

[54] **REFRIGERATION SYSTEM**
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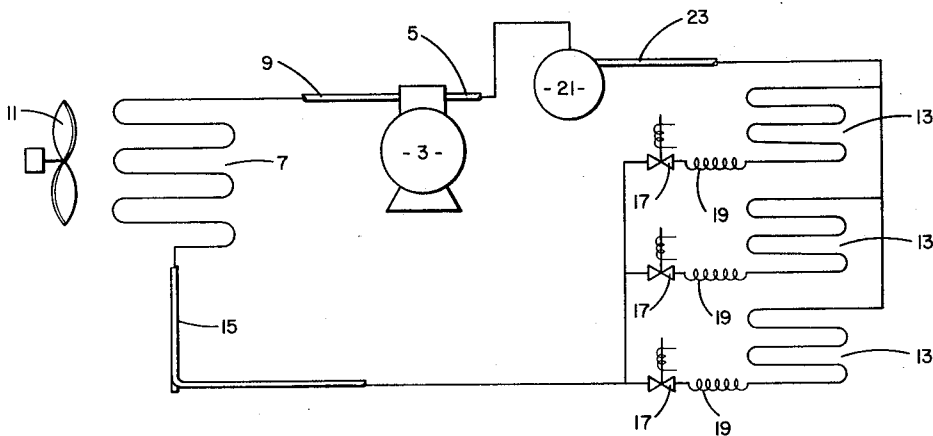
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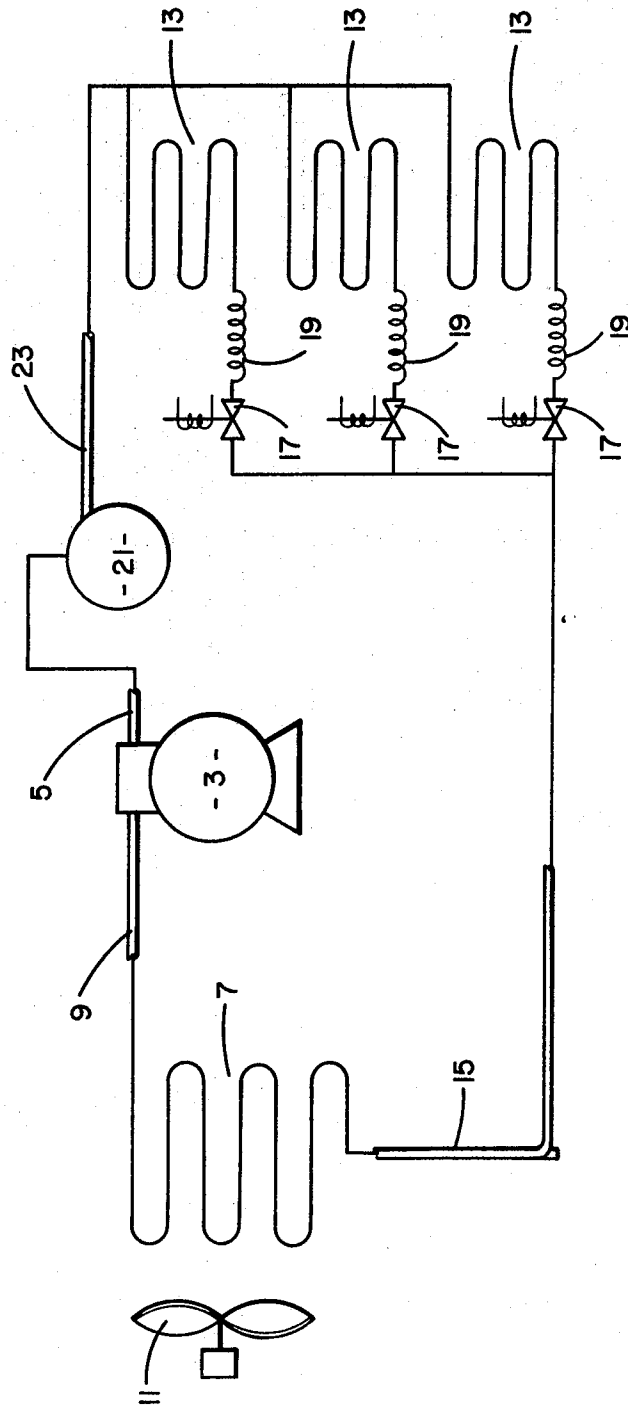
[57] **ABSTRACT**

A refrigeration system employing a plurality of evaporator circuits, the refrigerant flow to each circuit being controlled by a shut-off valve and a fixed restriction, the valve when open providing a first stage restriction to minimize the required pressure drop across the fixed restriction.

[56] **References Cited**
UNITED STATES PATENTS
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3 Claims, 1 Drawing Figure





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REFRIGERATION SYSTEM

BACKGROUND OF THE INVENTION

In many refrigeration systems, a plurality of evaporators or evaporator circuits may be employed with a single condensing unit. Liquid line solenoid valves may be employed to activate those evaporators or evaporator circuits that are needed to satisfy the load on the system. A restriction device such as a thermal expansion valve may be provided between the solenoid valve and the evaporator or evaporator circuit associated therewith to control the flow of refrigerant to the evaporator.

SUMMARY OF THE INVENTION

This invention relates to a refrigeration system comprising a compressor, a condenser for condensing high pressure refrigerant vapor from the compressor, and a plurality of evaporator circuits for passing heat exchange medium to be cooled in heat exchange relationship with refrigerant from the condenser, the refrigerant in the evaporator circuits being heated and vaporized by the heat exchange medium. Valve means are provided for each evaporator circuit, the valve means being adapted to prevent flow of refrigerant to the evaporator circuit when the valve means is closed and to provide a first stage restriction to the flow of refrigerant to the evaporator circuit when the valve means is open. A fixed refrigerant restrictor in the refrigerant line between the valve means and the evaporator circuit associated therewith is provided to produce a second stage restriction upstream of the evaporator circuit.

BRIEF DESCRIPTION OF THE DRAWING

The drawing is a schematic of a refrigeration system embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawing, there is illustrated a refrigeration system including a compressor 3 adapted to receive low pressure refrigerant vapor from refrigerant line 5 and provide high pressure refrigerant vapor to a condenser 7 through refrigerant line 9. Fan means 11 are provided for passing a heat exchange medium, preferably ambient air, in heat exchange relation with refrigerant within the condenser 7 to condense the refrigerant. Liquid refrigerant from condenser 7 is supplied to a plurality of evaporators or evaporator circuits 13 through refrigerant line 15.

Each of the evaporator circuits 13 is provided with suitable valve means such as solenoid valves 17 and suitable fixed restriction means such as capillaries 19. The solenoid valves 17 are adapted to prevent flow of refrigerant to the evaporator circuit associated therewith when the cooling load served by the evaporator circuit is satisfied. The valves 17 are also adapted to provide a first stage refrigerant flow restriction for the evaporator circuit associated therewith when the valve is open. The capillaries 19 provide second stage refrigerant flow restrictions for the evaporator circuits associated therewith, the total restriction provided by the valves and the capillaries being selected to provide the desired superheat in the refrigerant leaving the evaporator circuits under normal operation conditions.

In systems which have heretofor employed solenoid valves

to prevent flow of refrigerant to the evaporator circuit associated therewith, a valve two or three times as large as that necessary in the disclosed system was necessary to prevent flashing or undue restriction to the flow of refrigerant. By utilizing a small valve and placing a fixed restrictor adjacent or immediately downstream from the valve, the valve may be utilized as a first stage restriction. The fixed restriction must be placed adjacent or immediately downstream from the valve to minimize pressure recovery between the valve and the fixed restriction.

By providing a first stage pressure drop through the solenoid valve of at least 50 percent of the total pressure drop through the valve and the capillary, a smaller and, therefore, more economical valve may be employed in the system. Further, since the entire pressure drop is not taken across the capillary tube, a larger diameter capillary may be employed to minimize the possibility of contaminants in the system plugging the capillary.

A heat exchange medium to be cooled is passed over evaporator circuits 13 in heat exchange relation with the refrigerant therein, the heat exchange medium being cooled and the refrigerant being vaporized thereby. Refrigerant from the evaporator circuits is provided to an accumulator 21 through refrigerant line 23. Liquid refrigerant which may have passed through the evaporator circuits under low load conditions is collected in the lower portion of the accumulator to prevent "slugs" of liquid refrigerant from reaching the compressor and causing damage to the valves thereof. Refrigerant vapor from the upper portion of the accumulator passes to the compressor through refrigerant line 5 to complete the refrigeration cycle.

I claim:

1. A refrigeration system comprising a compressor;
a condenser for condensing refrigerant vapor from said compressor;
a plurality of evaporator circuits for passing heat exchange medium to be cooled in heat exchange relationship with refrigerant from said condenser, the refrigerant in the evaporator circuits being heated and vaporized thereby;
individual valve means associated with each of said evaporator circuits, each of said individual valve means being adapted to prevent flow of refrigerant to the evaporator circuit associated therewith when said valve means is closed and to provide a first stage pressure drop to restrict flow of refrigerant to the evaporator circuit associated therewith when said valve means is open; and
fixed restriction means disposed immediately downstream from each of said individual valve means to provide a second stage pressure drop to restrict flow of refrigerant to the evaporator circuit associated therewith, said individual valve means providing at least 50 percent of the pressure drop created by the combination of said individual valve means and said fixed restriction means.
2. A refrigeration system according to claim 1 wherein said refrigerant restriction means is a capillary tube.
3. A refrigeration system according to claim 2 wherein each of said individual valve means comprises a solenoid valve, the total restriction to refrigerant flow through said solenoid valve and said capillary producing the required refrigerant flow to the evaporator circuit associated herewith.

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