

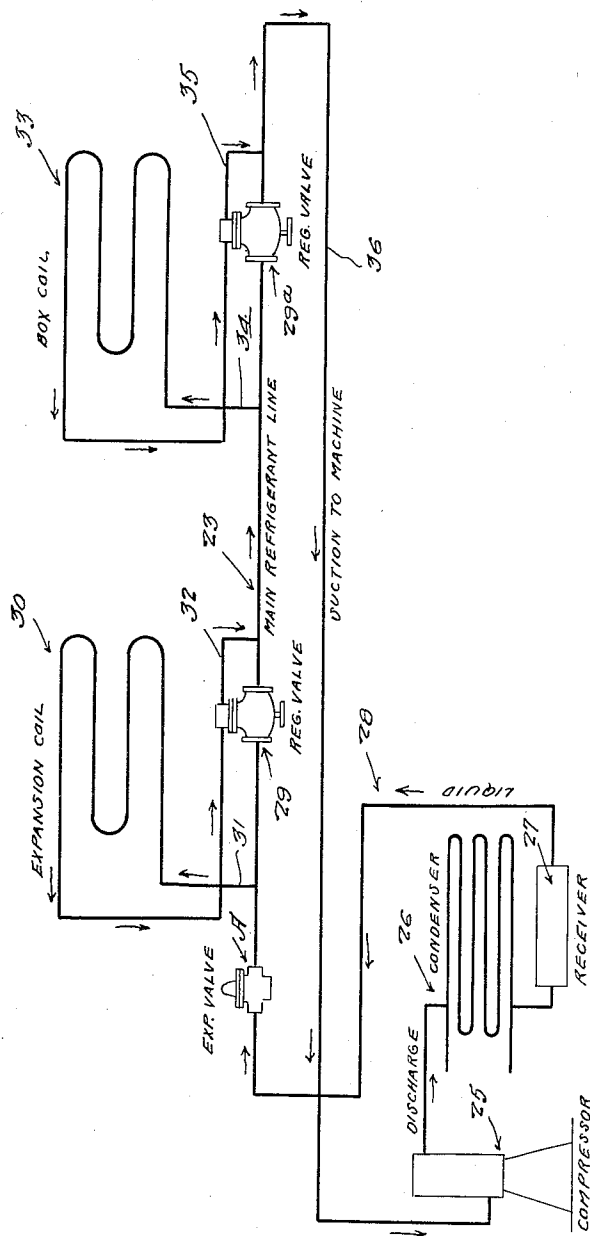
April 21, 1931.

E. E. SNADER

1,801,371

AUTOMATIC TEMPERATURE CONTROLLED REFRIGERATING SYSTEM

Filed March 13, 1929



Inventor

E. E. Snader

By *Clarence A. O'Brien*
Attorney

UNITED STATES PATENT OFFICE

EARL E. SNADER, OF WAYNESBORO, PENNSYLVANIA

AUTOMATIC TEMPERATURE-CONTROLLED REFRIGERATING SYSTEM

Application filed March 13, 1929. Serial No. 346,600.

This invention relates to an improved automatic temperature controlled refrigerating system for boxes, rooms, and analogous enclosures, where two or more units are fed by one automatic expansion valve as in the case of direct expansion systems.

The system disclosed and claimed in this application is also disclosed in application Serial No. 114,726, filed June 9, 1926, which matured into Patent #1,636,874, granted to me under date of July 26, 1927.

The patent shows, by way of disclosure, the system herein explicitly described and claimed, but has more particular reference to a particular automatic temperature actuated refrigerant regulating valve, of the type also embodied in this present application.

In nearly all forms of apparatus of this specification, the distribution of the refrigerant to the expansion coils or other refrigerating vessels is regulated by hand. Whereas this is practical with machines which always work under the same conditions of load and temperature, it has proven to be unsatisfactory in systems of the type units illustrated.

There are, however, cases, in which, by reason of the variations in the conditions of working, a single adjustment does not suffice. Instead the man in charge of the machine is compelled to continually adjust the distribution of the refrigerant in order to obtain as far as possible, the maximum efficiency of the machine under these varying conditions.

Refrigeration systems are commonly operated with a substantial loss in efficiency due to the fact that it is impractical with the systems as at present constructed to control the flow of the refrigerant to meet the varying requirements of a series of chambers being refrigerated. A regulating valve is set to maintain the pressure of the refrigerant at such a point necessary to effect a rapid frosting of all of the coils, the temperature of the refrigerant being correspondingly increased. Thus the cooling effect is lowered, and further there is danger that when the coils have been frosted an objectionable frosting back to the compressor will result. On the other hand, when the valve is set to supply

the refrigerant at a low pressure, the frosting of several coils occurs so slowly that some of them remain practically inoperative for a substantial portion of the period of operation.

It follows, therefore, that I have evolved and produced a characteristic new type of circulating system and valve arrangement wherein automatic temperature actuated refrigerant regulating valves are employed and arranged to be governed by temperature variations in the system, whereby to regulate the flow of refrigerants in accordance with the varying requirements.

Other ideas, advantages and features of the present contribution to the art will become more readily apparent from the following description and the accompanying drawing.

In the drawing:

The single figure represents a diagrammatic illustration of the complete system, showing the method of circulation of the refrigerant and the respective placement of valves.

Referring now to the drawing by reference numerals, it will be observed that 25 designates the compressor. The fluid passes from the compressor through the condenser 26, and into the receiver 27. By way of the piping 28, the fluid passes on to and through the automatic expansion valve A, into the main refrigerant line 23. Located in this refrigerant line is an automatic temperature actuated refrigerant regulating valve 29 of the construction illustrated in Patent #1,636,874, already mentioned. This is in direct association with the expansion coil generally designated by the reference numeral 30. It will be observed that the intake 31 is on one side of the valve 29 and the outlet or discharge end 32 is connected with the main refrigerant line on the opposite side of the valve, after passing through and having direct co-related connection with the thermostatic portion of the valve 29.

The reference character 33 designates a duplicate box or extension coil, whose intake end 34 leads from and has communication with the main refrigerant line 23, on the left

hand side of the second automatic regulating valve 29a.

The discharge end 35 is connected with the feed or refrigerant line on the opposite right hand side of this same valve. The reference character 36 designates the suction which extends back to the compressor 25.

In this system the liquid leaves the receiver and is led to the expansion valve which is nothing more than a pressure reducing valve where the pressure is reduced from high pressure on the one side to a lower pressure on the other or coil side. Since there is such a little bit of liquid allowed to pass the valve it is quickly vaporized by the heat of the air in the rooms, which results in a lowering temperature in the vicinity of the pipes.

The vapor takes the course shown by the arrows into the bottom of the coil, up through the coil and around through the top of the regulating valve where it comes into contact with the thermostatic element. Now the gas on its way through the coil absorbs the heat of the room. At first the amount of heat absorbed is so great that the temperature of the vapor at the thermostatic element is greater than at the point just after passing the expansion valve, but by passing a continuous stream of cold vapor through the coils in the room, the amount of heat absorbed becomes less and less at the thermostatic element, causing it to contract, allowing the valve to open.

By this system, I am able to control the amount of refrigerant fed to each coil by permitting the refrigerant to do the work, i. e., say the refrigerant after leaving the expansion valve is composed or made up of 25 units, the room is warm and requires an expenditure of 5 units to bring it to the required temperature for which my regulating valve has been set, the refrigerant upon going clear through the coil gives up the five units required and in the case of refrigeration, my refrigerating capacity is reduced by five units. The refrigerant has gone up five units in passing through the coils, which increase in temperature affects my thermostat or expansion element causing it to exert more pressure on the sliding sleeve and thereby reducing the area through the regulating valve so that the exact amount of refrigerant required to do the work goes through the coils and the remainder of the capacity of twenty five units passes through the regulating valve to the rest of the coils in the series. At the present time, as before stated, hand operated valves are used in this position and require the utmost of attention to maintain correct temperatures in the expansion units or coils.

In carrying out this invention, I wish it distinctly understood that it is not at all necessary to use an automatic temperature control valve of the character illustrated and claimed in the patent aforementioned.

In this type of valve, the thermostat is disposed directly to the temperature of the room or other enclosure within which it is confined. The gist of this structure is, therefore, the provision of a refrigerating system of the automatic type wherein there is a refrigerant line, a regulating valve in this line, suitable means for controlling the valve, and a by-pass in the form of an expansion or a box coil, which communicates with the line, at opposite sides of the regulating valve.

Comprehended more specifically, I would emphasize the main refrigerant feed line in connection with the inlet and outlet end of each coil of a series of two or more cooling coils, one automatic temperature regulating valve for each room and coil, the valve being located in the feed line between the inlet and outlet of the complementary coil and its opening and closing being controlled by the temperature of the refrigerant passing through said complementary coil.

For sake of completeness I desire to mention in conclusion that an automatic cut off spaced valve may be incorporated in the return line, or some well known low pressure or low temperature control for the driving motor may be incorporated in the return line 36 to the compressor.

A careful analysis of the description in connection with the drawings will enable the reader to obtain a clear understanding and comprehension of the features and advantages of the invention, for which reason a more detailed description is regarded as unnecessary.

In conclusion, I desire to remind the reader that minor changes in the shape, size, and rearrangement of details falling within the scope of the adjoining claims may be resorted to, in actual practice, if desired.

I claim:

1. An automatic refrigeration system comprising condensing mechanism, a refrigerant feed line, an expansion coil having inlet and outlet connections in continuous unobstructed communication with the feed line, an automatic temperature controlled valve interposed in said feed line between and independent of the inlet and outlet connections of said expansion coil to the feed line.

2. In a system as defined in claim 1, said temperature controlled valve being responsive to the temperature of the refrigerant leaving the outlet connection of said coil.

In testimony whereof I affix my signature.

EARL E. SNADER.