(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 757 302 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.12.2020 Bulletin 2020/53

(51) Int Cl.:
E03C 1/04 *(2006.01)*

(21) Application number: **20190546.0**

(22) Date of filing: **21.04.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **31.03.2017 DE 102017107042**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
17167542.4 / 3 382 110

(71) Applicant: **Brita GmbH**
65232 Taunusstein (DE)

(72) Inventor: **REIFMÜLLER, Stefan**
65195 Wiesbaden (DE)

(74) Representative: **van Lookeren Campagne, Constantijn August**
Meissner Bolte Patentanwälte
Rechtsanwälte Partnerschaft mbB
Kaiserswerther Str. 183
40474 Düsseldorf (DE)

Remarks:
This application was filed on 11-08-2020 as a divisional application to the application mentioned under INID code 62.

(54) TAP AND SYSTEM FOR SELECTIVELY DELIVERING PROCESSED AND UNPROCESSED LIQUID

(57) A tap includes a body (17), a valve (18) for regulating a flow of liquid and a spout (16). The spout (16) includes an outer tube (24) and at least one internal tube (34), arranged within the outer tube (24) and extending over part of a length of the spout (16). A series of passages is defined in the tap to lead liquid from the valve (18) through a passage (35) in the body (17), through at least the internal tube (34), to a passage leading to an outlet at an end of the spout (16). The internal tube (34) is connected at one end by a tube connector (37) including a flow regulating device (52) to a further internal tube (44) arranged within the outer tube (24).

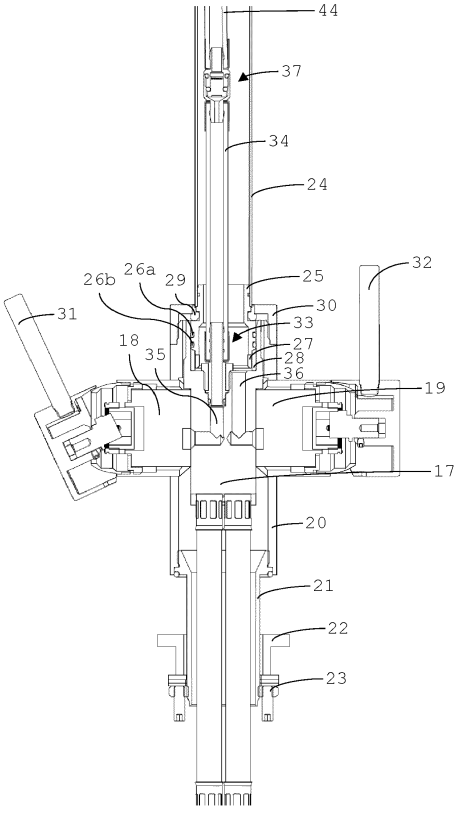

Fig. 5

EP 3 757 302 A2

Description

[0001] The invention relates to a tap.

[0002] The invention also relates to a system for selectively delivering processed and unprocessed liquid including a tap.

[0003] EP 0 577 164 A1 discloses a tap comprising a body which can be fastened below opposite a hole in a surface, e.g. the edge of a sink. The body comprises a seat for reception of a single-control mixing cartridge. In a position opposite that of the cartridge, the body has a seat for a stem valve. The cartridge has an outlet debouching into a chamber connected through a duct to a first zone or chamber of a seat for rotating engagement of an end or engagement element of a delivery tube element. The stem valve has an outlet debouching into a chamber connected through a duct to a second zone or chamber of the engagement seat of the tube element. The end element has peripheral seats for O-rings for hydraulic sealing towards the exterior, and a discoid terminal zone with an hydraulic seal O-ring separating the zones. The tube element comprises a first external tube connected through a passage of the engagement element and through holes to the first zone, identified by a restriction of the engagement element. A second tube, concentric with the first, passes axially through the engagement element to debouch into the second zone. In this manner, the external tube leads to a delivery mouth the water delivered by the mixer, whilst the tube leads to the mouth the water delivered by the stem valve.

[0004] A problem of the known tap, in which the second tube is connected at a lower end to the engagement element that is in turn fixed to the external tube, is that the engagement element and the ducts in the body have a relatively complicated configuration to allow water to be delivered to the second tube and the passage between the second tube and the interior wall of the external tube in each angular position of the tube. Multiple sealing elements are required to separate the two flows of water and one flow is introduced into the engagement element laterally.

[0005] DE 10 2015 000 198 A1 discloses a plumbing fixture with a body and a spout, mounted to the body so as to allow the spout to swivel. A fluid flow is led through the body by means of a first conduit to a connection piece. To this end, the first conduit is fixed with its first end to the connection piece. A second conduit leads from the connection piece to an outlet opening of the spout. To this end, a first end of the second conduit is fixed to the connection piece and a second end of the second conduit is connected to the outlet opening of the spout. The second conduit may be a flexible hose. The connection piece is embodied as a kind of sleeve, with the first end of the second conduit being girded around its circumference and a direct connection to the body being effected via the exterior surface of the connection piece. To this end, the connection piece can be press-fit into a seat aligned with the first end of the first conduit.

[0006] This arrangement allows for excentric placement of the first conduit, so that there is space for a further conduit adjacent the second conduit within the spout, which further conduit can also be directly connected to the body. However, the press-fit connection restricts the movement of the spout. The second conduit in the shape of a flexible hose will be twisted when the spout is swivelled out of a neutral position, which restricts the flow through the second conduit and may cause the spout to spring back to the neutral position.

[0007] It is an object of the invention to provide a tap and system of the type mentioned above in the opening paragraphs that allow the tap spout to swivel relatively unimpeded, but also to provide for separate flows through the spout without a complicated configuration of the end of the spout proximal to the body or of the passages leading to this end.

[0008] This object is achieved according to a first aspect by the tap according to the invention, which is characterised in that the tube connector includes a second component, fixed to the tap part and rotatably connected to the first component.

[0009] The internal tube is arranged within the outer tube, so that liquid led through the internal tube need not come into contact with the interior surface of the outer tube. Thus, the internal tube can be used to lead processed liquid to the outlet of the spout, with the processed liquid being hot (boiling or nearboiling) water or filtered water, for example. The body can include or carry one or more valves for regulating the flow of liquid through the tap, in particular through the series of passages. The tap is suitable for mounting at an edge of a sink or basin, because the spout is mounted to swivel with respect to the body. It can thus be moved out of the way to provide better access to the sink or basin. The spout may be mounted directly to the body, such that it is supported by the body, e.g. by means of a bearing. It may alternatively be supported by a housing surrounding the body and arranged in fixed position with respect to the body. The spout includes an outer tube with a fixed shape, being relatively rigid. The outer tube may be made of metal or a metal alloy, for example. At least one internal tube is arranged within the outer tube and extends over at least part of a length of the spout. In an embodiment, the internal tube extends over a majority of the length of the spout. The internal tube is loosely arranged within the outer tube, such that it contacts an interior surface of the outer tube only at discrete locations. There is generally a space formed between the internal tube and the interior surface of the outer tube. This allows for at least limited movement of the internal tube, allowing the spout to swivel more freely.

[0010] A series of passages is defined in the tap to lead liquid from a passage in the body through at least the internal tube to a passage leading to an outlet at an end of the spout. An interior of the internal tube forms one of the series of passages. The passage in the body may lead directly or via at least one further passage to a valve

for regulating a flow of liquid. The passage in the body may be formed by one or more bores, for example. The passage leading to an outlet may be formed in a nozzle or other device arranged in an outlet end of the spout. The internal tube is connected at at least one end by a tube connector to a tap part defining one of the series of passages. This tap part may be the body, a further internal tube or the device arranged in the outlet of the spout, for example. The tube connector places the passage in the tap part in sealed liquid communication with an interior of the internal tube, meaning that liquid can flow freely between the passage in the tap part and the interior of the internal tube through the tube connector, e.g. through one or more channels in at least one of the first and second components of the tube connector, essentially without leakage into an environment. The tube connector includes a first component reversibly or irreversibly fixed to the internal tube. Movement of the first component relative to the internal tube is prevented by the connection between the two. The tube connector also includes a second component, the second component being reversibly or irreversibly fixed to the tap part. Movement of the second component relative to the tap part is prevented by the connection between the two. The second component is rotatably connected to the first component. Thus, the second component can rotate about an axis, generally an axis aligned with the direction of flow through the tube connector. However, engagement between the first and second component holds them together in axial direction, e.g. through a shape-lock. The tube connector may include further components, one or more of which may interconnect the first and second components. In a relatively simple embodiment, the first and second components engage each other directly, such that at least part of one is rotatably received in the other and relative axial movement in at least one direction is prevented. As a consequence, the liquid pressure cannot lead to a separation of the internal tube from the tap part to which the tube connector connects it. However, a connection allowing relative rotation about an axis aligned with the longitudinal direction is provided at at least one location along the chain of parts from the body to the part defining the outlet of the spout. The internal tube will either rotate with the spout relative to the body or with the body relative to the spout or with neither (if a tube connector of the aforementioned construction is provided at each end of the internal tube). Swivelling of the spout will therefore not lead to substantial twisting of the internal tube about its longitudinal axis. The passage in the body to which the internal tube or a further tube interconnecting the body and the internal tube is connected, may be located excentrically, because there is no need to allow for rotation of the further tube or internal tube with the outer spout tube. Liquid need not be fed laterally into the spout. There can be relatively few sealing elements, even as the risk of leakage is reduced.

[0011] In an embodiment, the internal tube is made of an elastic material.

[0012] This allows the internal tube to stretch in longitudinal direction if the spout is swivelled over a relatively wide angle. The internal tube can thus be shorter in its unstretched state. Otherwise, it would have to be relatively long, forming a coil in a central position of the spout and being pulled tout as the spout is swivelled out of this central position. In the central position, however, a relatively long tube may be pinched or become caught, especially if a parallel arrangement of one or more internal tubes is provided within the outer spout tube. The elastic material may be silicone or natural rubber, nylon, polyurethane, polyethylene, or a combination thereof, for example. The internal tube may be reinforced, e.g. by a metal mesh that allows for lengthening and shortening of the internal tube as it is stretched. The internal tube may have a layered structure.

[0013] In an embodiment, the internal tube is connected at each end by a respective tube connector as defined above to tap parts defining respective ones of the series of passages.

[0014] One of the tap parts may be the body. The other may be a further internal tube or a part defining an outlet of the spout. The swivelling movement of the spout is thus even less constrained, in particular where the internal tube is arranged in a curve. A wider range of shapes of the spout is thus made possible, including shapes with relatively sharp bends.

[0015] In particular for such shapes of spout, the internal tube may be connected at at least one end by a tube connector, e.g. a tube connector as defined above, to a tap part in the form of a further internal tube arranged within the outer tube and extending over at least part of a length of the spout. Thus, if the tube connector is of the type defined above, the internal tube may be arranged with its longitudinal axis at a relatively small angle to or aligned with the axis of rotation of the spout. The further internal tube may follow a relatively sharp bend and then extend at a relatively large angle to the axis of rotation of the spout.

[0016] In a variant of this embodiment, a flow regulating device for restricting a flow of liquid between the internal tube and the further internal tube is included in the tube connector interconnecting the internal tube and the further internal tube.

[0017] The tube connector need not be as defined above to achieve the effect provided by this embodiment, namely to reduce dripping after dispensing liquid, in particular carbonated or other liquid with an increased concentration of dissolved gas. The flow regulating device includes at least one flow restrictor, which breaks up the flow of liquid when liquid in the downstream internal tube flows from the spout due to a decrease in solubility of the gas when the temperature of the liquid rises to ambient temperature.

[0018] Thus, according to an independent aspect, there is provided a tap, e.g. including any of the features of the tap disclosed herein, including: a body; a valve for regulating a flow of liquid; and a spout, wherein the spout

includes an outer tube and at least one internal tube, arranged within the outer tube and extending over part of a length of the spout, wherein a series of passages is defined in the tap to lead liquid from the valve through a passage in the body, through at least the internal tube, to a passage leading to an outlet at an end of the spout, wherein the internal tube is connected at one end by a tube connector including a flow regulating device to a further internal tube arranged within the outer tube.

[0019] The interiors of the internal tube and further internal tube define respective ones of the series of passages.

[0020] In a variant of any of the embodiments in which a flow regulating device for restricting a flow of liquid between the internal tube and the further internal tube is included in the tube connector interconnecting the internal tube and the further internal tube, the flow regulating device is provided at a level below a level of the outlet of the spout.

[0021] This is a relatively effective positon for reducing the amount of delayed dripping after the valve regulating the flow of liquid with dissolved gas has been closed.

[0022] In an embodiment of the tap, the spout is rotatably supported by the body.

[0023] This is simpler than providing further parts fixed in position to the body and supporting the spout, especially in terms of the measures needed to prevent leakage.

[0024] In a variant of this embodiment, at least one of an end of the outer tube and a spout connector, fixed to the end of the outer tube and having a passage defined therethrough in liquid communication with an interior of the outer tube, is received in a socket defined in the body.

[0025] The spout is thus held in an upright position in a relatively simple way. Moreover, one or more annular sealing elements between the socket wall and the exterior of the end of the outer tube or the exterior of the spout connector suffice to prevent leakage where liquid is also led through the passage defined between the internal tube and the interior surface of the outer tube.

[0026] In an embodiment of the tap, a parallel further series of passages is defined in the tap to lead liquid from a different passage in the body through one of at least one further internal tube and a passage formed between the internal tube and an interior surface of the outer tube to an outlet, e.g. a different outlet at the end of the spout.

[0027] The internal tube separates the liquid flowing through the passage formed between it and the interior surface of the outer tube from the liquid flowing through the internal tube itself. The tap can thus be used to dispense two types of liquid, without one type being contaminated by the other. In particular, the series of passages including the interior of the internal tube can be used to dispense processed liquid, e.g. filtered liquid. The further series of passages may lead at a downstream end to a valve for regulating a flow of liquid.

[0028] In a variant of this embodiment, in which also at least one of an end of the outer tube and a spout connector, fixed to the end of the outer tube and having a passage defined therethrough in liquid communication with an interior of the outer tube, is received in a socket defined in the body, the different passage terminates in an opening in an interior surface of the socket.

[0029] The interior surface may in particular be an axially facing surface of the socket (with respect to the axis of rotation of the spout). Both types of liquid are thus introduced axially into the spout. Complicated flow paths are avoided. It suffices to provide an annular seal between the side wall of the socket and the inserted spout connector or outer tube end to prevent leakage of the liquid led through the further series of passages. A tube connector may connect the internal tube or a further internal tube interconnecting the internal tube and the body to the body such as to isolate the two flows of liquid from one another. The different passage may be a bore in the body in one embodiment.

[0030] In an embodiment, at least a section of at least one of the first and second components is inserted into the passage defined by the tap part.

[0031] This simplifies the prevention of leakage.

[0032] In a variant of this embodiment, a section of the first component is inserted into the passage defined by the tap part and at least one annular sealing element is provided between the inserted section and the tap part.

[0033] Thus, the first component may be rotatably inserted into the passage without the risk of leakage. A channel through the first component may lead the liquid directly from the passage to the interior of the internal tube. Sealing between the second component and the tap part or between the first and second component is not required.

[0034] In a variant of this embodiment, the first component is inserted into the passage defined by the tap part through the second component.

[0035] Thus, the second component may form a bearing for the first component, supporting it for rotation. In a particular embodiment, at least a section of the second component may also be inserted into the passage in the tap part, such that an exterior surface of the inserted section directly contacts an interior surface of the passage. A threaded connection may be provided, for example. Alternatively a welded or adhesive joint may be provided or the second component may be press-fit into the passage in the tap part. The extent of contact in at least the longitudinal direction (corresponding to the direction of the flow of liquid) is relatively large, so that the tube connector is securely held.

[0036] In a particular embodiment of the variant in which the first component is inserted into the passage defined by the tap part through the second component, a longitudinal end of the second component abuts at least one laterally protruding part of the first component, e.g. a flange, to limit movement of the first component out of the passage.

[0037] This variant is of relatively simple construction and easy to assemble.

[0038] An embodiment of the tap includes at least one valve for regulating a flow of liquid to the passage in the body.

[0039] Thus, there need be no valve in or on the spout.

[0040] A variant of this embodiment is connectable to at least two conduits for delivering liquid to the tap, wherein the valve is comprised in a mixer valve, e.g. comprised in a mixer cartridge, arranged to mix liquid delivered by at least two of the conduits.

[0041] Thus, a property, as well as a rate of flow, of the liquid dispensed by the tap can be set. This property can be the temperature or the concentration of dissolved gas, for example.

[0042] A variant of this embodiment is connectable to at least a third conduit for delivering liquid to the tap, wherein a parallel further series of passages is defined in the tap to lead liquid from a different passage in the body to an outlet, e.g. a different outlet, at the end of the spout, and wherein the tap includes at least one further valve for regulating a flow of liquid from at least the third conduit to the different passage in the body.

[0043] Thus, at least two types of liquid, e.g. processed and unprocessed liquid, can be dispensed from the tap. Where the outlet is a different outlet, crosscontamination is completely prevented. The parallel further series of passages may include a passage defined between the internal tube and an interior surface of the outer spout tube, for example.

[0044] In a particular embodiment of this variant, the tap is connectable to at least a fourth conduit for delivering liquid to the tap, and the further valve is comprised in a mixer valve, e.g. comprised in a mixer cartridge, arranged to mix liquid delivered by the third and fourth conduits.

[0045] Thus, it is possible to provide at least two types of liquid, e.g. processed and unprocessed liquid, each with a property varying according to the settings of the mixer valves. For example, carbonated water with a controllable level of CO_2 can be dispensed in addition to mains water with a controllable temperature. As another example, filtered and unfiltered water can each be dispensed at a temperature desired by the user, but without the filtered water being contaminated by unfiltered water.

[0046] According to another aspect, the system for selectively delivering processed and unprocessed liquid according to the invention includes a tap according to any one of the preceding claims.

[0047] The system may in particular include at least one processing unit for processing liquid and at least one conduit connecting the processing unit to the tap to deliver processed liquid to the passage in the body.

[0048] Processing may include filtering, cooling, dissolution of gas, a concentrate or at least one salt or a combination thereof. The processed liquid is kept out of contact with the interior surface of the outer spout tube. The at least one processing unit may be connectable to a mains water supply, in particular the plumbing system of a building, for example.

[0049] The invention will be explained in further detail with reference to the accompanying drawings, in which:

Fig. 1 shows an example of a system for selectively delivering processed and unprocessed liquid at a point of use;
Fig. 2 is a front plan view of a tap for such a system;
Fig. 3 is a perspective view of the tap of Fig. 2;
Fig. 4 is a perspective view of the tap without its housing and without an outer nozzle tube;
Fig. 5 is a cross-sectional view of part of the tap;
Fig. 6 shows a section of the view of Fig. 5 in detail;
Fig. 7 shows a further section of the view of Fig. 5 in detail;
Fig. 8 is a perspective cross-sectional view of part of the tap;
Fig. 9 is a perspective view of a first tube connector comprised in the tap;
Fig. 10 is a cross-sectional view of the tube connector of Fig. 9;
Fig. 11 is a perspective view of a first component of the tube connector of Figs. 9 and 10;
Fig. 12 is a perspective view of a second component of the tube connector of Figs. 9-11; and
Fig. 13 is a perspective view of a sleeve comprised in the tube connector of Figs. 9-12.

[0050] A system (Fig. 1) for selectively delivering treated and untreated liquid at a point of use is configured to deliver processed and unprocessed drinking water at a point of use in a building, e.g. in a kitchen or bathroom. It can be used for other liquids in principle.

[0051] In the illustrated embodiment, a user can draw either: warm or cold mains water or a mix thereof at a ratio set by the user; or a first type of processed mains water or a second type of processed mains water or a mix of the two types of processed water at a ratio set by the user.

[0052] The first type of processed water can be any type of processed water, including filtered cold water, hot water heated to a temperature of more than 80 °C, e.g. more than 90 °C, more particularly more than 95 °C, wherein the hot water may be filtered water, carbonated water, filtered carbonated water, flavoured water, flavoured carbonated water, mineralised water, mineralised pre-filtered water or water resulting from a combination of any of these types of processing. The same is true for the second type of processed water, except that at least the degree to which it has been processed, but generally the type of processing, is different from that which the first type of processed water has undergone.

[0053] In the illustrated embodiment, one type of processed water is filtered cooled water and the other type of processed water is filtered cooled and carbonated water. Thus, it is possible for a user to draw cooled filtered water with a desired level of CO_2, from still to very sparkling.

[0054] Filtering may comprise mechanical filtering,

physico-chemical filtering or the like. This includes demineralisation, softening and dealkalysation. In particular, the water may be subjected to treatment by ion exchange or sorption. Suitable filter media include ion exchange resin, e.g. weakly acidic cation exchange resin at least partially in the hydrogen form, optionally at least partially in the potassium form, and activated carbon. The water may alternatively or additionally be subjected to reverse osmosis, nanofiltration or ultrafiltration, for example.

[0055] In the illustrated embodiment, cold unprocessed mains water is delivered through a first isolation valve 1 a T-piece 2 and a pressure reducer 3 to a filter head 4 to which a replaceable filter cartridge 5 is attached. The filter cartridge 5 is arranged to filter the water in one or more of the above-mentioned ways. The filtered water is then delivered to a water processing unit 6.

[0056] CO_2 is delivered to the water processing unit 6 from a gas cartridge 7 via a gas cartridge connector 8 and a gas pressure reducer 9.

[0057] A tap 10' is connected to a first reinforced hose 11 or similar conduit for delivering unprocessed cold mains water. This first reinforced hose 11 is connected to the T-piece 2. The tap is also connected to a second reinforced hose 12 or similar conduit for delivering unprocessed warm mains water. This second reinforced hose 12 is connected to a second isolation valve 13.

[0058] The water processing unit 6 is connected to the tap 10' via a third reinforced hose 14 or similar conduit and a fourth reinforced hose 15 or similar conduit, arranged to deliver the two types of processed water.

[0059] Figs. 2-13 show a tap 10 of the same construction as the tap 10' of Fig. 1, but with a spout 16 of a different shape.

[0060] The tap 10 includes a body 17 to which the reinforced hoses 11,12,14,15 can be connected. It is further arranged to receive first and second ceramic disk mixer cartridges 18,19. A suitable mixer cartridge is the model K-35 A sold by Kerox Ltd.

[0061] The tap 10 further includes a housing 20, which surrounds the body 17. A threaded shank 21 for insertion through a hole in a sink or worktop (not shown) is fixed to the housing 20. A sink shim 22 and nut 23, the latter provided with a threaded connection to the shank 21, are arranged for mounting under the sink or worktop to hold the tap 10 in place. A bolt with horseshoe brackets may be used for this purpose in an alternative embodiment.

[0062] The spout 16 includes a rigid outer spout tube 24, e.g. made of metal or a metal alloy. It may be made of stainless steel, e.g. brushed or plated. A spout connector 25 is fixed to an end of the outer spout tube 24 proximal to the body 17. In this example, it is partially inserted into the outer spout tube 24 and bonded to it, e.g. joined by soldering, brazing or welding. An opposite end is sealingly received in a bore in the body 17. Sealing elements 26a,b provide the sealing whilst allowing the spout connector 25 to rotate in the bore in the body 17. A spout adapter 27 and first anti-friction ring 28 support the spout connector 25 in the body 17 and form a bearing enabling the spout 16 to swivel with respect to the body 17. Other types of bearing may be provided in an alternative embodiment. A second anti-friction ring 29 engages the spout connector 25 at an axial position removed from the end of the spout connector 25 inserted into the body 17. This second anti-friction ring is shaped to engage a cap 30, which in turn is connected, in this example by means of a threaded connection, to the housing 20. In this way, the spout 16 is held to the housing 20, and via the housing 20 to the body 17 in axial direction, but free to swivel about an, in use, upright axis.

[0063] Bores (not shown in detail) in the body 17 deliver the water from the water processing unit 6 to a first mixer cartridge 18 and the unprocessed water to a second mixer cartridge 19. The mixer cartridges 18,19 are operable by respective levers 31,32 to set the mixing ratio and overall flow rate. Other types of handle may be used instead of the levers 31,32 in an alternative embodiment.

[0064] The body 17 has at least one passage formed therein that leads water from the first mixer cartridge 18 to a first tube connector 33, connected to an internal tube 34. In the illustrated embodiment, a first bore 35 forms the most downstream one of the passages in the body 17. The first bore 35 is positioned excentrically with respect to the axis about which the spout 16 is arranged to swivel. The first tube connector 33 is connected to the body 17 at the downstream end of the passages, in this case a delivery end of the first bore 35, to provide a sealed connection to the internal tube 34. In the illustrated embodiment, the internal tube 34 extends along part of the length of the spout 16. It is arranged within the outer spout tube 24, separated from it such that a surrounding passage is formed between the internal tube 34 and the interior surface of the outer spout tube 24.

[0065] The water from the second mixer cartridge 19 is conducted by at least one passage, in this example including a second bore 36, in the body 17, which opens out into an interior of the spout connector 25. From there, the water is able to flow into the passage formed between the internal tube 34 and the interior surface of the outer spout tube 24.

[0066] The internal tube 34 is a flexible tube made of elastic material, e.g. silicone rubber. Other polymer materials or composites thereof may be used instead.

[0067] The first tube connector 33 and a second tube connector 37 allow it to rotate freely about a longitudinal axis with respect to the outer spout tube 24, so that it is not twisted when the spout 16 swivels.

[0068] The first tube connector 33 (Figs. 9-13) includes a first component 38 in which a channel is formed. Hose barbs 39a-c formed on the first component co-operate with a sleeve 40 to engage an end of the internal tube 34 such that the latter is sealingly fixed to the first component and liquid is able to flow between the internal tube 34 and the channel through the first component 38. An opposite end of the first component is arranged for insertion into the first bore 35 and provided with an annular sealing element 41 to place the channel through the first

component 38 in sealed communication with the first bore 35. The first component 38 is rotatable within the first bore 35. The first component 38 is shaped for axial engagement of a second component 42 forming a coupler for fixing the first tube connector 33 to the body 17. In the illustrated embodiment, the first component 38 is provided with a flange 43 that engages an end of the second component to limit longitudinal movement of the first component 38 with respect to the second component 42. The second component 42 is provided with an, in this case exterior, screw thread for providing a threaded connection between the second component 42 and the body 17 of the tap 10. This connection is thus reversible. It may be irreversible in alternative embodiments.

[0069] The first component 38 is rotatable within the second component 42, but its movement in longitudinal direction is limited by the second component 42. The internal tube 34 can thus rotate, but it can also absorb water pressure without being pressed away from the body 17.

[0070] The second tube connector 37 (Fig. 7) connects the internal tube 34 to a further internal tube 44. The further internal tube 44 in this example is also a flexible tube made of elastic material such as silicone rubber or other polymer material. In other embodiments, the further internal tube 44 may be more rigid than the first internal tube 34. The further internal tube 44 is also arranged within the outer spout tube 24 with a space in between the further internal tube 44 and the interior surface of the outer spout tube 24.

[0071] The second tube connector 37 includes a first component 45 to which an end of the internal tube 34 is fixed, such that a channel through the first component 45 is in liquid communication with the interior of the internal tube 34. In the illustrated embodiment, the first component 45 has a hose barb 46 formed thereon, which co-operates with a sleeve 47 to hold an end section of the internal tube 34. Other types of coupling are conceivable. The channel leads into a socket formed at an opposite end of the first component 45 to which the internal tube 34 is connected.

[0072] The second tube connector 37 includes a second component 48 that is fixed to an end of the further internal tube 44, such that a channel through the second component 48 is in liquid communication with the interior of the further internal tube 34. Like the first component 45, the second component 48 has a hose barb 49 formed thereon, which co-operates with a sleeve 50 to hold an end section of the further internal tube 44. A longitudinal end section of the second component 48 is inserted into the socket formed in the first component 45. A shape-lock prevents longitudinal separation of the first and second components 45,48 whilst allowing relative rotation. A first sealing element 51 is mounted to the inserted end of the second component 48 to prevent leakage.

[0073] In the illustrated embodiment, the channel through the first component 45 and the channel through the second component 48 are in liquid communication via a flow regulating device 52 held between them in the socket. A second sealing element 53 prevents leakage of liquid past the flow regulating device 52. The flow regulating device 52 limits the water flow to the required flow of the processed water. Furthermore, the water jet of the processed liquid is optimised to reduce splashing and pumping. The flow resistance of the flow regulating device 52 in combination with the elastic internal tube 34 assure a continuous flow of the processed water, because the elastic internal tube 34 can expand and contract.

[0074] The second tube connector 37, including the flow regulating device 52, is provided at a level, in use, that is below the level of the outlet of the spout 16. This helps avoid delayed dripping due to heating of carbonated liquid remaining in the internal tubes 34,44 after dispensing. Upon closure of the valve in the first mixer cartridge 18, delayed dripping is initially primarily avoided due to the surface tension of the water film in the outlet aperture at the dispensing end of the spout 16. When the temperature of this liquid increases, carbon dioxide gases out due to the decreased solubility. This causes some of the water in the further internal tube 44 to start dripping. The flow regulating device 52, which forms a restrictor, prevents the liquid in the internal tube 34 from being drawn up by the liquid flowing out of the further internal tube 44 thus reducing dripping. The effect is slightly increased when the flow regulating device 52 is at a level below the level of the outlet of the spout 16.

[0075] The opposite end of the further internal tube 44 to the end connected to the second tube connector 37 is connected to a flow through aerator insert 54 (Fig. 4) attached to the outer spout tube 24 at an outlet of the spout 16. The aerator insert 54 provides an aerated outer flow path for the water that flows through the passage defined between the internal tubes 34,44 and the interior surface of the outer spout tube 24. An inner flow path through a central channel is isolated from the outer flow path and not aerated. The further internal tube 44 is connected to the aerator insert 54 with an interior of the further internal tube 44 in liquid communication with the central channel defined in the aerator insert 54. Thus, the processed water never passes through passages contaminated by unprocessed water. The internal tubes 34,44 isolate the processed water from the unprocessed water within the spout 16.

[0076] The invention is not limited to the embodiments described above. For example, one of the first and second tube connectors 33,37 may be replaced by a connector providing a fixed connection that does not allow for rotation of the end of the internal tube 34. Overall, the internal tube 34 would then still not rotate with the outer spout tube 24, so that twisting of the internal tube 34 is prevented.

[0077] The angle about which the spout 16 is free to revolve may be 360° or less, e.g. 180°. As an example, the spout 16 may be arranged to swivel over 90° in either direction from the position shown in the drawings, in

which it lies in a plane at right angles to a direction of alignment of the mixer cartridges 18,19.

List of reference numerals

[0078]

1 - 1st isolation valve

2 - T-piece

3 - pressure reducer

4 - filter head

5 - filter cartridge

6 - water processing unit

7 - gas cartridge

8 - gas cartridge connector

9 - gas pressure reducer

10,10' - tap

11 - 1st reinforced hose

12 - 2nd reinforced hose

13 - 2nd isolation valve

14 - 3rd reinforced hose

15 - 4th reinforced hose

16 - spout

17 - body

18 - 1st mixer cartridge

19 - 2nd mixer cartridge

20 - housing

21 - shank

22 - sink shim

23 - nut

24 - outer spout tube

25 - spout connector

26a,b - spout connector sealing elements

27 - spout adapter

28 - 1st anti-friction ring

29 - 2nd anti-friction ring

30 - cap

31 - 1st lever

32 - 2nd lever

33 - 1st tube connector

34 - internal tube

35 - 1st bore

36 - 2nd bore

37 - 2nd tube connector

38 - 1st component

39a-c - hose barbs

40 - sleeve

41 - sealing element on 1st component

42 - 2nd component

43 - flange

44 - further internal tube

45 - 1st component of second tube connector

46 - hose barb

47 - sleeve

48 - 2nd component of second tube connector

49 - hose barb

50 - sleeve

51 - 1st sealing element of second tube connector

52 - flow regulating device

53 - 2nd sealing element of second tube connector

54 - aerator insert

Claims

1. Tap, including:

   a body (17);
   a valve (18) for regulating a flow of liquid; and
   a spout (16),
   wherein the spout (16) includes an outer tube (24) and at least one internal tube (34), arranged within the outer tube (24) and extending over part of a length of the spout (16),
   wherein a series of passages is defined in the tap to lead liquid from the valve (18) through a passage (35) in the body (17), through at least the internal tube (34), to a passage leading to an outlet at an end of the spout (16),
   wherein the internal tube (34) is connected at one end by a tube connector (37) including a flow regulating device (52) to a further internal tube (44) arranged within the outer tube (24).

2. Tap according to claim 1,
   wherein the flow regulating device (52) is a flow regulating device (52) for restricting a flow of liquid between the internal tube (34) and the further internal tube (44).

3. Tap according to claim 2,
   wherein the flow regulating device (52) is provided at a level below a level of the outlet of the spout (16).

4. Tap, e.g. according to any one of the preceding claims, including:

   a body (17); and
   a spout (16), mounted to swivel with respect to the body (17),
   wherein the spout (16) includes an outer tube (24) and at least one internal tube (34), arranged within the outer tube (24) and extending over at least part of a length of the spout (16),
   wherein a series of passages is defined in the tap to lead liquid from a passage (35) in the body (17) through at least the internal tube (34) to a passage leading to an outlet at an end of the spout (16),
   wherein the internal tube (34) is connected at at least one end by a tube connector (33,37) to a tap part (17,44) defining one of the series of passages, the tube connector (33,37) placing that passage in sealed liquid communication with an interior of the internal tube (34), and
   wherein the tube connector (33,37) includes a first component (38,45) fixed to the internal tube (34),
   characterised in that
   the tube connector (33,37) includes a second component (42,48),
   fixed to the tap part (17,44) and rotatably connected to the first component (38,45).

5. Tap according to claim 4,
   wherein the internal tube (34) is connected at each end by a respective tube connector (33,37) as defined in claim 4 to tap parts (17,44) defining respective ones of the series of passages.

6. Tap according to any one of claims 1-3 in combination with claim 4 or 5,
   wherein the internal tube (34) is connected at at least one end by a tube connector (37) as defined in claim 4 to a tap part (44) in the form of a further internal tube (44) arranged within the outer tube (24) and extending over at least part of the length of the spout (16).

7. Tap according to any one of claims 4-6,
   wherein the spout (16) is rotatably supported by the body (17).

8. Tap according to claim 7,
   wherein at least one of an end of the outer tube (24) and a spout connector (25), fixed to the end of the outer tube (24) and having a passage defined therethrough in liquid communication with an interior of the outer tube (24), is received in a socket defined in the body (17).

9. Tap according to any one of claims 4-8,
   wherein a parallel further series of passages is defined in the tap to lead liquid from a different passage (36) in the body (17) through one of at least one further internal tube and a passage formed between the internal tube (34) and an interior surface of the outer tube (24) to an outlet, e.g. a different outlet, at the end of the spout (16).

10. Tap according to claims 8 and 9,
    wherein the different passage (36) terminates in an opening in an interior surface of the socket.

11. Tap according to any one of claims 4-10,
    wherein at least a section of at least one of the first and second components (38,42) is inserted into the passage defined by the tap part (17,44).

12. Tap according to claim 11,
    wherein a section of the first component (38) is inserted into the passage (35) defined by the tap part (17) and at least one annular sealing element is provided between the inserted section and the tap part (17).

13. Tap according to claim 12,
    wherein the first component (38) is inserted into the passage (35) defined by the tap part (17) through

the second component (42), wherein, optionally, a longitudinal end of the second component (42) abuts at least one laterally protruding part of the first component (38), e.g. a flange (43), to limit movement of the first component (38) out of the passage (35).

14. Tap according to any one of the preceding claims, wherein the internal tube (34) is made of an elastic material.

15. System for selectively delivering processed and unprocessed liquid, including a tap (10;10') according to any one of the preceding claims.

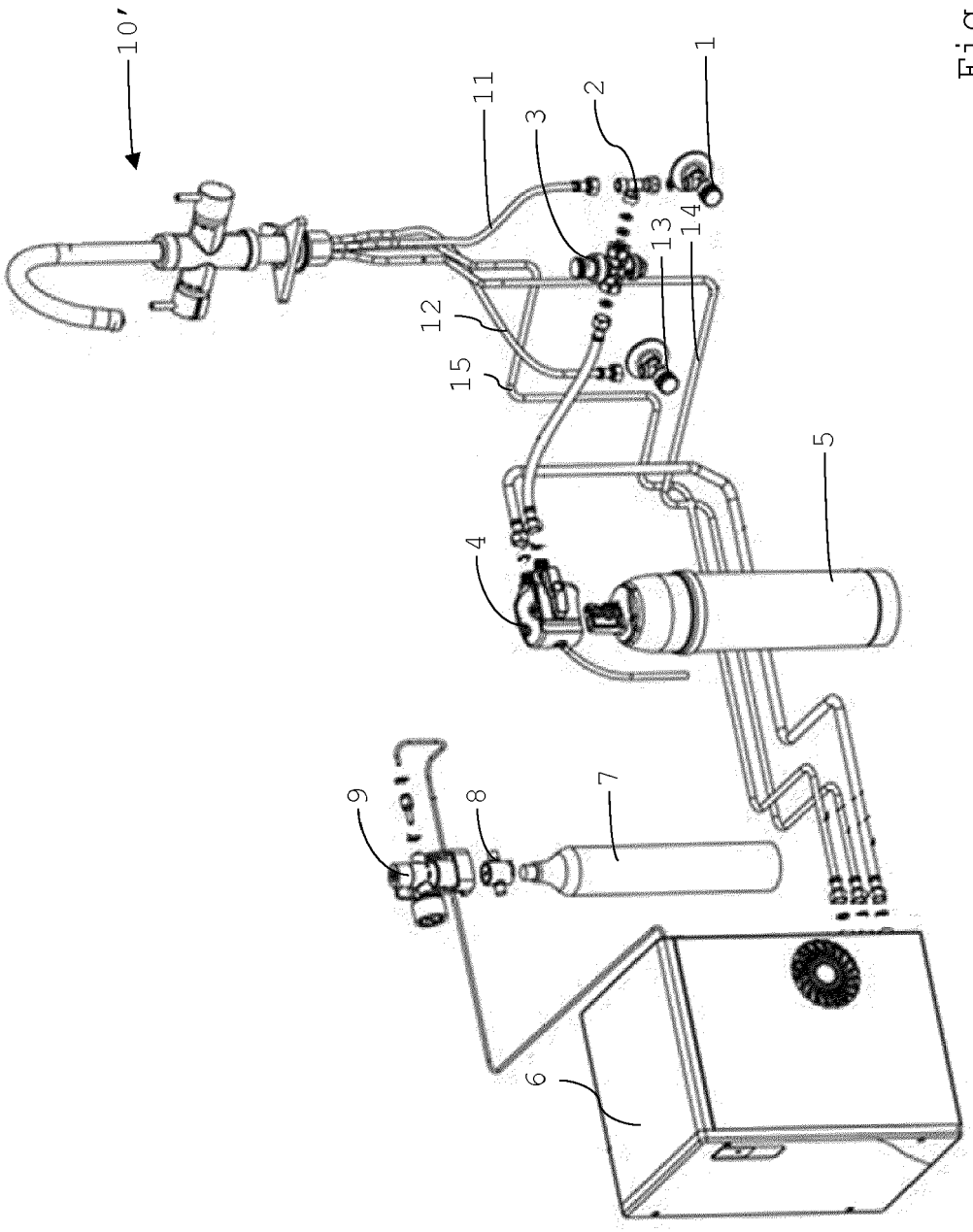

Fig. 1

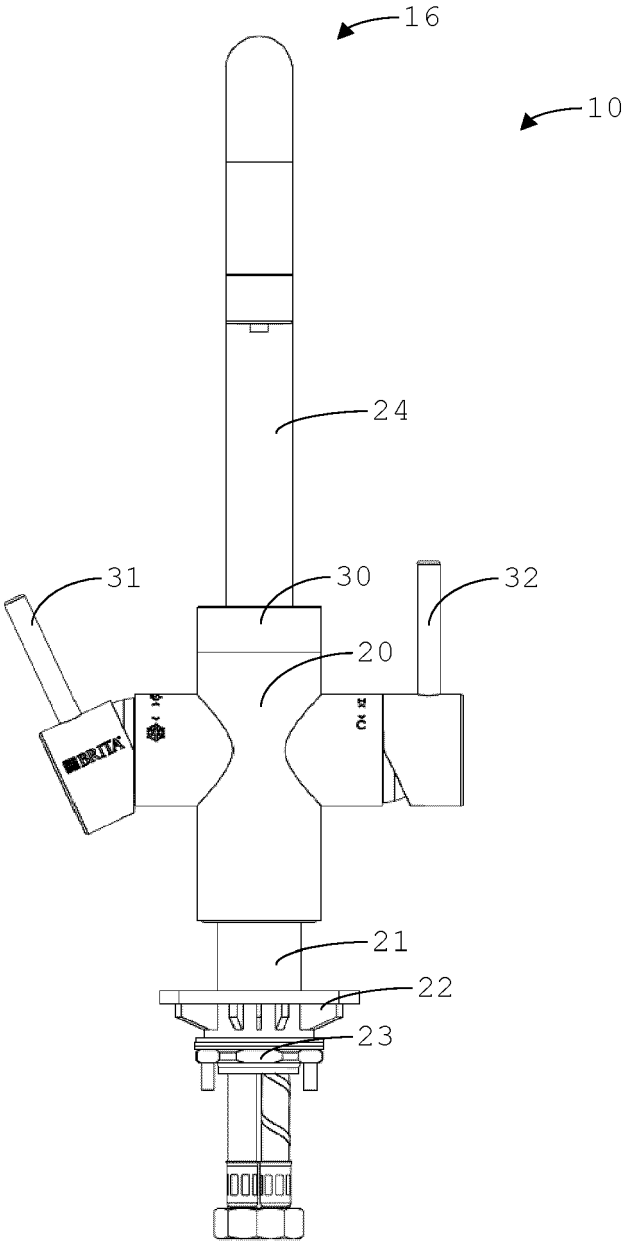

Fig. 2

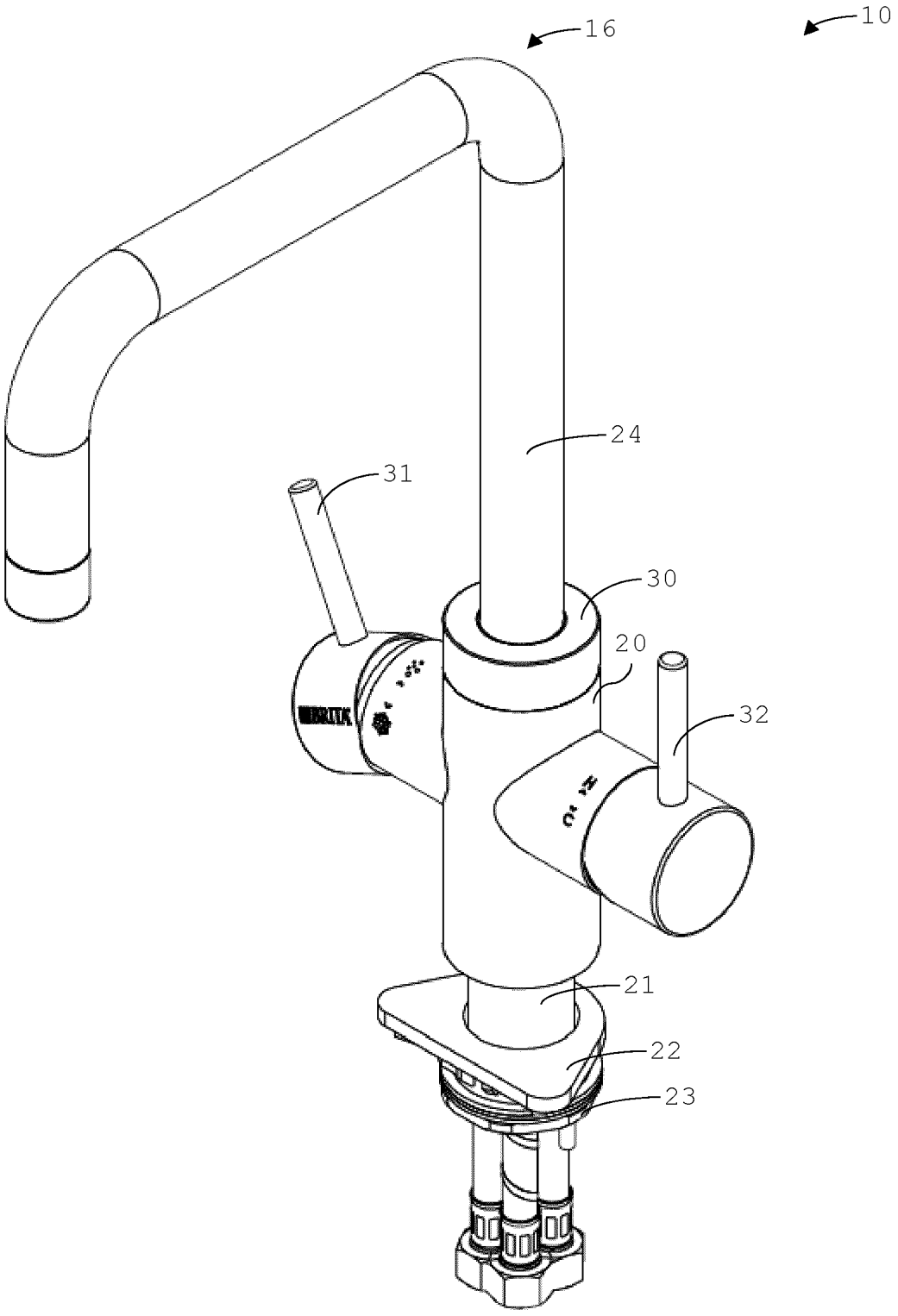

Fig. 3

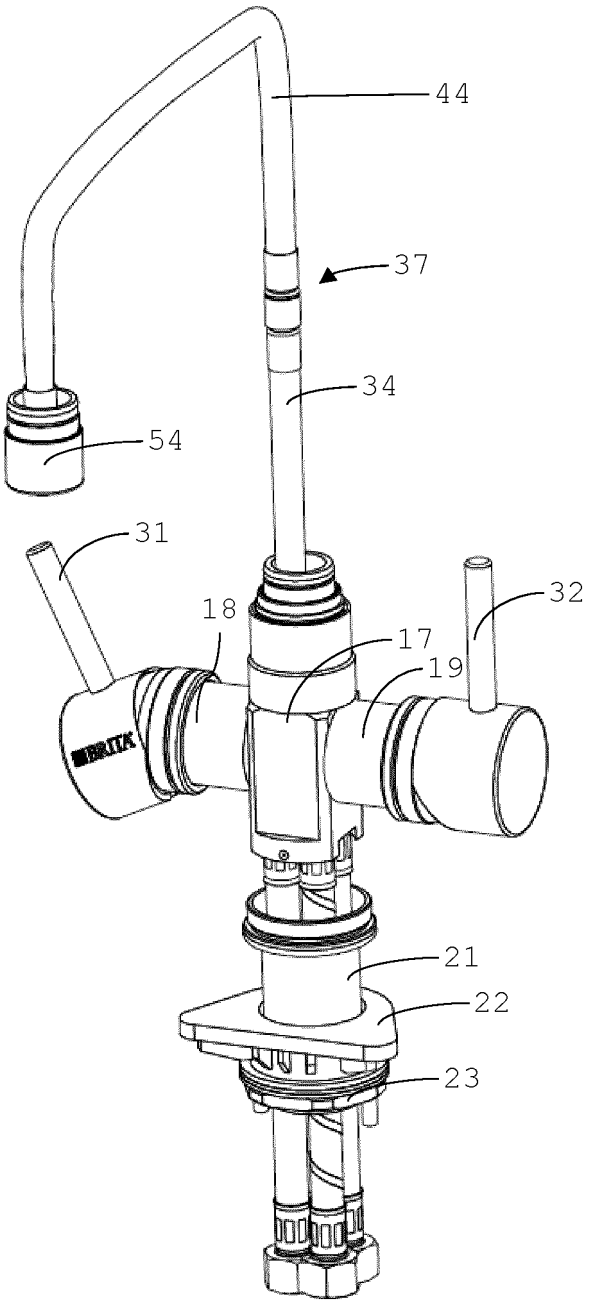

Fig. 4

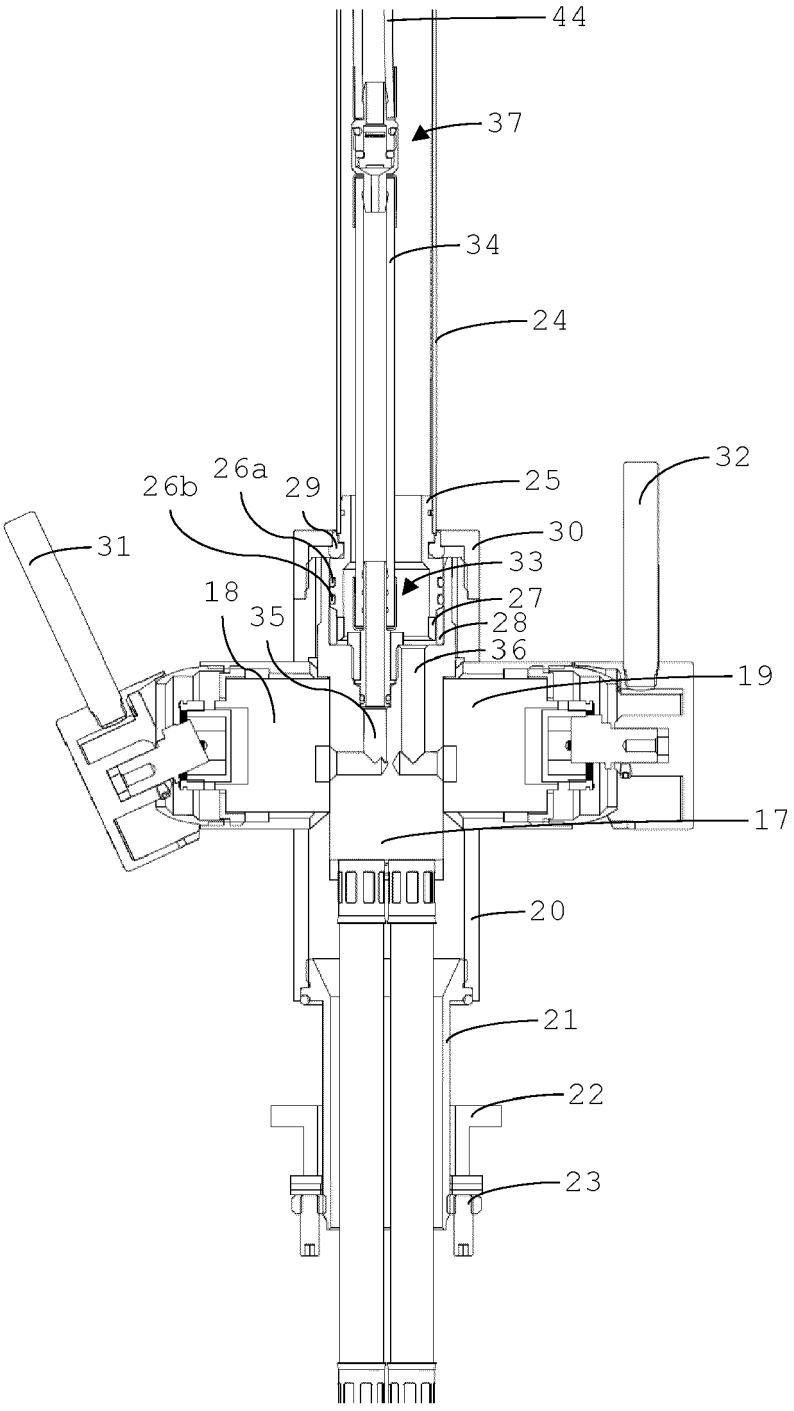

Fig. 5

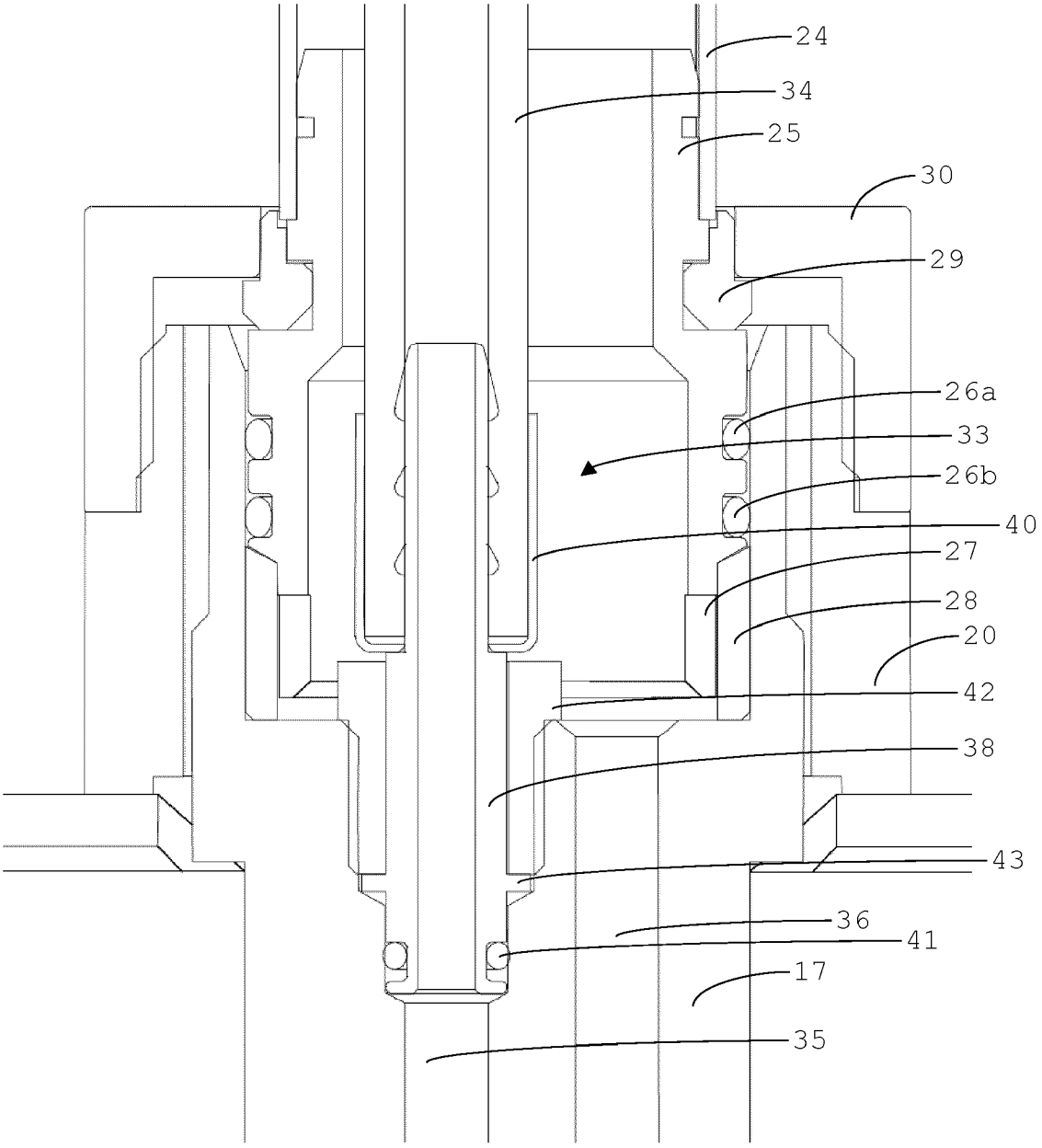

Fig. 6

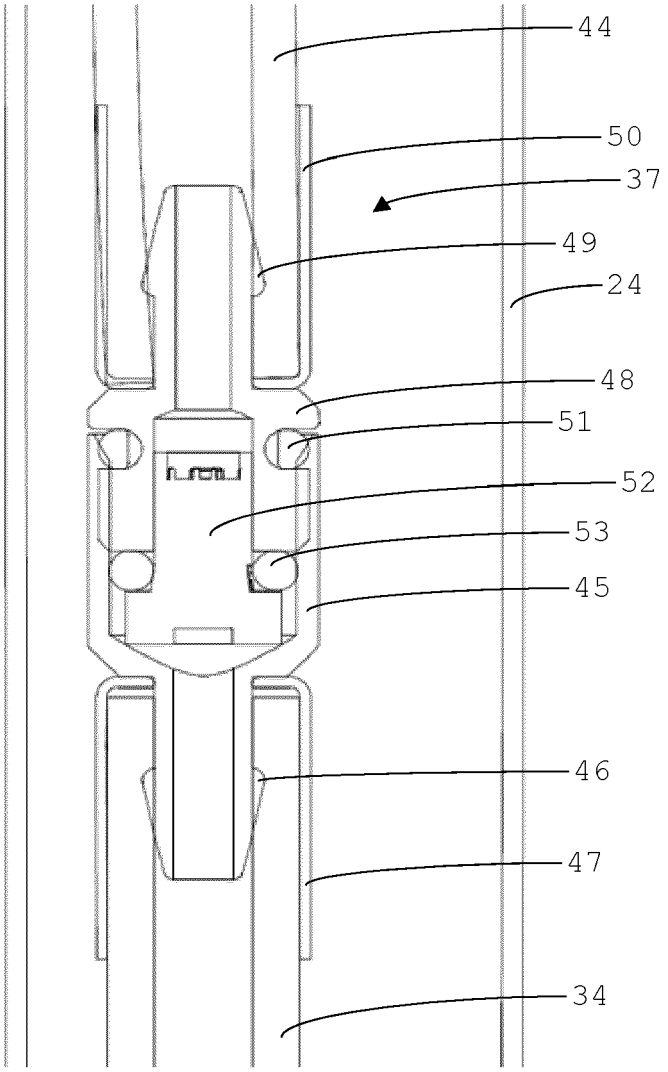

Fig. 7

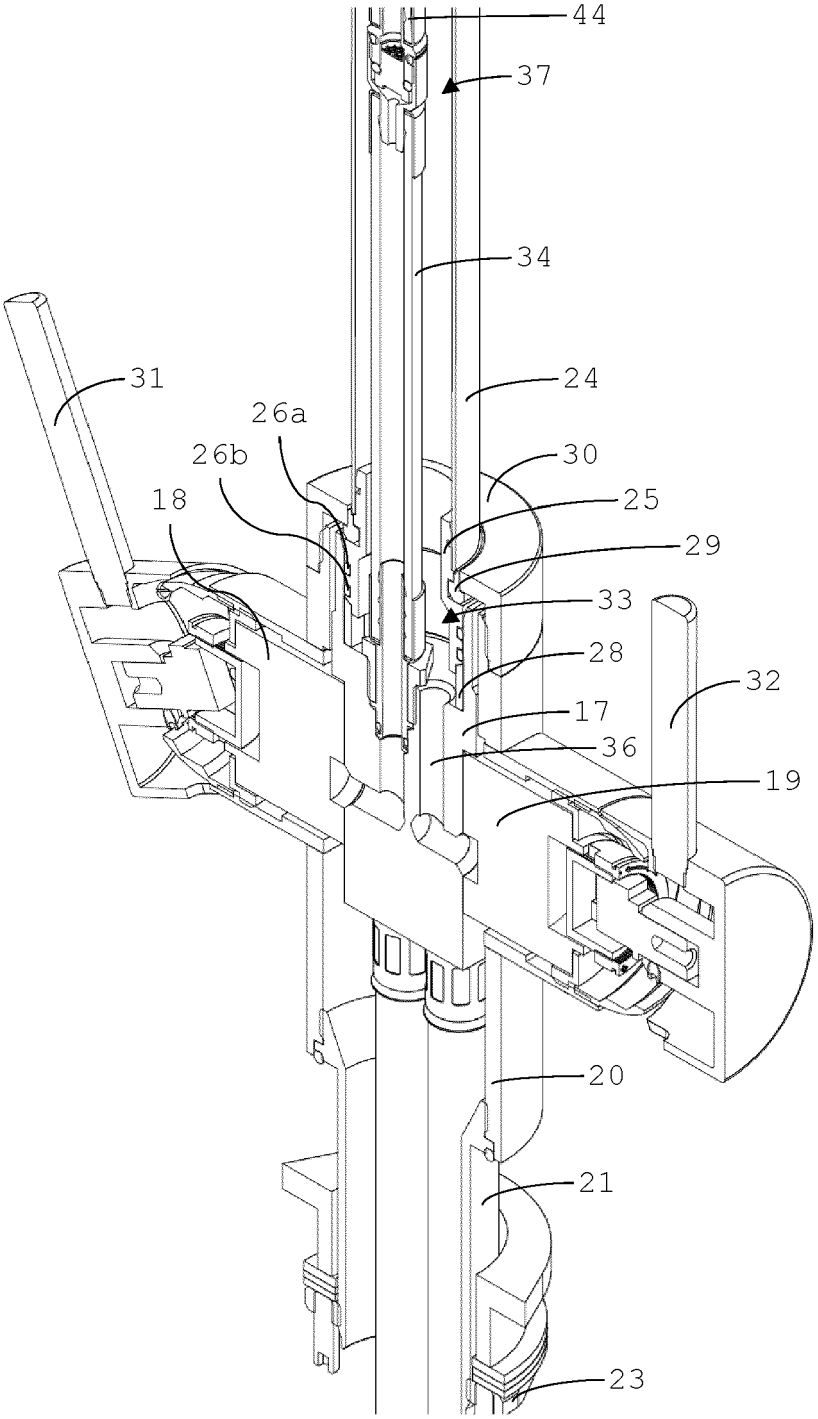

Fig. 8

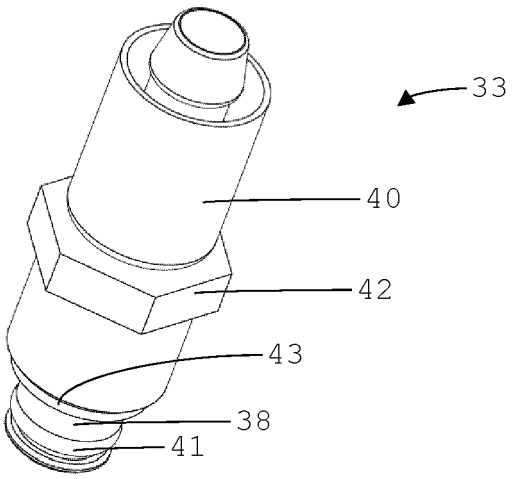

Fig. 9

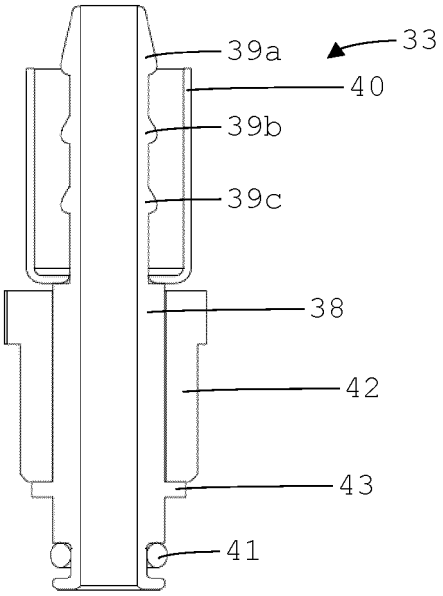

Fig. 10

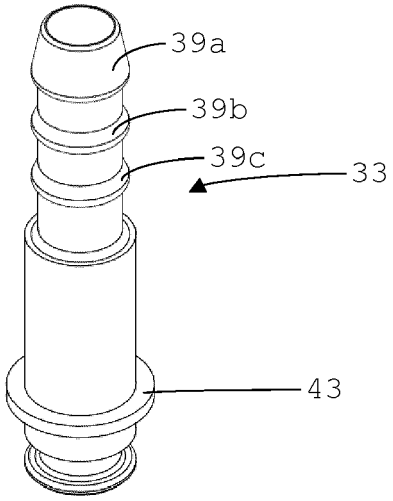

Fig. 11

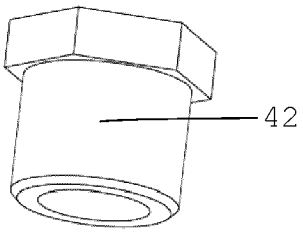

Fig. 12

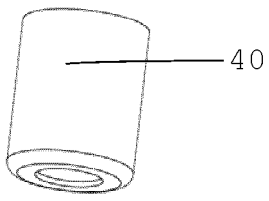

Fig. 13

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0577164 A1 **[0003]**
- DE 102015000198 A1 **[0005]**