

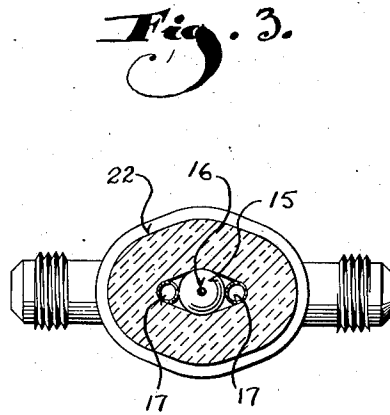
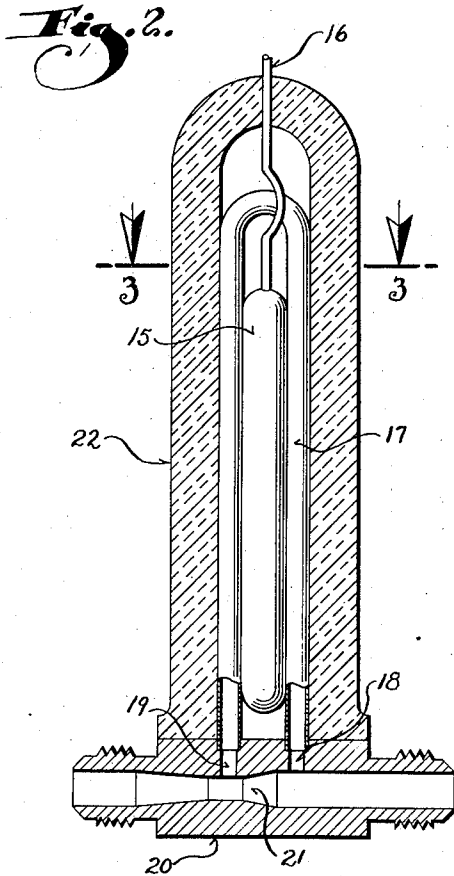
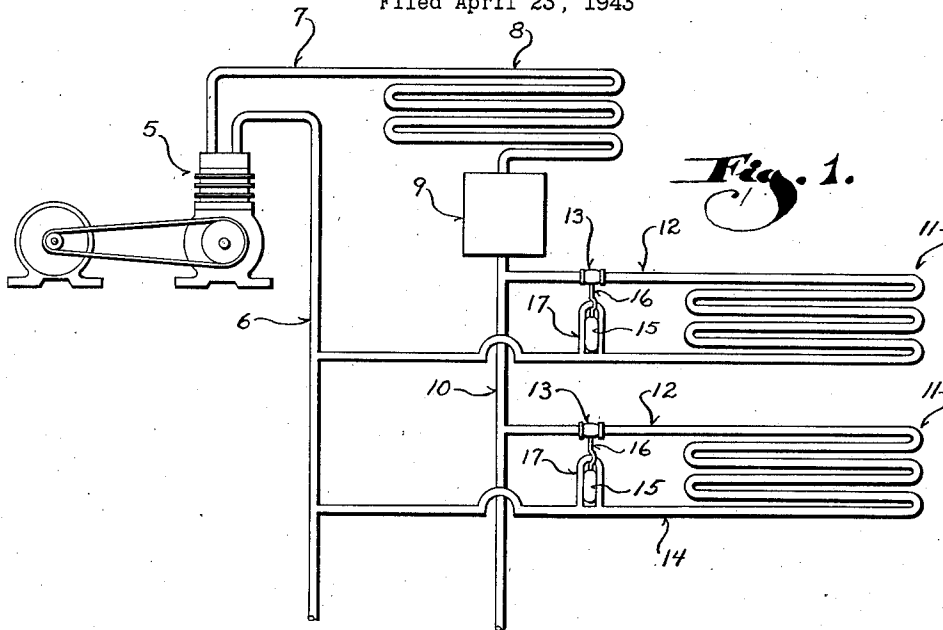
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REFRIGERATING SYSTEM

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REFRIGERATING SYSTEM

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This invention relates to refrigerating systems of the type wherein the flow of liquid refrigerant into an evaporator is controlled by a thermostatic expansion valve. The intended function of the thermostatic expansion valve is to have it feed liquid refrigerant to the evaporator in such a manner as to wet the entire surface of the evaporator without having liquid refrigerant pass into the suction line which leads from the evaporator.

However, it has been found extremely difficult with past systems to exclude liquid from the suction line and inasmuch as the temperature sensitive bulb which controls the functioning of the thermostatic expansion valve is positioned to be influenced by the temperature of the refrigerant in the suction line, it is apparent that the presence of liquid in the suction line has a detrimental effect upon the control of the valve.

In consequence to the periodic passage of "slugs" of liquid refrigerant through the suction line and past the bulb, hunting sets in; that is, successive and abrupt changes in temperature influence on the bulb caused by the "slugs" of liquid refrigerant flowing down the suction line, cause repeated opening and closing of the expansion valve with a resulting wetting and drying of portions of the evaporator and a constant fluctuation in suction pressure.

The purpose of this invention is to overcome this objectionable condition.

More specifically, it is an object of this invention to provide an improved manner of applying the temperature influence of the refrigerant passing from the evaporator to the control bulb of the thermostatic expansion valve by which violent temperature changes at the bulb are eliminated.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a diagrammatic illustration of a refrigerating system embodying this invention;

Figure 2 is an enlarged detail view illustrating the manner in which the control bulb of the expansion valve is mounted; and

Figure 3 is a detail cross sectional view taken through Figure 2 on the plane of the line 3—3.

Referring now particularly to the accompanying drawing, in which like numerals indicate like parts, the numeral 5 designates the compressor of a refrigerating system, the inlet of which has a main suction line 6 connected thereto. A pressure line 7 leads from the outlet of the compressor to a condenser 8. The compressor, as is customary, in conjunction with the condenser reduces the gaseous refrigerant flowing in the suction line 6 to a liquid.

The liquid refrigerant leaving the condenser 8 enters a suitable receiver 9 from which a main liquid refrigerant supply line 10 leads.

Connected across the main liquid supply line 10 and the main suction line 6 are evaporator units 11. Obviously, there may be but a single evaporator or as many as the installation requires. The feed line 12 of each evaporator which connects with the main liquid supply line 10 has a thermostatic expansion valve 13 connected therein to regulate the admission of liquid refrigerant into the evaporator. The other end of the evaporator is connected with the main suction line through a discharge or suction line 14.

The functioning of the thermostatic expansion valve 13 is controlled by a temperature sensitive bulb 15 connected with the valve by a capillary tube 16. Heretofore this temperature sensitive bulb has been mounted adjacent to the suction line 14 leading from the evaporator and as a consequence whenever a "slug" of liquid refrigerant passed through the suction line, which was inevitable due to the hunting prevalent in past systems, the temperature sensitive bulb 15 was subjected to a rather violent change in temperature and this perpetuated and aggravated the objectionable hunting.

The present invention overcomes this difficulty by mounting the temperature sensitive control bulb 15 not adjacent to the suction line 14, but rather in juxtaposition to a branch 17 of the suction line so arranged that only gaseous refrigerant passes therethrough.

In the specific embodiment illustrated, this branch 17 consists of a substantially hairpin shaped loop of tubing having parallel legs and having its ends brazed or otherwise secured in

inlet and outlet ports 18 and 19, respectively, of a coupling fitting 20.

The coupling fitting is connected in the suction line and is so mounted that the ports 18 and 19, and consequently, the shunt branch 17 project vertically up from the suction line. Thus, liquid refrigerant passing down the suction line is dissuaded from passing into and through the shunt branch while gaseous refrigerant is free to flow therethrough.

To positively induce the flow of gaseous refrigerant through the shunt branch 17, the fitting 20 has a Venturi throat 21 or other suitable constriction in its passageway between the inlet and outlet ports 18 and 19. By the size of this Venturi throat 21 the extent of the diversion of gaseous refrigerant through the shunt branch 17 can be controlled, as will be readily apparent.

Attention is directed to the fact that the shunt branch 17 has two parallel runs or legs and that the control bulb 15 is mounted between them preferably in contact therewith. Thus, the bulb has two areas of contact with the shunt branch to increase the temperature modifying influence of the gaseous refrigerant on the bulb.

It is also preferable to enclose the shunt branch 17 and the bulb 15 in a sheath 22 of suitable heat insulating material such as sponge rubber, asbestos, or the like.

From the foregoing description, taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art that this invention overcomes one of the most troublesome difficulties experienced in refrigerating systems by precluding the vacillating effect on the control bulb of the expansion valve, caused by "slugs" of liquid refrigerant passing down the suction line.

What I claim as my invention is:

1. A refrigerating system in which the flow of liquid refrigerant into an evaporator is controlled by a thermostatic expansion valve having a temperature sensitive bulb for actuating the same, characterized by the fact that: the bulb is mounted in juxtaposition to a branch of the suction line leading from the evaporator and connected with the suction line at spaced points and the inlet thereto extending abruptly upwardly from its juncture with the suction line so that the flow of liquid refrigerant which may be present in the suction line, through said branch is discouraged while gaseous refrigerant is free to pass through said branch.

2. A refrigerating system including an evaporator having a feed line leading thereto and a suction line leading therefrom and in which the flow of liquid refrigerant through the feed line and into the evaporator is controlled by a thermostatic expansion valve having a temperature sensitive bulb which effects operation of the valve, characterized by the fact that: the bulb is mounted in juxtaposition to a shunt branch connected with the suction line with the inlet thereof extending abruptly upwardly from the suction line; and by a constriction of the suction line adjacent the juncture of the outlet of said shunt branch with the suction line, whereby the flow of gas through said shunt branch is encouraged.

3. A refrigerating system including an evaporator having a feed line leading thereto and a suction line leading therefrom and in which the flow of liquid refrigerant through the feed line and into the evaporator is controlled by a thermostatic expansion valve having a temperature sen-

sitive bulb which effects operation of the valve, characterized by the fact that: the bulb is mounted in juxtaposition to a shunt branch connected with the suction line; and by a constriction of the suction line adjacent to the juncture of the outlet of said shunt branch with the suction line, whereby the flow of gas through said shunt branch is encouraged; and by the further fact that the shunt branch projects upwardly and substantially at right angles to the suction line so that liquid refrigerant which may be present in the suction line is discouraged from passing into the shunt branch.

4. In a refrigerating system of the type including an evaporator, a feed line for supplying liquid refrigerant to the evaporator, a thermostatic expansion valve in the feed line controlling the flow of liquid refrigerant into the evaporator, said expansion valve having a temperature sensitive bulb by which the functioning of the valve is controlled, and a suction line leading from the evaporator: a shunt passage connected with the suction line in a manner forming a branch thereof and with the inlet of said shunt passage extending upwardly from and at an abrupt angle to the suction line; and means for inducing the flow of refrigerant gases from said suction line into and through said branch, and said temperature sensitive bulb of the expansion valve being mounted in juxtaposition to said branch to be responsive to the temperature of the gas flowing therethrough.

5. In a refrigerating system having an evaporator from which a suction line leads and having an expansion valve controlling the flow of liquid refrigerant into the evaporator, said valve having a temperature sensitive bulb controlling the operation thereof: a shunt branch connected with the section line with the inlet of the shunt branch forming an abrupt upward angle to the suction line; the temperature sensitive bulb of the expansion valve being in juxtaposition to the shunt branch to be influenced by the temperature of refrigerant gases flowing through said shunt branch; and a constriction in the suction line between its junctions with the shunt branch and near the outlet of the shunt branch for inducing a flow of refrigerant gas through said shunt branch.

6. In a refrigerating system having an evaporator from which a suction line leads and having an expansion valve controlling the flow of liquid refrigerant into the evaporator, said valve having a temperature sensitive bulb controlling the operation thereof: a shunt branch connected with the suction line with the inlet of the shunt branch forming an abrupt upward angle with the suction line; the temperature sensitive bulb of the expansion valve being in juxtaposition to the shunt branch to be influenced by the temperature of refrigerant gases flowing through said shunt branch; and a Venturi throat in the suction line adjacent to the point of discharge of the shunt branch for inducing the flow of refrigerant gas through the shunt branch.

7. In a refrigerating system having an evaporator adapted to be fed with liquid refrigerant and from which a suction line leads and having a thermostatic expansion valve controlling the flow of liquid refrigerant into the evaporator, the expansion valve having a temperature sensitive control bulb: a branch line connected with the suction line and extending at an upward angle therefrom so that gases in the suction line readily flow into and through the branch line while

any liquid present in the suction line flows past the branch without entering it; and said control bulb being mounted in juxtaposition to the branch line to be influenced by the temperature of the gases flowing therethrough.

8. In a refrigerating system having an evaporator adapted to be fed with liquid refrigerant and from which a suction line leads and having a thermostatic expansion valve controlling the flow of liquid refrigerant into the evaporator, the expansion valve having a temperature sensitive control bulb: a branch line having its inlet connected with the suction line at one point and its outlet connected with the suction line downstream from said point, the branch line having a portion thereof between its inlet and outlet disposed at an elevation higher than the point at which the inlet connects with the suction line so that gases in the suction line readily flow into and through the branch line while any liquid present in the suction line is dissuaded from entering said portion of the branch line; said control bulb being mounted in juxtaposition to said portion of the branch line to be influenced by the temperature of the gases flowing therethrough; and a constriction in the suction line between its junctions with the branch line and near the outlet of the branch line to induce gas flow into and through the branch line.

9. In a refrigerating system having an evaporator adapted to be fed with liquid refrigerant and from which a suction line leads and having a

thermostatic expansion valve controlling the admission of liquid refrigerant into the evaporator, the expansion valve having a temperature sensitive control bulb: a looped branch line connected with the suction line to provide a parallel passage for refrigerant flowing through the suction line, said looped branch having closely adjacent spaced runs extending upwardly from the suction line; and the temperature sensitive bulb of the expansion valve being mounted in juxtaposition to said closely adjacent runs so as to be influenced by the temperature of the refrigerator flowing therethrough.

10. In a refrigerating system having an evaporator adapted to be fed with liquid refrigerant and from which a suction line leads and having a thermostatic expansion valve controlling the admission of liquid refrigerant into the evaporator, the expansion valve having a temperature sensitive control bulb: a looped branch line connected with the suction line to provide a parallel passage for refrigerant flowing through the suction line, said looped branch having closely adjacent spaced runs extending upwardly from the suction line; the temperature sensitive bulb of the expansion valve being mounted in juxtaposition to said closely adjacent runs so as to be influenced by the temperature of the refrigerant flowing therethrough; and an insulating sheath enclosing the branch line and the bulb to protect the same from influence by ambient temperature changes.

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