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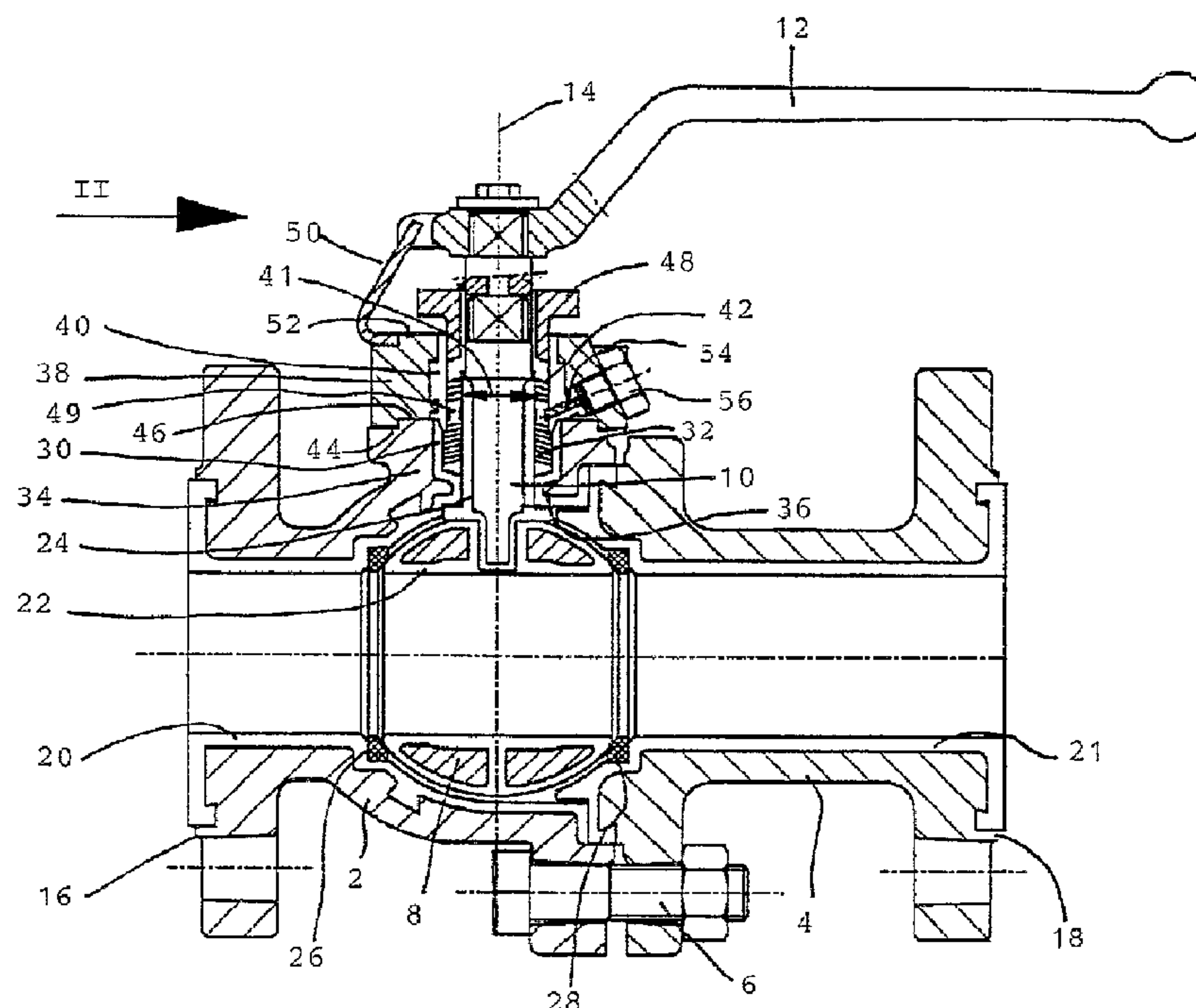
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(54) Titre : DISPOSITIF DE VANNES

(54) Title: VALVE ARRANGEMENT



(57) Abrégé/Abstract:

A valve arrangement contains a housing (2) and a shut-off element (8) with which a shaft (10) is rotatably coupled, the passage of the shaft through the housing (2) being sealed by means of sealing elements (32). The valve arrangement is to be improved to the effect that, with little constructive expense, the leakage rate can be minimized and strict safety requirements can be satisfied, the valve arrangement being provided in its interior with a lining (20, 21). It is proposed that, as an option to the first sealing element (32), which is disposed in an annular space between the shaft (10) and the housing (2), a second sealing element (42) is disposed at least partially within a ring (3) joined to the housing (2). The lining (20) of the housing (2) reaches at least as far as the first sealing element (32) which is directly in contact with the lining (20), the first sealing element (32), and if necessary the second element, being compressible by means of a bushing (48) movable in the direction of the axis of rotation (14) of the shaft (10).



ABSTRACT OF THE SPECIFICATION:**VALVE ARRANGEMENT**

A valve arrangement contains a housing (2) and a shut-off element (8) with which a shaft (10) is rotatably coupled, the passage of the shaft through the housing (2) being sealed by means of sealing elements (32). The valve arrangement is to be improved to the effect that, with little constructive expense, the leakage rate can be minimized and strict safety requirements can be satisfied, the valve arrangement being provided in its interior with a lining (20, 21). It is proposed that, as an option to the first sealing element (32), which is disposed in an annular space between the shaft (10) and the housing (2), a second sealing element (42) is disposed at least partially within a ring (3) joined to the housing (2). The lining (20) of the housing (2) reaches at least as far as the first sealing element (32) which is directly in contact with the lining (20), the first sealing element (32), and if necessary the second element, being compressible by means of a bushing (48) movable in the direction of the axis of rotation (14) of the shaft (10).

Valve Arrangement

The invention relates to a valve arrangement according to the features stated in the preamble of claim 1.

10 U.S. Patent 4,930,748 discloses such a valve arrangement configured as a shut-off and control valve. A shut-off element, which is configured as a plug, is affixed to a shaft and disposed for rotation in a housing, two seals being provided to seal off the shaft at the top cap of the housing. The first seal is supported on an annular disk on the bottom of the cap, inside of the housing, while the second seal is associated with the exterior and if necessary it can be adjusted from the outside. Since the shut-off element is configured as a plug the axial position of the shaft can vary due to production tolerances, wear, external forces or the like. Since the inner, first seal is supported on the annular disk a securely operating seal is achieved independently of the axial position of the stem. The increased safety prescriptions and standards for environmental protection are satisfied, and the required limits of leakage rates are maintained for a long useful life. This valve arrangement is designed for special applications and uses and calls for a not inconsiderable manufacturing cost and complexity.

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Mainly in the chemical industry today, pipe fittings lined or coated with plastic are used, especially with PTFE (polytetrafluoroethylene), FEP (fluoroethylene propylene) or PFA (perfluoroalkoxy). The manufacturing cost and expense, especially for the tools, for the production of plastic linings for valve housings and stems, are considerable. If the safety requirements imposed upon existing plants are increased, then the fittings must regularly be replaced with new fittings which satisfy these requirements. The cost of maintaining stocks in such cases are considerable for both manufacturers and dealers.

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German Gebrauchsmuster DE 89 10 895 U 1 discloses a valve arrangement which is configured as a ball valve. The housing and also the ball are provided with a plastic

coating. A shaft is formed integrally on the ball disposed for rotation in the housing, passes through the housing, and is surrounded by a special stuffing box. In the stuffing box a sealing element is disposed against which a spring thrusts. This added-on stuffing box is disposed partially outside of the housing and another part reaches into the interior of the housing as far as the ball. Additional measures are necessary for the dependable sealing of the stuffing box with respect to the valve housing. Also, the stuffing box is provided with a plastic coating which necessitates considerable manufacturing cost. Lastly, the stuffing box contains outwardly leading openings in the vicinity of the above-mentioned spring, and through them the medium flowing through the valve arrangement can escape through the valve arrangement if the sealing element is damaged.

Furthermore, German Gebrauchsmuster DE 84 31 238 U 1 has disclosed a relinable double stuffing box arrangement for a ball valve. An extension piece with a bottom plate, a tube and a top plate are provided, while in the said comparatively long tube a spindle prolongation is disposed. The tube and the two plates are joined together by weld seams. Furthermore, this arrangement has no coating or lining and is not easily appropriate for use under high safety conditions.

Lastly, German Patent DE 40 16 541 C 2 discloses a stuffing box packing which has active and passive sealing rings in a receiver. The passive stuffing box rings are designed for the transmission of axial forces and lie alternately with their radial inside surface upon the shaft or with their radial outside surface upon the wall of the stuffing box seal. Lining or coating is not provided.

Setting out from this the invention is addressed to the problem of improving a valve arrangement of the above-mentioned kind so as to minimize leakage rates and comply with stringent safety requirements, especially those of TA-Luft. The valve arrangement is to provide high reliability of operation and long useful life, and the replacement or substitution of the elements is to be easy to perform. The valve arrangement is to be

lined internally in the medium-handling portions, especially with plastic, and is to be able to be designed if needed for different requirements regarding leakage from the interior to the exterior.

According to the present invention, there is provided a valve arrangement adaptable to meet different requirements with respect to leakage comprising:

- a housing including a part on which a neck is formed,
- a shut-off element rotatably disposed in the housing,
- 10 a shaft which extends outwardly through an opening in the housing and is coupled to the shut-off element for rotation therewith, the shaft having a coating which extends beyond an axial end face of the neck,
- a first sealing element disposed in a first annular space between the shaft and the neck for sealing the shaft,
- a bushing disposed around the shaft and movable axially therealong to compress said first sealing element against the shaft and the neck,
- a lining in said housing, said lining extending into said
- 20 neck and into contact with said first sealing element, and
- a one-piece annular body optionally disposed on the axial end face of the neck, with a second annular space being provided between a lining on an inside surface of the annular body and the shaft over a total height of the annular body and a second sealing element disposed in said second annular space such that the bushing can also compress said second sealing element,
- the second annular space having a radial width which is substantially the same size as the first annular space, the
- 30 annular spaces directly adjoining one another,

the annular body lining directly adjoining the housing lining,

the bushing being joined by bolts passing through bores to the neck,

the neck being circumferentially continuous, being provided internally with the housing lining over its entire height, and having a step located between the first sealing element and the rotatable shut-off element.

Preferably, the proposed valve arrangement is characterized
10 by a simple and functional construction. To satisfy the requirements the valve arrangement is equipped with a single or with a double shaft seal. The double shaft seal makes possible inspection for leakage or pressure superimposition to meet increased requirements for preventing leakage to the exterior and to the atmosphere. Adapted sealing systems of uniform basic design are used for the different conditions of use or requirements as to prevention of leakage to the atmosphere. Especially the housing and shaft are the same for both embodiments, and
20 twice the number of the very expensive lining tools for housing and shaft are eliminated. Furthermore, it is a special advantage that valve arrangements already installed can be converted on the customer's premises. The embodiment involving the double sealing system is only slightly higher than the embodiment with a single sealing system. The dimensions for installation and the like remain unchanged, so that identical parts, such as bridges and coupling and operating means such as levers and the like, are used for both embodiments. Furthermore, the operation as well as
30 adjustments or the like are identical for both embodiments.

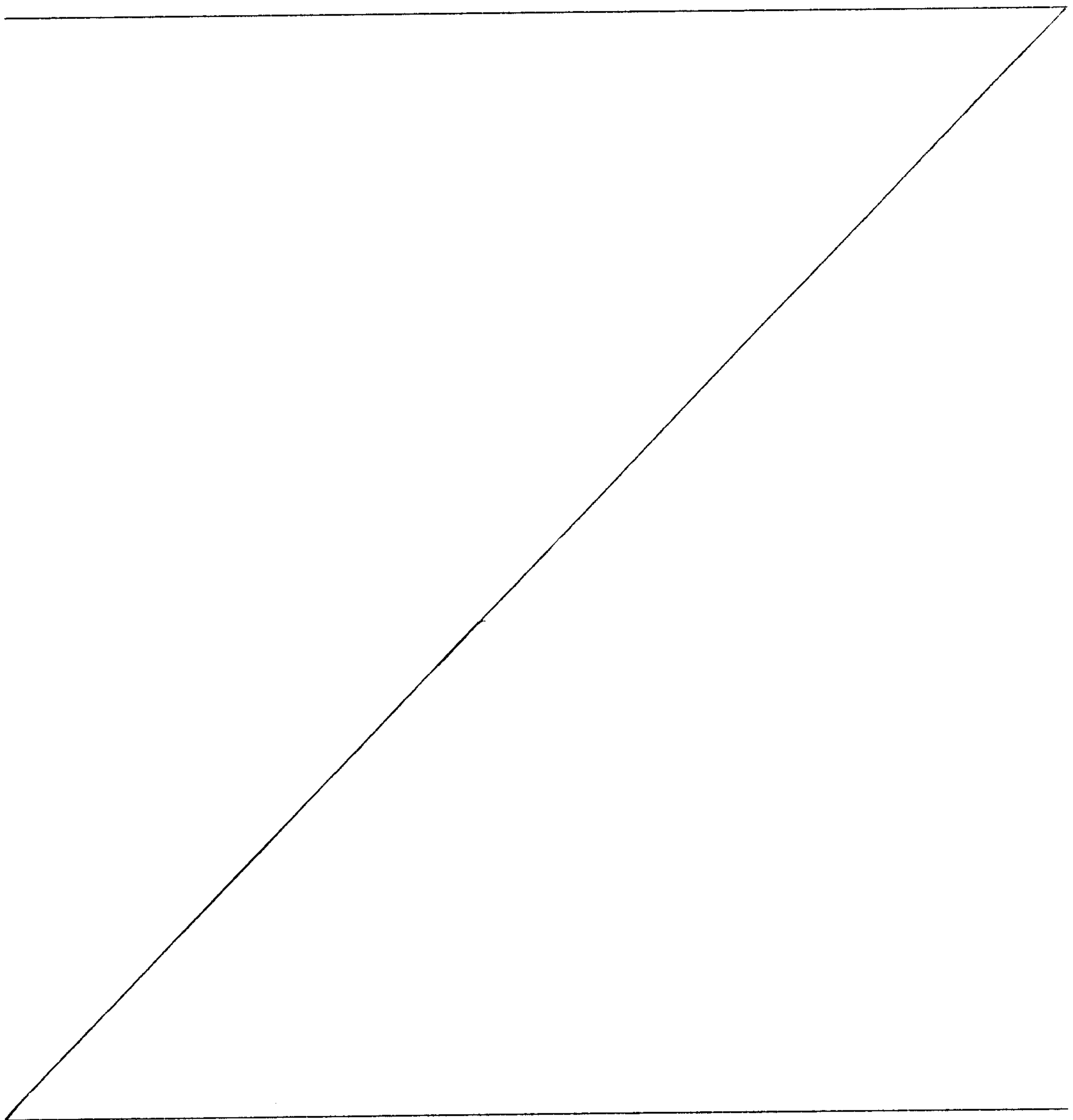
Preferably, the shut-off element and the shaft are configured each as separate components which are joined fixedly together by couplers. The shut-off element is completely covered with a coating or lining, and likewise the shaft, the couplings being desirably provided also with a coating or lining. In another embodiment a prolongation body is associated with the shaft, rotation by operating means, especially in the form of a lever, being provided on the shaft and, ultimately, the shut-off element.

- 10 Preferably, the sealing element or elements are disposed directly in the housing and the ring, and their outer radial surfaces are directly in contact with the lining of the housing and ring. The inside diameter of the ring lining is advantageously the same as the inside diameter of the lining of the bore in the housing provided for the sealing element.

The valve arrangement according to the invention will be explained herewith in conjunction with a ball valve, but this is no restriction of the invention. Thus the valve arrangement can be configured as a valve with a conical plug, as a turning cone valve or
20 as a flap valve with a flap disk or the like. It is the decided advantage of all embodiments of the valve arrangement that a choice of sealing systems is available for different requirements, while the rest of the components, especially also the plastic-lined housing as well as the shaft, are identical.

The invention is further explained in conjunction with a special embodiment represented in the drawing.

- Fig. 1 is an axial section through a ball valve with double shaft sealing,
Fig. 2 is a partially cut-away axial view of the ball valve as seen in the direction II in Figure 1.
Fig. 3 is an enlarged view of the area of the shaft of the ball valve of Fig. 1.
Fig. 4 is a top view of the ball valve.
Fig. 5 is an embodiment of the ball valve of Fig. 1, but with a single shaft seal.
Fig. 6 a view, partially cut away and partially in an axial view seen in direction VI of the ball valve of Fig. 5.



The ball valve represented in Fig. 1 has a split housing with two housing parts 2 and 4 which are joined together by screws 6. A shaft 10 is non-rotationally joined to a blocking element 8, which in the drawing has an opening 9 at the top and here is represented as a ball. The shaft 10 has a projection 11 reaching into the housing, which is shaped to correspond to the recess 9. The recess 9 and the projection 11 thus form coupling means for the transmission of torque. The recess 9 is preferably in the form of a slot in which the preferably flat projection 11 of the shaft is engaged. By means of a handle 12 corotational with the shaft 10 the shut-off element 8, which shall be called a ball hereinafter for the sake of simplicity, is moved to the desired rotational position with respect to the axis of rotation 14 of the shaft 10. Instead of the handle 12, any other operating means can be provided, such as an electrical or pneumatic drive or a handwheel for manual operation, which are mentioned herein only by way of example.

The housing parts 2 and 4 contain each a flange 16 and 18 for connection to a pipe not further represented. The housing parts 2 and 4 are provided inside and also in the area of the flanges 16 and 18, i.e., in the medium-carrying areas, with a lining 20 and 21 consisting especially of plastic, such as PTFE, FEP or PFA. Also, the shut-off element 8 is provided with a corresponding coating 22. Lastly, the shaft 10 has a coating 24 of this kind. The proposed valve arrangement is thus advantageously a lined or coated embodiment, and so corresponds to safety requirements for corrosive and aggressive fluids at elevated temperatures and pressures. For a seal between the shut-off element and the ball 8 and housing parts 2 and 4, sealing rings 26 and 28 are provided in a known manner.

The shaft 10 is inserted into a recess or bore 30 in the first housing part 2, and this bore 30 also is provided with the lining 20. In the recess or bore 30 is a first sealing element 32 is provided, which is in sealing contact with the shaft 10 and its coating 24. With this first sealing element a simple, basic seal from the exterior is achieved where the shaft passes through. Preferably the first sealing element 32 is a normal packing, especially a

PTFE packing. The first sealing element 32 is situated inside of a neck 34 of the first housing part 2, inside of an enlarged annular space which is present between the middle, cylindrical part of the shaft 10 and the neck 34. The sealing element 32 lies radially outward directly against the lining 20 of the recess or bore 30 of the housing 2 and its neck 34. The said annular space ends in the direction of the shut-off element 8 at a first step 36 on which the first sealing element 32 is resting.

10

The axial end face of the neck 34 is adjoined by a ring or annular body 38 whose inside surface is provided with a lining 40 like that of the neck 34. The lining 40 has over its axial length and/or over the entire length of the annular body 38 an inside diameter 41 which is preferably uniform. The inside diameter 41 is substantially of the same size as the inside diameter of the lining 20 of the neck 34. Within the internal lining 40 on the inside surface of the annular body 38 there is a second sealing element 42 in an annular space. This
20 second sealing element 42 lies radially outwardly directly on the inside surface of the inner lining 40 and radially inwardly, on the other hand, on the shaft 10, especially on the outer coating thereof 24.

The end face of the neck 34 and the axially opposite bearing surface of the annular body 38 contain coaxial and corresponding steps or collars 44 and 46 such that the annular body 38 is disposed coaxially with the axis of rotation 14. By means of the second sealing element 42 disposed in the
30 collars a sealing of the shaft 10 is achieved which corresponds to the improved and stricter safety requirements. By means of a sleeve or bushing 48 associated with the outer end of the second sealing element 42 the compression of the two sealing elements 32 and 42 disposed in tandem with one another is accomplished, a ring 49 being preferably provided between them. To establish and limit the rotation of the

handle 12 an abutment 50 is provided, which is fastened on the ring 38. The annular body 38 has a step 52 for the abutment 50, which is made to be in line with the step 44 of the neck 34.

The axial annular body 38, which adjoins the neck 34 and prolongs it, also contains a lateral bore 54 which can be closed tightly at its outside end by means of a screw 56. The inner end of the bore 54 opens in the area of the ring 49
10 between the two sealing elements and permits control or inspection of the effectiveness of the seal. If an elevated pressure or any medium is found between them, i.e., in back of the first sealing element 32 (in the direction of its compression), remedial measures are available. By means of the second sealing element 42 the assurance is given that, even in this case, any escape of the fluid medium to the exterior is prevented in order to satisfy the stricter safety requirements.

20 Fig. 2 shows, partially in an axial view and partially cut away, the ball valve with the ring 38 and the sleeve 48 which is configured as a gland for producing the axial bias against the two sealing elements 32 and 42. The sleeve or bushing 48 is affixed in the neck 34 of the first housing part 2 with bolts 58. The bolts 58 contain an abutment 60 which on the one hand permits the bolts 58 to be screwed into the neck, and on the other hand assures the definite setting of the ring 38 with respect to the housing part 2. The upper ends of the bolts 58 pass through bores in the bushing 48 which is
30 therefore adjustable by means of adjustable nuts 62 in the direction of the axis of rotation 14. The bushing 48 surrounds with a slight clearance a prolonged or extended portion 64 of the shaft 10. In this clearance a inner sleeve is preferably disposed, which will be explained further on. The extended portion 64 contains an additional stub 66 protruding outwardly from the bushing 48, and is configured especially square, and

which is configured for co-rotational connection with the above-mentioned handle or operating means. The pin 66 is provided correspondingly with a stub end 68, preferably square, which engages a corresponding recess 70 in the extension [64]. By means of the extension body 64, therefore, the rotary motion performed by means of the actuating means or handle on the shaft 10 is transmitted to the shut-off element.

- 10 The recess 9 in the shut-off element 8 and of the complementary prolongation 11 of shaft 10, which is engaged in the recess 9, are easily seen. The slot-like recess 9 extends transversely across the axis of the passage 71 which according to the drawing is orthogonal to the plane of the drawing, is orthogonal to the slot-like recess 9 and to the flat projection 11. The width of the flat projection 11 and the width of the recess 9 are greater than the diameter of the shaft 10. It is expressly stated that the shaft 10 with the projection 11 is provided with the coating 24. In an
 20 especially expedient manner, this coating 24 reaches radially upward at least so far that the second sealing element 42 also is in contact with the coating 24. Thus on the one hand any damage to the outer surface of the shaft is reliably and lastingly prevented, and on the other hand wear on the second sealing element 42 is desirably minimized.

- Instead of the bipartite configuration of the shut-off element and shaft thus far explained, these parts can also be made in one piece. In the case of one-piece design the extension 64
 30 is of very special importance in order to achieve the embodiment using only one sealing element now to be explained in conjunction with Figures 5 and 6. The shaft has the same length for both embodiments. However, even in the bipartite configuration of shut-off element and shaft explained above, the uniform configuration and specified length of the shaft is of especial significance inasmuch as only a single tool is

necessary for the manufacture and arrangement of the coating 24 on the shaft 10. On the other hand, such configurations with two shafts of different length are within the scope of the invention. The longer shaft in this case has the total length of shaft plus the extension represented in Figure 2. For the embodiment with only one sealing element, however, only the short shaft shown in Figure 2 is used.

Fig. 3 is an enlarged view of the upper part of the valve arrangement in the area of the shaft 10 with the extension body 64 and a portion of the handle 12. In an advantageous manner, the thickness of the projection 11 is less than the diameter of the cylindrical stem 10. Also the corresponding recess in the shut-off element, not represented, has a thickness smaller than the shaft diameter. In the above-mentioned annular gap between the extension body 64 and the bushing 48 there is provided an inner bush 72. This bush 72 advantageously serves for the radial guidance of the extension body 64, so that unwanted forces on the shaft 10 and/or the shut-off element, not here shown are avoided. The inner bush 72 serves in the scope of the invention as a lining for the bushing 48. The bush 72 furthermore contains a widened portion 73 which is in contact with the second sealing element 42. The axial adjustment and biasing forces are transferred by the widened portion 73 from the bushing 48 to the sealing elements 42, 32. It can be seen easily that the shaft coating 24 reaches radially into the range of the second sealing element 42. The coating 24 ends at a flange 77 of the shaft 10. The outside diameter of the flange 77 is preferably substantially equal to the outside diameter of the coating 24. As it can be seen, the second seal 42 lies partially on the coating 24 and partially also on the flange 77, the seal 42 having the same diameter throughout its length.

Lastly, the coating 24 has a radial flange 78 whose outside diameter is greater by a given amount than the outside

diameter of the coating in the area of the seals 32 and 42 already explained. The upper face of the flange 78 lies against the lining 20 of the housing 2 and its step 36. In an especially desirable manner, an axial securing of the shaft 10 is assured, which if necessary can also have a flange inside of the flange 78. Since the flange 78 of the coating 24 consists preferably of plastic, as does the lining 20, friction losses are reduced to a minimum.

- 10 The extension body 64 contains a central bore 74 through which a screw 76 is introduced and is threaded at its bottom end into an internal thread in the shaft 10 at its stub end 68. This screw 76, provides the non-rotational connection of the shaft 10 to both the handle 12 and the extension body 64. As already explained, the bias of the two sealing elements 32 and 42 in tandem with one another is established by the axial displacement of the bush 48.

- 20 Fig. 4 shows a top view of the ball valve with the two housing parts 2 and 4 and the annular body 38 which is fastened by the two bolts 58 to the neck of housing part 2. The bushing 48 is adjusted by means of the nuts 62 to establish the bias against the sealing elements explained above. The handle 12 has two projections 79 and 80 corresponding to the abutment 50 and can thus be turned in the direction of the arrow 82, whereupon the ball 8 is turned from the open position represented in Fig. 1 to the shut-off position.

- 30 Figs. 5 and 6 show an embodiment of the ball valve corresponding to the ball valve of Figs. 1 and 2. The housing parts 2 and 4 and also the shaft 10 are of a shape identical to the embodiment explained above, and likewise the first sealing element 32 in the neck 34 of housing part 2. It is to be noted that, in comparison with Fig. 2, in Fig. 5 the two housing parts 2 and 4 are represented in a position turned 180° on the axis 14. The handle 12 in this embodiment is

directly joined to the shaft 10 in which case the extension body, the ring and the second sealing element are not used. The stuffing box bushing 48 is again the same as in the first embodiment, but joined directly to the housing. The collar 77 in this configuration reaches partially into the bushing 48. On the other hand, the coating 24 extends on the inside partially into the bushing 48. Thus a reliably operating guidance of the shaft 10 is assured.

- 10 The production of the linings 20 and 21 of the two housing parts was also performed with the same tools as in the case of the two housing parts of the first embodiment. The abutment 50 is secured in its rotational position on the step 44 of the neck 34, the step 44 being configured and disposed the same as the step for the ring provided in Fig. 1 as explained in connection with the latter. The embodiment explained in connection with Figs. 5 and 6 has a simple shaft seal in the form of the first sealing element 32, but the essential components, such as especially the housing parts 2 and 4, the
- 20 shaft 10, also the first sealing element 32, the bushing 48, the abutment 50 and the handle 12 are configured the same as in the first embodiment.

CLAIMS

1. A valve arrangement adaptable to meet different requirements with respect to leakage comprising:
a housing including a part on which a neck is formed,
a shut-off element rotatably disposed in the housing,
a shaft which extends outwardly through an opening in the housing and is coupled to the shut-off element for rotation therewith, the shaft having a coating which extends beyond an axial end face of the neck,
10 a first sealing element disposed in a first annular space between the shaft and the neck for sealing the shaft,
a bushing disposed around the shaft and movable axially therealong to compress said first sealing element against the shaft and the neck,
a lining in said housing, said lining extending into said neck and into contact with said first sealing element, and
a one-piece annular body disposed on the axial end face of the neck, with a second annular space being provided between a lining on an inside surface of the annular body
20 and the shaft over a total height of the annular body and a second sealing element disposed in said second annular space such that the bushing can also compress said second sealing element,
the second annular space having a radial width which is substantially the same size as the first annular space, the annular spaces directly adjoining one another,
the annular body lining directly adjoining the housing lining,
the bushing being joined by bolts passing through bores to
30 the neck,

the neck being circumferentially continuous, being provided internally with the housing lining over its entire height, and having a step located between the first sealing element and the rotatable shut-off element.

2. The valve arrangement according to claim 1, wherein said second sealing element is disposed around said shaft and extends at least partially within said annular body.

3. The valve arrangement according to claim 1, wherein said housing comprises two housing parts joined to each other.
10

4. The valve arrangement according to claim 1, wherein the housing lining is formed of synthetic resin material.

5. The valve arrangement according to claim 1, wherein the annular body lining is formed of synthetic resin material.

6. The valve arrangement according to claim 1, further comprising a shaft extension connected to the shaft for rotation therewith such that the shaft and the shut-off element can be rotated by turning the shaft extension.

20 7. The valve arrangement according to claim 6, wherein the shaft extension has a recess at one end for matingly receiving a shaft key formed on the outer end of the shaft, and the other end of the shaft extension is formed with an extension key having the same configuration as the shaft key.

8. The valve arrangement according to claim 7, further comprising a handle keyed to the extension key for rotating the shaft extension, the shaft and the shut-off element.
9. The valve arrangement according to claim 1, wherein the shaft has a shaft coating which extends continuously axially therealong from the housing interior to the second sealing element.
10. The valve arrangement according to claim 9, wherein the shaft coating is formed of synthetic resin material.
- 10 11. The valve arrangement according to claim 1, wherein the annular body lining axially abuts the housing lining.
12. The valve arrangement according to claim 1, wherein the annular body has a bore which extends radially therethrough, and which can be closed sealingly.
13. The valve arrangement according to claim 12, wherein said bore is closed by a sealing screw.
14. The valve arrangement according to claim 12, wherein the bore has a radially inner end which opens between the first and second sealing elements.
- 20 15. The valve arrangement according to claim 1, wherein the annular body lining has a substantially constant inside diameter over its entire length.
16. The valve arrangement according to claim 1, wherein said first and second sealing elements have the same configuration.

17. The valve arrangement according to claim 1, wherein said first and second sealing elements are configured as packings.

18. The valve arrangement according to claim 17, wherein the packings are formed of polytetrafluoroethylene.

19. The valve arrangement according to claim 1, wherein the one-piece annular body is not provided on the axial end face of the neck and said first sealing element is the sole shaft sealing element.

10 20. The valve arrangement according to claim 1, wherein said shaft is sealed by a double seal comprising said first sealing element and said second sealing element.

21. The valve arrangement according to claim 1, further comprising a ring member disposed between the first sealing element and the second sealing element.

Fig. 1

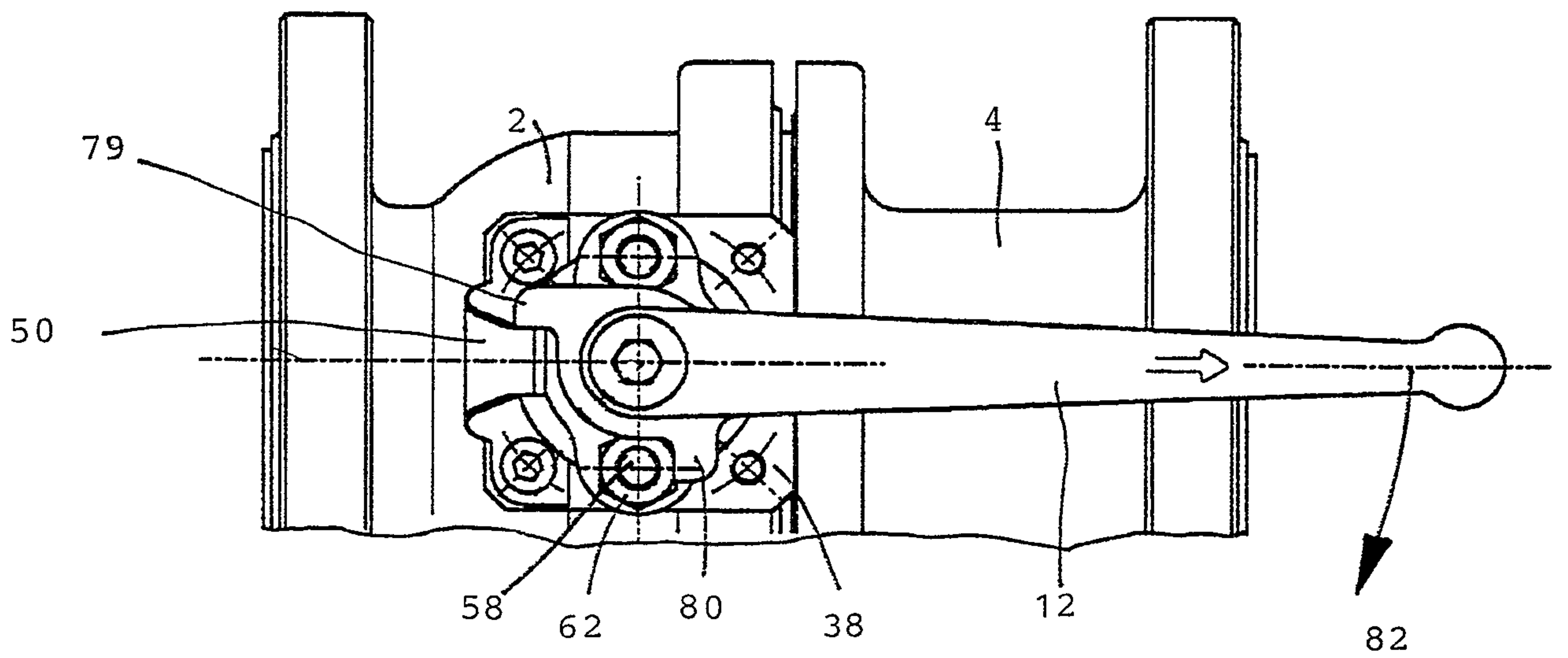
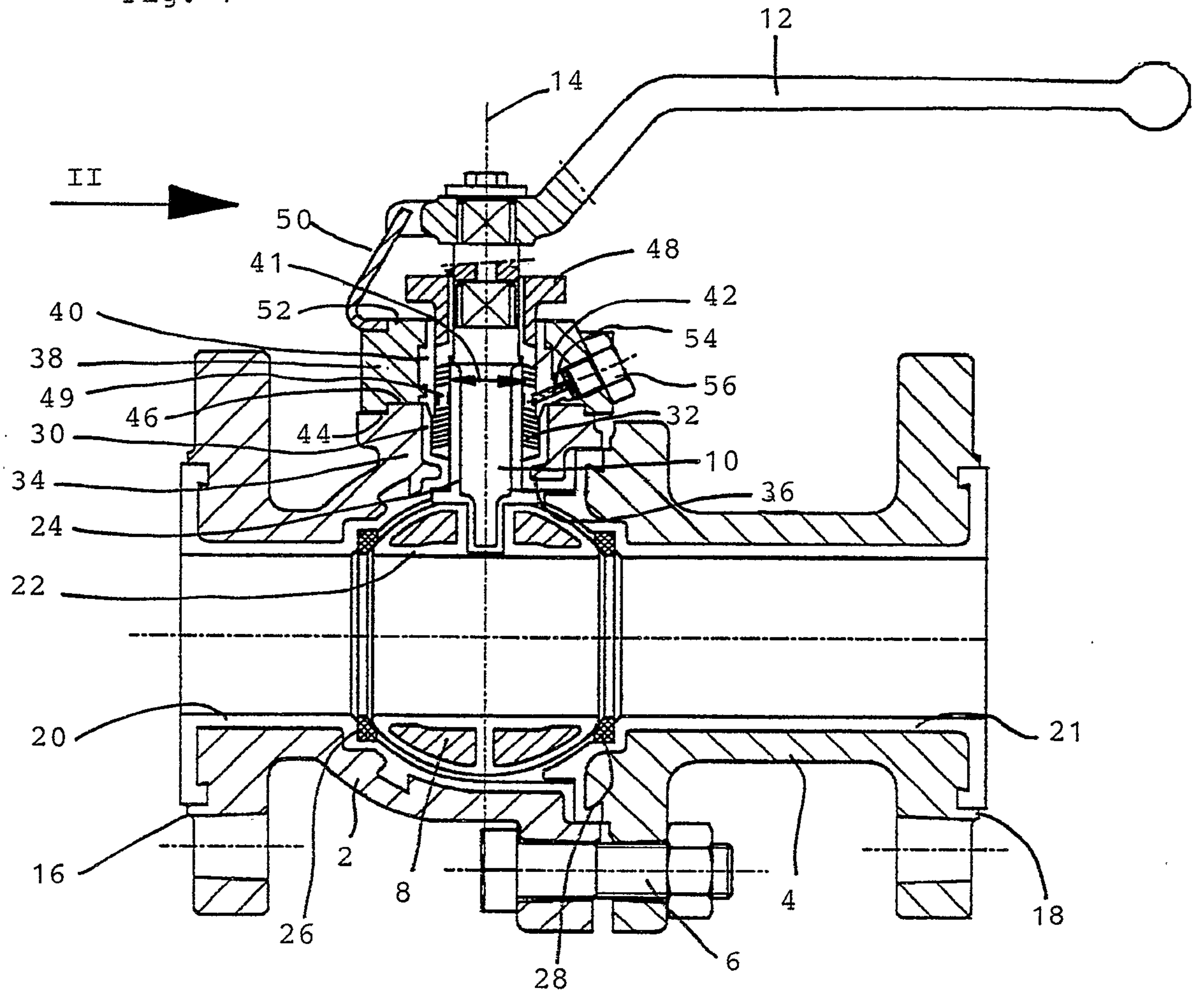


Fig. 4

Fig. 2

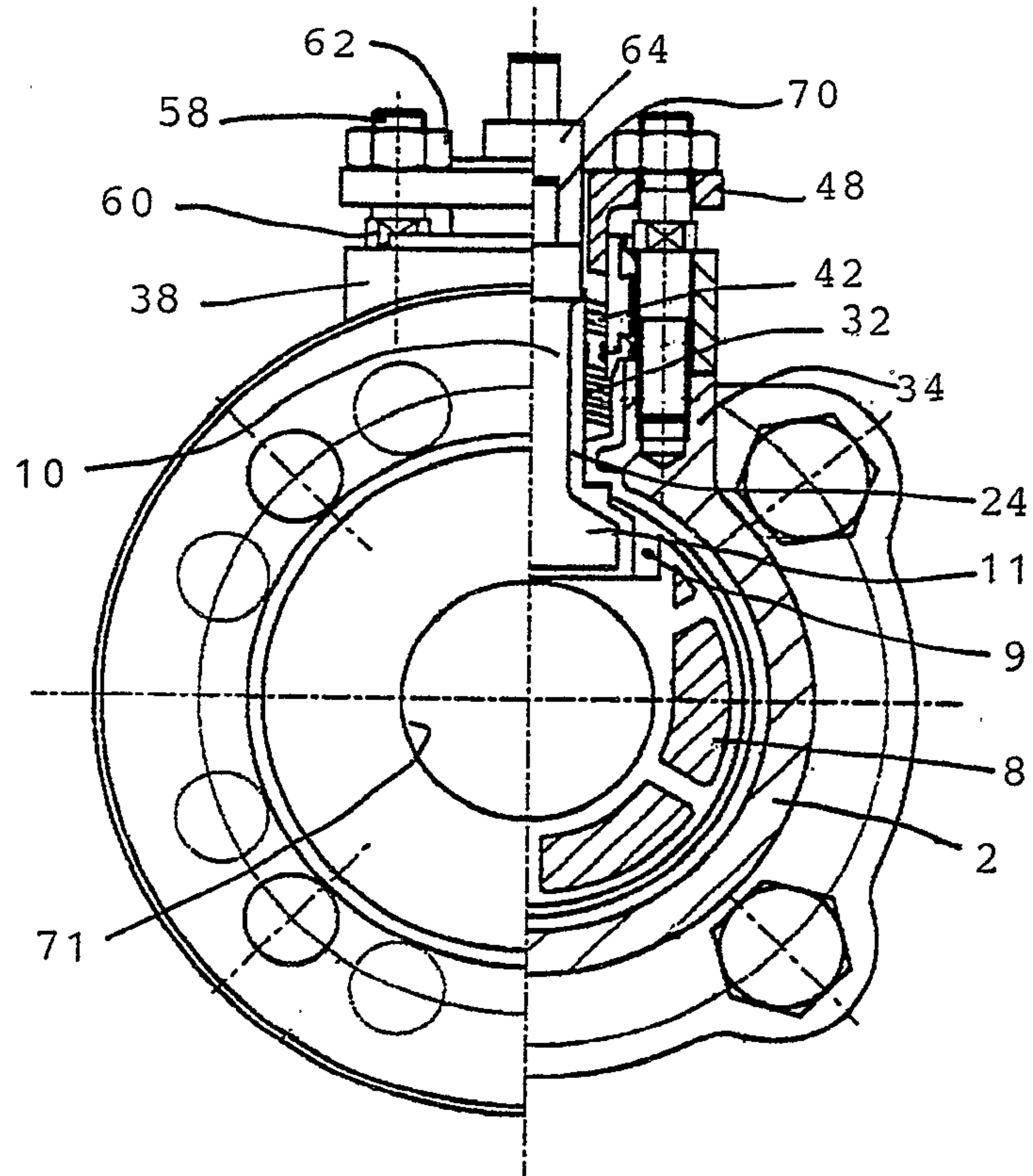


Fig. 3

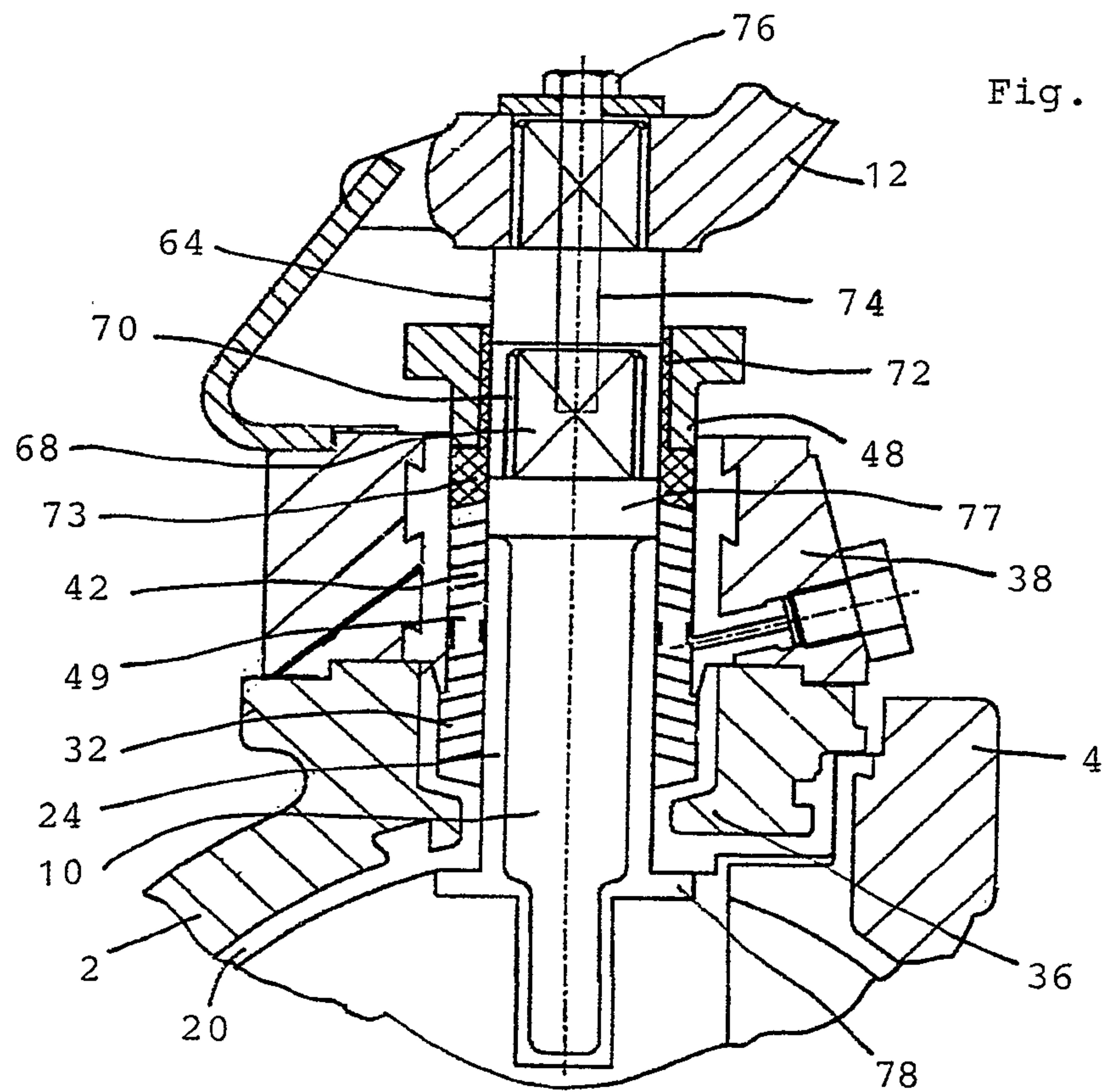


Fig. 5

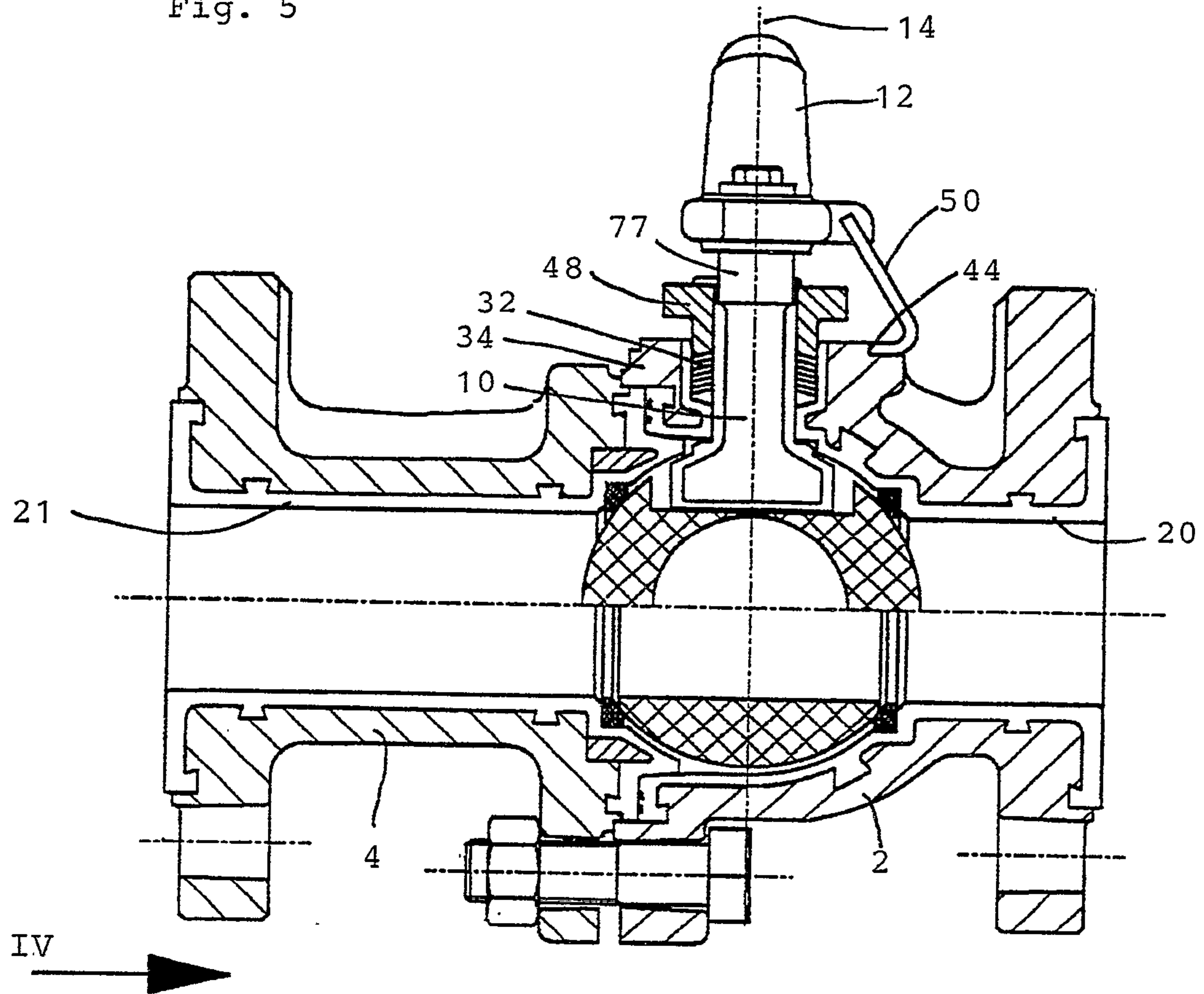


Fig. 6

