

Description

The present invention relates to check or non-return valves and, more particularly, to an improved poppet check valve as defined in the first part of claim 1 and known from US-A 1 913 664.

The invention is especially suited for small size, high pressure check valves and will be described with particular reference thereto; however, as will become apparent, the invention is applicable to check valves of a wide range of sizes, operable under a variety of pressure conditions.

There has been a continuing interest in reducing the size and overall length of poppet-type check valves. Most prior designs employ an elongated poppet moving against relatively long guide surfaces in order to maintain concentricity. Alternatively, separate guide rods or the like are provided in the valve chamber. These approaches run counter to the object of size reduction or result in increased pressure drop through the valves.

Another problem with the typical prior poppet-type check valve designs has been with respect to the seals. Blow-out and excessive wear of the seal and extrusion of the seal material often result under high pressure conditions or conditions of high back pressure. The various proposals and designs used to overcome these problems generally increase significantly the sizes of the seals, the valve elements or the seats. In addition, the designs are often complex and difficult to manufacture.

An object of the invention is to provide a poppet-type check valve which provides practical and effective solutions to the above-discussed problems. The invention provides a poppet check valve which can be significantly shorter and generally simpler than prior designs. Accordingly, another object of the invention is the provision of a poppet-type check valve which can have a very short length.

A further object is the provision of a poppet-type valve in which the valve element has low mass thereby to increase the sensitivity of the valve.

A still further object is the provision of a valve of the type described which is relatively simple and economical to manufacture.

Accordingly, the invention as defined in claim 1 provides a poppet-type check valve in which a shoulder is provided in the valve body between an inlet passage and a valve chamber having a cylindrical inner wall and in which a valve element in the valve chamber is biased by a coil spring to urge a seal element on the valve element against an annular valve seat on the shoulder, the valve element is thin, disc-like, and has a plurality of legs extending radially from a generally circular perforate central section on which the seal element is mounted and slidably engaging the cylindrical wall, characterised in that a poppet stop member is positioned between the valve element and the spring and has a plurality of circumferentially-spaced axially-extending force-applying elements engaging the central section of the valve element and at least one radially outer guide surface for sliding engagement with the inner wall of the valve chamber.

The poppet stop and poppet valve element are guided from the walls of the valve chamber and can have limited relative shifting or tilting movement without binding.

The arrangement of the valve element and the poppet stop member may be such that limited relative tilting can take place while both elements are guided from the walls of the valve chamber. The relationship prevents binding of the elements even though their total length axially of the valve chamber is relatively short.

The valve of the type described employs a thin disc-like valve element designed to limit stress application to the seal ring.

In accordance with another aspect of the invention, the valve element includes a resilient seal ring which extends towards the seat at a location radially inwardly of the legs. The ring is sized to engage the seat circumferentially of the inlet. The portion of the valve element inwardly of the seal ring has a conical surface such that, when the seal is compressed against the seat, the conical surface engages the juncture between the inlet and the valve chamber with line contact to provide an additional seal area and prevent further compression of the seal.

In accordance with a more limited aspect, the seal ring preferably has a cross-section, such that, upon compression, it expands radially outwardly. Also, the valve element is relieved in the region circumferentially of the seal ring to provide a space into which the seal material can deform. This in combination with the conical surface, limits the total stress on the seal even under extreme back pressures.

The invention is further described, by way of example, with reference to the accompanying drawings, wherein:

Fig.1 is a longitudinal sectional view through a poppet check valve in accordance with a preferred embodiment of the invention;

Fig.2 is a view similar to the centre portion of Fig. 1 but showing the valve in an open position;

Fig.3 is a cross-sectional view taken on line 3-3 of Fig. 1;

Fig.4 is an exploded perspective view of the valve of Fig.1;

Fig.5 is an enlarged sectional view of the valve element and seat portion of the Fig.1 embodiment;

Fig.6 is a greatly enlarged view of the circled portion of Fig.5;

Fig.7 is a view similar to Fig.6 but showing the valve element in a fully closed, metal-to-metal sealing position;

Fig.8 is a view similar to Fig.2 but showing a modified form of the invention; and

Fig.9 is a perspective view of the components used for making the modified poppet stop element of the Fig.8 embodiment.

Referring more particularly to the drawings, Fig. 1 shows the overall arrangement of a poppet-type check valve 10 which includes a body 12 comprised of male and female body-forming portions 14 and 16, respectively. The outer free ends of the body portions 14 and 16 are provided with suitable connect-

ing means 18 and 20 to allow the valve to be connected to fluid lines 22 and 24 respectively. In the embodiment shown, the connecting means 18 and 20 are shown as compression-type couplings well known in the art, but any particular type of coupling or connecting means could be used to allow the valve to be mounted in fluid lines.

The body halves or portions 14,16 are joined in sealed relationship by screw threads 26. As best seen in Fig.3, each of the body sections is conveniently provided with wrench flats 28 to facilitate connection and disconnection. In addition, the body halves are sealed relative to one another by an O-ring 30 and a back-up ring 32 carried in a recess 34 in the male body member 14.

The male body portion 14 is provided with an axially extending passage 38. The passage 38 includes a reduced diameter flange or shoulder portion 42 located generally midway between its ends. The female body portion 16 is also provided with an axially extending through passage 44. The latter includes a first portion 46 and a second larger diameter portion 48. Portions 46 and 48 are separated by a radially inwardly extending flange or shoulder 50 defining a smaller diameter inlet opening 52. The right-hand surface 54 of flange 50 is preferably flat and extends generally perpendicularly to the longitudinal axis of the body 12. In the embodiment shown, surface 54 functions as a valve seat. The surface 54 could have other configurations, depending on the arrangement of the co-operating valve element.

As can be seen, the enlarged bore portion 48 of the female body portion 16 together with the left-hand end of male body portion 14 co-operate to define a relatively short, cylindrical valve chamber 56 with axially aligned inlet and outlet openings.

Mounted within the valve chamber 56 for co-operation with the seat 54 is a valve disc element 60. Element 60 is maintained under a continual bias towards the seat 54 by a coil spring 62 acting through a poppet stop member 64. The arrangement of the valve member 60 and the poppet stop member 64 relative to the valve chamber 56 is important and can best be understood by reference to Figs. 4 and 5. The preferred arrangement of these elements allows the valve to be significantly shorter than prior art valves and eliminates the need for separate guiding structure or elements. Specifically, as shown in Figs. 3 and 5, the valve element or poppet 60 is comprised of generally flat, disc-shaped body 66 formed from any suitable material, such as stainless steel or the like. Body 66 has an imperforate, generally circular centre portion of a diameter significantly less than the diameter of bore 48 but larger than the opening 52. Extending radially outwardly from the circular centre portion are a plurality of tabs or legs 68. As best shown in Figs. 3 and 4, the legs 68 are of equal length and are spaced apart at equal circumferential distances about the periphery of body 66. While four of the tabs or legs 66 are shown, this number could vary. The legs or tabs 68 preferably have a total radial extend only slightly less than the radius of bore 48. Thus, the outer end portions of the tabs 68 guide the valve 60 from the internal surface of bore 48 which defines the valve

chamber. The space between adjacent tabs 68 provides a flow passage when the valve element 60 is in the open position shown in Fig.2.

Carried by body 66 and adapted to co-operate with valve seat surface is an annular elastomeric seal ring member 72 formed from any suitable elastomeric material capable of withstanding the intended operating conditions. As best shown in Figs. 5 and 6, the elastomeric seal ring 72 is preferably bonded in place in an axially extending circular groove 74 formed in the left-hand end face of valve element body 66. The diameter of the seal ring 72 is slightly greater than the innermost diameter of the seat-forming surface 54 so that when in the closed position, the seal engages circumferentially about the inlet. As best shown in Fig.6, the radially outermost wall 78 of groove 74 has a lateral extent substantially less than the inner wall 80. That is, the outer peripheral portion of the circular centre of disc 66 is cut away or relieved a distance "d" as shown in Fig.6. The importance of this relationship will be described hereinafter.

Referring again to Fig.6, the exposed axial end of the seal ring 72 is formed by intersecting co-operating surfaces 82 and 84. The inner surface 84 is shown inclined such that it makes an angle of about 45° with the seat surface 54. Surface 82, on the other hand, is somewhat more vertical and makes an angle of approximately 70° with surface 54. Fig.6 shows the valve element 60 in a closed position with the outer end of the seal ring 72 in sealing engagement with surface 54. With an increase in back pressure or pressure acting on the right-hand side of the valve element 60, as viewed in Fig.6, the seal ring 72 is continually compressed as the valve body 66 moves closer towards surface 54. The shape of the seal ring 72 causes the seal material to deform radially outwardly. The portion of the valve body 66 relieved by the distance "d" identified earlier provides room for the seal material to deform or extrude during this further movement of the valve element. The ultimate maximum extent of movement of the element 66 in a closing direction is shown in Fig.7. At this time metal-to-metal, sealing contact is made between the inner portion of body 66 and the seat surface 54. The excess seal material is deformed into the space existing between the outer peripheral portion of the disc 66 and surface 54.

In order to improve the metal-to-metal contact and sealing the left-hand face 67 of the valve disc body 66 preferably has a slightly conical configuration as best seen in Fig.5. This tends to shift the metal-to-metal contact to line contact between the corner 90 at the juncture between surface 54 and the outlet portion of inlet opening 52 (Fig.7).

As mentioned earlier, the valve disc 60 is maintained under a continual bias toward the valve seat surface 54 by the coil spring 62 acting through the poppet stop member 64. In the embodiment shown, the the poppet stop member 64 is arranged to allow slight tilting or shifting of the valve disc while generally maintaining it sufficiently aligned so as to prevent binding with the walls of bore 48. Specifically, as best shown in Figs. 4 and 5, the poppet stop member 64 includes an outer annular rim portion 94

whose outer periphery 95 has a diameter slightly less than the inner diameter of bore 48. At its radial inner edge the rim portion 94 is axially depressed as shown in Fig.5 to provide a seat 93 for receiving and locating the end of coil spring 62. Formed about the inner periphery of rim 94 are a plurality of axially extending force-applying element or fingers 98. Fingers 98 are uniformly spaced about the inner periphery of the rim 94. In the embodiment shown, four fingers 98 are shown but more or fewer could be used without affecting the overall function of the stop member 64.

Preferably, the member 64 is formed by a stamping operation and the fingers 98 are integral with the outer ring or rim portion 94.

Referring again to Fig.2, when the valve is moved to the open position under the effect of a higher pressure in the inlet line 24, the valve element 60 and the stop member 64 are moved to the right, overcoming the bias of spring 62. The total extent of rightward movement is limited by a stop defined by the innermost of left-hand end 100 of male body member 14. When the valve is in the open position shown in Fig.2 fluid flow can take place around the outer periphery of the disc member 66 between the outwardly extending legs or tabs 68 and then inwardly through the fingers 98 of poppet stop member 64. During movement of the valve element 60 and the poppet stop member 64 between open and closed positions, shifting and/or some slight tilting of the two elements, can take place relative to one another. Generally, however, the arrangement is such that the elements coact to prevent any tilting sufficient to produce binding or the like between their outer peripheries and the inner wall of the bore 48.

Because of the arrangement described, the overall valve can have an extremely short length and good guiding and concentricity of the valve element is maintained without the use of long guide surfaces or separate guide rods or elements. In addition, the total mass of the valve element and poppet stop can be low producing an increased sensitivity and more rapid response.

Figs. 8 and 9 show an alternative form for the poppet stop member of the valve. In all other particulars, the Figs. 8 and 9 embodiment is identical to that previously described with reference to Figs. 1 to 7. Accordingly, like reference numerals differentiated by the addition of a prime suffix have been used to identify the same parts. In this embodiment, the poppet stop member 109 comprises a pair of flat somewhat arrow-shaped elements 110 and 112 best seen in Fig.9. Element 110 includes a central body portion 114 which has a width w slightly less than the inner diameter of spring 62'. A pair of wings 116 extend laterally from the left-hand end of body portion 114. The total width w' between the outer ends 117 of wings 116 is slightly less than the bore 48'. Element 112 has generally the same configuration and the width t of its main body portion 118 is also only slightly less than the internal open diameter of coil spring 62'. Similarly, outwardly extending wings 120 have between their outer ends 121 a total width t' which is also only slightly less than the inner diameter of the

bore 48'. At the left-hand end of each of the elements 110 and 112 there is provided a rectangular notch 122 and 124 respectively. Adjacent each notch are inclined outwardly extending portions 126 and 128 respectively.

The two elements 110 and 112 include co-operating longitudinally extending slots 130 and 132 each having a width equal to the thickness of the corresponding member. This allows the two members to be slid together to form a generally x-shaped element as shown in Fig.8. The rear or right-hand portion of the stop member 109 is closely received within the coil spring and receives guidance therefrom. The outer end surfaces of the outwardly extending wings are slidably guided by the bore 48'. Force is applied from spring 62' to the valve element 60' by contact between the inclined portions 126, 128 of elements 110 and 112 respectively. This alternative form for the poppet stop member 109 provides good flow characteristics and applies the spring force closer to the center of the rear face of the poppet valve element 60'. The advantage of force application in this manner is that, in the event the left-hand end or face of the spring 62' is not ground precisely flat, any tilt applied to the poppet stop member 109 will not be transmitted to the poppet valve element 60'. This embodiment, therefore, allows looser tolerances with respect to the matter of spring manufacture. In addition, however, this embodiment also achieves extremely good guiding of both the poppet stop member and the poppet valve element itself without the use of extended guide surfaces or any separate guide elements.

Claims

1. A poppet-type check valve in which a shoulder (50) is provided in the valve body (12) between an inlet passage (46) and a valve chamber (56) having a cylindrical inner wall (48), and in which a valve element (60) in the valve chamber (56) is biased by a coil spring (62) to urge a seal element (72) on the valve element (60) against an annular valve seat (54) on the shoulder (50), the valve element (60) being thin disc-like and having a plurality of legs (68) extending radially from a generally circular imperforate central section (66) on which the seal element (72) is mounted and slidably engaging the cylindrical wall (48), characterised in that a poppet stop member (64 or 109) is positioned between the valve element (60) and comprises the spring (62), said poppet stop member has a plurality of circumferentially-spaced axially-extending force-applying elements (98 or 126, 128) engaging the central section (66) of the valve element (60) and comprises at least one radially outer guide surface (95 or 117, 121) for sliding engagement with the inner wall (48) of the valve chamber (56).

2. A check valve according to claim 1 in which the seal element (72) is a seal ring having a cross-sectional configuration such that, upon compression against the valve seat, the seal element deforms radially outwardly.

3. A check valve according to claim 2, in which the central section (66) of the valve element (60)

whose outer periphery 95 has a diameter slightly less than the inner diameter of bore 48. At its radial inner edge the rim portion 94 is axially depressed as shown in Fig.5 to provide a seat 93 for receiving and locating the end of coil spring 62. Formed about the inner periphery of rim 94 are a plurality of axially extending force-applying element or fingers 98. Fingers 98 are uniformly spaced about the inner periphery of the rim 94. In the embodiment shown, four fingers 98 are shown but more or fewer could be used without affecting the overall function of the stop member 64.

Preferably, the member 64 is formed by a stamping operation and the fingers 98 are integral with the outer ring or rim portion 94.

Referring again to Fig.2, when the valve is moved to the open position under the effect of a higher pressure in the inlet line 24, the valve element 80 and the stop member 64 are moved to the right, overcoming the bias of spring 62. The total extent of rightward movement is limited by a stop defined by the innermost of left-hand end 100 of male body member 14. When the valve is in the open position shown in Fig.2 fluid flow can take place around the outer periphery of the disc member 66 between the outwardly extending legs or tabs 68 and then inwardly through the fingers 98 of poppet stop member 64. During movement of the valve element 60 and the poppet stop member 64 between open and closed positions, shifting and/or some slight tilting of the two elements, can take place relative to one another. Generally, however, the arrangement is such that the elements coact to prevent any tilting sufficient to produce binding or the like between their outer peripheries and the inner wall of the bore 48.

Because of the arrangement described, the overall valve can have an extremely short length and good guiding and concentricity of the valve element is maintained without the use of long guide surfaces or separate guide rods or elements. In addition, the total mass of the valve element and poppet stop can be low producing an increased sensitivity and more rapid response.

Figs. 8 and 9 show an alternative form for the poppet stop member of the valve. In all other particulars, the Figs. 8 and 9 embodiment is identical to that previously described with reference to Figs. 1 to 7. Accordingly, like reference numerals differentiated by the addition of a prime suffix have been used to identify the same parts. In this embodiment, the poppet stop member 109 comprises a pair of flat somewhat arrow-shaped elements 110 and 112 best seen in Fig.9. Element 110 includes a central body portion 114 which has a width w slightly less than the inner diameter of spring 62'. A pair of wings 116 extend laterally from the left-hand end of body portion 114. The total width w' between the outer ends 117 of wings 116 is slightly less than the bore 48'. Element 112 has generally the same configuration and the width l of its main body portion 118 is also only slightly less than the internal open diameter of coil spring 62'. Similarly, outwardly extending wings 120 have between their outer ends 121 a total width t' which is also only slightly less than the inner diameter of the

bore 48'. At the left-hand end of each of the elements 110 and 112 there is provided a rectangular notch 122 and 124 respectively. Adjacent each notch are inclined outwardly extending portions 126 and 128 respectively.

The two elements 110 and 112 include co-operating longitudinally extending slots 130 and 132 each having a width equal to the thickness of the corresponding member. This allows the two members to be slid together to form a generally x-shaped element as shown in Fig.8. The rear or right-hand portion of the stop member 109 is closely received within the coil spring and receives guidance therefrom. The outer end surfaces of the outwardly extending wings are slidably guided by the bore 48'. Force is applied from spring 62' to the valve element 60' by contact between the inclined portions 126, 128 of elements 110 and 112 respectively. This alternative form for the poppet stop member 109 provides good flow characteristics and applies the spring force closer to the center of the rear face of the poppet valve element 60'. The advantage of force application in this manner is that, in the event the left-hand end or face of the spring 62' is not ground precisely flat, any tilt applied to the poppet stop member 109 will not be transmitted to the poppet valve element 60'. This embodiment, therefore, allows looser tolerances with respect to the matter of spring manufacture. In addition, however, this embodiment also achieves extremely good guiding of both the poppet stop member and the poppet valve element itself without the use of extended guide surfaces or any separate guide elements.

Claims

1. A poppet-type check valve in which a shoulder (50) is provided in the valve body (12) between an inlet passage (46) and a valve chamber (56) having a cylindrical inner wall (48), and in which a valve element (60) in the valve chamber (56) is biased by a coil spring (62) to urge a seal element (72) on the valve element (60) against an annular valve seat (54) on the shoulder (50), the valve element (60) being thin disc-like and having a plurality of legs (68) extending radially from a generally circular imperforate central section (66) on which the seal element (72) is mounted and slidably engaging the cylindrical wall (48), characterised in that a poppet stop member (64 or 109) is positioned between the valve element (60) and comprises the spring (62), said poppet stop member has a plurality of circumferentially-spaced axially-extending force-applying elements (98 or 126, 128) engaging the central section (66) of the valve element (60) and comprises at least one radially outer guide surface (95 or 117, 121) for sliding engagement with the inner wall (48) of the valve chamber (56).

2. A check valve according to claim 1 in which the seal element (72) is a seal ring having a cross-sectional configuration such that, upon compression against the valve seat, the seal element deforms radially outwardly.

3. A check valve according to claim 2, in which the central section (66) of the valve element (60)



has outwardly of the seal element (72) a relieved portion (d) into which the seat element can deform upon compression against the seat (54)

4. A check valve according to claim 1, 2 or 3, in which the guide surface or surfaces (95, 117, 121) on the poppet stop member (64 or 109) are axially spaced from the legs (68) on the valve element (60) and the poppet stop member (64 or 109) and the valve element (60) are capable of limited tilting relative to one another.

5. A check valve according to any preceding claim, in which the poppet stop member (64 or 109) has locating means (93 or 114, 118) for locating the spring (62).

6. A check valve according to claim 5, in which the locating means comprises a circular recessed portion (93) of the poppet stop member (64) (Fig. 5).

7. A check valve according to claim 5, in which the locating means comprises at least one portion (114, 118) of the poppet stop member (109) extending axially into the spring (62) (Fig. 8).

8. A check valve according to any of claims 1 to 7, in which the radially outer guide surface on the poppet surface (95) thereof (Fig. 1, 5).

9. A check valve according to any of claims 1 to 8, in which the poppet stop member (64) comprises a generally annular body (94) and the axially-extending force-applying elements comprise axially extending fingers (98) on the inner periphery of the annular body (94) (Fig. 4).

10. A check valve according to any preceding claim, in which the axially-extending force-applying element (98) are spaced substantially equal distances from one another circumferentially of the poppet stop member (64).

11. A check valve according to any claims 1 to 7, in which the radially outer guide surfaces on the poppet stop member (109) are on radially extending wings (116, 120) thereof (Fig. 8).

12. A check valve according to any preceding claim, in which the radially extending legs (68) of the valve element (60) are located at substantially equal distances apart circumferentially about the periphery of the central section (66).

13. A check valve according to any preceding claim, in which the seal element is a seal ring (72) bonded in a groove (74) in the valve element (60).

14. A check valve according to any preceding claim, in which the seal element is a seal ring (72) and the central section (66) of the valve element (60) has a conical face (67) inwards of the seal ring (72) for direct engagement with the valve seat (54) upon a predetermined compression of the seal ring against the seat.

15. A check valve according to any preceding claim, in which the valve body (12) includes means (100) for limiting the maximum extent of movement of the poppet stop member (64) in a direction away from the valve seat (54).

Revendications

1. Soupape de retenue du type, à champignon, dans laquelle un épaulement (50) est prévu dans le corps de soupape (10), un passage d'entrée (46) et

une chambre de soupape (56) présentant une paroi interne cylindrique (48), et dans laquelle un élément de soupape (60) de la chambre de soupape (56) est rappelé par un ressort hélicoïdal (62) pour pousser un élément d'étanchéité (72) sur l'élément de soupape (60) contre un siège de soupape annulaire (54) sur l'épaulement (50), caractérisée en ce que l'élément de soupape (60) est du type à disque mince et présente une pluralité de pattes (68) s'étendant radialement depuis la section centrale (66) non perforée, généralement circulaire, sur laquelle l'élément d'étanchéité (72) est monté et venait en contact couissant avec la paroi cylindrique (48), et qu'un élément de retenue (64 ou 109) à champignon est positionné entre l'élément de soupape (60) et le ressort (62) et que ledit élément de retenue présente une pluralité d'éléments (98 ou 126, 128) appliquant une force, s'étendant axialement, et espacés sur la circonférence, venant en contact avec la section centrale (66) de l'élément de soupape (60) et comprenant au moins une surface de guidage (95 ou 117, 121) externe radialement pour assurer un contact couissant avec la paroi interne (48) de la chambre de soupape (56).

2. Soupape de retenue selon la revendication 1, dans laquelle l'élément d'étanchéité (72) est une bague d'étanchéité présentant une configuration de section transversale telle que, suite à une compression contre le siège de soupape, l'élément d'étanchéité se déforme radialement vers l'extérieur.

3. Soupape de retenue selon la revendication 2, dans laquelle la section centrale (66) de l'élément de soupape (60) présente à l'extérieur de l'élément d'étanchéité (72) une portion dégagée (d) dans laquelle l'élément d'étanchéité peut se déformer par compression contre le siège (54).

4. Soupape de retenue selon la revendication 1, 2 ou 3, dans laquelle la surface ou les surfaces de guidage (95, 117, 121) de l'élément de retenue à champignon (64 ou 109) sont espacées des pattes (68) de l'élément de soupape (60) et dans laquelle l'élément de retenue à champignon (64 ou 109) et l'élément de soupape (60) sont susceptibles d'un basculement limité l'un par rapport à l'autre.

5. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle l'élément de retenue à champignon (64 ou 109) présente des moyens (93 ou 114, 118) pour positionner le ressort (62).

6. Soupape de retenue selon la revendication 5, dans laquelle les moyens de positionnement comprennent une partie en renforcement circulaire (93) de l'élément de retenue (64) à champignon.

7. Soupape de retenue selon la revendication 5, dans laquelle les moyens de positionnement comprennent au moins une partie (114, 118) de l'élément de retenue à champignon (109) s'étendant axialement dans le ressort (62) (figure 8).

8. Soupape de retenue selon une quelconque des revendications 1 à 7, dans laquelle la surface de guidage externe radialement de l'élément de retenue à champignon (64) est une surface périphérique annulaire externe (95) (figure 15).

9. Soupape de retenue selon une quelconque des revendications 1 à 8, dans laquelle l'élément de rete-



nue à champignon (64) comprend un corps généralement annulaire (94) et dans laquelle les éléments appliquant une force et s'étendant axialement comprennent des doigts (98) s'étendant axialement sur la périphérie interne du corps annulaire (94) (figure 4).

10. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle les éléments appliquant une force et s'étendant axialement (98) sont espacés sensiblement à égale distance les uns des autres sur la circonférence de l'élément de retenue (64) à champignon.

11. Soupape de retenue selon l'une des revendications précédentes, dans laquelle les surfaces de guidage radialement externes de l'élément de retenue à champignon (109) sont situées sur des ailes (116, 120) s'étendant radialement (figure 8) de celui-ci.

12. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle les pattes (68) de l'élément de soupape (60) s'étendant radialement sont situées à des distances sensiblement égales l'une de l'autre sur la périphérie de la section centrale (66).

13. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle l'élément d'étanchéité est une bague d'étanchéité (72) bloquée dans une rainure (74) de l'élément de soupape (60).

14. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle l'élément d'étanchéité est une bague d'étanchéité (72) et la section centrale (66) de l'élément de soupape (60) présente une face conique (67) vers l'intérieur de la bague d'étanchéité (72) pour venir directement en contact avec le siège de soupape (54) lors d'une compression prédéterminée de la bague d'étanchéité contre le siège.

15. Soupape de retenue selon une quelconque des revendications précédentes, dans laquelle le corps de soupape (12) comprend des moyens (100) pour limiter la valeur maximum du déplacement de l'élément de retenue à champignon (64) s'écartant du siège de soupape (54).

Patentansprüche

1. Rückschlag-Tellerventil mit einer Schulter (50) im Ventilgehäuse (12) zwischen einer Einlaßbohrung (46) und einer Ventilkammer (56), die eine zylindrische Innenwand (48) aufweist, und mit einem durch eine Schraubenfeder (62) derart belasteten Ventilelement (60), daß ein Dichtungselement (72) auf dem Ventilelement (60) an einen ringförmigen Ventilsitz (54) auf der Schulter (50) gedrückt wird, wobei das Ventilelement (60) dünn sowie scheibenförmig ist und eine Anzahl von Ansätzen (68) hat, die radial von einem allgemein kreisförmigen, undurchlässigen Mittelstück (66) abstehen, an dem das Dichtungselement (72) angebracht ist, und die gleitbar an der zylindrischen Wand (48) anliegen, dadurch gekennzeichnet, daß zwischen dem Ventilelement (60) und der Feder (62) ein Telleranschlag (64; 109) angeordnet ist, der in Umfangsabständen eine Anzahl von sich axial erstreckenden Anlageteile-

menten (98; 126, 128) hat, die am Mittelstück (66) des Ventilelements (60) angreifen, und der zur Gleitanlage an der Innenwand (48) der Ventilkammer (56) wenigstens eine radial äußere Führungsfläche (95; 117, 121) aufweist.

2. Rückschlagventil nach Anspruch 1, dadurch gekennzeichnet, daß das Dichtungselement (72) eine Ringdichtung von solcher Querschnittsgestalt ist, daß sich das Dichtungselement bei Andruck an den Ventilsitz nach außen radial verformt.

3. Rückschlagventil nach Anspruch 2, dadurch gekennzeichnet, daß am Mittelstück (66) des Ventilelements (60) außerhalb des Dichtungselements (72) ein Ausnehmungsbereich (d) vorhanden ist, in den sich das Dichtungselement bei Andruck an den Ventilsitz (54) hineinwölbt.

4. Rückschlagventil nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die bzw. jede Führungsfläche (95; 117, 121) des Telleranschlagkörpers (64; 109) einen Axialabstand zu den Ansätzen (68) des Ventilelements (60) hat und daß der Telleranschlagkörper (64; 109) sowie das Ventilelement (60) in bezug aufeinander begrenzt kippbar sind.

5. Rückschlagventil nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß der Telleranschlagkörper (64; 109) Ausricht- bzw. Zentriermittel (93; 114, 118) zum Ausrichten bzw. Zentrieren der Feder (62) aufweist.

6. Rückschlagventil nach Anspruch 5, dadurch gekennzeichnet, daß als Ausricht- bzw. Zentriermittel eine kreisförmige Aussparung (93) am Telleranschlagkörper (64) vorhanden ist (Fig. 5).

7. Rückschlagventil nach Anspruch 5, dadurch gekennzeichnet, daß die Ausricht- bzw. Zentriermittel wenigstens einen Bereich (114, 118) am Telleranschlagkörper (109) aufweisen, der axial in die Feder (62) ragt (Fig. 8).

8. Rückschlagventil nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die radial äußere Führungsfläche am Telleranschlagkörper (64) von einer äußeren ringförmigen Umfangsfläche (95) daran gebildet ist.

9. Rückschlagventil nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß der Telleranschlagkörper (64) einen allgemein ringförmigen Körper (94) aufweist, an dessen Innenumfang die als axiale Finger (98) ausgebildeten, sich axial erstreckenden Anlageteilelemente angeordnet sind.

10. Rückschlagventil nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß die sich axial erstreckenden Anlageteilelemente (98) von einander im wesentlichen gleiche Abstände am Umfang des Telleranschlagkörpers (64) haben.

11. Rückschlagventil nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die radial äußeren Führungsflächen des Telleranschlagkörpers (109) als von diesem radial abstehende Flügel bzw. Stummel (116, 120) ausgebildet sind.

12. Rückschlagventil nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, daß die radial abstehenden Ansätze (68) des Ventilelements (60) am Umfang des Mittelstücks (66) mit im wesentlichen gleichen Abständen zueinander angeordnet sind.

13. Rückschlagventil nach einem der Ansprüche 1 bis 12, dadurch gekennzeichnet, daß das Dich-



tungselement als in einer Nut (74) des Ventilelements (60) stoffschlüssig befestigter Dichtungsring (72) ausgebildet ist.

14. Rückschlagventil nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet, daß das Dichtungselement ein Dichtungsring (72) ist und daß das Mittelstück (66) des Ventilelements (60) einwärts vom Dichtungsring (72) eine Konusfläche (67) hat, die bei einem bestimmten Andruck des Dichtungsringes gegen den Ventilsitz (54) an diesem unmittelbar anliegt.

15. Rückschlagventil nach einem der Ansprüche 1 bis 14, dadurch gekennzeichnet, daß am bzw. im Ventilgehäuse (12) Mittel (100) zum Begrenzen der Maximalbewegung des Telleranschlagkörpers (64) vom Ventilsitz (54) weg vorhanden sind.

5

10

15

20

25

30

35

40

45

50

55

60

65



* C L M S *