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(54) **ANTI-FROST CRACK DEVICE AND WATER DISCHARGE DEVICE**

(57) An anti-freeze crack device (2), including: a main body (21) and a plugging assembly (22). The main body (21) is provided with a cavity (210) with an open end, and the open end of the cavity (210) is configured to communicate with a water chamber (10) of a water outlet valve (1). The plugging assembly (22) is disposed within the cavity (10) and can be switched between a first state in which the open end is closed and a second state in which the open end is opened.

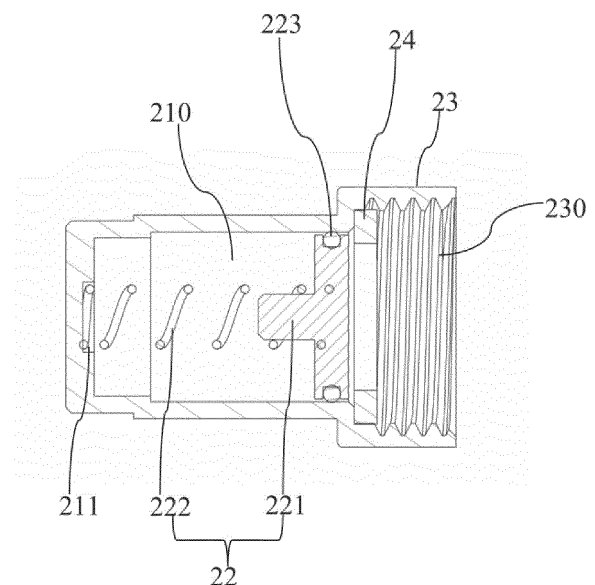


FIG. 6

Description

[0001] The present application claims priority to Chinese patent application No. 202322500873.6, filed to the China National Intellectual Property Administration on September 14, 2023 and entitled "Anti-freeze Crack Device and Water Outlet Device", the contents of which should be understood to be incorporated herein by reference.

Technical Field

[0002] The present application relates to, but is not limited to, the technical field of anti-freeze devices, and particularly relates to, but is not limited to, an anti-freeze crack device and a water outlet device.

Background

[0003] In freezing environment, water inside the valve body of shower or bathroom faucet will become ice, and the volume will increase by about 10%. The valve body of shower or bathroom faucet will cause cracks, water leakage and other defects due to freezing, which will cause economic damage to users.

Summary

[0004] The following is a summary of the subject matter described in detail herein, and this summary is not intended to limit the scope of protection of the claims.

[0005] An embodiment of the present application provides an anti-freeze crack device, including: a main body provided with a cavity with an open end, the open end of the cavity being configured to communicate with a water chamber of a water outlet valve; and a plugging assembly disposed in the cavity and capable of being switched between a first state in which the open end is closed and a second state in which the open end is opened.

[0006] An embodiment of the present application also provides a water outlet device, including: a water outlet valve, and the anti-freeze crack device as described in any of the above embodiments, which is installed in conjunction with the water outlet valve.

[0007] In the first state, the cavity of the anti-freeze crack device is isolated from the water chamber of the water outlet valve.

[0008] In the second state, the cavity of the anti-freeze crack device communicates with the water chamber of the water outlet valve.

Brief Description of Drawings

[0009] The drawings are used for providing a further understanding of technical solutions of the present application, and constitute a part of the specification. They are used together with embodiments of the present application to explain the technical solutions of the present

application, and do not constitute a restriction on the technical solutions of the present application.

FIG. 1 is a perspective split view of a water outlet device according to a first embodiment of the present application;

FIG. 2 is a front view of a water outlet device according to a first embodiment of the present application;

FIG. 3 is a cross-sectional view of an anti-freeze device of FIG. 2 in a first state;

FIG. 4 is a cross-sectional view of the anti-freeze device of FIG. 2 in a second state;

FIG. 5 is a perspective view of an anti-freeze device according to a first embodiment of the present application;

FIG. 6 is an axial cross-sectional view of an anti-freeze device according to a first embodiment of the present application;

FIG. 7 is a perspective split view of an anti-freeze device according to a first embodiment of the present application;

FIG. 8 is a perspective split view of a water outlet device according to a second embodiment of the present application;

FIG. 9 is a front view of a water outlet device according to a second embodiment of the present application;

FIG. 10 is a cross-sectional view of an anti-freeze device of FIG. 9 in a first state;

FIG. 11 is a cross-sectional view of the anti-freeze device of FIG. 9 in a second state;

FIG. 12 is a perspective view of an anti-freeze device according to a second embodiment of the present application;

FIG. 13 is an axial cross-sectional view of an anti-freeze device according to a second embodiment of the present application; and

FIG. 14 is a perspective split view of an anti-freeze device according to a second embodiment of the present application.

Reference signs:

[0010] Water outlet device- 100, 100a; Anti-freeze crack device- 2, 2a; Water outlet valve- 1, 1a; Water

chamber- 10, 10a; Main body- 21, 21a; Plugging assembly- 22, 22a; Cavity- 210, 210a; Closed chamber- A; Release chamber- B; Plugging member- 221, 221a; Positioning groove-211; Elastic element- 222, 222a; Plugging block- 2210; Extension- 2211; Mounting groove-2212; First sealing member- 223, 223a; Connecting portion- 23, 23a; Internal thread- 230, 110a; Second sealing member- 24, 24a; Mounting portion- 25, 25a; Third sealing member- 26a; Molding process hole- 11, 11a; External thread- 110.

Detailed Description

[0011] Embodiments of the present application will be described in detail with reference to the accompanying drawings. It should be noted that the embodiments in the present application and the features in the embodiments may be arbitrarily combined with each other provided that there is no conflict.

[0012] As shown in FIGS. 1 to 7, an embodiment of the present application provides a water outlet device 100 and an anti-freeze crack device 2. The water outlet device 100 includes a water outlet valve 1, and an anti-freeze crack device 2 installed in conjunction with the water outlet valve 1. The anti-freeze crack device 2 communicates with a water chamber 10 of the water outlet valve 1. The water chamber 10 may be a pre-valve water chamber or a post-valve water chamber, such as a water inlet chamber, a water mixing chamber, a hot water chamber, a water outlet chamber, and the like.

[0013] After the water outlet valve 1 is closed, a certain amount of water will be stored in the water chamber 10 of the water outlet valve 1. The water in the water chamber 10 will freeze in winter when the air temperature is low or when the ambient temperature is low, resulting in an increase in volume. By installing the anti-freeze crack device 2 on the water outlet valve 1, the anti-freeze crack device 2 can release a space communicating with the water chamber 10, and store the expanded volume of the water chamber 10 during the freezing process of water in the water chamber 10, thereby preventing freeze cracking of the water outlet valve 1 due to the volume expansion.

[0014] As shown in FIGS. 5-7, the anti-freeze crack device 2 of the embodiment of the present application includes a main body 21 and a plugging assembly 22. The main body 21 is provided with a cavity 210 with an open end, and the open end of the cavity 210 is configured to communicate with the water chamber 10 of the water outlet valve 1. The plugging assembly 22 is provided in the cavity 210 and can be switched between a first state in which the open end is closed and a second state in which the open end is opened.

[0015] As shown in FIGS. 3 and 4, the plugging assembly 22 is movable within the cavity 210. In the second state, the plugging assembly 22 can divide the cavity 210 into a closed chamber A and a release chamber B. The release chamber B may communicate with the water

chamber 10 of the water outlet valve 1. As shown in FIG. 3, in the first state, the plugging assembly 22 plugs the open end of the cavity 210, and the entire cavity 210 is a closed cavity body, so that water flow cannot enter. As shown in FIG. 4, in the second state, the plugging assembly 22 opens the open end and releases the cavity 210, which is mainly divided into a closed chamber A and a release chamber B.

[0016] Under normal use (the first state) of the anti-freeze crack device 2 according to the embodiment of the present application, the plugging assembly 22 plugs an opening of the cavity 210 to prevent the water in the water chamber 10 from entering the cavity 210. When the air temperature is low (the second state), the water in the water chamber 10 freezes, and the freezing causes volume expansion. The plugging assembly 22 partially releases the cavity 210 to store the expanded volume and prevents freeze cracking of the water outlet valve 1.

[0017] As shown in FIGS. 6-7, the plugging assembly 22 includes a plugging member 221 capable of closing the opening, and an elastic element 222 cooperating with the plugging member 221, and the elastic element 222 is configured to provide power for the plugging member 221 to move toward a position of closing the open end. The elastic element 222 is positioned in the cavity 10. One end of the elastic element 222 is positioned on the main body 21, and the other end of the elastic element 222 is positioned on the plugging member 221. When in the second state, the elastic element 222 is located within the closed chamber 10, to prevent the elastic element 222 from contacting with water and causing rust or function degradation.

[0018] As shown in FIG. 7, the plugging member 221 includes a plugging block 2210 and an extension 2211 extending from the plugging block 22 toward the inside of the closed chamber A. A positioning groove 211 is provided on an inner wall surface of an end of the main body 21 opposite to the opening 2101. One end of the elastic element 222 is sleeved on the extension 2211 and abuts against the plugging block 2210, and the other end of the elastic element 222 extends into the positioning groove 211 and abuts against a groove wall of the positioning groove 211. The elastic element 222 of the embodiment of the present application is a spring, and the plugging block 221 adopts a piston.

[0019] As shown in FIG. 3, under the normal use condition (the first state), the plugging block 221 is in a balanced position under the combined action of the elastic element 222 and the normal operating water pressure. As shown in FIG. 4, when the air temperature is low (the second state), the water in the water chamber 10 of the water outlet valve 1 freezes, the plugging member 221 is moved away from the opening under the driving force of freezing expansion, the elastic element 222 is compressed, and the cavity 210 of the anti-freeze crack device 2 releases the release chamber B. With the expansion volume of ice increasing, the driving force becomes larger, resulting in a larger space of the release

chamber B and a larger space for containing ice. After unfreezing, the plugging member 221 returns to an initial position under the combined action of the spring element 222 and the water pressure.

[0020] As shown in FIG. 6, a side wall surface of the plugging block 221 mates with and seals against a side wall surface of the cavity 210. The plugging assembly 22 further includes a first sealing member 223 that seals a mating and sealing position between the side wall surface of the plugging block 221 and the side wall surface of the cavity 210.

[0021] As shown in FIG. 7, a mounting groove 2212 is provided on a side wall of the plugging block 221, and the first sealing member 223 is mounted in the mounting groove 2212. In the first state, the first sealing member 223 can prevent the water in the water chamber 10 from entering the cavity 210 and occupying the space of the cavity 210. In the second state, the first sealing member 223 can prevent water in the water chamber 10 from entering the closed chamber A, thereby keeping no residual water within the cavity 210 after thawing. In this embodiment, the first sealing member 223 employs a seal ring.

[0022] As shown in FIGS. 5 and 6, the main body 21 is provided with a connecting portion 23 which can be installed in conjunction with the water outlet valve 1, and the connecting portion is a connection joint protruding from the open end. An internal thread 230 is provided in the connection joint, and the internal thread 230 is located on a side of the open end away from the plugging assembly 22.

[0023] The anti-freeze crack device 2 further includes a second sealing member 24 sleeved at the connecting portion and limited to the connecting portion. The anti-freeze crack device 2 further includes a mounting portion 25 arranged at one end opposite to the open end, which is used to cooperate with an installation tool to realize mounting and fastening of the anti-freeze crack device 2.

[0024] As shown in FIG. 1, when the water outlet valve 1 is designed and manufactured, it is inevitable that a molding process hole 11 communicating with the water chamber 10 is left, and a plug is used to seal the molding process hole 11 after the manufacturing is completed. The anti-freeze crack device 2 of the embodiment of the present application is configured to be installed in conjunction with the molding process hole 11. The molding process hole 11 is provided with an external thread 110 installed in conjunction with an internal thread 230 provided in the connection joint 23 of the anti-freeze crack device 2, so that the anti-freeze crack device 2 of the present application can be installed without changing the structure of the water outlet valve 1 itself, and the cost can be greatly reduced.

[0025] The anti-freeze crack device 2 of the embodiment of the present application has the advantages of simple structure, low cost, automatic operation of the process, no need to disassemble the product shell of the water outlet valve 1, flexible combination, mass pro-

duction and good economic benefits.

[0026] As shown in FIGS. 8 to 14, the embodiments of the present application provide a water outlet device 100a and an anti-freeze crack device 2a according to another embodiment. The water outlet device 100a includes a water outlet valve 1a, and an anti-freeze crack device 2a installed in conjunction with the water outlet valve 1a, and the anti-freeze crack device 2a communicates with a water chamber 10a of the water outlet valve 1a.

[0027] The main difference between the water outlet device 100a in this embodiment and the water outlet device 100 of the first embodiment is that the structure and number of the molding process holes 11a are different from those of the molding process holes 11. The rest can be referred to the water outlet device 100 of the first embodiment, which will not be repeated here. An inner wall surface of the molding process hole 11a of the water outlet device 100a in this embodiment is provided with an internal thread 110a, and the number of the molding process hole 11a is two.

[0028] As shown in FIGS. 12-14, the anti-freeze crack device 2a of the embodiment of the present application includes a main body 21a, and a plugging assembly 22a, the main body 21a is provided with a cavity 210a with an open end, and the open end of the cavity 210a is configured to communicate with the water chamber 10a of the water outlet valve 1a. The plugging assembly 22a is provided in the cavity 210a and can be switched between a first state in which the open end is closed and a second state in which the open end is opened. The plugging assembly 22a is provided and movable within the cavity 210a, and in the second state, divides the cavity 210a into a closed chamber A and a release chamber B which is configured to communicate with the water chamber 10 of the water outlet valve 1.

[0029] The main difference between the anti-freeze crack device 2a in this embodiment and the anti-freeze crack device 2 of the first embodiment is that, a structure of a connecting portion 23a where the anti-freeze crack device 2a is installed in conjunction with the water outlet valve 1a and the structure of the connecting portion 23 where the anti-freeze crack device 2 is installed in conjunction with the water outlet valve 1 are different, and the rest can be referred to the anti-freeze crack device 2 of the first embodiment, which will not be repeated here.

[0030] The main body 21a of the anti-freeze crack device 2a in this embodiment is provided with a connecting portion 23a which can be installed in conjunction with the water outlet valve 1a. The connecting portion 23a includes an external thread 230a provided on an outer side wall of the main body 21a. The external thread 230a mates with an internal thread 110a provided on an inner wall surface of the molding process hole 11a, and the anti-freeze crack device 2a can be at least partially accommodated in the molding process hole 11a. There are a plurality of anti-freeze crack device 2a installed in correspondence with a plurality of molding process holes 11a.

[0031] The anti-freeze crack device 2a in this embodiment further includes a first sealing member 223a and a second sealing member 24a, and the structure and installation of the first sealing member 223a and the second sealing member 24a can refer to the second sealing member 24 of the anti-freeze crack device 2 of the first embodiment, and will not be described herein. The anti-freeze crack device 2a in this embodiment further includes a third sealing member 26a, which is installed on an outer ring of the main body 21a and is located between end faces where the molding process hole 11a mates with the connecting portion 23a.

[0032] In the embodiments of the present application, the molding process holes 11 and 11a of the original water outlet valve 1 are fully utilized to connect with the anti-freeze crack devices 2 and 2a, without the need for additionally processing of the water outlet valves 1 and 1a. Moreover, according to the thread requirements of the molding process holes 11 and 11a, the connections can be categorized into internal thread connection mode and external thread connection mode, which are highly flexible. Additionally, installation can be easily accomplished by a wrench, which is simple and convenient.

[0033] The anti-freeze crack devices 2, 2a of the embodiment of the present application has the advantages of simple structure, low cost, automatic operation of the process, no need to disassemble the product shell of the water outlet valve 1, flexible combination, mass production and good economic benefits. In the description of the present application, it should be noted that the orientation or position relationships indicated by the terms "upper", "lower", "one side", "the other side", "one end", "the other end", "side", "relative", "four corners", "periphery" and "□ structure" or the like are based on the orientation or position relationships shown in the drawings, which are only for convenience of describing the present application and simplifying the description, rather than indicating or implying that the structure referred has the specific orientation, or is constructed and operated in the specific orientation, and thus cannot be interpreted as a limitation on the present application.

[0034] In the description of the embodiments of the present application, unless otherwise explicitly specified and limited, the terms "connection", "direct connection", "indirect connection", "fixed connection", "installation" and "assembly" should be understood in a broad sense. For example, it may be a fixed connection, a detachable connection or an integrated connection; and the terms "mounting", "connection" and "fixed connection" may be a direct connection, or an indirect connection through an intermediate medium, or may be an internal communication between two elements. For those of ordinary skills in the art, specific meanings of the above terms in embodiments of the present application can be understood according to situations.

[0035] Although implementations disclosed in the present application are described above, the described contents are only implementations adopted for facilitating

understanding of the present application, and are not intended to limit the present application. Without departing from the spirit and scope disclosed in the present application, any person skilled in the art to which the present application pertains may make any modifications and changes in the form and details of implementation, but the scope of patent protection of the present application shall still be defined by the appended claims.

Claims

1. An anti-freeze crack device comprising:

a main body provided with a cavity with an open end, the open end of the cavity being configured to communicate with a water chamber of a water outlet valve; and

a plugging assembly disposed in the cavity and capable of being switched between a first state in which the open end is closed and a second state in which the open end is opened.

2. The anti-freeze crack device according to claim 1, wherein the plugging assembly is movable within the cavity and divides the cavity into a closed chamber and a release chamber in the second state, and the release chamber is configured to communicate with the water chamber of the water outlet valve.

3. The anti-freeze crack device according to claim 2, wherein the plugging assembly comprises a plugging member capable of closing an opening, and an elastic element cooperating with the plugging member, and the elastic element is configured to provide power for the plugging member to move toward a position of closing the open end.

4. The anti-freeze crack device according to claim 3, wherein the elastic element is positioned within the cavity and abuts against the plugging member and the main body, and when in the second state, the elastic element is positioned within the closed chamber.

5. The anti-freeze crack device according to claim 4, wherein the plugging member comprises a plugging block and an extension extending from one end of the plugging block located in the closed chamber in a direction away from the opening, and an inner wall surface of one end of the main body opposite to the open end is provided with a positioning groove; and one end of the elastic element is sleeved on the extension and abuts against the plugging block, and the other end of the elastic element extends into the positioning groove and abuts against a groove wall of the positioning groove.

6. The anti-freeze crack device according to claim 5, wherein a side wall surface of the plugging block mates with and seals against a side wall surface of the cavity; and the plugging assembly further comprises a first sealing member arranged at a mating and sealing position between the side wall surface of the plugging block and the side wall surface of the cavity, a side wall of the plugging block is provided with a mounting groove extending along a circumferential direction of the plugging block, and the first sealing member is installed in the mounting groove. 5 10
7. The anti-freeze crack device according to any one of claims 1 to 6, wherein the main body is provided with a connecting portion capable of installing in conjunction with the water outlet valve; 15
- the connecting portion comprises a connection joint protruding from the open end, an internal thread is arranged in the connection joint, and the internal thread is located on a side of the open end away from the plugging assembly; or the connecting portion comprises an external thread provided on an outer side wall of the main body. 20 25
8. The anti-freeze crack device according to claim 7, further comprising a second sealing member sleeved at the connecting portion and limited to the connecting portion. 30
9. A water outlet device comprising: a water outlet valve and the anti-freeze crack device according to any one of claims 1 to 8, which is installed in conjunction with the water outlet valve; 35
- wherein in the first state, the cavity of the anti-freeze crack device is isolated from the water chamber of the water outlet valve; and in the second state, the cavity of the anti-freeze crack device communicates with the water chamber of the water outlet valve. 40
10. The water outlet device according to claim 9, wherein the water outlet valve comprises a molding process hole communicating with the water chamber, and the anti-freeze crack device is installed in conjunction with the molding process hole. 45 50
11. The water outlet device according to claim 10, wherein an outer wall surface of the molding process hole is provided with an external thread that mates with an internal thread of the anti-freeze crack device; or an inner wall surface of the molding process hole is provided with an internal thread that mates with an external thread of the main body of the anti-freeze 55

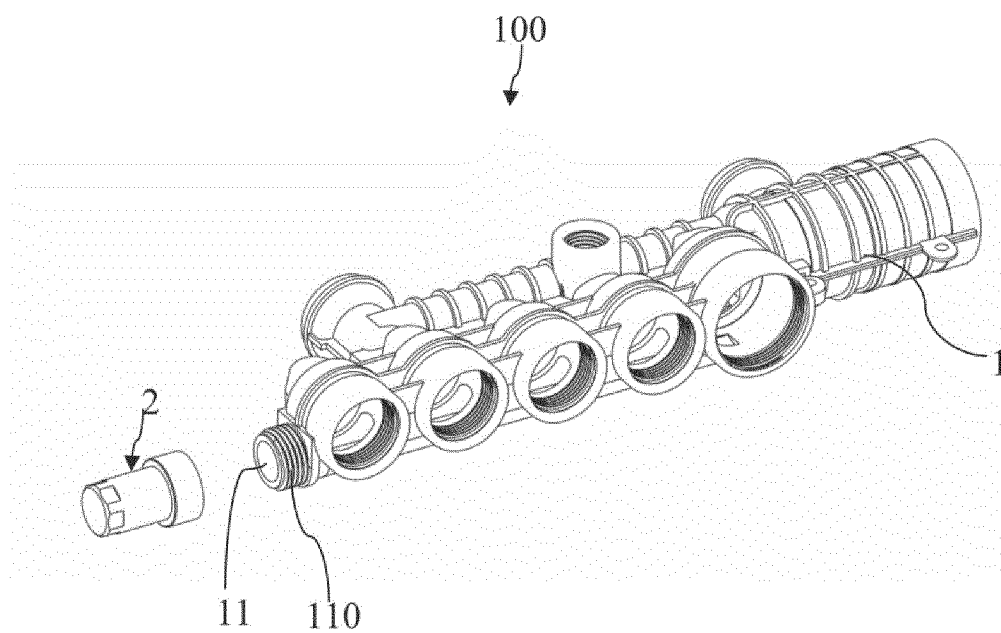


FIG. 1

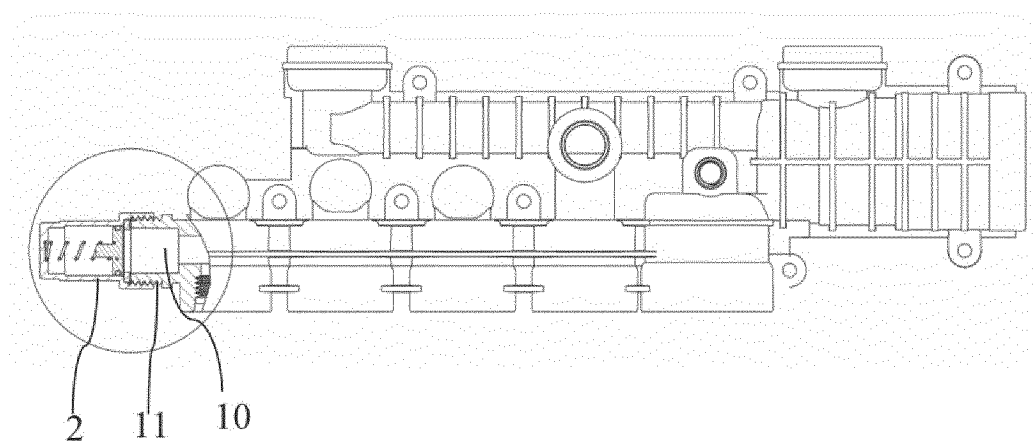


FIG. 2

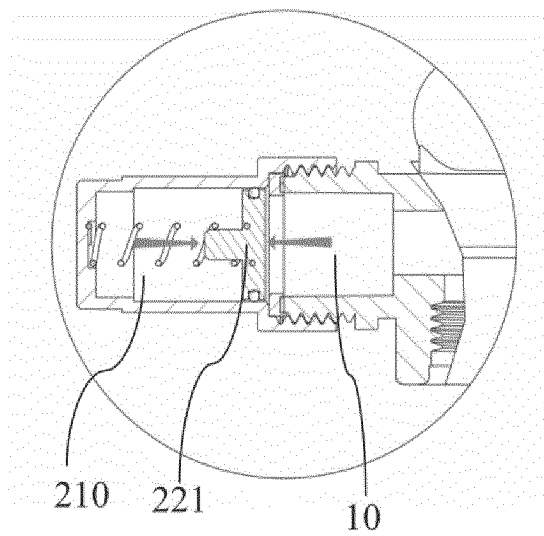


FIG. 3

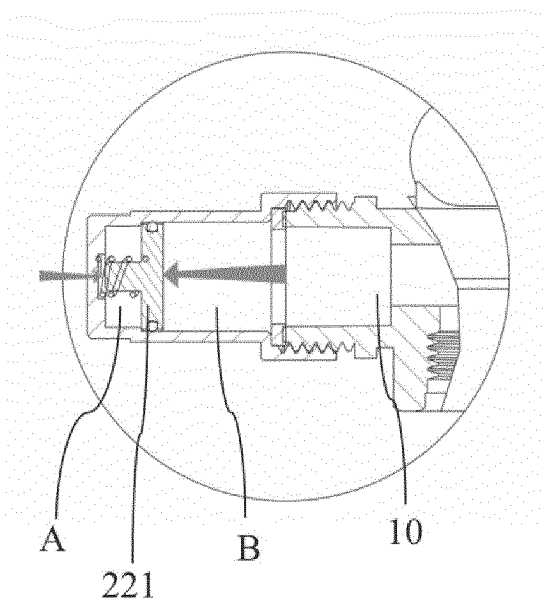


FIG. 4

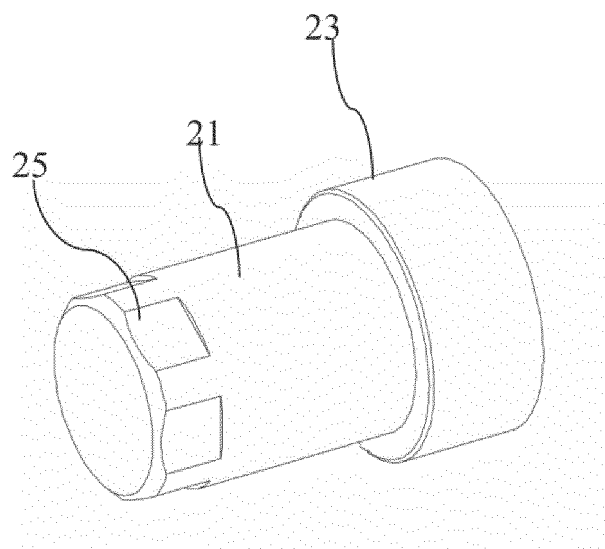


FIG. 5

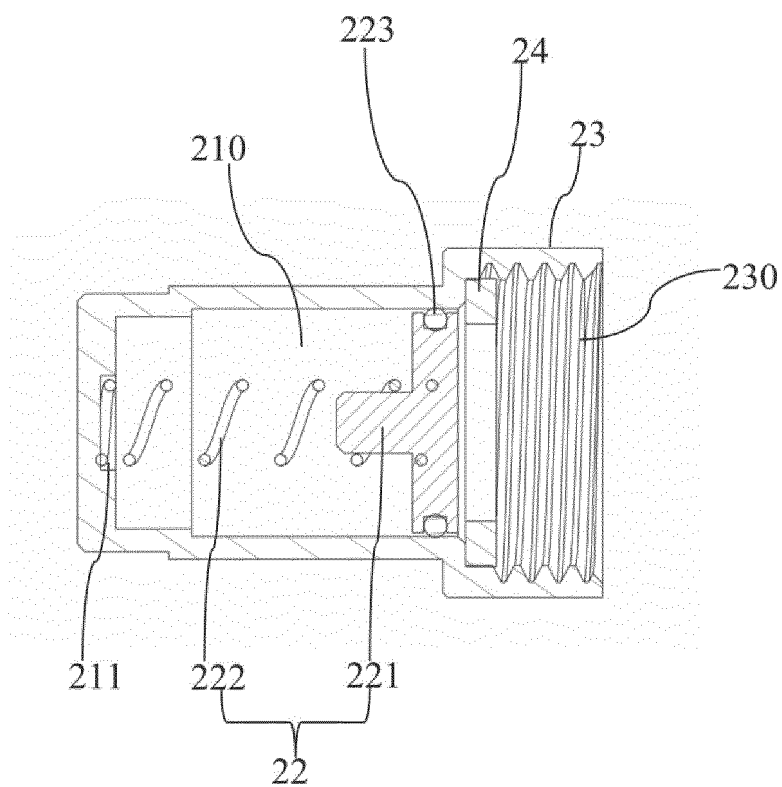


FIG. 6

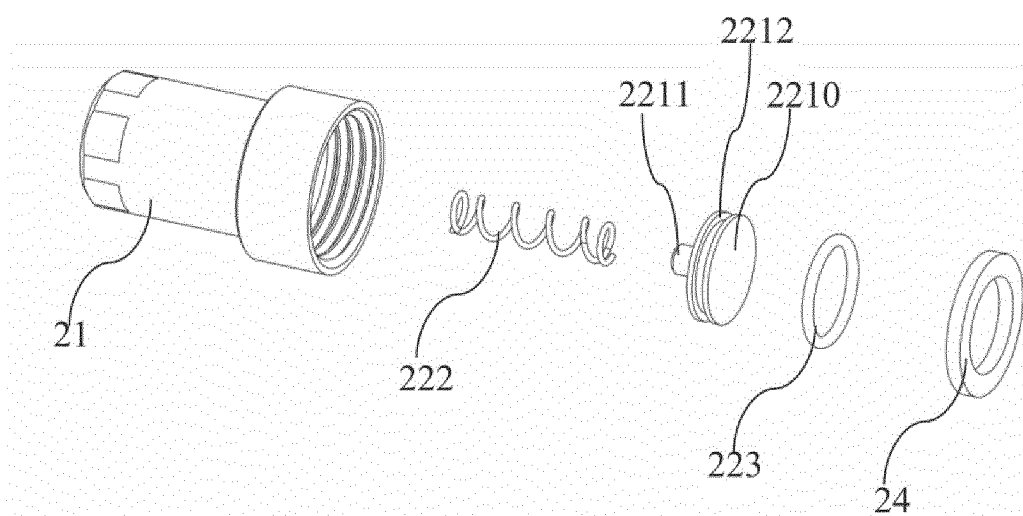


FIG. 7

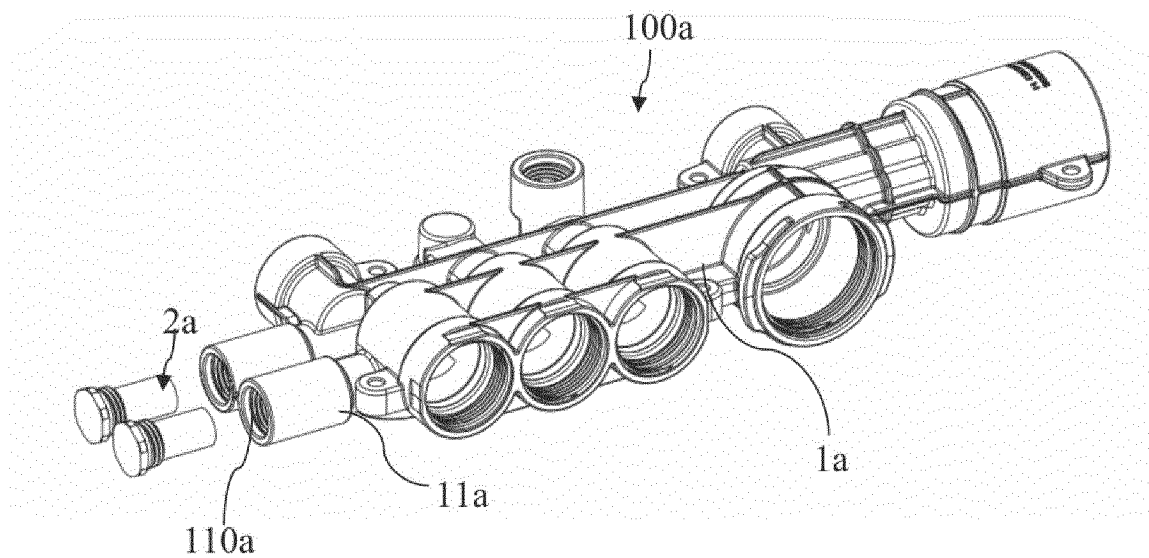


FIG. 8

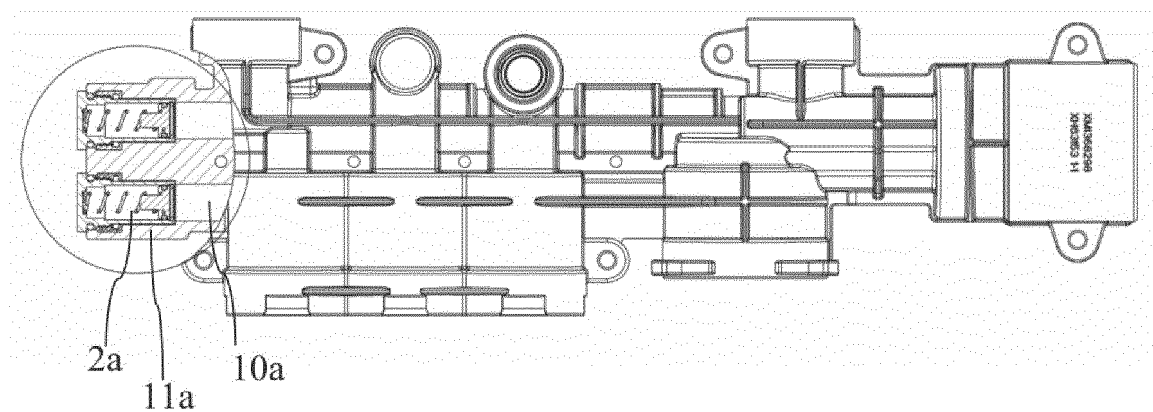


FIG. 9

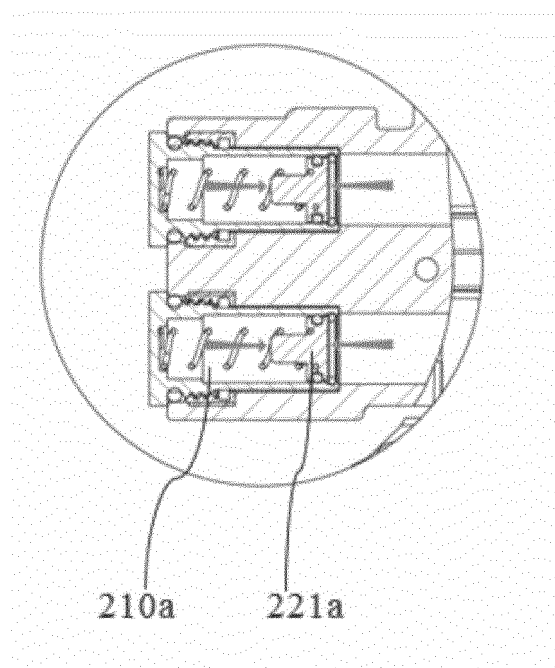


FIG. 10

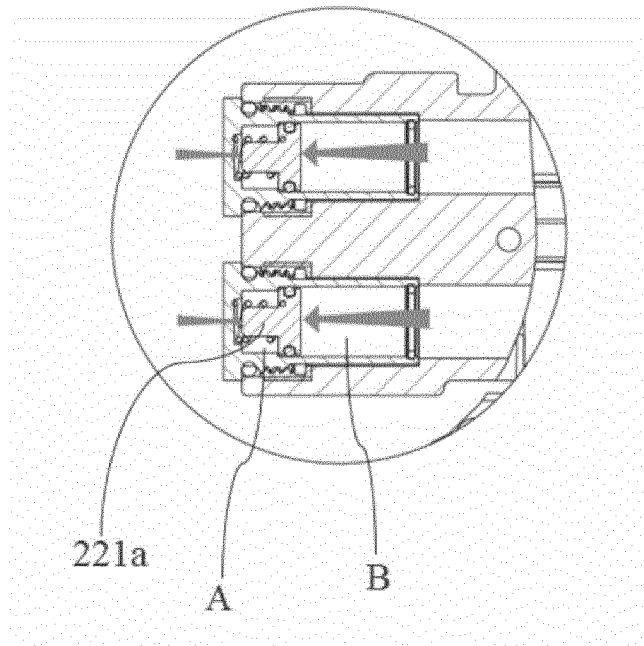


FIG. 11

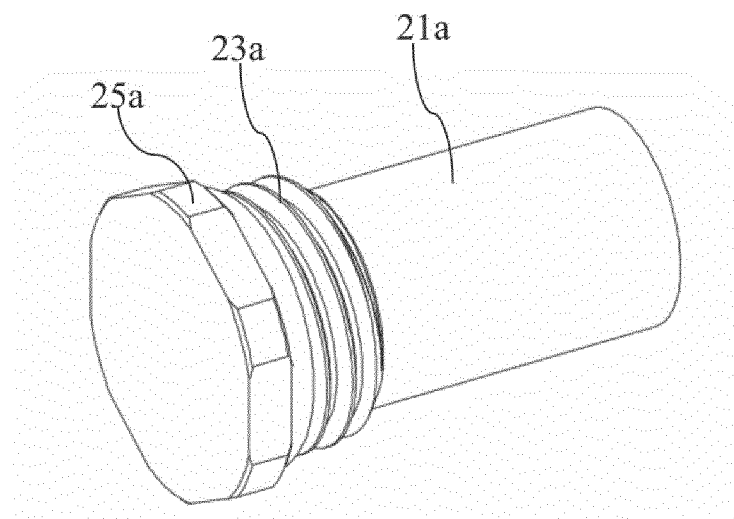


FIG. 12

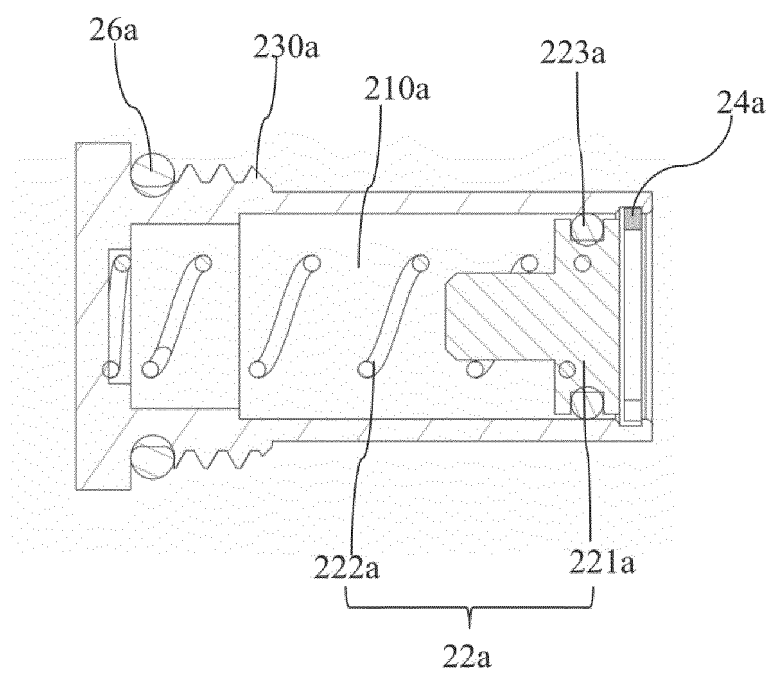


FIG. 13

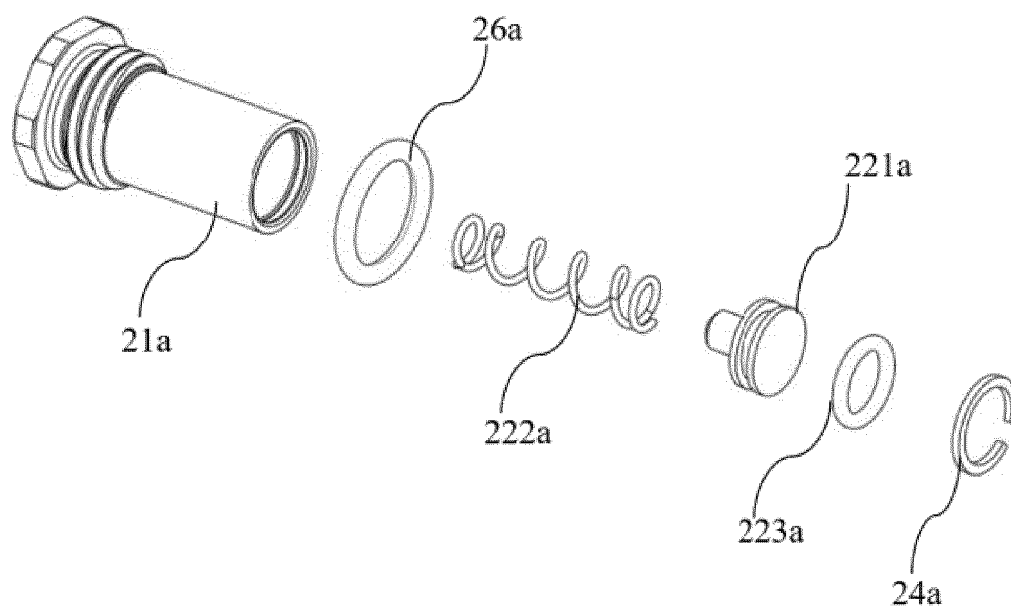


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/116758

A. CLASSIFICATION OF SUBJECT MATTER

F16L15/04(2006.01)i; F16L15/00(2006.01)i; E03B7/10(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F16L,E03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, VEN, ENTXTC, DWPI, CJFD: 福建西河卫浴科技有限公司, 出水阀, 阀体, 冻裂, 封堵, 弹簧, 弹性, 膨胀, 体积, 结冰, 移动, 活塞, 螺纹, 可拆卸, water, outlet, valve, freeze+, plug+, spring?, expansion, volume, ice, mov+, piston, thread, screw, detach+.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 220910718 U (FUJIAN XIHE SANITARY WARE TECHNOLOGY CO., LTD.) 07 May 2024 (2024-05-07) description, paragraphs 41-62, and figures 1-14	1-11
X	CN 206112214 U (A.O.SMITH (CHINA) WATER HEATER CO., LTD.) 19 April 2017 (2017-04-19) description, paragraphs 36-76, and figures 1-3	1-6, 9
Y	CN 206112214 U (A.O.SMITH (CHINA) WATER HEATER CO., LTD.) 19 April 2017 (2017-04-19) description, paragraphs 36-76, and figures 1-3	7, 8, 10, 11
Y	CN 210566528 U (GUANGZHOU SEAGULL HOUSING INDUSTRY CO., LTD.) 19 May 2020 (2020-05-19) description, paragraphs 24-37, and figures 1-3	7, 8, 10, 11
X	CN 105696652 A (SHEN YUZHONG) 22 June 2016 (2016-06-22) description, paragraphs 14-25, and figure 1	1-4

☒ Further documents are listed in the continuation of Box C.
☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

21 November 2024

Date of mailing of the international search report

23 December 2024

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/116758

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 205479991 U (SHEN YUZHONG) 17 August 2016 (2016-08-17) description, paragraphs 12-21, and figure 1	1-4
A	CN 209585205 U (FOSHAN CITY SHUNDE AREA LEHUA CERAMIC SANITARY WARE CO., LTD.) 05 November 2019 (2019-11-05) entire document	1-11
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Information on patent family members

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REFERENCES CITED IN THE DESCRIPTION

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