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

(11) **EP 3 845 111 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.07.2021 Bulletin 2021/27

(21) Application number: **19855309.1**

(22) Date of filing: **01.07.2019**

(51) Int Cl.:
A47L 15/22 *(2006.01)* ***A47L 15/42*** *(2006.01)*

(86) International application number:
PCT/CN2019/094275

(87) International publication number:
WO 2020/042752 (05.03.2020 Gazette 2020/10)

(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
Designated Extension States:
BA ME
KH MA MD TN

(30) Priority: **28.08.2018 CN 201810991115**
28.08.2018 CN 201821410963 U
28.08.2018 CN 201810990361
28.08.2018 CN 201821401305 U

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(54) SPRAYING ARM ASSEMBLY AND WASHING ELECTRIC APPLIANCE HAVING SAME

(57) A spraying arm assembly (1000) and a washing electric appliance having same. The spraying arm assembly (1000) comprises: a spraying arm (100), the spraying arm (100) having a spraying arm thread (121); a spraying arm base (200), the spraying arm (100) and the spraying arm base (200) being connected, and the spraying arm (100) being rotatable with respect to the spraying arm base (200); a ball assembly (300), the ball assembly (300) being provided at a position that the spraying arm (100) and the spraying arm base (200) are connected and matched, and the ball assembly (300) comprising a bearing substrate (3100) and a ball (330), the ball (330) being rotatably provided on the bearing substrate (3100), and the bearing substrate (3100) being provided with a ball thread matched with the spraying arm thread (121). The ball assembly (300) enables the form of friction between the spraying arm (100) and the spraying arm base (200) to be rolling friction, the hydrodynamic loss caused by the connection manner using a sliding friction form in the prior art is reduced, and the smoothness at the time of rotation of the spraying arm (100) can be improved and the noise can be lowered.

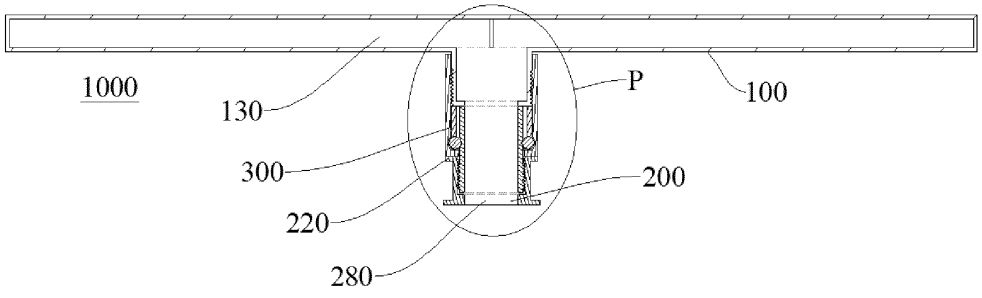

FIG. 2

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application Serial Nos. 201810991115.X, 201821410963.9, 201810990361.3 and 201821401305.3, all filed on August 28, 2018, and titled "Spray Arm and Washing Appliance Having Same", the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present disclosure relates to the technical field of household appliances, and more particularly to a spray arm and a washing appliance having same.

BACKGROUND

[0003] For an existing spray arm assembly, a spray arm is usually connected to a spray arm seat through a snap-fit with a flange, but this connection method will result in a relatively large gap between the spray arm and the spray arm seat. When the spray arm is working, water in the spray arm is easy to leak through the gap, which may affect a cleaning effect. In addition, when the spray arm and the spray arm seat produce relative motion, friction between the two is sliding friction, so hydrodynamic loss is relatively great. Moreover, the snap-fit connection directly causes height dimensions of the spray arm seat and the spray arm in an up-down direction to be large, which wastes space of an inner tank of a washing appliance and reduces space for the placement of objects to be cleaned inside the washing appliance.

SUMMARY

[0004] The present disclosure aims to solve at least one of the problems in the related art to a certain extent. To this end, the present disclosure provides a spray arm assembly that can reduce friction between a spray arm and a spray arm seat.

[0005] The present disclosure further provides a washing appliance having the above spray arm assembly.

[0006] A spray arm assembly according to embodiments of the present disclosure includes: a spray arm having a spray arm thread; a spray arm seat, the spray arm being connected to the spray arm seat and being rotatable relative to the spray arm seat; and a ball assembly arranged at a position where the spray arm and the spray arm seat are connected and cooperate, and including a bearing base and balls rotatably arranged on the bearing base, the bearing base being provided with a ball thread configured to cooperate with the spray arm thread.

[0007] For the spray arm assembly according to embodiments of the present disclosure, the spray arm and the spray arm seat are connected by the ball assembly, which can reduce friction between the spray arm and the spray arm seat, help to reduce the hydrodynamic loss, and decrease a height dimension of the spray arm assembly, thereby leaving more space for the placement of the tableware to be cleaned, and increasing the capacity of the dishwasher.

[0008] According to some embodiments of the present disclosure, the spray arm thread is a spray arm external thread, and the ball thread is a ball internal thread configured to cooperate with the spray arm internal thread.

[0009] According to some embodiments of the present disclosure, the spray arm includes a spray arm body and a spray arm connecting sleeve arranged on a lower side of the spray arm body; the spray arm connecting sleeve and the spray arm body have a communicating spray arm chamber, and the spray arm seat has a spray arm seat chamber in communication with the spray arm chamber; the spray arm external thread is arranged on an outer peripheral surface of the spray arm connecting sleeve.

[0010] Further, the bearing base includes an outer sleeve fitted over the outside of the spray arm connecting sleeve, and the ball internal thread is arranged on an inner peripheral surface of the outer sleeve.

[0011] Further, the bearing base further includes an intermediate sleeve arranged inside the outer sleeve, the intermediate sleeve is provided with a plurality of ball holes, and the balls are mounted in the ball holes.

[0012] The bearing base further includes an inner sleeve configured to be connected to the spray arm seat, and detachable connection is made between the spray arm seat and the inner sleeve.

[0013] Further, the inner peripheral surface of the outer sleeve is provided with an outer sleeve ball groove configured to cooperate with the balls, and an outer peripheral surface of the inner sleeve is provided with an inner sleeve ball groove configured to cooperate with the balls.

[0014] According to some embodiments of the present disclosure, an outer peripheral surface of the inner sleeve is provided with an inner sleeve external thread, an inner peripheral surface of the spray arm seat is provided with a spray arm seat internal thread configured to cooperate with the inner sleeve external thread, and the inner sleeve external thread is arranged below the inner sleeve ball groove.

[0015] According to some embodiments of the present disclosure, the spray arm seat is at least partially located inside the inner sleeve, and a top of the spray arm seat has a spray arm seat buckle configured to buckle onto an upper surface of inner sleeve.

[0016] Specifically, a plurality of grooves are arranged at a top end of the spray arm seat, and an opening orientation of each groove is parallel to an axial direction of the spray arm seat; the spray arm seat buckle extends upward from a bottom wall of the groove, and both sides of the spray arm seat buckle are separated from two side walls of the groove; a top end of the spray arm seat buckle

is provided with a hook facing the inner sleeve.

[0017] Specifically, the ball holes are arranged at a bottom of the intermediate sleeve, each ball hole is a major arc hole, and a bottom notch of each ball hole forms a ball fetching port.

[0018] Further, a weakening groove is provided between two adjacent ball holes, and a weakening groove post is provided in the weakening groove.

[0019] Specifically, the outer sleeve includes an outer sleeve peripheral wall and an outer sleeve bottom wall; the outer sleeve bottom wall is arranged on an end of the outer sleeve peripheral wall away from the spray arm and extends inward along a radial direction of the outer sleeve peripheral wall; the balls are arranged above the outer sleeve bottom wall.

[0020] Specifically, the spray arm connecting sleeve includes: a connecting sleeve peripheral wall and a connecting sleeve bottom wall extending inward in a radial direction of the connecting sleeve peripheral wall; the connecting sleeve bottom wall is arranged at an end of the connecting sleeve peripheral wall away from the spray arm body; the inner sleeve is arranged below the connecting sleeve bottom wall.

[0021] Further, an inner diameter of the connecting sleeve bottom wall is identical to an inner diameter of the inner sleeve.

[0022] Optionally, the spray arm seat has a spray arm seat water inlet hole, and an inner diameter of the spray arm seat water inlet hole is equal to an inner diameter of the inner sleeve.

[0023] Optionally, a gap between an upper surface of the inner sleeve and a lower surface of the connecting sleeve bottom wall is L1, and L1 satisfies a relationship: $0\ mm<L1\leq 0.5\ mm$.

[0024] According to some embodiments of the present disclosure, the spray arm thread is a spray arm internal thread; the bearing base includes an outer sleeve and an inner sleeve, and the outer sleeve is fitted over the outside of the inner sleeve; the ball thread is a ball external thread configured to cooperate with the spray arm internal thread, and the ball external thread is arranged on the outer sleeve or the inner sleeve.

[0025] According to some embodiments of the present disclosure, the inner sleeve is provided with a plurality of ball holes, the balls are mounted in the ball holes, and the ball external thread is arranged on an outer peripheral surface of the outer sleeve.

[0026] Further, the spray arm seat includes a spray arm seat body, and an outer peripheral surface of the spray arm seat body is provided with a spray arm seat ball groove configured to cooperate with the balls.

[0027] Further, an inner peripheral surface of the outer sleeve is provided with an outer sleeve ball groove configured to cooperate with the balls; the outer sleeve ball groove and the spray arm seat ball groove are both circumferentially annular grooves.

[0028] Specifically, the outer sleeve includes an outer sleeve peripheral wall and an outer sleeve bottom wall; the outer sleeve bottom wall is arranged on an end of the outer sleeve peripheral wall away from the spray arm and extends inward along a radial direction of the outer sleeve peripheral wall; the balls are arranged above the outer sleeve bottom wall.

[0029] Optionally, the spray arm seat further includes a spray arm seat flange extending outward along a radial direction of the spray arm seat body and arranged below the spray arm seat body; a plurality of ribs are arranged between the outer peripheral surface of the spray arm seat body and the spray arm seat flange; and the outer sleeve bottom wall is arranged above the ribs.

[0030] According to some embodiments of the present disclosure, the ball holes are arranged at a bottom of the inner sleeve, each ball hole is a major arc hole, and a bottom notch of each ball hole forms a ball fetching port.

[0031] Further, a weakening groove is provided between two adjacent ball holes, and a weakening groove post is provided in the weakening groove.

[0032] According to some embodiments of the present disclosure, the outer sleeve is provided with a plurality of ball holes, the balls are mounted in the ball holes, and the ball external thread is arranged on an outer peripheral surface of the inner sleeve.

[0033] Specifically, the spray arm seat includes: a spray arm seat water inlet shaft, a spray arm seat peripheral wall, and a spray arm seat annular wall arranged between the spray arm seat water inlet shaft and the spray arm seat peripheral wall; the spray arm seat peripheral wall is arranged above the spray arm seat annular wall; the spray arm seat water inlet shaft is arranged below the spray arm seat annular wall; a space enclosed by the spray arm seat peripheral wall forms an accommodating space configured to accommodate the ball assembly, and the accommodating space is located above the spray arm seat annular wall.

[0034] An inner diameter of the spray arm seat water inlet shaft is identical to an inner diameter of the inner sleeve.

[0035] Further, an outer peripheral surface of the inner sleeve is provided with an inner sleeve ball groove configured to cooperate with the balls; an inner peripheral surface of the spray arm seat peripheral wall is provided with a spray arm seat ball groove configured to cooperate with the balls; the inner sleeve ball groove and the spray arm seat ball groove are both circumferentially annular grooves.

[0036] Further, the inner sleeve and the outer sleeve are arranged above the spray arm seat annular wall, and a gap between a lower surface of the inner sleeve and an upper surface of the spray arm seat annular wall is L1 that satisfies a relationship: $0\ mm<L1\leq 0.5\ mm$.

[0037] Optionally, ribs are arranged between an outer peripheral surface of the spray arm seat water inlet shaft and the spray arm seat annular wall.

[0038] According to some embodiments of the present disclosure, the spray arm includes a spray arm body and a spray arm connecting sleeve arranged on a lower side

of the spray arm body; the spray arm connecting sleeve and the spray arm body have a communicating spray arm chamber, and the spray arm seat has a spray arm seat chamber in communication with the spray arm chamber; the spray arm internal thread is arranged on an inner peripheral surface of the spray arm connecting sleeve.

[0039] A washing appliance according to embodiments of another aspect of the present disclosure includes the above spray arm assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040]

FIG 1 is a schematic view of a third embodiment of a spray arm assembly.
FIG 2 is a half-sectional view of the third embodiment of the spray arm assembly.
FIG 3 is a partially enlarged view at P in FIG 3.
FIG. 4 is an exploded view of the third embodiment of the spray arm assembly.
FIG. 5 is a half-sectional view of a third embodiment of a ball assembly.
Fig. 6 is an exploded half-sectional view of the ball assembly at Q in FIG. 4.
Fig. 7 is a half-sectional view of an intermediate sleeve.
FIG. 8 is a perspective view of a first embodiment of a spray arm assembly.
FIG. 9 is a perspective half-sectional view of the first embodiment of the spray arm assembly.
FIG. 10 is a half-sectional schematic view of the first embodiment of the spray arm assembly.
FIG. 11 is a partially enlarged view at A in FIG. 10.
FIG. 12 is an assembling diagram of a ball assembly and a spray arm seat.
FIG. 13 is an exploded view of a ball assembly and a spray arm seat.
FIG. 14 is a perspective half-sectional view of a ball assembly and a spray arm seat.
FIG. 15 is a half-sectional view of a ball assembly and a spray arm seat.
FIG. 16 is a half-sectional view of a second embodiment of a spray arm assembly.
FIG. 17 is a partially enlarged view at B in FIG. 16.
FIG. 18 is an exploded view of a first embodiment of a spray arm assembly.

Reference numerals:

[0041] spray arm assembly 1000, spray arm 100, spray arm chamber 130, spray arm body 110, spray arm connecting sleeve 120, spray arm external thread 121, connecting sleeve peripheral wall 122, connecting sleeve bottom wall 123, spray arm seat 200, spray arm Seat chamber 280, spray arm seat flange 220, spray arm seat internal thread 2200, ball assembly 300, bearing base 3100, outer sleeve 310, ball internal thread 3111, outer sleeve ball groove 313, outer sleeve peripheral wall 311, Outer sleeve bottom wall 312, inner sleeve 320, inner sleeve ball groove 321, inner sleeve external thread 3122, intermediate sleeve 370, ball hole 350, weakening groove 360, weakening groove post 361, ball 330, inner sleeve Thread 121, spray arm seat body 210, rib 230, spray arm seat water inlet shaft 240, spray arm seat peripheral wall 250, spray arm seat annular wall 260, spray arm seat ball groove 270, ball external thread 340.

DETAILED DESCRIPTION

[0042] Embodiments of the present disclosure will be described in detail below, and examples of the embodiments will be illustrated in drawings. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to the drawings are explanatory and are merely used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

[0043] In the description of the present disclosure, it is to be understood that terms such as "longitudinal," "transverse," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "top," "bottom," "inner," and "outer" should be construed to refer to the orientations or positions as then described or as shown in the drawings under discussion. These relative terms are for convenience and simplification of description and do not indicate or imply that the device or element referred to must have a particular orientation or be constructed and operated in a particular orientation. Thus, these terms shall not be construed to limit the present disclosure.

[0044] In the description of the present disclosure, it should be noted that, unless specified or limited otherwise, the terms "mounted," "connected," "coupled," "fixed" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be direct connections or indirect connections via intervening structures; may also be inner communication or mutual interaction of two elements, which can be understood by those skilled in the art according to specific situations.

[0045] A spray arm assembly 1000 according to embodiments of the present disclosure will be described in detail below with reference to FIGS. 1 to 18. The spray arm assembly 1000 can be used in washing appliances. The structure of the spray arm assembly 1000 will be elaborated below by taking the application of the spray arm assembly 1000 in a dishwasher as an example.

[0046] Referring to FIGS. 1 and 8, the spray arm assembly 1000 according to the embodiments of the present disclosure may include: a spray arm 100, a spray arm seat 200, and a ball assembly 300.

[0047] The spray arm 100 has a spray arm thread, which makes it possible to connect the spray arm 100

with other components. The spray arm 100 is connected to the spray arm seat 200, and the spray arm 100 is rotatable relative to the spray arm seat 200. The spray arm seat 200 is located below the spray arm 100. The spray arm seat 200 is arranged to provide a connection interface for the spray arm 100. At the same time, after the spray arm 100 and the spray arm seat 200 are connected as a whole, the spray arm seat 200 can also serve as a water inlet pipe of the spray arm 100. In some embodiments, the spray arm 100 is provided with a spray hole and a drive hole. When a water pressure in the spray arm 100 reaches a certain value, the spray arm 100 starts to spray jets of water through the spray hole and the drive hole (not shown in the drawings), and the spray arm 100 rotates by a counterforce when the jets of water are sprayed. As the jets of water are continuously sprayed from the spray hole and the drive hole, the spray arm 100 sustainably rotates. With the rotation of the spray arm 100, the jets of water sprayed from the spray hole and the drive hole will be spilled to surfaces of tableware or an inner wall of the dishwasher, and clear away the stains on the tableware or the inner wall of the dishwasher, so that the dishwasher completes the work of cleaning the tableware. Orientations and positions of the water jets sprayed by the spray arm 100 onto the tableware are multi-directional, which can reduce dead space and make it easier to clean. Due to a large coverage rate of the water flow, the cleaning time can be decreased accordingly, which is beneficial to shorten the cleaning time.

[0048] The ball assembly 300 is arranged at a position where the spray arm 100 and the spray arm seat 200 are connected and cooperate. The ball assembly 300 may include a bearing base 3100 and balls 320 rotatably arranged on the bearing base 3100. The bearing base 3100 is provided with a ball thread that cooperates with the spray arm thread. Specifically, the bearing base 3100 may be one part or may be an assembly containing a plurality of parts. In an embodiment of the present disclosure, the bearing base 3100 is composed of more than one component, and a part of the bearing base 3100 is fixedly connected to the spray arm 100, while another part of the bearing base 3100 is fixedly connected to the spray arm seat 200, thereby achieving indirect connection between the spray arm 100 and the spray arm seat 200. The balls 320 are arranged in the middle of the bearing base 3100, and the balls 320 can rotate in the bearing base 3100, which can allow relative rotation of the spray arm 100 and the spray arm seat 200 through the balls 320, and change the form of friction between the spray arm 100 and the spray arm seat. The form of friction changes from sliding friction into rolling friction, which helps to reduce the friction between the spray arm 100 and the spray arm seat 200.

[0049] By providing the ball assembly 300, when the spray arm 100 and the spray arm seat 200 rotate relative to each other, the friction between the spray arm 100 and the spray arm seat 200 is rolling friction instead of sliding friction. In this way, the rolling friction generates little resistance to the rotation of the spray arm 100, so the hydrodynamic loss caused by friction can be reduced, and the utilization rate of hydrodynamic power can be improved. At the same time, the speed of rotation of the spray arm 100 relative to the spray arm seat 200 is high, so the ball assembly 300 is provided to enhance smoothness of the spray arm 100 during rotation and reduce noise of the dishwasher.

[0050] In addition, compared to a separate snap-fit connection between the spray arm 100 and the spray arm seat 200 in the related art, the connection between the spray arm 100 and the spray arm seat 200 by the ball assembly 300 can reduce a distance between the spray arm 100 and the spray arm seat 200 and in turn a height dimension of the spray arm assembly 1000, which can save internal space of the dishwasher, leave more space for placement of the tableware, and increase the tableware capacity of the dishwasher. For example, an internal loading capacity of the dishwasher can be increased by 10 mm to 40 mm.

[0051] The spray arm 100 and the ball assembly 300 are connected by threads, which is convenient to disassemble and assemble and guarantees reliable fixation.

[0052] For the spray arm assembly 1000 according to the embodiments of the present disclosure, the spray arm 100 is provided with the spray arm thread to provide an interface for the connection between the spray arm 100 and the ball assembly 300, and the connection between the spray arm 100 and the spray arm seat 200 by the ball assembly 300 can reduce the friction between the spray arm 100 and the spray arm seat 200, which is beneficial to reducing the hydrodynamic loss, improving the utilization rate of the hydrodynamic power, and ensuring high pressure of the water when sprayed from the spray hole of the spray arm, to enhance the dishwasher's cleaning effect on the tableware. In addition, the height dimension of the spray arm assembly 1000 can be reduced, thereby saving the internal space of the dishwasher, leaving more space for the placement of the tableware, and increasing the tableware capacity of the dishwasher.

[0053] The spray arm assembly 1000 according to an embodiment of the present disclosure will be described in detail below with reference to FIGS. 1 to 7.

[0054] Referring to FIGS. 4 to 6, the spray arm thread is a spray arm external thread 121; the ball thread is a ball internal thread 3111 that cooperates with the spray arm internal thread 121; and the bearing base 3100 is provided with the ball internal thread 3111 cooperating with the spray arm external thread 121.

[0055] That is, an external part of the bearing base 3100 is provided with the ball internal thread 3111 cooperating with the spray arm external thread 121. As shown in FIGS. 2-3 and 6, the ball internal thread 3111 is arranged on an inner peripheral surface of the external part of the bearing base 3100. Through cooperation between the spray arm external thread 121 and the ball internal thread 3111, the bearing base 3100 can be fixedly con-

nected to the spray arm 100. Moreover, an internal part of the bearing base 3100 is fixedly connected to the spray arm seat 200, the balls 330 are arranged on between the internal part and the external part of the bearing base 3100, and the internal part and the external part of the bearing base 3100 can rotate relative to each other, which can ensure relative rotation of the spray arm 100 and the spray arm seat 200, and simple and stable connection among the spray arm 100, the spray arm seat 200 and the ball assembly 300.

[0056] Referring to FIGS. 2 to 4, the spray arm 100 may include: a spray arm body 110 and a spray arm connecting sleeve 120. The spray arm connecting sleeve 120 is arranged on a lower side of the spray arm body 110. By providing the spray arm connecting sleeve 120, it is convenient to connect the spray arm 100 with the spray arm seat 200, which ensures that the spray arm 100 and the spray arm seat 200 can be reliably connected as a whole.

[0057] The spray arm connecting sleeve 120 and the spray arm body 110 have a communicating spray arm chamber 130, and the spray arm seat 200 has a spray arm seat chamber 280 in communication with the spray arm chamber 130. Thus, it is ensured that water from a water source of the dishwasher can smoothly enter the spray arm chamber 130 through the spray arm seat chamber 280, and then be sprayed to surfaces of the tableware through the spray hole and the drive hole on the spray arm 100, thereby completing an operation of washing the tableware. As water continuously enters the spray arm chamber 130, the water pressure in the spray arm chamber 130 becomes higher and higher. At this time, the counterforce generated by the water jet sprayed from the drive hole of the spray arm 100 is also great, and the rotation speed of the spray arm 100 is high. Meanwhile, the sprayed water jet generates a great beating force on the tableware, which is beneficial to cleaning the stains on the tableware. Therefore, by providing the spray arm chamber 130, a better washing effect of the dishwasher can be ensured.

[0058] Referring to FIGS. 5-7, the bearing base 3100 includes three parts, namely: an outer sleeve 310 (i.e., the external part of the bearing base 3100 mentioned above), an inner sleeve 320 (i.e., the internal part of the bearing base 3100 mentioned above), and an intermediate sleeve 370.

[0059] The outer sleeve 310 is fitted over the outside of the spray arm connecting sleeve 120, the ball internal thread 3111 is arranged on an inner peripheral surface of the outer sleeve 310, and the spray arm external thread 121 is arranged on an outer peripheral surface of the spray arm connecting sleeve 120. Thus, the outer sleeve 310 and the spray arm connecting sleeve 120 can be connected as a whole through the cooperation between the ball internal thread 3111 and the spray arm external thread 121, so as to ensure that the bearing base 3100 and the spray arm 100 are reliably connected as a whole.

[0060] The inner sleeve 320 is arranged inside the outer sleeve 310 and the intermediate sleeve 370, and is fixedly connected to the spray arm seat 200, which can ensure that the bearing base 3100 and the spray arm seat 200 are reliably connected as a whole.

[0061] The intermediate sleeve 370 is arranged between the outer sleeve 310 and the inner sleeve 320, the intermediate sleeve 370 is provided with a plurality of ball holes 350, and the balls 330 are arranged in the ball holes 350. The balls 330 are rotatably installed in the ball holes 350, and the ball holes 350 provide support for the fixation of the balls 330, ensure that relative positions of the plurality of balls 330 remain unchanged, and prevent collision and squeezing among the plurality of balls 330, thereby improving the working stability of the ball assembly 300, and further enhancing the smoothness of the spray arm 100 during rotation.

[0062] Optionally, the number of ball holes 350 is identical to the number of balls 330. The balls 330 protrude from an inner peripheral surface and an outer peripheral surface of the intermediate sleeve 370 in a radial direction of the intermediate sleeve 370. That is, a diameter of each ball 330 is greater than a wall thickness of the intermediate sleeve 370. Only a central part of the ball 330 is installed in the intermediate sleeve 370. An outer side of the ball 330 protrudes outward from the outer peripheral surface of the intermediate sleeve 370, and an inner side of the ball 330 protrudes inward from the inner peripheral surface of the intermediate sleeve 370. In this way, the outer side of the ball 330 can be in rolling contact with an inner surface of the outer sleeve 310, and the inner side of the ball 330 can be in rolling contact with an outer surface of the inner sleeve 320. The ball 330 is in rolling contact with both the outer sleeve 310 and the inner sleeve 320. The outer sleeve 310 is fixedly connected to the spray arm 100, and the inner sleeve 320 is fixedly connected to the spray arm seat 200. Therefore, the ball 330 indirectly provides support for the connection between the spray arm 100 and the spray arm seat 200. When the relative rotation of the spray arm 100 and the spray arm seat 200 occurs, the spray arm 100 is in indirect contact with the spray arm seat 200 through the balls 330, so there is rolling friction between the spray arm 100 and the spray arm seat 200.

[0063] Optionally, the diameter of each ball 330 is 3 mm to 8 mm, and the number of the balls 330 is four to twelve.

[0064] Referring to FIGS. 4-6, further, the inner peripheral surface of the outer sleeve 310 is provided with an outer sleeve ball groove 313 configured to cooperate with the balls 330. The ball internal thread 3111 is arranged above the outer sleeve ball groove 313, to provide space for the balls 330 to rotate smoothly in the outer sleeve ball groove 313. An outer peripheral surface of the inner sleeve 320 is provided with an inner sleeve ball groove 321 configured to cooperate with the balls 330. The outer sleeve ball groove 313 and the inner sleeve ball groove 321 are both circumferentially annular grooves, which can ensure the smoothness of full-circle rotation of the

spray arm 100. The ball 330 is in rolling contact with both the outer sleeve ball groove 313 and the inner sleeve ball groove 321, so the friction is small. In a specific embodiment, a diameter of the outer sleeve ball groove 313 and a diameter of the inner sleeve ball groove 321 may be equal to the diameter of the ball 330 or may be slightly larger than the diameter of the ball 330, thereby ensuring that the ball 330 can well cooperate with the outer sleeve ball groove 313 and the inner sleeve ball groove 321.

[0065] In combination with FIGS. 3 to 4, in a direction of a central axis of the spray arm connecting sleeve 120, positions of the outer sleeve ball groove 313, the inner sleeve ball groove 321, and the ball hole 350 correspond to each other, and the ball 330 is partially arranged in the ball hole 350. The outer side of the ball 330 is in contact with the outer sleeve ball groove 313, and the inner side of the ball 330 is in contact with the inner sleeve ball groove 321, thereby completing the connection between the outer sleeve 310 and the inner sleeve 320. Since the outer sleeve 310 is fixedly connected to the spray arm 100, and the inner sleeve 320 is fixedly connected to the spray arm seat 200, the indirect connection between the spray arm 100 and the spray arm seat 200 is realized. Since the positions of the outer sleeve ball groove 313, the inner sleeve ball groove 321, and the ball hole 350 correspond to each other, it is possible to avoid a situation that a sliding trajectory of the ball 330 when the spray arm 100 rotates is different from trajectories of the outer sleeve ball groove 313 and the inner sleeve ball groove 321 and thus the ball is squeezed, causing the spray arm 100 to fail to rotate.

[0066] In some embodiments, the spray arm seat 200 and the inner sleeve 320 are detachably connected.

[0067] Referring to FIGS. 3-4, the outer peripheral surface of the inner sleeve 320 is provided with an inner sleeve external thread 3122, and an inner peripheral surface of the spray arm seat 200 is provided with a spray arm seat internal thread 2200 adapted to cooperate with the inner sleeve external thread 3122. Through the cooperation between the inner sleeve external thread 3122 and the spray arm seat internal thread 2200, the inner sleeve 320 and the spray arm seat 200 are reliably connected as a whole. The spray arm seat 200 and the ball assembly 300 are connected by threads, which is easy to disassemble and assemble, and makes fixation reliable. The inner sleeve external thread 3122 is arranged below the inner sleeve ball groove 321 to provide space for the ball 330 to rotate smoothly in the inner sleeve ball groove 321.

[0068] Referring to FIGS. 4 and 6, the ball internal thread 3111 is arranged above the outer sleeve ball groove 313, and the inner sleeve external thread 3122 is arranged below the inner sleeve ball groove 321. Therefore, a fixation position of the outer sleeve 310 and the spray arm 100 is located above, and a cooperation position of the inner sleeve 320 and the spray arm seat 200 is located below, thereby making full use of height space and preventing an axial size at the position where the spray arm 100 is connected to and cooperates with the spray arm seat 200 from being too large.

[0069] Referring to FIGS. 6-7, specifically, the ball hole 350 is arranged at a bottom of the intermediate sleeve 370, the ball hole 350 is a major arc hole, and a bottom notch of the ball hole 350 forms a ball fetching port. The ball 330 enters the ball hole 350 or exits from the ball hole 350 through the ball fetching port, which can facilitate installation and detachment of the ball 330 in and from the ball hole 350. The major arc hole is a hole with a central angle greater than 180° and less than 360°, so that each ball 330 can be mostly located in the ball hole 350 to prevent the ball 330 from falling out of the ball hole 350 after installation. During installation of the ball 330, the ball fetching port can be expanded with the help of external force, and then the ball 330 is installed in the ball hole 350 through the ball fetching port. Then, as the external force is removed, elastic deformation of the ball hole 350 disappears, and the ball hole 350 is restored into its original shape. At this time, the ball hole 350 tightly wraps the ball 330, so that the installation of the ball 330 in the ball hole 350 is firmer and more reliable.

[0070] In a specific embodiment, the plurality of ball holes 350 can be evenly distributed along a circumferential direction of the intermediate sleeve 370, thereby making the relative rotation of the spray arm 100 and the spray arm seat 200 more stable. Preferably, the number of balls 330 is an even number, thus ensuring a balanced force on the ball assembly 300 and relieving a stress concentration phenomenon.

[0071] Referring to FIGS. 6-7, a weakening groove 360 is provided between two adjacent ball holes 350. By providing the weakening groove 360, the rigidity between the two adjacent ball holes 350 can be made smaller. Therefore, when the ball 330 is installed, the ball hole 350 is easily deformed, thereby reducing the difficulty of mounting or dismounting the ball 330.

[0072] The weakening groove 360 is provided with a weakening groove post 361. Optionally, a central axis of the weakening groove post 361 is parallel to a central axis of the intermediate sleeve 370, which is beneficial to simplifying the processing technique of the intermediate sleeve 370. By providing the weakening groove post 361, a certain strengthening effect can be achieved, so as to prevent the weakening groove 360 from excessively weakening the rigidity of the intermediate sleeve 370, thereby helping to improve the working reliability of the ball assembly 300.

[0073] The intermediate sleeve 370 has three main functions. First, by providing the ball holes 350 on the intermediate sleeve 370 and installing the balls 330 in the ball holes 350, the positions of the balls 330 can be fixed and limited to prevent accumulation of the balls 330. Second, food residues can be isolated and prevented from entering ball grooves, which may otherwise cause friction. Third, the intermediate sleeve can play a strengthening role, and can isolate vibration of the spray arm 100 to prevent the spray arm 100 from shaking se-

riously.

[0074] Referring to FIGS. 5 to 6, specifically, the outer sleeve 310 may include: an outer sleeve peripheral wall 311 and an outer sleeve bottom wall 312. The outer sleeve bottom wall 312 is arranged on an end of the outer sleeve peripheral wall 311 away from the spray arm 100. In combination with FIG. 3, the outer sleeve bottom wall 312 is arranged at a lower end of the outer sleeve peripheral wall 311, and the outer sleeve bottom wall 312 extends inward along a radial direction of the outer sleeve peripheral wall 311. The outer sleeve ball groove 313 is arranged at a junction of the outer sleeve bottom wall 312 and the outer sleeve peripheral wall 311. Thus, the ball 330 is arranged above the outer sleeve bottom wall 312, and the outer sleeve bottom wall 312 can protect the ball 330 to a certain extent and prevent the ball 330 from being exposed to the outside, which may otherwise affect the service life of the ball 330.

[0075] Referring to FIGS. 2-4, further, a top of the spray arm seat 200 has a spray arm seat flange 220. The spray arm seat flange 220 extends outward along a radial direction of the spray arm seat 200 and is arranged below the outer sleeve bottom wall 312. A gap between an upper surface of the spray arm seat flange 220 and a lower surface of the outer sleeve bottom wall 312 is denoted as L2, and L2 satisfies a relationship: $0\ mm<L2\leq 0.5\ mm$. Therefore, when the spray arm 100 and the spray arm seat 200 rotate relative to each other, sliding friction caused by contact between the lower surface of the outer sleeve bottom wall 312 and the upper surface of the spray arm seat flange 220 can be avoided. That is, there is no friction between the outer sleeve 310 and the spray arm seat 200. In addition, the gap between the lower surface of the outer sleeve bottom wall 312 and the upper surface of the spray arm seat flange 220 is small, which can prevent leftovers or other contaminants from entering the gap and from increasing the friction between the spray arm 100 and the spray arm seat 200 or even making the spray arm 100 get stuck. Moreover, when the spray arm 100 is tilted, the outer sleeve 310 can quickly get contact with the spray arm seat 200, thereby preventing the spray arm 100 from further tilting.

[0076] For example, in some optional embodiments, the gap L2 between the upper surface of the spray arm seat flange 220 and the lower surface of the outer sleeve bottom wall 312 may be 0.1 mm, or may be 0.2 mm or 0.3 mm.

[0077] Referring to FIGS. 3-5, specifically, the spray arm connecting sleeve 120 may include: a connecting sleeve peripheral wall 122 and a connecting sleeve bottom wall 123. The connecting sleeve bottom wall 123 extends inwardly in a radial direction of the connecting sleeve peripheral wall 122, and the connecting sleeve bottom wall 123 is arranged at an end of the connecting sleeve peripheral wall 122 away from the spray arm body 110. As shown in FIG. 3, the connecting sleeve bottom wall 123 is arranged at a lower end of the connecting sleeve peripheral wall 122, and the inner sleeve 320 and the intermediate sleeve 370 are arranged below the connecting sleeve bottom wall 123.

[0078] Referring to FIG. 3, an inner diameter of the connecting sleeve bottom wall 123 is equal to an inner diameter of the inner sleeve 320, and the connecting sleeve bottom wall 123 is aligned with the inner sleeve 320, that is, there is no sudden step between the two, which can avoid the loss of water flow pressure. At the same time, when water enters the spray arm connecting sleeve 120 from the inner sleeve 320, the water experiences buffering and transition at the connecting sleeve bottom wall 123, which can avoid affecting the smooth rotation of the spray arm 100 due to a sudden change in the water flow velocity. A bottom of the spray arm seat 200 has a spray arm seat inner flange. The spray arm seat inner flange extends inward along the radial direction of the spray arm seat 200. The inner sleeve 320 is located above the spray arm seat inner flange. A center of the spray arm seat inner flange has a spray arm seat water inlet hole. An inner diameter of the spray arm seat water inlet hole is also equal to the inner diameter of the inner sleeve 320, and the spray arm seat water inlet hole is aligned with the inner sleeve, that is, there is no sudden step between the two, which can avoid the loss of water flow pressure. At the same time, when water enters the inner sleeve 320 from the spray arm seat 200, it is also possible to avoid affecting the smooth rotation of the spray arm 100 due to a sudden change in the water flow velocity.

[0079] That is, when the water source of the dishwasher is turned on, the water flow enters from the spray arm seat 200, and then flows into the spray arm chamber 130 of the spray arm connecting sleeve 120. Therefore, the equal inner diameters of the connecting sleeve bottom wall 123, the inner sleeve 320 and the spray arm seat water inlet hole can ensure that the water flow velocity in the spray arm seat 200, the inner sleeve 320 and the connecting sleeve bottom wall 123 is constant. Since the inner diameter of the connecting sleeve bottom wall 123 is not much different from the inner diameter of the connecting sleeve peripheral wall 122, when water enters the connecting sleeve peripheral wall 122 through the connecting sleeve bottom wall 123, the change of the water flow velocity is small. Since the flow velocity of the water entering the spray arm chamber 130 is stable, it is possible to prevent the spray arm 100 from shaking seriously due to a drastic change in the water flow velocity, ensure that the water pressure in the spray arm chamber 130 rises steadily, and avoid the sudden change in the flow velocity at the connection between the spray arm seat 200 and the inner sleeve 320 and at the connection between the inner sleeve 320 and the spray arm connecting sleeve 120, thereby ensuring stable rotation of the spray arm 100 and high working reliability of the spray arm assembly 1000.

[0080] A gap between an upper surface of the inner sleeve 320 and a lower surface of the connecting sleeve bottom wall 123 is denoted as L1, and L1 satisfies a re-

lationship: 0 mm<L1≤0.5 mm. Thus, when the spray arm 100 and the spray arm seat 200 rotate relative to each other, sliding friction caused by contact between the upper surface of the inner sleeve 320 and the lower surface of the connecting sleeve bottom wall 123 can be avoided. That is, there is no friction between the inner sleeve 320 and the spray arm connecting sleeve 120. In addition, the gap between the upper surface of the inner sleeve 320 and the lower surface of the connecting sleeve bottom wall 123 is small, which can prevent leftovers or other contaminants from entering the gap and from increasing the friction between the spray arm 100 and the spray arm seat 200 or even making the spray arm 100 get stuck. Moreover, it is possible to prevent excessive water from entering between the inner sleeve 320 and the connecting sleeve bottom wall 123 and causing hydrodynamic loss. Furthermore, when the spray arm 100 is tilted, the inner sleeve 320 can quickly get contact with the spray arm connecting sleeve 120 to avoid further tilting of the spray arm 100.

[0081] For example, in some optional embodiments, the gap L1 between the upper surface of the inner sleeve 320 and the lower surface of the connecting sleeve bottom wall 123 may be 0.1 mm, or may be 0.2 mm or 0.3 mm.

[0082] After the spray arm 100 and the spray arm seat 200 are connected by the ball assembly 300, the height dimension of the spray arm connecting sleeve 120 can be reduced, thereby reducing the overall height dimension of the spray arm assembly 1000, and leaving more space for the placement of the tableware.

[0083] In a specific embodiment, the balls 330 are plastic balls or stainless steel balls. Since a working environment of the spray arm assembly 1000 is full of water, and the spray arm assembly 1000 is in a warm and humid environment for a long time, which will easily cause the balls 330 to rust and jam, the plastic balls or stainless steel balls have a strong anti-corrosion ability, which can effectively slow down or even avoid the rust of the balls 330.

[0084] In some embodiments not illustrated herein, the spray arm seat 200 is at least partially located inside the inner sleeve 320, and the top of the spray arm seat 200 has a spray arm seat buckle configured to buckle onto the upper surface of inner sleeve 320. By providing the spray arm seat buckle on the top of the spray arm seat 200, it is possible to ensure that the spray arm seat 200 and the inner sleeve 320 are reliably connected as a whole, and it is convenient for the spray arm seat 200 to be connected with and detached from the ball assembly 300, which is convenient for the installation of the spray arm assembly 1000.

[0085] Specifically, there is a plurality of grooves at a top end of the spray arm seat 200, and an opening orientation of each groove is parallel to an axial direction of the spray arm seat 200. The spray arm seat buckle extends upward from a bottom wall of the groove, and both sides of the spray arm seat buckle are separated from two side walls of the groove, which ensures that the spray arm seat buckle can be elastically deformed in the groove. A top end of the spray arm seat buckle is provided with a hook facing the inner sleeve 320, and the hook is configured to hook on a top end of the inner sleeve 320, so as to limit relative axial positions of the spray arm seat 200 and the inner sleeve 320.

[0086] When the inner sleeve 320 is assembled with the spray arm seat 200, an inner peripheral surface of the inner sleeve 320 squeezes the hook of the spray arm seat buckle, to deform the spray arm seat buckle toward the inside of the spray arm seat 200 and ensure that the spray arm seat buckle can reach the top end of the inner sleeve 320 from a bottom end of the inner sleeve 320 (i.e., from bottom to top). When the spray arm seat buckle passes over the top end of the inner sleeve 320, a squeezing force imposed on the spray arm seat buckle disappears, under the action of an elastic force of the spray arm seat buckle itself, the spray arm seat buckle approaches the inner sleeve 320 to allow the hook to hook the top end of the inner sleeve 320.

[0087] When the inner sleeve 320 needs to be separated from the spray arm seat 200, the spray arm 100 only needs to be lifted upward, and the top end of the inner sleeve 320 squeezes the hook so that the hook is retracted into the inside of the inner sleeve 320. When the spray arm 100 is further lifted, the inner sleeve 320 can be separated from the spray arm seat 200.

[0088] Based on an embodiment of FIG. 3, the bearing base 3100 of the present disclosure may have many variations, and these variations fall within the protection scope of the present disclosure. Hereinafter, a plurality of variations of the bearing base 3100 according to the embodiment of the present disclosure will be summarized in conjunction with FIG. 3.

[0089] For example, in the first embodiment (not illustrated), the bearing base 3100 may only include the outer sleeve 310. That is, compared with the embodiment of FIG. 3, the intermediate sleeve 370 and the inner sleeve 320 are omitted. By using the balls 330 to directly cooperate with the outer sleeve 310 and the spray arm seat 200, the rolling connection between the spray arm connecting sleeve 120 and the spray arm seat 200 can also be achieved. At this time, an outer peripheral surface of the spray arm seat 200 is provided with a spray arm seat ball groove suitable for cooperating with the balls 330.

[0090] For example, in the second embodiment (not illustrated), the bearing base 3100 may only include the outer sleeve 310 and the intermediate sleeve 370. That is, compared with the embodiment of FIG. 3, the inner sleeve 320 is omitted. By using the balls 330 to directly cooperate with the outer sleeve 310 and the spray arm seat 200, the rolling connection between the spray arm connecting sleeve 120 and the spray arm seat 200 can also be achieved. At this time, an outer peripheral surface of the spray arm seat 200 is provided with a spray arm seat ball groove suitable for cooperating with the balls 330.

[0091] For example, in the third embodiment (not illustrated), the bearing base 3100 may only include the outer sleeve 310 and the inner sleeve 320. That is, compared with the embodiment of FIG. 3, the intermediate sleeve 370 is omitted. By using the balls 330 to directly cooperate with the outer sleeve 310 and the inner sleeve 320, the rolling connection between the spray arm connecting sleeve 120 and the spray arm seat 200 can also be achieved.

[0092] The spray arm assembly 1000 according to an embodiment of the present disclosure will be described in detail below with reference to FIGS. 8-18.

[0093] Referring to FIGS. 10-11 and 16-17, the spray arm thread is a spray arm internal thread 121. The bearing base 3100 includes an outer sleeve 310 and an inner sleeve 320, and the outer sleeve 310 is fitted over the outside of the inner sleeve 320. The ball thread is a ball external thread 340 cooperating with the spray arm internal thread 121, and the ball external thread 340 is arranged on the outer sleeve 310 or the inner sleeve 320. As shown in FIG. 11, the ball external thread 340 is arranged on an outer peripheral surface of the outer sleeve 310, the outer sleeve 310 is fixedly connected to the spray arm 100, and the ball 330 is in rolling contact with an outer surface of the spray arm seat 200. As shown in FIG. 17, the ball external thread 340 is arranged on an outer peripheral surface of the inner sleeve 320, the inner sleeve 320 is fixedly connected to the spray arm 100, and the ball 330 is in rolling contact with an inner surface of the spray arm seat 200. The structure of connection among the spray arm 100, the spray arm seat 200 and the ball assembly 300 is simple and stable.

[0094] By providing the spray arm seat 200, a connection interface is offered to the spray arm 100. At the same time, the spray arm seat 200 also serves as a water inlet pipe of the spray arm 100. The spray arm 100 and the spray arm seat 200 are connected by the ball assembly 300, so that the spray arm 100 and the spray arm seat 200 are in rolling contact, which can reduce friction between the spray arm 100 and the spray arm seat 200, help to reduce the hydrodynamic loss, improve the utilization rate of the hydrodynamic power, and ensure high pressure of the water when sprayed from the spray hole of the spray arm 100, thereby enhancing the dishwasher's cleaning effect on the tableware. In addition, the spray arm 100 and the spray arm seat 200 are connected by the ball assembly 300, which can reduce a height dimension of the spray arm assembly 1000, thereby saving the internal space of the dishwasher, leaving more space for the placement of the tableware, and increasing the tableware capacity of the dishwasher.

[0095] The first embodiment of the present disclosure will be described in detail with reference to FIGS. 8-15.

[0096] Referring to FIGS. 10-13, the inner sleeve 320 is provided with a plurality of ball holes 350, and the balls 330 are rotatably installed in the ball holes 350. The ball holes 350 provide support for the fixation of the balls 330, ensure that relative positions of the plurality of balls 330 remain unchanged, and prevent collision and squeezing among the plurality of balls 330, thereby improving the working stability of the ball assembly 300, and further enhancing the smoothness of the spray arm 100 during rotation. Optionally, the number of ball holes 350 is identical to the number of balls 330.

[0097] The balls 330 protrude from an inner peripheral surface and an outer peripheral surface of the inner sleeve 320 in a radial direction of the inner sleeve 320. That is, a diameter of each ball 330 is greater than a wall thickness of the inner sleeve 320. Only a central part of the ball 330 is installed in the inner sleeve 320. An outer side of the ball 330 protrudes outward from the outer peripheral surface of the inner sleeve 320, and an inner side of the ball 330 protrudes inward from the inner peripheral surface of the inner sleeve 320. In this way, the outer side of the ball 330 can be in rolling contact with an inner surface of the outer sleeve 310, and the inner side of the ball 330 can be in rolling contact with an outer surface of the spray arm seat 200. The ball 330 is in rolling contact with both the outer sleeve 310 and the spray arm seat 200, and the ball 330 provides support for the connection between the spray arm 100 and the spray arm seat 200. When the relative rotation of the spray arm 100 and the spray arm seat 200 occurs, the outer sleeve 310 is in contact with the spray arm seat 200 through the balls 330, so there is rolling friction between the outer sleeve 310 and the spray arm seat 200.

[0098] The ball external thread 340 is arranged on an outer peripheral surface of the outer sleeve 310, and the ball external thread 340 is screwed with the spray arm internal thread 121, thereby realizing the fixation of the outer sleeve 310 and the spray arm 100. The spray arm 100 and the outer sleeve 310 are connected by threads, which is easy to assemble and disassemble and makes connection reliable. At this time, the form of friction between the spray arm 100 and the spray arm seat 200 is equivalent to rolling friction, which can reduce the loss of hydrodynamic power. Thus, more hydrodynamic power can be sprayed from the spray hole and the drive hole on the spray arm 100, to ensure that the pressure of water after being sprayed from the spray hole is greater, which is conducive to cleaning the tableware, and improving the cleaning performance of the dishwasher.

[0099] In a specific embodiment, the plurality of ball holes 350 can be evenly distributed along a circumferential direction of the inner sleeve 320, thereby making the relative rotation of the spray arm 100 and the spray arm seat 200 more stable. Preferably, the number of balls 330 is an even number, thus ensuring a balanced force on the ball assembly 300 and relieving a stress concentration phenomenon.

[0100] Optionally, the diameter of each ball 330 is 3 mm to 8 mm, and the number of the balls 330 is four to twelve.

[0101] Further, referring to FIGS. 14-15, the spray arm seat 200 may include a spray arm seat body 210 and a spray arm seat flange 220. The spray arm seat flange

220 is arranged below the spray arm seat body 210, and the spray arm seat flange 220 extends outward along a radial direction of the spray arm seat body 210. An outer diameter of the spray arm seat flange 220 is larger than an outer diameter of the spray arm seat body 210. The spray arm seat flange 220 is suitable to be connected with other parts in the dishwasher. The outer diameter of the spray arm seat flange 220 is larger, so that the fixation between the spray arm seat 200 and other parts can be more stable and reliable. An outer peripheral surface of the spray arm seat body 210 is provided with a spray arm seat ball groove 270 suitable for cooperating with the balls 330.

[0102] Further, an inner peripheral surface of the outer sleeve 310 is provided with an outer sleeve ball groove 313 suitable for cooperating with the ball 330. The outer sleeve ball groove 313 and the spray arm seat ball groove 270 are both circumferentially annular grooves, which can ensure the smoothness of full-circle rotation of the spray arm 100. The ball 330 is in rolling contact with both the outer sleeve ball groove 313 and the spray arm seat ball groove 270, so the friction is small. In a specific embodiment, a diameter of the outer sleeve ball groove 313 and a diameter of the spray arm seat ball groove 270 may be equal to the diameter of the ball 330 or may be slightly larger than the diameter of the ball 330, thereby ensuring that the ball 330 can well cooperate with the outer sleeve ball groove 313 and the spray arm seat ball groove 270.

[0103] Further, referring to FIGS. 11, 13, and 15, in a direction of a central axis of the spray arm connecting sleeve 120, positions of the spray arm seat ball groove 270, the outer sleeve ball groove 313, and the ball hole 350 correspond to each other, and the ball 330 is partially arranged in the ball hole 350. The outer side of the ball 330 is in contact with the outer sleeve ball groove 313, and the inner side of the ball 330 is in contact with the spray arm seat ball groove 270, thereby completing the connection between the spray arm seat 200 and the outer sleeve 310. Since the outer sleeve 310 is fixedly connected to the spray arm 100, the indirect connection between the spray arm 100 and the spray arm seat 200 is realized. Since the positions of the spray arm seat ball groove 270, the outer sleeve ball groove 313, and the ball hole 350 correspond to each other, it is possible to avoid a situation that a sliding trajectory of the ball 330 when the spray arm 100 rotates is different from trajectories of the spray arm seat ball groove 270 and the outer sleeve ball groove 313 and thus the ball is squeezed, causing the spray arm 100 to fail to rotate.

[0104] Specifically, referring to FIGS. 10-11, the outer sleeve 310 may include: an outer sleeve peripheral wall 311 and an outer sleeve bottom wall 312. The outer sleeve bottom wall 312 is arranged on an end of the outer sleeve peripheral wall 311 away from the spray arm 100. As shown in FIG. 11, the outer sleeve bottom wall 312 is arranged at a lower end of the outer sleeve peripheral wall 311, and the outer sleeve bottom wall 312 extends inward along a radial direction of the outer sleeve peripheral wall 311. The outer sleeve ball groove 313 is arranged at a junction of the outer sleeve bottom wall 312 and the outer sleeve peripheral wall 311. Thus, the ball 330 is arranged above the outer sleeve bottom wall 312, and the outer sleeve bottom wall 312 can protect the ball 330 to a certain extent and prevent the ball 330 from being exposed to the outside, which may otherwise affect the service life of the ball 330.

[0105] In addition, the ball external thread 340 is arranged on an outer peripheral surface of the outer sleeve peripheral wall 311, the outer sleeve ball groove 313 is arranged on an inner peripheral surface of the outer sleeve peripheral wall 311, and the outer sleeve ball groove 313 is arranged below the ball external thread 340. Therefore, a fixation position of the outer sleeve 310 and the spray arm 100 is located above, and a cooperation position of the outer sleeve 310 and the spray arm seat 200 is located below, thereby making full use of height space and preventing an axial size at the position where the spray arm 100 is connected to and cooperates with the spray arm seat 200 from being too large.

[0106] Optionally, referring to FIGS. 11 and 13, a plurality of ribs 230 are provided between the outer peripheral surface of the spray arm seat body 210 and the spray arm seat flange 220, and the outer sleeve bottom wall 312 is arrange above the ribs 230. By providing the ribs 230, the structural strength and rigidity of the spray arm seat body 210 and the spray arm seat flange 220 can be enhanced, and the spray arm seat 200 can be effectively prevented from being broken and damaged when the spray arm 100 rotates at a high speed, thereby facilitating extension of the service life of the spray arm assembly 1000.

[0107] The plurality of ribs 230 are evenly distributed along a peripheral direction of the spray arm seat body 210, thereby helping to improve the performance of the spray arm seat 200. Optionally, the number of ribs 230 is four, and two adjacent ribs 230 are spaced apart by 90 degrees.

[0108] The ball hole 350 is arranged at a bottom of the inner sleeve 320. As shown in FIG. 13, the ball hole 350 is a major arc hole, and a bottom notch of the ball hole 350 forms a ball fetching port 351. The ball 330 enters the ball hole 350 or exits from the ball hole 350 through the ball fetching port 351, which can facilitate installation and detachment of the ball 330 in and from the ball hole 350.

[0109] Further, a weakening groove 360 is provided between two adjacent ball holes 350, and a weakening groove post 361 is provided in the weakening groove 360. Optionally, a central axis of the weakening groove post 361 is parallel to a central axis of the inner sleeve 320, which is beneficial to simplifying the processing technique of the inner sleeve 320. By providing the weakening groove 360, the rigidity between two adjacent ball holes 350 can be made smaller, so that when the ball 330 is installed, the ball hole 350 is easily deformed,

thereby reducing the difficulty of mounting or dismounting the ball 330. In addition, by providing the weakening groove post 361, a certain strengthening effect can be achieved, so as to prevent the weakening groove 360 from excessively weakening the rigidity of the inner sleeve 320, thereby helping to improve the working reliability of the ball assembly 300.

[0110] The second embodiment of the present disclosure will be described in detail with reference to FIGS. 16-18.

[0111] As shown in FIGS. 16-18, the outer sleeve 310 is provided with a plurality of ball holes 350, and the balls 330 are rotatably installed in the ball holes 350. The ball holes 350 provide support for the fixation of the balls 330, ensure that relative positions of the plurality of balls 330 remain unchanged, and prevent collision and squeezing among the plurality of balls 330, thereby improving the working stability of the ball assembly 300, and further enhancing the smoothness of the spray arm 100 during rotation. Optionally, the number of ball holes 350 is identical to the number of balls 330.

[0112] It should be noted that the outer sleeve 310 discussed in the present disclosure means that this sleeve is located outside the entire ball assembly 300, and the term "outer" of the outer sleeve 310 is relative to the term "inner" of the inner sleeve 320. That is, the outer sleeve 310 is located on the periphery of the inner sleeve 320, and the inner sleeve 320 is enclosed in a hollow inner cavity of the outer sleeve 310. It does not mean that the outer sleeve 310 must be exposed to the outside of the entire spray arm 1000.

[0113] The ball 330 protrudes from an inner peripheral surface and an outer peripheral surface of the outer sleeve 310 in a radial direction of the outer sleeve 310. That is, a diameter of each ball 330 is larger than a wall thickness of the outer sleeve 310, and only a central part of the ball 330 is installed in the outer sleeve 310. An outer side of the ball 330 protrudes outward from the outer peripheral surface of the outer sleeve 310, and an inner side of the ball 330 protrudes inward from the inner peripheral surface of the outer sleeve 310. In this way, the outer side of the ball 330 can be in rolling contact with an inner surface of the spray arm seat 200, and the inner side of the ball 330 can be in rolling contact with an outer surface of the inner sleeve 320. The ball 330 is in rolling contact with both the inner sleeve 320 and the spray arm seat 200, and the ball 330 provides support for the connection between the spray arm 100 and the spray arm seat 200. When the relative rotation of the spray arm 100 and the spray arm seat 200 occurs, the inner sleeve 320 is in contact with the spray arm seat 200 through the balls 330, so there is rolling friction between the inner sleeve 320 and the spray arm seat 200.

[0114] The ball external thread 340 is arranged on an outer peripheral surface of the inner sleeve 320, and the ball external thread 340 is screwed with the spray arm internal thread 121, thereby realizing the fixation of the inner sleeve 320 and the spray arm 100. The spray arm 100 and the inner sleeve 320 are connected by threads, which is easy to assemble and disassemble and makes connection reliable. Likewise, the form of friction between the spray arm 100 and the spray arm seat 200 is equivalent to rolling friction, which can reduce the loss of hydrodynamic power. Thus, more hydrodynamic power can be sprayed from the spray hole and the drive hole on the spray arm 100, to ensure that the pressure of water after being sprayed from the spray hole is greater, which is conducive to cleaning the tableware, and improving the cleaning performance of the dishwasher.

[0115] In a specific embodiment, the plurality of ball holes 350 can be evenly distributed along a circumferential direction of the outer sleeve 310, thereby making the relative rotation of the spray arm 100 and the spray arm seat 200 more stable. Preferably, the number of balls 330 is an even number, thus ensuring a balanced force on the ball assembly 300 and relieving a stress concentration phenomenon. As shown in FIG. 18, the ball holes 350 are located in a lower middle part of the outer sleeve 310.

[0116] Optionally, the diameter of each ball 330 is 3 mm to 8 mm, and the number of the balls 330 is four to twelve.

[0117] Specifically, the spray arm seat 200 may include: a spray arm seat water inlet shaft 240, a spray arm seat annular wall 260, and a spray arm seat peripheral wall 250. The spray arm seat annular wall 260 is arranged between the spray arm seat water inlet shaft 240 and the spray arm seat peripheral wall 250. The spray arm seat peripheral wall 250 is arranged above the spray arm seat annular wall 260. The spray arm seat peripheral wall 250 is perpendicularly connected to the spray arm seat annular wall 260, and the connection position is located at the lowest end of the spray arm seat peripheral wall 250 and the outermost end of the spray arm seat annular wall 260. The spray arm seat water inlet shaft 240 is arranged below the spray arm seat annular wall 260. The spray arm seat water inlet shaft 240 is perpendicularly connected to the spray arm seat annular wall 260, and the connection position is located at an uppermost part of the spray arm seat water inlet shaft 240 and the innermost end of the spray arm seat annular wall 260. A diameter of the spray arm seat peripheral wall 250 is larger than a diameter of the spray arm seat water inlet shaft 240. The spray arm seat peripheral wall 250 is parallel to the spray arm seat water inlet shaft 240. An inner diameter of the spray arm seat water inlet shaft 240 is equal to an inner diameter of the inner sleeve 320, thereby ensuring that a water flow velocity in the spray arm seat water inlet shaft 240 and the inner sleeve 320 is constant, so as to avoid a sudden change in the water flow velocity at the connection between the spray arm seat 200 and the ball assembly 300, which may otherwise affect the stability of relative rotation between the spray arm seat 200 and the spray arm 100.

[0118] A space enclosed by the spray arm seat peripheral wall 250 forms an accommodating space configured

to accommodate the ball assembly 300, and the accommodating space is located above the spray arm seat annular wall 260.

[0119] An inner peripheral surface of the spray arm seat peripheral wall 250 is provided with a spray arm seat ball groove 270 configured to cooperate with the balls 330.

[0120] Further, an outer peripheral surface of the inner sleeve 320 is provided with an inner sleeve ball groove 321 configured to cooperate with the balls 330. The inner sleeve ball groove 321 and the spray arm seat ball groove 270 are both circumferentially annular grooves, which can ensure the smoothness of full-circle rotation of the spray arm 100. The ball 330 is in rolling contact with both the inner sleeve ball groove 321 and the spray arm seat ball groove 270, so the friction is small. In a specific embodiment, a diameter of the inner sleeve ball groove 321 and a diameter of the spray arm seat ball groove 270 may be equal to the diameter of the ball 330 or may be slightly larger than the diameter of the ball 330, thereby ensuring that the ball 330 can well cooperate with the inner sleeve ball groove 321 and the spray arm seat ball groove 270.

[0121] Further, referring to FIG. 17, in a direction of a central axis of the spray arm connecting sleeve 120, positions of the spray arm seat ball groove 270, the inner sleeve ball groove 321, and the ball hole 350 correspond to each other, and the ball 330 is partially arranged in the ball hole 350. An outer side of the ball 330 is in contact with the spray arm seat ball groove 270, and an inner side of the ball 330 is in contact with the inner sleeve ball groove 321, thereby completing the connection between the spray arm seat 200 and the outer sleeve 310. Since the inner sleeve 320 is fixedly connected to the spray arm 100, the indirect connection between the spray arm 100 and the spray arm seat 200 is realized. Since the positions of the spray arm seat ball groove 270, the inner sleeve ball groove 321, and the ball hole 350 correspond to each other, it is possible to avoid a situation that a sliding trajectory of the ball 330 when the spray arm 100 rotates is different from trajectories of the spray arm seat ball groove 270 and the inner sleeve ball groove 321 and thus the ball is squeezed, causing the spray arm 100 to fail to rotate.

[0122] In addition, the ball external thread 340 and the inner sleeve ball groove 321 are both arranged on the outer peripheral surface of the inner sleeve 320, and the inner sleeve ball groove 321 is arranged below the ball external thread 340. Thus, a fixation position of the inner sleeve 320 and the spray arm 100 is located above, and a cooperation position of the inner sleeve 320 and the spray arm seat 200 is located below, thereby making full use of height space and preventing an axial size at the position where the spray arm 100 is connected to and cooperates with the spray arm seat 200 from being too large.

[0123] Further, the inner sleeve 320 and the outer sleeve 310 are arranged above the spray arm seat annular wall 260, so that the spray arm seat annular wall 260 can protect the ball assembly 300 to a certain extent and prevent the ball assembly 300 from being exposed to the outside, which may otherwise affects the service life of the ball assembly 300. A gap between a lower surface of the inner sleeve 320 and an upper surface of the spray arm seat annular wall 260 is denoted as L1, and L1 satisfies a relationship: $0\ mm<L1\leq 0.5\ mm$. Therefore, when the spray arm 100 and the spray arm seat 200 rotate relative to each other, sliding friction caused by contact between the lower surface of the inner sleeve 320 and the upper surface of the spray arm seat annular wall 260 can be avoided. That is, there is no friction between the inner sleeve 320 and the spray arm seat 200. In addition, the gap between the lower surface of the inner sleeve 320 and the upper surface of the spray arm seat annular wall 260 is small, which can prevent leftovers or other contaminants from entering the gap and from increasing the friction between the spray arm 100 and the spray arm seat 200 or even making the spray arm 100 get stuck. Moreover, when the spray arm 100 is tilted, the inner sleeve 320 can quickly get contact with the spray arm seat 200, to avoid further tilting of the spray arm 100, and prevent excessive water from entering between the inner sleeve 320 and the spray arm seat annular wall 260 and causing hydrodynamic loss.

[0124] Ribs (not shown in the drawings) are provided between an outer peripheral surface of the spray arm seat water inlet shaft 240 and the spray arm seat annular wall 260 to increase the structural strength and rigidity of the spray arm seat 200, thereby effectively preventing the spray arm seat 200 from being broken and damaged during high-speed rotation of the spray arm 100, and prolonging the service life of the spray arm assembly 1000.

[0125] Referring to FIGS. 10-11 and 16-17, the spray arm 100 may include: a spray arm body 110 and a spray arm connecting sleeve 120. The spray arm connecting sleeve 120 is arranged on a lower side of the spray arm body 110. By providing the spray arm connecting sleeve 120, it is convenient to connect the spray arm 100 with the spray arm seat 200, which ensures that the spray arm 100 and the spray arm seat 200 can be reliably connected as a whole.

[0126] The spray arm connecting sleeve 120 and the spray arm body 110 have a communicating spray arm chamber 130, and the spray arm seat 200 has a spray arm seat chamber 280 in communication with the spray arm chamber 130. Thus, it is ensured that water from a water source of the dishwasher can smoothly enter the spray arm chamber 130 through the spray arm seat chamber 280, and then be sprayed to surfaces of the tableware through the spray hole on the spray arm 100, thereby completing an operation of washing the tableware. As water continuously enters the spray arm chamber 130, the water pressure in the spray arm chamber 130 becomes higher and higher. At this time, a counterforce generated by water jets sprayed from the drive hole of the spray arm 100 is also great, and the rotation speed

of the spray arm 100 is high. Meanwhile, the sprayed water jets generate a great beating force on the tableware, which is beneficial to cleaning the stains on the tableware. Therefore, by providing the spray arm chamber 130, a better washing effect of the dishwasher can be ensured. Orientations and positions of the water jets sprayed by the spray arm 100 onto the tableware are multi-directional, which can reduce dead space and make it easier to clean. Due to a large coverage rate of the water flow, the cleaning time can be decreased accordingly, which is beneficial to shorten the cleaning time.

[0127] The spray arm internal thread 121 is arranged on an inner peripheral surface of the spray arm connecting sleeve 120. As shown in FIG. 11, the outer sleeve 310 is screwed and fixed with the spray arm internal thread 121; as shown in FIG. 17, the inner sleeve 320 is screwed and fixed with the spray arm internal thread 121.

[0128] After the spray arm 100 and the spray arm seat 200 are connected by the ball assembly 300, the height dimension of the spray arm connecting sleeve 120 can be decreased, and hence the overall height dimension of the spray arm assembly 1000 can be reduced, thereby leaving more space for placement of the tableware.

[0129] In a specific embodiment, the balls 330 are plastic balls or stainless steel balls. Since a working environment of the spray arm assembly 1000 is full of water, and the spray arm assembly 1000 is in a warm and humid environment for a long time, which will easily cause the balls 330 to rust and jam, the plastic balls or stainless steel balls have a strong anti-corrosion ability, which can effectively slow down or even avoid the rust of the balls 330.

[0130] In some embodiments (not illustrated), the balls 330 may be arranged between the outer sleeve 310 and the inner sleeve 320. That is, both of the outer sleeve 310 and the inner sleeve 320 are not provided with ball holes 350. The inner peripheral surface of the outer sleeve 310 is provided with an outer sleeve ball groove 313, and the outer peripheral surface of the inner sleeve 320 is provided with an inner sleeve ball groove 321. The outer side of the ball 330 is in rolling contact with the outer sleeve ball groove 313, and the inner side of the ball 330 is in rolling contact with the inner sleeve ball groove 321. Likewise, the rolling connection between the spray arm 100 and the spray arm seat 200 can be achieved. There is rolling friction between the spray arm 100 and the spray arm seat 200, which is beneficial to reducing the hydrodynamic consumption and improving the cleaning performance of the spray arm assembly 1000.

[0131] A washing appliance according to embodiments of another aspect of the present disclosure includes the spray arm assembly 1000 in the above embodiments. The washing appliance may be a dishwasher, a fruit and vegetable washing machine, a medical washing machine, and other washing appliances with washing functions, and can have a similar effect to the dishwasher with the spray arm 10000 arranged therein, which will not be repeated here.

[0132] Reference throughout this specification to "an embodiment," "some embodiments," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of these phrases in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples. Moreover, those skilled in the art can incorporate and combine different embodiments and examples described herein.

[0133] Although explanatory embodiments have been illustrated and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, modifications, alternatives, and variations can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

Claims

1. A spray arm assembly, comprising:

   a spray arm having a spray arm thread;
   a spray arm seat, the spray arm being connected to the spray arm seat and being rotatable relative to the spray arm seat; and
   a ball assembly arranged at a position where the spray arm and the spray arm seat are connected and cooperate, and comprising a bearing base and balls rotatably arranged on the bearing base, the bearing base being provided with a ball thread configured to cooperate with the spray arm thread.

2. The spray arm assembly according to claim 1, wherein the spray arm thread is a spray arm external thread, and the ball thread is a ball internal thread configured to cooperate with the spray arm internal thread.

3. The spray arm assembly according to claim 2, wherein the spray arm comprises a spray arm body and a spray arm connecting sleeve arranged on a lower side of the spray arm body; the spray arm connecting sleeve and the spray arm body have a communicating spray arm chamber, and the spray arm seat has a spray arm seat chamber in communication with the spray arm chamber; the spray arm external thread is arranged on an outer peripheral surface of the spray arm connecting sleeve.

4. The spray arm assembly according to claim 3, wherein the bearing base comprises an outer sleeve fitted over the outside of the spray arm connecting sleeve, and the ball internal thread is arranged on an inner peripheral surface of the outer sleeve.

5. The spray arm assembly according to claim 4, wherein the bearing base further comprises an intermediate sleeve arranged inside the outer sleeve, the intermediate sleeve is provided with a plurality of ball holes, and the balls are mounted in the ball holes.

6. The spray arm assembly according to claim 4 or 5, wherein the bearing base further comprises an inner sleeve configured to be connected to the spray arm seat, and detachable connection is made between the spray arm seat and the inner sleeve.

7. The spray arm assembly according to claim 6, wherein the inner peripheral surface of the outer sleeve is provided with an outer sleeve ball groove configured to cooperate with the balls, and an outer peripheral surface of the inner sleeve is provided with an inner sleeve ball groove configured to cooperate with the balls.

8. The spray arm assembly according to claim 6, wherein an outer peripheral surface of the inner sleeve is provided with an inner sleeve external thread, an inner peripheral surface of the spray arm seat is provided with a spray arm seat internal thread configured to cooperate with the inner sleeve external thread, and the inner sleeve external thread is arranged below the inner sleeve ball groove.

9. The dishwasher according to claim 6, wherein the spray arm seat is at least partially located inside the inner sleeve, and a top of the spray arm seat has a spray arm seat buckle configured to buckle onto an upper surface of inner sleeve.

10. The spray arm assembly according to claim 9, wherein a plurality of grooves are arranged at a top end of the spray arm seat, and an opening orientation of each groove is parallel to an axial direction of the spray arm seat; the spray arm seat buckle extends upward from a bottom wall of the groove, and both sides of the spray arm seat buckle are separated from two side walls of the groove; a top end of the spray arm seat buckle is provided with a hook facing the inner sleeve.

11. The spray arm assembly according to claim 5, wherein the ball holes are arranged at a bottom of the intermediate sleeve, each ball hole is a major arc hole, and a bottom notch of each ball hole forms a ball fetching port.

12. The spray arm assembly according to claim 4, wherein the outer sleeve comprises an outer sleeve peripheral wall and an outer sleeve bottom wall; the outer sleeve bottom wall is arranged on an end of the outer sleeve peripheral wall away from the spray arm and extends inward along a radial direction of the outer sleeve peripheral wall; the balls are arranged above the outer sleeve bottom wall.

13. The spray arm assembly according to claim 6, wherein the spray arm connecting sleeve comprises: a connecting sleeve peripheral wall and a connecting sleeve bottom wall extending inward in a radial direction of the connecting sleeve peripheral wall; the connecting sleeve bottom wall is arranged at an end of the connecting sleeve peripheral wall away from the spray arm body; the inner sleeve is arranged below the connecting sleeve bottom wall.

14. The spray arm assembly according to claim 13, wherein an inner diameter of the connecting sleeve bottom wall is identical to an inner diameter of the inner sleeve.

15. The spray arm assembly according to claim 13, wherein a gap between an upper surface of the inner sleeve and a lower surface of the connecting sleeve bottom wall is L1, and L1 satisfies a relationship: $0\ mm<L1 \leq 0.5\ mm$.

16. The spray arm assembly according to claim 6, wherein the spray arm seat has a spray arm seat water inlet hole, and an inner diameter of the spray arm seat water inlet hole is equal to an inner diameter of the inner sleeve.

17. The spray arm assembly according to claim 1, wherein the spray arm thread is a spray arm internal thread; the bearing base comprises an outer sleeve and an inner sleeve, and the outer sleeve is fitted over the outside of the inner sleeve; the ball thread is a ball external thread configured to cooperate with the spray arm internal thread, and the ball external thread is arranged on the outer sleeve or the inner sleeve.

18. The spray arm assembly according to claim 17, wherein the inner sleeve is provided with a plurality of ball holes, the balls are mounted in the ball holes, and the ball external thread is arranged on an outer peripheral surface of the outer sleeve.

19. The spray arm assembly according to claim 18, wherein the spray arm seat comprises a spray arm seat body, and an outer peripheral surface of the spray arm seat body is provided with a spray arm seat ball groove configured to cooperate with the balls.

20. The spray arm assembly according to claim 19, wherein an inner peripheral surface of the outer sleeve is provided with an outer sleeve ball groove configured to cooperate with the balls; the outer sleeve ball groove and the spray arm seat ball groove are both circumferentially annular grooves.

21. The spray arm assembly according to claim 19, wherein the outer sleeve comprises an outer sleeve peripheral wall and an outer sleeve bottom wall; the outer sleeve bottom wall is arranged on an end of the outer sleeve peripheral wall away from the spray arm and extends inward along a radial direction of the outer sleeve peripheral wall; the balls are arranged above the outer sleeve bottom wall.

22. The spray arm assembly according to claim 19 or 21, wherein the spray arm seat further comprises a spray arm seat flange extending outward along a radial direction of the spray arm seat body and arranged below the spray arm seat body, and a plurality of ribs are arranged between the outer peripheral surface of the spray arm seat body and the spray arm seat flange.

23. The spray arm assembly according to claim 18, wherein the ball holes are arranged at a bottom of the inner sleeve, each ball hole is a major arc hole, and a bottom notch of each ball hole forms a ball fetching port.

24. The spray arm assembly according to claim 17, wherein the outer sleeve is provided with a plurality of ball holes, the balls are mounted in the ball holes, and the ball external thread is arranged on an outer peripheral surface of the inner sleeve.

25. The spray arm assembly according to claim 24, wherein the spray arm seat comprises: a spray arm seat water inlet shaft, a spray arm seat peripheral wall, and a spray arm seat annular wall arranged between the spray arm seat water inlet shaft and the spray arm seat peripheral wall; the spray arm seat peripheral wall is arranged above the spray arm seat annular wall; the spray arm seat water inlet shaft is arranged below the spray arm seat annular wall; a space enclosed by the spray arm seat peripheral wall forms an accommodating space configured to accommodate the ball assembly, and the accommodating space is located above the spray arm seat annular wall.

26. The spray arm assembly according to claim 25, wherein an inner diameter of the spray arm seat water inlet shaft is identical to an inner diameter of the inner sleeve.

27. The spray arm assembly according to claim 25, wherein an outer peripheral surface of the inner sleeve is provided with an inner sleeve ball groove configured to cooperate with the balls; an inner peripheral surface of the spray arm seat peripheral wall is provided with a spray arm seat ball groove configured to cooperate with the balls; the inner sleeve ball groove and the spray arm seat ball groove are both circumferentially annular grooves.

28. The spray arm assembly according to claim 25, wherein the inner sleeve and the outer sleeve are arranged above the spray arm seat annular wall, and a gap between a lower surface of the inner sleeve and an upper surface of the spray arm seat annular wall is L1 that satisfies a relationship: $0\ mm<L1\leq 0.5\ mm$.

29. The spray arm assembly according to claim 18 or 24, wherein the spray arm comprises a spray arm body and a spray arm connecting sleeve arranged on a lower side of the spray arm body; the spray arm connecting sleeve and the spray arm body have a communicating spray arm chamber, and the spray arm seat has a spray arm seat chamber in communication with the spray arm chamber; the spray arm internal thread is arranged on an inner peripheral surface of the spray arm connecting sleeve.

30. A washing appliance, comprising a spray arm assembly according to any one of claims 1 to 29.

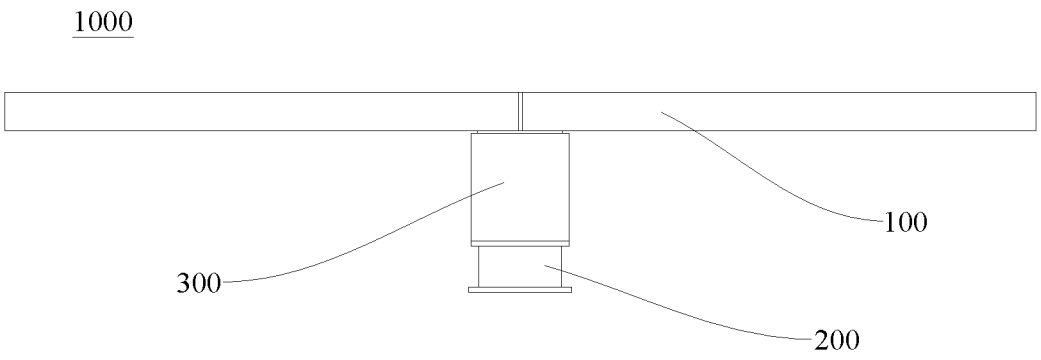

FIG. 1

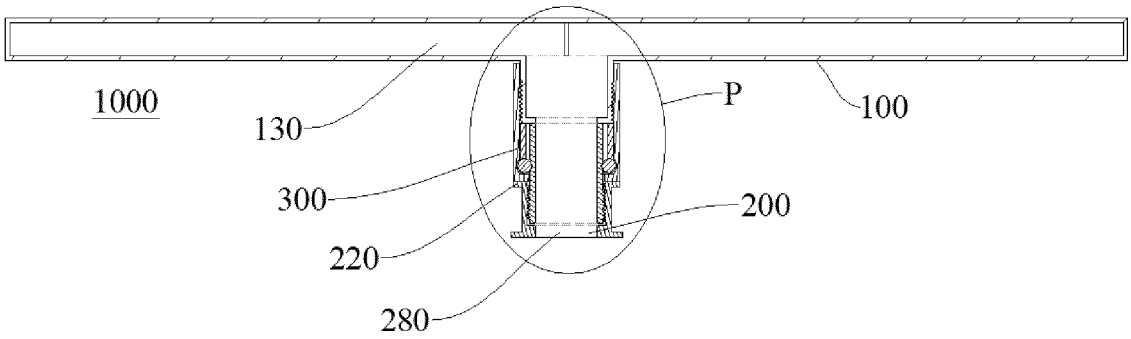

FIG. 2

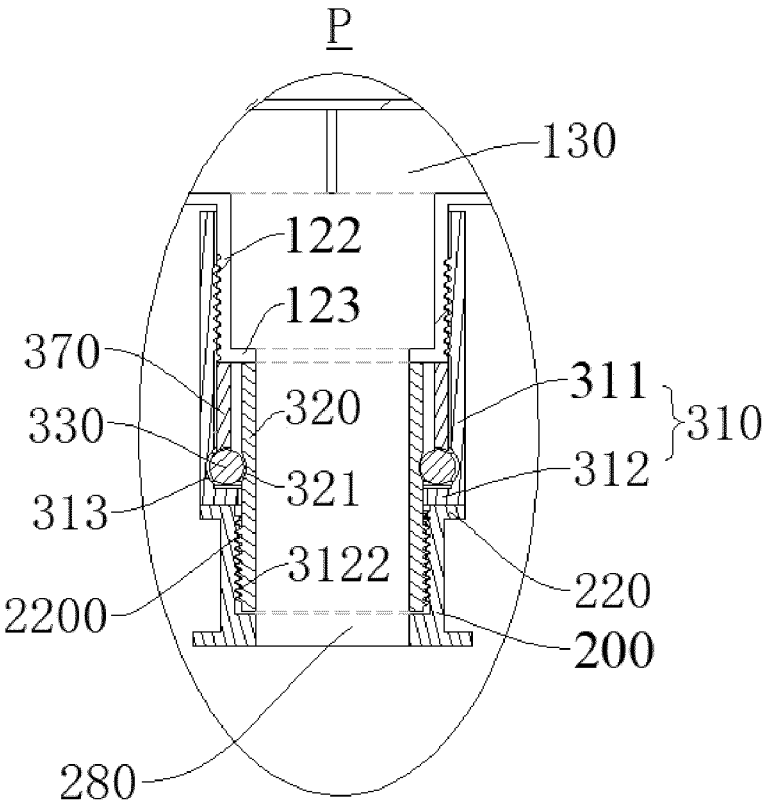

FIG. 3

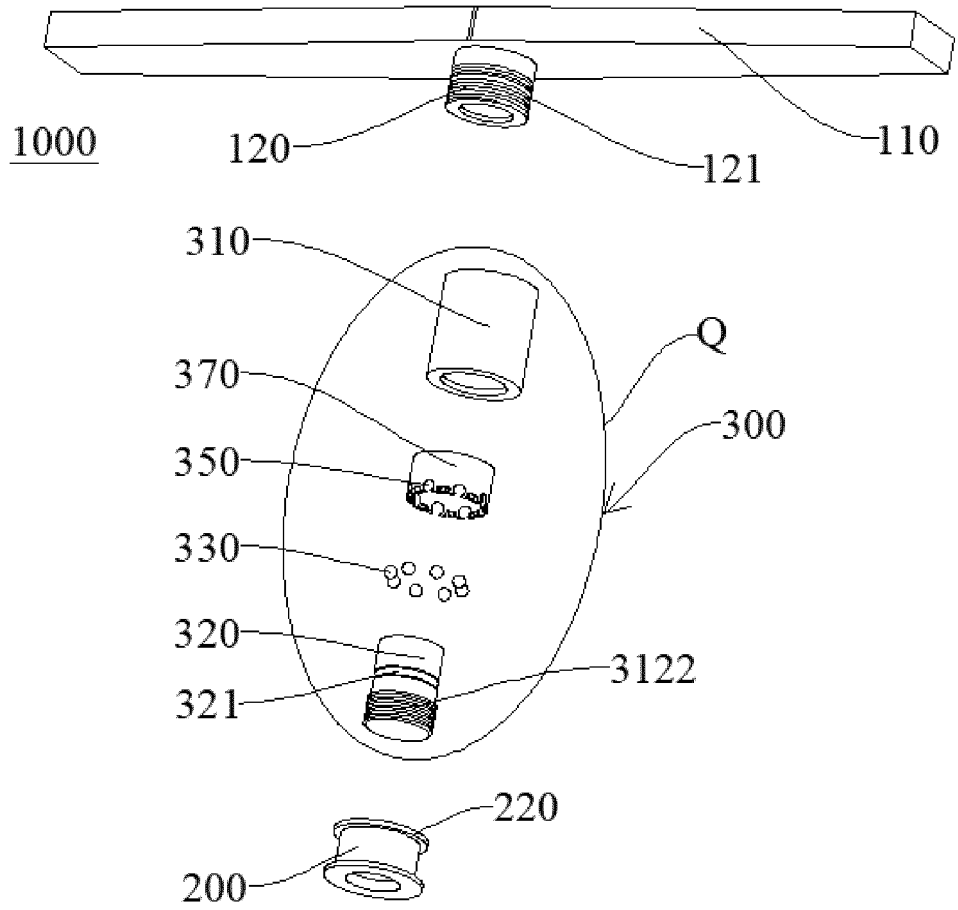
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FIG. 4

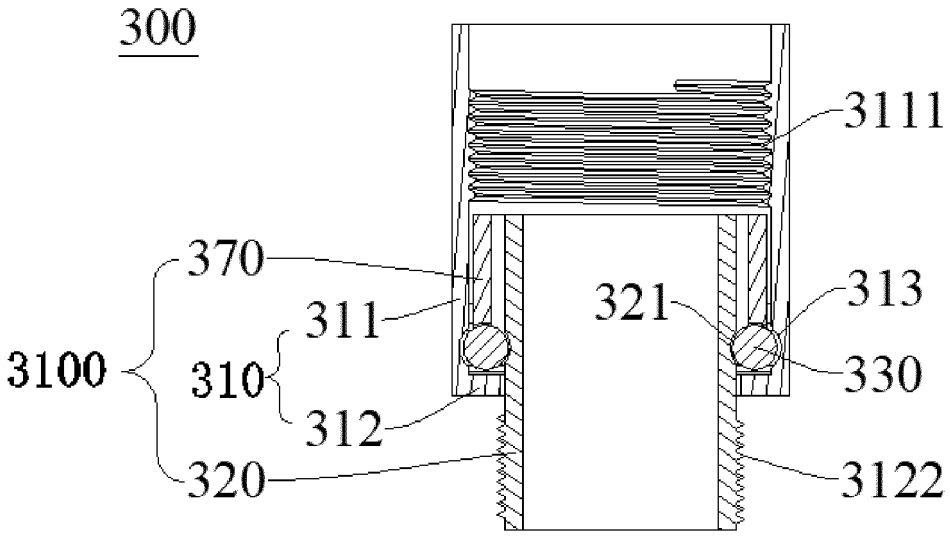
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FIG. 5

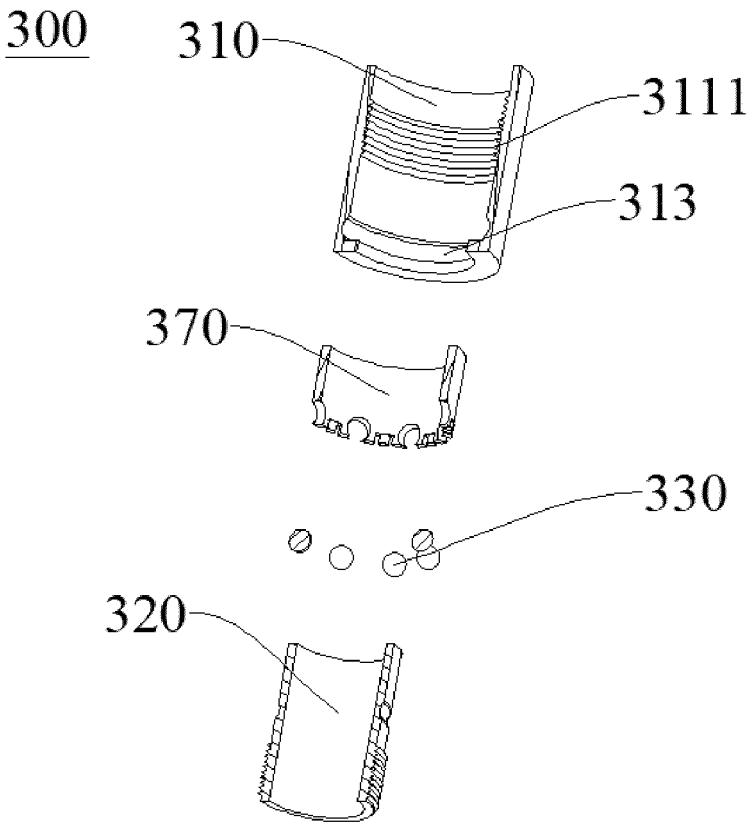

FIG. 6

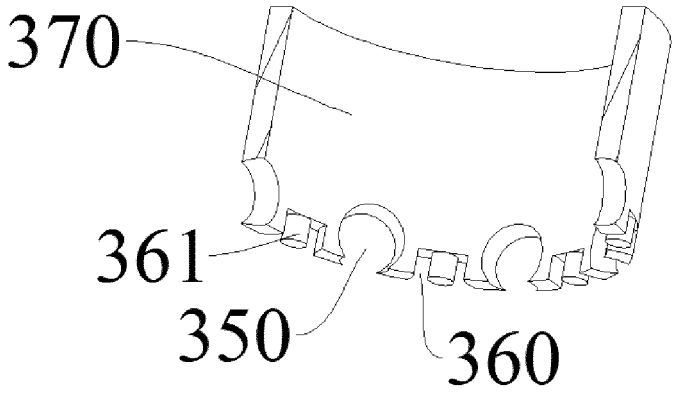

FIG. 7

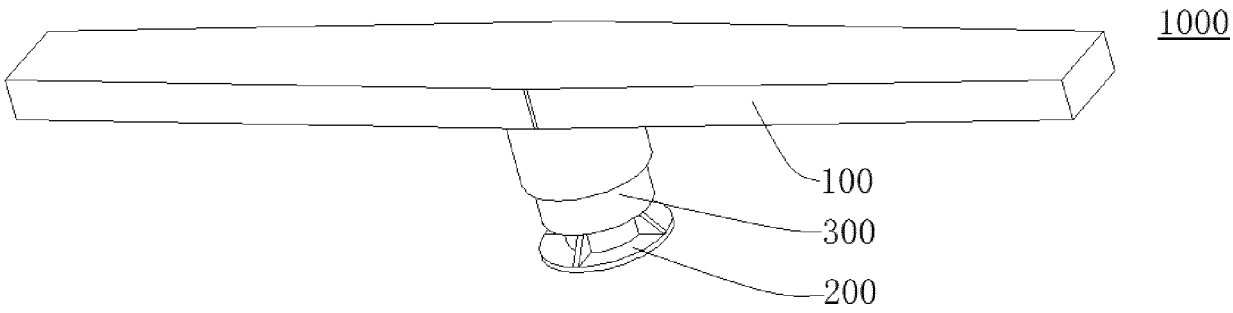

FIG. 8

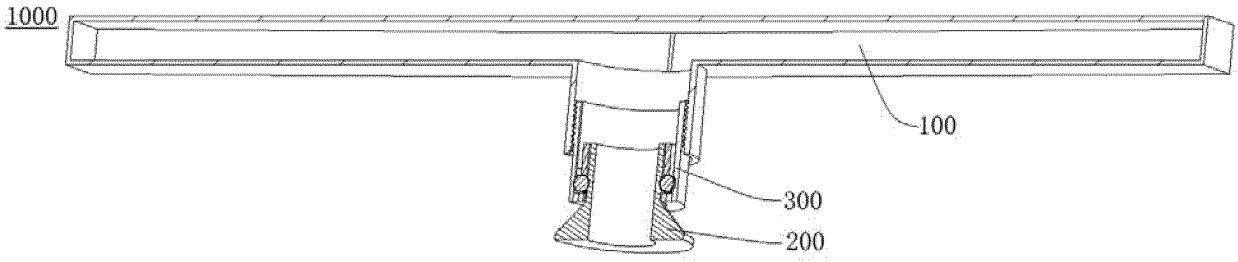

FIG. 9

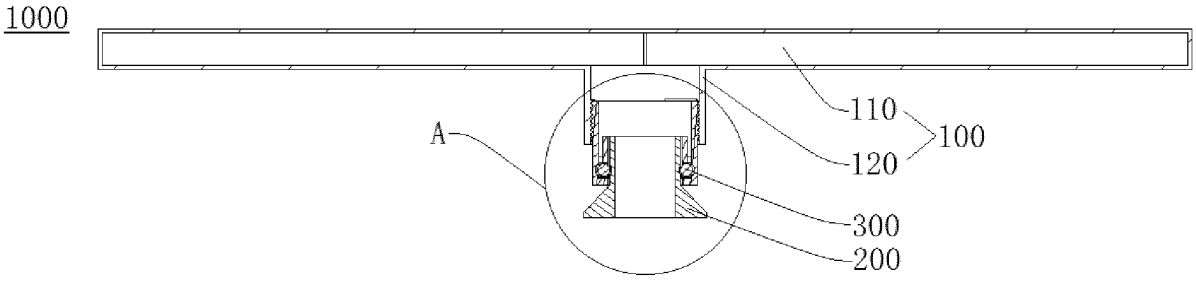

FIG. 10

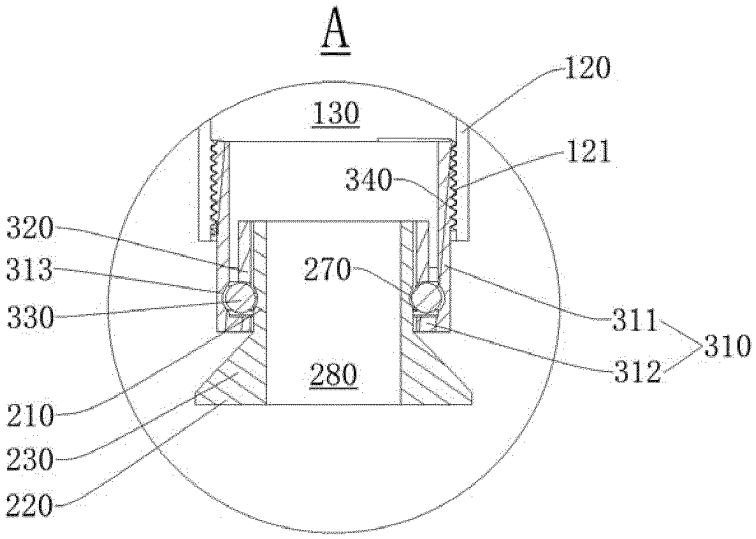

FIG. 11

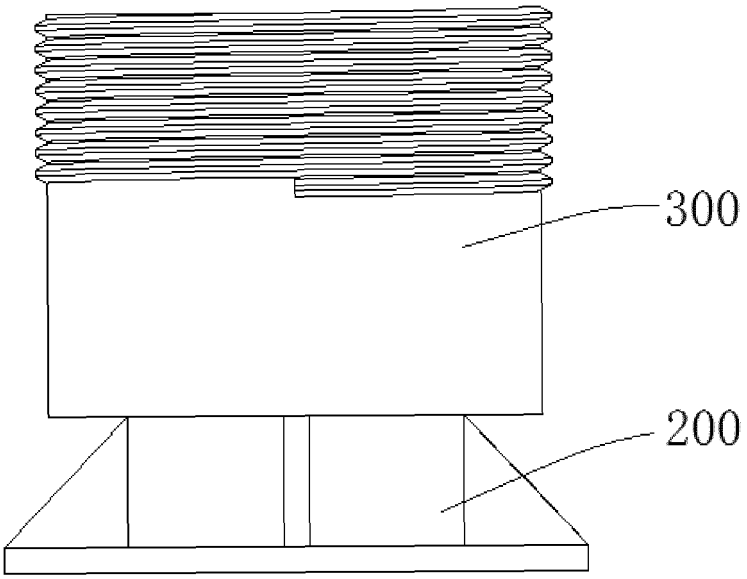

FIG. 12

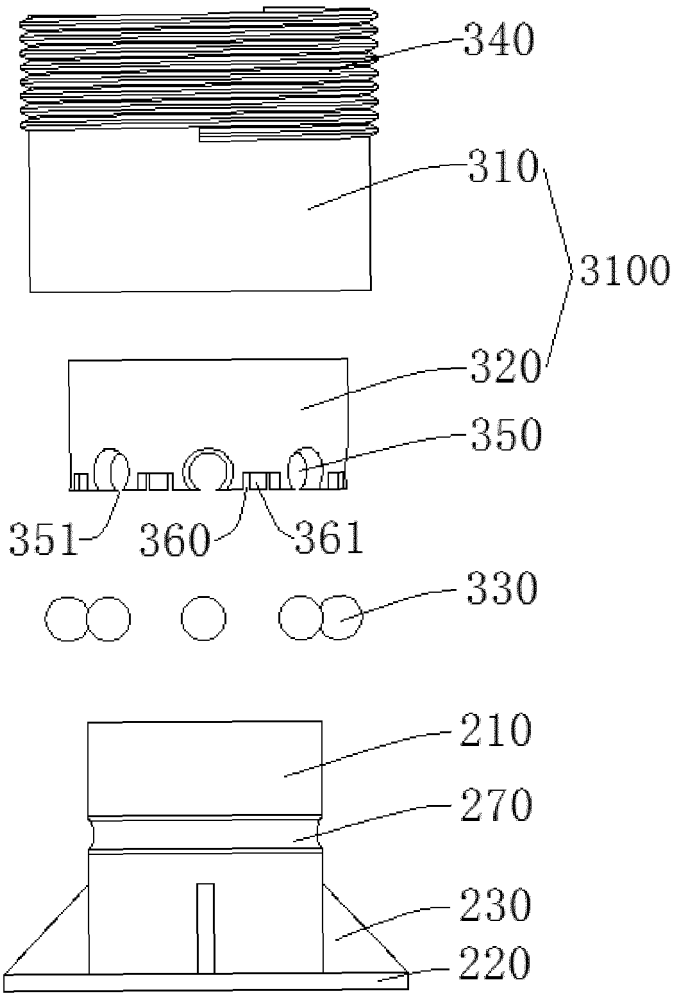

FIG. 13

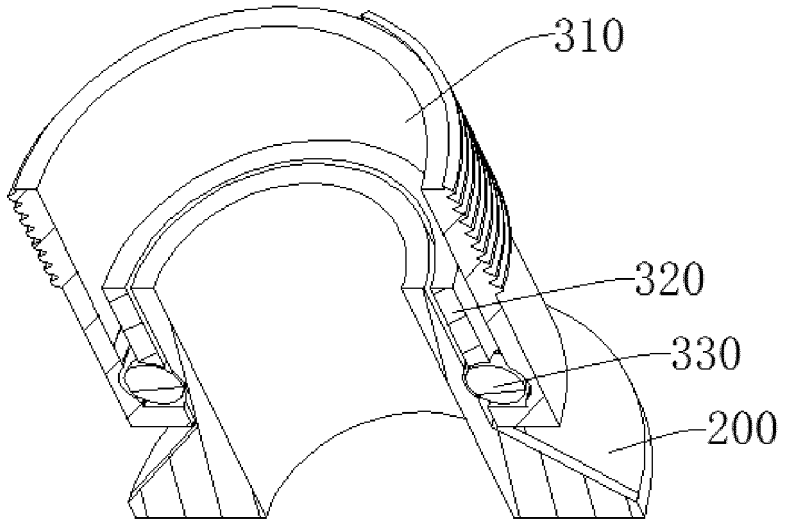

FIG. 14

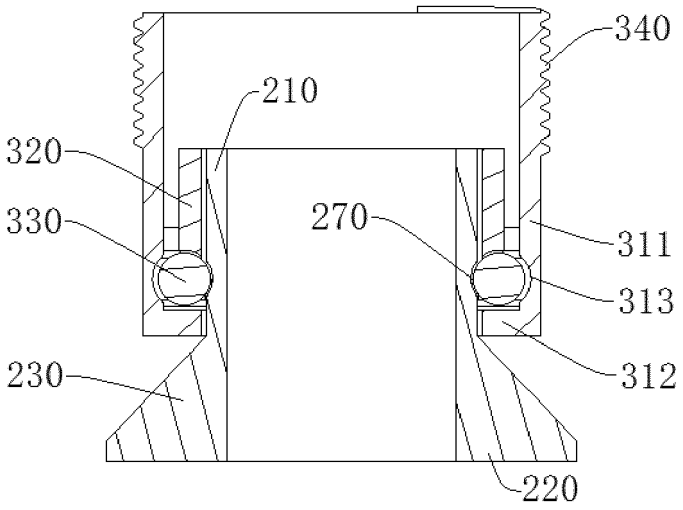

FIG. 15

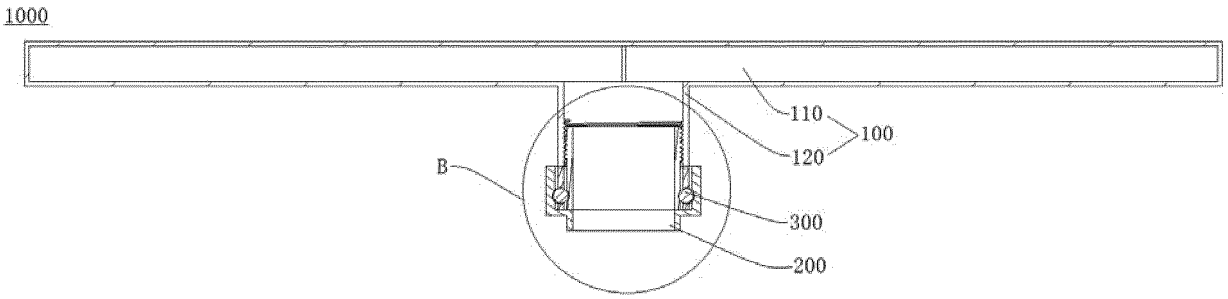

FIG. 16

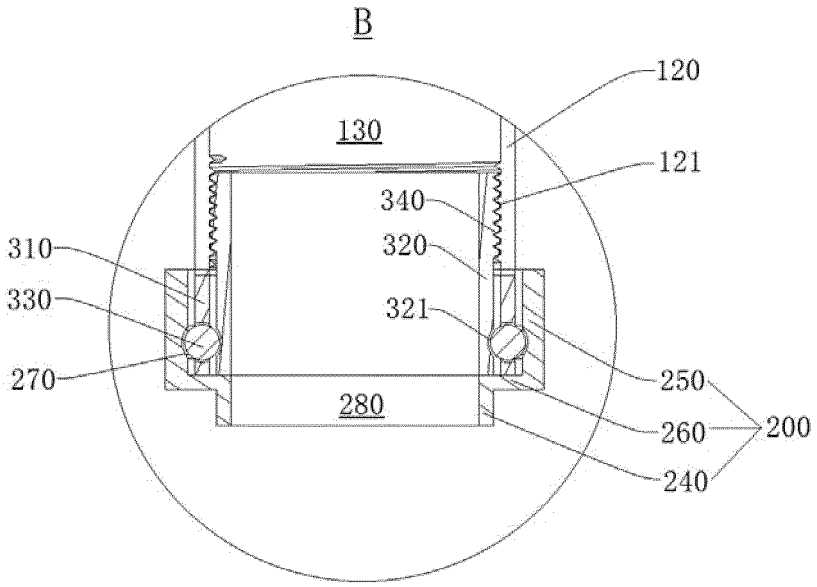
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FIG. 17

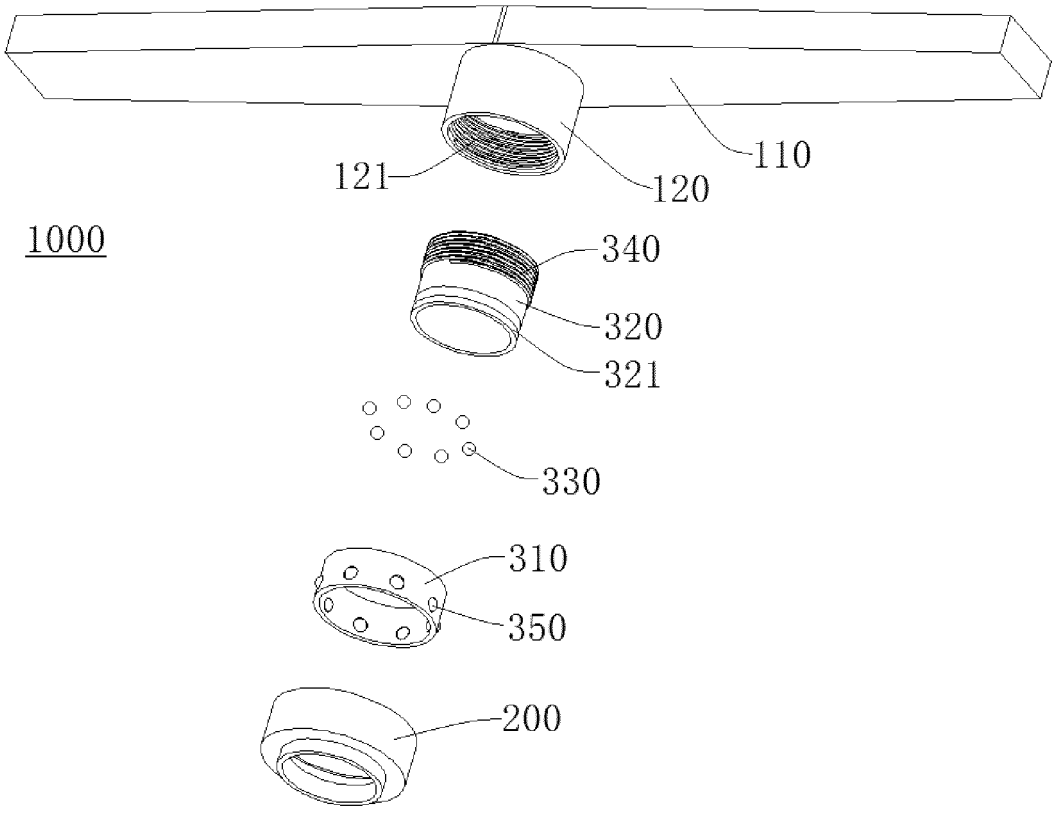
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FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/094275

A. CLASSIFICATION OF SUBJECT MATTER

A47L 15/22(2006.01)i; A47L 15/42(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)

A47L15/-

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)

CNPAT, WPI, EPODOC, CNKI: 美的, 钢珠, 钢球, 滚珠, 喷臂, 喷淋臂, 螺纹, ball?, spray, jet???, eject

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 208973739 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0036]-[0082], and figures 1-7	1-30
PX	CN 208973764 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0046]-[0124], and figures 1-9	1-30
PX	CN 208973737 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0040]-[0083], and figures 1-11	1-30
PX	CN 209032217 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 28 June 2019 (2019-06-28) description, paragraphs [0038]-[0106], and figures 1-8	1-30
PX	CN 208973738 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0045]-[0176], and figures 1-15	1-30
PX	CN 208973736 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0052]-[0098], and figures 1-16	1-30

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 September 2019	**26 September 2019**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/094275

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 208973740 U (FOSHAN SHUNDE MIDEA WASHING APPLIANCES MFG. CO., LTD. ET AL.) 14 June 2019 (2019-06-14) description, paragraphs [0042]-[0085], and figures 1-12	1-30
X	CN 86203638 U (LI, LASHENG) 14 January 1987 (1987-01-14) description, p. 4, second-to-last paragraph to p. 5, paragraph 1, and figures 1 and 2	1-30
X	CN 206603647 U (JOYOUNG CO., LTD.) 03 November 2017 (2017-11-03) description, paragraphs [0036]-[0048], and figures 1-3	1-30
X	CN 1269195 A (YAO, LING) 11 October 2000 (2000-10-11) description, p. 3, last paragraph to p. 4, paragraph 3, and figures 1-10	1-30
X	US 5725002 A (TCA, INC.) 10 March 1998 (1998-03-10) description, column 3, line 3 to column 9, line 20, and figures 4 and 5	1-30

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/094275

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 208973739 U	14 June 2019	None	
CN 208973764 U	14 June 2019	None	
CN 208973737 U	14 June 2019	None	
CN 209032217 U	28 June 2019	None	
CN 208973738 U	14 June 2019	None	
CN 208973736 U	14 June 2019	None	
CN 208973740 U	14 June 2019	None	
CN 86203638 U	14 January 1987	None	
CN 206603647 U	03 November 2017	None	
CN 1269195 A	11 October 2000	None	
US 5725002 A	10 March 1998	None	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- CN 201810991115X **[0001]**
- CN 201821410963 **[0001]**
- CN 201810990361 **[0001]**
- CN 201821401305 **[0001]**