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Faucet assembly and a bushing thereof

Abstract

A faucet assembly and a bushing thereof are described. The faucet assembly comprises a case, a drain tube and a bushing. The drain tube is assembled in the case. The drain tube has a first opening and a second opening extending coaxially from the first opening. The bushing set is at the first opening of the drain tube. The bushing is assembled to a water pipe extending from a wall. The case has an exit at a front end thereof. The second opening of the drain tube is connected to the exit. The bushing comprises a main body. The main body has a through opening formed therethrough to be assembled to a water pipe. The main body further comprises a water-inlet portion, a water-outlet portion, and a protruding portion between the water-inlet portion and the water-outlet portion. The protruding portion is thicker than both of the water-inlet portion and the water-outlet portion of the main body. The water-outlet portion has an outer surface and an inner surface.

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Background/Summary

BACKGROUND

Field of Invention

(1) The present invention relates generally to a faucet, and, more specifically, to a faucet assembly and a bushing thereof.

Description of Related Art

(2) Usually, a faucet is assembled to a wall so as to connect to a water pipe on the wall. However, the water pipes in the area have various types. If the faucet is not suitable for the water pipe, the faucet would not be able to connect to the water pipe.

(3) The present invention is, therefore, arisen to obviate or at least mitigate the above mentioned disadvantages.

SUMMARY OF THE INVENTION

(4) According to one aspect of the present disclosure, a bushing is provided. The bushing is set at a drain tube. The bushing comprises a main body. The main body has a through opening formed therethrough to be assembled to a water pipe. The main body further comprises a water-inlet portion, a water-outlet portion, and a protruding portion between the water-inlet portion and the water-outlet portion. The protruding portion is thicker than both of the water-inlet portion and the water-outlet portion of the main body. The water-outlet portion has an outer surface and an inner surface. The bushing further comprises a first slope between the water-inlet portion and the protruding portion. The bushing further comprises a second slope between the water-outlet portion and the protruding portion. The bushing further comprises a first ring groove formed in the outer surface of the water-outlet portion. The bushing further comprises a first ring member positioned in the first ring groove. The bushing further comprises a second ring groove formed in the inner surface of the water-outlet portion. The bushing further comprises a second ring member positioned in the second ring groove. The drain tube has a first opening and a second opening extending coaxially from the first opening. The bushing is set at the first opening of the drain tube. The first

opening is larger in diameter than the second opening of the drain tube. The bushing further comprises a step portion defined between the first opening and the second opening. The water-outlet portion of the main body is adjacent to the step portion. The first opening has an inner side adjacent to the step portion. The first ring member is adjacent to the inner side of the first opening.

(5) According to one aspect of the present disclosure, a faucet assembly is provided. The faucet assembly comprises a case, a drain tube and a bushing, the drain tube assembled in the case, the drain tube having a first opening and a second opening extending coaxially from the first opening, the bushing set at the first opening of the drain tube, the bushing assembled to a water pipe extending from a wall, the case having an exit at a front end thereof, the second opening of the drain tube connected to the exit.

(6) The bushing comprises a main body having a through opening formed therethrough to be assembled to a water pipe, the main body comprising a water-inlet portion, a water-outlet portion, and a protruding portion between the water-inlet portion and the water-outlet portion. The water-outlet portion having an outer surface and an inner surface. The faucet assembly further comprises a threaded hole formed on the water-inlet portion of the main body. The protruding portion is thicker than both of the water-inlet portion and the water-outlet portion of the main body. The water-outlet portion and the water-inlet portion have the same thickness. The protruding portion is thicker than both of the water-inlet portion and the water-outlet portion of about 3.6 mm. The faucet assembly further comprises a knob **17** being movable to control an on-off state of the drain tube.

(7) Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

(8) The present invention will become more obvious from the following description when taken in connection with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment(s) in accordance with the present invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

- (1) FIG. **1** is a three-dimensional schematic diagram of a faucet assembly according to a first preferred embodiment of the present invention.
- (2) FIG. **2** is a three-dimensional schematic diagram of a faucet assembly according to a second preferred embodiment of the present invention.
- (3) FIG. **2A** is a schematic cross-sectional view of a bushing according to the second preferred embodiment of the present invention.
- (4) FIG. **3** is a three-dimensional schematic diagram of a faucet assembly according to a third preferred embodiment of the present invention.
- (5) FIG. **4** is a three-dimensional schematic diagram of a faucet assembly according to a fifth preferred embodiment of the present invention.
- (6) FIG. **5** is a three-dimensional schematic diagram of a drain tube, a bushing and a case according to the second preferred embodiment of the present invention.
- (7) FIG. **6** is a schematic cross-sectional view of a drain tube, a bushing and a water tube according to the second preferred embodiment of the present invention.

DETAILED DESCRIPTION

(8) Plural embodiments of the present disclosure are disclosed through drawings. For the purpose of clear illustration, many practical details will be illustrated along with the description below. It should be understood that, however, these practical details should not limit the present disclosure. In other words, in embodiments of the present disclosure, these practical details are not necessary. In addition, for the purpose of simplifying the drawings, some conventional structures and

components are simply and schematically depicted in the figures.

(9) It is to be understood that although particular phrases used herein, such as “first”, “second”, “third”, and so on, are used to describe different components, members, regions, layers, and/or sections, these components, members, regions, layers, and/or sections should not be limited by these terms. These phrases are used to distinguish one component, member, region, layer, or section from another component, member, region, layer, or section. In this way, a first component, member, region, layer, and/or section to be described below may be referred to as a second component, member, region, layer, and/or section, without departing from the spirit and scope of the present disclosure.

(10) Spatially relative phrases, such as “onto”, “on”, “over”, “under”, “below”, “underlying”, “beneath”, “above”, and so on used herein, are used for facilitating description of a relation between one component or feature and another component or feature depicted in the drawings. Therefore, it can be understood that, in addition to directions depicted in the drawings, the spatially relative terms mean to include all different orientations during usage or operations of the device. For example, it is assumed that a device in a figure is reversed upside down, a component described as being “under”, “below”, or “beneath” another component or feature is oriented “onto” or “on” the other component or feature. Therefore, these exemplary terms “under” and “below” may include orientations above and below. The device may be otherwise oriented (e.g., turned by 90 degrees, or other orientations), and the spatially relative terms used herein should be explained accordingly.

(11) Accordingly, it may be understood that when a component or a layer is referred to as being “onto”, “on”, “connected to”, or “coupled to” another component or another layer, it may be immediately on the other component or layer, or connected to or coupled to the other component or layer, or there may be one or more intermediate components or intermediate layers. Further, it can be understood that when a component or a layer is referred to as being “between” two components or two layers, it may be the only component or layer between the two components or layers, or there may be one or more intermediate components or intermediate layers.

(12) Terminologies used herein are only for the purpose of describing particular embodiments, but not limiting the present disclosure. The singular form of “a” and “the” used herein may also include the plural form, unless otherwise indicated in the context. Accordingly, it can be understood that when there terms “include” or “comprise” are used in the specification, it clearly illustrates the existence of a specified feature, bulk, step, operation, component, and/or member, while not excluding the existence or addition of one or more features, bulks, steps, operations, components, members and/or groups thereof. “And/or” used herein includes any and all combinations of one or more related terms that are listed. When a leading word, such as “at least one of”, is added ahead of a component list, it is to describe the entire component list, but not individual components among the lists.

(13) Unless otherwise specified, in the description of the present invention, it should be noted that “at” “assembled to”, “adjacent to” “positioned in”, “formed in”, “between”, “extending coaxially from”, “extending from”, “on”, “in”, “connected” should be understood in a broad sense, for example, a detachable connection, a fixed connection, an integrally formed connection, or an integrally formed, mechanical connection or electrical connection. It can be directly connected or indirectly connected through an intermediate. It can be the internal communication of two components. One of ordinary skill in the field may understand the specific meanings of the above terms in the present invention.

(14) FIG. 1 is a three-dimensional schematic diagram of a faucet assembly according to a first preferred embodiment of the present invention. Referring to FIG. 1, the faucet assembly of the invention comprises a case **10** and a drain tube **70**. The drain tube **70** may be assembled in the case **10**. The material of the drain tube **70** is, for example, polyoxymethylene (POM for short).

(15) Referring to FIG. 1, the faucet assembly may further comprise a female thread **10a** formed at a

front end of the case **10**. The faucet assembly may further comprise a male thread **70a** may be formed at an end of the drain tube **70**. The female thread **10a** of the case **10** may be screwed to the male thread **70a** of the drain tube **70**. A water pipe **91C** may be assembled in the drain tube **70**. The length of water pipe **91C** outside the wall **8** may be, for example, about $\frac{1}{2}$ inches. A male thread **91c** may be formed at an end of the water pipe **91C**. The water pipe **91C** may have a size of about $\frac{3}{4}$ inches. The female thread **10a** of the water pipe **91C** may be screwed to the male thread **91c** of the drain tube **70**.

(16) FIG. 2 is a three-dimensional schematic diagram of a faucet assembly according to a second preferred embodiment of the present invention. Referring to FIG. 2, the faucet assembly may comprise a case **10**, a drain tube **70**, and a bushing **60**. The drain tube **70** may be assembled in the case **10**. The drain tube **10** may have a first opening **72** and a second opening **73** extending coaxially from the first opening **72**. The first opening **72** may be larger in diameter than the second opening **73** of the drain tube **70**. The bushing **60** may be set at the first opening **72** of the drain tube. The bushing **60** may be assembled to a water pipe **91B** extending from a wall **8**. The case **10** may have an exit **11** at a front end **12** thereof.

(17) Referring to FIG. 2, the faucet assembly may further comprise a female thread **10a** formed at a front end of the case **10**. The faucet assembly may further comprise a male thread **70a** may be formed at an end of the drain tube **70**. The female thread **10a** of the case **10** may be screwed to the male thread **70a** of the drain tube **70**. The second opening **73** of the drain tube **70** may be connected to the exit **11** by screwing the female thread **10a** of the case to the male thread **70a** of the drain tube **70**. The bushing **60** may be assembled in the first opening **72** of the drain tube **70**. The material of the bushing **60** may be, for example, aluminum (Al).

(18) Referring to FIG. 2, a water pipe **91A** may be assembled in the drain tube **70**. The length of the water pipe **91A** outside the wall **8** may be, for example, about 1-2 inches. The water pipe **91A** may have a size of about $\frac{1}{2}$ inches. The water pipe **91A** may be assembled in the bushing **60**. The bushing **60** may be assembled to the water tube **91A** and surrounded by the first opening **72** of the drain tube **70**.

(19) FIG. 2A is a schematic cross-sectional view of a bushing according to the second preferred embodiment of the present invention. Referring to FIG. 2 and FIG. 2A, the bushing **60** may comprise a main body having a through opening **60c** formed therethrough to be assembled to the water pipe **91A**. The main body **61** may comprise a water-inlet portion **63**, a water-outlet portion **82**, and a protruding portion **52** between the water-inlet portion **63** and the water-outlet portion **82**. The protruding portion **52** is not threaded.

(20) Referring to FIG. 2, the water from the water pipe **91A** could flow into the drain tube **70**. The on-off state of the drain tube **22** may be controlled so as to allow the water to flow out or not. In an "on" state, water flows from the water-inlet portion **63** to the water-outlet portion **82** of the bushing **60**.

(21) Referring to FIG. 2A, the bushing **60** may comprise a first slope **53** between the water-inlet portion **63** and the protruding portion **52**. The bushing **60** may comprise a second slope **83** between the water-outlet portion **82** and the protruding portion **52**. The protruding portion **52** comprises a smooth surface **52b** between the first slope **53** and the second slope **83**.

(22) FIG. 6 is a schematic cross-sectional view of a drain tube, a bushing and a water tube according to the second preferred embodiment of the present invention. Referring to FIG. 6, the water-outlet portion **82** may have an outer surface **82a** and an inner surface **82b**.

(23) Referring to FIG. 6 and FIG. 2A, the bushing **60** may comprise a first ring groove **88** formed in the outer surface **82a** of the water-outlet portion **82**. The depth of the first ring groove **88** may be about 1.7 mm. The width of the first ring groove **88** may be about 2.6 mm. The bushing **60** may comprise a first ring member **66** positioned in the first ring groove **88**. The first ring member **66** is not adjacent to the second slope **83**, the smooth surface **52b** or the slope **53** of the protruding portion **52**. The first ring member **66** in the first ring groove **88** may be partially exposed.

(24) The material of the first ring member **66** may be rubber. The first ring member **66** may be an O-ring. The bushing **60** may comprise a second ring groove **84** formed in the inner surface **82b** of the water-outlet portion **82**. The second ring groove **84** is not in the protruding portion **52**. The second ring groove **84** is not in the second slope **83**.

(25) The bushing **60** may comprise a second ring member **27** positioned in the second ring groove **84**. The second ring groove **84** may have a depth of about 1.45 mm. The second ring groove **84** may have a width of about 2.6 mm. The material of the second ring member **27** may be rubber.

(26) FIG. **6** is a schematic cross-sectional view of a drain tube, a bushing and a water tube according to the second preferred embodiment of the present invention. Referring to FIG. **2A** and FIG. **6**, the drain tube **70** may have a first opening **72** and a second opening **73** extending coaxially from the first opening **72**. The bushing **60** is set at the first opening **72** of the drain tube **70**. The first opening **72** is larger in diameter than the second opening **73** of the drain tube **70**.

(27) Referring to FIG. **6**, the faucet assembly may comprise a step portion **75** defined between the first opening **72** and the second opening **73**. The water-outlet portion **82** of the main body **61** may be adjacent to or may abut against the step portion **75**. The first opening **72** has an inner side **74** adjacent to the step portion **75**. The first ring member **66** may be adjacent to the inner side **74** of the first opening **72**.

(28) FIG. **5** is a three-dimensional schematic diagram of a drain tube, a bushing and a case according to the second preferred embodiment of the present invention. Referring to FIG. **2A** and FIG. **5**, the bushing **60** may further comprise a through opening **60c** and a threaded hole **63a** formed on the water-inlet portion **63** of the main body **62**.

(29) Referring to FIG. **6** and FIG. **5**, the threaded hole **63a** communicates with the through opening **60c**. The bushing **60** may further comprise a screw **31** screwed into the threaded hole **63** (FIG. **6**) until the screw **31** abuts against the water pipe **91A** (FIG. **2**), so as to tighten one portion of the water pipe **91A** in the bushing **60**.

(30) Referring to FIG. **2A**, the water-outlet portion **82** and the water-inlet portion **63** may have the same thickness of about but not limited to about 22.3 millimeters (mm). The protruding portion **52** may be thicker than both of the water-inlet portion **63** and the water-outlet portion **82** of about but not limited to 3.6 mm. That is also one reason why the protruding portion **52** called “protruding” portion **52**. The thickness of the protruding portion **52** may be about 25.9 mm.

(31) Referring to FIG. **5**, the faucet assembly further comprises a knob **17** being movable to control an on-off state of the drain tube. The material of the knob **17** is, for example, ZINC or Zinc alloy. The faucet assembly may further comprise a rod **13**. The material of the rod **13** is, for example, copper. The O-ring **15** may be installed between the knob **17** and the rod **13**.

(32) Referring to FIG. **2** and FIG. **5**, the faucet assembly may further comprise a knob being movable to control an on-off state of the drain tube. In an “on” state of the drain tube **70**, water flows from the water pipe **91A**, through water pipe to the exit **11** of the case **10**. In an “off” state of the drain tube **70**, water does not flow.

(33) Referring to FIG. **5**, The water from the water pipe could flow into the drain tube **70**. The knob **17** could control the on-off state of the drain tube **22** so as to allow the water to flow out or not. The rod **13** is assembled at a bottom end of the knob **17**. The rod **13** is inserted from a top side of the case **10** into the case **10**. The faucet assembly may further comprise a gate **19** and a gate washer **21** in the exit **11**. The material of the case **10** is, for example, ZINC or zinc alloy. The material of exit **11** is, for example, zinc alloy. The material of the gate washer **21** may be rubber. The material of the gate **19** is, for example, polyoxymethylene (POM).

(34) Referring to FIG. **2A**, the bushing **60** may further comprise a third ring groove **63b**. The depth of the third ring groove **63b** may be about 10.4 mm. The third ring groove **63b** may have a width of about 4 mm.

(35) FIG. **3** is a three-dimensional schematic diagram of a faucet assembly according to a third preferred embodiment of the present invention. Referring to FIG. **3**, the faucet assembly may

comprise a case **10**, a drain tube **70**, and a bushing **33**. The drain tube **70** may be assembled in the case **10**. The drain tube **10** may have a first opening **72** and a second opening **73** extending coaxially from the first opening **72**. The first opening **72** may be larger in diameter than the second opening **73** of the drain tube **70**. The bushing **33** may be set at the first opening **72** of the drain tube. The bushing **33** may be assembled to a water pipe **91B** extending from a wall **8**. The case **10** may have an exit **11** at a front end **12** thereof.

(36) Referring to FIG. **3**, the faucet assembly may further comprise a female thread **10a** formed at a front end of the case **10**. the faucet assembly may further comprise a male thread **70a** may be formed at an end of the drain tube **70**. The female thread **10a** of the case **10** may be screwed to the male thread **70a** of the drain tube **70**. The second opening **73** of the drain tube **70** may be connected to the exit **11** by screwing the female thread **10a** of the case to the male thread **70a** of the drain tube **70**.

(37) Referring to FIG. **3**, the bushing **33** may, for example, have a male thread **33a** thereon and a female thread **33b** therein. The bushing **33** may be assembled in the first opening **72** of the drain tube **70**. The material of the bushing **33** may be, for example, polyoxymethylene (POM).

(38) Referring to FIG. **3**, a water pipe **91B** may be assembled in the drain tube **70**. The length of water pipe **91B** outside the wall **8** may be, for example, about $\frac{1}{2}$ inches. A male thread **91b** may be formed at an end of the water pipe **91B**. The water pipe **91B** may have a size of about $\frac{1}{2}$ inches. The female thread **10a** of the water pipe **91B** may be screwed to the bushing **33**. The bushing **33** may be assembled to the water tube **91B** and surrounded by the first opening **72** of the drain tube **70**.

(39) FIG. **4** is a three-dimensional schematic diagram of a faucet assembly according to a fifth preferred embodiment of the present invention. Referring to FIG. **4**, the faucet assembly comprises a case **10** and a female thread **10a** formed at a front end of the case **10**. A water pipe **91D** may be assembled in case **10**. The length of water pipe **91D** outside the wall **8** may be, for example, about $3\frac{7}{8}$ inches. A male thread **91d** may be formed at an end of the water pipe **91D**. The water pipe **91D** may have a size of about $\frac{1}{2}$ inches. The female thread **10a** of the water pipe **91D** may be screwed to the male thread **10a** of the case **10**.

(40) According to the preferred embodiments, the faucet assembly and the bushing thereof are all suitable for a water pipe to be connected.

(41) It is understood that the various embodiments described herein are by way of example only and are not intended to limit the scope of the invention. For example, many of the materials and structures described herein may be substituted with other materials and structures without deviating from the spirit of the invention. The present invention as claimed may therefore include variations from the particular examples and preferred embodiments described herein, as will be apparent to one of skill in the art. It is understood that various theories as to why the invention works are not intended to be limiting.

Claims

1. A bushing set at a drain tube having a first opening and a second opening extending coaxially from the first opening, the bushing comprising: a main body having a through opening formed therethrough to be assembled to a water pipe, the main body comprising a water-inlet portion, a water-outlet portion, and a protruding portion between the water-inlet portion and the water-outlet portion; the protruding portion being thicker than both of the water-inlet portion and the water-outlet portion of the main body; the water-outlet portion having an outer surface and an inner surface; and a step portion being defined between the first opening and the second opening of the drain tube, wherein the water-outlet portion of the main body is adjacent to the step portion.
2. The bushing of claim 1, further comprising a first slope between the water-inlet portion and the protruding portion.

3. The bushing of claim 1, further comprising a second slope between the water-outlet portion and the protruding portion.
 4. The bushing of claim 1, further comprising a first ring groove formed in the outer surface of the water-outlet portion.
 5. The bushing of claim 4, further comprising a first ring member positioned in the first ring groove.
 6. The bushing of claim 1, further comprising a second ring groove formed in the inner surface of the water-outlet portion.
 7. The bushing of claim 6, further comprising a second ring member positioned in the second ring groove.
 8. The bushing of claim 1, wherein the bushing is set at the first opening of the drain tube.
 9. The bushing of claim 1, wherein the first opening is larger in diameter than the second opening of the drain tube.
 10. The bushing of claim 1, wherein the first opening has an inner side adjacent to the step portion.
 11. The bushing of claim 10, wherein the first ring member is adjacent to the inner side of the first opening.
 12. A faucet assembly comprising: a case, a drain tube and a bushing, the drain tube assembled in the case, the drain tube having a first opening and a second opening extending coaxially from the first opening, the bushing set at the first opening of the drain tube, the bushing assembled to a water pipe extending from a wall, the case having an exit at a front end thereof, the second opening of the drain tube connected to the exit, wherein, the bushing comprises: a main body having a through opening formed therethrough to be assembled to a water pipe, the main body comprising a water-inlet portion, a water-outlet portion, and a protruding portion between the water-inlet portion and the water-outlet portion; the protruding portion being thicker than both of the water inlet portion and the water-outlet portion of the main body; the water-outlet portion having an outer surface and an inner surface; and a step portion being defined between the first opening and the second opening of the drain tube, wherein the water-outlet portion of the main body is adjacent to the step portion.
 13. The faucet assembly of claim 12, further comprising a threaded hole formed on the water-inlet portion of the main body.
 14. The faucet assembly of claim 12, wherein the water-outlet portion and the water-inlet portion have the same thickness.
 15. The faucet assembly of claim 12, wherein the protruding portion is thicker than both of the water-inlet portion and the water-outlet portion of about 3.6 mm.
 16. The faucet assembly of claim 12, further comprising a knob being movable to control an on-off state of the drain tube.
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