



(11) **EP 4 249 666 A1**

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

- (43) Date of publication: **27.09.2023 Bulletin 2023/39**
- (21) Application number: **21893875.1**
- (22) Date of filing: **16.11.2021**
- (51) International Patent Classification (IPC):
D06F 39/08^(2006.01)
- (52) Cooperative Patent Classification (CPC):
**D06F 33/62; D06F 37/02; D06F 39/08;
D06F 39/083; D06F 37/065; D06F 2103/24;
D06F 2105/08; D06F 2105/46**
- (86) International application number:
PCT/CN2021/130826
- (87) International publication number:
WO 2022/105728 (27.05.2022 Gazette 2022/21)

(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
Designated Validation States:
KH MA MD TN

(30) Priority: **20.11.2020 CN 202011314285**

(71) Applicants:
• **Qingdao Haier Drum Washing Machine Co., Ltd.
Qingdao, Shandong 266101 (CN)**

• **HAIER SMART HOME CO., LTD.
Laoshan District
Qingdao
Shandong 266101 (CN)**

(72) Inventors:
• **ZHAO, Zhiqiang
Qingdao, Shandong 266101 (CN)**
• **LV, Peishi
Qingdao, Shandong 266101 (CN)**
• **XU, Sheng
Qingdao, Shandong 266101 (CN)**

(74) Representative: **Beck & Rössig
European Patent Attorneys
Cuvilliesstraße 14
81679 München (DE)**

(54) **CLOTHING TREATMENT DEVICE AND CONTROL METHOD**

(57) The present disclosure discloses a clothes treatment device and a control method. The clothes treatment device includes: a drum, a plurality of water draining openings are formed in the drum, and a centrifugal water draining valve is arranged at each water draining opening respectively; the centrifugal water draining valves are driven by a centrifugal force to open the corresponding water draining openings after a drum rotating speed exceeds a set value, and the drum rotating speed set value corresponding to opening the water draining opening by at least one centrifugal water draining valve is different

from those by the other centrifugal water draining valves. Through the above arrangement, different numbers of centrifugal water draining valves may be driven to open respectively when the drum of the clothes treatment device is in different rotating speeds, so that the clothes treatment device may adjust the drum rotating speed, the number of the opened water draining openings of the drum may be adjusted correspondingly, and thus an effect of correspondingly adjusting a draining flow speed of a holeless drum of the clothes treatment device may be achieved.

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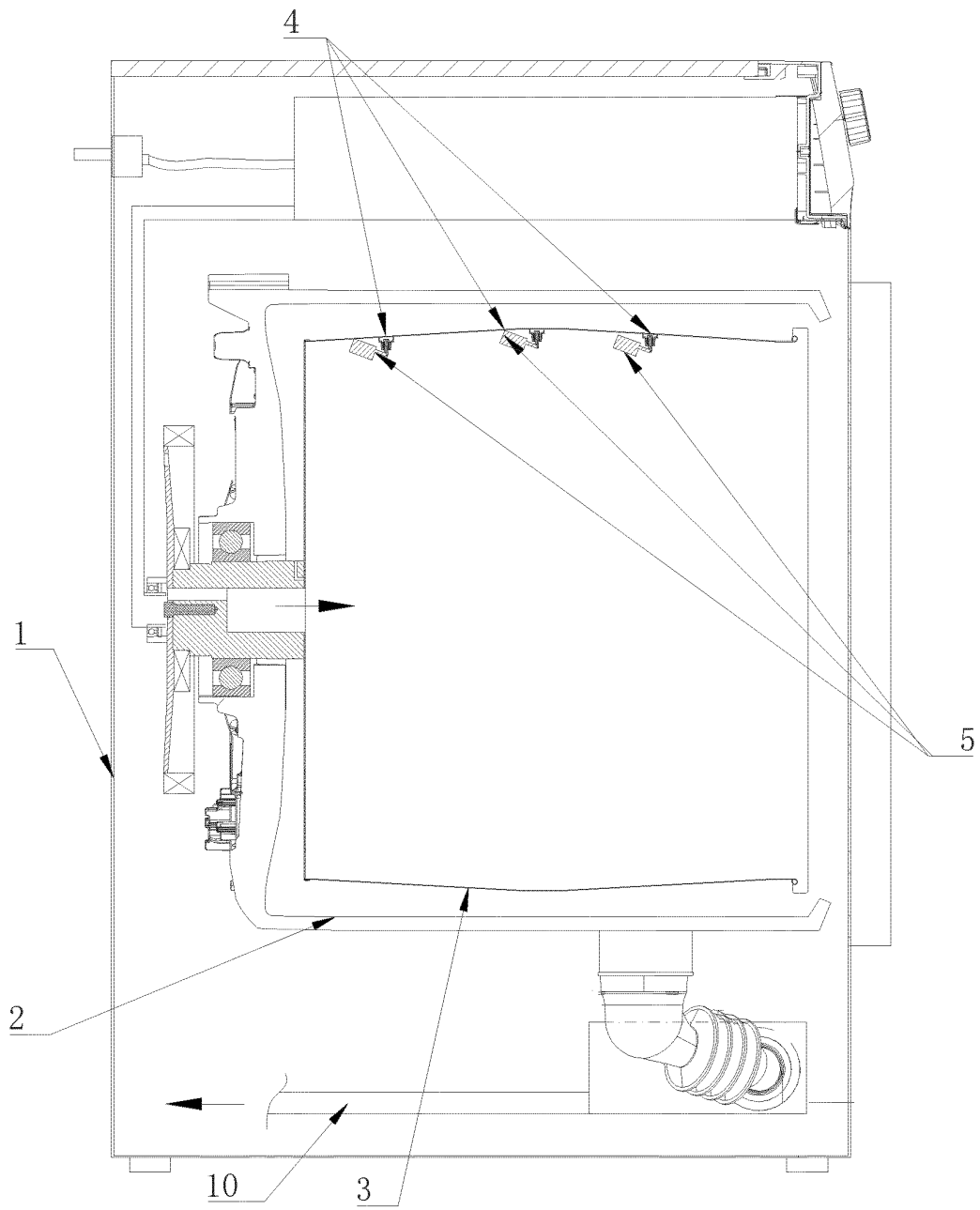


FIG. 4

Description**TECHNICAL FIELD**

[0001] The present disclosure relates to clothes treatment devices in household appliances, in particular to a clothes treatment device with a holeless drum, especially a drainage control method for a holeless drum without a dewatering hole.

BACKGROUND

[0002] With improving of people's living standards, existing washing machines are generally integrated with some other clothes treatment functions, for example, a washing and drying integrated machine, a clothes dryer and the like with a clothes drying function, a restoring machine with a clothes wrinkle flattening and ironing function, and the like. These clothes treatment devices gradually enter the public family.

[0003] An existing clothes treatment device with a clothes washing function may be roughly divided into an impeller type, an agitator type and a drum type. However, no matter what kind of above clothes treatment devices, during washing treatment of clothes, dirt and stains of to-be-washed items are removed through water and a detergent so as to achieve an effect of washing clothes.

[0004] A housing is usually arranged in a drum-type clothes treatment device, an outer drum for containing washing water is mounted inside, an inner drum for containing the to-be-washed items is arranged on an inner side of the outer drum, and a motor and a shaft for rotating the drum are arranged on a back surface of the outer drum.

[0005] While the above existing drum-type clothes treatment device executes a washing procedure, the washing water may flow across between the drum and the outer drum, and consequently, a large amount of dirt may commonly remain between an outside of the drum and an inside of the outer drum. In order to prevent the above dirt from contaminating the washing water, an applicant previously provides a holeless-drum clothes treatment device with an inner barrel and an outer drum being integrated into one, so as to solve a problem of remaining dirt between the drum and the outer drum. While the above holeless-drum clothes treatment device executes water draining, a valve at a water draining opening is driven to open by means of a drum rotating centrifugal force, so the washing water in the drum flows out from the water draining opening, and a drained water flow flows to a water collecting container to be collected and then is discharged out of the clothes treatment device through a water draining pipe connected with the water collecting container.

[0006] However, the value arranged at the drum water draining opening of the above holeless-drum clothes treatment device usually opens or closes the water draining opening at the same time after the drum rotates to

the same set value, which may cause the following problems:

during water draining of the clothes treatment device, especially in an initial stage of a water draining procedure, a situation of too high water level in a water collecting tank caused by rushing drained water of the clothes treatment device is prone to occurring, and even a problem of causing the drained water flow to overflow to an outside of the clothes treatment device happens.

[0007] Besides, in a last stage of water draining of the clothes treatment device, an amount of washing water remaining in the drum, so a draining flow speed becomes low, at the moment, in order to guarantee opening of the water draining opening, the drum still needs to be driven to rotate at a high rotating speed, so working energy consumption of the clothes treatment device is increased.

[0008] In view of this, the present disclosure is provided.

SUMMARY

[0009] A technical problem to be solved by the present disclosure is to overcome defects in the prior art and provide a clothes treatment device, so as to achieve a purpose of controlling and adjusting a draining flow speed. Besides, the present disclosure further provides a control method for the clothes treatment device so as to intelligently adjust and control a water draining procedure and then achieve a purpose of avoiding draining overflow.

[0010] In order to solve the above technical problem, a basis concept of a technical solution adopted by the present disclosure is as follows.

[0011] A clothes treatment device,

includes: a drum, wherein a plurality of water draining openings are formed in the drum, a centrifugal water draining valve is arranged at each of the water draining openings respectively, the centrifugal water draining valves are driven by a centrifugal force to open the corresponding water draining openings after a drum rotating speed exceeds a set value, and the drum rotating speed set value corresponding to opening the water draining opening by at least one centrifugal water draining valve is different from those by the other centrifugal water draining valves.

[0012] In a case that the drum rotating speed set values corresponding to opening the water draining openings by two or more than two centrifugal water draining valves are different from those by the other centrifugal water draining valves, the drum rotating speed set values corresponding to opening the water draining openings by the above two or more than two centrifugal water draining valves may be the same value or different values.

[0013] The plurality of above water draining openings are two or more than two, that is, two or more than two

centrifugal water draining valves are arranged on the drum.

[0014] Further, each of the centrifugal water draining valves includes:

- a valve element, sealing the corresponding water draining opening;
- a closing restoration structure, applying an acting force of closing the water draining opening to the valve element; and
- a centrifugal driving structure, rotating along with the drum, overcoming the closing acting force applied to the valve element by the closing restoration structure under the action of a drum rotating centrifugal force, and generating a displacement of pulling the valve element to open the water draining opening.

[0015] Further, the closing acting force applied to the valve element of at least one centrifugal water draining valve by the closing restoration structure is different from those of the other centrifugal water draining valves; and preferably, each of the closing restoration structures is a spring in a compressed state, two ends of the spring are connected with the valve element and the drum respectively, the compressed spring applies to the valve element a thrust force that moves outwards in a radial direction of the drum and closes the water draining opening; and an elastic coefficient of the spring of at least one centrifugal water draining valve is different from those of the other centrifugal water draining valves.

[0016] Further, a distance between the at least one centrifugal water draining valve and a drum shaft of the drum is different from those of the other centrifugal water draining valves; and

preferably, a drum wall of the drum is an abnormal-shaped barrel with different radial dimensions, the water draining openings are formed in different sections of the drum wall of the drum respectively, and the radial dimensions of all the sections of the drum wall where the water draining openings are formed are not the same.

[0017] Further, a mass of the centrifugal driving structure of at least one centrifugal water draining valve is different from those of the other centrifugal water draining valves; and

preferably, each of the centrifugal driving structures includes a centrifugal piece, the centrifugal piece is connected with the valve element via a lever structure, and a product of the centrifugal piece of at least one centrifugal water draining valve multiplied by a distance between a center of gravity of the centrifugal piece and a fulcrum of the lever structure is different from those of the other centrifugal water draining valves.

[0018] Further, the larger a drum rotating speed needed for opening of the centrifugal water draining valve of each water draining opening is, the smaller an aperture of the water draining opening is.

[0019] Further, at least one water draining opening is formed in a section with a largest drum diameter of the

drum, a drum rotating speed needed for opening of the centrifugal water draining valve arranged at the above water draining opening is smaller than or equal to the centrifugal water draining valves arranged at the other water draining openings.

[0020] Further, an outer drum is further included and arranged on an outside of the drum in a sleeving mode and is used for collecting water flows of the drum flowing out from the water draining opening; and a water level sensor for detecting a water level height in the outer drum is arranged on the outer drum.

[0021] The present disclosure further provides a control method for any above clothes treatment device. During water draining, liquid level monitoring is performed on a water level in the outer drum; and after a liquid level detected value is higher than a set value, a drum rotating speed is reduced, and the number of opened water draining openings is reduced.

[0022] Further, specific steps of the draining control method for the clothes treatment device are as follows:

Step S 1, starting to execute a water draining procedure, a drum rotating at a largest first set value, and a centrifugal water draining valve at each water draining opening being opened under the action of a centrifugal force;

Step S2, detecting a water level height in the outer drum, executing step S3 if a water level detected value of the outer drum is greater than a set water level; and otherwise, continuing to execute step S 1; and

Step S3, controlling the drum rotating speed to decrease to a second set value to rotate, the centrifugal water draining valves of some water draining openings being closed and the centrifugal water draining valves of some water draining openings keeping open under the action of the centrifugal force.

[0023] Compared with the prior art, after adopting the above technical solution, the present disclosure has the following beneficial effects:

through the above arrangement, different numbers of centrifugal water draining valves may be driven to open respectively when the drum of the clothes treatment device is in different rotating speeds, so that the clothes treatment device may adjust the drum rotating speed, the number of the opened water draining openings of the drum may be adjusted correspondingly, and thus an effect of correspondingly adjusting a draining flow speed of the holeless drum of the clothes treatment device may be achieved.

[0024] Meanwhile, as for the present disclosure, a structure is simple, the method is concise, the effects are remarkable, and the present disclosure is suitable for being applied and popularized.

[0025] Specific implementations of the present disclosure are further described in detail below with reference to accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings, as a part of the present disclosure, are used for providing further understanding for the present disclosure, schematic embodiments of the present disclosure and their description are used for explaining the present disclosure, but do not constitute an improper limitation on the present disclosure. Apparently, the accompanying drawings in the following description are merely some embodiments, and those ordinarily skilled in the art can further obtain other drawings according to these accompanying drawings without creative efforts. In the accompanying drawings:

Fig. 1 is a schematic structural diagram of a clothes treatment device in an embodiment of the present disclosure.

Fig. 2 is a schematic structural enlarged view of a position A of Fig. 1 in an embodiment of the present disclosure.

Fig. 3 is a schematic structural enlarged view of a position A of Fig. 1 in another embodiment of the present disclosure.

Fig. 4 is a schematic structural front view of a clothes treatment device in yet another embodiment of the present disclosure.

Fig. 5 is a flowchart of a control method for a clothes treatment device in an embodiment of the present disclosure.

[0027] Description of main elements in the drawings: 1, housing; 2, outer drum; 3, drum; 4, water draining opening; 5, centrifugal water draining valve; 6, valve element; 7, centrifugal piece; 8, lever; 9, spring; 10, water draining pipe.

[0028] It needs to be noted that these accompanying drawings and text descriptions are not intended to limit the concept scope of the present disclosure in any form, but to explain the concept of the present disclosure for those skilled in the art with reference to specific embodiments.

DETAILED DESCRIPTION

[0029] In order to make objectives, technical solutions and advantages of the embodiments of the present disclosure clearer, the technical solutions in the embodiments will be described clearly and completely below with reference to the accompanying drawings in the embodiments of the present disclosure, and the following embodiments are used for explaining the present disclosure but not for limiting the scope of the present disclosure.

[0030] In the description for the present disclosure, it needs to be noted that orientations or position relationships indicated by terms such as "upper", "lower", "front", "rear", "left", "right", "vertical", "inner" and "outer" are orientations or position relationships shown based on the accompanying drawings and are merely intended to con-

veniently and concisely describe the present disclosure, but not to indicate or imply that an apparatus or an element referred to definitely has a specific orientation and constructed and operated in the specific orientation, so as not to be construed as limiting the present disclosure.

[0031] In the description for the present disclosure, it needs to be noted that unless otherwise clearly specified and limited, terms "mount", "connected", "connection" are to be understood in a broad sense, for example, may be a fixed connection, or a detachable connection, or an integrated connection, or a mechanical connection, or an electrical connection, or a direct connection, or an indirect connection through an intermediate medium. Those ordinarily skilled in the art may understand specific meanings of the above terms in the present disclosure according to specific conditions.

[0032] As shown in Fig. 1 to Fig. 4, an embodiment of the present disclosure introduces a clothes treatment device, including a drum 3, the drum 3 is a barrel-shaped structure without a normally-open through hole. The drum may independently contain washing water and rotate while the clothes treatment device executes a clothes washing procedure, clothes and water are beaten by using a rotating acting force so as to achieve an effect of washing treatment for the clothes in the drum. A problem that the washing water flows across inside and outside the drum 3 during working of the clothes treatment device, and the washing water is contaminated by dirt and bacteria accumulated outside the drum and cannot clean the clothes thoroughly is avoided.

[0033] In the embodiment of the present disclosure, a plurality of water draining openings 4 are formed in the drum 3, a centrifugal water draining valve 5 is mounted at each water draining opening 4 respectively, a valve element 6 of each centrifugal water draining valve 5 seals the corresponding water draining opening 4. And thus, during normal working of the clothes treatment device, the water draining openings of the drum are sealed under the action of the valve elements, and then it is guaranteed that the drum forms a sealed water container. Meanwhile, after a rotating speed of the drum 3 reaches a set value, the valve elements 6 are driven by a centrifugal force to open the corresponding water draining openings 4, so that the washing water contained in the drum 3 is drained outwards from the water draining openings 4, flows into a water collecting container on an outside of the drum 3, and then flows out of the clothes treatment device via a water draining pipe 10 communicating with a bottom of the water collecting container. The plurality of above water draining openings 4 are two or more than two water draining openings 4, so that two or more than two centrifugal water draining valves 5 are arranged on the drum 3.

[0034] In the embodiment of the present disclosure, the water collecting container is an independent part, which may be a water collecting tank arranged below and on a periphery of the drum, or may also be directly composed of an existing outer drum 2 (shown in Fig. 1 to Fig.

4), or the like.

[0035] In the embodiment of the present disclosure, the drum 3 is rotationally mounted on a supporting piece, and the supporting piece may be an independent piece or other pieces. Preferably, as shown in Fig. 1 to Fig. 4, in the embodiment of the present disclosure, the supporting piece is the outer drum 2 arranged on the outside of the drum in a sleeving mode, the outer drum 2 is telescopically mounted in a housing 1 of the clothes treatment device via a damping supporting piece, and the outer drum 2 forms the water collecting container which collects a drained water flow of the drum flowing out from the open water draining opening 4.

[0036] As shown in Fig. 1 to Fig. 4, in the embodiment of the present disclosure, the clothes treatment device includes: the drum 3, the plurality of water draining openings 4 are formed in the drum 3, and the centrifugal water draining valve 5 is arranged at each water draining opening 4 respectively. After the rotating speed of the drum 3 exceeds the set value, the centrifugal water draining valves 5 are driven by the centrifugal force to open the corresponding water draining openings 4; and a set value of the rotating speed of the drum 3 corresponding to opening the water draining opening 4 by at least one centrifugal water draining valve 5 is different from those

by the other centrifugal water draining valves 5. **[0037]** When the drum rotating speed set values corresponding to opening the water draining openings by two or more than two centrifugal water draining valves are different from those by the other centrifugal water draining valves, the drum rotating speed set values corresponding to opening the water draining openings by the above two or more than two centrifugal water draining valves may be the same value or different values.

[0038] Through the above arrangement, different numbers of centrifugal water draining valves may be driven to open respectively when the drum of the clothes treatment device is in different rotating speeds, so that the clothes treatment device may adjust the drum rotating speed, the number of the opened water draining openings of the drum may be adjusted correspondingly, and thus an effect of correspondingly adjusting a draining flow speed of the holeless drum of the clothes treatment device may be achieved.

Embodiment 1

[0039] As shown in Fig. 1 and Fig. 2, an embodiment introduces a clothes treatment device, including: a drum 3, a plurality of water draining openings 4 are formed in the drum 3, and a centrifugal water draining valve 5 is mounted at each water draining opening 4 respectively. After a rotating speed of the drum 3 exceeds a set value, the centrifugal water draining valves 5 are driven by a centrifugal force to open the corresponding water draining openings 4; and a set value of the rotating speed of the drum 3 corresponding to opening the water draining opening 4 by at least one centrifugal water draining valve

5 is different from those by the other centrifugal water draining valves 5.

[0040] As shown in Fig. 1 and Fig. 2, in the embodiment, each centrifugal water draining valve 5 includes:

a valve element 6, sealing the corresponding water draining opening 4;

a closing restoration structure, applying an acting force of closing the water draining opening 4 to the valve element; and

a centrifugal driving structure, rotating along with the drum 3, overcoming the closing acting force applied to the valve element 6 by the closing restoration structure under the action of a drum 3 rotating centrifugal force, and generating a displacement of pulling the valve element 6 to open the water draining opening 4.

[0041] In the embodiment, in order to achieve different drum 3 rotating speed set values corresponding to opening the water draining openings 4 by the different centrifugal water draining valves 5, the following arrangement is made:

As shown in Fig. 1 and Fig. 2, in the embodiment, the closing acting force applied to the valve element 6 of at least one centrifugal water draining valve 5 by the closing restoration structure is different from those of the other centrifugal water draining valves 5, so that the closing restoration structures of the different centrifugal water draining valves 5 are arranged differently, to achieve a purpose of correspondingly adjusting the drum 3 rotating speed set values corresponding to closing of the valve elements 6 of the centrifugal water draining valves 5.

[0042] In the embodiment, each closing restoration structure may be any existing elastic component such as a spring 9, a hydraulic rod and a pneumatic rod, and the different closing restoration structures of the different centrifugal water draining valves may be arranged with different elastic coefficients, different quantities and the like. For example, the following arrangement is made:

as shown in Fig. 1 and Fig. 2, in the embodiment, the closing restoration structure of each centrifugal water draining valve is a spring 9 in a compressed state, two ends of the spring 9 are connected with the valve element 6 and the drum 3 respectively, the compressed spring 9 applies to the valve element 6 a thrust force that moves outwards in a radial direction of the drum 3 and closes the water draining opening 4; and an elastic coefficient of the spring 6 of at least one centrifugal water draining valve 5 is different from those of the other centrifugal water draining valves 5.

Embodiment 2

[0043] Based on above embodiment 1, the embodiment further has the following technical features:

as shown in Fig. 4, in the embodiment, in order to achieve different drum 3 rotating speed set values corresponding

to opening water draining openings 4 by different centrifugal water draining valves 5, the following arrangement is made:

as shown in Fig. 4, in the embodiment, a distance between the at least one centrifugal water draining valve 5 and a drum shaft of a drum 3 is different from those of the other centrifugal water draining valves 5, so that centrifugal forces borne by valve elements 6 of the centrifugal water draining valves 5 with different distances while the drum 3 is in the same rotating speed are different, thus the centrifugal water draining valves 5 in different positions open in different drum 3 rotating speeds, and then the drum 3 rotating speed set values corresponding to opening of the valve elements 6 of the centrifugal water draining valves 5 in the different positions are different.

[0044] Preferably, in the embodiment, a drum wall of the drum 3 is an abnormal-shaped barrel with different radial dimensions, at least one water draining opening is formed in different sections of the drum wall of the drum 3 respectively, and the radial dimensions of all the sections of the drum wall where the water draining openings 4 are formed are not the same.

[0045] Further preferably, in the embodiment, at least one water draining opening 4 is formed in a section with a largest radial dimension of the drum 3, so as to guarantee that water contained in the drum can be drained from the water draining opening, and residual washing water in the drum is avoided.

Embodiment 3

[0046] Based on above embodiment 1 and embodiment 2, the embodiment further has the following technical features:

as shown in Fig. 1 and Fig. 3, in the embodiment, in order to achieve different drum 3 rotating speed set values corresponding to opening water draining openings 4 by different centrifugal water draining valves, the following arrangement is made:

as shown in Fig. 1 and Fig. 3, in the embodiment, a mass of a centrifugal driving structure of at least one centrifugal water draining valve 5 is different from those of the other centrifugal water draining valves 5, so that opening acting forces applied to valve elements 6 by the centrifugal driving structures of the different centrifugal water draining valves 5 while the drum 3 is in the same rotating speed are different, and thus an effect of different drum 3 rotating speed set values corresponding to opening of the centrifugal water draining valves 5 at the different water draining openings 4 is achieved.

[0047] Preferably, as shown in Fig. 1 and Fig. 3, in the embodiment, each centrifugal driving structure includes a centrifugal piece 7, the centrifugal piece 7 is connected with the valve element 6 via a lever structure 8, and a product of the centrifugal piece 7 of at least one centrifugal water draining valve 5 multiplied by a distance between a center of gravity of the centrifugal piece 7 and a fulcrum of the lever structure 8 is different from those of

the other centrifugal water draining valves 5. That is, masses of the centrifugal pieces 7 of the different centrifugal water draining valves 5 and/or distances between the centrifugal pieces 7 and fulcrums are not the same, so that the opening acting forces applied to the valve elements 6 by the centrifugal pieces 7 while the drum 3 is in the same rotating speed are different, and thus arrangement that the drum 3 rotating speed set values corresponding to opening of the valve elements 6 of the different centrifugal water draining valves 5 are not the same is achieved.

Embodiment 4

[0048] The embodiment introduces a clothes treatment device. In order to achieve different drum 3 rotating speed set values corresponding to opening water draining openings 4 by different centrifugal water draining valves 5, the clothes treatment device may be arranged by adopting a mode of any one or a combination of above embodiment 1 to embodiment 3.

Embodiment 5

[0049] Based on above embodiment 1 to embodiment 4, the embodiment further has the following technical features:

in the embodiment, in order to guarantee smooth draining and drain all washing water in a drum 3, the following arrangement is made: apertures of all water draining openings 4 in the drum 3 of a clothes treatment device are not the same, the larger a drum 3 rotating speed needed for opening of a centrifugal water draining valve 5 of each water draining opening 4 is, the smaller the aperture of the water draining opening 4 is, a draining rate of the drum 3 decreases progressively in an equal-difference mode while the rotating speed of the drum 3 is reduced, and the draining rate may be guaranteed on the premise of effectively preventing draining overflow.

[0050] As shown in Fig. 4, in the embodiment, at least one water draining opening 4 is formed in a section with a largest drum diameter of the drum 3, a drum 3 rotating speed needed for opening of the centrifugal water draining valve 5 arranged at the above water draining opening 4 is smaller than or equal to the centrifugal water draining valves 5 arranged at the other water draining openings 4, so as to guarantee that while the clothes treatment device executes a water draining procedure, the water draining opening 4 formed in the section with the largest diameter of the drum 3 keeps open all the time, and all the water contained in the drum 3 may be drained.

[0051] In the embodiment, the clothes treatment device further includes an outer drum 2, arranged on an outside of the drum 3 in a sleeving mode to form a water collecting container and used for collecting water flows of the drum 3 flowing out from the water draining opening 4; and a water level sensor for detecting a water level height in the outer drum 2 is arranged on the outer drum

2, so as to detect a water draining level accumulated in the outer drum 2 in real time (not shown in the figures).

Embodiment 5

[0052] The embodiment introduces a control method for the clothes treatment device described in above any one of above embodiment 1 to embodiment 4. During water draining executed by the clothes treatment device, liquid level monitoring is performed on a water level in an outer drum of the clothes treatment device; and after a liquid level detected value is higher than a set value, a drum rotating speed is reduced, and the number of opened water draining openings is reduced.

[0053] As shown in Fig. 5, in the embodiment, specific steps of the draining control method for the clothes treatment device are as follows:

Step S 1, executing a water draining procedure, a drum rotating at a largest first set value, and a centrifugal water draining valve at each water draining opening being opened under the action of a centrifugal force;

Step S2, detecting a water level height in the outer drum, step S3 is executed if a water level detected value of the outer drum is greater than a set water level; and otherwise, step S 1 continues to be executed; and

Step S3, the drum rotating speed being controlled to decrease to a second set value to rotate, the centrifugal water draining valves of some water draining openings being closed and the centrifugal water draining valves of some water draining openings keeping open under the action of the centrifugal force.

[0054] In the embodiment, the plurality of water draining openings are formed in the drum, all the water draining openings are divided into many types according to drum rotating speeds corresponding to opening of the centrifugal water draining valves, namely, a first type of water draining openings, a second type of water draining openings...an n^{th} type of water draining openings. A drum rotating speed corresponding to opening and closing of the first type of water draining openings is a first set rotating speed, a drum rotating speed corresponding to opening and closing of the second type of water draining openings is a second set rotating speed..., and a drum rotating speed corresponding to opening and closing of the n^{th} type of water draining openings is an n^{th} set rotating speed.

[0055] In the embodiment, the first centrifugal water draining valve is mounted at the first type of water draining openings, the second centrifugal water draining valve is mounted at the second type of water draining openings..., the n^{th} centrifugal water draining valve is mounted at the n^{th} type of water draining openings. The drum rotating speed corresponding to opening the first type of

water draining openings by the first centrifugal water draining valve is the first set rotating speed, the drum rotating speed corresponding to opening the second type of water draining openings by the second centrifugal water draining valve is the second set rotating speed..., the drum rotating speed corresponding to opening the n^{th} type of water draining openings by the n^{th} centrifugal water draining valve is the n^{th} set rotating speed, and the first set rotating speed is smaller than the second set rotating speed... and smaller than the n^{th} set rotating speed.

[0056] Preferably, in the embodiment, an aperture of the first type of water draining openings is smaller than an aperture of the second type of water draining openings... and smaller than an aperture of the n^{th} type of water draining openings. Further preferably, at least one n^{th} type of water draining opening is formed in a section with a largest diameter of the drum, so as to guarantee that all water contained in the clothes treatment drum can be drained.

[0057] Preferably, in the embodiment, specific steps of the draining control method for the clothes treatment device may be as follows:

Step S 1, executing the water draining procedure, the drum rotating at the largest first set value, and the centrifugal water draining valve at each water draining opening being opened under the action of the centrifugal force;

Step S2, detecting the water level height in the outer drum, step S3 is executed if the water level detected value of the outer drum is greater than the set water level; and otherwise, step S 1 continues to be executed;

Step S3, the drum rotating speed being controlled to decrease to the second set value to rotate, the centrifugal water draining valves of the first type of water draining openings being closed and the centrifugal water draining valves of other water draining openings keeping open under the action of the centrifugal force;

Step S4, detecting the water level height in the outer drum; step S5 is executed if the water level detected value of the outer drum is greater than a second set water level; and otherwise, step S3 continues to be executed;

Step S5, the drum rotating speed being controlled to decrease to a third set value to rotate, the centrifugal water draining valves of the first type of water draining openings and the second type of water draining openings being closed and the centrifugal water draining valves of the other water draining openings keeping open under the action of the centrifugal force;

[0058] Step Sn, detecting the water level height in the outer drum, where the centrifugal water draining valves of all the water draining openings are closed if the water

level detected value of the outer drum is greater than an nth set water level, and the clothes treatment device gives an alarm prompt signal of draining blockage.

[0059] The above description is merely exemplary embodiments of the present disclosure and does not limit the present disclosure in any form. Though the present disclosure is already revealed as the above exemplary embodiments but is not limited by them. Any person skilled and well knowing this patent can make some changes or modifications as equivalent changed embodiments by using the above provided technical contents without departing from the scope of the technical solutions of the present disclosure. Implementations in the above embodiments may be further combined or replaced, but any simple variation, equivalent change and modification made to the above embodiments according to the technical essence of the present disclosure without departing from the contents of the technical solutions of the present disclosure still fall within the scope of the solutions of the present disclosure.

Claims

1. A clothes treatment device,

comprising: a drum, a plurality of water draining openings being formed in the drum, a centrifugal water draining valve being arranged at each of the water draining openings respectively, the centrifugal water draining valves being driven by a centrifugal force to open the corresponding water draining openings after a drum rotating speed exceeds a set value, and **characterized in that** the drum rotating speed set value corresponding to open the water draining opening by at least one centrifugal water draining valve is different from those by the other centrifugal water draining valves.

2. The clothes treatment device according to claim 1, **characterized in that** each of the centrifugal water draining valves comprises:

a valve element, sealing the corresponding water draining opening; a closing restoration structure, applying an acting force of closing the water draining opening to the valve element; and a centrifugal driving structure, rotating along with the drum, overcoming a closing acting force applied to the valve element by the closing restoration structure under the action of the centrifugal force, and generating a displacement of pulling the valve element to open the water draining opening.

3. The clothes treatment device according to claim 2, **characterized in that** the closing acting force applied to the valve element of at least one centrifugal water draining valve by the closing restoration structure is different from those of the other centrifugal water draining valves; and preferably, each of the closing restoration structures is a spring in a compressed state, two ends of the spring are connected with the valve element and the drum respectively, the compressed spring applies to the valve element a thrust force that moves outwards in a radial direction of the drum and closes the water draining opening; and an elastic coefficient of the spring of at least one centrifugal water draining valve is different from those of the other centrifugal water draining valves.

4. The clothes treatment device according to claim 1 or 2, **characterized in that** a distance between at least one centrifugal water draining valve and a drum shaft of the drum is different from those of the other centrifugal water draining valves; and preferably, a drum wall of the drum is an abnormal-shaped barrel with different radial dimensions, the water draining openings are formed in different sections of the drum wall of the drum respectively, and the radial dimensions of all the sections of the drum wall where the water draining openings are formed are not the same.

5. The clothes treatment device according to claim 2, **characterized in that** a mass of the centrifugal driving structure of at least one centrifugal water draining valve is different from those of the other centrifugal water draining valves; and preferably, each of the centrifugal driving structures comprises a centrifugal piece, the centrifugal piece is connected with the valve element via a lever structure, and a product of the centrifugal piece of at least one centrifugal water draining valve multiplied by a distance between a center of gravity of the centrifugal piece and a fulcrum of the lever structure is different from those of the other centrifugal water draining valves.

6. The clothes treatment device according to any one of claims 1 to 5, **characterized in that** the larger a drum rotating speed needed for opening the centrifugal water draining valve of each of water draining openings is, the smaller an aperture of the water draining opening is.

7. The clothes treatment device according to any one of claims 1 to 6, **characterized in that** at least one water draining opening is formed in a section with a largest drum diameter of the drum, a drum rotating speed needed for opening the centrifugal water draining valve arranged at the above water draining

opening is smaller than or equal to the centrifugal water draining valves arranged at the other water draining openings.

8. The clothes treatment device according to any one of claims 1 to 7, **characterized by** further comprising an outer drum arranged on an outside of the drum in a sleeving mode and used for collecting a water flow of the drum flowing out from the water draining opening; and a water level sensor for detecting a water level height in the outer drum being arranged on the outer drum. 5
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9. A control method for the clothes treatment device according to any one of claims 1 to 8, **characterized in that** during water draining, liquid level monitoring is performed on a water level in the outer drum; and after a liquid level detected value is higher than a set value, a drum rotating speed is reduced, and a number of opened water draining openings is reduced. 15
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10. The control method for the clothes treatment device according to claim 9, **characterized in that** specific steps are as follows: 25

Step S 1, starting to execute a water draining procedure, the drum rotating at a largest first set value, and the centrifugal water draining valve at each water draining opening being opened under the action of the centrifugal force; 30

Step S2, detecting a water level height in the outer drum, executing step S3 if a water level detected of the outer drum is greater than a set water level; and otherwise, continuing to execute step S 1; and 35

Step S3, controlling the drum rotating speed to decrease to a second set value to rotate, the centrifugal water draining valves of part water draining openings being closed and the centrifugal water draining valves of some water draining openings keeping open under the action of the centrifugal force. 40

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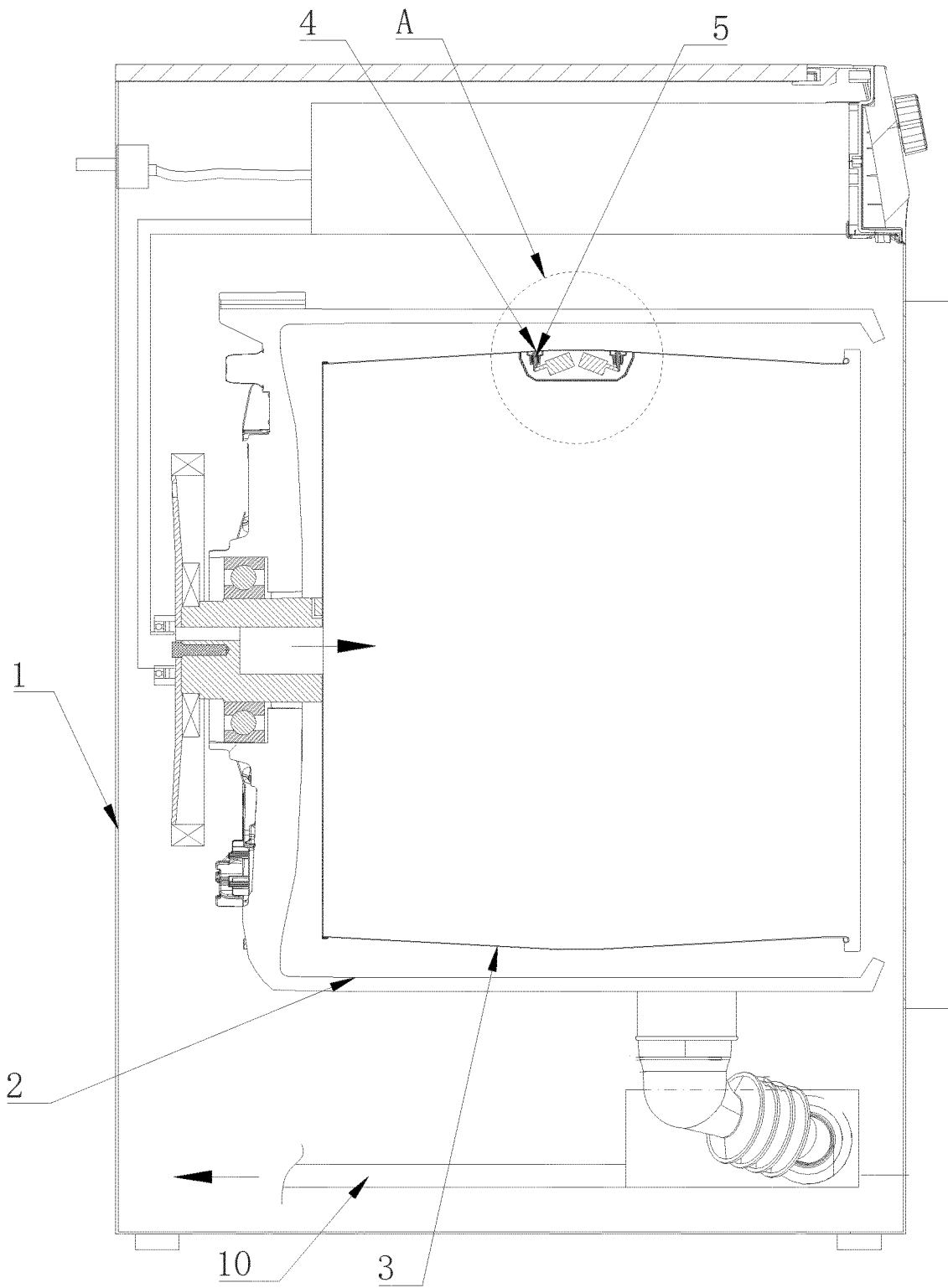


FIG. 1

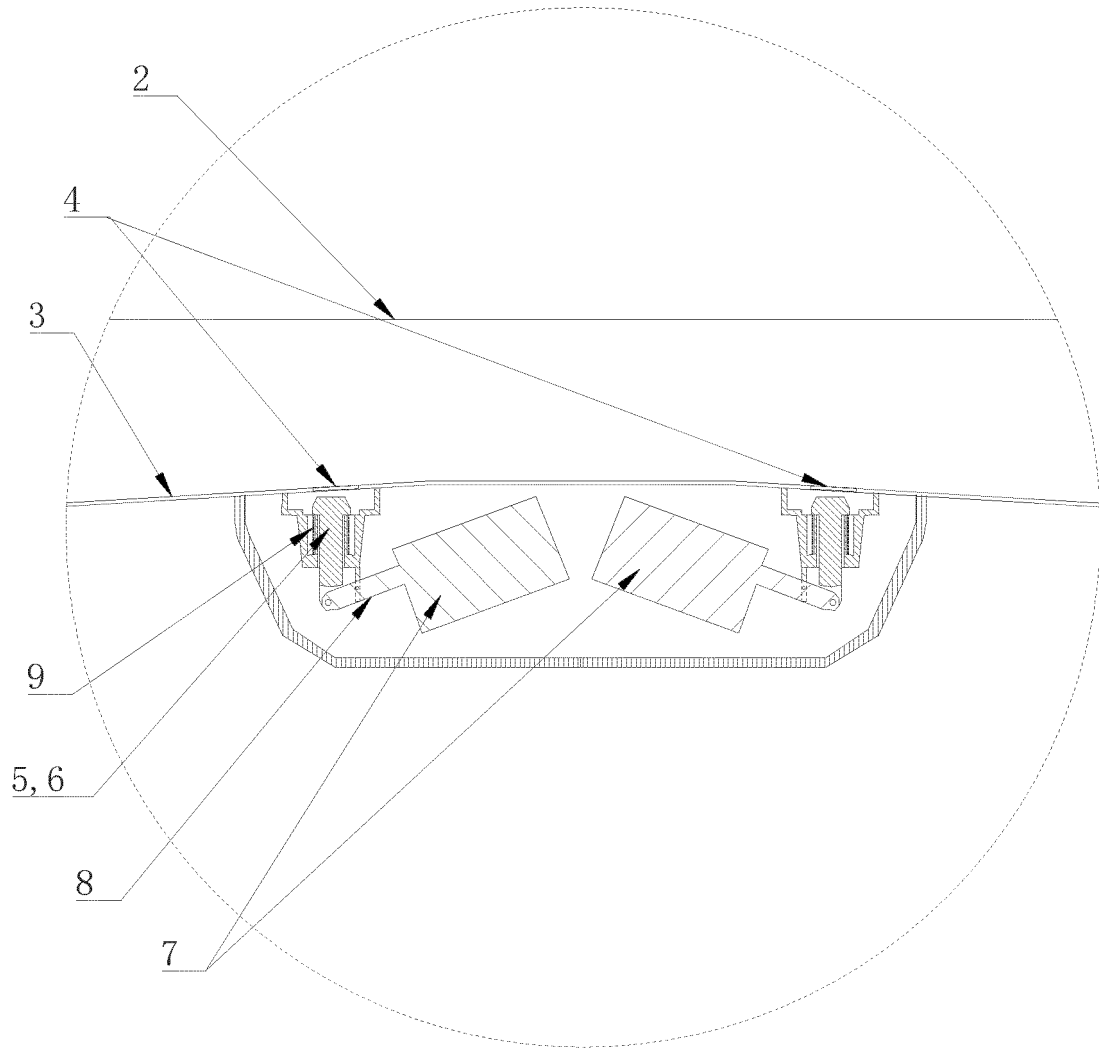


FIG. 2

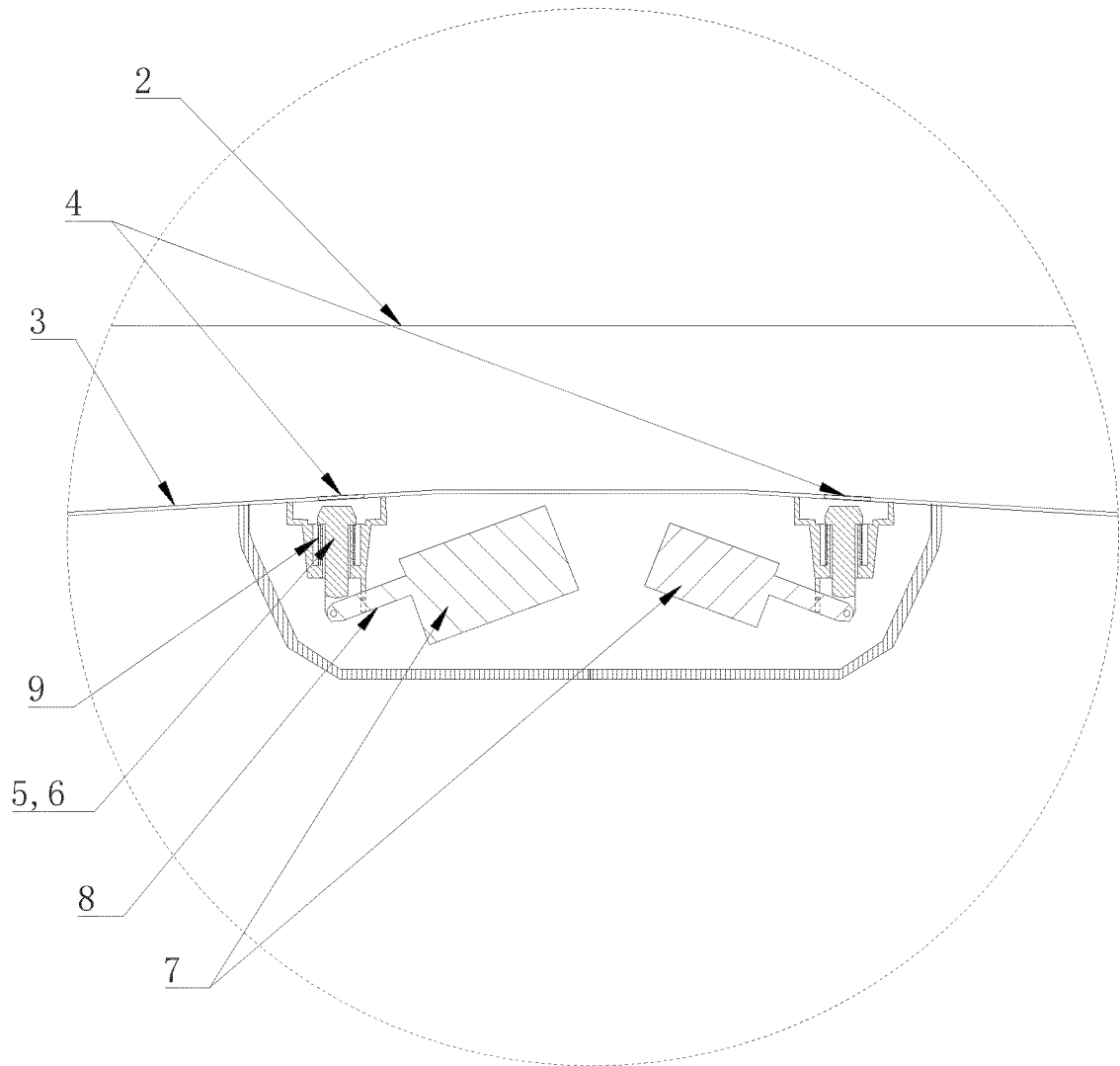


FIG. 3

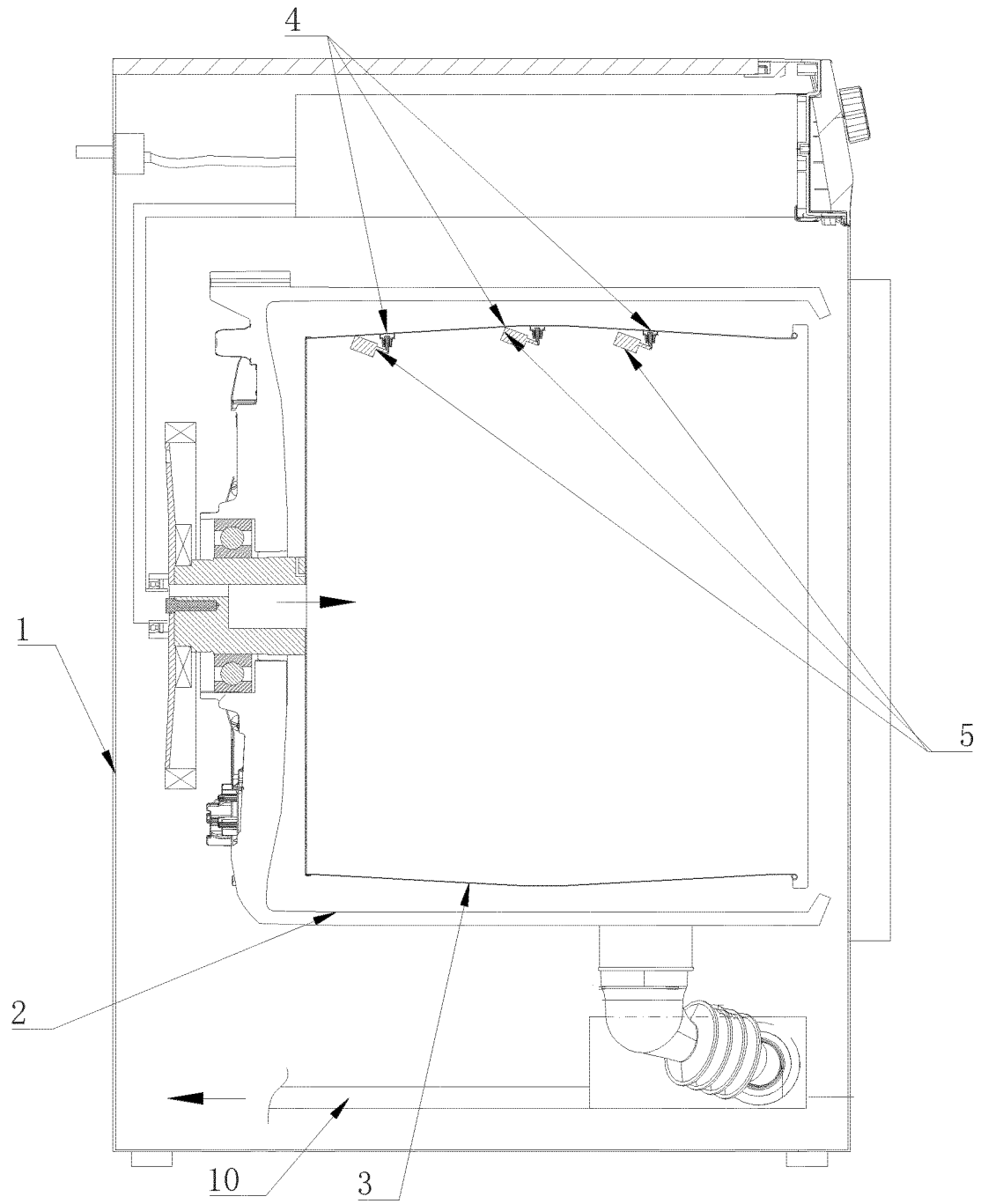


FIG. 4

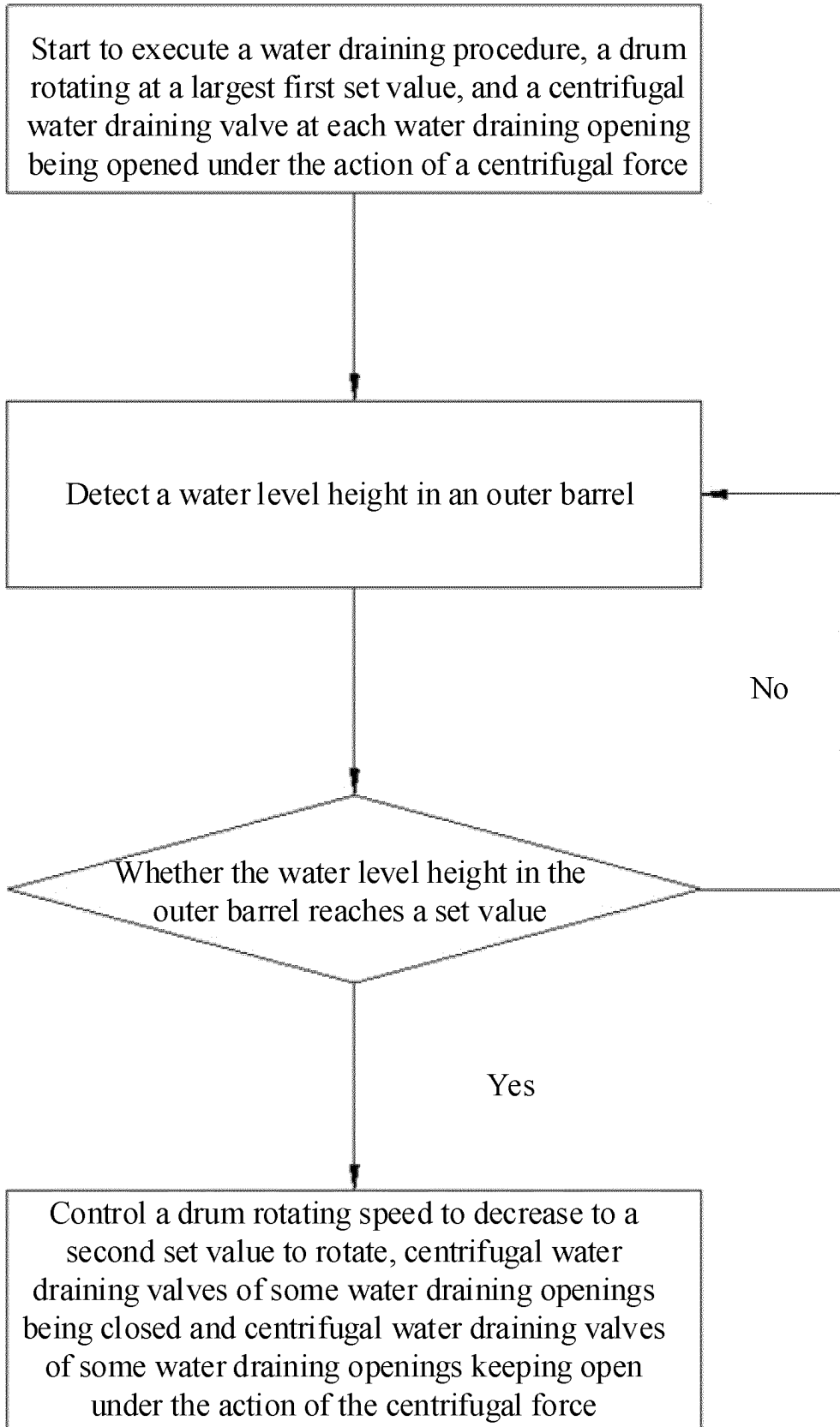


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/130826

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A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/08(2006.01)j

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

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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

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

WPI, EPODOC, CNPAT, CNKI: 洗衣, 排水, 出水, 滚筒, 排水阀, 出水阀, 转速, 溢流, 溢水, 控制, washer, drain, outlet, valve, rotat+, flood, overfall, control

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 111485369 A (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 04 August 2020 (2020-08-04) description, paragraphs 39-100, figures 1-6	1-10
A	CN 210420599 U (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 28 April 2020 (2020-04-28) entire document	1-10
A	CN 111519404 A (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 11 August 2020 (2020-08-11) entire document	1-10
A	CN 111764115 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD. et al.) 13 October 2020 (2020-10-13) entire document	1-10
A	CN 110499624 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 26 November 2019 (2019-11-26) entire document	1-10
A	US 4231130 A (HITACHI LTD.) 04 November 1980 (1980-11-04) entire document	1-10

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

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"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

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"&" document member of the same patent family

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Date of the actual completion of the international search

21 January 2022

Date of mailing of the international search report

10 February 2022

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Name and mailing address of the ISA/CN

**China National Intellectual Property Administration (ISA/
CN)**
No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing
100088, China

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/130826

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CN	110499624	A	26 November 2019	None			
US	4231130	A	04 November 1980	CA	1106474	A	04 August 1981
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