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Valve cartridge for a sanitary fitting

Description

[0001] The present invention relates to a self-closing valve cartridge for a sanitary fitting according to the preamble of the independent patent claim 1 and a sanitary fitting which is provided with such a valve cartridge.

[0002] Self-closing sanitary fittings having a preferably adjustable delay time are typically used in sanitary installations such as showers, wash basins, etcetera. After activation (opening), they independently close again after a set delay time and thus prevent water from inadvertently flowing again. This limits the water consumption and prevents potential water damage.

[0003] A generic self-closing valve cartridge or self-closing sanitary fitting typically comprises the following functional groups:

- a valve which blocks or releases a water throughflow,
- a movable actuating element which cooperates with the valve and which opens the valve when moved forwards and which closes the valve when moved backwards,
- an operating member for manually moving the actuating element forwards,
- a return drive which is generally produced by a spring for the actuating element, and
- a delay device in order to temporally delay the return movement of the actuating element, wherein the delay time can typically be adjusted.

[0004] In many cases, the valve cartridge or sanitary fitting also comprises a mixing device for mixing cold and hot water, wherein the mixing ratio may also be able to be adjusted. The adjustment of the mixing ratio can generally also be carried out using the operating member.

[0005] A typical example of such a self-closing valve cartridge or sanitary fitting is described in document EP 1 039 189 B1. The actuating element is arranged so as to be axially adjustable in this sanitary fitting and can be moved manually by the operating member in the direction towards the valve of the valve unit (forward movement). In this

instance, a hydraulic medium is pressed from a first chamber by means of a one-way valve arrangement into a second chamber. The actuating element can be magnetically coupled by means of a (ring) magnet to a magnet armature which is fitted to the valve body of the valve, whereby the valve body is lifted from its seat and opens the valve. The time-delayed return movement of the actuating element and consequently the closure of the valve is carried out in a hydraulically damped manner by means of resilient force, wherein the hydraulic medium flows back from the second chamber via an adjustable restriction into the first chamber. As soon as the actuating element is returned in a time-delayed manner to such an extent that the magnet can no longer hold the magnet armature, the valve body falls back into the seat thereof and thereby closes the valve again.

[0006] As a result of the present invention, a self-closing valve cartridge for a sanitary fitting or a self-closing sanitary fitting of the generic type or type described in the document EP 1 039 189 B1 is intended to be improved with regard to simpler and consequently more cost-effective capacity for production, greater operational reliability and better ability to control the time delay. These objectives are achieved by the features of the self-closing valve cartridge according to the invention according to the independent patent claim 1. Advantageous embodiments or developments are set out in the dependent patent claims.

[0007] The above-mentioned objectives are inter alia achieved by a self-closing valve cartridge which is not claimed in this instance for a sanitary fitting which comprises: an inlet and an outlet, a valve for blocking or releasing a throughflow path from the inlet to the outlet, an actuating element which cooperates with the valve and which is movable backward and forward from a closed position into an open position and by means of which the valve can be opened during its forward movement and closed during its return movement, a return drive for the return movement of the actuating element from the open position to the closed position, and a delay device for the return movement of the actuating element. The delay device has a first and a second hydraulic-medium-containing chamber, which chambers are separated by a partition wall and are communicatively connected, on the one hand, via a one-way valve arrangement and, on the other hand, via a return flow channel having a restriction so that hydraulic medium can be driven from the first chamber into the second chamber through the one-way

valve arrangement during the forward movement of the actuating element and so that during the return movement of the actuating element hydraulic medium can be driven back from the second chamber into the first chamber only through the return flow channel having the restriction. The one-way valve arrangement comprises a resilient valve diaphragm which is arranged in abutment against the partition wall so as to be able to be resiliently lifted off and covers at least one throughflow opening which is arranged in the partition wall. The resilient valve diaphragm has an annular portion and a peripheral annular flange portion. On the annular portion of the valve diaphragm there are arranged resilient securing pins which protrude away therefrom and which each have a thickened portion and which engage through recesses in the partition wall, wherein the thickened portions at the side of the partition wall opposite the valve diaphragm are in abutment therewith and fix the valve diaphragm to the partition wall.

[0008] This construction of the valve diaphragm enables simple and cost-effective assembly of the valve diaphragm with at the same time an improved sealing function.

[0009] According to a main aspect, the invention comprises the following:
A self-closing valve cartridge for a sanitary fitting comprises an inlet and an outlet, a valve for blocking or releasing a throughflow path from the inlet to the outlet, an actuating element which cooperates with the valve and which is movable backward and forward from a closed position into an open position and by means of which the valve can be opened during its forward movement and closed during its return movement, a return drive for the return movement of the actuating element from the open position to the closed position, and a delay device for the return movement of the actuating element, wherein the delay device has a first and a second hydraulic-medium-containing chamber, which chambers are separated by a partition wall and are communicatively connected, on the one hand, via a one-way valve arrangement and, on the other hand, via a return flow channel having a restriction so that hydraulic medium can be driven from the first chamber into the second chamber through the one-way valve arrangement during the forward movement of the actuating element and so that during the return movement of the actuating element hydraulic medium can be driven back from the second chamber into the first chamber only through the return flow channel having the restriction. The return flow channel extends through the actuating element from an inlet opening via a hollow-cylindrical section of the actuating element up to an outlet

opening. A throttle member having a cylindrical throttle head is arranged in the actuating element such that it can be adjusted in the longitudinal direction of the actuating element relative thereto, wherein the throttle head can be inserted in the hollow-cylindrical section of the actuating element by adjusting the throttle member. Either the throttle head or the inner wall of the hollow-cylindrical section of the actuating element has a groove which extends from one end of the throttle head in the longitudinal direction thereof and which has a depth which decreases away from the end of the throttle head or which extends from the outlet opening of the actuating element in the longitudinal direction thereof and which has a depth which decreases away from the outlet opening. The throttle head forms the restriction with the inner wall of the hollow-cylindrical section of the actuating element and with the groove, wherein by adjusting the throttle member relative to the actuating element, the return flow channel can be closed to a greater or lesser extent and thereby the throughflow cross section of the restriction is adjustable.

[0010] This production of the restriction is particularly favourable in technical production terms and enables precise adjustability of the delay time of the delay device within very wide limits.

[0011] Advantageously, the annular flange portion of the valve diaphragm in the state not installed in the valve cartridge is constructed in a conical or concave manner so that the valve diaphragm has a concave shape at the side of the securing pins. This "umbrella-like" construction of the valve diaphragm ensures a high sealing force.

[0012] Advantageously, there is formed on the annular portion of the valve diaphragm an annular or sleeve-like sealing lip which abuts in a sealing manner against the actuating element which extends through the valve diaphragm. The sealing element can thereby slide easily, but with a high level of sealing being ensured at the same time.

[0013] According to a particularly advantageous embodiment, the resilient valve diaphragm has an annular portion and a peripheral annular flange portion. On the annular portion of the valve diaphragm there are arranged resilient securing pins which protrude away therefrom and which each have a thickened portion and which extend through recesses in the partition wall, wherein the thickened portions at the side of the

partition wall opposite the valve diaphragm are in abutment therewith and fix the valve diaphragm to the partition wall. The return flow channel extends through the actuating element from an inlet opening via a hollow-cylindrical section of the actuating element up to an outlet opening. A throttle member having a cylindrical throttle head is arranged in the actuating element such that it can be adjusted in the longitudinal direction of the actuating element relative thereto, wherein the throttle head is insertable in the hollow-cylindrical section of the actuating element by adjusting the throttle member. Either the throttle head or the inner wall of the hollow-cylindrical section of the actuating element has a groove which extends from one end of the throttle head in the longitudinal direction thereof and which has a depth which decreases away from the end of the throttle head or which extends from the outlet opening of the actuating element in the longitudinal direction thereof and which has a depth which decreases away from the outlet opening. In this case, the throttle head forms the restriction with the inner wall of the hollow-cylindrical section of the actuating element and with the groove, wherein, by adjusting the throttle member relative to the actuating element, the return flow channel can be closed to a greater or lesser extent and thereby the throughflow cross section of the restriction is adjustable. This embodiment of the valve cartridge combines the advantages of both aspects of the invention.

[0014] Advantageously, the valve cartridge comprises a preferably annular magnet which is kinematically connected to the actuating element for actuating the valve. The valve has in this instance a valve seat, a valve body and a magnet armature which is preferably in the form of an annular plate, wherein the magnet armature can be attracted by the magnet when it approaches, wherein the magnet armature being attracted causes the valve body to lift off the valve seat and consequently an opening of the valve can be triggered. Such a magnetically actuatable valve is particularly reliable.

[0015] Advantageously, the valve cartridge has a mixing device which is arranged in the throughflow path upstream of the valve for water, in particular cold and hot water, which can be supplied from two separate inlets.

[0016] Advantageously, the mixing device has two ceramic discs which can be rotated relative to one another and which sealingly slide against one another and have throughflow openings passing through them, wherein, depending on the relative

rotational position of the two ceramic discs, water can be routed through the throughflow openings in the two ceramic discs either only from one inlet or only from the other inlet or simultaneously from both inlets to the valve. A mixing device having ceramic discs is structurally simple and functionally reliable.

[0017] Advantageously, the outlet and the at least one inlet open in or out parallel with the movement direction of the actuating element. This increases the mechanical and connection compatibility of the valve cartridge and facilitates the replacement of existing valve cartridges with a cartridge according to the invention.

[0018] With regard to the sanitary fitting, the invention involves the sanitary fitting having a self-closing valve cartridge according to the invention.

[0019] The invention will be explained in greater detail below with reference to embodiments which are illustrated in the drawings and in which:

Figure 1 shows a side view of a first embodiment of the valve cartridge according to the invention;
Figure 2 shows a perspective view of the valve cartridge of Figure 1;
Figure 3 shows an axial section through the valve cartridge of Figure 1 in the closed state of the valve;
Figure 4 shows an exploded illustration of the valve cartridge according to Figures 1 to 3;
Figure 5 shows an exploded illustration of a delay device of the valve cartridge;
Figure 6 shows an axial section through a self-closing sanitary fitting according to the invention which is provided with a valve cartridge according to Figures 1 to 3 in the open state of the valve;
Figure 7 shows an axial section similar to Figure 3 through a second embodiment of the valve cartridge according to the invention in the closed state of the valve;
Figures 8-9 show a perspective view and a sectioned view of a valve diaphragm of the valve cartridge according to the invention in the state prior to installation in the valve cartridge;

Figure 10 shows a sectioned view of a detail of the delay device of the valve cartridge according to the invention with the valve diaphragm installed,
Figure 11 shows a perspective view of a throttle member of the valve cartridge according to the invention;
Figure 12 shows a perspective partial view of an actuating element of the valve cartridge according to the invention and
Figure 13 shows a perspective partial view of the actuating element similarly to Figure 12 with an inserted throttle member.

[0020] For the following description, the following applies: if reference numerals are provided in a Figure for the purposes of illustrative clarity but are not mentioned in the directly associated portion of the description, reference may be made to the explanation thereof in the preceding or following portions of the description. Conversely, in order to prevent excessive illustration for direct understanding, less relevant reference numerals are not indicated in all the Figures. In this regard, reference may be made to the remaining Figures in each case. Position and direction indications, such as top, bottom, upwards, downwards, refer to the typical installation orientation of the valve cartridge as illustrated in the Figures.

[0021] The outer form of an embodiment of the valve cartridge according to the invention can be seen in Figures 1 and 2. The valve cartridge has a stepped cylindrical housing 1 having a longitudinal axis A. At the upper end (in Figure 1), a handle carrier 2 is arranged. At the end wall 1a of the housing 1 opposite the handle carrier 2 are two inlets 3 and 4 and an outlet 5 for supplying and discharging water. The inlets 3 and 4 and the outlet 5 are orientated parallel with the axis A. The outlet could in a variant also alternatively open laterally out of the housing 1. It is further possible to see a limitation member 51 for limiting the mixing ratio of the water which is supplied through the inlets 3 and 4. This will be discussed in greater detail below.

[0022] The outer form of the valve cartridge is with respect to shape and dimensions constructed in such a manner that the valve cartridge is mechanically and in terms of connection compatible with conventional valve cartridges, whether of the self-closing or non-self-closing type. It is thereby possible to use the valve cartridge in sanitary fittings

without structural changes or adaptations thereof as a replacement for existing valve cartridges.

[0023] The detailed structure of the valve cartridge can be seen from the sectioned illustration of Figure 3 and the exploded illustrations of Figures 4 and 5. Inside the housing 1, three functional units are arranged axially one above the other. At the very bottom, that is to say, at the housing end facing the inlets and outlets, there is a mixing device 30. In a state arranged above is a valve device 40 and above that a delay device 50 which partially protrudes from the housing 1 and which carries the handle carrier 2. The delay device 50, the valve device 40 and portions of the mixing device 30 are arranged so as to be able to be rotatably adjusted (in a limited manner) together with respect to the housing 1 about the axis A, wherein the maximum rotational adjustment (maximum rotation angle) is limited by the limitation member 51. The limitation member 51 is itself arranged on the (upper) edge of the housing so as to be able to be adjusted in a rotatable manner in steps about the axis A and has a stop 51a which cooperates with stops which are not described on the housing edge. Accordingly, depending on the position of the limitation member 51, the maximum rotation angle of the delay device 50, the valve device 40 and the portions of the mixing device 30 can be adjusted in steps.

[0024] The valve device 40 is arranged in technical flow terms in a throughflow path between the two inlets 3 and 4 and the outlet 5 and interrupts this throughflow path (valve closed) or releases it (valve open). The throughflow path comprises an inlet-side portion P1 in the flow direction upstream of the valve and an outlet-side portion P2 downstream of the valve. The throughflow path extends through recesses in different components of the mixing device 30 and can be only partially seen in Figure 3. Figure 6 illustrates a complete throughflow path.

[0025] The valve device 40 comprises a valve housing 41, an injection-moulded component 42 made of plastics material, a valve body 43 having a control opening 431, a resilient carrier diaphragm 44 having a control opening 441, an axial pin 45, a magnet armature 46 in the form of a plate made of ferromagnetic material and a helical closure spring 47. The valve body 43 and the carrier diaphragm 44 are connected to each other so as to be secured in terms of movement and form a common unit which can be moved

in an axial (limited) manner. The pin 45 and the magnet armature 46 are connected to each other so as to be secured in terms of movement and form a common unit which can be moved in an axial (limited) manner. The carrier diaphragm 44 carries the valve body 43 and is clamped with the circumferential edge thereof between the injection-moulded component 42 and the valve housing 41. There is formed in the injection-moulded component 42 an annular valve seat 42a on which the valve body 43 rests with the carrier diaphragm 44 (when the valve is closed). The actual valve of the valve device 40, which valve is generally designated 48 for easier reference, is consequently formed by the valve seat 42a and the valve body 43 which is secured in the carrier diaphragm 44. The valve body 43 is supported so as to be able to be axially moved by the resilient carrier diaphragm 44 so that, in order to open the valve 48, it is raised from the valve seat 42a and conversely, in order to close the valve 48, it can be placed on the valve seat 42a again. The closure spring 47 which is arranged between an intermediate wall 41a of the valve housing 41 and the magnet armature 46 presses (in the rest state of the valve cartridge) the valve body 43 onto the valve seat 42a and thus keeps the valve 48 closed.

[0026] The mixing device 30 which is arranged below the valve 48 of the valve device 40 comprises two ceramic discs 31 and 32 which abut each other in a sealing manner and which can be adjusted rotationally relative to each other (about the axis A). Specifically, the ceramic disc 32 (together with the injection-moulded component 42) can be rotated, whilst the ceramic disc 31 is arranged so as to be rotationally secured with respect to the housing 1 of the valve cartridge. The rotatably arranged ceramic disc 32 is sealed with respect to the injection-moulded component 42 by means of O-rings 32a and 32b. The two ceramic discs 31 and 32 and the injection-moulded components 42 have through-openings through which, on the one hand, water from the two inlets 3 and 4 can flow to the valve device 40 and, on the other hand, from the valve device 40 to the outlet 5. In Figure 3, only two through-openings 31a and 32c are illustrated. The remaining through-openings are located in the same manner as the inlets 3 and 4 outside the drawing plane and therefore cannot be seen. Depending on the relative rotation position of the two ceramic discs 31 and 32, the through-openings can be brought into alignment with each other in such a manner that water either from only one inlet or from only the other inlet or from both inlets 3 and 4 can reach the valve. As a result of relative rotation of both ceramic discs 31 and 32, the mixing ratio of the water coming from the two inlets can be adjusted. In the case of cold and hot water, this results in a

temperature adjustment. The relative rotation of the ceramic disc 32 and consequently the temperature adjustment of the discharge water is carried out by rotating the handle carrier 2 about the axis A, wherein the entire delay device 50, the valve device 40 and the injection-moulded component 42 thereof are rotated and also rotate the ceramic disc 32. The limitation member 51 is used for a gradually adjustable limitation of the rotational movement of the handle carrier 2 and ultimately of the ceramic plate 32 and consequently for temperature limitation of the discharged water. Mixing devices with discs which can be rotationally adjusted relative to each other are known, for example, from the document EP 2 998 623 B1 and therefore require no further explanation at this point.

[0027] In the lower end of the housing 1 of the valve cartridge there is inserted a closure portion 6 which is rotationally secure with respect to the housing 1 and which receives the ceramic disc 31 which is arranged in a rotationally secure manner with respect to the housing 1. The inlets 3 and 4 and the outlet 5 are also arranged on this closure portion 6 (see also the exploded illustration of Figure 4).

[0028] The delay device 50 adjoins the valve device 40 directly above it. It comprises a chamber housing 52 which is substantially H-shaped in axial section and which forms two chambers 54 and 55 which are separated by a partition wall 53. The chamber housing 52 is arranged directly on the valve housing 41 of the valve device 40. There is arranged on the chamber housing 52 a tubular guiding portion 56 which protrudes upwards out of the housing 1 of the valve cartridge. The valve housing 41, the chamber housing 52 and the guiding portion 56 are connected to each other so as to be secured in terms of movement.

[0029] The lower chamber 55 in the drawing which is described below as the second chamber is closed at the side thereof opposite the partition wall 53 by means of a chamber wall 58 which is arranged by means of a resilient carrier diaphragm 57 so as to be able to be moved axially (in a limited manner). The carrier diaphragm 57 is clamped with the circumferential edge thereof between the chamber housing 52 and the valve housing 41. In a similar manner, the upper chamber 54 which is described below as the first chamber is closed by means of a chamber wall which comprises two flange portions 71a and 71b and which is also arranged so as to be able to be axially moved (in

a limited manner). The two flange portions 71a and 71b clamp between them a resilient carrier diaphragm 59 which is clamped with the circumferential edge thereof between the chamber housing 52 and a continuation 56a of the guiding portion 56. The two chambers 54 and 55 are completely filled with a hydraulic medium which is indicated in Figure 3 by the finely hatched regions within the two chambers. At the outer side of the chamber wall 58, an annular magnet 64 is secured so as to be rigid in terms of movement.

[0030] At the outer side on the guiding portion 56, the handle carrier 2 is supported so as to be able to be axially displaced in a sliding manner counter to the restoring force of a helical spring 22 and secured by means of a securing ring 21. At the inner side in the guiding portion 56, an elongate, substantially tubular actuating element 70 is supported in an axially displaceable manner. The flange portion 71a is formed directly on the outer side on the actuating element 70, the flange portion 71b is clamped at the outer side on the actuating element 70. In the upper end of the actuating element 70, a removable securing ring 72 is arranged.

[0031] The actuating element 70 is supported so as to be able to be moved by means of a handle 102 (see Figure 6) which is connected to the handle carrier 2 manually counter to the force of a restoring spring 62 from a closed position in an axial direction inwards (in a limited manner) in the direction towards the valve 48 into an open position (forward movement) and away from the valve 48 (backward movement). The restoring spring 62 is supported, on the one hand, on the chamber wall 58 and, on the other hand, on the intermediate wall 41a of the valve housing 41 and forms a restoring drive for the actuating element 70.

[0032] The actuating element 70 extends through the first chamber 54, the partition wall 53 and the second chamber 55 and presses with the lower end thereof on the carrier diaphragm 57 and consequently indirectly on the chamber wall 58. During axial movement of the actuating element 70, the two chamber walls 58 and 71a, 71b also move and vice versa. The restoring spring 62 presses the chamber wall 58 and consequently the actuating element 70 in the direction away from the valve 48.

[0033] So that a movement of the actuating element 70 and, in a state connected thereto, the two chamber walls is possible at all, the two chambers 54 and 55 are connected to each other so as to communicate so that hydraulic medium which is displaced as a result of the movement of the chamber walls can flow from one chamber into the other and back again. The communicating connection is, on the one hand, produced by means of throughflow openings 53a which are provided in the partition wall 53 and, on the other hand, by means of a return flow channel 73 which extends through the inner side of the actuating element 70 and has a restriction. At the side of the partition wall 53 facing the second chamber 55 there is arranged a resilient valve diaphragm 80 which covers the throughflow opening 53a and which together therewith forms a one-way valve arrangement through which during the forward movement of the actuating element 70 hydraulic medium can flow from the first chamber 54 in a practically unimpeded manner and rapidly into the second chamber 55. As a result of the one-way valve arrangement, the return flow of the hydraulic medium from the second chamber 55 into the first chamber 54 can only occur through the return flow channel 73 which has the restriction. As a result of the action of the restriction which impedes the flow, the return flow of the hydraulic medium is comparatively slow so that the return movement of the actuating element 70 and accordingly the closure of the valve 48 is carried out with a time delay which is determined by the restriction or the free throughflow cross section thereof. Details of the restriction are explained more extensively below.

[0034] In order to activate the valve cartridge, that is to say, in order to open the valve 48, the actuating element 70 is moved manually by means of the handle carrier 2 counter to the force of the restoring spring 62 axially inwards in the direction towards the valve 48. In this instance, the chamber wall 58 with the magnet 64 fitted thereon also moves. As soon as the magnet 64 is close enough to the valve 48, it attracts the magnet armature 46 and lifts it and the axial pin 45 counter to the force of the closure spring 47 from the valve body 43. This results in water from the region above the valve body 43 now being able to flow through the control opening 431 in an outward direction (in Figure 3 downwards) into the outlet 5. Since the control opening 431 is larger than the control opening 441 in the carrier diaphragm 44, more water flows from the region above the valve body 43 in an outward direction (downwards) than through the control opening 441 in the region above the valve body 43 in an inward direction (upwards), whereby the excess pressure which is initially present in the region above the valve

body 43 is dissipated and the valve body 43 is finally pressed by the water pressure acting from below in an upward direction away from the valve seat 42a into the open position which is illustrated in Figure 6. In this open position, the axial pin 45 closes the control opening 431 again.

[0035] As soon as the handle carrier 2 is released, on the one hand, the helical spring 22 moves the handle carrier 2 back into the starting position thereof and, on the other hand, the restoring spring 62 moves the chamber wall 58 with the magnet 64 fitted thereto together with the actuating element 70 away from the valve 48 (return movement). In this instance, the magnet 64 moves away from the magnet armature 46. When the distance of the magnet 64 from the magnet armature 46 is sufficiently large, the magnet 64 can no longer retain the magnet armature 46 counter to the force of the closure spring 47 so that the closure spring 47 together with the water pressure from above on the magnet armature 46 and the valve body 43 presses it onto the valve seat 42a and consequently closes the valve 48 again (rest position of the valve cartridge). The return movement of the actuating element 70 is carried out as a result of the flow-impeding action of the restriction which is arranged in the return flow channel 73 comparatively slowly so that the valve 48 closes only with a specific time delay.

[0036] The exploded illustration of Figure 4 shows all the individual components of the valve cartridge, but with the delay device 50 being illustrated only as a whole. In Figure 5, the delay device 50 itself is illustrated as an exploded view. The reference numerals in Figures 4 and 5 correspond to those of Figure 3.

[0037] With the exception of the mixing device 30, the valve cartridge according to the invention substantially corresponds in terms of structure and function to the valve cartridge disclosed in the document EP 1 039 189 B1 so that the person skilled in the art requires no further explanation. The most significant differences of the valve cartridge according to the invention with respect to the valve cartridge known from the document EP 1 039 189 B1 involve the detailed construction of the delay device 50, which will be discussed in greater detail below with reference to Figures 8-13.

[0038] The resilient valve diaphragm 80 which together with the partition wall 53 and the throughflow openings 53a thereof forms a one-way valve arrangement has a

functionally significant meaning. It is constructed in a plate-like manner and comprises an inner annular portion 81 and a peripheral annular flange portion 82. The slightly thicker annular portion 81 has a conical passage opening 81b and terminates as an annular sealing lip 81a. The slightly thinner annular flange portion 82 is in the non-installed state constructed in a slightly conical manner so that the valve diaphragm 80 in the non-installed state is curved in a slightly concave manner ("umbrella-like" shape, Figure 9). On the annular portion 81 (in this instance, for example, three) similarly resilient securing pins 83 are arranged in a state distributed in a uniform manner over the circumference. The securing pins 83 extend substantially perpendicularly to the plane of the annular portion 81 of the valve diaphragm 80. The securing pins 83 in each case have a thickened portion 83a. Prior to the installation of the valve diaphragm 80, the securing pins 83 further each also have an elongate continuation 83b (Figures 8 and 9).

[0039] Figure 10 illustrates the securing of the valve diaphragm 80 to the partition wall 53 of the chamber housing 52. In the partition wall 53, there are provided a number of recesses 53b which corresponds to the number of securing pins 83 and whose spatial distribution corresponds to that of the securing pins 83. In order to install the valve diaphragm 80, the continuations 83b of the securing pins 83 are guided through the recesses 53b in the partition wall 53. The (resiliently compressible) thickened portions 83a on the continuations 83b are then pulled through the recesses 53b until the annular portion 81 of the valve diaphragm 80 abuts flush against the partition wall 53. The thickened portions 83a relax again and prevent the valve diaphragm 80 from being able to become detached from the partition wall 53. After the securing of the valve diaphragm 80, the now superfluous continuations 83b are removed. The peripheral annular flange portion 82 of the valve diaphragm 80 covers the throughflow openings 53a of the partition wall 53 and closes it in a tight manner, wherein, as a result of the originally slightly concave shaping of the valve diaphragm prior to the installation, a slight pre-tensioning which improves the sealing is produced. As a result of the relatively small thickness of the resilient annular flange portion 82, however, this portion can readily be pressed away from the partition wall 53 in order to enable the throughflow of hydraulic medium through the partition wall in a downward direction (in the drawings). The construction of the valve diaphragm 80 according to the invention

with securing pins 83 enables a very simple and cost-effective assembly thereof. The "umbrella-like" construction ensures a high sealing force.

[0040] Figure 10 also shows a passage opening 53c through which the actuating element 70 extends in the assembled state of the valve cartridge (see Figure 3). The valve diaphragm 80 is arranged in such a manner that the passage opening 81b thereof is located with the annular or sleeve-like sealing lip 81a coaxially with respect to the passage opening 53c. The actuating element 70 also extends through the valve diaphragm 80 or the sleeve-like sealing lip 81a thereof. The passage of the actuating element 70 through the partition wall 53 must be tight so that between the outer wall of the actuating element 70 and the inner wall of the passage opening 53c no secondary flow path for the hydraulic medium is produced between the two chambers. In the valve diaphragm 80 according to the invention, the sealing is carried out by the sleeve-like sealing lip 81a of the valve diaphragm 80, in which the actuating element 70 can easily slide, but with a high fluid-tightness being ensured at the same time.

[0041] Another significant aspect of the valve cartridge according to the invention is the construction of the restriction in the return flow channel 73 for the hydraulic medium, which is shown in the detailed views of Figures 11-13.

[0042] The return flow channel 73 extends through the portion of the actuating element 70 which bridges the two chambers 54 and 55 and comprises a lateral inlet opening 73a into the actuating element 70, a hollow-cylindrical section 73b of the actuating element 70 and an outlet opening 73c which opens laterally out of the actuating element 70 in the vicinity of the flange portion 71a (cf. also Figure 3, in which, however, no reference numerals are indicated for the sake of clarity).

[0043] An elongate throttle member 90 is screwed into the actuating element 70, wherein an outer thread 91 of the throttle member 90 engages in an inner thread 74 of the actuating element 70 so that the throttle member 90 in the actuating element 70 can be adjusted relative thereto in an axial direction. The throttle member 90 has at one end a screw head 92 and at the other end a cylindrical throttle head 93 whose outer diameter is only slightly smaller than the inner diameter of the portion 73b of the actuating element 70. The throttle member 90 can be introduced with the throttle head 93 thereof

to a lesser or greater extent in the portion 73b of the actuating element 70. In the throttle head 93, an axially parallel groove 94 whose (radial) depth decreases in the direction away from the free end of the throttle head 93 is milled. As a result of the precise fitting of the throttle head 93 in the portion 73b of the actuating element 70, the return flow of the hydraulic medium can thus be carried out only through the groove 74. The throttle head 93 with the groove 94 thereof forms together with the inner wall of the portion 73b of the actuating element 70 the restriction which has already been mentioned. Depending on the screwing-in depth of the throttle member 90 in the actuating element 70, the throttle head 93 protrudes to a greater or lesser extent into the portion 73b of the actuating element 70, wherein, as a result of the depth of the groove 94 which is different over the length thereof, a different throughflow cross section of the restriction formed in this manner is produced. By adjusting the throttle member 90 relative to the actuating element 70, therefore, the effective throughflow cross section of the restriction and consequently the delay time of the delay device 50 can be adjusted in an extremely precise manner within wide limits. The adjustment of the throttle member 90 and consequently adjustment of the delay time can be carried out in a very simple manner through the actuating element 70 and the securing ring 72 (see Figure 3) without the valve cartridge having to be disassembled for this purpose. The securing ring 72 forms a stop for unscrewing the throttle member 90. The described construction of the restriction leads to lower production costs since the individual components can be produced in a simpler manner and enable greater production tolerances.

[0044] The throttle head 93 may also have two or more grooves 94. Alternatively, it is also possible to construct the throttle head 93 without a groove 94 and to provide for this purpose one or more longitudinal groove(s) with correspondingly decreasing depth progression in the inner wall of the portion 73b of the actuating element 70.

[0045] The adjustment of the delay time via the throttle member 90 is independent of the pressure relationships in the water supply.

[0046] Figure 6 shows a self-closing sanitary fitting in the form of a water tap which is provided with the valve cartridge as described above. There is additionally arranged on the valve cartridge a handle 102 which is connected to the handle carrier 2 so as to be secured in terms of movement and which together therewith forms an operating

member. With the handle 102, the handle carrier 2, the guiding portion 56 and the actuating element 70 can be pressed inwards in an axial direction (in Figure 6 downwards). The valve cartridge is adapted in terms of shape to a base member 100 of the water tap and inserted into this base member 100. The base member 100 has a supply channel 103 for cold water and a supply channel, which cannot be seen in Figure 6, for hot water and a laterally opening discharge channel 105 for mixed water. The two supply channels open in each case in one of the two inlets 3 and 4 of the valve cartridge, the discharge channel 105 is connected to the outlet 5 of the valve cartridge.

[0047] The valve cartridge is illustrated with an open valve 48. The annular magnet 64 has attracted the magnet armature 46 and, in a manner activated by this, the valve body has been raised from the valve seat by means of the water pressure. Cold and/or hot water can flow from the supply channels via the ceramic discs 31 and 32 of the mixing device and the injection-moulded component 42 as mixing water to the valve 48. The mixing water passes from the valve 48 through the injection-moulded component 42 and the ceramic discs 31 and 32 and reaches the outlet 5, and passes from there into the discharge channel 105. All the remaining elements of the sanitary fitting or the valve cartridge which is inserted therein correspond to the valve cartridge illustrated in Figures 1 to 3 and are therefore not explained again separately here.

[0048] In Figure 7, a second embodiment of the valve cartridge according to the invention is illustrated. It differs from the embodiment illustrated in Figures 1 to 3 only in that it has no mixing device and consequently also only a single inlet (which cannot be seen in the drawings). The valve cartridge is externally structurally identical to the first embodiment. The injection-moulded component 242, on which the valve seat 42a is formed, is constructed to be higher in an axial direction so that it bridges the space which has been freed by the missing ceramic discs of the mixing device as far as the closure portion 6 or the end wall 1a of the housing 1. Supplied water passes via the inlet via a passage opening 242b in the injection-moulded component 242 to the valve 48 and from there via another throughflow opening 242c in the injection-moulded component 242 to the outlet 5. All remaining elements of the valve cartridge correspond in terms of structure and function to the valve cartridge illustrated in Figures 1 to 3 and are therefore not explained separately again here.

PATENTKRAV

1. Selvlukkende ventilpatron til et sanitetsarmatur med et indløb (3, 4) og et udløb (5), med en ventil (48) til at blokere eller frigøre en strømningsvej fra indløbet (3, 4) til udløbet (5), med et justeringselement (70), der samvirker med ventilen (48) og er bevægeligt frem og tilbage mellem en lukket stilling og en åben stilling, hvor ventilen (48) kan åbnes ved hjælp af sin fremadgående bevægelse og lukkes ved hjælp af sin returbevægelse og med et returdrev (62) til returbevægelse af justeringselementet (70) fra den åbne stilling til den lukkede stilling, og med en forsinkelsesindretning (50) til returbevægelse af justeringselementet (70), hvor forsinkelsesindretningen (50) har et første og et andet kammer (54, 55) indeholdende hydraulisk medium, hvilke kamre er adskilt af en skillevæg (53) og på den ene side er kommunikativt forbundet via en envejsventilanordning (53a, 80) og på den anden side via en returløbskanal (73) med en begrænsning, således at hydraulisk medium kan drives fra det første kammer (54) ind i det andet kammer (55) gennem envejsventilanordningen (53a, 80), og hydraulisk medium ved returbevægelsen af justeringselementet (70) kun kan drives tilbage fra det andet kammer (55) ind i det første kammer (54) gennem returløbskanalen (73) med begrænsningen, hvor returløbskanalen (73) strækker sig gennem justeringselementet (70) fra en indløbsåbning (73a) via en hul cylindrisk sektion (73b) af justeringselementet (70) til en udløbsåbning (73c), kendetegnet ved, at et drosselorgan (90) med et cylindrisk drosselhoved (93) er anbragt i længderetningen af justeringselementet (70) og justerbart i forhold til dette, hvor drosselhovedet (93) kan indsættes i den hule cylindriske sektion (73b) af justeringselementet (70) ved at justere drosselorganet (90), og ved at enten drosselhovedet (93) eller indervæggen af den hule cylindriske sektion (73b) af justeringselementet (70) har en rille (94), som strækker sig fra den ene ende af drosselhovedet (93) i dettes længderetning og har en dybde, der aftager væk fra enden af drosselhovedet, eller som strækker sig fra udløbsåbningen (73c) på justeringselementet (70) i dettes længderetning og har en dybde, der aftager væk fra udløbsåbningen (73c), hvor drosselhovedet (93) danner begrænsningen sammen med indervæggen af den hule cylindriske sektion (73b) af justeringselementet (70) og med rillen (94), hvorved returløbskanalen (73) kan lukkes i

større eller mindre grad ved at justere drosselorganet (90) i forhold til justeringselementet (70), og hvorved strømningstværsnittet af begrænsningen er justerbart.

2. Ventilpatron ifølge krav 1, kendetegnet ved, at den omfatter en magnet (64), der er kinematisk forbundet med justeringselementet (70) til aktivering af ventilen (48), og ved at ventilen (48) har et ventilsæde (42a), et ventilhus (43) og et magnetanker (46), hvor magnetankeret (46) tiltrækkes af magneten (64), når den nærmer sig, hvorved tiltrækningen af magnetankeret (46) udløser, at ventilhuset (43) løfter sig fra ventilsædet (42a), hvorved åbning af ventilen (48) kan udløses.

3. Ventilpatron ifølge krav 2, kendetegnet ved, at magneten (64) er ringformet, og magnetankeret (46) er ringpladeformet.

4. Ventilpatron ifølge et hvilket som helst af de foregående krav, kendetegnet ved, at den omfatter en justerbar blandeindretning (30) anbragt i strømningsvejen foran ventilen (48) til at blive forsynet med vand, især koldt og varmt, via to separate indløb (3, 4).

5. Ventilpatron ifølge krav 4, kendetegnet ved, at blandeindretningen (30) har to keramiske skiver (31, 32), som kan drejes i forhold til hinanden og glide tæt mod hinanden og har gennemløbsåbninger, der går igennem dem, hvor - afhængigt af den relative drejestilling af de to keramiske skiver (31, 32) - vand kan ledes gennem gennemløbsåbningerne i de to keramiske skiver (31, 32) enten kun fra det ene indløb (3) eller kun fra det andet indløb (4) eller samtidigt fra begge indløb (3, 4) til ventilen (48).

6. Sanitetsarmatur, kendetegnet ved, at det har en selvlukkende ventilpatron ifølge et hvilket som helst af de foregående krav.

Fig. 1

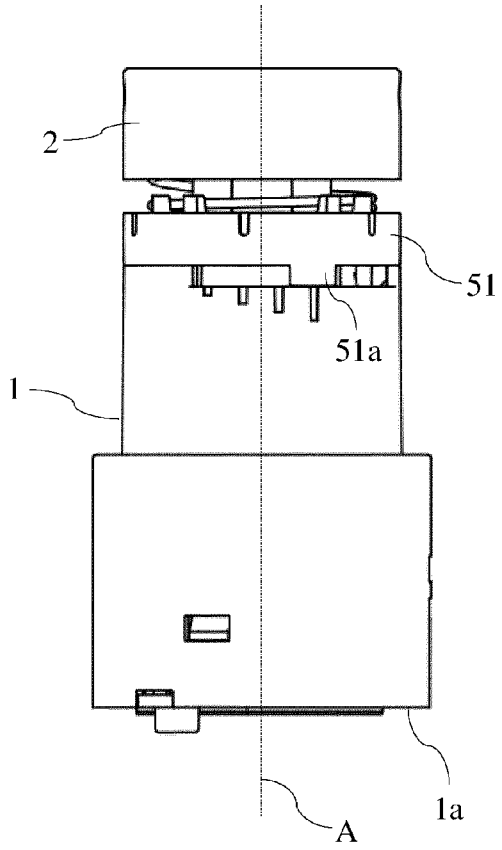
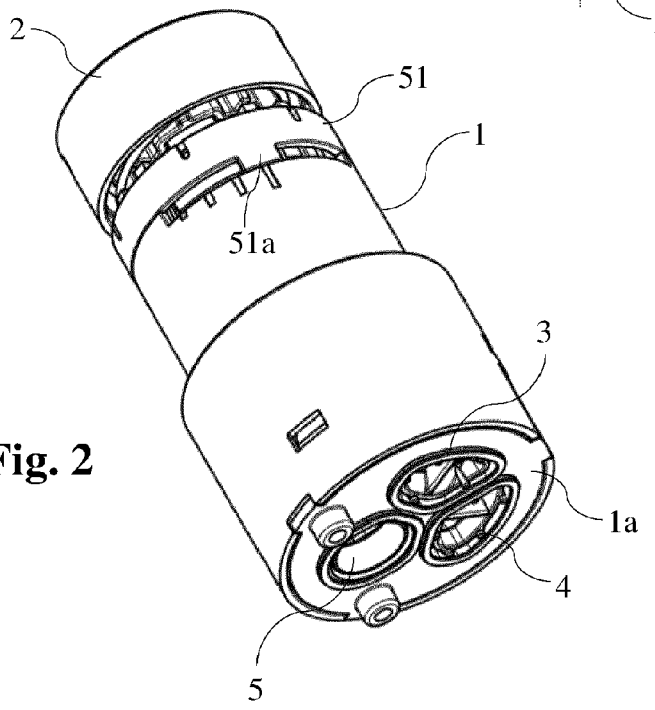
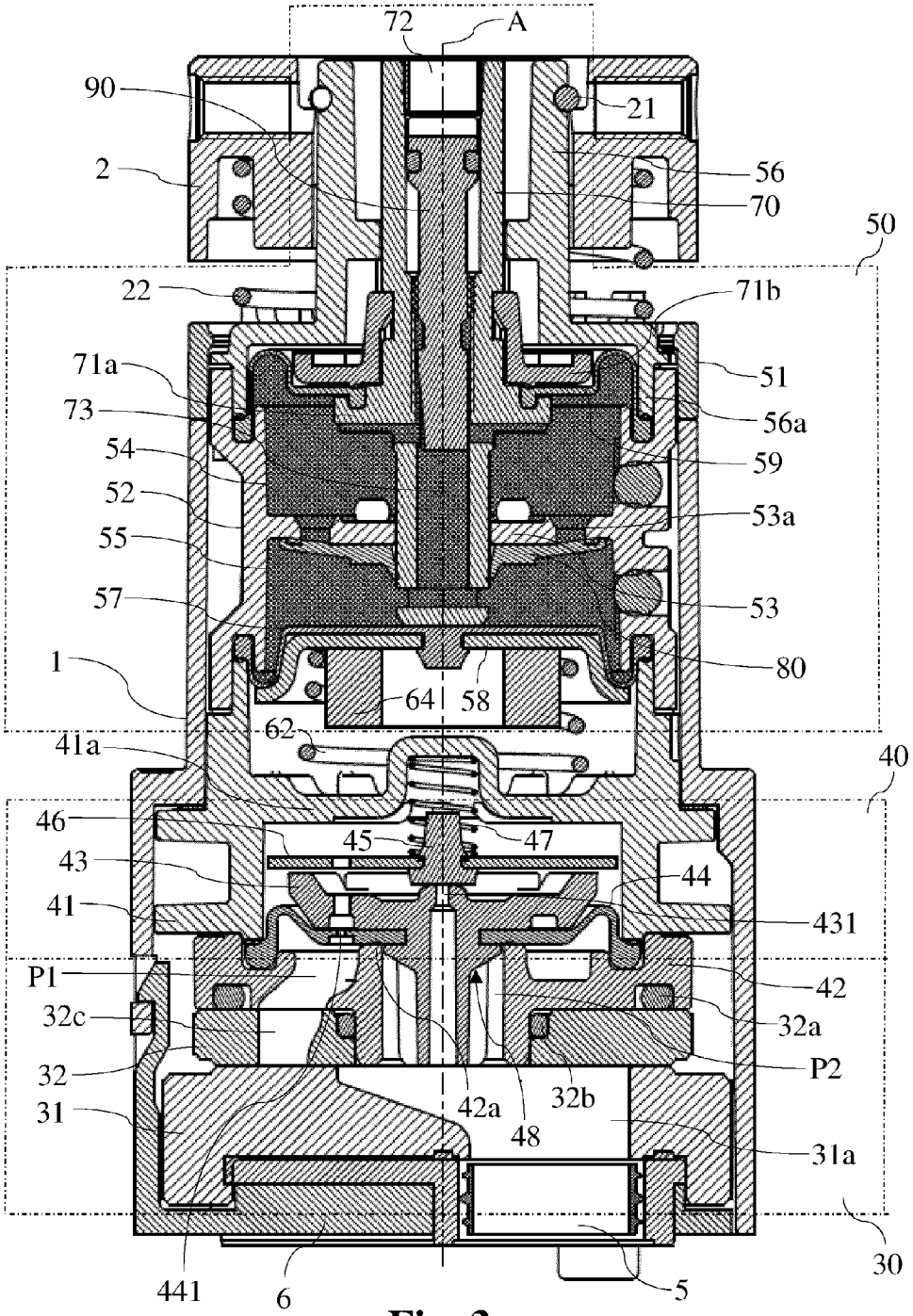


Fig. 2

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A
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2
56
70
50
22
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71a
51
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54
59
52
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55
57
53
1
80
64
58
62
41a
40
46
45
47
43
44
41
431
P1
42
32c
32a
32
P2
42a
32b
31
48
31a
441
6
5
30

Fig. 3

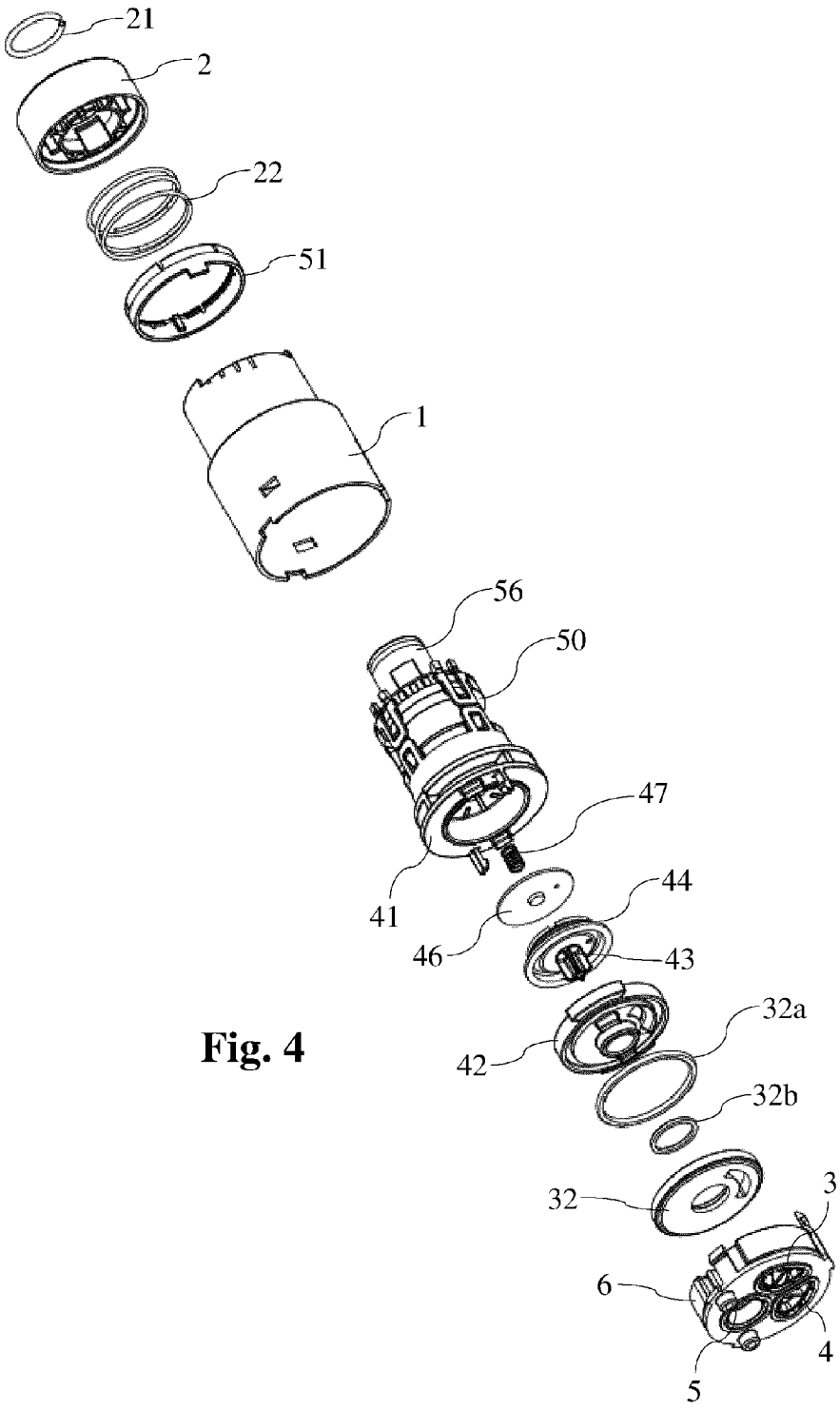

Fig. 4

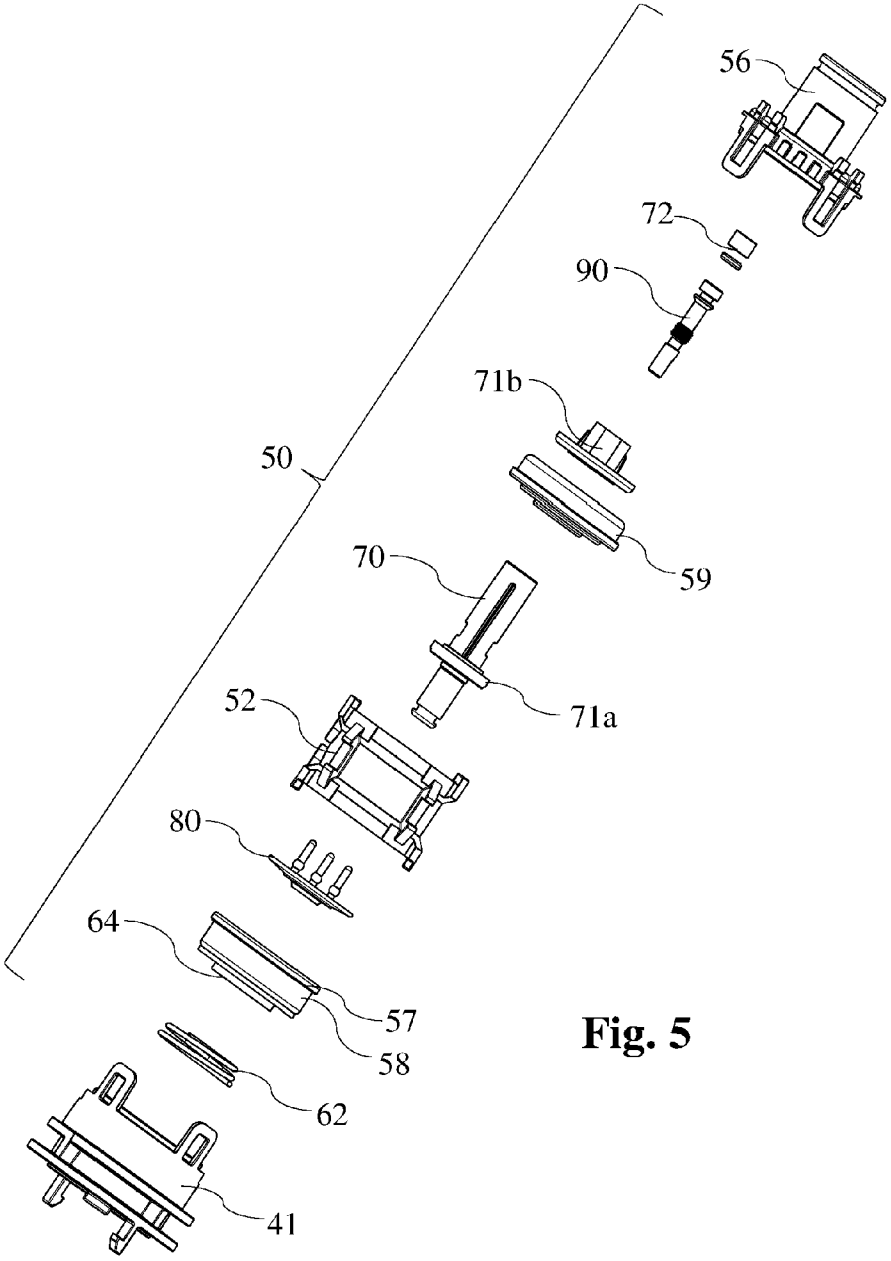

Fig. 5

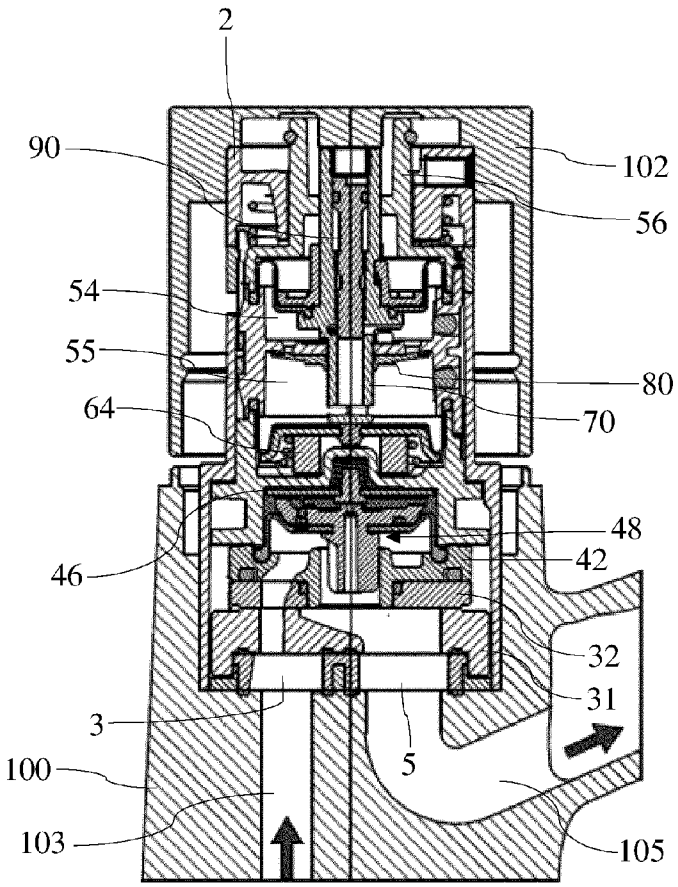

Fig. 6

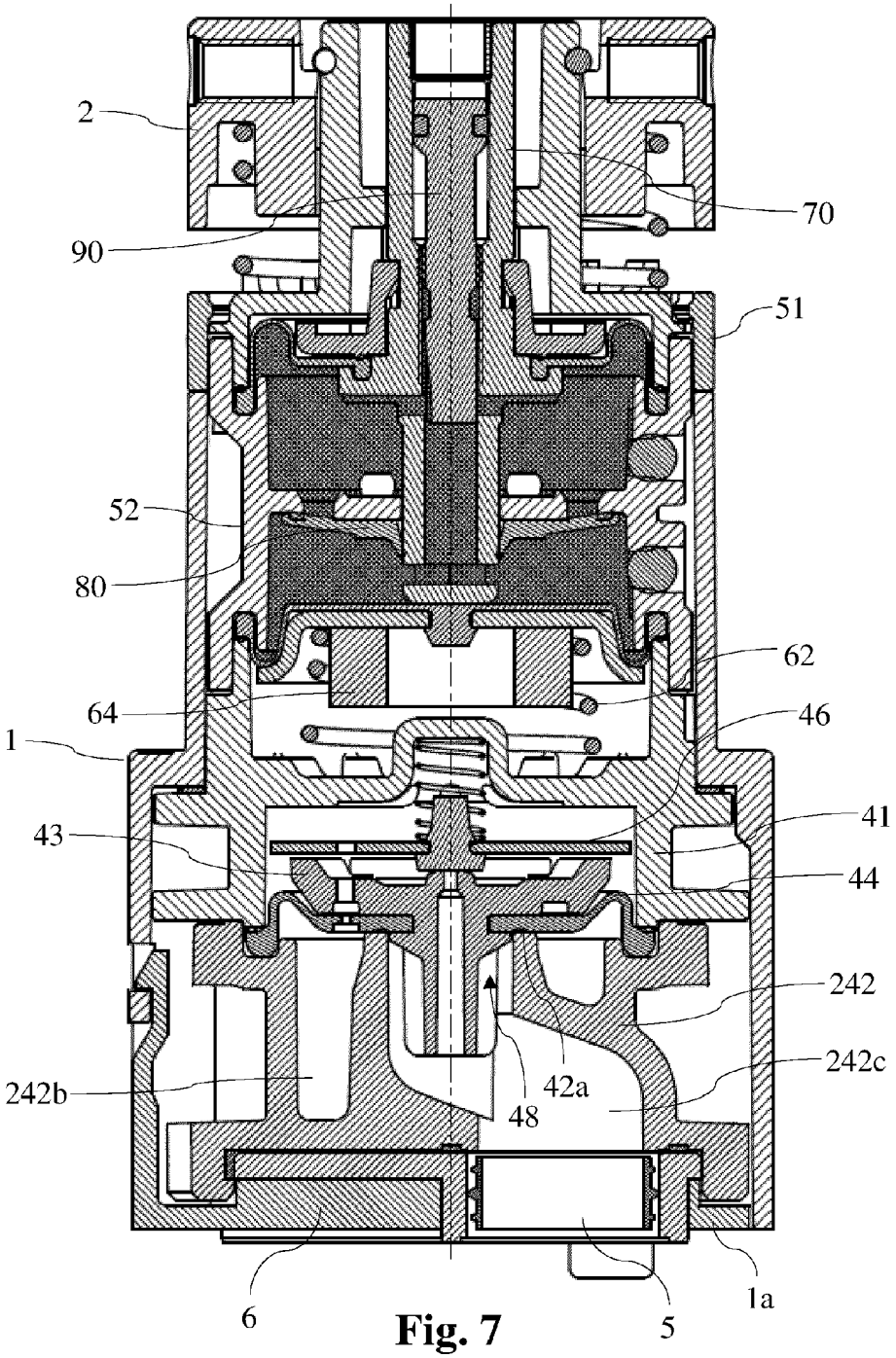

Fig. 7

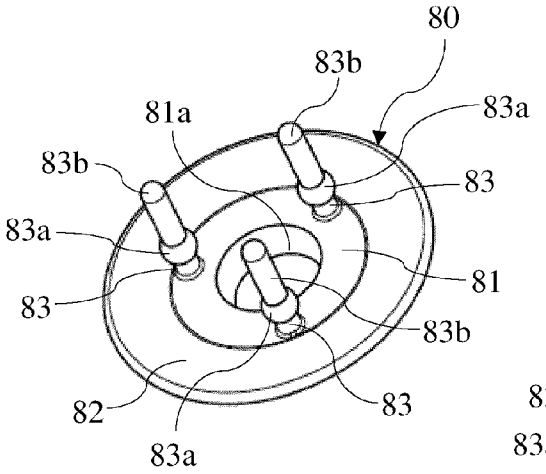

Fig. 8

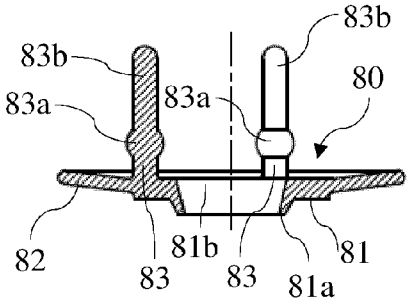

Fig. 9

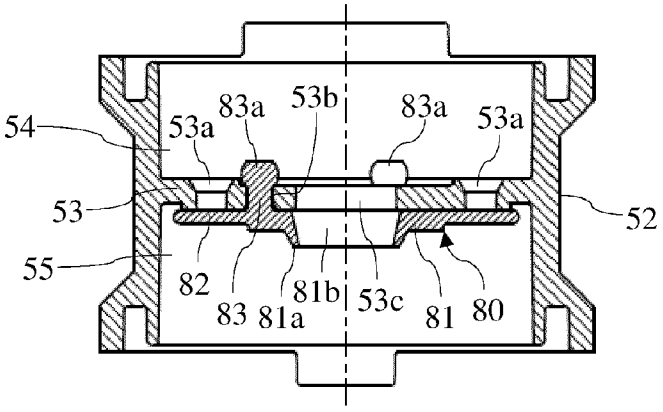

Fig. 10

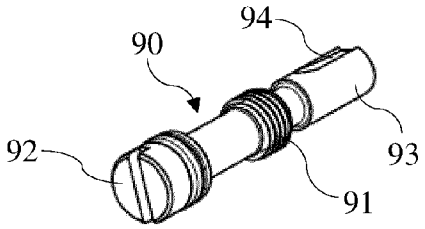

Fig. 11

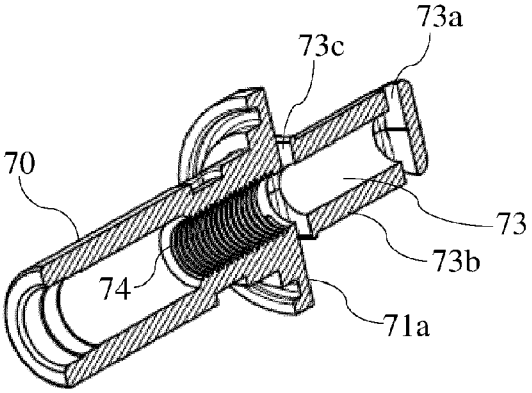

Fig. 12

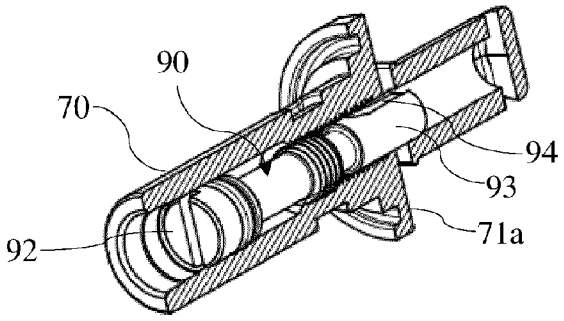

Fig. 13