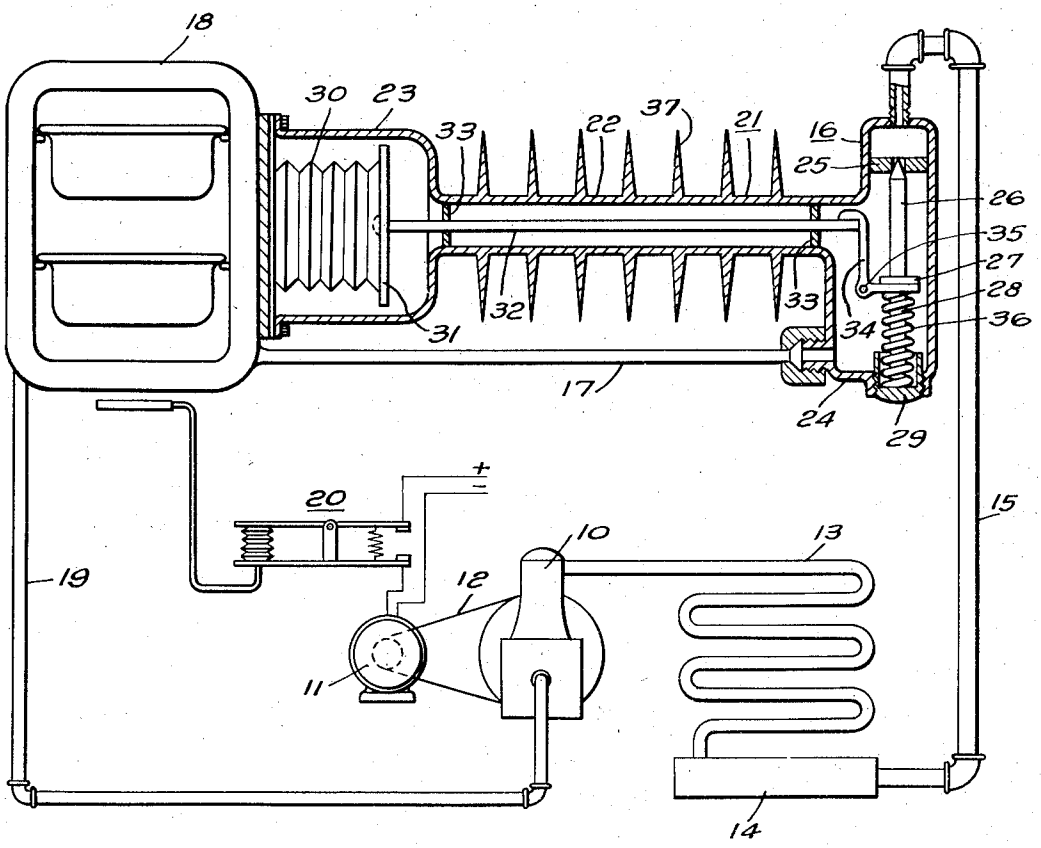
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REFRIGERATING APPARATUS

Filed Aug. 14, 1929



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REFRIGERATING APPARATUS

Application filed August 14, 1929. Serial No. 385,880.

My invention relates to refrigerating apparatus and specifically to refrigerating apparatus of the type that is provided with automatic controls.

It is an object of the invention to provide, in such an apparatus, an improved form of expansion or pressure-reducing valve.

A further object is to provide an expansion valve in which the pressure of the refrigerant medium through the evaporator may be reduced in proportion to a reduction of the evaporator temperature.

More specifically the invention has for its object to provide an expansion valve responsive to the differential between the internal pressure of the evaporator and the pressure existing within a gas filled expansible chamber located adjacent the evaporator, this latter pressure being in turn responsive to the evaporator temperature.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawing, wherein:

The single figure illustrates a refrigerating system embodying the invention, the expansion valve being shown on an enlarged scale.

A compressor 10 is driven from a motor 11, by means of a belt 12. The compressed refrigerant is liquefied in a condenser 13, and the liquid refrigerant is collected in receiver 14. Conduit 15 conducts liquid refrigerant under pressure from the receiver to the pressure reducing valve 16. Liquid refrigerant passes through the valve 16 to conduit 17, and thence to the evaporator or heat absorbing chamber 18. The liquid refrigerant in passing through valve 16 has its pressure reduced to such an extent that it vaporizes in evaporator 18, due to the absorption of heat from the surrounding air. The vaporized refrigerant is withdrawn from the evaporator through conduit 19, by the compressor, where it is recompressed for the succeeding cycle. A pressure-operated switch 20, responsive to the temperature of the evaporator 18, may be employed for controlling the starting and stopping of motor 11.

Referring specifically to the pressure-reducing valve 16, which comprises the present invention, there is shown a casing 21 having a central elongated tubular portion 22 provided at each of its ends with an enlarged portion or chamber 23 and 24. The chamber 24 contains a seat 25, with which cooperates the valve member 26. The valve is provided with a stem 28, and carries a collar 27. A light coil spring 36 encircles the stem 28 and is retained between the collar 27 and a recessed member 29, which may be screw-threaded into the chamber 24 and adjustable from outside the chamber in order to regulate the tension of the spring. The spring normally tends to seat valve 26.

Chamber 23 has a portion of its surface disposed in intimate thermal contact with the evaporator. An expansible element or sylphon bellows 30 is disposed within chamber 33 and is supported from that portion of the chamber which is in thermal contact with the evaporator.

The movable end of bellows 30 is closed by a head 31 which has rigidly attached thereto one end of a rod 32. The rod extends through the elongated tubular portion 22 of the valve casing, and is slidably supported by guide members 33. The free end of rod 32 extends partially into the chamber 24, where it contacts with one arm of a bell-crank lever 34. The bell-crank is pivoted within chamber 24, as indicated at 35. The other arm of the bell-crank may be substantially U-shaped, and is located around the valve stem 28, and interposed between collar 27 and spring 36.

The expansible element or bellows is filled with a volatile gas which, under predetermined temperature conditions, will build up sufficient pressure to expand the bellows and thereby move rod 32 to the right in the figure. The movement of the rod in this direction will cause it to bear against the adjacent arm of the bell-crank lever 34, and thereby rotate this lever in a clockwise direction about its pivot 35. The other arm of the bell crank will thereupon compress the spring 36 and permit the valve to unseat.

In the operation of the device, assuming the evaporator to be relatively warm, the volatile gas in the expansible member 30 will

exert sufficient pressure to move rod 32 and bell-crank lever 34 and thereby unseat valve 26. This will admit a quantity of liquid refrigerant to the evaporator 18 at a reduced pressure. The refrigerant then expands, due to the absorption of heat from the air surrounding the evaporator, and builds up a back pressure which acts against head 31 of expansible element 30, and thereby opposes the pressure exerted within this element by the gas contained therein. When the back pressure in the evaporator and consequently in the chamber 23 is equal to that within the bellows, the spring 36 seats the valve 26. An excess of pressure within the bellows, over the combined back pressure and pressure of the spring, will unseat the valve and permit more refrigerant to enter the evaporator. Since the pressure within bellows 30 is directly dependent on the temperature of evaporator 18, it will be apparent that the valve is controlled by both the evaporator temperature and the pressure within the evaporator, as distinguished from the conventional expansion valve between the back pressure and atmospheric pressure acting on opposite sides of a diaphragm or bellows, assisted generally by a spring.

The tubular portion 22 is made of considerable length and provided with fins 37, in order that the temperature of the valve chamber may not influence the expansible element 30, thereby permitting the latter to be controlled entirely by the evaporator temperature.

It will be apparent that my invention provides an expansion valve which is decidedly sensitive and will maintain a pressure in the evaporator which is proportional to the evaporator temperature, thereby ensuring the most efficient operation of the compressor.

While I have shown a single embodiment of the invention, it will be apparent that other forms might be adopted, all coming within the scope of the appended claims.

I claim as my invention:

1. In a refrigerating apparatus, an evaporator, an expansion valve for controlling the flow of refrigerant medium through said evaporator, said valve comprising a sealed casing having enlarged end portions and an intermediate tubular portion, one of the enlarged end portions being adjacent the evaporator and in thermal contact therewith, a gas-filled expansible member in said adjacent portion, a valve and valve seat in the opposite end portion, and operative connections between said expansible member and said valve, said connections passing through the tubular portion.

2. An expansion valve comprising a relatively long tubular portion having enlarged recesses at each of its ends, the whole comprising a sealed casing, an expansible member in one of said recesses, a valve and seat therefor in the other recess, and connections between the expansible member and the valve, said connections extending through the tubular portion, said tubular portion having a finned outer surface.

In testimony whereof, I have hereunto subscribed my name this 3rd day of August 1929.

MILTON KALISCHER.