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GAS REGULATOR CONSTRUCTION

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FIG. 1.

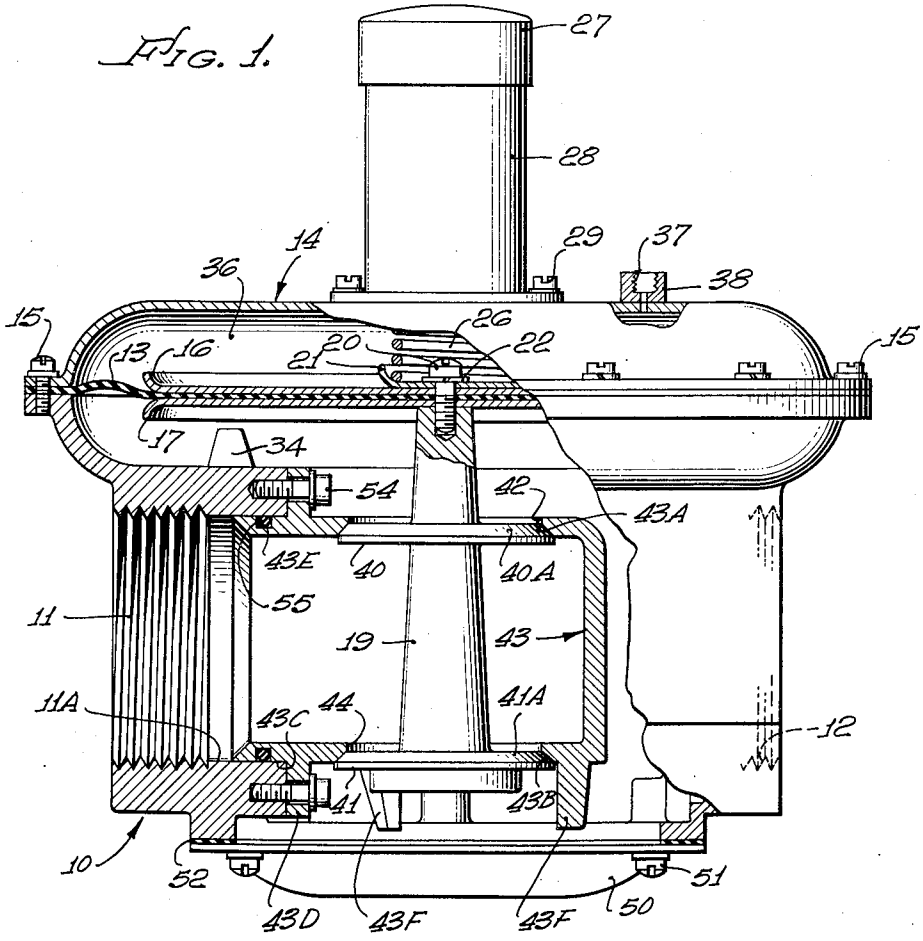
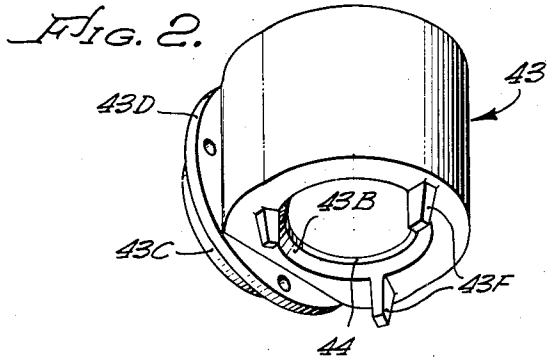


FIG. 2.



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GAS REGULATOR CONSTRUCTION

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1 Claim. (Cl. 137—454.2)

The present invention relates to improvements in the construction of gas pressure regulators and particularly to improvements in the type of gas pressure regulator described and claimed in my copending application Serial No. 759,608, filed September 8, 1958.

An object of the present invention is to provide an improved construction for a gas regulator used in gas supply lines for supplying gases to such devices as furnaces, stoves, refrigerators and the like, for the purpose of maintaining substantially constant pressure to the device despite rather wide variations in the pressure in the supply lines.

Another object of the present invention is to provide an improved construction in a gas regulator of the semi-balanced type.

Another object of the present invention is to provide novel means and techniques whereby the double seat construction shown in my above mentioned co-pending application is incorporated in an internal casting releasably maintained on the main body by releasable fastening means such as bolts, to thereby provide a construction which permits the fabrication of the inner valve and/or seats from more expensive material such as aluminum, brass, stainless steel, for achieving other purposes in the present invention.

Another object of the present invention is to provide improved means and techniques involving the use of an insert construction, such construction serving to substantially eliminate the transmission of stresses from the main body of the valve into the double-seated valve structure, thereby assuring a tighter construction.

Another object of the present invention is to provide means and techniques whereby accurate precision machine work need only be accomplished on an insert instead of on an entire valve body construction in the manufacture of a gas regulator of the character described in my above-mentioned application.

Another object of the present invention is to provide means and techniques which allow the fabrication of a gas regulator valve of this type without any loose pieces in a core box used in its manufacture, thereby reducing materially the cost of fabrication of the valve body.

Another object of the present invention is to provide an improved construction of this character involving an insert in which a pair of aligned valve seats may be accurately machined and such that the insert as a whole may be readily, conveniently and accurately fastened in operative position within the valve body, such that when the insert is inserted in the valve body there is assurance that the valve seats are accurately aligned with respect to a valve member carried by a diaphragm.

Another object of the present invention is to provide means and techniques which allow more convenient and inexpensive fabrication of a double-seated gas regulator valve featured by the fact that the double seats are formed in an insert and with the additional feature that the construction and assembly is such that the completed gas regulator as a whole accomplishes its intended functions with a relatively low pressure drop and a low energy loss occurring through the valve and in which vibration or fluttering of the movable valve element at intermediate positions does not occur in any appreciable amount.

Another object of the present invention is to provide an improved gas regulator and more particularly to provide a quickly attachable and detachable insert which may be of small size and of such material as to be machined accurately to predetermined dimensions.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claim. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

FIGURE 1 illustrates an improved construction for a gas regulator embodying features of the present invention, such drawing being partly in elevation and partly in section.

FIGURE 2 is a perspective view of the insert 43 shown in FIGURE 1.

The gas regulator has a valve body 10 in which there are threaded inlet and outlet ports or openings 11 and 12 respectively, such openings being axially aligned.

A flexible circular diaphragm 13 of gas-impervious material has its marginal edge or circumferential portion clamped between the valve body 10 and the cover member 14 by means of circumferentially spaced machine screws 15 which are threaded in the flanged portion of the valve body 10. This diaphragm 13, as shown, has its major portion sandwiched between a pair of metal discs 16 and 17, each having their peripheral portion turned outwardly from the diaphragm 13 to avoid the adjacent portion of the diaphragm 13 from engaging a sharp edge. This assembly comprising the diaphragm 13 and discs 16 and 17 is secured to the movable valve element 19 by a central machine screw 20 which extends through a disc-shaped spring seat 21, assembly 13, 16 and 17 and which is threaded into the valve member 19. A lock washer 22 may be placed between the head of the bolt 20 and the spring seat 21 to secure the bolt in position.

The diaphragm 13 is flexed downwardly by an adjustable prestressed coil compression spring 26 which has its lower end bearing against the spring seat 21. The compressive force exerted by the compression spring 26 is adjusted using conventional means, once the removable cover 27 is removed. The upper portion of the spring 26 is housed within a cylindrical member 28 which is bolted by means of circumferentially spaced bolts 29 to the cover member 14.

As disclosed in my above-mentioned application, the housing 28 may include an adjustable screw threaded in such cylindrical member 28 and arranged to be turned when the cap 27 is removed. By turning such screw, the compressive force exerted by the spring 26 on the diaphragm 13 is adjusted in conventional manner. Further, it is understood that downward movement of the diaphragm 13 is limited by engagement of the disc 17 with spaced abutments or stops 34 formed integrally with the valve body 10.

It is observed that the diaphragm 13 defines one wall of a chamber 36 which is preferably vented to the atmosphere through a threaded opening 37 in the small tube 38 which is secured within an apertured portion of the cover 14.

It is noted that the valve element 19 may be generally in the form of a hollow truncated cone and has a pair of spaced flanged portions 40 and 41, each of circular form and each having a circumferentially beveled portion 40A and 41A respectively.

The flanged portion 40 cooperates with an annular opening 42 in the valve body portion 43 which, in accordance with important features of the present invention, is in the form of an insert as more fully described later.

The flanged portion 40 cooperates with the annular opening 42 to regulate the flow of gas therethrough and in similar manner the flanged portion 41 cooperates with the opening 44 in the same insert 43 for the same purpose.

In order to substantially eliminate sideway of the valve member 19, guide means for the same may be provided.

In the extreme upward position of the valve member 19, the beveled portions 40A and 41A each engage correspondingly mated beveled surfaces 43A and 43B of the insert 43, such beveled surfaces 43A and 43B being accurately machined valve ports.

The lower portion of the valve casing 10 is closed by a cover 50 with circumferentially spaced bolts which are threaded in the valve body 10 so as to squeeze the ring-shaped seal 52 between the cover 50 and valve body 10. It is observed that when the cover 50 is removed, a relatively large opening exists for assembly and disassembly of the insert 43 and the valve element 19.

This insert 43 in which the valve ports 43A and 43B are accurately machined has an accurately machined cylindrical portion 43C machined so as to be snugly received within the inner unthreaded portion 11A of the opening 11 and also such insert 43 is provided with an accurately machined annular flange portion 43D which serves as an abutment and thus to accurately locate the axis of the ports 43A and 43B with respect to the longitudinal axis of the movable valve member 19. This flange portion 43D serves also with the two bolts 54 passing therethrough as a means whereby the insert 43 is secured to the valve body 10. Preferably the cylindrical portion 43C has an annular recessed portion 43E for receiving and partially confining an O-ring 55 serving as a seal.

It is observed that the flange 40 has an effective area which is somewhat smaller than the effective area of the flange 41.

In operation of the gas regulator, the pressure at the outlet 12 is controlled by movement of the diaphragm 13 which either serves to move the valve element 19 upwardy or downwardly, depending upon whether the pressure at the outlet 12 is above or below a preset value established by adjustment of the spring 26.

It will be observed that pressure on the inlet side acting on the flange 40 tends to move the valve element 19 towards closed position and also that such pressure acting on the flange 41 tends to move the valve element 19 towards open position. These two tendencies are counteracted to a large extent but since the effective area of flange 41 is larger than the effective area of flange 40, there is a resultant tendency for the valve element 19 to move to open position with increased inlet pressures; however, this resultant tendency is overriden by the large forces developed on the relative large effective area of the diaphragm 13 and as a consequence, the pressure at the outlet remains substantially constant and unaffected by the gas pressures exerted on valve element 19.

Also, to insure a straight line movement of the valve element 19, guide ribs 43F are integrally formed with the insert 43 for contacting the peripheral edge of the disc or flange 41 to provide any stabilization if and when needed.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claim is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

A gas regulator comprising a valve body having a valve chamber, said body having inlet and outlet openings, said openings being substantially on a common axis, an insert mounted in said valve chamber, means securing said insert in said valve chamber, said insert having a pair of valve openings which lie on a second axis which is substantially perpendicular to said common axis, a valve element having a pair of flanges and movable along said second axis with each of said flanges cooperating with a corresponding one of said valve openings to restrict the flow of gas therethrough, a diaphragm responsive to said pressure in said outlet opening for moving and positioning said valve element flanges relative to said valve openings in said insert so that the position of said valve element is automatically determined by said pressure, said valve openings in said insert each comprising a surface mating with a corresponding surface on a corresponding one of said flanges, said insert having a cylindrical portion snugly fitted within one of said body openings, said insert having a flanged portion contiguous with said cylindrical portion and engaging an end portion of said one body opening, fastening means extending through said flanged portion and into said end portion, said insert having a plurality of ribs extending outwardly therefrom for engaging different portions of one of said flanges to guide said valve element, and said valve openings in said insert being of different diameters, said valve body having an access opening coextensive with said second axis through which said insert is allowed to pass in the assembly and disassembly of said insert on said valve body, and a closure member closing said access opening.

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