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(54) Title: VALVE <div style="text-align: center;"> </div> (57) Abstract <p>Shut-off valve with a shut-off element (4; 4') which is provided with a hemispherical external surface and in which a through-running channel (20) is provided. The shut-off element is rotatable in a housing (2; 2') which comprises a number of channels. At the places where the channels open out into the interior space of the housing, an O-ring (32) is fitted around the opening of each channel, in a groove provided between the housing and the shut-off element. The interior space between the shut-off element and the housing is sealed off from the environment by a sealing ring (26) which is disposed between the essentially hemispherical surfaces of the housing and the shut-off element above the mouths of the channels in the housing and those of each channel in the shut-off element. The housing is provided on the outside with one or more radially outward projecting ribs (40; 62), around which radially inward projecting hook edge parts (38; 60) of the shut-off element or of a shut-off element retaining element (5) can grip, for the purpose of rotatably connecting the shut-off element and the housing, and for axially retaining the shut-off element in the housing. On the other hand, the housing and the shut-off element can be connected by a bayonet connection at the housing bottom.</p>		

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- 1 -

Valve

The invention relates to a shut-off valve with a shut-off element which is provided with an essentially hemispherical external surface and in which at least one through-running channel is provided, which shut-off element
5 is rotatable about the rotational axis of symmetry of the hemispherical external surface thereof in a housing which is provided with an essentially hemispherical space for the accommodation with play of the shut-off element, and in which sealing means are accommodated for sealing off the
10 interior space between the housing and the shut-off element from the environment, the housing comprising a number of channels which at least in one angular position of the shut-off element connect to the channel in the shut-off element for the formation of one or more uninterrupted
15 passages in the shut-off valve, while in another angular position of the shut-off element the passage through the shut-off valve is blocked by the external surface of the shut-off element, and at the places where the channels open out into the interior space of the housing a closed sealing
20 element is fitted around the opening of each channel, between the housing and the shut-off element.

Such a shut-off valve is known from European Patent Application 0,399,095. This shut-off valve for shutting off hydraulic pipes comprises a housing made up of a base part
25 and a cover, a number of channels being provided in the base part, and the cover being connected to the base part and being provided with a central opening for allowing through a shaft which is connected to the shut-off element and to which an operating lever is connected outside the
30 housing, for rotating the shut-off element in the housing.

A drawback of the known arrangement is that sealing means have to be provided both between the base part and the cover and between the cover and the shaft passed through it, for the purpose of sealing off the interior
35 space between the housing and the shut-off element from the environment. This not only means that the shut-off valve is assembled from a large number of parts, but also that there

- 2 -

is a greater risk of mistakes in the assembly of the shut-off valve, there is a considerable risk of leakages, and the shut-off valve is relatively expensive.

5 The object of the invention is to make a considerable reduction in the number of parts in the type of shut-off valve described in the preamble, to make the assembly of the shut-off valve much simpler, to reduce the risk of leakages, and to lower the cost.

10 For this purpose, the shut-off valve according to the invention is characterised in that the sealing means for sealing off the interior space between the housing and the shut-off element from the environment comprise an annular sealing element which is disposed between the essentially hemispherical surfaces of the housing and the
15 shut-off element above the mouths of the channels in the housing and those of each channel in the shut-off element. This removes the limitations as regards the shape of the shut-off valve, which are imposed by the presence of a cover of the type described above, and the seals which are
20 required in this case. There are no sealing problems between the shut-off element and an operating element interacting therewith for rotating the shut-off element. The housing and the essentially hemispherical shut-off element can each be manufactured simply from plastic and by
25 injection moulding, following which the parts require no finishing. These factors provide a low-cost shut-off valve.

The hemispherical shape of the interior space of the shut-off valve means that the pressure of a liquid in this space creates a resultant force which tries to press
30 the shut-off element out of the hemispherical space of the housing. For a simple assembly of the shut-off valve according to the invention, said shut-off valve is provided with hook or snap hook means for retaining the shut-off element in the housing in the axial direction, i.e. in the
35 direction of the axis of symmetry thereof.

In a preferred embodiment, the housing of the shut-off valve is provided with a retaining element extending

- 3 -

over the shut-off element, for retaining the shut-off element in the housing in the axial direction. Unlike the shut-off valve according to the prior art, in which the cover acts as a retaining element, the retaining element in
5 the shut-off valve according to the invention does not have to be connected in a sealing manner to the housing, which means a great design simplification. The retaining element is preferably designed as a bridge extending between two edge parts of the housing which lie diametrically opposite
10 each other. With a suitably chosen shape of the bridge, the side of the shut-off element facing the bridge remains highly accessible for the purpose of fixing operating elements thereon for rotating the shut-off element in the housing.

15 In an advantageous embodiment, the shut-off element is rotatably mounted relative to the retaining element, near the central part of the shut-off element. This means that the contact surface in the bearing between the shut-off element and the retaining element is relatively small,
20 with the result that the moment of force required for rotating the shut-off element in the housing is small.

A simple assembly of the shut-off valve according to the invention can be obtained by providing the housing on the outside with one or more radially outward projecting
25 ribs, extending parallel to a plane at right angles to the rotational axis of symmetry of the shut-off element, around which ribs radially inward projecting, complementarily shaped hook edge parts of the retaining element grip, for the purpose of axially retaining the shut-off element in
30 the housing. Provision can be made for the shape of the retaining element and the housing to allow sufficient flexibility thereof for bending outwards of the hook edge parts of the retaining element over the ribs of the housing during the fitting of the retaining element. On the other
35 hand, provision can be made for a bayonet connection to be produced in the abovementioned way between the housing and the retaining element by interrupting the ribs on the

- 4 -

housing over at least the tangential length of the hook edge parts of the retaining element.

A shut-off valve which is particularly simple to assemble, and in which a retaining element need not be used, is obtained by providing the housing on the outside with one or more radially outward projecting ribs, extending parallel to a plane at right angles to the rotational axis of symmetry of the shut-off element, around which ribs radially inward projecting, complementarily shaped hook edge parts of the shut-off element grip, for the purpose of rotatably connecting the shut-off element and the housing.

The snap hook or hook or bayonet connection thus achieved between the housing and the shut-off element or retaining element provides the required pre-tension on the sealing elements around the mouth of the channels in the interior space of the housing.

In the above last-described embodiment, the moment required for operating the shut-off valve can be reduced considerably by replacing the abovementioned snap connection between the housing and the shut-off element by providing a through-running hole with an essentially circular cross-section in the housing, which hole lies coaxially with the axis of rotation of the shut-off element, and along the circumference of which a radially inward directed collar with one or more radial recesses is provided, so that in a certain angular position of the shut-off element relative to the housing one or more radially outward directed bosses, provided on the outer periphery of an essentially cylindrical projection which runs coaxially with the axis of rotation of the shut-off element and is provided thereon, are allowed through in order to form a bayonet connection between the housing and the shut-off element.

For an operation of the shut-off valve according to the invention which requires little force, the shut-off element is preferably provided with one or more operating handles or fitting means therefor which are fitted near the

- 5 -

peripheral edge of the shut-off element. Such operating handles can be formed integrally with the shut-off element if desired.

5 A good seal at the mouths of the channels in the housing can be obtained in a simple and expedient manner relative to the shut-off element if the sealing elements around the mouths of the channels in the housing consist of O-rings which are accommodated in grooves which are determined by facing upright sides of ribs formed on the
10 internal surface of the space in the housing, the groove bottoms running along a hemispherical surface at a predetermined distance from the hemispherical external surface of the shut-off element.

Through the use of a hemispherical shut-off
15 element, the shut-off valve according to the invention is extremely well suited for production from plastic, manufactured by means of an injection moulding process. For a simple mould construction, the upright sides of the ribs in the housing preferably run parallel to the axis of
20 rotation of the shut-off element.

In a preferred embodiment, the shape of the cross-section of the channels in the housing is selected in such a way that the grooves run in a circle. The O-rings to be placed in the grooves can then fulfil their function in the
25 optimum manner. In this case the channels will generally have an elliptical cross-section, in which the geometry of the ellipse depends on the direction in which the axes of the channels in the housing intersect the axis of rotation of the shut-off element, and on the position of the
30 channels in the housing.

The shut-off valve according to the invention is suitable in particular for use in a water pipe system, where there are large numbers of products which have to be as cheap as possible.

35 The invention is explained with reference to the drawing, in which:

Fig. 1 shows a side view, partially in cross-

- 6 -

section, of an embodiment of a shut-off valve according to the invention, mounted on a fixing bracket;

Fig. 2 shows a top view of the shut-off valve of Fig. 1, with partially cut-away shut-off element and housing shown partially in cross-section;

Fig. 3 shows a side view of the shut-off valve of Fig. 1, partially in cross-section, in the direction of arrow III in Fig. 1;

Figs. 4a and 4b show a detail of a cross-section and a bottom view, respectively, of a bayonet connection between a shut-off element and a housing;

Fig. 5a shows a view in perspective of a further embodiment of a shut-off valve according to the invention;

Fig. 5b shows a cross-section of the shut-off valve according to Fig. 5a;

Fig. 5c shows a longitudinal section of the shut-off valve according to Fig. 5a;

Fig. 6a shows a view in perspective of the housing part of the shut-off valve according to Fig. 5a;

Fig. 6b shows a cross-section of the housing part according to Fig. 6a;

Fig. 6c shows a longitudinal section of the housing part according to Fig. 6a;

Fig. 7a shows a view in perspective of the shut-off element of the shut-off valve according to Fig. 5a;

Fig. 7b shows a cross-section of the shut-off element according to Fig. 7a;

Fig. 7c shows a longitudinal section of the shut-off element according to Fig. 7a;

Fig. 8a shows a view in perspective of the retaining element of the shut-off valve according to Fig. 5a; and

Fig. 8b shows a longitudinal section of the retaining element according to Fig. 8a.

In the Figures the same reference numerals relate to the same parts, or to parts having the same functions.

Fig. 1 shows a shut-off valve comprising two

- 7 -

different plastic main parts, namely a housing part 2 and a shut-off and control part 4, which parts are rotatable relative to each other about an axis 6.

The housing part 2 is provided with two connecting
5 branches 8 and 10 lying in line with each other, into each of which a connecting piece 12 of a pipe system can be inserted and, for example, snapped in by providing the inside of the connecting branches 8 and 10 and the outside of corresponding connecting pieces 12 with interacting,
10 transverse projecting hook lobes (see, for example, hook lobe 13 in connecting branch 8 in Fig. 2). The connecting pieces 12 are provided at one end with an external peripheral groove 14, in which an O-ring 16 is accommodated. After the fitting of a connecting piece 12 in
15 a connecting branch 8, 10, the sealing O-ring 16 rests against an internal sealing face 18 of the connecting branch 8, 10. The connecting piece 12 is fixed in the peripheral direction by radially outward projecting, axially directed lobes 15 which are accommodated in axial
20 grooves on the inner perimeter of the connecting branches 8, 10 (see, for example, grooves 17 in Fig. 3). Appendages connected to the connecting pieces 12 can be fixed in the peripheral direction in this way. The connecting piece 12 can also be freely rotatable in the connecting branch 8,
25 10, in order to prevent torsion forces in the pipe system from being transmitted to the housing part 2 and being able to deform said housing part. The connecting piece 12 is also movable in the axial direction over a certain distance relative to the corresponding connecting branch 8, 10, with
30 the result that tolerances in the pipe system at the position of the shut-off valve can be absorbed in a simple manner.

As Figs. 1, 2 and 3 show, the internal surface of the housing part 2 is essentially formed according to the
35 surface of a hemisphere, as is the external surface of the shut-off and control part 4 situated at a slight distance opposite it. The pipe branches 8 and 10 of the housing part

- 8 -

2 connect to openings in the wall of the housing part 2, which openings in turn in the angular position of the shut-off and control part 4 shown connect to a channel 20 formed in said last-mentioned part. The cross-section of the passage thus formed through the housing part 2 and the shut-off and control part 4 is elliptical, as shown in particular in Fig. 3. The geometry of the elliptical shape is chosen in such a way that the slanting cross-section through the passage is circular at the point of the transition between housing part 2 and shut-off and control part 4.

The housing part 2 is provided on the inside thereof, on the bottom of the hemispherical surface, with an annular seat with a flat bottom and an upright cylindrical wall, in which seat an O-ring 22 is fitted. The shut-off and control part 4 is provided opposite the abovementioned upright cylindrical wall with a self-contained rib 24 projecting parallel thereto, the cylindrical outside of which is in contact with the O-ring 22 while exerting a compressing force thereon for the bearing of the shut-off and control part 4 locally and the sealing off of the space above it between the housing part 2 and the shut-off and control part 4.

The housing part 2 is provided on the inside thereof, near the top edge, with a second annular seat with a flat bottom and an upright cylindrical wall, in which seat an O-ring 26 is fitted. The shut-off and control part 4 is provided opposite the last-mentioned upright cylindrical wall with a cylindrical surface which extends parallel thereto and is in contact with the O-ring 26 while exerting a compressing force thereon for the bearing of the shut-off and control part 4 locally and the sealing off of the space below it between the housing part 2 and the shut-off and control part 4.

Moulded along the internal surface of the housing part 2 are an inner rib 28 and outer rib 30 extending partly round a passage in the wall of the housing part 2,

- 9 -

between which ribs an annular O-ring 32 can be retained.

In the illustrated position of the shut-off and control part 4 relative to the housing part 2, the O-ring 32 provides a seal between the passage and the space
5 bounded by the O-rings 22, 26 and 32 between the housing part 2 and the shut-off and control part 4. When the shut-off and control part 4 is rotated from the illustrated position through 90° about the axis 6 relative to the housing part 2, the passage from connecting branch 8 to
10 connecting branch 10 is blocked, through the fact that the closed part of the hemispherical external surface of the shut-off and control element 4 shuts off the openings in the wall of the housing part 2.

The shut-off and control part 4 is provided with
15 two wings 34, with which this part can be rotated by hand relative to the housing part 2. Provision is made for blocking means (not shown), for limiting the angle through which the shut-off and control part 4 can be rotated. The housing part 2 is also provided with a laterally projecting
20 lobe 35a, in which a through-running hole is provided. In the position of the housing part 2 relative to the shut-off and control part 4 shown in the Figures, the lobe 35a is situated opposite a corresponding lobe 35b forming part of the shut-off and control part 4, and is also provided with
25 a through-running hole. A padlock or seal through the holes which are in line with each other in the lobes 35a and 35b can ensure that the shut-off valve remains in the open position. In a similar way, it can be ensured by means of a padlock or a seal through a hole 35c (see Fig. 1) in a wing
30 34 and the hole in the lobe 35a that the shut-off valve remains in the closed position.

The shut-off and control part 4 has a cylindrical part extending around the top edge of the housing part 2 and provided along its inner perimeter with a number of
35 radially inward facing hook lobes 38. The hook lobes 38 grip under a radially outward projecting hook edge 40 on the top edge of the housing part 2. By these measures, the

- 10 -

assembly of the shut-off valve from the loose parts 2, 4, 22, 26 and 32 can be carried out particularly quickly and simply by first fitting the O-rings 22 and 26 in the seats of the housing part 2 intended for them, then fitting an O-
5 ring 32 near each passage in the wall of the housing part 2, between the inner and outer ribs 28, 30 and, finally, pressing the shut-off and control part 4 in the direction of the line 6 into the housing part 2 until the hook lobes 38 have snapped behind the hook edge 40.

10 Figs. 4a and 4b show an alternative to the snap connection between the housing part 2 and the shut-off and control part 4 shown in Figs. 1 to 3. The connection between the parts 2 and 4 is produced here by means of a bayonet connection. For this purpose, the base of the
15 housing part 2 is provided with a through-running hole with a circular cross-section, which hole is situated coaxially with the axis of rotation 6. Fitted on the outside of the housing, along the periphery of the hole, is a radially inward directed collar 50, which is connected to the wall
20 of the hole by means of reinforcement ribs 52. A recess 54 is provided at at least one place along the periphery of the collar 50. The shut-off and control part 4 is provided with an essentially cylindrical projection 56, which is situated coaxially with the axis of rotation 6, and on the
25 outer periphery of which a lobe 58 is provided. The dimensions of the hole in the housing part 2, the collar 50, the recess 54, the projection 56 and the lobe 58 are selected in such a way that the projection 56 of the shut-off and control part 4 in a certain angular position
30 thereof relative to the housing part 2 can be inserted through the hole in the housing part 2 and a bayonet connection can then be produced by rotating the shut-off and control part 4 relative to the housing part 2. Provision is made for locking means (not shown), by means
35 of which a connection between the housing part 2 and the shut-off and control part 4 is possible, and disconnection is no longer possible. For this purpose, the locking means

- 11 -

may comprise, for example, a resilient lip which on rotation of the parts 2 and 4 relative to each other can deform, in order to pass a lobe, following which the lip cannot now pass the lobe in the opposite direction.

5 For a rapid fitting of the shut-off valve in a pipe system, the housing part 2 is provided on the outside with a base with hook projections 42, which are intended for accommodation in openings of upright lips of a fixing bracket 44.

10 The shut-off valve illustrated in Figs. 5a to 5c, 6a to 6c, 7a to 7c, 8a and 8b differs essentially from the shut-off valve shown in Figs. 1 to 3 by the fact that a shut-off and control part 4' is axially retained in a housing part 2' by means of a retaining element 5. The
15 retaining element 5, which is shown in detail in Figs. 8a and 8b, is in the form of a bridge, and is provided with two hook edge parts 60 which face each other and are complementarily moulded onto corresponding ribs 62 of the housing part 2', with the result that a bayonet connection
20 can be produced between the retaining element 5 and the housing part 2', as shown in Figs. 5a to 5c. The retaining element 5 is provided at the side which is to face the shut-off and control part 4' with a central bearing face 64, which is intended to rest on concentric ribs 66 of the
25 shut-off and control part 4', which in this case is axially retained in the housing part 2'. The shut-off and control part 4' is provided with means 61 for fitting one or more operating elements on the part 4' by means of a snap connection. Such control elements can comprise, for
30 example, wings such as those shown in Fig. 1 and indicated by reference number 34, or a cover-type handle.

 The housing part 2' is provided on its underside with a pipe branch 70, which is in turn provided with transverse projecting drain pipe branches 72. The pipe
35 branch 70 is in communication with the drain pipe branches 72 and with connecting branch 8' of the housing part 2'. Fitted in an axially slidable manner in the pipe branch 70

- 12 -

is a plug 74 with sealing ring 75, which plug 74 can be moved by turning operating knob 76. In this case the plug 74 can be moved away from the housing part 2' by means of a screw connection with the operating knob 76, out of the position shown in Fig. 5c, in which the pipe branch 70 and the drain pipe branches 72 are shut off, with the result that an open communication is produced between the interior space of the pipe branch 8' and the environment of the shut-off valve, for draining of the shut-off valve.

10 The retaining element 5 has a round central part with an external diameter which is smaller than the distance between the operating element fixing means 61 of the shut-off and control part 4'. Since the parts 4' and 5 are coaxially mounted in the shut-off valve, the necessary free angle is thereby produced for the rotation of the shut-off and control part 4' to be produced in the housing part 2' with the aid of the operating element fixing means 61.

20 The shut-off valve shown in Figs. 5a to 8b can be assembled particularly quickly and simply from the loose parts 2', 4', 5, 26, 32, 74, 75 and 76 by first fitting the sealing ring 75 in a groove intended for it in the plug 74, placing the plug 74 from the inside of the housing 2' in the pipe branch 70, and screwing the operating knob 76 onto the part of the plug 74 projecting out of the pipe branch 70 until a hook edge of the operating knob 76 snaps behind a collar of the pipe branch 70. The sealing rings 26 and 32 are then fitted in the seats provided for the purpose in the housing part 2', the shut-off and control part 4' is pressed with the hemispherical side thereof into the housing part 2', and the retaining element 5 is placed on the housing part 2' and rotated so far that the hook edge parts 60 thereof grip behind the ribs 62 of the housing part 2'. The hook edge parts 60 here pass resilient locking lips 63, and they are blocked by stop lobes 65, in such a way that the retaining element 5 is retained between the stop lobes 65 and the locking lips 63 and is fixed securely

- 13 -

to the housing part 2'.

The shut-off valves described are particularly compact and in their open position have a very low hydraulic resistance, due to the virtually straight
5 passage. The housing parts 2 and 2', the shut-off and control parts 4 and 4', and the retaining element 5 can each be formed in one step in an injection moulding process, without any finishing being necessary, with the
10 result that a particularly effective, simple and cheap construction is obtained.

- 14 -

CLAIMS

1. Shut-off valve with a shut-off element (4; 4') which is provided with an essentially hemispherical external surface and in which at least one through-running channel (20) is provided, which shut-off element is
5 rotatable about the rotational axis of symmetry (6) of the hemispherical external surface thereof in a housing (2; 2') which is provided with an essentially hemispherical space for the accommodation with play of the shut-off element, and in which sealing means are accommodated for sealing off
10 the interior space between the housing and the shut-off element from the environment, the housing comprising a number of channels which at least in one angular position of the shut-off element connect to the channel in the shut-off element for the formation of one or more uninterrupted
15 passages in the shut-off valve, while in another angular position of the shut-off element the passage through the shut-off valve is blocked by the external surface of the shut-off element, and at the places where the channels open out into the interior space of the housing a closed sealing
20 element (32) is fitted around the opening of each channel, between the housing and the shut-off element, characterised in that the sealing means for sealing off the interior space between the housing (2; 2') and the shut-off element (4; 4') from the environment comprise an annular sealing
25 element (26) which is disposed between the essentially hemispherical surfaces of the housing and the shut-off element above the mouths of the channels in the housing and those of each channel (20) in the shut-off element.
2. Shut-off valve according to Claim 1, characterised
30 in that provision is made for hook or snap hook means (38, 40; 60, 62) for retaining the shut-off element (4; 4') in the housing (2; 2') in the axial direction.
3. Shut-off valve according to Claim 1 or 2,
characterised in that the housing (2') is provided with a
35 retaining element (5) extending over the shut-off element

- 15 -

(4'), for retaining the shut-off element in the housing in the axial direction.

4. Shut-off valve according to Claim 3, characterised in that the retaining element (5) is designed as a bridge
5 extending between two edge parts of the housing (2') which lie diametrically opposite each other.

5. Shut-off valve according to Claim 3 or 4, characterised in that the shut-off element (4') is rotatably mounted relative to the retaining element (5),
10 near the central part of the shut-off element.

6. Shut-off valve according to any of Claims 3 to 5, characterised in that the housing (2') is provided on the outside with one or more radially outward projecting ribs (62), extending parallel to a plane at right angles to the
15 rotational axis of symmetry (6) of the shut-off element (4'), around which ribs radially inward projecting, complementarily shaped hook edge parts (60) of the retaining element (5) grip, for the purpose of axially retaining the shut-off element in the housing.

20 7. Shut-off valve according to Claim 1 or 2, characterised in that the housing (2) is provided on the outside with one or more radially outward projecting ribs (40), extending parallel to a plane at right angles to the rotational axis of symmetry (6) of the shut-off element
25 (4), around which ribs radially inward projecting, complementarily shaped hook edge parts (38) of the shut-off element grip, for the purpose of rotatably connecting the shut-off element and the housing.

8. Shut-off valve according to Claim 1 or 2,
30 characterised in that the housing (2) is provided with a through-running hole with an essentially circular cross-section, which hole lies coaxially with the axis of rotation (6) of the shut-off element (4), and along the circumference of which a radially inward directed collar
35 (50) with one or more radial recesses (54) is provided, so that in a certain angular position of the shut-off element relative to the housing one or more radially outward

- 16 -

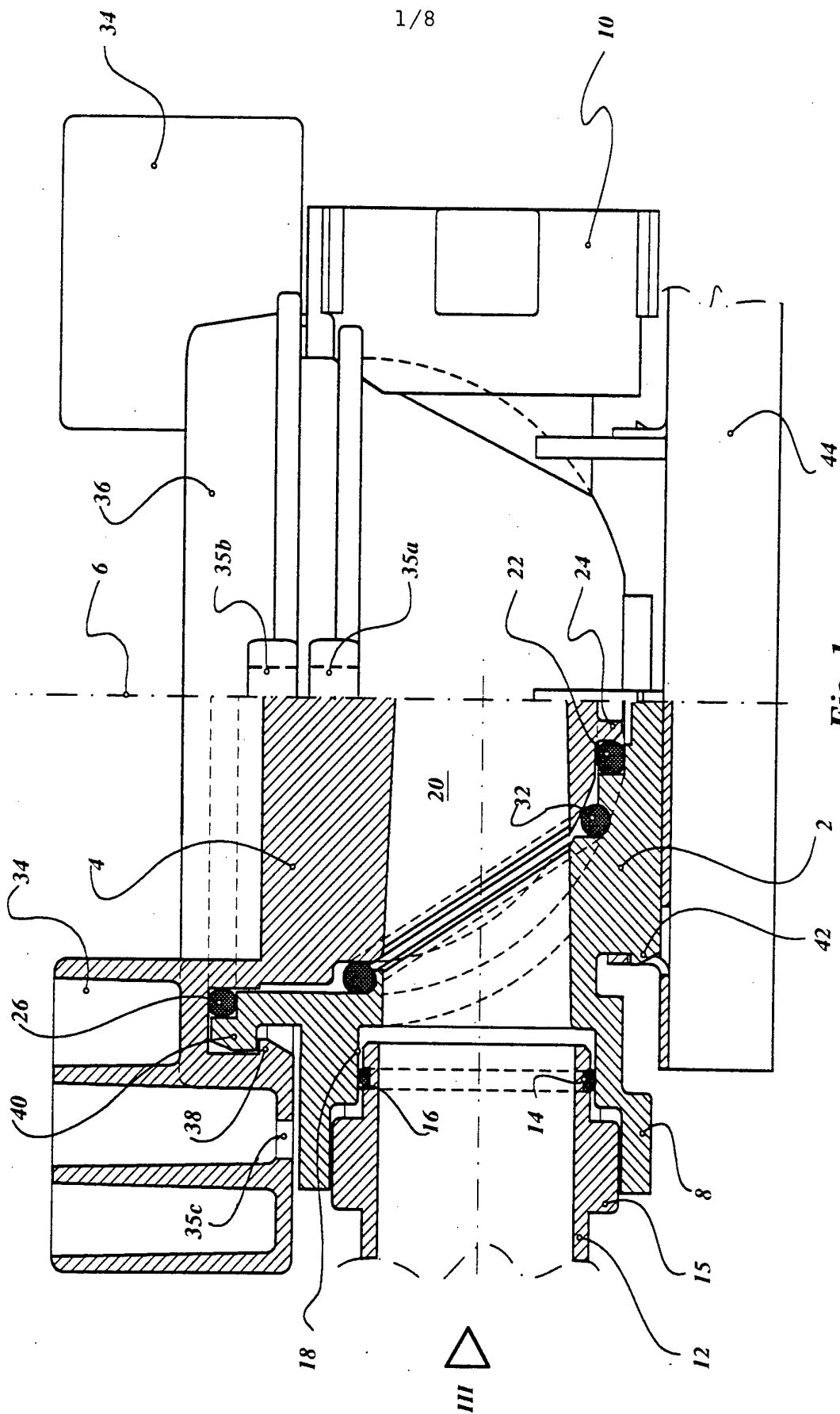
directed lobes (58), provided on the outer periphery of an essentially cylindrical projection (56) which runs coaxially with the axis of rotation of the shut-off element and is provided thereon, are allowed through in order to
5 form a bayonet connection between the housing and the shut-off element.

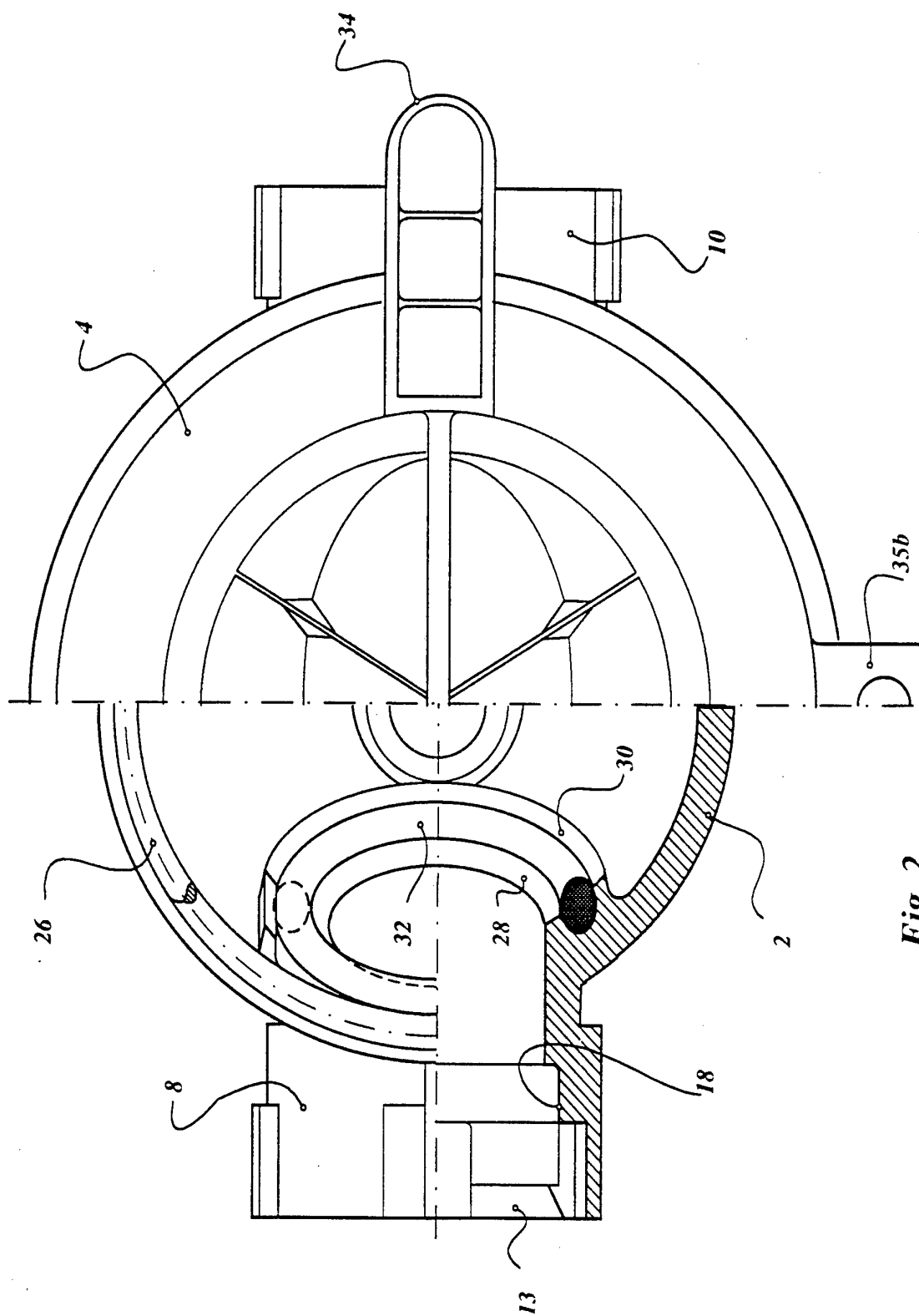
9. Shut-off valve according to any of the preceding claims, characterised in that the shut-off element (4; 4') is provided with one or more handles (34) or fitting means
10 (61) therefor which are fitted near the peripheral edge of the shut-off element.

10. Shut-off valve according to any of the preceding claims, characterised in that the sealing elements around the mouths of the channels in the housing (2; 2') consist
15 of O-rings (32) which are accommodated in grooves which are determined by facing upright sides of ribs (28, 30) formed on the internal surface of the space in the housing, the groove bottoms running along a hemispherical surface at a predetermined distance from the hemispherical external
20 surface of the shut-off element (4; 4').

11. Shut-off valve according to Claim 10, characterised in that the upright sides of the ribs (28, 30) run parallel to the axis of rotation (6) of the shut-off element.

12. Shut-off valve according to Claim 10 or 11,
25 characterised in that the shape of the cross-section of the channels in the housing (2; 2') is selected in such a way that the grooves are circular.





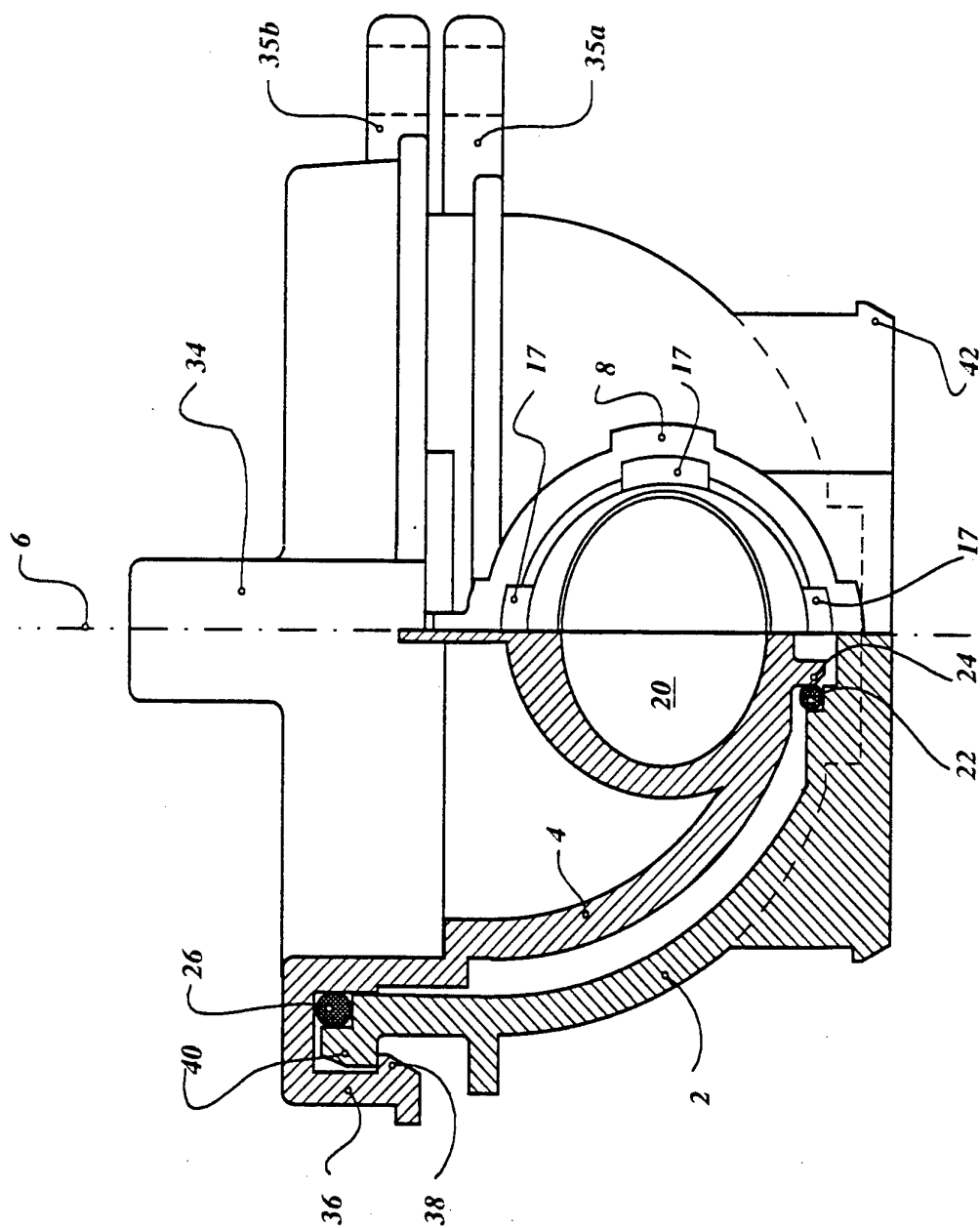


Fig. 3

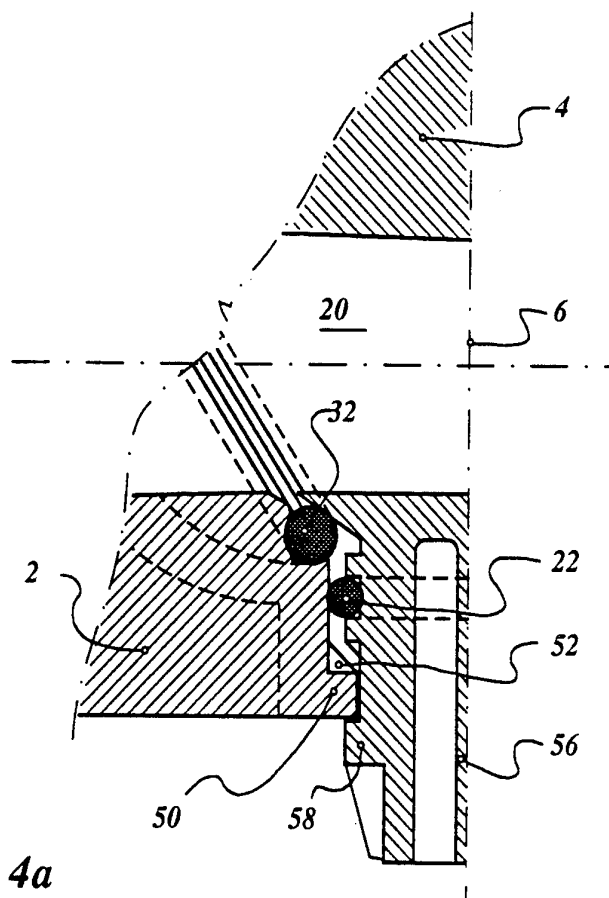


Fig. 4a

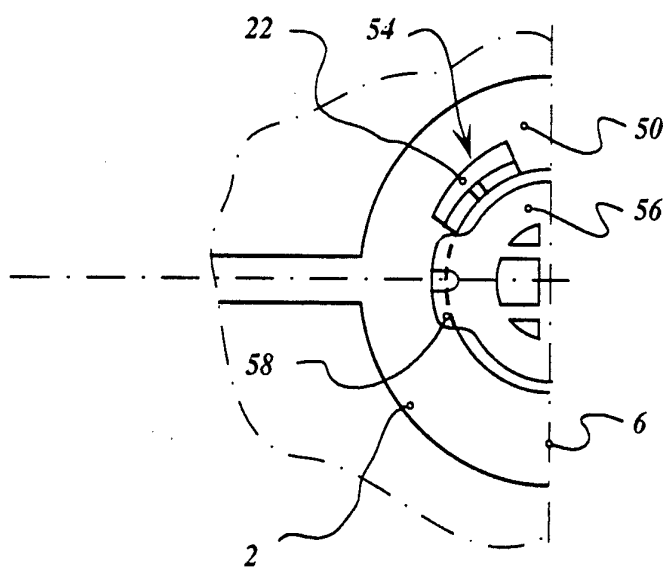


Fig. 4b

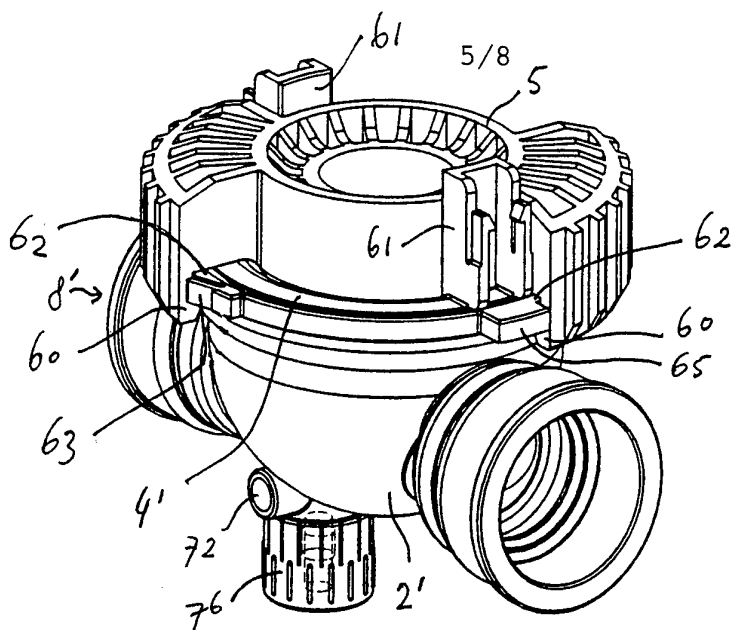


Fig. 5a

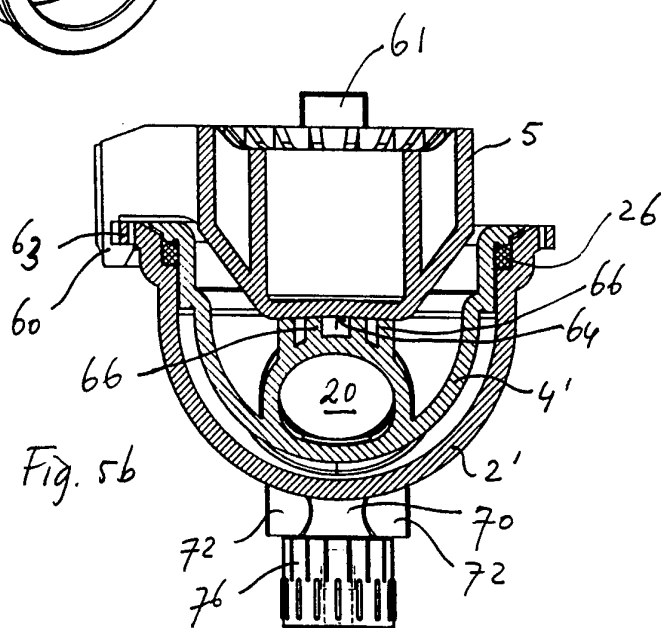


Fig. 5b

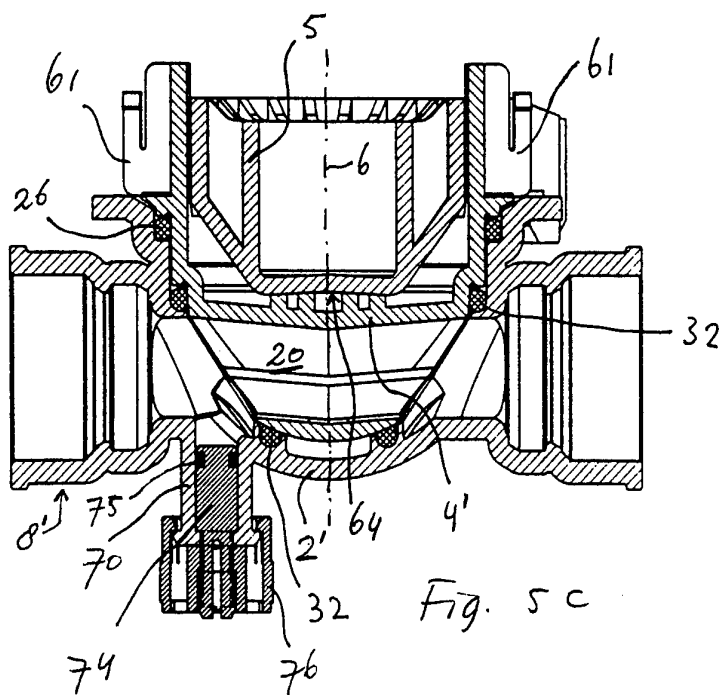
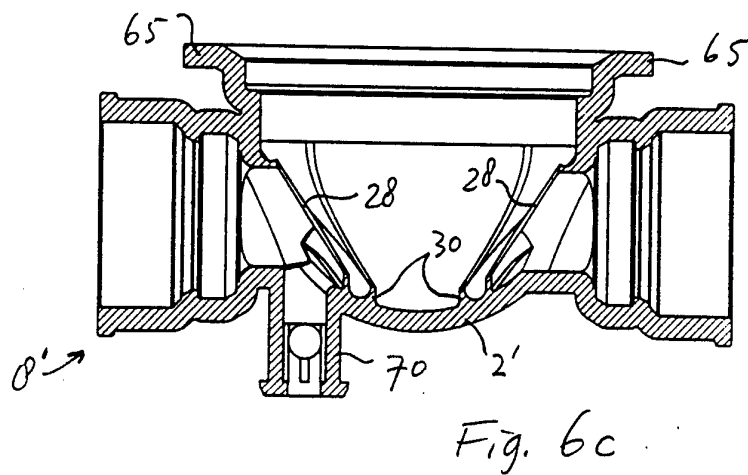
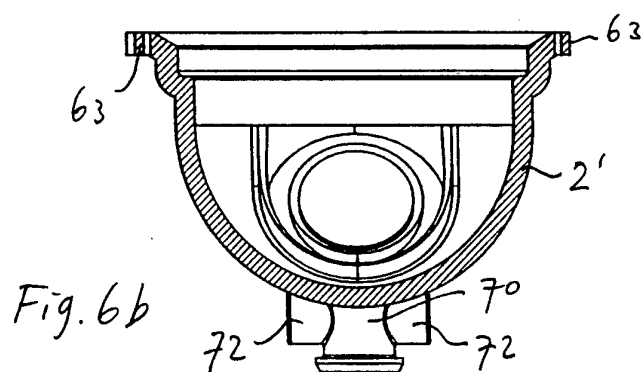
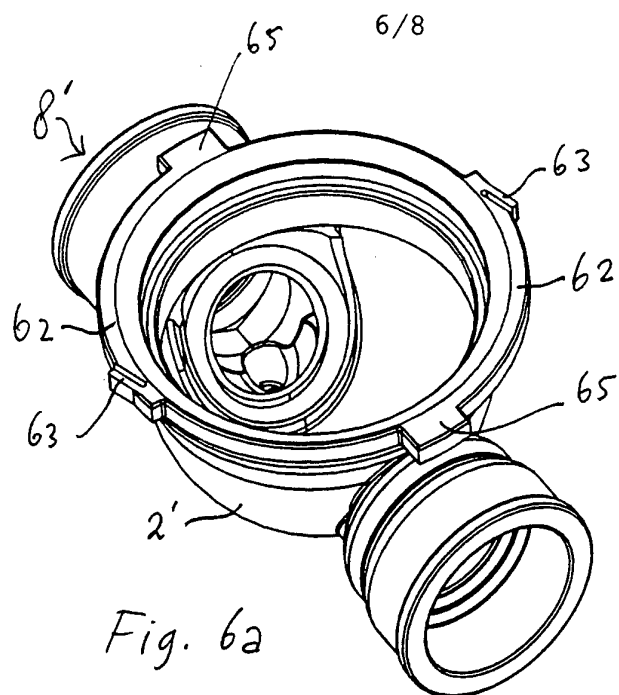
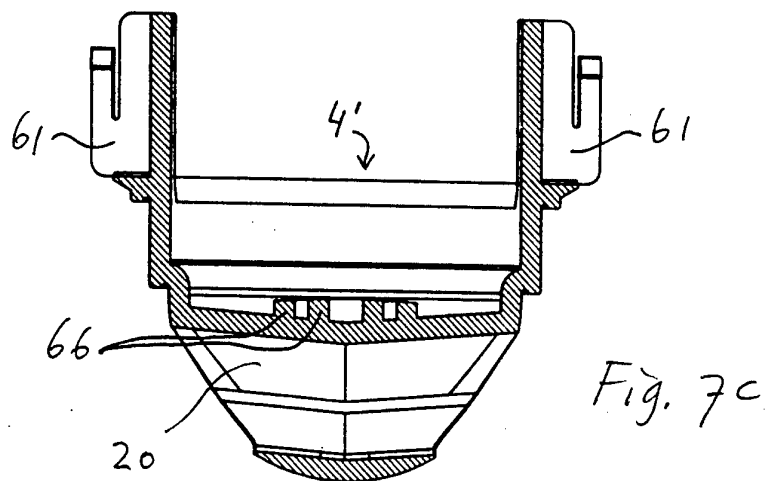
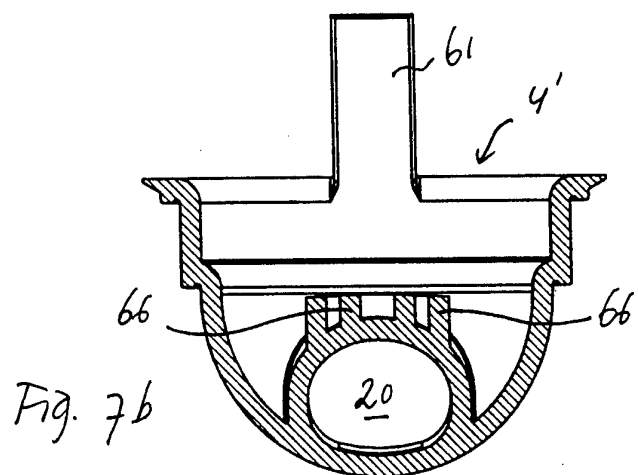
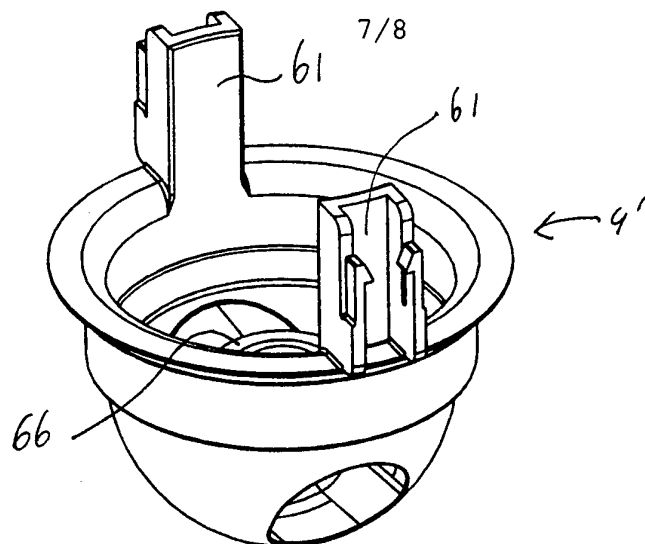
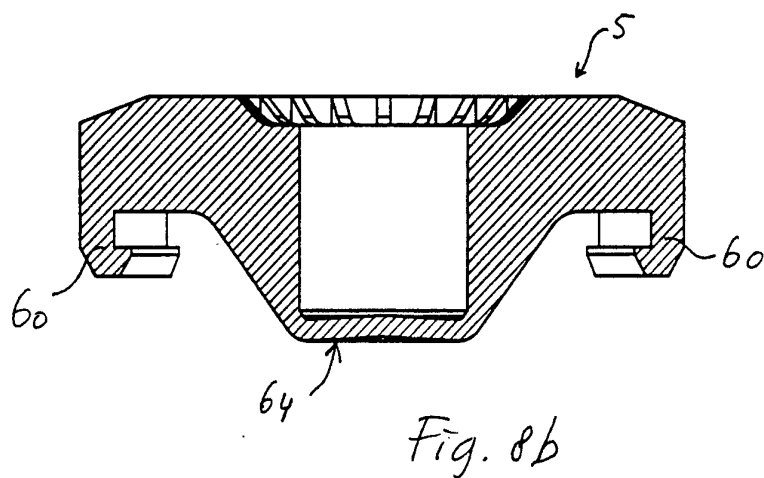
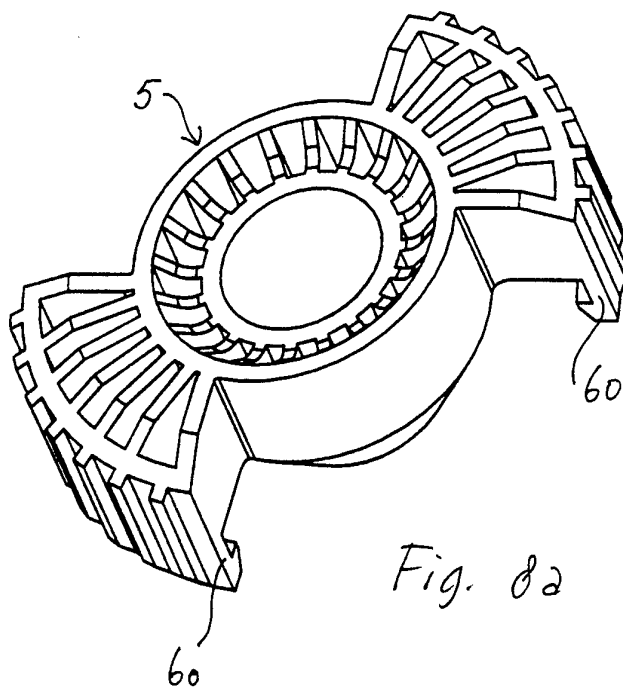


Fig. 5c





8/8



INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 93/00131

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 F16K5/06; F16K11/087

II. FIELDS SEARCHEDMinimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

F16K

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸**III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹**

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	NL,C,111 100 (TACONIS) 16 November 1964 see the whole document ---	1,9,10, 12
A	FR,A,1 160 452 (QUARTEX) 16 July 1958 see the whole document ---	1-4,6,7
A	US,A,2 492 140 (FIKE) 22 January 1944 see the whole document ---	1,10,12
A	GB,A,2 093 164 (HIGGINGS) 25 August 1982 see the whole document ---	1-3,6,7
A	US,A,4 147 184 (JESS) 3 April 1979 see the whole document ---	1,2,7,9
	-/--	

¹⁰ Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

16 SEPTEMBER 1993

Date of Mailing of this International Search Report

23. 09. 93

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

VERELST P.E.J.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,3 057 370 (HAMILTON) 9 October 1962 see the whole document -----	1,2,7

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

NL 9300131
SA 76273

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16/09/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
NL-C-111100		None	
FR-A-1160452		None	
US-A-2492140		None	
GB-A-2093164	25-08-82	None	
US-A-4147184	03-04-79	None	
US-A-3057370		None	