

PATENT SPECIFICATION

(11)

1 565 211

1 565 211

(21) Application No. 52204/75 (22) Filed 19 Dec. 1975

(23) Complete Specification Filed 1 Dec. 1976

(44) Complete Specification Published 16 Apr. 1980

(51) INT. CL.³ F16K 7/02

(52) Index at Acceptance
F2V E1L2

(72) Inventor: GEOFFREY HANSON

(19)



(54) AN IMPROVED VALVE

(71) We, PEGLER-HATTERSLEY LIMITED, a British Company of St. Catherine's Avenue, Doncaster, Yorkshire, DN4 8DF, England do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention concerns valves for use in industrial, office and domestic pipe installations. Thus the invention relates to, for example, sink taps, radiator valves, water works valves, chemical applications valves, food industry (hygienic) valves, drain valves, plug cocks and the like.

An object of the present invention is to provide a valve in which there are a minimal number of parts, and in which machining operations on the parts during manufacture of the valve are reduced as compared to the machining operations currently required during valve manufacture.

A further object of the invention is to provide a glandless valve in which the seating member is of elastomeric material and is wholly supported.

Thus according to one aspect of the present invention there is provided a control member for a valve comprising a first relatively rigid member having a longitudinal axis and a second relatively flexible member surrounding the first member and being provided with an external surface at least a part of which is of ribbed form, the said ribs being at least two in number and extending in parallelism longitudinally of the second member and at diametrically opposed positions on its surface, said second relatively flexible member being in continuous resilient engagement with a continuous surface of the first member, said first member being so arranged that on relative movement between said members the contours of said flexible member are

changed whereby a valve control function may be effected.

Preferably the first member is provided with means adapted to assist in reducing the force required to cause relative movement between it and the second member.

According to a further aspect of the present invention there is provided a valve including inlet and outlet ports, a flow passage therebetween and a seating member chamber extending across the flow passage there being a control member as hereinbefore defined contained within the seating member chamber. Conveniently the control member consists of a first relatively rigid member in the form of a core having a longitudinal axis and a second relatively flexible member provided with an external surface, at least part of which is of ribbed form, the said ribs being at least two in number and extending in parallelism longitudinally of the second member and at diametrically opposed positions on its surface, the said relatively flexible member surrounding the core and in intimate resilient engagement therewith, the first and second members being positioned across the flow passage with the second member secured against rotation and the first member being rotatable relative to the second member whereby on rotation of the first member relative to the second the contours of the latter are changed to open or close the valve.

The invention will now be described further, by way of example only, with reference to the accompanying schematic illustrations in which:

Figures 1, 2 and 3 illustrate one form of valve made in accordance with the invention respectively in the fully open, part closed and fully closed positions,

Figure 4 is a part sectional cut away perspective view of the valve of Figures 1 to 3.

50

55

60

65

70

75

80

85

90

(10)

2

1 565 211

2

Figure 5 is a cross-section of a modification of one of the components of the valve of Figures 1 to 4.

Figure 6 shows a modification of the valve of Figures 1 to 4,

Figures 7 to 12 are schematic illustrations showing further modifications,

Figure 13 is a part sectional plan view of a still further modification,

Figure 14 is a section on the line XIV - XIV of the valve of Figure 13,

Figure 15 is a view on arrow A of Figure 13, and

Figure 16 is a part sectional exploded view of part of the valve of Figures 13 to 15.

In the drawings and description identical parts of the valves illustrated will be given the same reference numerals.

As shown in figures 1 to 4 a valve and control member made in accordance with one form of the invention comprises a body or housing 10 in which are, in the valve being described, aligned ports 11 (only one of which can be seen). The body 10 is provided with end flanges 10a to enable the valve to be fixed in position, for example in a pipeline. The ports 11 are formed at the ends of flow-passages 13 separated from each other by a seating member chamber 14. The end regions 14a of the seating member chamber wall 14b are of circular cross-section to facilitate the securing thereon of a valve closure element, yet to be described. Between its ends the chamber is of substantially rectangular cross-section. The longitudinal axis of the chamber is preferably at right angles to the longitudinal axis of the body 10. As can be seen the flow passages 13 open into the chamber 14. At the end regions 14a of the chamber wall 14b peripheral grooves 15 are formed to receive flanged ends 16 of a fixedly mounted flexible externally ribbed hollow member 17 which forms a valve closure element. The ribs which may for example be of the form shown in Figure 5 are diametrically opposed on the member 17 and extend in parallel along its length. The member 17 contains, and completely surrounds, a lenticular shaped rotatable core 18 of rigid material. The core 18 is provided with trunnion bearings 19 at each end and these are mounted in end caps 20 of the chamber 14. The end caps 20 also serve to retain the ends of the valve closure member 17 and for this purpose they are rebated to enable the inner region of the flanged ends of the closure member 17 to seat therein.

As one alternative to providing flanges 16 at the ends of the member 17 to enable it to be fixed in position the ends may be plain and the member can thus be secured in position by bonding it to plain surfaces at the ends of the chamber wall 14b.

Other means of fixing the ends of the

member 17 will readily suggest themselves to one skilled in the art.

One trunnion bearing 19 is provided with an integral extension 21 which, together with a part of the trunnion 19, extends outwardly from one of the end caps 20 to receive a handwheel 22 or the like.

In use, assuming the valve to be open as shown in Figures 1 and 4, media in the line in which the valve is located can pass around the lenticular closure 17. To close the valve the handwheel or lever 22 is turned and as the core 18 rotates within the closure element 17, its contours are changed as the major axis of the core 18 is rotationally displaced and thus the flow space around the closure element 17 is continuously reduced until, after one quarter of a turn of the handwheel or lever 22, the ribs of the closure element are pressed against the seating member chamber and thus in Figure 3. The external ribs of the closure member 17 when pressed into seating contact with the internal surface of the chamber 14 provide an externally effective seal of the chamber. Additionally the internal surface of the chamber 14 can be provided with longitudinal ribs or grooves to co-operate with the ribs of the flexible closure member 17 when the valve is in the closed position.

Clearly end closures for the chamber 14 may be of a form other than that disclosed above. For example, as shown in Figure 6 the end closures may be in the form of bolt on discs 23, one of which is provided with a central blind bore 24 to receive the end of a core trunnion 19 and serve as a bearing. The other end disc 23 would be provided with a through bore 25 to enable the extension 21 of the trunnion 19 to project therethrough to receive the handwheel 22. As can be seen both discs 23 are peripherally rebated to provide a seating for the grooved ends of the chamber wall 14a, and in order that the inner face of each disc 23 can bear against the adjacent end of the closure element 17 firmly to hold it in position when the discs 23 are bolted into position. Clearly, if desired or necessary, roller, needle or other bearings 30 may be provided (as shown in Figure 11) for the mounting of the core 18 in the chamber 14 and, in large valves, there may be provided power driven valve operating means including a prime mover 31 and, for example, a gear drive 32 (as shown schematically in Figure 12) for rotating the core 18 for the purpose of opening and closing the valve. If desired bearings 30 are provided (as shown) for the ends of the core 18.

In a further modification means is provided for ensuring that the core 18 can be rotated relatively easily within the non-rotatable closure member 17, which as stated above, completely encloses the core. Many alternative core modifications are

possible to achieve ease of rotation. For example, as shown in Figure 7 the core 18 may be provided, at the ends of its major axis, with rollers 26 or, as shown in Figure 8, with spring loaded blades 27. Further modifications may, for example, consist simply, as shown in Figure 9 of sleeving the whole core 18 with a sleeve 28 of low friction material such as PTFE (polytetrafluoroethylene) or, as shown in Figure 10 the core 18 may be provided with oilways 29 to enable lubricant under pressure to be fed between the core 18 and the closure member 17.

15 In a still further modification, as shown particularly in Figure 13, there is provided a valve consisting basically of a body 100 and an integral closure member chamber 101 formed with its longitudinal axis at right angles to the longitudinal axis of the body 100. The closure member chamber 101 is located centrally of the body 100.

20 The body 100 has integrally formed internally screw threaded ends or any other type of connection forming inlet and outlet ports 102, to which the ends of, for example, two pipes (not shown) may be secured.

25 The internal area of the closure member chamber 101 can be equal to the area of the inlet and outlet ports 102, as can be seen particularly from Figure 14 and at positions adjacent its ends there can be provided grooves 103 adapted to receive peripheral, external, ribs 104 formed at the ends of a flexible closure member 105 which latter is provided with parallel diametrically opposed longitudinal ribs of the kind referred to in relation to the value of Figures 1 to 4. The ends of the closure member are provided with diametrically opposed grooves 106 (see Figures 13 and 16) into which seat diametrically opposed splines 107 formed on the external periphery of annular bearing bushes 108 (see particularly Figure 16). The ends of the splines 107 of the bearing bushes 108, when seated in the grooves 106 serve to prevent the bushes 108 rotating relative to the closure member chamber 101. In addition the splines 107, extend from what, when the bushes 108 are in position, is the outer face 108a. The projecting ends of the splines 107 of one of the bushes 108 serve, in association with blocks 109 of an operating handle element 110, to limit movement of the operating handle element 110 to an arc of 90°. For this purpose the blocks 109 of the operating handle element 110 are so positioned as to lie, when the element 110 is in position, between side faces 111 of the splines 107. Blocks (not shown) similar to those of the operating handle element 110 are formed on an end cap 112 (see Figures 13 and 14) which is positioned, in use, at the opposite end of the closure member chamber 101.

The end cap 112 and the operating handle element 110 are each provided with a centrally located inwardly projecting spigot 113. The end cap 112 and operating handle member 110, together with their spigots 113 are centrally drilled to receive securing bolts 114. The spigots 113 are adapted to seat in recesses 115 formed in bearings 115a yet to be described.

Within the flexible closure member 105 of this valve is a core 116 which in contradistinction to the unitary core 18 of the previously described valve, consists of three elements 117, 117a and 118. The core 116 is best seen in Figure 16. As can be seen the elements 117, 117a are of identical form, each consisting of the bearing 115a and an integral pair of spaced-apart receiving members 119 for the element 118. The receiving members 119 are of semi-circular external contour at their ends adjacent the bearings 115a and their cross-section varies along the length of the members to terminate at a straight edge at the inner extremity. The spaced-apart opposed faces 120 (see Figure 14) of the members 119 of each pair are flat although in one design they could abut. The element 118 is of such a length that, when located with its end regions between the receiving members 119, the straight edges of the members 119 are spaced apart and the bearings 115a seat in the bushes 108 with the end faces 121 of the elements 119 in abutment with the end faces of the bushes 108. The end faces of the bushes 108 are chamfered at their outer edges in order that an O-ring seal 122 (see Figures 13 and 14) can be located between the elements 119, the bushes 108 and the bearings 115a. The element 118 is of flat bar form having radiused edges 123. The ends of the element 118 are centrally drilled and tapped to receive the bolts 114.

In use the valve closure element can be moved from a valve open position, as best shown in Figure 14 to a fully closed position by rotating the handle through 90° in the same manner as that described above.

By virtue of the fact that the size of the spigots 113 is the same on the operating handle member 110 and end cap 112 these elements may be used at either end of the closure member chamber and thus the operating handle can be at the side of the body 100 at which it is most conveniently placed for valve operation.

If desired the operating handle can be replaced by gear means to enable the valve to be drive motor operated in a manner similar to that described above.

Valves made in accordance with the embodiments of the invention described above have many advantages not least of which lies in the fact that since an elastomeric externally ribbed seating member is used,

70

75

80

85

90

95

100

105

110

115

120

125

130

(12)

tight closure and sealing of the valve can be achieved since the seating member ribs can be somewhat compressed against the surface against which they seat and thus slight imperfections in the surface of either the seating member or the seat will not tend to create leakage paths. Thus by using elastomeric material for the seating member machining of the seat need not be so accurate as is required for the production of a seat for a rigid valve closure element. In addition, the valve can be used in pipework or systems in which dirty fluids are to be handled and in fact in pipework or systems in which powders and slurries are handled since the seating member, having a relatively high degree of resilience as compared to a metallic seating member, will not be scored or otherwise adversely affected by the impingement thereon of particles, granules or the like in the material being handled.

A further advantage of glandless valves as described above lies in the fact that the valve closure chamber is totally isolated from the atmosphere and thus the risk of pollution is eliminated. In addition, since the valve closure element is completely supported against pressure, the range of polymeric materials that can be used for the closure member is almost unlimited, thus giving the designer the ability to choose the material most compatible with the operating conditions under which the valve will be used.

The fact that the valve closure can move from a fully open to a fully closed position in one quarter of a turn means that the valve can be operated quickly, moreover the valve is, between fully closed and fully open capable of very fine adjustment, thus flow regulation of a very high standard can be achieved.

Valves of the kind described above can be used in any orientation and in the case in which the valve closure chamber is horizontally disposed, the valve is completely self draining. The interior surfaces of the valve can, if desired, be lined to produce a hygienic valve and if desired the whole valve, for some uses, can be made from plastics material.

It is also possible, and in some designs of valve preferable to dispense with the flanged ends 16 of the flexible hollow member 17. In this form of hollow member the ends thereof are bonded to the valve body 10.

WHAT WE CLAIM IS:

1. A control member for a valve comprising a first relatively rigid member having a longitudinal axis and a second relatively flexible member surrounding the first member and being provided with an external surface at least part of which is of ribbed form, the said ribs being at least two in

number and extending in parallelism longitudinally of the second member and at diametrically opposed positions on its surface, said second relatively flexible member being in continuous resilient engagement with a continuous surface of said first member, said first member being so arranged that on relative movement between said members the contours of said flexible member are changed whereby a valve control function may be effected.

2. A control member for a valve as claimed in Claim 1 in which the first member is provided with means adapted to assist in reducing the force required to cause relative movement between it and the second member.

3. A control member for a valve as claimed in Claim 2 in which the first member is provided with roller means adapted to bear against the inner periphery of the second member.

4. A control member for a valve as claimed in Claim 2 in which the first member is provided with spring loaded blades adapted to bear against the inner periphery of the second member.

5. A control member for a valve as claimed in Claim 2 in which the first member is provided with an external sleeve or coating of low friction material such as polytetrafluoroethylene.

6. A control member for a valve as claimed in Claim 2 in which the first member is provided with oilways to enable lubricant, preferably under pressure, to be fed between the first and second members.

7. A valve including inlet and outlet ports, a flow passage therebetween and a seating member chamber extending across the flow passage, there being a control member as defined by Claim 1 contained within said seating member chamber.

8. A valve as claimed in Claim 7 in which the control member consists of a first relatively rigid member in the form of a core having a longitudinal axis and a second relatively flexible member provided with an external surface, at least part of which is of ribbed form the said ribs being at least two in number and extending in parallelism longitudinally of the second member and at diametrically opposed positions on its surface, said second relatively flexible member surrounding the core and in intimate resilient engagement therewith, the first and second members being positioned across the flow passage with the second member secured against rotation and the first member being rotatable relative to the second member whereby on rotation of the first member relative to the second the contours of the latter are changed to open or close the valve.

9. A valve as claimed in Claim 8 in

70

75

80

85

90

95

100

105

110

115

120

125

130

(12)



* C L M S *

5 tight closure and sealing of the valve can be
achieved since the seating member ribs can
be somewhat compressed against the sur-
face against which they seat and thus slight
imperfections in the surface of either the
seating member or the seat will not tend to
create leakage paths. Thus by using elas-
tomer material for the seating member
machining of the seat need not be so
accurate as is required for the production of
a seat for a rigid valve closure element. In
addition, the valve can be used in pipework
or systems in which dirty fluids are to be
handled and in fact in pipework or systems
in which powders and slurries are handled
since the seating member, having a relative-
ly high degree of resilience as compared to a
metallic seating member, will not be scored
or otherwise adversely affected by the im-
pingement thereon of particles, granules or
the like in the material being handled.

10 A further advantage of glandless valves as
described above lies in the fact that the
valve closure chamber is totally isolated
from the atmosphere and thus the risk of
pollution is eliminated. In addition, since
the valve closure element is completely
supported against pressure, the range of
polymeric materials that can be used for the
closure member is almost unlimited, thus
giving the designer the ability to choose the
material most compatible with the operating
conditions under which the valve will be
used.

15 The fact that the valve closure can move
from a fully open to a fully closed position in
one quarter of a turn means that the valve
can be operated quickly, moreover the valve
is, between fully closed and fully open
capable of very fine adjustment, thus flow
regulation of a very high standard can be
achieved.

20 Valves of the kind described above can be
used in any orientation and in the case in
which the valve closure chamber is horizon-
tally disposed, the valve is completely self
draining. The interior surfaces of the valve
can, if desired, be lined to produce a
hygienic valve and if desired the whole
valve, for some uses, can be made from
plastics material.

25 It is also possible, and in some designs of
valve preferable to dispense with the
flanged ends 16 of the flexible hollow
member 17. In this form of hollow member
the ends thereof are bonded to the valve
body 10.

WHAT WE CLAIM IS:

30 1. A control member for a valve com-
prising a first relatively rigid member having
a longitudinal axis and a second relatively
flexible member surrounding the first mem-
ber and being provided with an external
surface at least part of which is of ribbed
form, the said ribs being at least two in

number and extending in parallelism longi-
tudinally of the second member and at
diametrically opposed positions on its sur-
face, said second relatively flexible member
being in continuous resilient engagement
with a continuous surface of said first
member, said first member being so
arranged that on relative movement be-
tween said members the contours of said
flexible member are changed whereby a
valve control function may be effected.

2. A control member for a valve as
claimed in Claim 1 in which the first
member is provided with means adapted to
assist in reducing the force required to cause
relative movement between it and the
second member.

3. A control member for a valve as
claimed in Claim 2 in which the first
member is provided with roller means
adapted to bear against the inner periphery
of the second member.

4. A control member for a valve as
claimed in Claim 2 in which the first
member is provided with spring loaded
blades adapted to bear against the inner
periphery of the second member.

5. A control member for a valve as
claimed in Claim 2 in which the first
member is provided with an external sleeve
or coating of low friction material such as
polytetrafluoroethylene.

6. A control member for a valve as
claimed in Claim 2 in which the first
member is provided with oilways to enable
lubricant, preferably under pressure, to be
fed between the first and second members.

7. A valve including inlet and outlet
ports, a flow passage therebetween and a
seating member chamber extending across
the flow passage, there being a control
member as defined by Claim 1 contained
within said seating member chamber.

8. A valve as claimed in Claim 7 in
which the control member consists of a first
relatively rigid member in the form of a core
having a longitudinal axis and a second
relatively flexible member provided with an
external surface, at least part of which is of
ribbed form the said ribs being at least two
in number and extending in parallelism
longitudinally of the second member and at
diametrically opposed positions on its sur-
face, said second relatively flexible member
surrounding the core and in intimate resi-
lient engagement therewith, the first and
second members being positioned across the
flow passage with the second member se-
cured against rotation and the first member
being rotatable relative to the second mem-
ber whereby on rotation of the first member
relative to the second the contours of the
latter are changed to open or close the
valve.

9. A valve as claimed in Claim 8 in

70

75

80

85

90

95

100

105

110

115

120

125

130



13

which the chamber is provided, at each end, with a retaining element in which mounting means on the control member are rotatably mounted, one of said mounting means being extended through its retaining element and carrying an operating means.

10. A valve as claimed in Claim 9 in which the operating means is motorised.

11. A valve as claimed in Claim 7 or 9 in which the valve is produced from plastics material by moulding.

12. A valve as claimed in Claim 8 in which the first member includes a pair of elements adapted to receive therebetween a flat bar element.

13. A valve as claimed in Claim 12 in which each element of the pair consists of a bearing and a pair of integral spaced-apart receiving members for the flat bar element.

14. A valve as claimed in Claim 8 in which the first and second members are of lenticular shape, the second member being of elastomeric material.

15. A valve as claimed in Claim 8 or 9 in which the chamber is longitudinally grooved or ribbed on its internal surface.

16. A valve as claimed in Claims 8 or 14 in which means are provided on the first member to assist in reducing the force required to cause relative movement between it and the second member.

17. A control member for a valve substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

18. A valve substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 4, or Figure 6 and Figure 11 or Figure 12, or Figures 13 to 16 and Figure 11 or Figure 12 of the accompanying drawings.

WILSON GUNN & ELLIS,
41-51 Royal Exchange,
Cross Street,
Manchester M2 7DB,
Agents for the Applicants.