooler element, conduits for liquids passing through said element, a connection from said water cooler element to said source of refrigerant, a suction connection for refrigerant return, parallel connections between said suction connection and said water cooler element and said storage compartment coil, and a single pressure regulating valve in said suction connection posterior to said coils and water cooling apparatus for controlling the flow of all of the refrigerant through said suction connection.

10. In combination in a refrigerating system, a water cooler element, a plurality of cooling coils positioned one at either end of said cooler element, means connecting said coils in series with each other, a storage compartment cooling coil in series with said first-mentioned coils and posterior thereto in the direction of flow of the refrigerant through said coils, a restricted refrigerant inlet means joined to said first-mentioned coils and adapted to pass refrigerant therethrough for expansion of said coils, means connecting said first-mentioned coils to said storage compartment cooling coil in series, a refrigerant suction conduit and means connecting it to said cooler element and to said storage compartment cooling coil in parallel, and a single pressure sensitive valve in said suction conduit posterior to said coils and cooler element in the direction of movement of the refrigerant for preventing circulation of refrigerant through said system while the pressure within said last-named valve remains below a predetermined minimum.

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