Feb. 26, 1929. 1,703,531

R. M. HYDE

DIAPHRAGM FOR EXPANSION VALVES

Filed May 23, 1927

Fig. 1.

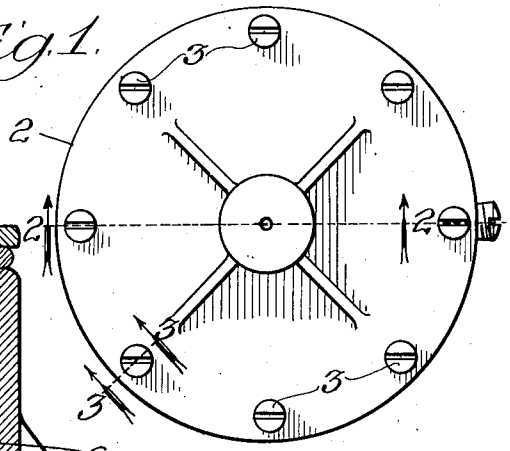

Fig. 2.

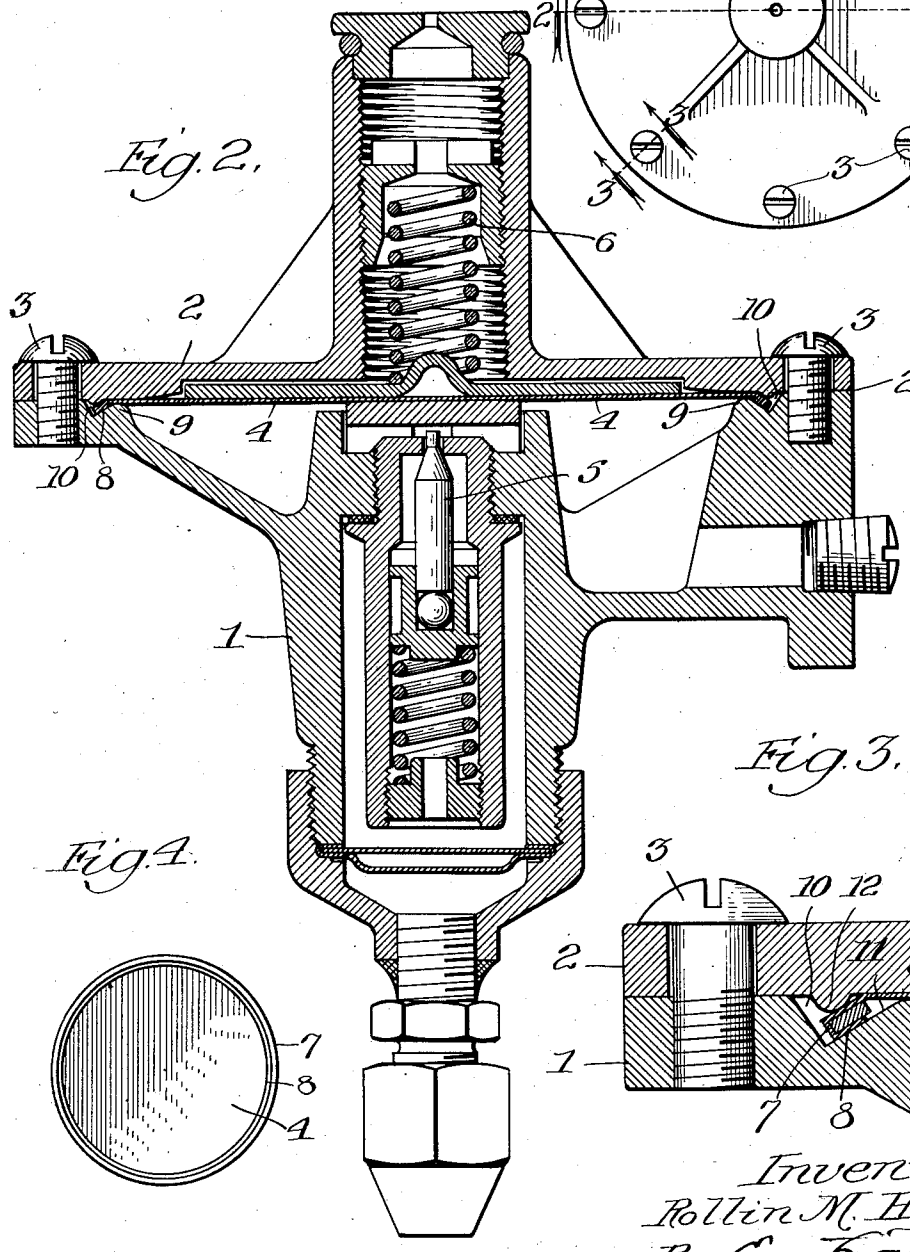

Fig. 3.

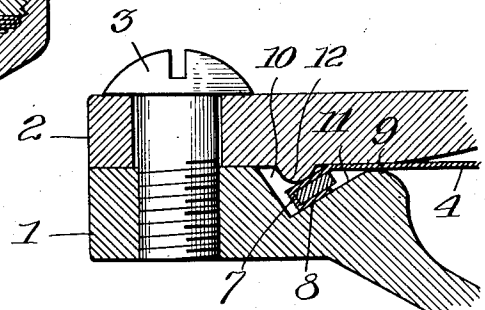

Fig. 4.

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UNITED STATES PATENT OFFICE.

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DIAPHRAGM FOR EXPANSION VALVES.

Application filed May 23, 1927. Serial No. 193,455.

This invention relates to expansion valves for refrigerating machines, and more particularly to means for securing the light metal diaphragms in place in the valves and maintaining them under tension so that they will operate properly at all times.

Heretofore, the practice has been to solder the outer edges of these light metal diaphragms in grooves machined in the bodies of the valves. The soldering operation, by reason of the heat employed, causes the diaphragms to warp because the heat can not be uniformly applied, and warped diaphragms have been a source of great annoyance in connection with these valves because they operate at a set pressure by means of the diaphragms. Moreover, in soldering the diaphragms to the valve bodies, considerable difficulty has been encountered in trying to keep the diaphragms perfectly flat when applied so that they will function properly in all valves at all times.

The main object of my invention is to clamp the diaphragms to the valve bodies without the use of solder, and thus avoid warped diaphragms as the application of heat thereto in securing the diaphragms to the valve bodies is entirely eliminated.

A further object of my invention is to place the diaphragms under tension as they are clamped in place and thus have perfectly flat diaphragms when applied, to act properly in all valves.

One way to accomplish this object is to thicken the outer edge of the diaphragm as by a lead gasket and force this gasketed edge against an inclined surface which may be in a groove so as to exert an outward tension on the diaphragm all around to stretch it and thus have it flat when applied to the valve.

The invention consists further in the matters hereinafter described and claimed.

In the accompanying drawings—

Fig. 1 is a top plan view of an expansion valve in which the diaphragm is secured in accordance with my invention;

Fig. 2 is an enlarged vertical sectional view taken through the valve on line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary vertical sectional view taken on line 3—3 of Fig. 1; and

Fig. 4 is a rear view of the diaphragm on a smaller scale, before being clamped in the valve body.

The valve to which my invention applies has a body 1 and a cover 2 which is clamped to the body 1 by screws 3, 3 about the outer edges of the cover and body, respectively, as shown. Disposed between the body 1 and the cover 2, in accordance with valves of this character, is a light metal diaphragm 4. In these valves, the opening and closing of the needle valve 5 is controlled by the flexing of the diaphragm 4. As the mechanism by which this is accomplished forms no part of my invention, it need not be described. All that need be said is that a coiled spring 6 in the cover 2 acts against the upper side of the diaphragm, while its under side is acted on by the pressure of the refrigerant passed through the body of the valve, as common in devices of this character.

In accordance with my invention, the outer peripheral edge of the diaphragm 4 is bent inward on itself to provide a channel 7 in which is rolled or otherwise fitted a relatively soft metal ring 8, which may be of lead, as shown in Figs. 3 and 4. The body 1 of the valve inside of the line of screws 3 is provided with an upwardly facing annular boss 9, which supports the diaphragm just inside of its gasketed edge 7—8. Machined or otherwise formed in the body 1 between the line of screws and the boss 9 is an annular groove 10, which is provided with a downwardly inclined bottom wall or surface 11, against which the gasketed edge of the diaphragm is forced by a rib 12 on the under side of the cover 2. With the bottom surface 11 of the groove inclined, as shown, the downward pressure of the rib 12 on the gasketed edge of the diaphragm when clamping the cover 2 to the body 1 by the screws 3 forces the gasketed edge downward and outward from the center of the diaphragm and thereby stretches the same over the boss 9 like the head of a drum to place the diaphragm under tension and maintain it normally flat, when applied, throughout all its portions over the body 1 inside of the boss 9. The greater the tension on the gasketed edge of the diaphragm the greater the stretching and the greater the sensitiveness of the diaphragm to pressure on its opposite sides.

In securing the diaphragm in place in the manner shown and described, all soldering as heretofore employed for this purpose is done away with, which effects a tremendous saving in manufacturing as well as service costs. In addition, this method of securing the diaphragm in place keeps it normally flat when

applied and in no way is it distorted or warped as heretofore. The result is that the diaphragms of all the valves produced will function properly.

The details of structure and arrangement of parts may be variously changed and modified without departing from the spirit and scope of my invention.

I claim as my invention:

1. An expansion valve for refrigerating machines having a body part and a cover part, a flat relatively light metal diaphragm between said parts, and means for clamping the diaphragm in place, said means including a support for the diaphragm and a surrounding inclined surface on one part and a member permanently carried on the other part sufficiently outward from the inner edge of said surface to engage the outer edge of the diaphragm and force it outward along said inclined surface for stretching the diaphragm over said support on the clamping of the two parts together.

2. An expansion valve for refrigerating machines having a body part and a cover part, a flat relatively light metal diaphragm between said parts, means about the outer edge of the diaphragm for increasing the thickness thereof, and means for clamping the diaphragm between the body and cover parts, said means including on one part a support for the diaphragm and a surrounding groove with an inclined surface and a member integrally carried on the other part sufficiently outward from the inner edge of said surface to engage the thickened outer edge of the diaphragm and force it into said groove and outward along said inclined surface for stretching the diaphragm over said support on clamping the body and cover parts together.

3. An expansion valve for refrigerating machines having a body part and a cover part, a relatively light metal diaphragm between said parts, said diaphragm having its outer marginal edge bent to provide a channel, a relatively soft metal ring fitted in said channel to increase the thickness of the outer edge of the diaphragm, and means for clamping the diaphragm between the body and cover parts, said means including on one part a support for the diaphragm and a surrounding groove with an inclined surface and a rib on the other part to engage the thickened edge of the diaphragm and force it into said groove and outward along said inclined surface for stretching the diaphragm over the support on clamping the cover and body parts together.

4. A diaphragm for an expansion valve for refrigerating machines, said diaphragm being flat and made circular in form of relatively light gauge metal, said diaphragm having its surrounding outer edge folded inward to provide an inwardly opening channel, and a ring of relatively soft metal fitting in said channel with the folded edge of the diaphragm enclosing the outer edge of the ring and extending under the lower surface of the same for attaching the ring to the diaphragm.

In testimony whereof I affix my signature.

ROLLIN M. HYDE.