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(54) **WASHING MACHINE SPRAYER APPARATUS AND DRUM WASHING MACHINE HAVING SAME**

(57) A sprinkling device (1) for a washing machine and a front-loading washing machine having the same are disclosed. The sprinkling device (1) includes: a water circulating member (10), internally provided with a water circulating passage, wherein an upper end face of the water circulating member is provided with a water inlet (11) in communication with the water circulating passage, and a lower end face thereof is provided with a water outlet (12) in communication with the water circulating passage; a water guide member (20), disposed below the water circulating member (10), and having a tapered water guide surface (21) opposite the water outlet (12); and a plurality of shunting members (30), wherein lower ends of the plurality of shunting members (30) are connected to the tapered water guide surface (21) equidistantly along a circumferential direction of the tapered water guide surface (21) and located between an apex and an outer circumference of the tapered water guide surface (21); upper ends of the plurality of shunting members (30) are connected with the water circulating member (10) respectively.

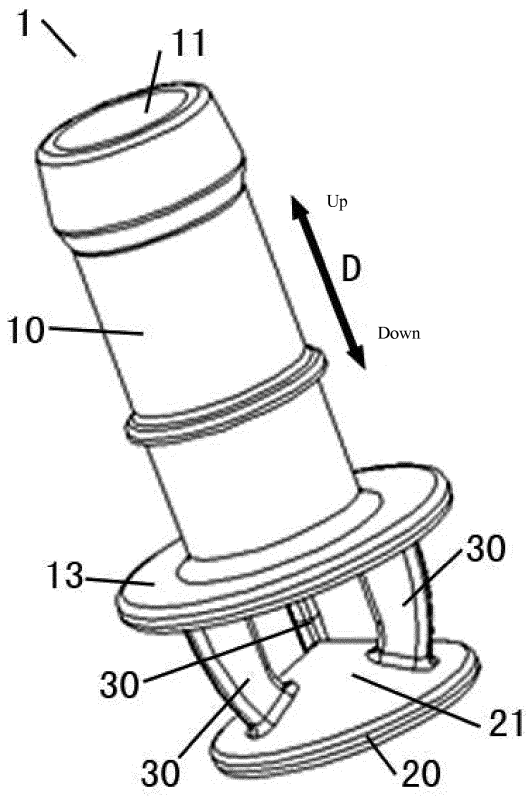

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a technical field of manufacturing washing machines, and more particularly, to a sprinkling device for a washing machine and a front-loading washing machine having the same.

BACKGROUND

[0002] For a washing machine in the related art, some foam will stick to a door seal and a door body after a detergent dissolves during a laundry process, which not only reduces a utilization rate of the detergent, but also leads to foam residue after rinsing. Subsequent water inflow will wash the residual foam into clothes, resulting in secondary addition of the detergent, such that the washing is not clean, and the washing time and washing effect are affected. Some washing machines are additionally equipped with a sprinkling device, but a sprinkling effect is limited.

SUMMARY

[0003] The present disclosure aims to solve at least one of the above technical problems in the prior art to at least some extent. Accordingly, one objective of the present disclosure is to provide a sprinkling device for a washing machine, which has advantages of enhancing a utilization rate of a detergent, decreasing washing time and improving a washing effect.

[0004] Another objective of the present disclosure is to provide a front-loading washing machine having the sprinkling device.

[0005] In order to achieve the above objectives, embodiments of a first aspect of the present disclosure provide a sprinkling device for a washing machine. The sprinkling device includes: a water circulating member, internally provided with a water circulating passage, in which an upper end face of the water circulating member is provided with a water inlet in communication with the water circulating passage, and a lower end face of the water circulating member is provided with a water outlet in communication with the water circulating passage; a water guide member, disposed below the water circulating member, and having a tapered water guide surface opposite the water outlet; and a plurality of shunting members, in which lower ends of the plurality of shunting members are connected to the tapered water guide surface equidistantly along a circumferential direction of the tapered water guide surface and located between an apex and an outer circumference of the tapered water guide surface; upper ends of the plurality of shunting members are connected with the water circulating member respectively.

[0006] For the sprinkling device according to embodiments of the present disclosure, by providing the water guide member having the tapered water guide surface, and the plurality of shunting members, it is possible to sprinkle uniformly in the form of a 360-degree sheet shape. Compared with the sprinkling device in the related art, the sprinkling device according to embodiments of the present disclosure has a better sprinkling effect. Therefore, a door body and a door seal of the washing machine and clothes therein may be washed simultaneously, such that a detergent is fully dissolved, foam residue is reduced, and a washing effect is improved while decreasing the washing time of the clothes.

[0007] Moreover, the sprinkling device according to embodiments of the present disclosure may further have the following additional technical features.

[0008] According to an embodiment of the present disclosure, the tapered water guide surface is configured as a conical surface, and a cross section of the shunting member extends along a radial direction of the tapered water guide surface.

[0009] According to an embodiment of the present disclosure, three shunting devices are provided.

[0010] According to an embodiment of the present disclosure, the water circulating passage is configured as a cylindrical passage, and the water inlet is communicated with an upper end of the water circulating passage while the water outlet is communicated with a lower end of the water circulating passage. Thus, the water in the water circulating passage of the water circulating member may flow more smoothly.

[0011] According to an embodiment of the present disclosure, a central axis of the water circulating passage coincides with a central axis of the tapered water guide surface. Thus, it may be ensured that a water flow out of the water outlet is accurately impinged at the apex of the tapered water guide surface.

[0012] According to an embodiment of the present disclosure, the water circulating passage has a diameter of 6 to 9 mm, and a distance between the apex of the tapered water guide surface and the lower end face of the water circulating member is 3 to 5 mm.

[0013] According to an embodiment of the present disclosure, a taper angle of the tapered water guide surface ranges from 120° to 130°, and a distance between the lower end of the shunting member and the outer circumference of the tapered water guide surface is 1.5 to 2.5 mm.

[0014] According to an embodiment of the present disclosure, a lower end of the water circulating member is provided with a connecting ring extending along a circumferential direction of an outer circumferential surface of the water circulating member, and the upper end of the shunting member is connected to the connecting ring, so as to facilitate connection between the shunting members and the water circulating member without affecting the shunting effect.

[0015] According to an embodiment of the present disclosure, the water circulating member, the connecting ring, the water guide member and the plurality of shunting

members are formed integrally, which can not only enhance an overall structural strength of the sprinkling device, but also simplify a production process of the sprinkling device to decrease a production cost of the sprinkling device.

[0016] A front-loading washing machine is provided according to embodiments of a second aspect of the present disclosure. The front-loading washing machine includes: a cabinet, provided with a clothes access port; an inner tub, disposed in the cabinet; a door seal, disposed to the cabinet and surrounding the clothes access port; a door body, disposed to the cabinet to open or close the clothes access port; and at least one sprinkling device, configured as a sprinkling device for a washing machine according to embodiments of the first aspect of the present disclosure, and disposed to the door seal and located in the cabinet.

[0017] By being provided with the sprinkling device according to embodiments of the first aspect of the present disclosure, the front-loading washing machine according to embodiments of the present disclosure has advantages of a high detergent utilization rate, short washing time and a better washing effect.

[0018] According to an embodiment of the present disclosure, three sprinkling devices are arranged evenly in a circumferential direction of the door seal. Therefore, the water flow out of the three sprinkling devices may be sprinkled uniformly in the 360 degrees.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a perspective view of a sprinkling device for a washing machine according to an embodiment of the present disclosure;

Fig. 2 is a schematic view of dimensions of a sprinkling device for a washing machine according to an embodiment of the present disclosure;

Fig. 3 is a partial schematic view of a water flow structure of a sprinkling device for a washing machine according to an embodiment of the present disclosure.

[0020] Reference numerals: sprinkling device 1 for washing machine, water circulating member 10, water inlet 11, water outlet 12, connecting ring 13, water guide member 20, tapered water guide surface 21, shunting member 30.

DETAILED DESCRIPTION

[0021] Reference will now be made in detail to exemplary embodiments, examples of which are illustrated in the accompanying 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, which aim to illustrate the present disclosure, but shall not be construed to limit the present disclosure.

[0022] A sprinkling device 1 for a washing machine according to embodiments of the present disclosure will be described below with reference to drawings.

[0023] As shown in Figs. 1 to 3, the sprinkling device 1 according to embodiments of the present disclosure includes a water circulating member 10, a water guide member 20 and a plurality of shunting members 30.

[0024] The water circulating member 10 internally has a water circulating passage; an upper end face of the water circulating member 10 is provided with a water inlet 11 in communication with the water circulating passage, and a lower end face of the water circulating member is provided with the water inlet 11 in communication with the water circulating passage (an up-and-down direction as indicated by arrow A in Fig. 1).

[0025] The water guide member 20 is disposed below the water circulating member 10; an upper surface of the water guide member 20 is configured as a tapered water guide surface 21 opposite to the water outlet 12; and the tapered water guide surface 21 is a tapered surface projecting in a direction towards the water outlet 12.

[0026] Lower ends of the plurality of shunting members 30 are connected to the tapered water guide surface 21 equidistantly along a circumferential direction of the tapered water guide surface 21, and upper ends of the plurality of shunting members 30 are connected with the water circulating member 10 respectively, so as to connect the water circulating member 10 with the water guide member 20. The lower ends of the plurality of shunting members 30 are located between an apex and an outer circumference of the tapered water guide surface 21. In other words, in a radial direction of the tapered water guide surface 21, the lower ends of the plurality of shunting members 30 have a predetermined distance from the apex and the outer circumference of the tapered water guide surface 21 respectively.

[0027] A sprinkling process of the sprinkling device 1 according to embodiments of the present disclosure will be described below. As shown in Fig. 3 (broken lines in Fig. 3 indicating a flow direction of a water flow), the water flow enters the water circulating passage of the water circulating member 10 through the water inlet 11 of the water circulating member 10, and flows out of the water outlet 12 along the water circulating passage. The water flow out of the water outlet 12 is impinged at the apex of the tapered water guide surface 2; the water flow presents a sheet shape after passing by the apex of the tapered water guide surface 21, and then is scattered out in a number of directions by encountering with the plurality of shunting members 30; the water flow scattered in a number of directions converges again when passing by the outer circumference of the tapered water guide surface 21; finally forming the water flow sprinkled uniformly in a 360-degree sheet shape.

[0028] For the sprinkling device 1 according to embod-

iments of the present disclosure, by providing the water guide member 20 having the tapered water guide surface 21, and the plurality of shunting members 30, it is possible to sprinkle uniformly in the form of the 360-degree sheet shape. Compared with the sprinkling device in the related art, the sprinkling device 1 according to embodiments of the present disclosure has a better sprinkling effect. Therefore, a door body and a door seal of the washing machine and clothes therein may be washed simultaneously, such that a detergent is fully dissolved, foam residue is reduced, and a washing effect is improved while decreasing the washing time of the clothes. Thus, the sprinkling device 1 according to embodiments of the present disclosure has advantages of enhancing a utilization rate of the detergent, reducing the washing time and improving the washing effect.

[0029] The sprinkling device 1 according to specific embodiments of the present disclosure will be described below with reference to the drawings.

[0030] In some specific embodiments of the present disclosure, as shown in Figs. 1 to 3, the sprinkling device 1 according to embodiments of the present disclosure includes the water circulating member 10, the water guide member 20 and three shunting members 30.

[0031] A lower surface of the water guide member 20 is circular, and the tapered water guide surface 21 is a conical surface. A cross section of the shunting member 30 extends along the radial direction of the tapered water guide surface 21, and connection lines, between two adjacent shunting members 30 and the apex of the tapered water guide surface 21, form an included angle of 120 degrees. Hence, it is possible to improve a guiding effect of the tapered water guide surface 21 on the water flow, and a shunting effect of the shunting member 30 on the water flow, thereby further enhancing uniformity of water sprinkling.

[0032] Further, the water circulating member 10 is configured as a substantially cylindrical shape; the water circulating passage is configured as a cylindrical passage; the water inlet 11 is communicated with an upper end of the water circulating passage while the water outlet 12 is communicated with a lower end of the water circulating passage; a central axis of the water circulating passage coincides with a central axis of the tapered water guide surface 21. Therefore, the water flow may be more smooth within the water circulating passage of the water circulating member 10, and it may be ensured that the water flow out of the water outlet 12 is accurately impinged at the apex of the tapered water guide surface 21, thus further improving the sprinkling effect of the sprinkling device 1.

[0033] In some specific embodiments of the present disclosure, as shown in Fig. 2, the water circulating passage has a diameter of 6 to 9 mm; a distance A between the apex of the tapered water guide surface 21 and the lower end face of the water circulating member 10 is 3 to 5 mm; a taper angle B of the tapered water guide surface 21 ranges from 120° to 130°; a distance C between the lower end of the shunting member 30 and the outer circumference of the tapered water guide surface 21 is 1.5 to 2.5 mm. Therefore, it is possible to ensure the sprinkling effect of the sprinkling device 1, and reduce a volume of the sprinkling device 1 to facilitate installation of the sprinkling device 1 within the washing machine.

[0034] In some specific embodiments of the present disclosure, as shown in Figs. 1 and 2, a lower end of the water circulating member 10 is provided with a connecting ring 13 extending along a circumferential direction of an outer circumferential surface of the water circulating member 10, and the upper ends of the plurality of shunting members 30 are connected to a lower surface of the connecting ring 13 equidistantly along a circumferential direction of the connecting ring 13, so as to facilitate connection between the shunting members 30 and the water circulating member 10 without affecting the shunting effect.

[0035] Advantageously, the water circulating member 10, the connecting ring 13, the water guide member 20 and the plurality of shunting members 30 are formed integrally, which can not only enhance an overall structural strength of the sprinkling device 1, but also simplify a production process of the sprinkling device 1 to decrease a production cost of the sprinkling device 1.

[0036] A front-loading washing machine according to embodiments of the present disclosure will be described below.

[0037] The front-loading washing machine according to embodiments of the present disclosure includes a cabinet (not shown), an inner tub (not shown), a door seal (not shown), a door body (not shown) and at least one sprinkling device.

[0038] The cabinet is provided with a clothes access port. The inner tub is disposed in the cabinet. The door seal is disposed to the cabinet and surrounds the clothes access port. The door body is disposed to the cabinet to open or close the clothes access port. The sprinkling device is configured as the sprinkling device 1 according to the above embodiments, and the sprinkling device 1 is disposed to the door seal and located within the cabinet.

[0039] By being provided with the sprinkling device 1 according to the above embodiments of the present disclosure, the front-loading washing machine according to embodiments of the present disclosure has advantages of a high detergent utilization rate, short washing time and a better washing effect.

[0040] Alternatively, three sprinkling devices 1 are arranged evenly in a circumferential direction of the door seal. Therefore, the water flow out of the three sprinkling devices 1 may be sprinkled uniformly in the 360 degrees.

[0041] Other configurations and operations of the front-loading washing machine according to embodiments of the present disclosure are known to those skilled in the art, which will not be described in detail herein.

[0042] It could be appreciated by those skilled in the art that the number of the sprinkling device 1 in the front-loading washing machine may be set to more than one

depending on actual applications and requirements, and the sprinkling device 1 may also be applied to other types of washing machines, for example, a pulsator-type washing machine.

[0043] In the specification, it is to be understood that terms such as "central," "longitudinal," "transverse," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," "clockwise," and "counterclockwise" should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the device or element be constructed or operated in a particular orientation, shall not be construed to limit the present disclosure.

[0044] In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with "first" and "second" may comprise one or more of this feature. In the description of the present disclosure, "a plurality of" means two or more than two, unless specified otherwise.

[0045] In the present disclosure, 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 mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements, which can be understood by those skilled in the art according to specific situations.

[0046] In the present disclosure, unless specified or limited otherwise, a structure in which a first feature is "on" or "below" a second feature may include an embodiment in which the first feature is in direct contact with the second feature, and may also include an embodiment in which the first feature and the second feature are not in direct contact with each other, but are contacted via an additional feature formed therebetween. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right or obliquely "on," "above," or "on top of" the second feature, or just means that the first feature is at a height higher than that of the second feature; while a first feature "below," "under," or "on bottom of" a second feature may include an embodiment in which the first feature is right or obliquely "below," "under," or "on bottom of" the second feature, or just means that the first feature is at a height lower than that of the second feature.

[0047] Reference throughout this specification to "an embodiment," "some embodiments," "an example," or "a specific example," 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 the 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. Furthermore, different embodiments or examples in thus specification can be jointed and combined by those skilled in the art without mutual contradiction.

[0048] Although explanatory embodiments have been shown 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, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

Claims

1. A sprinkling device for a washing machine, comprising:

   a water circulating member, internally provided with a water circulating passage, wherein an upper end face of the water circulating member is provided with a water inlet in communication with the water circulating passage, and a lower end face of the water circulating member is provided with a water outlet in communication with the water circulating passage;

   a water guide member, disposed below the water circulating member, and having a tapered water guide surface opposite the water outlet; and

   a plurality of shunting members, wherein lower ends of the plurality of shunting members are connected to the tapered water guide surface equidistantly along a circumferential direction of the tapered water guide surface and located between an apex and an outer circumference of the tapered water guide surface; upper ends of the plurality of shunting members are connected with the water circulating member respectively.

2. The sprinkling device according to claim 1, wherein the tapered water guide surface is configured as a conical surface, and a cross section of the shunting member extends along a radial direction of the tapered water guide surface.

3. The sprinkling device according to claim 2, wherein three shunting devices are provided.

4. The sprinkling device according to claim 2, wherein the water circulating passage is configured as a cylindrical passage, and the water inlet is communicated with an upper end of the water circulating passage while the water outlet is communicated with a lower

end of the water circulating passage.

5. The sprinkling device according to claim 4, wherein a central axis of the water circulating passage coincides with a central axis of the tapered water guide surface.

6. The sprinkling device according to any one of claims 1 to 5, wherein the water circulating passage has a diameter of 6 to 9 mm, and a distance between the apex of the tapered water guide surface and the lower end face of the water circulating member is 3 to 5 mm.

7. The sprinkling device according to claim 6, wherein a taper angle of the tapered water guide surface ranges from 120° to 130°, and a distance between the lower end of the shunting member and the outer circumference of the tapered water guide surface is 1.5 to 2.5 mm.

8. The sprinkling device according to claim 1, wherein a lower end of the water circulating member is provided with a connecting ring extending along a circumferential direction of an outer circumferential surface of the water circulating member, and the upper end of the shunting member is connected to the connecting ring.

9. The sprinkling device according to claim 8, wherein the water circulating member, the connecting ring, the water guide member and the plurality of shunting members are formed integrally.

10. A front-loading washing machine, comprising:

a cabinet, provided with a clothes access port;
an inner tub, disposed in the cabinet;
a door seal, disposed to the cabinet and surrounding the clothes access port;
a door body, disposed to the cabinet to open or close the clothes access port; and
at least one sprinkling device, configured as a sprinkling device for a washing machine according to any one of claims 1 to 9, and disposed to the door seal and located in the cabinet.

11. The front-loading washing machine according to claim 10, wherein three sprinkling devices are arranged evenly in a circumferential direction of the door seal.

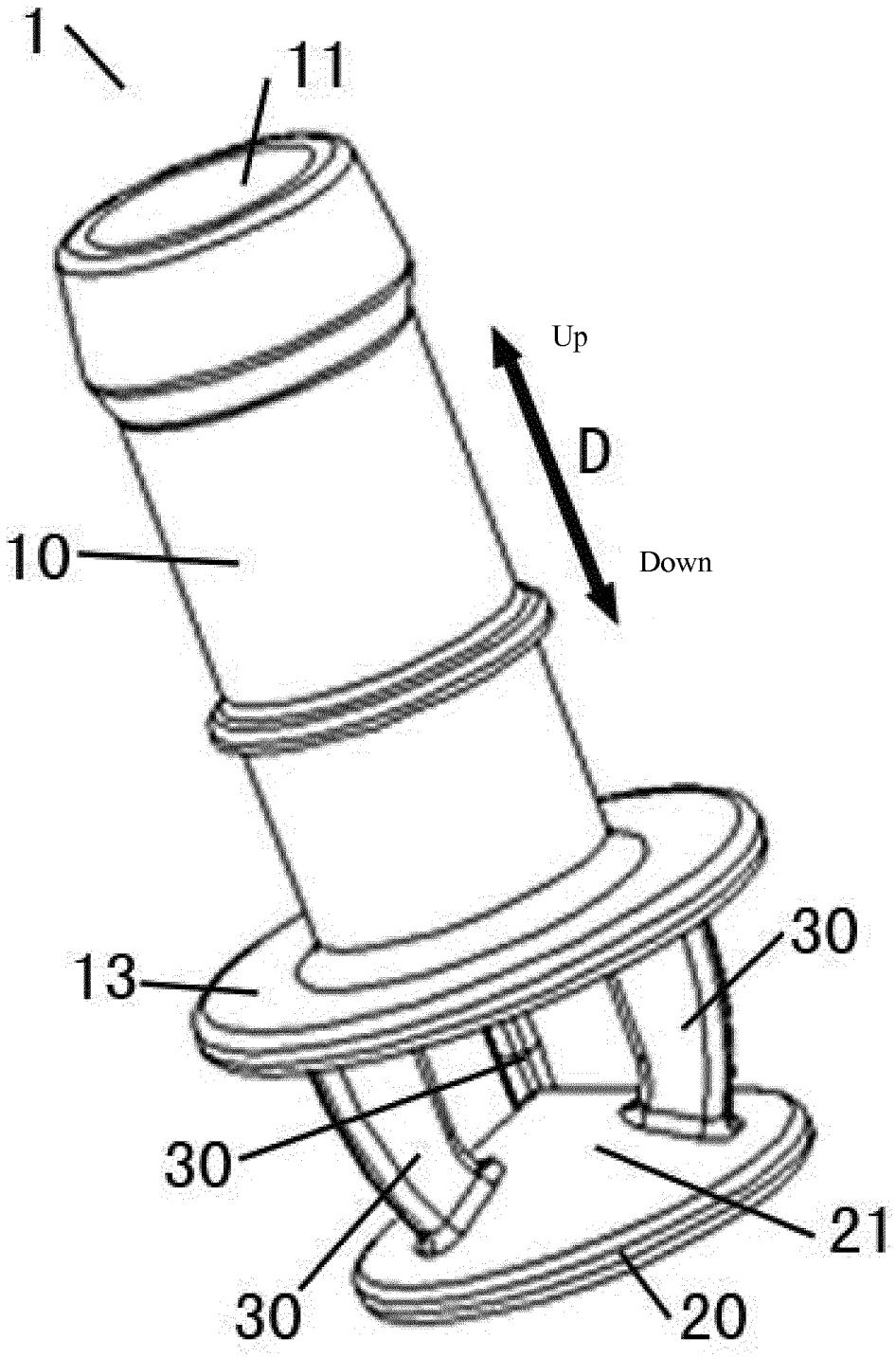

Fig. 1

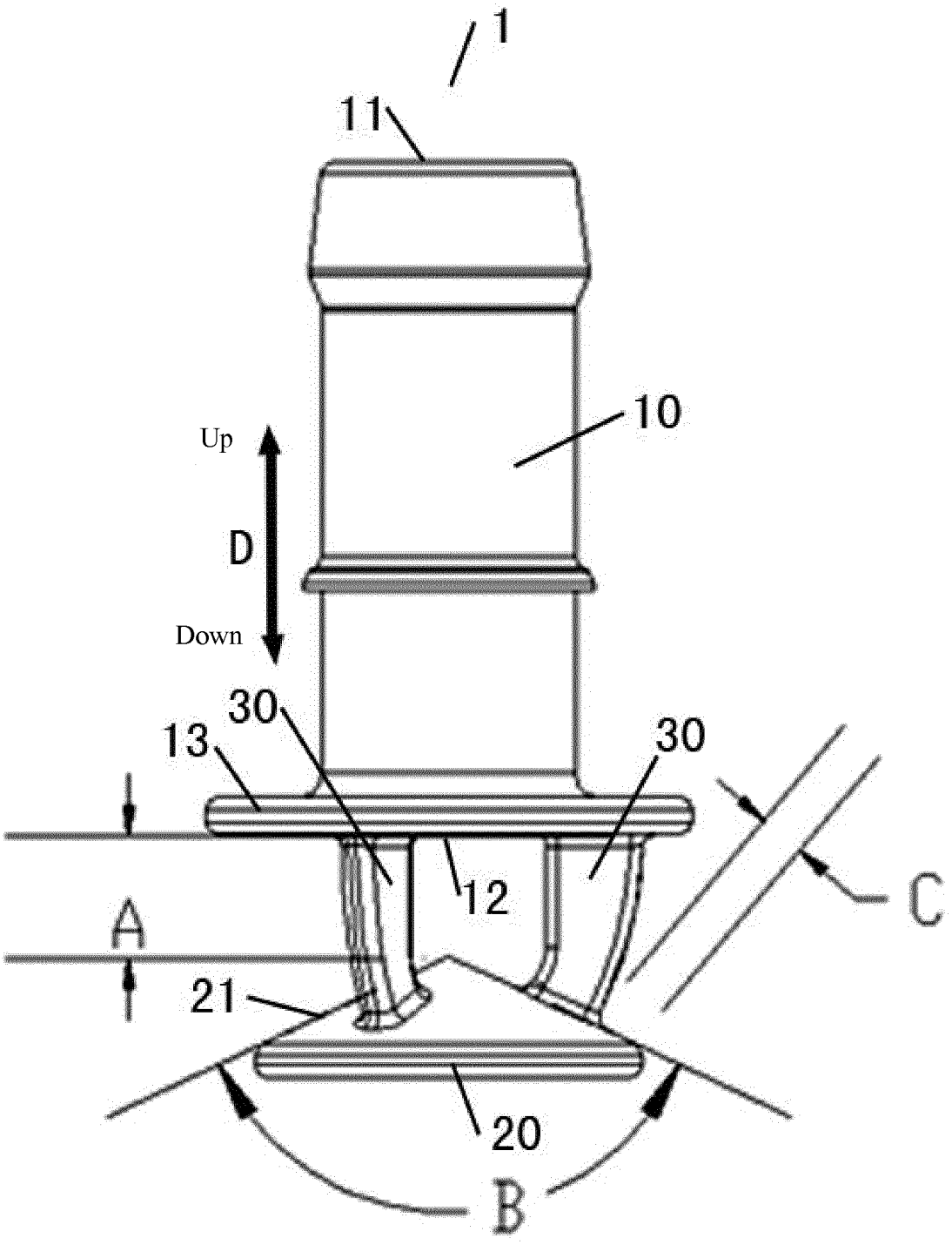

Fig. 2

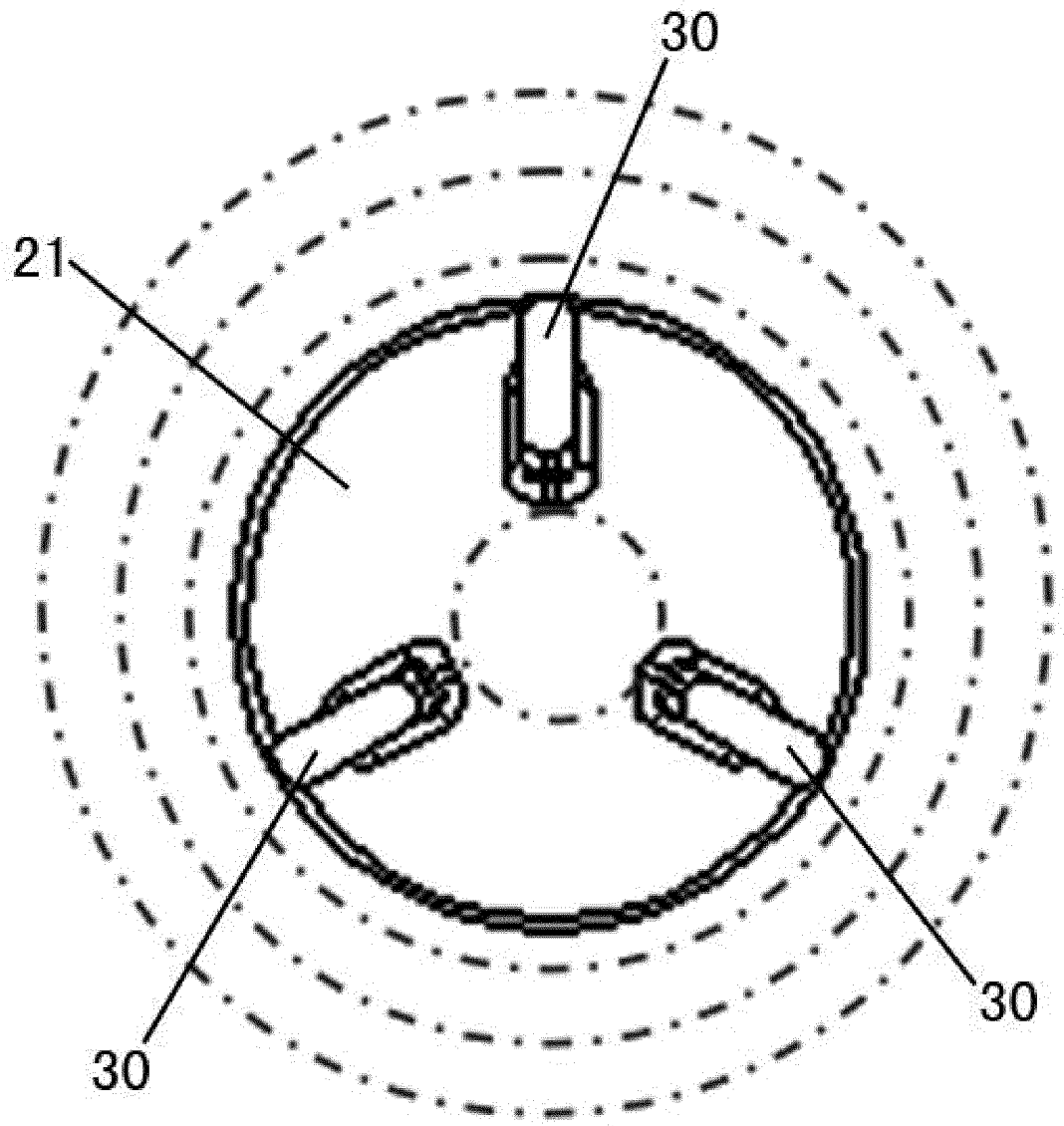

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/090748

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/08 (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)

D06F

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

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

CNTXT, CNABS, DWPI, SIPOABS: spray, pour, diffluence, diffuse, pump in, guild water, prick diffluenc+, distribute, spray+, spurt+, spout+, scatter+, dispers+, supply+, suppli+, taper, cone

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2012141407 A2 (LG ELECTRONICS INC.) 18 October 2012 (18.10.2012) description, paragraphs [0035]-[0109], and figures 7, 8a and 8b	1-11
A	JP 2001511055 A (SAMSUNG ELECTRONICS CO., LTD.) 07 August 2001 (07.08.2001) the whole document	1-11
A	CN 2372345 Y (HAIER GROUP CROP et al.) 05 April 2000 (05.04.2000) the whole document	1-11
A	CN 1619047 A (SAMSUNG ELECTRONICS CO., LTD.) 25 May 2005 (25.05.2005) the whole document	1-11
A	JP 6423991 U (SANSHIN JUSHI KOGYO KK) 08 February 1989 (08.02.1989) the whole document	1-11

☐ 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
29 April 2015	13 May 2015
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer XU, Yan Telephone No. (86-10) 62084546

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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