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(54) **FAUCET**

(57) The present application provides a faucet including a faucet body and a water inlet assembly, the faucet body having a water inlet port. The faucet further includes a freezing crack prevention assembly, the freezing crack prevention assembly including a piston and an elastic member. The piston is connected between the water inlet port and the water inlet assembly and provided with a communication hole for communicating the water inlet assembly with the water inlet port. Two ends of the elastic member abut against the water inlet assembly and the piston, respectively, to enable the piston to move relative to the faucet body and the water inlet assembly.

In the faucet, by building in a freezing crack prevention assembly, the faucet is suitable for different environments, which particularly solves the pain point of freezing crack and burst of the faucet in an unheated bathroom environment in winter. The freezing crack prevention assembly is capable of automatic adjustment to expand the volume of the inner cavity of the faucet body so as to supplement an expanded volume due to water turning into ice, which does not require an operation and is convenient in use. The built-in freezing crack prevention assembly has a simple structure and a low cost, and is convenient to install.

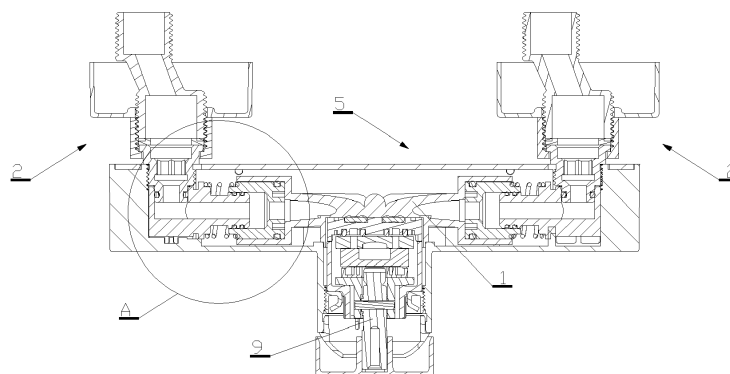


FIG. 6

Description

Technical Field

[0001] This application relates to, but is not limited to, the field of sanitary products, in particular to, but is not limited to, a faucet.

Background

[0002] In a freezing environment, water inside a faucet turns into ice, and the volume is 1.1 times the previous volume, which leads to a pain point of freezing crack and burst of the faucet in an unheated bathroom environment in winter, and affects the faucet in terms of use environment. In some cases, a faucet is prevented from freezing crack by draining water inside the faucet, but this requires manual drainage, leading to inconvenience in use.

Summary

[0003] The following is a summary of the subject matter described in detail herein. This summary is not intended to limit the protection scope of the claims.

[0004] An embodiment of the present application provides a faucet, which adapts to solve the problem of volume expansion due to water turning into ice by automatically expanding a volume of an inner cavity of a faucet body, thereby realizing automatic freezing crack prevention of the faucet.

[0005] A faucet includes a faucet body and a water inlet assembly, the faucet body having a water inlet port. The faucet further includes a freezing crack prevention assembly, the freezing crack prevention assembly including a piston and an elastic member, the piston being connected between the water inlet port and the water inlet assembly, the piston being provided with a communication hole for communicating the water inlet assembly with the water inlet port, and both ends of the elastic member abutting against the water inlet assembly and the piston, respectively, to enable the piston to move relative to the faucet body and the water inlet assembly.

[0006] For the faucet according to an embodiment of the present application, a freezing crack prevention assembly is provided therein, so that the faucet is suitable for different environments, which particularly solves the pain point of freezing crack and burst of the faucet in an unheated bathroom environment in winter. The freezing crack prevention assembly is configured to supplement an expanded volume due to water turning into ice by expanding a volume of an inner cavity of the faucet body, so as to realize freezing crack prevention. The adjustment process is automatically realized without an operation, which is convenient in use. The built-in freezing crack prevention assembly has a simple structure and a low cost, and is convenient to install.

[0007] Other features and advantages of embodiments of the present application will be set forth in the

following description.

Brief Description of Drawings

[0008]

FIG. 1 is a schematic diagram of a structure of a faucet according to an embodiment of the present application.

FIG. 2 is a schematic front view of a structure of the faucet shown in FIG. 1.

FIG. 3 is a schematic top view of a structure of the faucet shown in FIG. 1.

FIG. 4 is a schematic right view of a structure of the faucet shown in FIG. 1.

FIG. 5 is a schematic exploded view of a structure of the faucet shown in FIG. 1.

FIG. 6 is a schematic sectional view of a structure of the faucet shown in FIG. 1, with the faucet in a normal use state.

FIG. 7 is a schematic enlarged view of a structure of part A in FIG. 6.

FIG. 8 is a schematic sectional view of a structure of the faucet shown in FIG. 1, with the faucet in a freezing crack prevention state.

FIG. 9 is a schematic enlarged view of a structure of part B in FIG. 8.

FIG. 10 is a schematic partial sectional view of a structure of a faucet according to another embodiment of the present application.

Reference signs:

[0009] 1-faucet body, 101-water inlet port, 102-water outlet port, 103-first stepped surface, 104-convex rib, 2-water inlet assembly, 3-piston, 301-communication hole, 302-second stepped surface, 303-protruding portion, 4-elastic member, 5-housing, 501-housing cover, 502-bottom plate, 503-first screw, 6-handle, 7-semicircular decorative cover, 8-valve core gland, 9-valve core, 10-first sealing member, 11-second sealing member, 12-second screw, 13-connecting joint, 14-third sealing member, 15-water level joint, 16-gasket, 17-hexagonal nut, 18-curved foot decorative cover, and 19-curved foot.

[0010] Detailed Description

Embodiments of the present application will be described in detail below with reference to the accompa-

nying drawings. It should be noted that the embodiments in the present application and the features in the embodiments can be arbitrarily combined with each other if there is no conflict.

[0011] As shown in FIGS. 1-9, an embodiment of the present application provides a faucet including a faucet body 1 and a water inlet assembly 2. The faucet body 1 has a water inlet port 101. The faucet further includes a freezing crack prevention assembly. The freezing crack prevention assembly includes a piston 3 and an elastic member 4. The piston 3 is connected between the water inlet port 101 and the water inlet assembly 2. The piston 3 is provided with a communication hole 301 for communicating the water inlet assembly 2 with the water inlet port 101. Two ends of the elastic member 4 abut against the water inlet assembly 2 and the piston 3, respectively, to enable the piston 3 to move relative to the faucet body 1 and the water inlet assembly 2.

[0012] In the faucet, the piston 3 is connected between the faucet body 1 and the water inlet assembly 2, and the piston 3 is provided with a communication hole 301 to communicate the water inlet assembly 2 with the water inlet port 101 of the faucet body 1, so that water inlet of the faucet is not affected. The two ends of the elastic member 4 abut against the water inlet assembly 2 and the piston 3, respectively. The elastic member 4 is deformable so that the piston 3 can move to change a volume of an inner cavity of the faucet body 1.

[0013] As shown in FIGS. 6 and 7, the faucet is in a normal use state. In a freezing environment, water inside the faucet turns into ice, and the volume is 1.1 times the previous volume. As shown in FIGS. 8 and 9, when water in the inner cavity of the faucet body 1 turns into ice so that the volume thereof is expanded significantly, a force pushing the piston 3 is greater than an elastic force applied to the piston 3 by the elastic member 4, so that the piston 3 moves towards a side where the water inlet assembly 2 is located, expanding the volume of the inner cavity of the faucet body 1 and compressing the elastic member 4, thus achieving the purposes of protecting the faucet body 1 and preventing the faucet body 1 from freezing crack and burst. When the water temperature rises, the elastic force applied to the piston 3 by the elastic member 4 is greater than the water pressure on the piston 3. Under the action of the elastic member 4, the piston 3 moves towards the faucet body 1 and is restored, returning to the state shown in FIGS. 6 and 7.

[0014] For the faucet according to an embodiment of the present application, the purpose of preventing the faucet from freezing crack is achieved by providing a freezing crack prevention assembly in the faucet body 1 to expand the volume of the inner cavity of the faucet body 1 to supplement the volume expansion caused by water turning into ice. Moreover, the freezing crack prevention assembly is an automatic adjusting assembly, which does not require a manual operation, and does not have any external auxiliary parts, and therefore is convenient to use. The realization of the freezing crack pre-

vention function only requires adding a piston 3 and an elastic member 4 in the faucet, which is simple in structure and low in cost.

[0015] As shown in FIGS. 6-9, one end of the piston 3 is sleeved outside the water inlet assembly 2, and the other end extends into the water inlet port 101. A first sealing member 10 is provided between the piston 3 and the water inlet port 101, and a second sealing member 11 is provided between the piston 3 and the water inlet assembly 2.

[0016] As shown in FIGS. 6-9, the first sealing member 10 is sleeved at and mounted to one end of the piston 3, and the one end of the piston 3 and the first sealing member 10 extend into the water inlet port 101 of the faucet body 1, realizing the sealing connection between the faucet body 1 and the piston 3. The second sealing member 11 is sleeved at and mounted to one end of the water inlet assembly 2, and the one end of the water inlet assembly 2 and the second sealing member 11 extend into the communication hole 301 of the piston 3, realizing the sealing connection between the water inlet assembly 2 and the piston 3.

[0017] As shown in FIGS. 7 and 9, the first sealing member 10 may include one or more (two or more) O-rings, and the second sealing member 11 may include one or more (e.g., two) O-rings.

[0018] As shown in FIGS. 7 and 9, a through-flow cross-sectional area S_2 of a portion of the water inlet port 101 sleeved outside the piston 3 is larger than a through-flow cross-sectional area S_1 of a portion of the communication hole 301 sleeved outside the water inlet assembly 2.

[0019] When the faucet changes from the normal use state shown in FIGS. 6 and 7 to the freezing crack prevention state shown in FIGS. 8 and 9, the piston 3 moves towards the water inlet assembly 2 by a distance L , making the increased inner cavity volume ($S_2 * L - S_1 * L$) of the faucet greater than 10% of the inner cavity volume of the faucet body 1, so as to adapt to the 1.1 times change in volume when water in the faucet body 1 turns into ice.

[0020] As shown in FIGS. 6 and 7, the water inlet port 101 is a first stepped hole which has a first stepped surface 103, and the piston 3 is configured to be able to abut against the first stepped surface 103 under the action of the elastic member 4 for positional restriction.

[0021] As shown in FIGS. 6 and 7, when the faucet is in the normal use state, an end surface of one end of the piston 3 extending into the water inlet port 101 of the faucet body 1 abuts against the first stepped surface 103 of the water inlet port 101 under the action of the elastic member 4.

[0022] As shown in FIG. 7, the through-flow cross-sectional area of one end of the communication hole 301 close to the first stepped surface 103 is smaller than the through-flow cross-sectional area of a hole on the first stepped surface 103.

[0023] As shown in FIG. 7, the through-flow cross-sectional area of one end of the communication hole 301

close to the first stepped surface 103 is smaller than the through-flow cross-sectional area of a hole on the first stepped surface 103, so that an inner side of the end surface of one end of the piston 3 extending into the water inlet port 101 forms a protruding portion 303 protruding from the hole on the first stepped surface 103. When water in the inner cavity of the faucet body 1 turns into ice in a freezing environment, the piston 3 can be pushed towards the side where the water inlet assembly 2 is located by pushing the protruding portion 303 of the piston 3.

[0024] Of course, the end surface of one end of the piston 3 extending into the water inlet port 101 may not completely fit with the first stepped surface 103. When water in the inner cavity of the faucet body 1 turns into ice, the piston 3 can be pushed by pushing the end surface of one end of the piston 3 extending into the water inlet port 101.

[0025] As shown in FIG. 10, the first stepped surface 103 is provided with a convex rib 104, and the piston 3 is configured to be able to abut against the convex rib 104 under the action of the elastic member 4. The convex rib 104 may be an annular convex rib.

[0026] As shown in FIG. 10, in the normal use state, the piston 3 abuts against the convex rib 104 on the first stepped surface 103 under the action of the elastic member 4, so that there is a water storage gap between the end surface of the piston 3 extending into the water inlet port 101 and the first stepped surface 103. When water in the inner cavity of the faucet body 1 turns into ice in a freezing environment, the piston 3 can be pushed towards the side where the water inlet assembly 2 is located by pushing the end surface of the piston 3 extending into the water inlet port 101.

[0027] In other exemplary embodiments, the end surface of one end of the piston 3 extending into the water inlet port 101 is provided with a convex rib, and the piston 3 is configured such that the convex rib can abut against the first stepped surface 103 under the action of the elastic member 4.

[0028] In the normal use state, under the action of the elastic member 4, the convex rib of the piston 3 abuts against the first stepped surface 103, so that there is a water storage gap between the end surface of the piston 3 extending into the water inlet port 101 and the first stepped surface 103. When water in the inner cavity of the faucet body 1 turns into ice in a freezing environment, the piston 3 can be pushed towards the side where the water inlet assembly 2 is located by pushing the end surface of the piston 3 extending into the water inlet port 101.

[0029] As shown in FIG. 9, the communication hole 301 is a second stepped hole. The through-flow cross-sectional area of one end of the second stepped hole close to the water inlet assembly 2 is larger than the through-flow cross-sectional area of one end of the second stepped hole close to the water inlet port 101. The second stepped hole has a second stepped surface 302, and the piston 3 is configured to be able to abut against

the water inlet assembly 2 through the second stepped surface 302 for positional restriction.

[0030] The communication hole 301 in the piston 3 is a stepped hole. In a freezing environment, the piston 3 can move towards the side where the water inlet assembly 2 is disposed. When the second stepped surface 302 of the piston 3 abuts against the end surface of one end of the water inlet assembly 2 extending into the communication hole 301, the piston 3 is restricted from moving continuously, thus limiting the position of the piston 3. A displacement stroke of the piston 3 is limited by the cooperation between the end surface of the piston 3 and the first stepped surface 103 of the water inlet port 101, and the cooperation between the end surface of the water inlet assembly 2 and the second stepped surface 302 of the communication hole 301.

[0031] As shown in FIGS. 1-6 and 8, the faucet body 1 has two water inlet ports 101, namely a cold water inlet port and a hot water inlet port. There are two water inlet assemblies 2, namely a cold water inlet assembly and a hot water inlet assembly. There are two freezing crack prevention assemblies, which are connected between the cold water inlet port and the cold water inlet assembly and between the hot water inlet port and the hot water inlet assembly, respectively.

[0032] Freezing crack prevention assemblies are provided between the hot water inlet port of the faucet body 1 and the hot water inlet assembly and between the cold water inlet port of the faucet body 1 and the cold water inlet assembly, respectively. When the faucet changes from the normal use state shown in FIGS. 6 and 7 to the freezing crack prevention state shown in FIGS. 8 and 9, the piston 3 of each freezing crack prevention assembly moves by a distance L, making the increased inner cavity volume $2 \cdot (S_2 \cdot L - S_1 \cdot L)$ of the faucet greater than 10% of the inner cavity volume of the faucet body 1, so as to adapt to the 1.1 times change in volume when water in the faucet body 1 turns into ice. It should be understood that the moving distances of the pistons 3 of the two freezing crack prevention assemblies may not be equal.

[0033] As shown in FIGS. 1-6 and 8, the faucet further includes a housing 5. The faucet body 1 is fixed in the housing 5, and one end of the water inlet assembly 2 extends into the housing 5 and is fixedly connected with the housing 5.

[0034] The water inlet assembly 2 and the faucet body 1 are both fixed to the housing 5, so that the housing 5 bears the installation and stress of all parts in the faucet. The housing 5 bears the main installation locking force, so that the strength is guaranteed. At this time, the faucet body 1 only plays the role of sealing and water passing. Modularization of the faucet is realized, and different appearance shapes can be achieved by replacing different housings 5, thus achieving high practicability.

[0035] As shown in FIGS. 1-6 and 8, the faucet further includes a handle 6 and a valve core 9. The handle 6 is connected with the valve core 9 and can drive the valve core 9 to move. The valve core 9 is connected with the

faucet body 1, and a water passage in the valve core 9 communicates with the water inlet port 101 and the water outlet port 102 on the faucet body 1, so as to realize the opening and closing of the faucet and the adjustment of the temperature of the outlet water by the handle 6 driving the valve core 9 to move. The valve core 9 may be fixedly installed in the housing 5 through a valve core gland 8, and a semicircular decorative cover 7 is provided between the valve core 9 and the handle 6.

[0036] As shown in FIGS. 1-5, the housing 5 includes a housing cover 501 and a bottom plate 502, and the housing cover 501 and the bottom plate 502 are fixed by a first screw 503. The faucet body 1 is fixed in the housing cover 501 by a second screw 12.

[0037] As shown in FIGS. 1-6 and 8, the water inlet assembly 2 includes a connecting joint 13, a third sealing member 14, a water level joint 15, a gasket 16, a hexagonal nut 17, a curved foot decorative cover 18 and a curved foot 19. One end of the connecting joint 13 extends into the communication hole 301 of the piston 3. The second sealing member 11 is provided between the connecting joint 13 and the piston 3. The elastic member 4 (a spring) is sleeved outside the connecting joint 13, and the two ends of the elastic member 4 abut against the connecting joint 13 and the piston 3, respectively. One end of the water level joint 15 extends into the connecting joint 13. The third sealing member 14 is provided between the water level joint 15 and the connecting joint 13. The water level joint 15 is threadedly connected with the housing cover 501 of the housing 5. The other end of the water level joint 15 is fixed to the curved foot 19 by the hexagonal nut 17, and the gasket 16 is provided between the water level joint 15 and the curved foot 19. The curved foot decorative cover 18 is fixed to the curved foot 19. The connecting joint 13, the water level joint 15 and the curved foot 19 are each provided with a water passing cavity, and the water passing cavities of the connecting joint 13, the water level joint 15 and the curved foot 19 are sequentially communicated to form a water inlet passage of the water inlet assembly 2.

[0038] The faucet body 1 can be made of plastic.

[0039] The housing 5 can be made of metal. For example, the housing 5 is made of zinc alloy.

[0040] The metal housing 5 has high structural strength, so that the strength is guaranteed when the metal housing 5 bears the installation and stress of all parts of the faucet, and different appearance shapes can be achieved by replacing different metal housings 5.

[0041] The piston 3 can be made of plastic.

[0042] As shown in FIGS. 5-7 and 9, the elastic member 4 includes a spring.

[0043] To sum up, for the faucet of the embodiments of the present application, freezing crack prevention is achieved by expanding the volume of the inner cavity of the faucet body to supplement the expanded volume due to water turning into ice, rather than by leaving no water in the faucet (or draining off water). The freezing crack prevention assembly is an automatic device, which does

not need any manual operation and is convenient to use. The freezing crack prevention assembly is provided in the faucet, and only includes a piston and an elastic member. Since the freezing crack prevention assembly includes few parts, the installation thereof is convenient and the cost is low.

[0044] Although the implementations disclosed in the present application are described above, the described contents are only the implementations adopted for facilitating the understanding of the present application, and are not intended to limit the present application. Any person skilled in the art to which the present application pertains may make any modifications and variations in the form and details of implementation without departing from the spirit and scope disclosed by the present application. Nevertheless, the scope of patent protection of the present application shall still be determined by the scope defined by the appended claims.

Claims

1. A faucet, comprising a faucet body (1) and a water inlet assembly (2), the faucet body (1) having a water inlet port (101), wherein the faucet further comprises a freezing crack prevention assembly, the freezing crack prevention assembly comprises a piston (3) and an elastic member (4), the piston (3) is connected between the water inlet port (101) and the water inlet assembly (2), the piston (3) is provided with a communication hole (301) for communicating the water inlet assembly (2) with the water inlet port (101), and two ends of the elastic member (4) abut against the water inlet assembly (2) and the piston (3), respectively, to enable the piston (3) to move relative to the faucet body (1) and the water inlet assembly (2).
2. The faucet according to claim 1, wherein one end of the piston (3) is sleeved outside the water inlet assembly (2), the other end of the piston (3) extends into the water inlet port (101), a first sealing member (10) is provided between the piston (3) and the water inlet port (101), and a second sealing member (11) is provided between the piston (3) and the water inlet assembly (2).
3. The faucet according to claim 2, wherein a through-flow cross-sectional area of a portion of the water inlet port (101) sleeved outside the piston (3) is larger than a through-flow cross-sectional area of a portion of the communication hole (301) sleeved outside the water inlet assembly (2).
4. The faucet according to any one of claims 1-3, wherein the water inlet port (101) is a first stepped hole which has a first stepped surface (103), and the piston (3) is configured to be able to abut against the

first stepped surface (103) under the action of the elastic member (4) for positional restriction.

5. The faucet according to claim 4, wherein a through-flow cross-sectional area of one end of the communication hole (301) close to the first stepped surface (103) is smaller than a through-flow cross-sectional area of a hole on the first stepped surface (103). 5

6. The faucet according to claim 4, wherein the first stepped surface (103) is provided with a convex rib (104), and the piston (3) is configured to be able to abut against the convex rib (104) under the action of the elastic member (4); or 10
 an end surface of one end of the piston (3) extending into the water inlet port (101) is provided with a convex rib (104), and the piston (3) is configured such that the convex rib (104) can abut against the first stepped surface (103) under the action of the elastic member (4). 15
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7. The faucet according to any one of claims 1-3, wherein the communication hole (301) is a second stepped hole, a through-flow cross-sectional area of one end of the second stepped hole close to the water inlet assembly (2) is larger than a through-flow cross-sectional area of one end of the second stepped hole close to the water inlet port (101), the second stepped hole has a second stepped surface (302), and the piston (3) is configured to be able to abut against the water inlet assembly (2) through the second stepped surface (302) for positional restriction. 25
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8. The faucet according to any one of claims 1-3, wherein the faucet body (1) has two water inlet ports (101), which are a cold water inlet port and a hot water inlet port; there are two water inlet assemblies (2), which are a cold water inlet assembly and a hot water inlet assembly; and there are two freezing crack prevention assemblies, which are connected between the cold water inlet port and the cold water inlet assembly and between the hot water inlet port and the hot water inlet assembly, respectively. 35
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9. The faucet according to any one of claims 1-3, wherein the faucet further comprises a housing (5), the faucet body (1) is fixed in the housing (5), and one end of the water inlet assembly (2) extends into the housing (5) and is fixedly connected with the housing (5). 50

10. The faucet according to claim 9, wherein the faucet body (1) is made of plastic, the housing (5) is made of metal, the piston (3) is made of plastic, and the elastic member (4) is a spring. 55

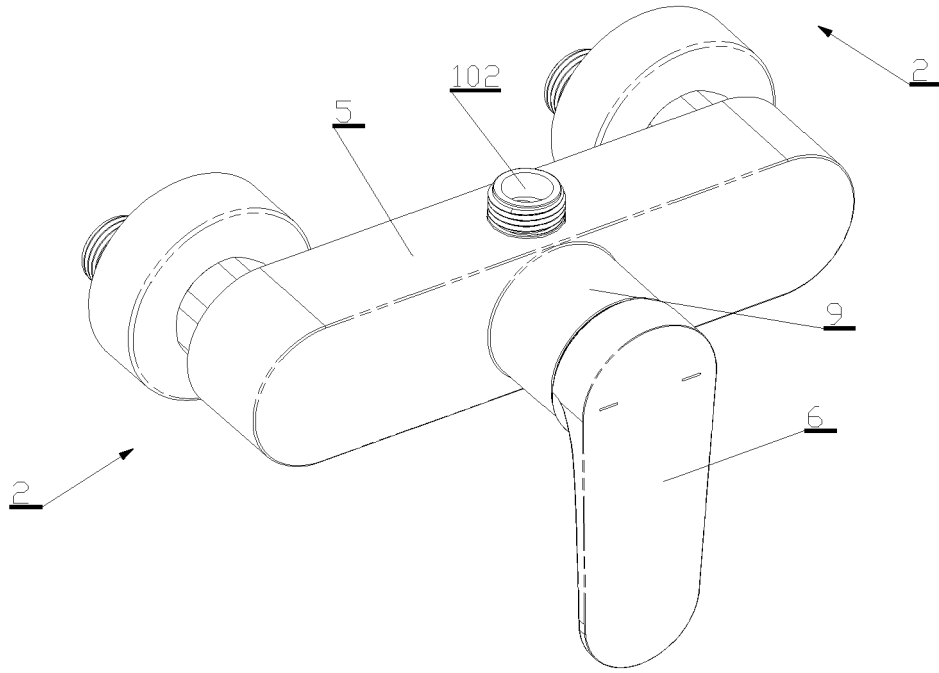


FIG. 1

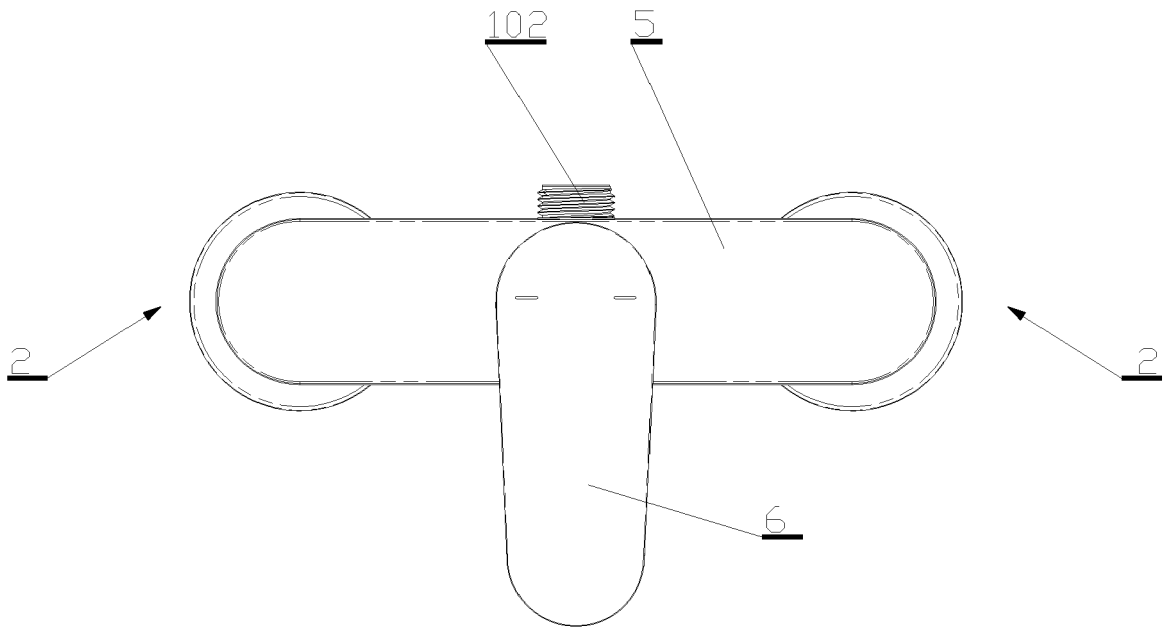


FIG. 2

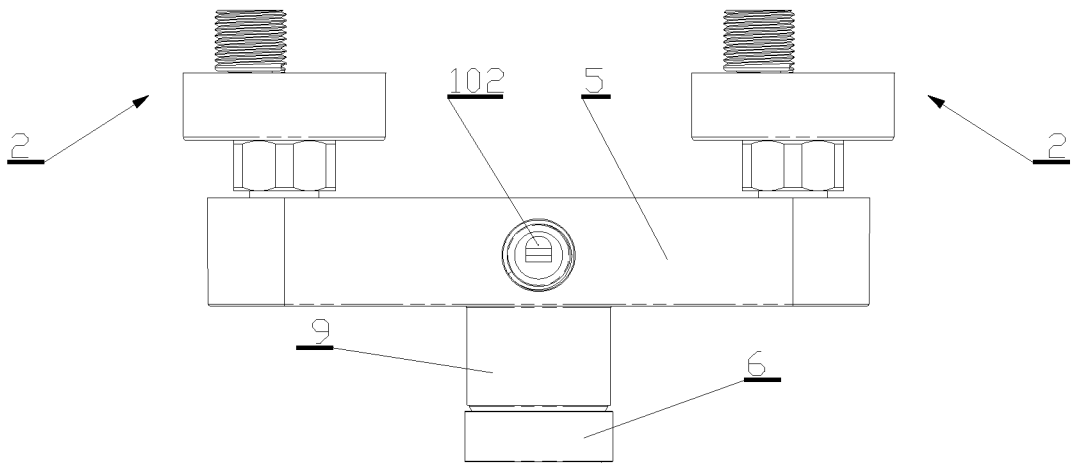


FIG. 3

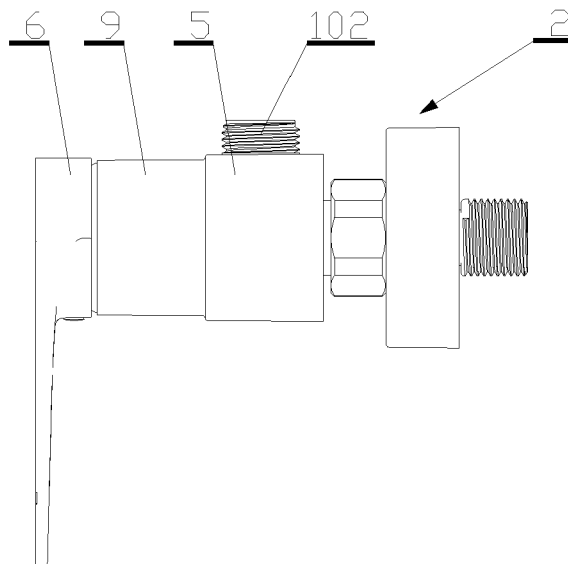


FIG. 4

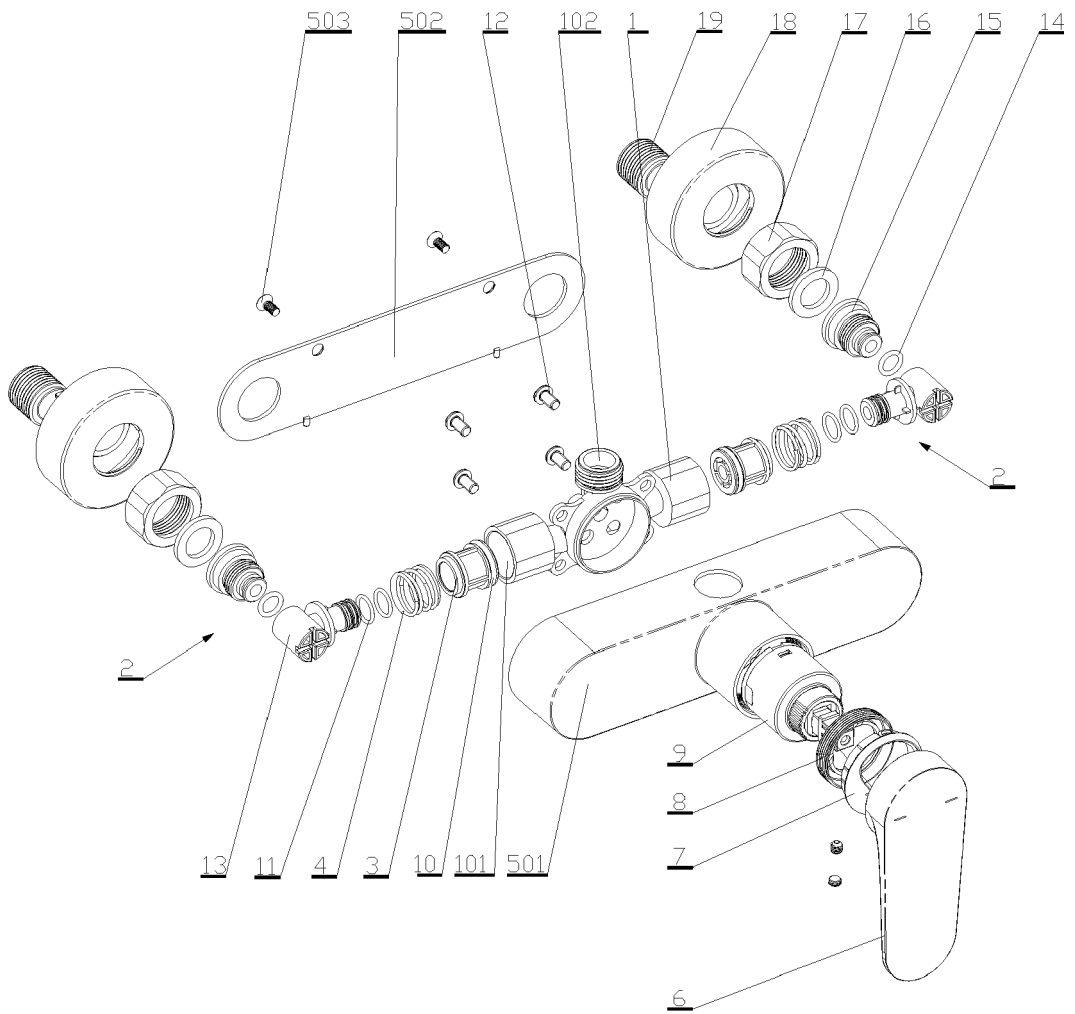


FIG. 5

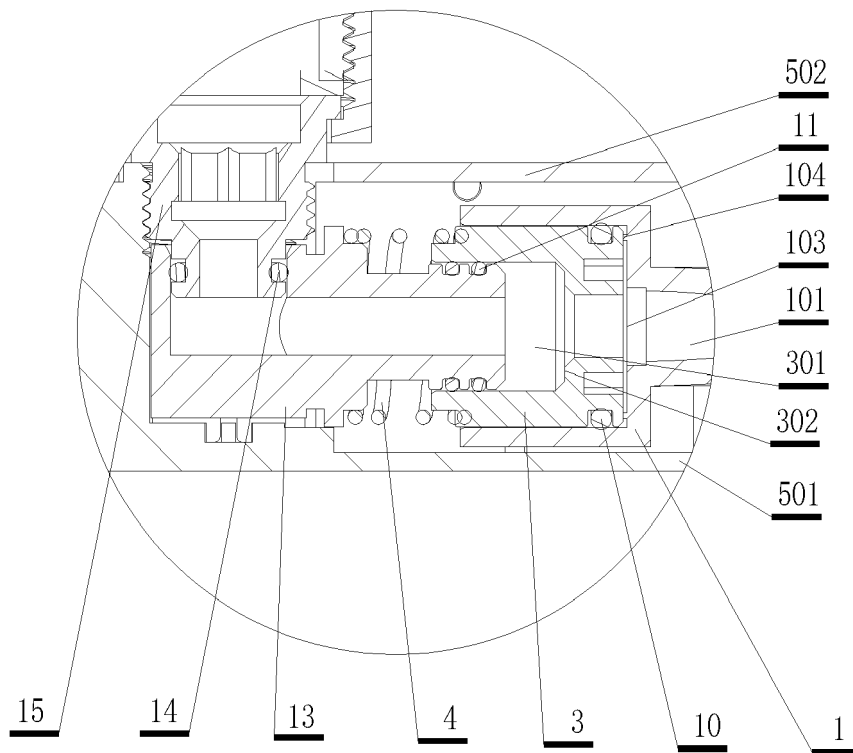


FIG. 10



EUROPEAN SEARCH REPORT

Application Number
EP 20 20 5157

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y A	EP 1 002 984 A2 (FREY CONRAD [CH]) 24 May 2000 (2000-05-24) * paragraph [0006] - paragraph [0008]; figure 2 *	1-5,7-10 6	INV. E03C1/04
Y	----- JP H05 81597 U ([JP]) 5 November 1993 (1993-11-05) * figures 4,5 *	1-5,7-10	
Y	----- JP H05 263985 A ([JP]) 12 October 1993 (1993-10-12) * figures 1-3 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) E03C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 April 2021	Examiner Horst, Werner
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EPO FORM 1503 03.02 (P04C01)

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

EP 20 20 5157

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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09-04-2021

	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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