Jan. 7, 1930. F. G. SLAGEL 1,742,323

EXPANSION VALVE MECHANISM FOR REFRIGERATORS

Filed July 5, 1927

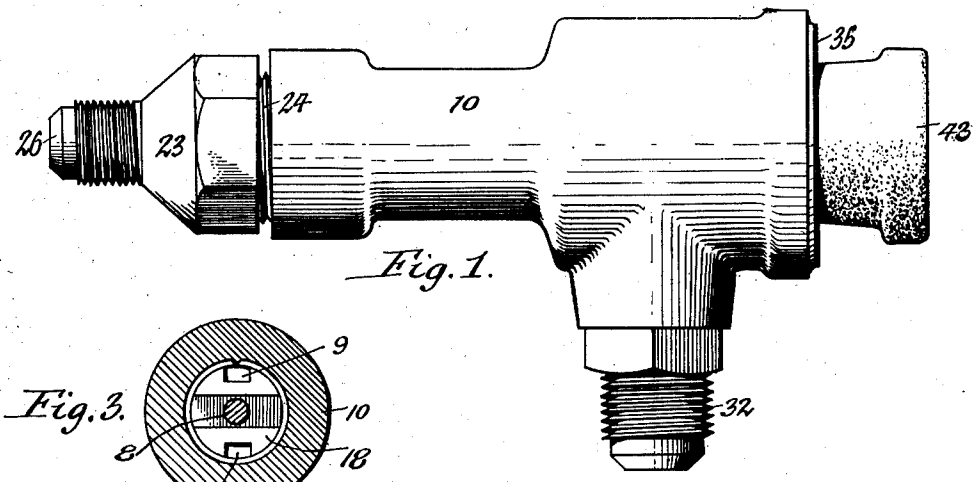


Fig. 1.

Fig. 3.

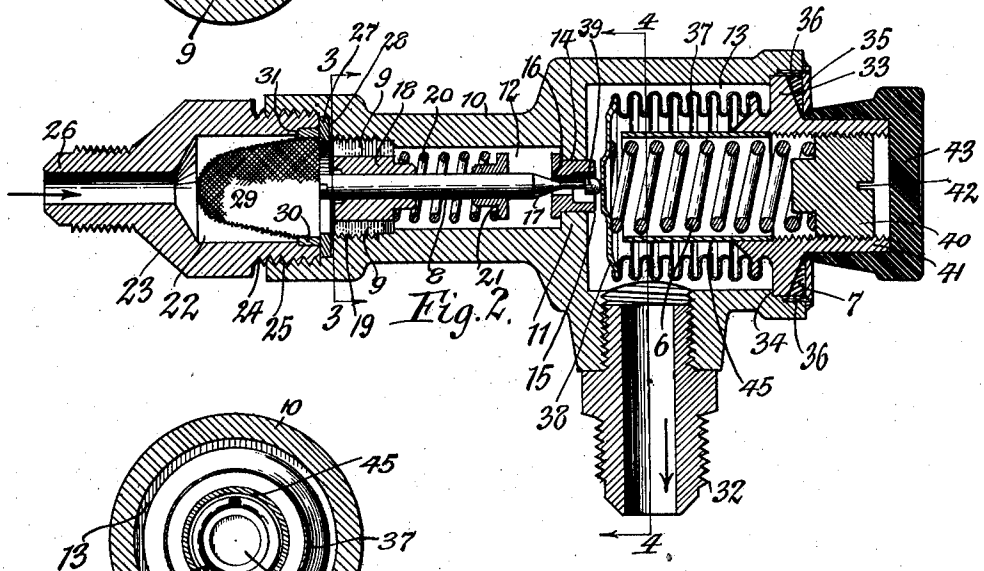


Fig. 2.

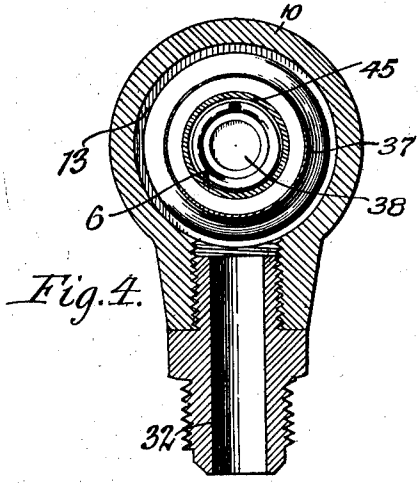


Fig. 4.

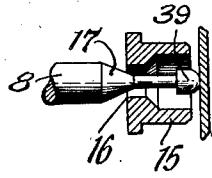


Fig. 5.

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UNITED STATES PATENT OFFICE

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EXPANSION-VALVE MECHANISM FOR REFRIGERATORS

Application filed July 5, 1927. Serial No. 203,302.

This invention relates to an expansion valve mechanism for refrigerating machines whereby the flow of refrigerant to the coils and the vaporization of the same for producing a cooling effect are automatically controlled.

The purpose of this invention is the production of a valve mechanism of this character which can be easily adjusted for securing the desired temperature; also to so organize the several parts that the parts can not be readily tampered with; also to prevent the formation of frost on such parts which must be accessible for inspection or adjustment; and also to assemble the several parts in a manner which will insure steady and efficient operation under varying conditions.

In the accompanying drawings:—

Figure 1 is a side elevation of my improved expansion valve mechanism.

Figure 2 is a vertical longitudinal section of the same.

Figures 3 and 4 are cross-sections taken on the correspondingly numbered lines in Fig. 2.

Figure 5 is a fragmentary longitudinal section, on an enlarged scale, of the valve, valve seat and the adjacent part of the diaphragm.

Similar characters of reference indicate like parts in the several figures of the drawings.

The numeral 10 represents the casing of the expansion valve mechanism which is provided internally with a transverse partition 11 whereby the space within the casing is divided into a rear inlet or valve chamber 12 and a front outlet or vapor chamber 13. In this partition is an opening 14 in which is secured a bushing 15 forming a port leading from the inlet to the outlet chamber and having a valve seat 16 at its rear end. This port is controlled by a regulating or vaporizing valve 17 which is movable toward and from the valve seat 16 and arranged on the front end of a valve stem 8 movable lengthwise in the inlet chamber. The rear end of this valve stem is guided in a bushing 18 which is secured in the casing by a screw connection 19 between the periphery of this bushing and the adjacent part of the bore of the casing. This bushing is provided on its periphery with one or more passages 9 for the refrigerant. The regulating valve 17 is yieldingly held in its closed position by a spring 20 surrounding the valve stem and bearing with its rear end against the front end of the bushing and with its front end against a shoulder formed by a collar 21 which is secured to the front part of the stem.

In rear of the inlet chamber is arranged a screen chamber 22 which is formed within a tubular extension 23 having an external screw thread 24 at its front end which engages an internal screw thread 25 at the rear end of the casing. At its rear end the casing extension is provided with an inlet nipple 26 which is adapted to be connected with a pipe through which the liquid refrigerant is supplied under pressure. For producing a leak-tight joint between the extension 23 and the casing, an elastic gasket or washer 27 is clamped between the front end of the extension and a rearwardly facing shoulder 28 on the casing.

Between the screen chamber and the valve chamber is arranged a screen 29 preferably of cap-shape form which has its convex end facing rearwardly and which has secured to its front edge a stiffening collar 30. This collar is clamped between the rear side of the washer 27 and a forwardly facing shoulder 31 on the tubular extension, as shown in Fig. 2, thereby removably securing the screen in the casing and permitting the same to be readily cleaned whenever required.

On its lower side the outlet chamber is provided with an outlet nozzle or nipple 32 whereby this chamber is connected with a delivery pipe leading to the coils or brine tank adapted to receive the vaporized refrigerant for cooling purposes.

The front end of the outlet chamber is closed by a head 33 which bears against an outwardly facing shoulder 34 at the bottom of a rabbet on the front end of the casing and the joint between this head and the casing is rendered leak-tight by filling in the annular groove between the bore of the casing and

the marginal part of the casing with solder, as shown at 7 in Fig. 2. A metal ring 35 preferably extends over this solder and the adjacent end portion of the casing, which ring is held in place on the casing by pins 36 and not only serves to protect the solder joint but also produces a more finished appearance and also forms a convenient name plate bearing information regarding the valve mechanism.

Within the outlet chamber are arranged the means whereby the valve is automatically opened and additional refrigerant is admitted in the form of vapor when the pressure in the outlet chamber and connecting passages drops below normal and again automatically cuts off the admission of such refrigerant when the pressure in the outlet chamber has been restored to normal. The means for thus automatically controlling the admission of refrigerant into the outlet chamber in response to variations in the pressure therein are preferably constructed as follows:—

This automatic controlling mechanism comprises a diaphragm which preferably has a bellows or an accordion shaped side wall or body 37 which is arranged in the vapor or outlet chamber and connected at its front end with the outer head of this chamber, and a head 38 arranged at the rear end of the accordion wall and engaging with a shifting pin or head 39 arranged on the front end of the valve. Within the diaphragm is arranged a resistance spring 6 which bears at its inner end against the head of the diaphragm and at its outer end against a screw plug 40 working in an internally threaded tubular neck 41 on the outer head of the vapor chamber.

Undue lateral deflection of the resistance spring and the diaphragm is prevented by a guide tube 45 which surrounds the resistance spring and is secured at its outer end to the head of the vapor chamber. The plug 40 may be turned to vary the tension of the resistance spring, this being preferably accomplished by inserting a screw driver or similar tool in a nick 42 in the outer end of this plug. For the purpose of concealing this plug so that the device is not likely to be disarranged by persons unacquainted with the workings of the device, a cap 43 of rubber or other heat insulating material is slipped over the outer end of the neck so as to conceal the adjusting plug, which cap also improves the appearance of the device and prevents frost from gathering on the neck and plug which otherwise would prevent convenient access to the plug when adjustment of the same is required.

When the pressure in the outlet or vaporizing chamber is below normal due to lowering of the temperature below normal adjacent to the cooling unit or coils, then the pressure of the resistance spring expands the diaphragm and causes the valve to be opened, thereby permitting the liquid refrigerant under pressure in the inlet chamber to pass through the port into the outlet chamber in the form of vapor, whereby the temperature in the latter and the coils connected therewith is lowered and the pressure raised. During such increase in pressure in the vaporizing chamber the diaphragm is compressed and when the normal pressure in this chamber has been restored corresponding to the desired reduction in temperature, the diaphragm is contracted to such an extent as to permit the valve to again close under the pressure of its spring, thereby preventing the further increase in pressure in the vaporizing chamber.

This valve mechanism is not liable to stick nor get out of order, thereby insuring steady operation of the refrigerating apparatus of which it forms a part and maintaining the material to be preserved constantly at the desired temperature.

I claim as my invention:—

An expansion valve mechanism comprising a casing having an inlet chamber, an outlet chamber and a port connecting said chambers, a valve arranged in said inlet chamber and movable toward and from said port and having a shifting pin projecting through said port into said outlet chamber, a head closing the outer end of said outlet chamber and provided with a tubular neck, a diaphragm arranged in said outlet chamber and having an accordion wall one end of which is secured to said casing head and a head arranged on the opposite end of said accordion wall and adapted to engage said pin, a spring arranged within the diaphragm and engaging one end with the head thereof, a screw plug working in said neck and engaging with the other end of said spring and a cap of heat insulating material applied to the outer side of said neck.

In testimony whereof, I hereby affix my signature.

FRANKLIN G. SLAGEL.