

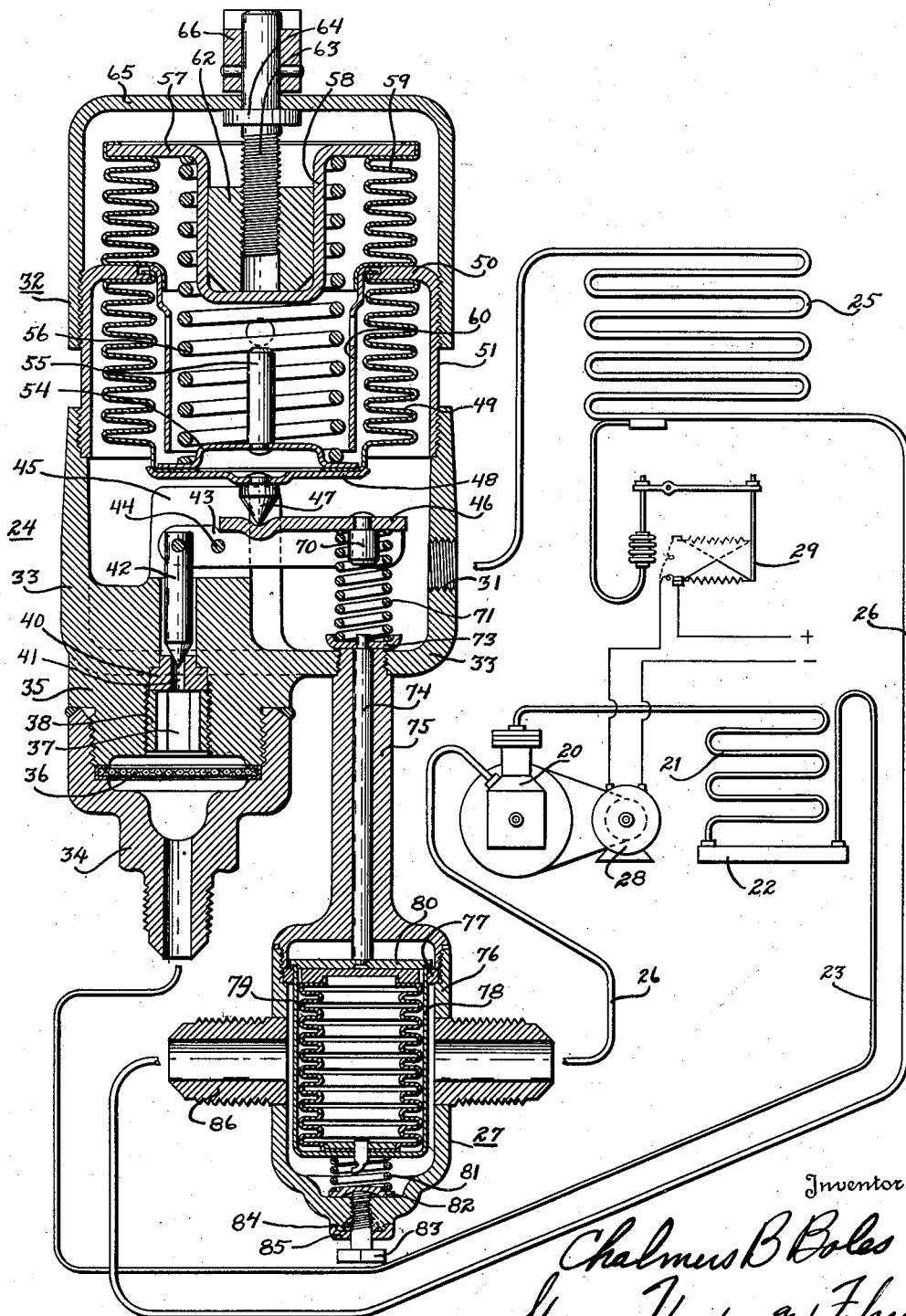
May 30, 1939.

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2,160,453

REFRIGERATING APPARATUS

Filed Feb. 26, 1934



UNITED STATES PATENT OFFICE

2,160,453

REFRIGERATING APPARATUS

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Application February 26, 1934, Serial No. 712,954

3 Claims. (Cl. 236—92)

This invention relates to refrigerating apparatus and more particularly to fluid control means therefor.

It is an object of my invention to provide an improved fluid control means for a refrigerating system incorporating a unitary structure which controls the flow of refrigerant to the evaporator according to the temperature of the refrigerant leaving the evaporator.

It is another object of my invention to provide a fluid controlling device responsive to the pressure of the fluid flowing therethrough having a temperature responsive means acting independently of the pressure responsive means upon the fluid controlling means.

It is a more specific object of my invention to provide a thermostatic control means acting upon the return spring of a pressure responsive expansion valve.

It is another object of my invention to provide a convenient sealed adjusting means for a thermostatic expansion valve which acts upon the pressure responsive control means independently of the thermostatic means to provide means for definitely setting and limiting back pressure independently of the thermostatic means.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

The figure is a sectional view of a fluid controlling means together with the remaining portions of a refrigerating system illustrated diagrammatically.

Referring to the drawing, there is shown a compressor 20 for compressing the refrigerant and for forwarding the compressed refrigerant to a condenser 21 where the compressed refrigerant is liquefied and collected in a receiver 22. From the receiver the liquid refrigerant is forwarded through a supply conduit 23 to my improved fluid controlling means 24 which controls the flow of liquid refrigerant to an evaporator 25. The evaporator 25 absorbs heat from the medium to be cooled and evaporates the liquid refrigerant. This evaporated refrigerant is returned to the compressor through the return conduit 26 which passes through the thermostatic portion 27 of the fluid controlling means 24 on its way to the compressor. The compressor 20 is driven by an electric motor 28 through a suitable pulley and belt means under the control of a snap acting switch means 29 which is con-

trolled by any suitable means, such as the temperature of a portion of the evaporator 25.

The fluid controlling device 24 is provided with a housing 32 which is made up of a plurality of pieces which are threaded together. The lower portion of the housing is formed by the cup-shaped valve casing 33 provided with a coupling member 34 which connects the fluid controlling device with the supply conduit 23. The coupling member is threaded to a boss 35 formed upon the lower portion of the valve casing. Held between the coupling member 34 and the boss 35 is a filter or screen 36. The boss 35 is provided with a fluid passage 37 extending therethrough which is provided with a threaded bushing 38 which holds a valve seat member 40 against the shoulder in the passage. This valve seat member has a passage 41 extending therethrough and is provided with a valve seat upon its upper surface.

A valve member 42, located within the passage 37, is pinned at its upper end to a lever 43 which is pivoted upon a pivot pin 44 extending between bosses 45 formed within the valve casing. The lever 43 is provided with a flanged upper surface 46 having a recess which receives the conical point 47 riveted to an end plate 48 which is hermetically sealed to the lower end of a flexible metal bellows 49. The upper end of this flexible metal bellows 49 is fastened and hermetically soldered to the flange 50 of an intermediate casing member 51 threaded to the upper edge of the valve casing 33. Within the bellows 49 is an inner end plate 54 which is provided with a flushing pin 55 riveted thereto. Resting upon this end plate and surrounding the flushing pin is a compression type coil adjusting spring 56 which has its upper end held by a movable end plate 57 provided with a boss 58 extending within the compression spring 56.

This movable end plate 57 is hermetically soldered to the upper end of a flexible metal bellows 59 which at its lower end is hermetically soldered to the flange 50 of the intermediate casing member 51. Extending downwardly from the flange 50 is an internal bellows stop 60 which limits the collapsing of the bellows 49 under high pressure conditions. This bellows stop is provided with apertures to permit the free flow of any air or gas within the bellows interior. Within the boss 58 provided in the movable end plate 57 is an adjusting block 62 which is tightly fastened therein. This adjusting block receives an adjusting screw 63 provided with a flange 64 which rests against a cap member 65 forming the upper end of the housing 32 and threaded to the intermedi-

ate casing member 51. The adjusting screw 63 extends through the cap member 65 and is provided with a finger manipulator 66 upon its exterior portion. Between the bellows 59 and the cap member 65 is provided a non-congealing sealing solution which prevents any moisture from condensing or freezing upon the bellows 59 or the adjusting screw 63. The bellows 59 seals the interior of the lower bellows 49 as well as the compression spring 56 and the other parts therein.

At the end opposite the valve 42, the lever 43 is provided with a pin 70 which is surrounded by a compression type return spring 71 tending to urge the valve 42 to closed position. The lower end of the compression spring is supported by the spring retainer 73 which is riveted to a stem 74 which extends within a tubular connecting member 75 having its adjacent end threaded into the valve casing 33. The opposite end of the member 75 carries a thermostatic control means 27 including a housing member 76 threaded to the member 75 which holds between shoulders a bellows plate 77. One end of the cup-shaped metal bellows is hermetically soldered to this plate 77 while its opposite closed end is connected to the closed end of a yoke 78 which extends around three sides of the bellows 79. This yoke 78 has its arms connected through apertures in the plate 77 to a movable plate 80 which is riveted to the adjacent end of the stem 74. This thermostatic means is provided with an adjustment which includes a compression spring 81 extending between the yoke 78 and a spring retainer 82. The location of the spring retainer 82 may be varied by an adjusting screw 83 which extends through the end of the thermostatic housing member 76 and is provided with packing 84 and a packing gland 85 for preventing the escape of any refrigerant.

In operation the liquid refrigerant from the supply conduit 23 enters the valve through the coupling 34 and passes through the passages 37 and 41 to the valve 42. If the pressure within the valve casing is sufficiently low the compression spring 56 will expand the bellows 49 to pivot the lever 43 in a clockwise direction to open the valve 42. This will permit the refrigerant to flow into the chamber provided in the valve casing and exert its pressure upon the bellows 49. This refrigerant passes from this chamber through the outlet 31 in the wall of the chamber directly into the evaporator 25 and thus under these conditions the bellows 49 is directly under the influence of the pressure within the evaporator 25. As the refrigerant leaves the evaporator 25 it passes through the coupling 86 into the bellows chamber of the thermostatic portion 27. The interior of the bellows 79 is preferably charged with a volatile fluid, such as a volatile refrigerant, which, if desired, may be the same refrigerant as is used in the refrigerating system.

When all the refrigerant has been evaporated in the evaporator 25 and only vapor is being discharged therefrom, the bellows 79 will be expanded and be in a position with the movable plate 80 held against the fixed plate 77 which serves as a stop. In this position the thermostatic control is inactive. However, when too much liquid refrigerant is being supplied to the evaporator 25, liquid refrigerant or saturated vapor will pass into the bellows chamber and cool the volatile fluid within the bellows. This will cause the bellows to contract and to cause the yoke 78 and the stem 74 to be moved toward the valve housing 32, thereby moving the spring

retainer 73 upwardly to further compress the compression spring 71, which in turn will provide a greater force to urge the valve 42 to closing position. In this way the flow of liquid refrigerant is properly controlled and is prevented from being returned to the compressor 20.

This thermostatic control when effective merely serves to lower the pressure at which the valve 42 is moved to closing position by the compression spring 56 and in this way the thermostatic control acts to lower the back pressure within the evaporator 25 when too much refrigerant has been supplied thereto and in this way facilitates the evaporation of the refrigerant and the correction of such a condition.

The thermostatic control device cannot at any time raise the permissible back pressure. This can only be accomplished by the adjusting screw 63 which by varying the tension of the compression spring 56 varies the maximum back pressure. The finger manipulator 66 provides a very convenient adjustment of the maximum back pressure independently of the thermostatic control. By the screw 83 the thermostatic control may be adjusted independently of the pressure responsive means. By this particular arrangement I am enabled to adjust the back pressure entirely independently of the thermostatic means since under such conditions the thermostatic control is inactive. These particular advantages are mainly accomplished by making the thermostatic control independent of the pressure control by providing an independent adjustment for the pressure control and thermostatic control. Another feature contributing to this is the resilient connection between the thermostatic control and the valve means which is provided by the compression spring 71 and which permits independent operation of the pressure and thermostatic controls. By turning the adjusting screw sufficiently, the end plate 57 may be caused to engage the flushing pin 55 to positively hold the valve open.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A fluid controlling means including a lever, a valve connected to the lever for controlling the flow of fluid, a pressure responsive means responsive to the pressure of the fluid flowing through the valve and acting upon said lever for affecting the opening and closing of the valve, a spring means positioned upon the opposite side of the lever as said pressure responsive means and acting upon the lever for urging the valve to closed position, and thermostatic means acting directly upon said spring means and through the medium of said spring means to urge the valve to closed position responsive to a decrease in temperature, adjusting means for said thermostatic means, a second spring means acting upon said pressure responsive means, and adjusting means for said second spring means.

2. A fluid controlling means including a lever, a valve connected to the lever for controlling the flow of fluid, pressure responsive means responsive to the pressure of the fluid flowing through the valve and acting upon said lever for affecting the opening and closing of the valve, a spring means acting upon the lever for urging the valve to closed position, thermostatic means acting directly upon and through the medium

of said spring means to urge the valve to closed position in response to a decrease in temperature, a second spring means acting upon said pressure responsive means for opening the valve, a casing means enclosing the valve, the lever, the pressure responsive means, the thermostatic means and both of said spring means, and adjusting means having an operating portion outside of said casing for adjusting said thermostatic means and a second external adjusting means independent of said first mentioned adjusting means, and having operating means outside of said casing for adjusting said second spring means.

3. A fluid controlling means including a lever, a valve connected to the lever for controlling

the flow of fluid, a pressure responsive means responsive to the pressure of the fluid flowing through the valve and acting upon said lever for affecting the opening and closing of the valve, a spring means acting upon the lever for urging the valve to closed position, thermostatic means acting directly upon said spring means and through the medium of said spring means to urge the valve to closed position responsive to a decrease in temperature, a second spring means acting upon said pressure responsive means for opening the valve, adjusting means for said second spring means, a third spring means acting upon said thermostatic means, and a second adjusting means for said third spring means.

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