Feb. 29, 1944. A. F. JENKINS 2,343,146

VALVE

Original Filed Dec. 6, 1940

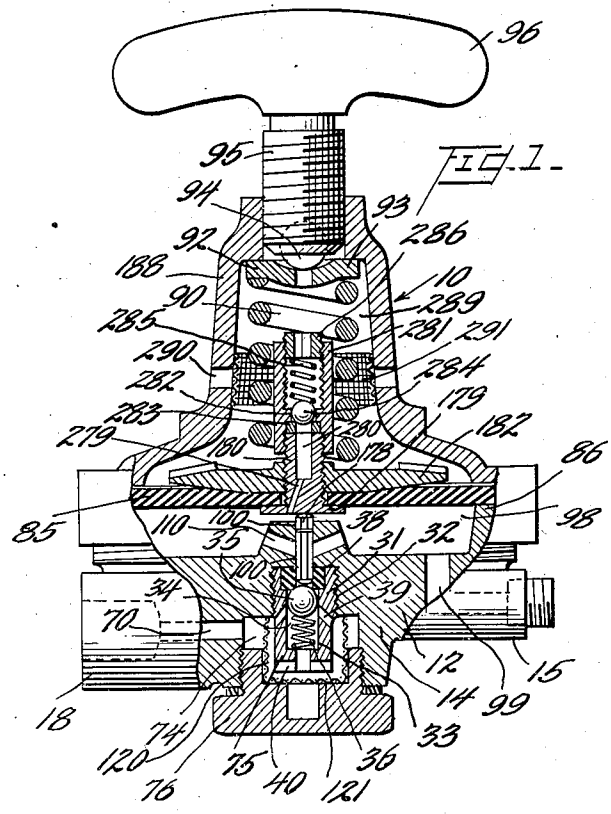


FIG. 1.

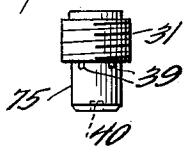


FIG. 2.

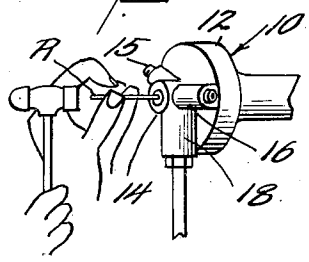


FIG. 3.

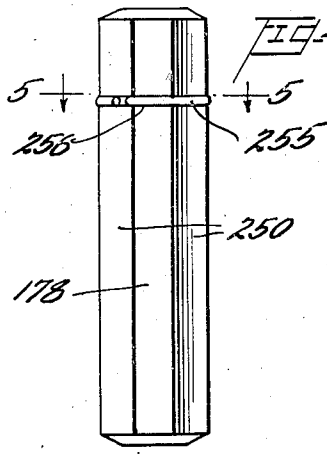


FIG. 4.

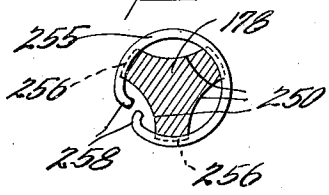


FIG. 5.

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2,343,146

VALVE

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Original application December 6, 1940, Serial No. 368,937. Divided and this application December 5, 1941, Serial No. 421,819

1 Claim. (Cl. 50—23)

This invention relates to fluid pressure regulators and more particularly to devices of this character which are adapted to be inserted in high pressure gas lines to effect the delivery of gases at reduced pressures which may be maintained at constant values.

The general object of the invention is to provide novel and improved pressure regulators of the class described which are of simple construction, composed of a minimum number of parts, and easy to manufacture, assemble, and use.

A more particular object of the invention is the provision of a regulator comprising a novel valve seat and nozzle assembly which may be applied to and removed from the device as a unit and which is practically frictionless, exceedingly sensitive, and subject to a minimum amount of variation.

Other objects of the invention will be apparent from the following specification when read in connection with the accompanying drawing in which certain embodiments of my invention are illustrated by way of example.

In the drawing:

Figure 1 is a view partly in side elevation and partly in vertical section of a regulator of the type described;

Figure 2 is a view in elevation of the valve unit which forms an essential part of the regulator;

Figure 3 is a perspective view illustrating a method of effecting the initial seating of the valve in the regulator;

Figure 4 is a view in side elevation of a novel actuating element for the regulating valve having a vibration arrester applied thereto; and

Figure 5 is a transverse sectional view taken substantially on line 5—5 of Figure 4.

In the drawing are shown certain features which are not directly involved in the present invention but which are comprised in the inventions described in my co-pending application, Serial No. 368,937, filed December 6, 1940, of which the present application is a division, and described in my co-pending application Serial No. 421,820, filed Dec. 5, 1941; and reference is made to these applications for a more detailed disclosure of such features. The novel valve construction which comprises an important feature of the present invention, is shown in Figure 1 of the drawing in association with the pressure regulator of which it is an important part. The regulator assembly, designated generally by the numeral 10, comprises a body casting 12, which is of a generally circular configuration. The body portion 12 is provided with a central downwardly projecting boss 14 around which are formed raised portions containing fluid passageways and terminating respectively in the outlet nipple 15, the gauge nipple 16 to which a pressure gauge of conventional type may be applied, and the inlet nipple 18 for the attachment of inlet connections, which may be connected to the source of liquid, either directly or through a prior stage of pressure regulation.

The body casting 12 of the regulator is provided with an inlet passageway 70 passing through the nipple or boss 18 and leading to an inlet chamber 74 disposed within the central boss 14. This chamber 74 is adapted to receive the novel valve unit 75 which is substantially a self-contained element which is threaded into the body portion of the regulator. For this purpose, the slightly larger portion 31 of the substantially cylindrical valve unit 75 is externally threaded for cooperation of the internal threads of the recess 32 in the regulator casting.

The valve unit 75 is provided with an axial bore 33 which is enlarged adjacent the midportion to form a chamber 34 for receiving the ball valve element 35 and the coil spring 36 for urging the ball against its seat. The valve seat element comprises an annular plug 38, made of hard rubber or a similar composition, which is pressed firmly within the annular recess formed in the end of the valve unit. The valve unit is also provided with a series of inclined inlet openings 39. The bore 33 at the end of the unit 75 opposite the valve seat is provided with a slot or squared enlargement 40 for the application of a screwdriver or other tool for removing the valve unit from the device. The chamber 74 is normally closed by the cap 76 which may be unscrewed for the removal of the valve unit 75. This cap is provided with a recess 121 in which is seated a cup-shaped filter screen element 120. This filter screen completely surrounds the downwardly projecting portion of the valve plug 75 and may be readily removed for cleaning by the removal of the cap 76.

In the upper portion of the body casting 12 of the regulator, there is formed an outlet fluid chamber 98 which is of an annular configuration, the upper wall of which is comprised by the actuating diaphragm 85. An outlet passage 99 leads from the chamber 98 through the outlet nipple 15. The pressure gauge nipple 16 also has a passageway communicating with the outlet chamber 98.

For operatively connecting the valve 75 with the actuating diaphragm 85, there is provided a

pin or plunger 178, the configuration of which is clearly shown in the enlarged views of Figures 4 and 5. The plunger is disposed within a passageway 100 which has branches 110 leading laterally into the outlet chamber 98. The pin 178 is adapted to move vertically to unseat the valve element 35 upon the flexing of the diaphragm 85 which is clamped between the annular wall 86 of the body portion of the regulator, and the walls of the dome-like casing member 188.

The diaphragm 85 is provided centrally with an opening through which extends a member 180 which is provided with a head 179 adapted to abut the pin 178. The member 180 is threaded into a plate 182 and the diaphragm is clamped at its central portion between the head 179 and the plate 182. The dome or cap member 188 encloses the coil spring 90 which is compressed between the diaphragm plate 182 and the upper spring seat button 92. The adjusting screw 95 is threaded into the end of the cap or casing 188 and is manipulated by means of a handle 96 to accurately adjust the degree of compression exerted upon the diaphragm by the spring 90. To provide an anti-friction connection between the screw 95 and the spring, the spring seat 92 is cupped as at 93 and a ball element 94 received within a recess in the end of the screw 95 is adapted to seat in the cupped portion of the member 92.

The central member 180 which passes through the diaphragm is provided with a passageway 280 into the bottom of which one or more passageways 279 lead from the outlet chamber 98.

A relief valve casing 281 is threaded upon the upper end of the central plug 180 and extends upwardly therefrom. This casing 281 is substantially cylindrical and is threaded internally except for an intermediate portion which is internally flanged to provide a narrower bore as at 282. This narrowed portion also provides a downwardly facing shoulder which is adapted to clamp the valve seat 283 against the upper end of the plug 180. A ball valve 284 occupies the bore 282 and is adapted to close against the seat 283. A spring 285 is compressed between the ball valve and an adjusting element or plug 286 which is threaded within the upper portion of the valve casing 281.

It will be readily seen that when the outlet pressure in the chamber 98 exceeds a certain amount, determined by the adjustment of the element 286 against which the spring 285 bears, the ball valve 284 will be unseated and the gas will be vented into the chamber 289 enclosed within the dome or casing 188. From this chamber the gases may pass into the atmosphere through one or more openings 290 provided in the wall thereof. An annular screen element 291 is disposed within the chamber 289 and is adapted to cover the openings 290 to provide a flame arrester as a safety feature in case the gases employed are of a combustible nature.

It will be seen that the novel relief valve arrangement is conveniently stowed within the normal confines of regulators of this type instead of being projected outwardly from the casing, and this positioning of the valve within the casing enables the provision of the flame preventing means embodied in the screen 291.

One important feature of the present invention is the readiness by which an accurate seating surface may be formed on the hard rubber or composition valve seats 38. Before using the device, the cap 76 in the bottom of the regulator assembly is removed, thus exposing the valve unit 75. Then a slender rod R may be inserted through the mouth of the bore 33 in the end of the valve unit and in contact with the ball valve 35. The rod R is then given several light taps with a small hammer in the manner clearly illustrated in Figure 3 of the drawing. This will effectively seat the ball in the rubber or composition seating member 38 and the seat thus formed will conform exactly to the spherical contour of the ball valve. Thus, the valve is readily accessible for this purpose and also for complete removal from the device, the whole valve and seat assembly being withdrawn as a unit, as clearly illustrated in Figure 2 of the drawing.

Another feature applicable to regulators of this type and which may also be embodied in other valve controls involves the actuating pin or plunger 178 which extends between the diaphragm head 179 and the regulating valve element 35. This pin may be made from a blank originally cylindrical in form, and provided with longitudinal flutes 250, of which there are three in the embodiment shown. The pin 178 is disposed in a cylindrical bore 100 formed in the body casting 12 of the device and the flutes 250 provide means for the passage of the gas through this bore when the pin is in operative position. Branch passageways 110, of course, may lead from the lower portion of this bore to the outlet chamber 98.

In order to prevent chattering of the pin under certain conditions of operation of the regulator, a vibration preventing device is employed which comprises the resilient ring 255 which is adapted to fit in the grooves or notches 256 cut in the remaining portion of the peripheral surface of the pin after the flutes 250 have been formed. This spring ring 255 is adapted to fit snugly within the grooves 256 and the ends 258 of the spring are bent inwardly into one of the flutes 250 as shown. This causes the portions of the spring wing which bridge the remaining flutes 250 to bulge or bow outwardly to an exceedingly slight degree. This bowing or projecting of the spring element is not sufficient to prevent the prompt movement of the pin in response to the action of the diaphragm or of the valve spring 36, but it is effective to apply just enough friction to the pin to prevent chattering or vibration thereof under certain conditions of approximate balance between the inlet and outlet pressures.

It is understood that various changes and modifications may be made in the embodiment illustrated herein without departing from the scope of the invention as defined by the following claim.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

In a fluid pressure regulator of the class described, the combination of a casing containing inlet and outlet chambers and a passageway connecting the same; a self contained valve carrying unit threaded in said passageway and having its inlet end projecting therefrom into said inlet chamber, said unit comprising a tubular member having a bore extending axially therethrough; said bore communicating with a wider socket at the outlet end of the unit, whereby an internal shoulder is formed at the junction of said bore and socket; an annular, somewhat malleable, non-metallic valve seat element in said socket in engagement with said shoulder and frictionally retained therein; a valve element in said bore and

adapted to seat against the inner side of the annular seating element at the margin of the central opening therethrough; a coil spring seated against a second internal shoulder formed in the walls of the bore near the inlet end of the unit and resiliently pressing the valve element toward its seat; said bore extending with narrower diameter from said second shoulder through the inlet end of the unit and opening outwardly thereof, whereby a tamping pin may be inserted to cause the valve element to form a seating surface on said member, means on the inlet end of said valve carrying unit for the application of a tool to apply and remove said unit; a cup-like perforated screen element surrounding the protruding end of said valve unit and occupying a portion of said inlet chamber; and a cap threaded in an opening in the casing wall opposite said valve unit and removable to provide access through the opening for said pin and said tool, said cap having a cylindrical socket conforming to the configuration of said cup-like screen element therein to receive and support said screen element when the cap is applied.

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