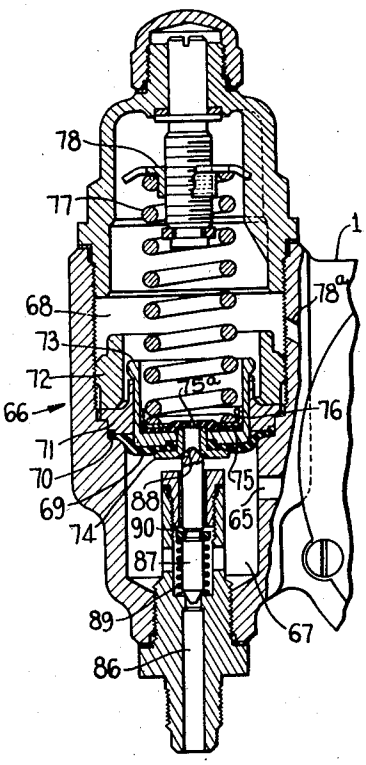
Jan. 25, 1949. A. VON WANGENHEIM 2,460,048

PRESSURE REGULATING MEANS

Filed March 25, 1944

FIG-1



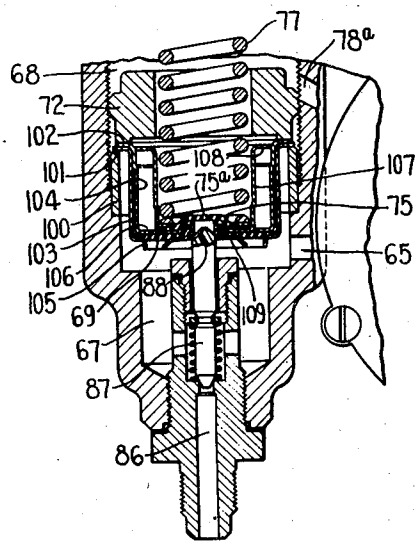


FIG-2

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2,460,048

PRESSURE REGULATING MEANS

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Application March 25, 1944, Serial No. 528,073

10 Claims. (Cl. 137—153)

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This invention relates to new and useful improvements in devices for regulating fluid pressure and more particularly to a by-pass type pressure regulating valve.

An object of the invention is to provide a device in which the component parts may be readily assembled with accuracy in commercial quantity production.

Another object is to provide a pressure regulating valve in which hissing or other noise of discharging liquid will be silenced and substantially eliminated.

The invention consists in the improved construction of parts and their cooperative relation to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings to be taken as a part of this specification, there are fully and clearly shown several preferred embodiments of the invention, in which drawings:

Figure 1 is a view in longitudinal central section of a pressure regulating valve together with part of a pump casing in elevation, and

Fig. 2 is a longitudinal central sectional view of part of a valve similar to Fig. 1, but showing another form of by-pass valve structure.

Referring to the drawings, Fig. 1, by characters of reference, 1 designates generally the casing or housing member for a pump and a pressure regulating means 66. The housing member 1 has an inlet passage or conduit 65 opening from the outlet of the pump and into the pressure chamber 67 of the regulating means 66. The regulating means 66 also includes a by-pass chamber 68 and these chambers 67 and 68 are separated by a pressure responsive member 69, preferably a sheet of flexible, stretchable, resilient material, such, for example, as "Ameripol." Between the chambers 67, 68, the housing member has an internal annular shoulder 70 on which the marginal portion of the member 69 seats. A clamping ring and guide member 71 overlies the shoulder 70 and clamps the marginal edge of the member 69 in tight sealing relation thereto. The ring member 71 is held in position by a hollow clamping nut 72 screw-threaded within the chamber 68. Slidably guided within the ring member 71, there is a cup-shaped backing member 73 having its base portion seating on the pressure responsive diaphragm member 69. Through the diaphragm member 69 and the cup member base portion, there are central alined openings through which there extends a tubular valve seat and guide member 74 having an annular clamping flange which seats against

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and tightly clamps the diaphragm member 69 to the cup member base portion. The seat member 74 extends through the cup member base portion and is rigidly secured thereto and has a projecting end portion within the chamber 68. Within the cup member 73 and seating on its base, there is a silencer disc member 75 of flexible, stretchable, resilient material, such, for example, as "Ameripol" and having a small opening 75a therethrough registering with the bore of the seat member 74. This silencer member 75 is held at its marginal edge portion tightly against the bottom of the cup member 73 by a flanged washer 76 having a tight fit in the cup member 73 and by a helical coil spring 77 which seats at one end on the washer 76. The spring 77, at its other end, abuts an adjustable abutment means 78 by which the force of the spring 77 can be adjusted to determine the fluid pressure in chamber 67 and acting on diaphragm member 69 which will move the diaphragm member 69 toward the by-pass chamber 68. Leading from the by-pass chamber 68 through the wall of housing member 1, there is a by-pass outlet conduit 78a for returning the by-passed liquid either to the pump inlet or to the source of supply for example. The pressure chamber 67 has an outlet port or passageway 86 controlled by valve means 87, which is preferably in the form of a double ended valve member also controlling the flow through the seat member 74 into the by-pass chamber 68. The bore of the seat member 74 provides a by-pass outlet from the pressure chamber 67. The valve member end portion cooperable with the seat member preferably has a bleed slot 88, so that any entrapped air or gas will be discharged and not cause the pump to lose its prime or to be air bound. The spring 77 urges the seat member 74 into closing relation against the double ended valve member 87 and urges this valve member 87 into closing relation with the outlet 86. A spring 89 tends to move the valve means 87 into open relation with respect to the outlet 86 and does so move the valve member 87 when pressure in the chamber 67 moves the diaphragm member 69 upward or toward the by-pass chamber 68. A stop member 90 is provided to limit the movement of valve means 87 by the spring 89, so that when the valve means has been opened a predetermined distance, the seat member 74 can thereupon move away from the valve means 87 to open the by-pass port into the by-pass chamber 68. This action of the valve means 87 is well understood in the art and no further explanation is therefore necessary.

The operation of the pressure regulating means

66 as utilizable in the supplying of oil to an oil burner, for example, is as follows: When the pressure of the oil in the chamber 67, and supplied thereto through the passage 65 by the pump in casing 1, has built up so that the force exerted against the diaphragm 69 is sufficient to overcome the force of the compression regulating spring 77, then the diaphragm member 69 will be moved toward the by-pass chamber 68, thus permitting the valve means 87 to move toward open position or upward, thereby permitting the discharge of oil through the outlet passage 86 to the burner. When the pump gets up to speed and is discharging oil at a rate to create the maximum desired pressure in chamber 67 and at the burner, then the stop 90 will limit further opening of the outlet 86 and upon any pressure increase, the diaphragm member 69 will move away from the valve means 87, thereby opening the by-pass port through seat member 74. The extent of opening at the valve seat member 74 will, of course, vary with the pressure in chamber 67. The oil discharging into chamber 68 will be fed therefrom through the passageway 78a to the pump inlet or to the supply tank.

The silencing feature of the pressure regulating means functions by automatically controlling the flow area of the small opening 75a. The pressure in chamber 67, which is sufficient to lift the diaphragm member 69, will, if its flow is at a greater rate than can be handled by the small opening 75a, cause the disc member 75 to stretch upward, thereby increasing the size of the small opening 75a. Therefore, instead of the oil which discharges through the seat member 74 being sprayed into the chamber 68 with a hissing noise, the oil will be confined by the port or small opening 75a and be discharged into chamber 68 as a solid stream. It will, of course, be apparent that the size of the opening 75a will vary automatically, in accordance with the pressure of the liquid against the inlet side of the disc member 75.

Referring to Fig. 2, the pressure regulating means differs from that of Fig. 1 by the use of sheet metal supporting structure for the diaphragm and silencer disc members, as follows: The interior of the pressure regulating means casing has a supporting ring 100 providing an annular shoulder 101 facing the by-pass chamber 68. Seating on the shoulder 101 are the overlying outturned annular flanges or rims 102 of sleeved tubular supporting members 103, 104 which extend toward the burner outlet 86 and form part of the partition or wall between the pressure chamber 67 and the by-pass chamber 68. The flanges 102 are clamped and sealed to each other and to the shoulder 101 by a ring nut 72 screw-threaded in the housing member. The lower ends of the sleeved members 103, 104 have inturned annular flanges 105, 106 respectively which clamp and seal therebetween the marginal edge portion of the diaphragm member 69 of "Ameripol" or the like material. Positioned concentrically within the inner tubular member 104 there is a cup-like backing member 107 having its bottom wall seating on the diaphragm member 69 and having a rim or out-turned flange 108 slidably fitting in the tubular member 104 to center the backing member 107. The diaphragm member has a central opening therethrough alined with a central opening through the base of the backing member 107, which openings receive a tubular valve port member 109 having a surrounding flange which clamps and seals the diaphragm member to the backing member 107. The port member 109 is sealed and secured to the backing member 107 by solder or by welding and projects above the base portion of the backing member. The silencer member disc 75 of "Ameripol" or like material having the small opening 75a is positioned within the backing member 107 and is tightly secured to the backing member base portion by a ring member surrounding the port member 109 and receiving one end of the spring 77. Flow through the port member 108 from chamber 67 to chamber 68 is controlled by valve member 87 which also controls the outlet 86.

The operation of the silencer disc member 75 and diaphragm member 69 in the structure of Fig. 2 will be apparent from the foregoing description and the operation of these parts in Fig. 1.

This application is a continuation in part of copending application Serial No. 466,116, filed November 19, 1942, for Pump and pressure control means.

Having thus described the invention, what is claimed and is desired to be secured by Letters Patent of the United States is:

1. In a device of the character described, a housing member having a pressure chamber with an inlet and having an outlet chamber, a diaphragm member of flexible stretchable resilient material separating said chambers, a backing member in said outlet chamber and seating on and clamped to said diaphragm member, said backing member and said diaphragm member having an opening therethrough, valve means in said pressure chamber and cooperable with and controlling flow through said opening and having a constantly open bleed, a flexible stretchable resilient member in said outlet chamber and seating on said backing member to close said opening and having a constantly open small opening therethrough for free flow of fluid passing through said bleed, said stretchable member automatically stretching and contracting to regulate the size of said small opening in accordance with the flow permitted by said valve means.

2. In a device of the character described, a housing member having a pressure chamber with an inlet and an outlet and having a by-pass outlet chamber, a diaphragm member of flexible resilient stretchable material within said housing member and separating said chambers, means sealing the marginal edge portion of said diaphragm member to the internal wall of said housing member, a backing member in said by-pass chamber and seating on said diaphragm member, said diaphragm member and said backing member having a central opening therethrough, a tubular valve seat member extending through said opening and having a portion projecting into said by-pass chamber, said seat member having an annular flange overlying said diaphragm member, means securing said seat member to said backing member, valve means in said pressure chamber and cooperating with and controlling flow through said pressure chamber outlet and also being cooperable with said seat member to control flow therethrough into said by-pass chamber, a flexible stretchable resilient sheet material member overlying said backing member and extending across and closing said seat member projecting portion, a ring member seating on said sheet material member around said seat member, and a coil spring resisting movement of said diaphragm member and

seating on said ring member to hold said sheet material member to said backing member, said sheet material member having a small opening therethrough alined with the opening through said seat member, said sheet material member automatically stretching and contracting to regulate the size of said small opening in accordance with the flow through said seat member which is permitted by said valve means.

3. In a device of the character described, a housing member having a pressure chamber with an inlet and an outlet and having a by-pass outlet chamber, said housing member having an internal annular shoulder between said chambers, a diaphragm member of flexible stretchable resilient material seating marginally on said shoulder and separating said chambers, an annular guide member clamping said diaphragm member to said shoulder, a cup-like backing member in said by-pass chamber and seating on said diaphragm member, said backing member having a sliding fit in said guide member, said diaphragm member and said backing member having a central opening therethrough, a tubular valve seat member extending through said opening and having a portion projecting into said by-pass chamber, said seat member having an annular flange overlying said diaphragm member, means securing said seat member to said backing member, valve means in said pressure chamber and cooperating with and controlling flow through said pressure chamber outlet and also being cooperable with said seat member to control flow therethrough into said by-pass chamber, a flexible stretchable resilient sheet material member within said cup-like backing member and extending across and closing said seat member projecting portion, a ring member seating of said sheet material member around said seat member, and a coil spring resisting movement of said diaphragm member and seating on said ring member to hold said sheet material member to said backing member, said sheet material member having a small opening therethrough alined with the opening through said seat member, said sheet material member automatically stretching and contracting to regulate the size of said small opening in accordance with the flow through said seat member which is permitted by said valve means.

4. In a device of the character described, a housing member having a pressure chamber with an inlet and an outlet and having a by-pass outlet chamber, said housing member having an internal annular shoulder facing said by-pass chamber, a pair of sleeved tubular members having out-turned overlying annular flanges at one end and seating on said shoulder, an annular clamping member secured in said housing member and clamping and sealing said flanges to each other and to said shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a cup-like backing member concentrically positioned within said sleeved members and having its base portion seating on said diaphragm member, said backing member having an out-turned rim engaging the inner one of said sleeved members to center said backing member, said diaphragm member and said backing member having a central opening therethrough, a tubular valve seat member extending through said opening and having a portion projecting into said by-pass chamber, said seat member having an annular flange overlying said diaphragm member, means securing said seat member to said backing member, valve means in said pressure chamber and cooperating with and controlling flow through said pressure chamber outlet and also being cooperable with said seat member to control flow therethrough into said by-pass chamber, a flexible stretchable resilient sheet material member within said cup-like backing member and extending across and closing said seat member projecting portion, a ring member seating on said sheet material member around said seat member, and a coil spring resisting movement of said diaphragm member and seating on said ring member to hold said sheet material member to said backing member, said sheet material member having a small opening therethrough alined with the opening through said seat member, said sheet material member automatically stretching and contracting to regulate the size of said small opening in accordance with the flow through said seat member which is permitted by said valve means.

5. In a device of the character described, a housing member having a pressure chamber with an inlet and an outlet and having a by-pass outlet chamber, said housing member having an internal annular shoulder facing said by-pass chamber, a pair of sleeved tubular members having out-turned overlying annular flanges at one end and seating on said shoulder, an annular clamping member secured in said housing member and clamping and sealing said flanges to each other and to said shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a backing member positioned within said sleeved members and seating on said diaphragm member, means to center substantially one end of said backing member within said sleeved members, said diaphragm member and said backing member having a central opening therethrough, valve means in said pressure chamber and cooperating with and controlling flow through said pressure chamber outlet and also being cooperable with said central opening to control flow into said by-pass chamber, and a coil spring extending concentric within said sleeved member and seating on said backing member to resist movement of said diaphragm member.

6. In a device of the character described, a housing member having a pressure chamber with an inlet and an outlet and having a by-pass outlet chamber, said housing member having an internal annular shoulder facing said by-pass chamber, a pair of sleeved tubular members having out-turned overlying annular flanges at one end and seating on said shoulder, an annular clamping member secured in said housing member and clamping and sealing said flanges to each other and to said shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a cup-like backing member concentrically positioned within said sleeved members and having its base portion seating on said diaphragm member, said backing member having an out-turned rim engageable with the inner one of said sleeved mem-

bers to aline said backing member at its rim end generally axially of said sleeved members, said diaphragm member and said backing member having a central opening therethrough, a tubular valve seat member extending into said opening and having an annular flange overlying said diaphragm member, means securing said seat member to said backing member, valve means in said pressure chamber and cooperating with and controlling flow through said pressure chamber outlet and also being cooperable with said seat member to control flow therethrough into said bypass chamber, and a coil spring resisting movement of said diaphragm member and seating within and against the base of said backing member.

7. A valve seat structure comprising a pair of sleeved tubular members, one of said members having an out-turned annular flange extending laterally outward from said members for seating on a supporting shoulder, the outer one of said sleeved members having at its other end an inturned annular flange to receive in clamping relationship the other end portion of the inner one of said sleeved members, a diaphragm member of flexible stretchable material with its marginal portion clamped and sealed between said inturned flange and said inner member end portion, a backing member positioned within said sleeved members and seating at one end on said diaphragm member, an out-turned rim at the other end of said backing member and cooperable with the inner one of said sleeved members to aline generally the rim end of said backing member axially of said sleeved members, said diaphragm member and said one end of said backing member having alined openings therethrough providing a valve port.

8. A valve seat structure comprising a pair of sleeved tubular members having out-turned overlying annular flanges at one end adapted to seat on a supporting shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a backing member positioned within said sleeved members and seating on said diaphragm member, and means to center substantially one end of said backing member within said sleeved members, said diaphragm member and said backing member having a central opening therethrough providing a valve port.

9. A valve seat structure comprising a pair of

sleeved tubular members having out-turned overlying annular flanges at one end adapted to seat on a supporting shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a backing member positioned within said sleeved members and seating on said diaphragm member, means to center substantially one end of said backing member within said sleeved members, said diaphragm member and said backing member having a central opening therethrough, and a valve seat member having a lateral flange abutting said diaphragm and having a central tubular portion extending through said diaphragm member and backing member central openings, said central tubular portion tightly fitting said backing member opening to clamp said seat member flange and said backing member to said diaphragm member.

10. A valve seat structure comprising a pair of sleeved tubular members having out-turned overlying annular flanges at one end adapted to seat on a supporting shoulder, said sleeved members having at their other ends inturned annular flanges overlying each other, a diaphragm member of flexible stretchable resilient material having its marginal portion clamped and sealed between said inturned flanges, a backing member positioned within said sleeved members and seating at one end on said diaphragm member, an out-turned rim at the other end of said backing member and cooperable with the inner one of said sleeved members to aline generally the rim end of said backing member axially of said sleeved members, said diaphragm member and said backing member having a central opening therethrough providing a valve port.

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