

Description

Background of the Invention and Prior Art

This invention relates generally to gas pressure diaphragm regulator valves and particularly to a gas pressure regulator valve that is usable for both natural gas and liquified petroleum gas (LP or propane) service.

Gas pressure diaphragm type regulator valves are well-known in the art, for instance from FR-A-1 324 992. In such valves, a valve disk and a mating seat assembly are positioned intermediate to an upstream and a downstream portion of a flowpath for controlling downstream pressure and gas flow by varying the valve opening, that is, the amount by which the valve disk is displaced from its associated valve seat. Gas pressure and flow regulation are achieved by modulating the valve opening to maintain the required downstream pressure while delivering the quantity of gas demanded by the load. The popular, low cost, single stage regulator valve includes a diaphragm that acts as both the measuring and the actuation device with the downstream pressure being applied to one side of the diaphragm against the force of an opposed, adjustable regulator spring. The spring force initially holds the diaphragm and the attached stem linkage mechanism in such a position so as to have retracted the valve disk from the valve seat. As upstream pressure is introduced, gas flow occurs through the seat to the disk opening and into the downstream side of the device. The downstream pressure force is applied against the diaphragm and enables the diaphragm to overcome the opposing regulator spring force thereby moving the stem linkage and the valve disk to a position closer to the valve seat. In this manner, the adjustment of the regulator spring loading determines the downstream control pressure as a force equilibrium is achieved between the loading force of the spring and the force on the diaphragm from the downstream pressure. The linkage mechanism provides a mechanical advantage which enables a small diaphragm actuated by very low downstream control pressures to close the valve disk against the valve seat despite the relatively high pressure acting to push the disk open.

FR-A-1 324 992 discloses, in particular with reference to the description on pages 1 to 3 and the figures, more particularly figure 4, a droop compensated gas regulator valve comprising a spring casing and a lower casing, a diaphragm interposed between said spring casing and said lower casing, adjustable spring means in said spring casing for loading on one side of said diaphragm, a stem coupled to said diaphragm and having a cam profile extending into said lower

casing, an inlet port and outlet port in said lower casing, a valve seat positioned in said inlet port, a valve disk holder including support means and a valve disk carried by said valve disk holder, wherein said valve further comprises an orifice tube cooperating with said support means on said valve disk holder for supporting said valve disk holder for straight line movement for moving said valve disk into and out of engagement with said valve seat, said cam profile being non-linear, and bias means for directly coupling said cam profile on said stem to said valve disk holder.

All single stage regulator valves experience so-called "droop" in their pressure flow characteristic. Droop is caused by two factors, one being the small change in the force exerted by the regulating spring due to changes in its length during travel of the diaphragm, and the other because the effective area of the diaphragm changes slightly as the diaphragm moves. These effects combine to lower the downstream control pressure with flow increases. Hence the pressure is said to "droop." A relatively simple, inexpensive and effective partial solution is to use "velocity boosting" to apply a slightly lower pressure than the controlled downstream pressure to the diaphragm. The effect is to cause a larger valve opening and greater gas flow rates. Velocity boosting can be accomplished by a pitot tube that is positioned to sense the lower pressure at the vena contracta of the valve or by a boost tube to develop a lower pressure with increased velocity of flow in the valve chamber that communicates with the diaphragm. Other techniques for aspirating the chamber to reduce the effective pressure below that of the controlled downstream pressure are also contemplated.

It will be appreciated that in domestic gas service, the downstream pressure must be maintained at an extremely low level, on the order of 17.8 to 27.9 cm of water column pressure for natural gas and LP gas service, respectively, whereas the inlet or upstream pressure may be on the order of 20.7 Kg/cm² or more. Good pressure relief operation is required to preclude potentially serious over pressure conditions in the downstream system as well as to minimize annoying (and potentially dangerous) extinguishing of pilot lights in domestic appliances. However, the demands on gas pressure regulators, for domestic use in particular, are such that design compromises are required in the simple mechanical devices. For example, friction and hysteresis or backlash, inherent in linkage mechanisms, detract from the consistency of regulator performance. As mentioned, the spring effect and the diaphragm effect combine to cause output pressure droop. This droop will be overcome only at certain inlet pressures or across limited flow ranges by imprecise velocity boosting

techniques. The fixed mechanical advantage linkage mechanisms do nothing to overcome droop. In many current examples of the art, the relief valve is contained in an actuator housing which is separated from the body that houses the valve seat, forcing overpressured downstream gas to flow through restricting passages before reaching the relief valve for venting.

Objects of the Invention

A principal object of the invention is to provide a novel gas pressure regulator valve overcoming the output pressure droop.

Another object of the invention is to provide a low cost, high performance, direct acting, single stage gas pressure regulator valve as above.

A further object of the invention is to provide an improved single stage gas pressure regulator valve as above

Description of the Invention

The gas regulator valve of the present invention has the features as recited in the main claim.

The gas pressure regulator valve of the invention overcomes the problems of the state of the art by utilizing a combination of a characterized cam stem and an orifice tube which is a valve seat with an integral boost tube. The characterized or contoured cam stem has a cam profile that is directly operable by the regulator spring and diaphragm for moving a valve disk in a straight line into and out of engagement with a valve seat in a nonlinear fashion, without the intervention of any linkage mechanism. The cam stem provides a high mechanical advantage when required to close the valve disk against the seat, yet exhibits a low mechanical advantage to achieve rapid, nonlinear opening of the valve disk to mechanically induce a boost effect and maintain the desired downstream control pressure in all flow situations. The orifice tube aids in the uniformity of regulation by inducing flow activated boost as its configuration determines the space between the end of the tube and the valve outlet which in turn controls aspiration of the diaphragm cavity, which is the downstream pressure measuring element of the regulator. The arrangement also permits the diaphragm to be exposed to a large volume flow chamber, and in conjunction with a large area relief seat on the cam stem, provides excellent over pressure protection or relief performance. The direct acting pressure regulator valve of the invention is thus suitable for either natural gas or LP gas service use by simply changing the predetermined, adjustable relief valve spring and regulator spring loads.

Brief Description of the Drawings

These and other objects and advantages of the invention will be apparent upon reading the following description in conjunction with the drawings, in which:

FIG. 1 is a cross section of a regulator valve constructed in accordance with the invention;

FIG. 2 is an enlarged partial showing of the characterized cam stem, boost tube and linearly movable disk holder of the inventive regulator valve;

FIG. 3 is a top view of the arrangement of FIG. 2;

FIG. 4 is a partially cutaway perspective view of the arrangement of FIGS. 2 and 3;

FIG. 5 is a partial view taken along line 5-5 in FIG. 2; and

FIG. 6 is an elevation view of the structure of FIG. 3.

Description of the Preferred Embodiment

Referring to FIG. 1, a regulator valve 10 includes a spring casing 12 that is assembled onto a regulator valve body or lower casing 14 by any conventional means. For example, the casings may include mating flanges along their peripheries that are secured together by suitable threaded fasteners and mating threaded apertures. These details are not illustrated. Spring casing 12 defines an upper chamber 16 and valve body 14 defines a lower chamber 18 of large volume. Separating these two chambers is an elastomeric, generally annular diaphragm 20 that is affixed to a large diameter diaphragm head 21. The circular, outer periphery of diaphragm 20 is captivated between the flanges of spring casing 12 and valve body 14. In any suitable manner, the inner peripheral portion of diaphragm 20 is affixed to the outer periphery of diaphragm head 21. Diaphragm head 21 has a centrally disposed, upstanding cylindrical collar 19. As will be appreciated by those skilled in the art, diaphragm head 21 is not solid, but defines a plurality of large apertures that in normal operation are sealed by a large area, generally cup-shaped, relief seat 30 that is an integral part of a cam stem 26. The relief seat may, of course, simply be affixed to cam stem 26. Cam stem 26 includes a cylindrical post 28 that terminates in a threaded end. Collar 19 of diaphragm head 21 is slidably mounted on post 28. Pressure is applied to seal the underside of diaphragm 20 with relief seat 30 by an adjustable relief spring 46 captivated between diaphragm head 21 and an adjustment nut 48 that threadingly engages the threaded end of post 28. Relief spring 46 is adjusted such that, for normal operating pressures, diaphragm head 21

does not move relative to cam stem 26 and consequently relief seat 30 remains in engagement with the underside of diaphragm 20.

When the diaphragm and relief seat are engaged, there is no path from valve body 14 to spring casing 12. When an over pressure condition exists such that diaphragm head 21 is driven upward with respect to cam stem 26, the seal between diaphragm 20 and relief seat 30 is broken and gas flow occurs from lower chamber 18 around relief seat 30 and through large orifices (not shown) in the body of diaphragm head 21, to upper chamber 16.

The upper portion of spring casing 12 is closed by a closing cap 40. An adjustable regulator spring 36 is captivated between diaphragm head 21 and an upper spring seat 39 that is vertically displaceable by turning an adjustment screw 38 for increasing or decreasing the force exerted by regulator spring 36 on the diaphragm head. Cap 40 includes a downwardly projecting travel stop 42 to limit the upward movement of cam stem 26 to force the regulator into relief operation in the event of catastrophic failure of the valve mechanism both to close in response to a cessation of gas demand and also to fail to relieve the resulting over pressure through normal relief operation. Spring casing 12 also defines a relief vent 44 by means of which upper chamber 16 communicates with the external environment.

Regulator valve body 14 includes an inlet port 22 and an outlet port 24 that are threadingly engageable for connection of the regulator valve in a pipeline (not shown) in which gas flows. Inlet port 22 and outlet port 24 are preferably axially aligned as shown to provide a relatively straight through flowpath for the gas in the pipeline. Cam stem 26 terminates in a stem end 32 having a front cam profile or surface 33 and a similarly contoured rear cam profile or surface 34. Stem end 32 extends through generally rectangular openings in a cylindrical orifice tube 50 having a length that extends over a substantial portion of the distance between inlet port 22 and outlet port 24. Orifice tube 50 is secured in valve body 14 and forms a gas tight seal with the inner wall of inlet port 22 by means of an O ring 54 and has a tapered portion 51 providing an entranceway thereto and forming a circular valve seat 52. Orifice tube 50 also has a boost extension 56 for providing a velocity boosting effect to gas flow therethrough to produce, by aspiration of the chamber by the flow velocity, a slightly lower pressure on the underside of diaphragm 20 than exists at outlet port 24. A valve disk 60 is carried by a disk holder 58 that is horizontally movable within orifice tube 50 in response to vertical movement of cam stem 26 at right angles thereto. This is accomplished by cam follower surfaces 62 and

63 on disk holder 58 that are engageable with front cam surface 33 on end 32. As will be seen with reference to the other figures, disk holder 58 is confined to straight line axial movement within orifice tube 50 by means of a pair of grooves in the orifice tube, one of which (70) is viewable in FIG. 1. A bias spring 64 engages rear cam surface 34 of stem end 32 and serves to overcome hysteresis effects in valve operation.

It should be noted that the underside of diaphragm 20 is substantially in direct communication with the flowpath that exists between inlet port 22 and outlet port 24. This arrangement, in conjunction with a large relief seat 30 on cam stem 26, enables fast, effective high pressure relief operation in the event of a sudden increase in outlet or downstream pressure, as described above. It should also be noted that the vertical movement of cam stem 26 is directly translated into straight line horizontal movement of valve disk 60 with respect to valve seat 52. There is no linkage mechanism, i.e., levers or pivots, to impose frictional losses or introduce mechanical play. Thus with the construction of the inventive arrangement, tight control over outlet pressure and flow, with excellent pressure relief, is achievable in a simple, low cost, direct operated regulator.

Reference to FIGS. 2-6 will reveal further construction details of the inventive arrangement. In the enlarged view of FIG. 2, the cutaway of disk holder 58 clearly shows valve disk 60, which is preferably constructed of a resilient material such as synthetic rubber, and maintained in a suitable recess in the forward end of disk holder 58. Disk holder 58 is generally cylindrical in shape with a cutout portion defining a pair of inner parallel side walls 72 and 74, a rear wall 76 and a forward wall defined by cam follower surfaces 62 and 63. Rear wall 76 extends into a groove 66 in which the end of bias spring 64 is secured so that its curved end 65 resiliently engages the rear cam profile 34 on stem end 32 of cam stem 26. Disk holder 58 has four extensions or wings 57, two on each side, that cooperate with a pair of diametrically opposed slots 68 and 70 in the inner surface of orifice tube 50 to confine disk holder 58 to straight line axial movement within the orifice tube. First and second mounting ears 55 are formed at the forward end of orifice tube 50 and include mounting apertures 55a for mounting the orifice tube securely within lower casing 14 of the regulator valve.

As shown, cam follower surfaces 62 and 63 are flat and angled with respect to each other. The cam follower surfaces cooperate with front cam profile 33 on cam stem 26 to move disk holder 58 and thereby control the flow opening between valve seat 52 and valve disk 60. The contour of cam profile 33 and the cam follower surfaces 62 and 63

provide approximately a 4:1 force advantage to facilitate firm closure of the valve disk when necessary, which tapers to approximately a 2:1 mechanical advantage to facilitate regulation stability and capacity during flow conditions.

As mentioned, the difficulty with hysteresis or mechanical backlash which results in variations in regulation under both upstream pressure and downstream load changes, is resolved with the construction of the invention by providing a similarly contoured cam profile 34 on the rear of end 32 of cam stem 26. Curved end 65 of bias spring 64 rides along cam profile 34 and continually urges cam surface 33 into engagement with the involved one of cam follower surfaces 62 and 63. This eliminates the hysteresis effect and contributes to the very consistent performance of the regulator with load cycling and inlet pressure changes.

The regulator is preferably constructed of lightweight but strong materials in keeping with its cost design objection. The cam stem, orifice tube and disk holder may be fabricated of engineering resins of inherently high self-lubricity or the like to provide lightweight, strength and low friction. The diaphragm may be fabricated from any well-known elastomeric materials utilized for such purposes. The cam stem and relief seat are preferably molded in a single piece. Similarly, the valve seat may be a separate insert or, as shown, integrally formed as part of the orifice tube. As should be apparent to those skilled in the art, changing the diameter of the orifice in valve seat 52 and the configuration of the cam surfaces as well as altering the length and size of orifice tube 50 will enable a manufacturer to provide single stage, low cost gas pressure regulator valves to meet a wide range of environmental and operating conditions.

Claims

1. A droop compensated gas regulator valve (10) comprising a spring casing (12) and a lower casing (14), a diaphragm (20) interposed between said spring casing (12) and said lower casing (14), adjustable spring means (36,39) in said spring casing (12) for loading one side of said diaphragm, a stem (26) coupled to said diaphragm (20) and having a cam profile (33) extending into said lower casing (14), an inlet port (22) and outlet port (24) in said lower casing (14), a valve seat (52) positioned in said inlet port (22) a valve disk holder (58) including support means (56,57,68,70), and a valve disk (60) carried by said valve disk holder (58), an orifice tube (50) cooperating with said support means (56,57,60,70) on said valve disk holder (58) for support said valve disk holder (58) for straight line movement for moving said valve disk (60) into and out of engagement with said valve seat (52), said cam profile being non linear, and bias means (64) for directly coupling said cam profile (33) on said stem to said valve disk holder (58), characterized in that the orifice tube extends from said inlet port and has an orifice tube outlet end adjacent said outlet port with a boost extension (56) positioned adjacent said outlet port (24) for controlling pressure applied to the other side of said diaphragm (20) and said valve disk holder (58) has a cross sectional area that is significantly smaller than the cross sectional area of said orifice tube (50) to permit gas flow thereover, the gas flow exiting from said orifice tube outlet end and the gas flow over said valve disk providing aspiration and pressure reduction under said diaphragm resulting in droop compensation.
2. The apparatus of claim 1, further including pressure relief means (19,46,48) in said spring casing (12) coupled to said diaphragm (20).
3. The apparatus of claim 1 wherein said valve disk holder (58) includes a cam follower surface (62,63) in contact with said non linear cam profile (33), and further including a similar non linear cam profile (34) on the opposite side of said stem (26); and
wherein said bias means (64) comprises a bias spring (64) coupled between said valve disk holder (58) and said similar non linear cam profile (34).
4. The apparatus of claim 3 wherein said non linear cam profile (34) imparts movement to said disk holder (58) at a non linear rate responsive to movement of said diaphragm (20).
5. The apparatus of claim 4, further including pressure relief means (19,46,48) in said spring casing coupled to said diaphragm (20) and wherein said stem (26) includes a large area relief seat (30) coupled to said diaphragm (20), in order to allow gas flow from the lower to the upper chamber, defined by said diaphragm (20) interposed between said spring casing (12) and said lower casing (14), in the event that an over pressure is formed in the valve.
6. The apparatus of claim 2 wherein said stem (26) includes a stem end (33) defining said non linear cam profile (33) on one side thereof and defining a similar cam profile (34) on the opposite side thereof; and wherein said bias means (64) comprises a bias spring (64) coupled between said disk holder (58) and said

provide approximately a 4:1 force advantage to facilitate firm closure of the valve disk when necessary, which tapers to approximately a 2:1 mechanical advantage to facilitate regulation stability and capacity during flow conditions.

As mentioned, the difficulty with hysteresis or mechanical backlash which results in variations in regulation under both upstream pressure and downstream load changes, is resolved with the construction of the invention by providing a similarly contoured cam profile 34 on the rear of end 32 of cam stem 26. Curved end 65 of bias spring 64 rides along cam profile 34 and continually urges cam surface 33 into engagement with the involved one of cam follower surfaces 62 and 63. This eliminates the hysteresis effect and contributes to the very consistent performance of the regulator with load cycling and inlet pressure changes.

The regulator is preferably constructed of lightweight but strong materials in keeping with its cost design objection. The cam stem, orifice tube and disk holder may be fabricated of engineering resins of inherently high self-lubricity or the like to provide lightweight, strength and low friction. The diaphragm may be fabricated from any well-known elastomeric materials utilized for such purposes. The cam stem and relief seat are preferably molded in a single piece. Similarly, the valve seat may be a separate insert or, as shown, integrally formed as part of the orifice tube. As should be apparent to those skilled in the art, changing the diameter of the orifice in valve seat 52 and the configuration of the cam surfaces as well as altering the length and size of orifice tube 50 will enable a manufacturer to provide single stage, low cost gas pressure regulator valves to meet a wide range of environmental and operating conditions.

Claims

1. A droop compensated gas regulator valve (10) comprising a spring casing (12) and a lower casing (14), a diaphragm (20) interposed between said spring casing (12) and said lower casing (14), adjustable spring means (36,39) in said spring casing (12) for loading one side of said diaphragm, a stem (26) coupled to said diaphragm (20) and having a cam profile (33) extending into said lower casing (14), an inlet port (22) and outlet port (24) in said lower casing (14), a valve seat (52) positioned in said inlet port (22) a valve disk holder (58) including support means (56,57,68,70), and a valve disk (60) carried by said valve disk holder (58), an orifice tube (50) cooperating with said support means (56,57,60,70) on said valve disk holder (58) for support said valve disk holder (58) for straight line movement for moving said valve

disk (60) into and out of engagement with said valve seat (52), said cam profile being non linear, and bias means (64) for directly coupling said cam profile (33) on said stem to said valve disk holder (58), characterized in that the orifice tube extends from said inlet port and has an orifice tube outlet end adjacent said outlet port with a boost extension (56) positioned adjacent said outlet port (24) for controlling pressure applied to the other side of said diaphragm (20) and said valve disk holder (58) has a cross sectional area that is significantly smaller than the cross sectional area of said orifice tube (50) to permit gas flow thereover, the gas flow exiting from said orifice tube outlet end and the gas flow over said valve disk providing aspiration and pressure reduction under said diaphragm resulting in droop compensation.

2. The apparatus of claim 1, further including pressure relief means (19,46,48) in said spring casing (12) coupled to said diaphragm (20).
3. The apparatus of claim 1 wherein said valve disk holder (58) includes a cam follower surface (62,63) in contact with said non linear cam profile (33), and further including a similar non linear cam profile (34) on the opposite side of said stem (26); and
wherein said bias means (64) comprises a bias spring (64) coupled between said valve disk holder (58) and said similar non linear cam profile (34).
4. The apparatus of claim 3 wherein said non linear cam profile (34) imparts movement to said disk holder (58) at a non linear rate responsive to movement of said diaphragm (20).
5. The apparatus of claim 4, further including pressure relief means (19,46,48) in said spring casing coupled to said diaphragm (20) and wherein said stem (26) includes a large area relief seat (30) coupled to said diaphragm (20), in order to allow gas flow from the lower to the upper chamber, defined by said diaphragm (20) interposed between said spring casing (12) and said lower casing (14), in the event that an over pressure is formed in the valve.
6. The apparatus of claim 2 wherein said stem (26) includes a stem end (33) defining said non linear cam profile (33) on one side thereof and defining a similar cam profile (34) on the opposite side thereof; and wherein said bias means (64) comprises a bias spring (64) coupled between said disk holder (58) and said

similar cam profile (34) for maintaining said non linear cam profile (33) in contact with said cam follower surface (62,63).

7. The apparatus of claim 6 wherein said orifice tube (50) includes a pair of diametrically opposed grooves (68,70) and wherein said support means (56,57,68,70) on said disk holder (58) includes a plurality of wing-like extensions (57) cooperating with said grooves (68,70).

Patentansprüche

1. Druckabfallkompensiertes Gasregelventil (10), das folgendes aufweist: ein Federgehäuse (12) und ein unteres Gehäuse (14), eine zwischen dem Federgehäuse (12) und dem unteren Gehäuse (14) angeordnete Membran (20), eine einstellbare Federeinrichtung (36, 39) in dem Federgehäuse (12), um auf eine Seite der Membran eine Kraft aufzubringen, eine mit der Membran (20) gekoppelte Spindel (26), die ein in das untere Gehäuse (14) verlaufendes Exzenterprofil (33) hat, eine Einlaßöffnung (22) und eine Auslaßöffnung (24) in dem unteren Gehäuse (14), einen Ventilsitz (52), der in der Einlaßöffnung (22) positioniert ist, einen Ventilplattenhalter (58) einschließlich einer Abstützeinrichtung (56, 57, 68, 70) und eine von dem Ventilplattenhalter (58) getragene Ventilplatte (60), ein Drosselrohr (50), das mit der Abstützeinrichtung (56, 57, 60, 70) an dem Ventilplattenhalter (58) zusammenwirkt, um den Ventilplattenhalter (58) für eine geradlinige Bewegung abzustützen, um die Ventilplatte (60) in und außer Eingriff mit dem Ventilsitz (52) zu bewegen, wobei das Exzenterprofil nichtlinear ist, und eine Vorspanneinrichtung (64), um das Exzenterprofil (33) an der Spindel direkt mit dem Ventilplattenhalter (58) zu verbinden, dadurch gekennzeichnet, daß das Drosselrohr von der Einlaßöffnung ausgeht und ein Drosselrohrauslaßende benachbart der Auslaßöffnung hat, wobei ein Verstärkungsansatz (56) der Auslaßöffnung (24) benachbart positioniert ist, um auf die andere Seite der Membran (20) aufgebrachten Druck zu regeln, und der Ventilplattenhalter (58) eine Querschnittsfläche hat, die erheblich kleiner als die Querschnittsfläche des Drosselrohrs (50) ist, um einen Gasdurchfluß darüber zuzulassen, wobei der Gasdurchfluß aus dem Auslaßende des Drosselrohrs austritt und der Gasdurchfluß über die Ventilplatte für Aspiration und Druckminderung unter der Membran sorgt und in einer Druckabfallkompensation resultiert.

2. Vorrichtung nach Anspruch 1, die ferner eine mit der Membran (20) gekoppelte Druckbegrenzungseinrichtung (19, 46, 48) in dem Federgehäuse (12) aufweist.
3. Vorrichtung nach Anspruch 1, wobei der Ventilplattenhalter (58) eine Exzenterastfläche (62, 63) in Kontakt mit dem nichtlinearen Exzenterprofil (33) hat, und wobei die Vorrichtung ferner ein gleichartiges nichtlineares Exzenterprofil (34) auf der entgegengesetzten Seite der Spindel (26) aufweist; und wobei die Vorspanneinrichtung (64) eine Vorspannfeder (64) aufweist, die zwischen den Ventilplattenhalter (58) und das gleichartige nichtlineare Exzenterprofil (34) gekoppelt ist.
4. Vorrichtung nach Anspruch 3, wobei das nichtlineare Exzenterprofil (34) den Plattenhalter (58) mit einer Bewegung mit einer nichtlinearen Rate nach Maßgabe der Bewegung der Membran (20) beaufschlagt.
5. Vorrichtung nach Anspruch 4, die ferner eine mit der Membran (20) verbundene Druckbegrenzungseinrichtung (19, 46, 48) in dem Federgehäuse aufweist und wobei die Spindel (26) einen mit der Membran (20) gekoppelten großflächigen Begrenzungssitz (30) aufweist, um Gasdurchfluß aus der unteren zu der oberen Kammer, die durch die zwischen dem Federgehäuse (12) und dem unteren Gehäuse (14) angeordnete Membran (20) definiert ist, zuzulassen, falls in dem Ventil ein Überdruck ausgebildet wird.
6. Vorrichtung nach Anspruch 2, wobei die Spindel (26) ein Spindelende (33) aufweist, das auf seiner einen Seite das nichtlineare Exzenterprofil (33) und auf seiner entgegengesetzten Seite ein gleichartiges Exzenterprofil (34) definiert; und wobei die Vorspanneinrichtung (64) eine Vorspannfeder (64) aufweist, die zwischen den Plattenhalter (58) und das gleichartige Exzenterprofil (34) gekoppelt ist, um das nichtlineare Exzenterprofil (33) in Kontakt mit der Exzenterastfläche (62, 63) zu halten.
7. Vorrichtung nach Anspruch 6, wobei das Drosselrohr (50) ein Paar von diametral entgegengesetzten Nuten (68, 70) aufweist und wobei die Abstützeinrichtung (56, 57, 68, 70) an dem Plattenhalter (58) eine Vielzahl von flügelartigen Ansätzen (57) hat, die mit den Nuten (68, 70) zusammenwirken.



Revendications

1. Valve (10) régulatrice de gaz à "affaissement" de pression compensé comprenant un corps à ressort (12) et un corps inférieur (14), un diaphragme (20) disposé entre le corps à ressort (12) et le corps inférieur (14), des éléments (36, 39) formant ressort réglable dans le corps à ressort (12) pour charger un côté du diaphragme, une tige (26) reliée au diaphragme (20) et présentant un profil de came (33) s'étendant dans le corps inférieur (14), une ouverture d'admission (22) et une ouverture de sortie (24) dans le corps inférieur (14), un siège de soupape (52) disposé dans l'ouverture d'admission (22), un organe (58) qui, destiné à retenir un disque formant soupape, comporte des supports (56, 57, 68, 70), et un disque (60) formant soupape porté par l'organe de retenue de disque (58), ou porte-disque, un tube à orifices (50) coopérant avec les supports (56, 57, 60, 70) prévus sur le porte-disque (58) afin de supporter le porte-disque (58) de façon à lui permettre un mouvement rectiligne destiné à mettre le disque (60) formant soupape en prise et hors de prise avec le siège de soupape (52), ledit profil de came étant non linéaire, et un organe (64) soumis à une tension initiale permettant au profil de came (33) de la tige précitée d'être directement au contact du porte-disque (58), caractérisée en ce que le tube à orifices s'étend à partir de l'ouverture d'admission et présente une extrémité de sortie contiguë à l'ouverture de sortie précitée, un prolongement activateur (56) étant disposé au voisinage de l'ouverture de sortie (24) pour régler la pression exercée sur l'autre côté du diaphragme (20), et en ce que le porte-disque (58) présente une section transversale qui est sensiblement inférieure à la section transversale du tube à orifices (50) pour permettre un écoulement de gaz à travers celui-ci, le flux de gaz sortant de l'extrémité de sortie du tube à orifices et l'écoulement de gaz au-delà du disque formant soupape créant une aspiration et une réduction de pression sous le diaphragme, d'où résulte une compensation de l'"affaissement" de la courbe de pression.
2. Appareil selon la revendication 1, comprenant en outre des organes de réduction d'excès de pression (19, 46, 48) qui, disposés dans le corps à ressort (12), sont reliés au diaphragme (20).
3. Appareil selon la revendication 1, dans lequel le porte-disque (58) comporte une surface (62, 63) mue par came et se trouvant au contact du profil de came non linéaire (33), et présente en outre un profil de came non linéaire analogue (34) du côté opposé de la tige (26), et dans lequel l'organe (64) soumis à une tension initiale consiste en un ressort (64) à une tension initiale mis en prise entre le porte-disque (58) et le profil de came non linéaire semblable (34).
4. Appareil selon la revendication 3 dans lequel ledit profil de came non linéaire (34) communique au portedisque (58) un mouvement à une vitesse non linéaire en réponse au mouvement du diaphragme (20).
5. Appareil selon la revendication 4, qui comprend en outre des organes de réduction d'excès de pression (19, 46, 48) montés dans le corps à ressort et reliés au diaphragme (20) et dans lequel la tige (26) comporte un siège de sûreté (30) de grande étendue relié au diaphragme (20) afin de permettre un écoulement de gaz à partir de la chambre inférieure à la chambre supérieure, qui sont déterminées par le diaphragme (20) disposé entre le corps à ressort (12) et le corps inférieur (14), dans le cas où une surpression s'établit dans la valve.
6. Appareil selon la revendication 2, dans lequel la tige (26) comporte une extrémité (32) définissant le profil de came non linéaire précité (33) sur un côté et définissant un profil de came semblable (34) sur le côté opposé de cette extrémité ; et dans lequel l'organe (64) soumis à une tension initiale consiste en un ressort à tension initiale (64) assujetti entre le porte-disque (58) et le profil de came semblable (34) pour maintenir le profil de came non linéaire (33) en contact avec la surface (62, 63) mue par came.
7. Appareil selon la revendication 6, dans lequel le tube à orifices (50) comporte une paire de rainures diamétralement opposées (68, 70) et dans lequel les supports (56, 57, 68, 70) sur le porte-disque (58) comportent un certain nombre d'éléments saillants (57) en forme d'ailes qui coopèrent avec les rainures (68, 70).



* C L M S *