

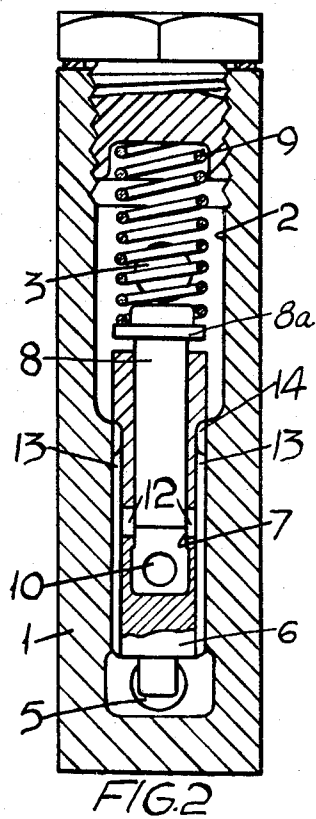
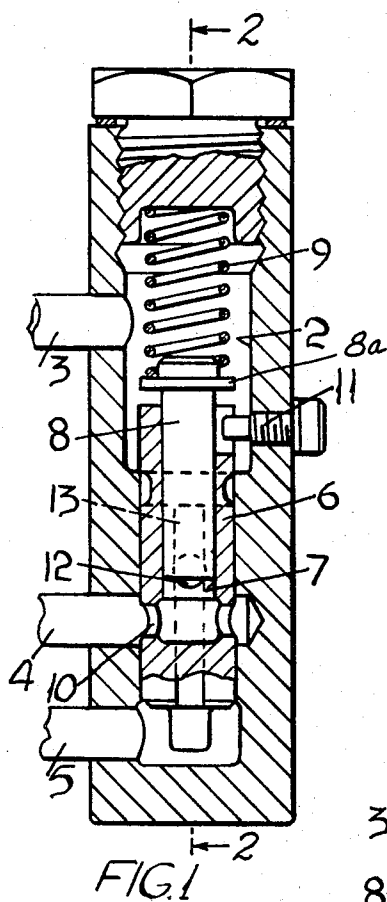
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PRESSURE REGULATING VALVES

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PRESSURE REGULATING VALVES

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3 Claims

ABSTRACT OF THE DISCLOSURE

The object of this invention is to provide in a convenient form a pressure regulating valve whereby a fluid pressure can be maintained automatically at a substantially constant predetermined proportion of the pressure of the source from which it is derived.

A valve according to the invention comprises in combination a cylinder having an inner end for connection to apparatus to be subjected to the lower pressure, an inlet in the wall of the cylinder for connection to the fluid pressure source, a piston occupying the cylinder, a bore extending from the outer end of the piston to adjacent its inner end, a plunger engaging said bore, a spring urging the plunger towards the inner end of the cylinder, a first port in the wall of the piston, said first port being arranged to communicate with said inlet throughout the permitted axial movement of the piston, a second port in the wall of the piston nearer its outer end, said second port being arranged to be uncovered by the plunger by an amount dependent upon the relative axial settings of the piston and plunger, and passage means interconnecting the second port with the inner end of the cylinder, and also with a peripheral spill groove in the piston arranged to be uncovered to a leakage path by an amount dependent upon the axial position of the piston in the cylinder.

In the accompanying drawings:

FIGURE 1 is a sectional side elevation of one example of a valve in accordance with the invention and

FIGURE 2 is a similar view taken on the line 2—2 of FIGURE 1.

Referring to the drawings, there is provided a body part 1 in which is defined a stepped cylindrical chamber 2, the wider end of which is provided with an outlet 3. In the wall of the narrower portion of the chamber is formed an inlet 4 which is arranged to be connected to a source of fluid under pressure and at the end of the narrower portion of the chamber remote from the wider portion thereof is formed a further outlet 5 which is arranged to be connected to apparatus which requires to be supplied with fluid from said source at a pressure which is a predetermined proportion of the pressure of said source.

Engaging the narrower portion of the chamber 2 (hereinafter termed the cylinder) is a piston 6 in which is formed an axial blind bore 7 extending from its outer end (i.e. its end extending into the wider part of the cylinder) to near its inner end. In the blind bore 7 is engaged a plunger 8 which is urged inwardly by a coiled compression spring 9 disposed within the wider portion of the cylinder the extent of such inward movement being limited by an abutment 8a on the plunger.

Moreover, in the piston is a port 10 which registers with the inlet 4 throughout the permitted axial movement of the piston, and through which the inlet is in communication with the bore 7 in the piston, the piston being prevented from angular movement by a screw pin 11 in the body part engaging a recess in the outer end of the piston. Furthermore, in the wall of the piston at a position intermediate the ports 10 and the outer end of the piston

and at right angles to the port 10 is a pair of ports 12. These ports are arranged to be partially uncovered by the plunger 8 as the piston and plunger move relative to each other as will be described.

The ports 12 are in communication with a pair of longitudinal grooves 13 respectively formed in the periphery of the piston 6 and which extend from its inner end to a circumferential groove 14. This groove is disposed to be uncovered to the wider portion of the chamber (and therefore to the outlet 3) by an amount dependent upon the axial setting of the piston in the cylinder.

In use, when fluid under pressure is applied to the inner end of the bore 7 by way of the inlet 4 and the port 10, a force is applied to the inner end wall of the plunger 8 which acts in opposition to the force produced by the spring 9. The plunger therefore moves to a position in which these two forces are balanced. An equal force is applied to the piston 6 since the effective area of the base wall of the blind bore 7 is equal to the area of the end wall of the plunger 8. This force moves the piston downwardly as viewed in the drawing, and the ports 12 are opened so that fluid under pressure flows by way of the grooves 13 to the inner end of the cylinder. This fluid produces a force on the piston which acts to move it in opposition to the force produced by the fluid under pressure from the inlet 4 acting on the end wall of the blind bore 7. The area of the end wall of the piston 6 is larger than that of the end wall of the blind bore 7 with the result that if the pressures were the same then there would be a predominating force moving the piston upwardly. In fact the piston does move upwardly and opens the circumferential groove 14 to the wider end of the cylinder. At the same time the opening of the ports 12 is reduced and the effect is that the piston assumes an equilibrium position in which the force exerted on the end of the piston is equal to the force exerted on the plunger, and this is of course equal to the force developed by the spring. The pressure at the outlet side is a constant proportion of the pressure at the inlet 4, and the ratio of these pressures is the same as the ratio of the area of the end of the piston and the end of the plunger. If the pressure at the outlet side should fall, then the piston will move downwardly to reduce the flow of fluid to the wider end of the cylinder, and also to increase the flow through the ports 12 so that equilibrium is again established.

As shown in the drawing the circumferential groove 14 is closed to the wider end of the cylinder, and this condition can occur when there is flow through the outlet 5. If the flow through the outlet 5 increases, then the piston will move to open the ports 12 to maintain the pressure and if the flow decreases, then the piston will move in the other direction to allow flow through the groove 14 and to close the ports 12.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A pressure regulating valve for producing an output pressure which is a substantially constant proportion lower than an input pressure, the valve also acting to regulate the input pressure, comprising in combination: a body part; a cylinder formed in the body part; an outlet in the body part in communication with one end of said cylinder, and at which said output pressure is obtained; a piston slidably mounted within said cylinder, one end of said piston being exposed to the fluid pressure within said one end of the cylinder; a blind bore formed in said piston and extending from the other end of the piston towards said one end thereof; an inlet in the body part; port means placing the blind end of said blind bore in communication with said inlet; a plunger slidable within said blind bore; one end of said plunger being exposed to the fluid pressure pertaining at said blind end; resilient means loading the plunger towards said blind end in opposition to

3

said fluid pressure; a port in the piston wall defining said blind bore, the extent of opening of said port being determined by the relative settings of the piston and plunger; passage means placing said port in communication with said one end of the cylinder; and a peripheral spill groove formed in the piston, said groove being in communication with said port and said one end of the cylinder, and being arranged to be uncovered by an amount dependent upon the setting of the piston within the cylinder, the ratio of the relative areas of said one end of the piston and said one end of the plunger being equal to the desired ratio of the input pressure and the output pressure.

2. A pressure regulating valve as claimed in claim 1 in

4

which said passage means comprises a groove formed in the periphery of the piston and extending from said one end thereof to the spill groove.

3. A pressure regulating valve as claimed in claim 2 in which said resilient means comprises a coiled compression spring.

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