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(54) **DRUM WASHING MACHINE AND CONTROL METHOD THEREFOR**

(57) Provided are a drum washing machine and a control method thereof. The drum washing machine includes: an inner drum (3) having a washing chamber capable of independently containing washing water; an inner drum drainage port (9) disposed in the inner drum (3); and a drainage sealing device installed on the inner drum drainage port (9) to control opening and closing thereof, wherein the drainage sealing device includes a drainage channel (7) communicating with the inner drum drainage port (9) and a blocking component (8) that controls opening and closing of the drainage channel (7). The drum washing machine realizes the opening and

closing control over the inner drum drainage port through the drainage sealing device, the drainage sealing device includes the drainage channel communicating with the inner drum drainage port and the blocking component that controls the opening and closing of the drainage channel, the opening and closing control over the inner drum drainage port is converted into on-off control of the drainage channel, the blocking component can be designed to have different motion states by using the shifting of working states of the inner drum, thereby switching on-off of the drainage channel, the structure is simple, and control is easy to realize.

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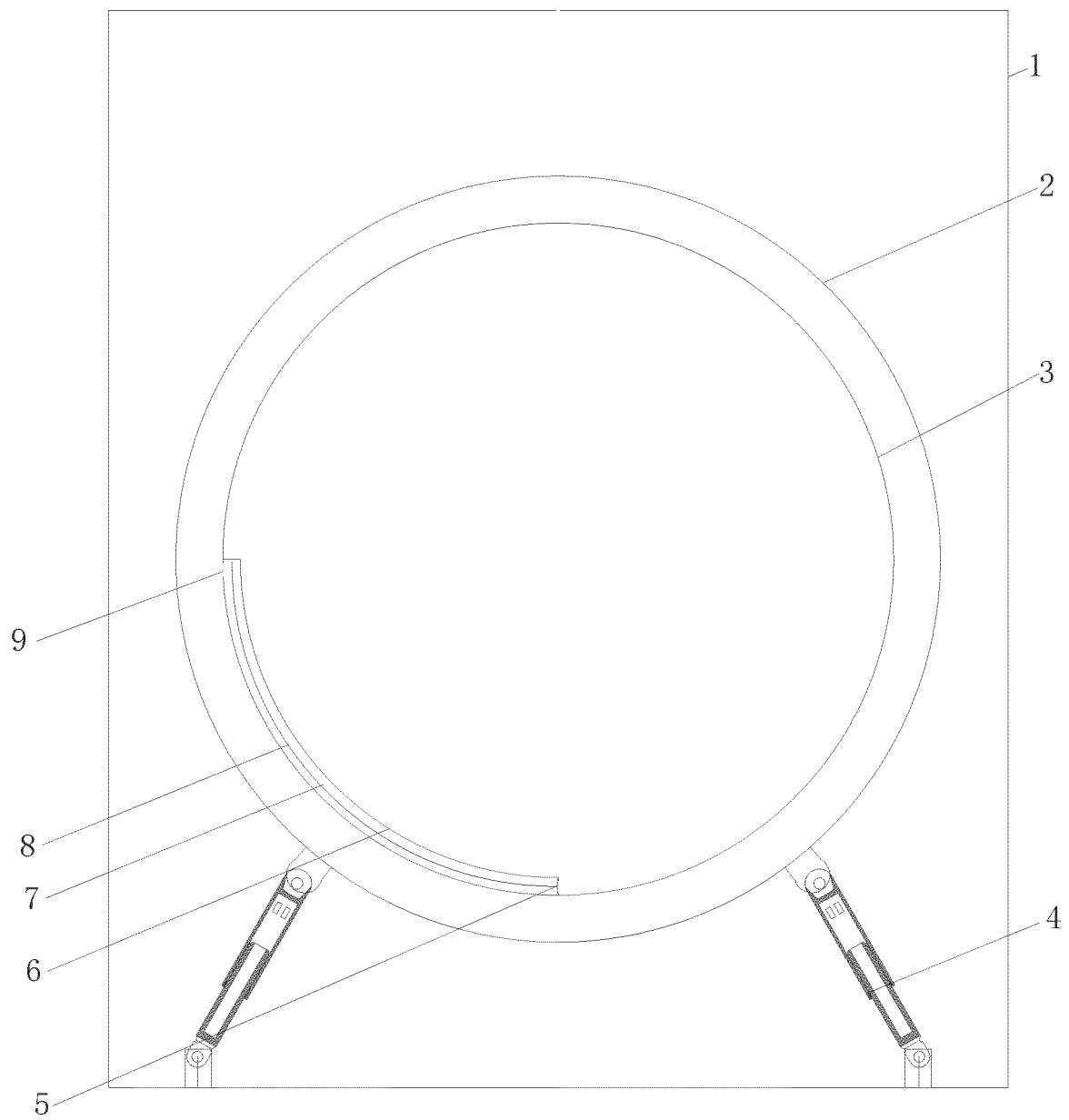


Fig. 1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of laundry equipment, in particular to a drum washing machine and a control method thereof.

BACKGROUND

[0002] As the most widely used household appliance in people's daily life, washing machines help people get rid of the trouble of laundry and bring great convenience to people. However, existing washing machines generally include an inner drum and an outer drum, there are a plurality of dewatering holes in the wall of the inner drum. In the washing process, washing water between the inner drum and the outer drum will not be used, causing this part of washing water to be wasted, and dirt generated in the washing process will be accumulated as the water flows between the inner drum and the outer drum, so that with long-term use, the accumulation of the dirt will affect the washing effect and reduce the user use experience.

[0003] In order to solve the water-wasting problem of the washing machines, some patents have also been proposed. For example, there is a Chinese disclosure patent with a patent number being 201410215346.3, entitled a drum washing machine, the disclosure relates to a drum washing machine, including a box body, an inner drum and an outer drum are arranged in the box body, a door seal is arranged between the outer drum and the box body, the inner drum is connected with a driving device. The inner drum is a holeless inner drum and is a conical drum with a small diameter at the bottom of the drum and a large diameter at the opening of the drum, the opening of the inner drum is curved inwards, the door seal is provided with a water inlet guide pipe, one end of the water inlet guide pipe is connected with a rapid washing water heating device, the other end of the water inlet guide pipe extends through the door seal into the inner drum, and the outer drum is provided with a drainage port and a water pressure detection device. It can be seen from the above technical solution that the inner drum of the present disclosure is the holeless inner drum, water inflow of the inner drum is realized through the water inlet guide pipe disposed on the door seal, and water is discharged in the dewatering process through the shape of the inner drum itself, so that water is prevented from being accumulated between the inner drum and the outer drum, and the washing water consumption is greatly reduced.

[0004] The above-mentioned disclosure provides the drum washing machine with the holeless inner drum, which solves the problems of waste of water between the inner drum and the outer drum and the accumulation of dirt between the inner drum and the outer drum. However, the inner drum of the existing drum washing ma-

chine is only designed as a holeless structure, which has little practical significance. Since the inner drum not only needs to rotate for washing and dewatering, but also contains water, how to realize the drainage of the washing machine with the holeless inner drum becomes the first problem of the inner drum being holeless.

[0005] In view of this, the present disclosure is proposed.

10 SUMMARY

[0006] In order to solve the above problems, a first objective of the present disclosure is to provide a drum washing machine, specifically, the following technical solutions are adopted.

[0007] A drum washing machine comprising:

an inner drum, having a washing chamber for independently containing washing water;

an inner drum drainage port being disposed in the inner drum; and

a drainage sealing device being installed on the inner drum drainage port to control opening and closing of the inner drum drainage port; wherein the drainage sealing device includes a drainage channel communicating with the inner drum drainage port and a blocking component that controls opening and closing of the drainage channel.

[0008] Further, the inner drum has a first operating state rotating in a clockwise direction and a second operating state rotating in a counterclockwise direction, and the blocking component keeps the inner drum drainage port closed in the first operating state and keeps the inner drum drainage port open in the second operating state; or the blocking component keeps the inner drum drainage port closed in the second operating state, and keeps the inner drum drainage port open in the first operating state.

[0009] Further, the drainage channel is disposed on a side wall of the inner drum and arranged in a circumferential direction of the inner drum, and the blocking component is of a one-way valve structure; and preferably, the drainage channel is disposed on an inner side wall or an outer side wall of the inner drum.

[0010] Further, the drainage channel is disposed on the inner side wall of the inner drum and is provided with a water inlet communicating with the inner drum and a water outlet communicating with the inner drum drainage port, the one-way valve structure comprises a valve ball that moves between the water inlet and the water outlet of the drainage channel along with rotation of the inner drum, the valve ball keeps blocking the water inlet in the first operating state so that the drainage channel is closed and is far away from the water inlet in the second operating state so that the drainage channel is opened; or the valve ball keeps blocking the water inlet in the second

operating state so that the drainage channel is closed and is far away from the water inlet in the first operating state so that the drainage channel is opened.

[0011] Further, the one-way valve structure further includes a centrifugal block that may move between the water inlet and the water outlet of the drainage channel along with rotation of the inner drum, and the centrifugal block is connected to the valve ball.

[0012] Further, the drainage channel is disposed on the inner side wall of the inner drum, and has a water inlet communicating with the inner drum and a water outlet communicating with the inner drum drainage port, the one-way valve structure comprises a one-way valve plate installed at the water inlet,

the one-way valve plate keeps blocking the water inlet in the first operating state so that the drainage channel is closed and opening the water inlet in the second operating state so that the drainage channel is opened; or the one-way valve plate keeps blocking the water inlet in the second operating state so that the drainage channel is closed and opening the water inlet in the first operating state so that the drainage channel is opened.

[0013] Further, the drainage sealing device comprises an elastic member, and the elastic member is in an elastic compression state to provide the one-way valve structure with elastic force for keeping blocking the water inlet; the one-way valve structure is subjected to the elastic force of the elastic member in the first operating state to keep blocking the water inlet so that the drainage channel is closed and overcomes the elastic force of the elastic member in the second operating state to be far away from the water inlet so that the drainage channel is opened; or the one-way valve structure is subjected to the elastic force of the elastic member in the second operating state to keep blocking the water inlet so that the drainage channel is closed and overcomes the elastic force of the elastic member in the first operating state to be far away from the water inlet so that the drainage channel is opened.

[0014] A second objective of the present disclosure is to provide a control method of the above-mentioned drum washing machine, specifically, the following technical solutions are adopted.

[0015] According to the control method of the drum washing machine, when the washing machine performs washing, a blocking component is controlled to close a drainage channel, and an inner drum is closed to independently contain washing water; and when the washing machine drains water, the blocking component is controlled to open the drainage channel, and the water in the inner drum enters into the drainage channel and is discharged from an inner drum drainage port.

[0016] Further, when the washing machine performs washing, the inner drum is controlled to keep operating in the first operating state or second operating state, and a one-way valve structure is in a normally closed state to close the drainage channel; and

when the washing machine drains water, the inner drum is controlled to keep operating in the second operating state or first operating state, and the one-way valve structure opens the drainage channel.

[0017] The present disclosure provides the drum washing machine with a structure design of a holeless inner drum. The inner drum independently contains the washing water during washing, and there is no water between the inner drum and an outer drum, which avoids the possibility of dirt adhesion between the inner drum and the outer drum, greatly improves user health and user experience, and greatly saves water resources.

[0018] The drum washing machine of the present disclosure realizes the opening and closing control over the inner drum drainage port through the drainage sealing device, the drainage sealing device includes the drainage channel communicating with the inner drum drainage port and the blocking component that controls the opening and closing of the drainage channel, the opening and closing control over the inner drum drainage port is converted into on-off control of the drainage channel, the blocking component can be designed to have different motion states by using the shifting of working states of the inner drum, thereby switching the on-off of the drainage channel, the structure is simple, and control is easy to realize.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Fig. 1 is a schematic structural diagram of a drum washing machine of an embodiment of the present disclosure;

Fig. 2 is a schematic structural diagram I of an inner drum of a drum washing machine of an embodiment of the present disclosure;

Fig. 3 is a schematic structural diagram II of an inner drum of a drum washing machine of an embodiment of the present disclosure (rotating clockwise, at the highest position of a water inlet of a drainage channel, water does not enter into the drainage channel);

Fig. 4 is a schematic structural diagram III of an inner drum of a drum washing machine of an embodiment of the present disclosure (rotating clockwise, at the lowest position of a water inlet of a drainage channel, water does not enter into the drainage channel);

Fig. 5 is a schematic structural diagram IV of an inner drum of a drum washing machine of an embodiment of the present disclosure (rotating counterclockwise, at the lowest position of a water inlet of a drainage channel, water enters into the drainage channel);

Fig. 6 is a schematic structural diagram V of an inner drum of a drum washing machine of an embodiment of the present disclosure (rotating counterclockwise, at the highest position of a water inlet of a drainage channel, a water level in the inner drum is lowered); and

Fig. 7 is a schematic structural diagram VI of an inner drum of a drum washing machine of an embodiment of the present disclosure (rotating counterclockwise, at the highest position of a water inlet of a drainage channel, a water inlet valve plate is opened, and water enters into the drainage channel).

DETAILED DESCRIPTION

[0020] A drum washing machine and a control method thereof of the present disclosure will be described in detail below with reference to the accompanying drawings.

[0021] As shown in Figs. 1-7, an embodiment provides a drum washing machine with a structural design of a holeless inner drum. The inner drum independently contains washing water during washing, and there is no water between the inner drum and an outer drum, which avoids the possibility of dirt adhesion between the inner drum and the outer drum, greatly improves user health and user experience, and greatly saves water resources.

[0022] The drum washing machine of the present embodiment has a housing 1, and the housing 1 includes: an upper panel, a front panel, a back panel, and a bottom plate. Feet are installed and fixed on the bottom plate to support the entire washing machine. The housing 1 is provided with an outer drum 2 inside, and an inner drum 3 is coaxially disposed in the outer drum 2. The main purpose of the outer drum 2 is to collect drained water of the inner drum 3 and drained water from the high-speed centrifugal dewatering of the inner drum 3, the outer drum 2 is connected to a drainage pipe, the drainage pipe is provided with a drainage control device that controls on and off of the drainage pipe, and the drainage control device is a drainage pump or a drain valve. The inner drum 3 rotates, which, preferably, is provided with lifting ribs to continuously lift, drop and beat clothes, so as to wash the clothes. The inner drum 3 is of a holeless structure. The outer drum 2 is provided a central mounting hole, and a bearing is installed and fixed in the central mounting hole. An inner drum shaft, which is tightly connected to the inner drum 3, passes through the bearing shown and is connected to a drive motor. An openable and closable inner drum door is installed on a front opening of the inner drum 3, thereby realizing that the inner drum 3 is of a sealed cabin structure.

[0023] The housing 1 of the present embodiment is provided with a machine door that can be opened or closed.

[0024] The drum washing machine, includes:

- an inner drum 3, with a washing chamber capable of independently containing washing water;
- an inner drum drainage port 9, disposed in the inner drum 3; and
- a drainage sealing device, installed at the inner drum drainage port 9 to control opening and closing thereof; wherein
- the drainage sealing device includes a drainage

channel 7 communicating with the inner drum drainage port 9 and a blocking component 8 that controls opening and closing of the drainage channel 7.

[0025] The drum washing machine of the present embodiment realizes the opening and closing control over the inner drum drainage port 9 through the drainage sealing device, the drainage sealing device includes the drainage channel 7 communicating with the inner drum drainage port 9 and the blocking component 8 that controls the opening and closing of the drainage channel 7, the opening and closing control over the inner drum drainage port 9 is converted into on-off control of the drainage channel 7, and the blocking component 8 can be designed to have different motion states by using the shifting of working states of the inner drum, thereby switching on-off of the drainage channel 7.

[0026] The drainage channel 7 of the present embodiment may be formed between a separate member 6 installed on the inner wall of the inner drum and the inner wall of the inner drum, or may be formed by interlacing and then connecting the butting positions of the side walls of the inner drum, and a water inlet of the drainage channel 7 and the inner drum drainage port 9 are respectively disposed at positions of two connecting faces.

[0027] As an implementation of the present embodiment, the inner drum 3 has a first operating state rotating in a clockwise direction and a second operating state rotating in a counterclockwise direction, and the blocking component 8 keeps the inner drum drainage port 9 closed in the first operating state and keeps the inner drum drainage port 9 open in the second operating state; or the blocking component 8 keeps the inner drum drainage port 9 closed in the second operating state and keeps the inner drum drainage port 9 open in the first operating state.

[0028] The blocking component 8 of the present embodiment uses the change of a rotation direction of the inner drum 3 to switch the opening and closing states of the inner drum drainage port 9, so as to realize the change from controlling the opening and closing of the inner drum drainage port 9 to controlling the opening and closing of the drainage channel 7. Meanwhile, according to the working characteristics of the inner drum of the washing machine, the control over the drainage channel 7 by the blocking component 8 is realized, the structure is simple, and control is easy to realize.

[0029] Specifically, the drainage channel 7 of the present embodiment is disposed on the side wall of the inner drum 3 and arranged in a circumferential direction of the inner drum 3, and the blocking component 8 is of a one-way valve structure. The blocking component 8 of the present embodiment uses the one-way valve structure to realize on-off control of the drainage channel 7. The one-way valve structure keeps the drainage channel in a closed state when the inner drum is at a standstill or in the first operating state or second operating state. When the inner drum is switched in the second operating

state or first operating state, the one-way valve structure is activated and the drainage channel is opened.

[0030] Preferably, the drainage channel 7 is disposed on an inner side wall or an outer side wall of the inner drum 3.

[0031] As shown in Fig. 2, the drainage channel 7 described according to the present embodiment is disposed on the inner side wall of the inner drum 3 and has a water inlet 5 communicating with the inner drum 3 and a water outlet communicating with the inner drum drainage port 9. The one-way valve structure includes a valve ball 10 that moves between the water inlet 5 and the water outlet of the drainage channel 7 along with rotation of the inner drum. The valve ball 10 keeps blocking the water inlet 5 in the first operating state so that the drainage channel is closed and is far away from the water inlet in the second operating state so that the drainage channel 7 is opened; or the valve ball 10 keeps blocking the water inlet 5 in the second operating state so that the drainage channel is closed and is far away from the water inlet in the first operating state so that the drainage channel 7 is opened.

[0032] Furthermore, the one-way valve structure further includes a centrifugal block 12 that moves between the water inlet 5 and the water outlet of the drainage channel 7 along with rotation of the inner drum 3, and the centrifugal block 12 is connected to the valve ball 10.

[0033] In the present embodiment, the centrifugal block 12 is used, the mass of the centrifugal block 12 is generally larger than that of the valve ball 10, and the centrifugal movement with the rotation of the inner drum is more stable, so that the state of the valve ball is kept more stable, and the possibility that turbulent flow opens a ball valve by mistake is avoided.

[0034] As shown in Fig. 3, when washing starts, the initial state of the inner drum of the present embodiment is such that the position of the water inlet 5 of the drainage channel 7 is higher than the highest water level in the inner drum 3, and no washing water enters into the drainage channel 7.

[0035] When washing starts, the inner drum 3 is controlled to rotate clockwise, the centrifugal block 12 moves relative to the inner drum along the drainage channel 7 toward the side of the water inlet 5, the centrifugal block 12 drives the ball valve 9 to move to the water inlet 5 to block the water inlet, and the drainage channel is closed.

[0036] As shown in Fig. 4, when the inner drum is controlled to rotate clockwise until the water inlet 5 of the drainage channel 7 is at the lowest position, the ball valve 9 keeps the water inlet blocked so that the drainage channel is closed.

[0037] As shown in Fig. 5, the inner drum is controlled to rotate counterclockwise, the centrifugal block 12 moves relative to the inner drum along the drainage channel 7 to be away from the side of the water inlet 5, the centrifugal block 12 drives the ball valve 9 to be away from the water inlet 5, the drainage channel is opened, and water in the inner drum enters into the drainage channel 7 and is discharged from the inner drum through the

inner drum drainage port 9.

[0038] As shown in Fig. 6, the inner drum is controlled to keep rotating counterclockwise and return to the initial position of the water inlet 5 of the drainage channel 7, the water level in the inner drum 3 drops, the water inlet is higher than the water level in the inner drum, and no water enters into the drainage channel.

[0039] As shown in Fig. 7, as another implementation of the present embodiment, the drainage channel 7 of the present embodiment is disposed on the inner side wall of the inner drum 3, and has a water inlet 5 communicating with the inner drum 3 and a water outlet communicating with the inner drum drainage port. The one-way valve structure includes a one-way valve plate 13 installed at the water inlet. The one-way valve plate 13 keeps blocking the water inlet 5 in the first operating state so that the drainage channel is closed and opening the water inlet 5 in the second operating state so that the drainage channel 7 is opened; or the one-way valve plate 13 keeps blocking the water inlet 5 in the second operating state so that the drainage channel is closed and opening the water inlet 5 in the second operating state so that the drainage channel 7 is opened.

[0040] In order to maintain one-way seal of the one-way valve structure of the present embodiment, the drainage sealing device of the present embodiment further includes an elastic member, and the elastic member is in an elastic compression state to provide the one-way valve structure with elastic force for keeping blocking the water inlet.

[0041] The one-way valve structure is subjected to the elastic force of the elastic member in the first operating state or the second operating state to keep blocking the water inlet so that the drainage channel is closed, and overcomes the elastic force of the elastic member in the second operating state or the first operating state to be far away from the water inlet so that the drainage channel is opened.

[0042] In order to realize the inflow of water into the holeless inner drum of the present embodiment, the drum washing machine of the present embodiment includes the drive motor and the inner drum shaft, the drive motor drives the inner drum 3 to rotate through a transmission connection between the inner drum shaft and the inner drum 3, the inner drum shaft internally has a hollow channel communicating with the inner drum 3, and a water inlet pipe of the washing machine communicates with the hollow channel of the inner drum shaft.

[0043] Specifically, the inner drum shaft is connected to the drive motor, the drive motor includes a stator and a rotor, and the rotor is fixedly connected to the inner drum shaft; and a through hole is formed in the center of the rotor, and the water inlet pipe passes through the through hole of the rotor and then communicates with the hollow channel of the inner drum shaft.

[0044] The present embodiment also solves the problem of how to accurately determine the amount of water entering the drum washing machine with the holeless

inner drum, and the specific solution is as follows.

[0045] The drum washing machine, includes the inner drum 3 and the water inlet pipe communicating with the inner drum 3. The inner drum is the holeless inner drum and contains washing water when washing clothes. The water inlet pipe is provided with a flow sensor 1 configured to detect the flow of entering water.

[0046] In the present embodiment, the flow sensor is installed on the water inlet pipe to monitor the flow during water entering, and when the set water entering flow is reached, a water inlet valve is closed to complete the water entering. In the present embodiment, the flow sensor is used to solve the water entering problem of the drum washing machine with the holeless inner drum according to the set water level, the washing effect is ensured, the structure is simple, and operation and control are convenient.

[0047] As an implementation of the present embodiment, the flow sensor is a rotor flow sensor, or a turbine flow sensor, or an ultrasonic flow sensor, or an electromagnetic flow sensor, or an orifice flow sensor.

[0048] The present embodiment also solves the problem of how to avoid the unbalanced air pressure in a sealed compartment of the drum washing machine with the holeless inner drum. Specifically, the sudden water cut off of a solenoid valve, especially the water cut off of a tap water pipe network, creates a negative pressure and returns the washing water in the sealed compartment to the pipe network, or the problem that there is air inside, and water is difficult to enter.

[0049] The drum washing machine of the present embodiment includes the inner drum 3, which is the holeless inner drum and contains washing water when washing clothes, and also includes an air pressure balance mechanism configured to make the inner drum 3 communicate with the external environment to balance the air pressure inside the inner drum.

[0050] When water enters, air in the sealed compartment of the inner drum may overflow through the balance mechanism under pressure to ensure the air pressure balance.

[0051] When water is suddenly cut off, the outside air may quickly enter into the sealed compartment of the inner drum and break the inverse suction, ensure the air pressure balance, and prevent the washing water from being sucked into the tap water pipe network.

[0052] In other cases, such as dewatering, the air pressure balance mechanism can also ensure the air pressure balance of the inner drum.

[0053] As an implementation of the present embodiment, the air pressure balance mechanism includes a pressure equalization channel disposed on the inner drum 3, and one end, communicating with the inner drum 3, of the pressure equalization channel is disposed at the position, close to a central axis of rotation, of the inner drum 3 and is always higher than the highest water level in the inner drum 3.

[0054] Specifically, the pressure equalization channel

is formed on the inner drum shaft to make the inside of the inner drum 3 communicate with the external environment, and the highest water level in the inner drum 3 is lower than the inner drum shaft. In this way, the water in the inner drum can be prevented from flowing out of the pressure equalization channel.

[0055] An embodiment also provides a control method of a drum washing machine, including:

when the washing machine performing washing, a blocking component being controlled to close a drainage channel, an inner drum being closed to independently contain washing water; and
when the washing machine draining water, the blocking component being controlled to open the drainage channel, and the water in the inner drum enters the drainage channel and being discharged from an inner drum drainage port.

[0056] Further, when the washing machine performs washing, the inner drum is controlled to keep operating in a first operating state or the second operating state, and a one-way valve structure is in a normally closed state to close the drainage channel.

[0057] When the washing machine drains water, the inner drum is controlled to keep operating in the second operating state or first operating state, and the one-way valve structure opens the drainage channel.

[0058] In the present embodiment, the inner drum is controlled to keep operating in the first operating state during washing or rinsing and to keep operating in the second operating state during drainage and dewatering; or the inner drum is controlled to keep operating in the second operating state during washing or rinsing and to keep operating in the second operating state during drainage and dewatering.

[0059] The difference between the first operating state and the second operating state of the present embodiment is only in the direction of rotation. Of course, in the same operating state, the rotation speeds of washing, dewatering, and drainage may also be different, and the rotation speeds of dewatering and drainage are greater than the rotation speed of washing and rinsing.

[0060] During washing or rinsing in the present embodiment, the inner drum may also be controlled to switch between the first operating state and the second operating state. However, since one of the operating states will drain water out of the inner drum, it is necessary to perform a water replenishment operation in the washing process, or, control the entering water of the inner drum to be higher than a set value.

[0061] The above description are only the preferable embodiments of the present disclosure and do not limit the present disclosure in any form. Although the present disclosure has been disclosed in the preferable embodiments as above, it is not intended to limit the present disclosure. Without departing from the scope of the technical solutions of the present disclosure, any skilled per-

son familiar with this patent can use the technical content suggested above to make slight changes or modifications into equivalent embodiments with equivalent changes, and without deviating from any content of the technical solutions of the present disclosure, any simple changes, equivalent changes and modifications made to the above embodiments according to the technical essence of the present disclosure still fall within the scope of the solutions of the present disclosure.

Claims

1. A drum washing machine comprising:

an inner drum having a washing chamber for independently containing washing water;
 an inner drum drainage port being disposed in the inner drum; and
 a drainage sealing device being installed at the inner drum drainage port to control opening and closing of the inner drum drainage port; **characterized in that**
 the drainage sealing device comprises a drainage channel communicating with the inner drum drainage port and a blocking component that controls opening and closing of the drainage channel.

2. The drum washing machine according to claim 1, **characterized in that** the inner drum has a first operating state rotating in a clockwise direction and a second operating state rotating in a counterclockwise direction, and the blocking component keeps the inner drum drainage port closed in the first operating state and keeps the inner drum drainage port open in the second operating state; or the blocking component keeps the inner drum drainage port closed in the second operating state, and keeps the inner drum drainage port open in the first operating state.

3. The drum washing machine according to claim 1 or 2, **characterized in that** the drainage channel is disposed on a side wall of the inner drum and arranged in a circumferential direction of the inner drum, and the blocking component is of a one-way valve structure;
 preferably, the drainage channel is disposed on an inner side wall or an outer side wall of the inner drum.

4. The drum washing machine according to claim 3, **characterized in that** the drainage channel is disposed on the inner side wall of the inner drum and is provided with a water inlet communicating with the inner drum and a water outlet communicating with the inner drum drainage port, the one-way valve structure comprises a valve ball that moves between

the water inlet and the water outlet of the drainage channel along with rotation of the inner drum, the valve ball keeps blocking the water inlet in the first operating state so that the drainage channel is closed and is far away from the water inlet in the second operating state so that the drainage channel is opened; or the valve ball keeps blocking the water inlet in the second operating state so that the drainage channel is closed and is far away from the water inlet in the first operating state so that the drainage channel is opened.

5. The drum washing machine according to claim 4, **characterized in that** the one-way valve structure comprises a centrifugal block that moves between the water inlet and the water outlet of the drainage channel along with rotation of the inner drum, and the centrifugal block is connected to the valve ball.

6. The drum washing machine according to claim 3, **characterized in that** the drainage channel is disposed on the inner side wall of the inner drum, and has a water inlet communicating with the inner drum and a water outlet communicating with the inner drum drainage port, the one-way valve structure comprises a one-way valve plate installed at the water inlet,
 the one-way valve plate keeps blocking the water inlet in the first operating state so that the drainage channel is closed and opening the water inlet in the second operating state so that the drainage channel is opened; or the one-way valve plate keeps blocking the water inlet in the second operating state so that the drainage channel is closed and opening the water inlet in the first operating state so that the drainage channel is opened.

7. The drum washing machine according to any of claims 3-6, **characterized in that** the drainage sealing device comprises an elastic member, and the elastic member is in an elastic compression state to provide the one-way valve structure with elastic force for keeping blocking the water inlet;
 the one-way valve structure is subjected to the elastic force of the elastic member in the first operating state to keep blocking the water inlet so that the drainage channel is closed and overcomes the elastic force of the elastic member in the second operating state to be far away from the water inlet so that the drainage channel is opened; or the one-way valve structure is subjected to the elastic force of the elastic member in the second operating state to keep blocking the water inlet so that the drainage channel is closed and overcomes the elastic force of the elastic member in the first operating state to be far away from the water inlet so that the drainage channel is opened.

8. A control method of the drum washing machine according to any of claims 1-7, **characterized in that**

when the washing machine performs washing, the blocking component is controlled to close the drainage channel, and the inner drum is closed to independently contain washing water; and

when the washing machine drains water, the blocking component is controlled to open the drainage channel, and the water in the inner drum enters into the drainage channel and is discharged from the inner drum drainage port.

9. The control method of the drum washing machine according to claim 8, **characterized in that** when the washing machine performs washing, the inner drum is controlled to keep operating in the first operating state or the second operating state, and the one-way valve structure is in a normally closed state to close the drainage channel; and
- when the washing machine drains water, the inner drum is controlled to keep operating in the second operating state or first operating state, and the one-way valve structure opens the drainage channel.

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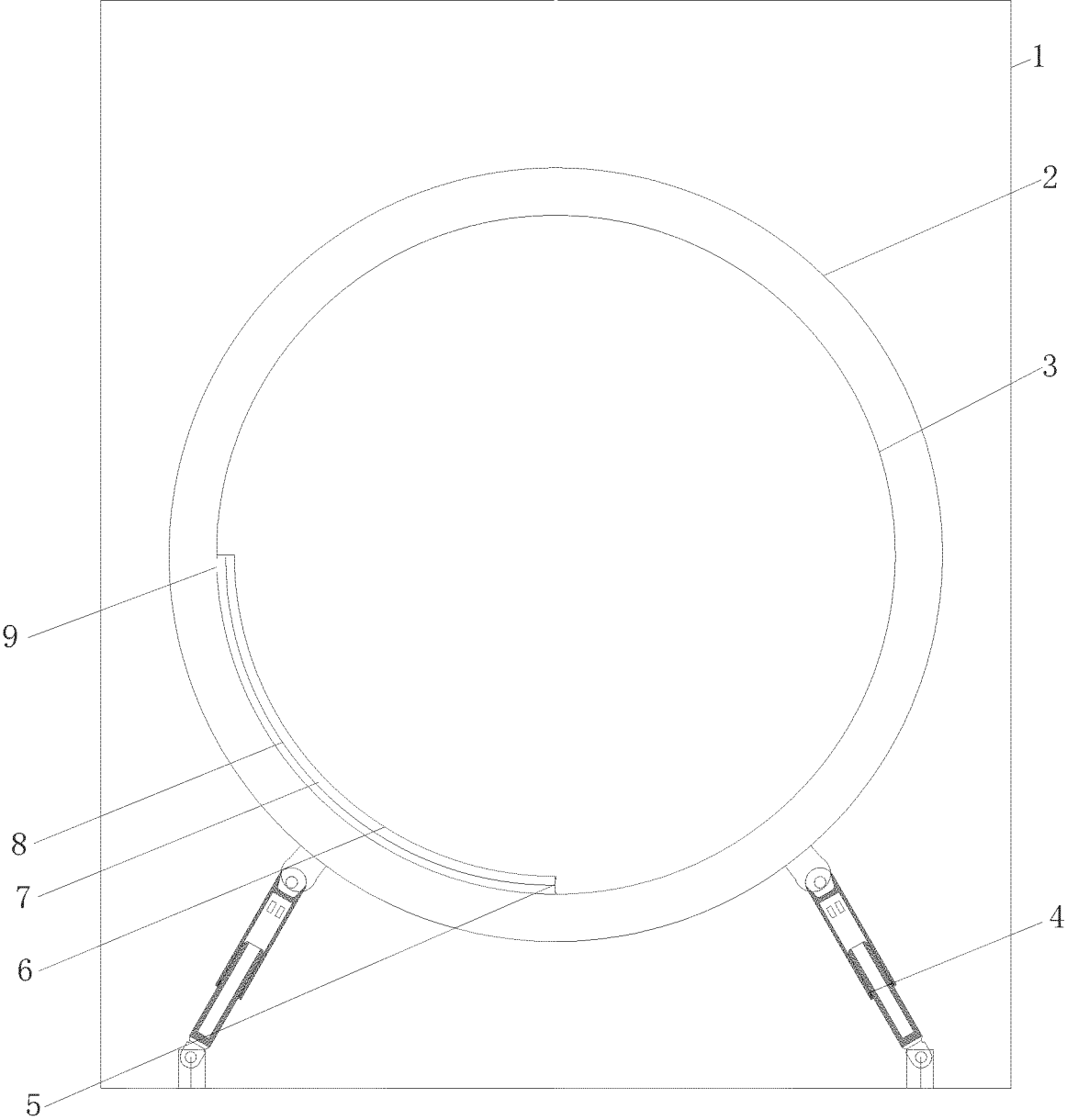


Fig. 1

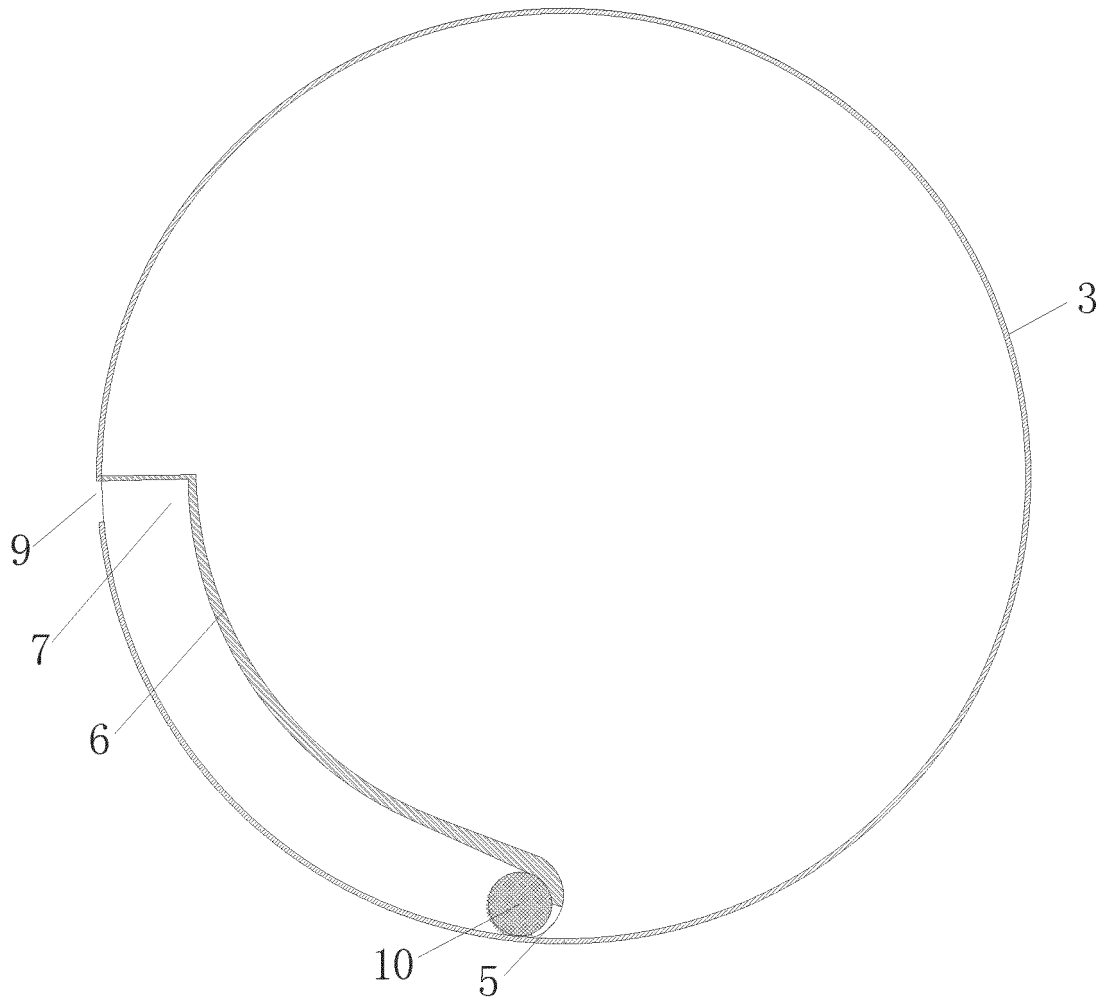


Fig. 2

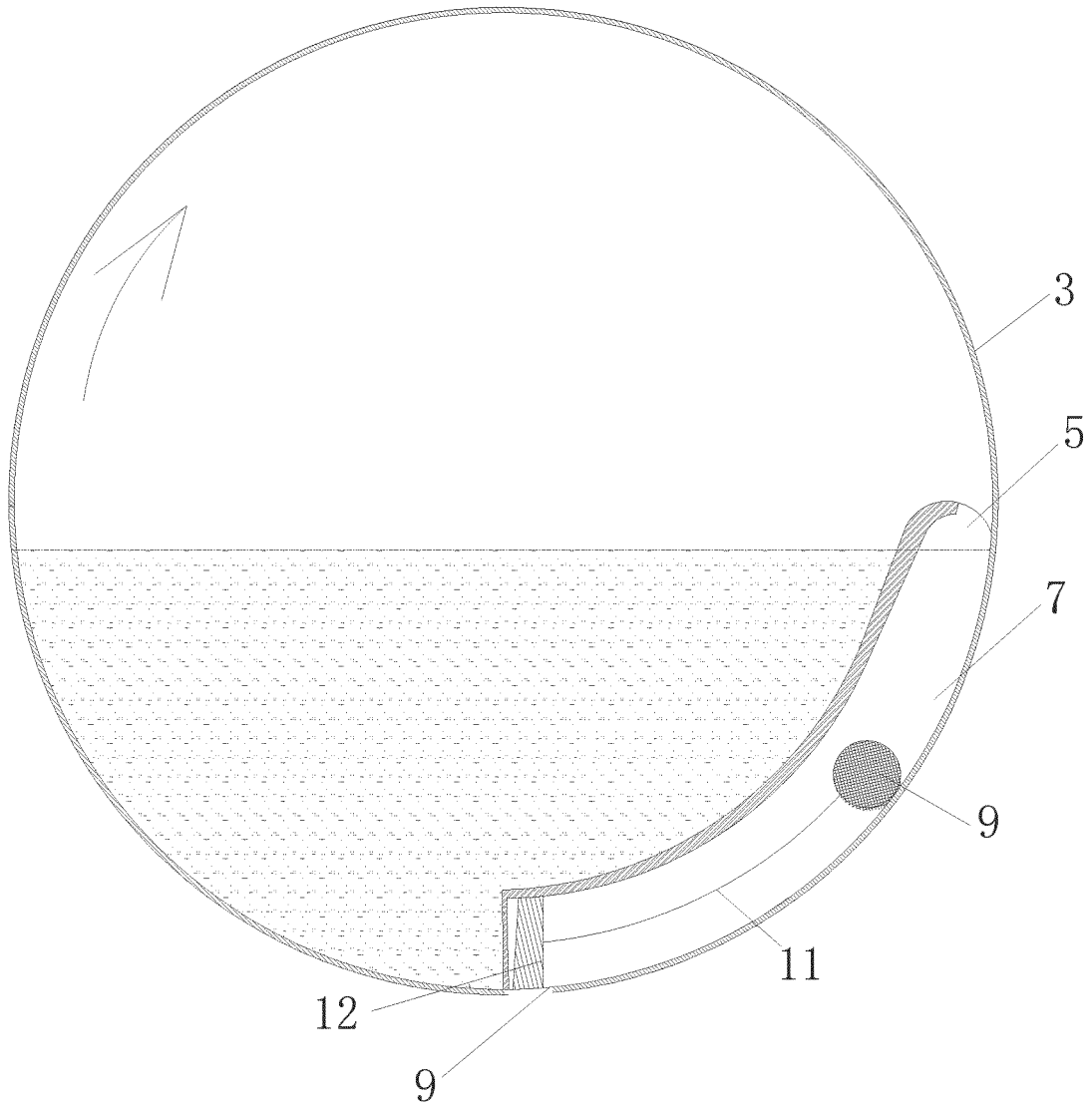


Fig. 3

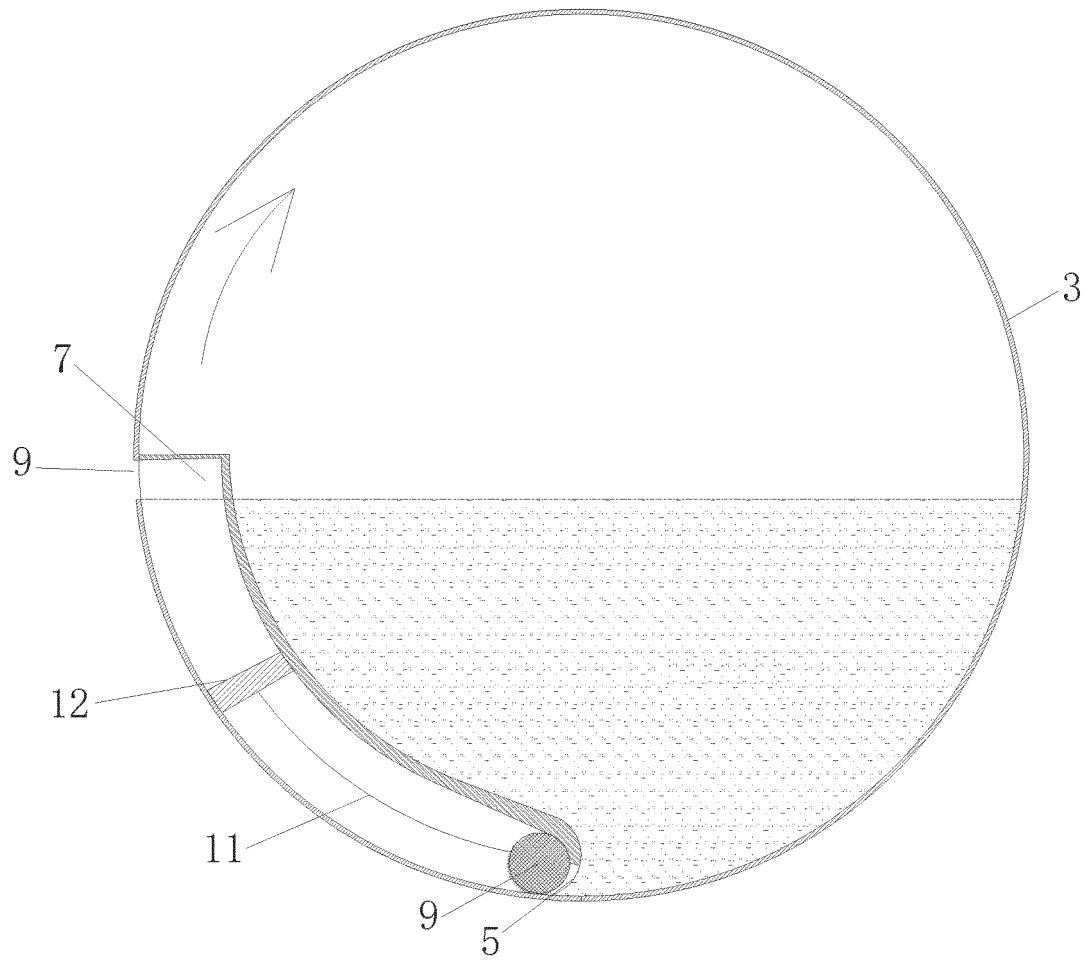


Fig. 4

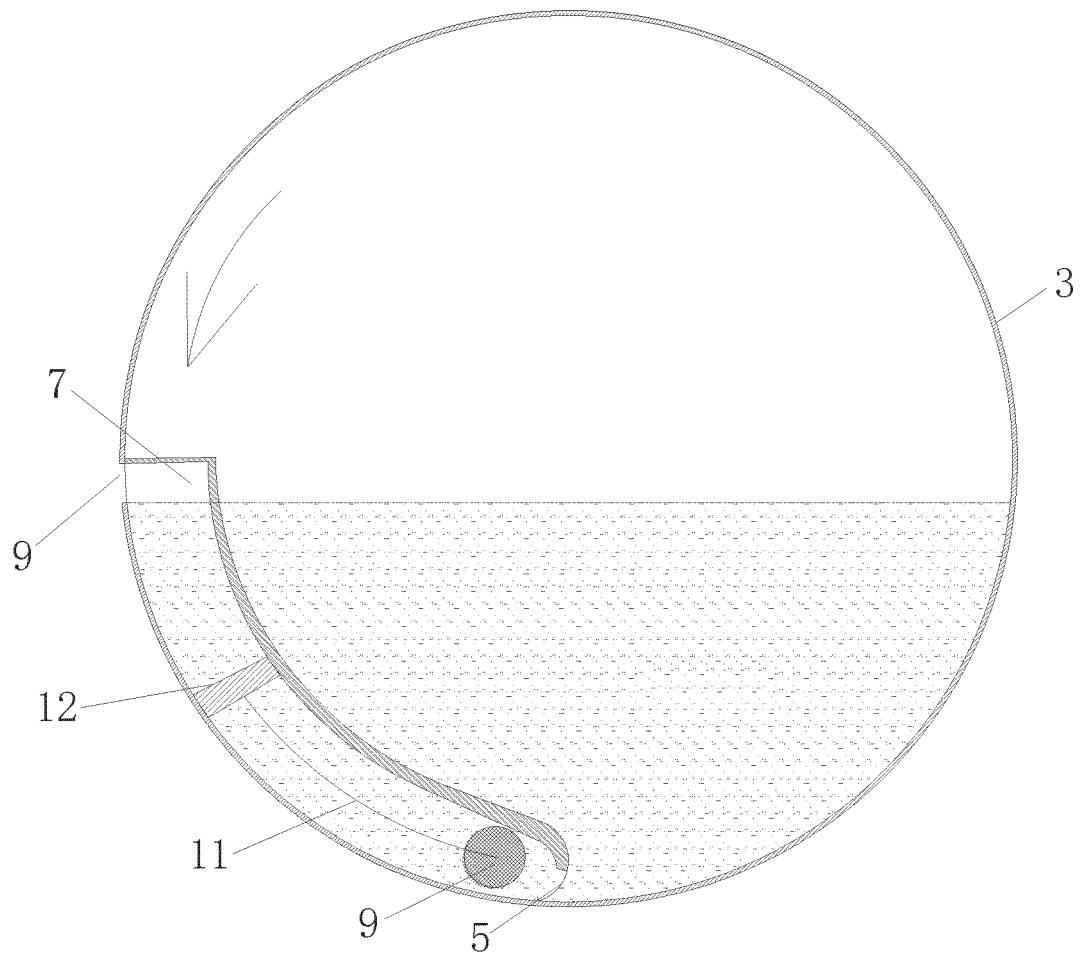


Fig. 5

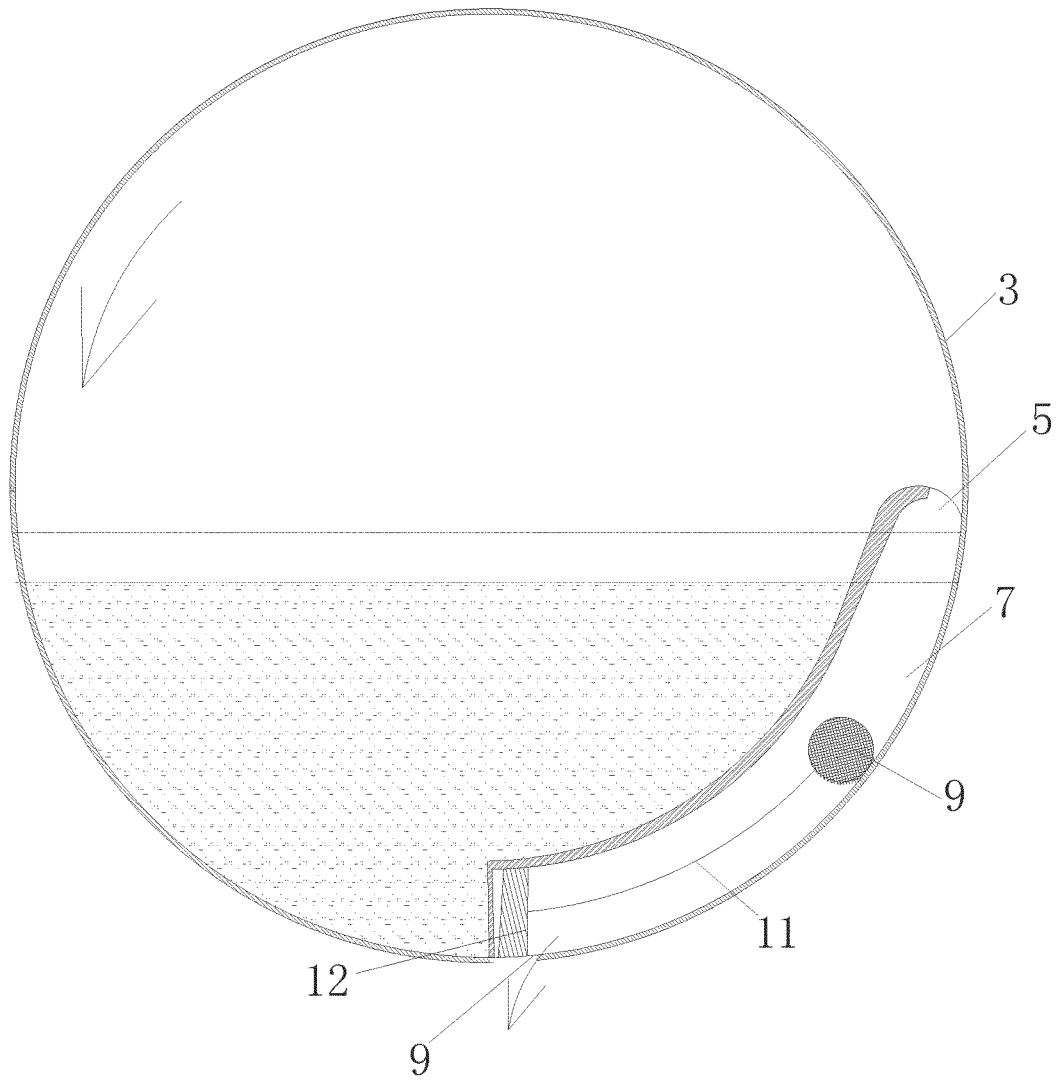


Fig. 6

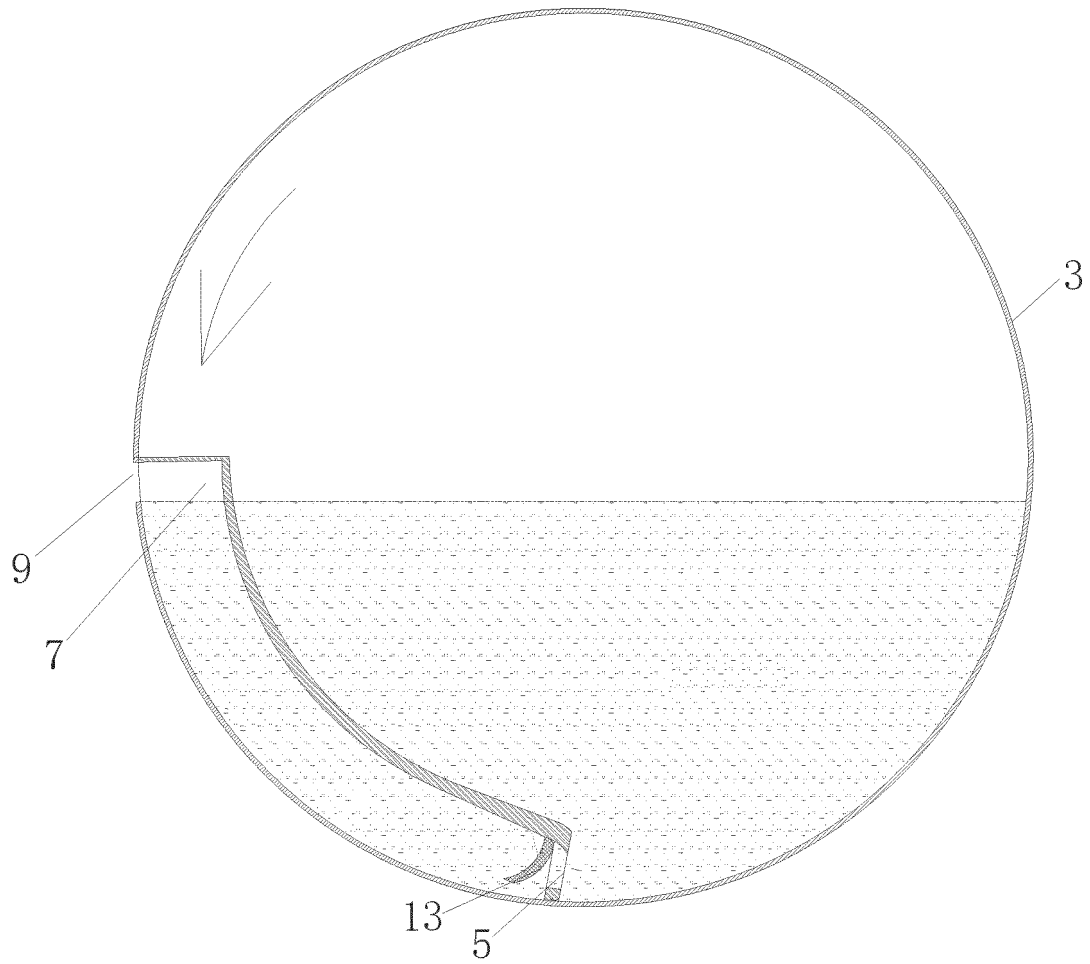


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/095507

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/04(2006.01)i; 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)

CNPAT, WPI, EPODOC, CNKI: 滚筒, 滚桶, 洗衣筒, 洗衣桶, 洗涤筒, 洗涤桶, 内筒, 内桶, 洗涤槽, 脱水槽, 出水, 排水, 泄水, 口, 孔, 通道, 路径, 管, 水道, 单向, 转动, 旋转, 二次污染, 污染, 污垢, 安徽聚隆传动科技, drum, basket, cylinder, buffer, tumble, roller, discharge, drain+, water shoot, waterspout, outfall, scupper, tub, tank, barrel, cask, container, valve, ball, pipe, channel?, tube, canal, conduit, passage, pollution, dirt+, fouling, contaminant, deposit, adherence, adhe+, attach+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 110359213 A (ANHUI JULONG TRANSMISSION TECHNOLOGY CO., LTD.) 22 October 2019 (2019-10-22) description, specific embodiments, and figures 1-18	1-9
PX	CN 110359231 A (ANHUI JULONG TRANSMISSION TECHNOLOGY CO., LTD.) 22 October 2019 (2019-10-22) description, specific embodiments, and figures 1-38	1-9
X	CN 208472396 U (ANHUI JULONG TRANSMISSION TECHNOLOGY CO., LTD.) 05 February 2019 (2019-02-05) description paragraphs 5-81, figures 1-12	1-9
X	CN 208829965 U (ANHUI JULONG TRANSMISSION TECHNOLOGY CO., LTD.) 07 May 2019 (2019-05-07) description, specific embodiments, and figures 1-38	1-9
A	CN 205821767 U (ANHUI JULONG TRANSMISSION TECHNOLOGY CO., LTD.) 21 December 2016 (2016-12-21) entire document	1-9

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

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Date of the actual completion of the international search

21 August 2020

Date of mailing of the international search report

15 September 2020

Name and mailing address of the ISA/CN

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Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/095507

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 109281117 A (WHIRLPOOL (CHINA) CO., LTD.) 29 January 2019 (2019-01-29) entire document	1-9
A	EP 0844324 A2 (AEG HAUSGERAETE G.M.B.H.) 27 May 1998 (1998-05-27) entire document	1-9
A	CN 106436135 A (WUXI LITTLE SWAN CO., LTD.) 22 February 2017 (2017-02-22) entire document	1-9
A	CN 108442077 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 24 August 2018 (2018-08-24) entire document	1-9
A	CN 107974795 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 01 May 2018 (2018-05-01) entire document	1-9

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/095507

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	110359213	A	22 October 2019	None			
CN	110359231	A	22 October 2019	CN	110359230	A	22 October 2019
				CN	110359212	A	22 October 2019
				CN	208829966	U	07 May 2019
				CN	110359245	A	22 October 2019
				CN	209798341	U	17 December 2019
				CN	110359210	A	22 October 2019
				CN	209798369	U	17 December 2019
				CN	208829969	U	07 May 2019
				CN	208604368	U	15 March 2019
				CN	209941321	U	14 January 2020
				CN	208829967	U	07 May 2019
				CN	208829965	U	07 May 2019
				CN	209798340	U	17 December 2019
				CN	208604370	U	15 March 2019
				CN	209941320	U	14 January 2020
				CN	208604369	U	15 March 2019
				CN	110359214	A	22 October 2019
				CN	110359229	A	22 October 2019
				CN	208829961	U	07 May 2019
				CN	208472396	U	05 February 2019
CN	208472396	U	05 February 2019	CN	110359230	A	22 October 2019
				CN	110359212	A	22 October 2019
				CN	208829966	U	07 May 2019
				CN	110359245	A	22 October 2019
				CN	209798341	U	17 December 2019
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				CN	208829969	U	07 May 2019
				CN	208604368	U	15 March 2019
				CN	209941321	U	14 January 2020
				CN	110359231	A	22 October 2019
				CN	208829967	U	07 May 2019
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				CN	209798340	U	17 December 2019
				CN	208604370	U	15 March 2019
				CN	209941320	U	14 January 2020
				CN	208604369	U	15 March 2019
				CN	110359214	A	22 October 2019
				CN	110359229	A	22 October 2019
				CN	208829961	U	07 May 2019
CN	208829965	U	07 May 2019	CN	110359230	A	22 October 2019
				CN	110359212	A	22 October 2019
				CN	208829966	U	07 May 2019
				CN	110359245	A	22 October 2019
				CN	209798341	U	17 December 2019
				CN	110359210	A	22 October 2019
				CN	209798369	U	17 December 2019
				CN	208829969	U	07 May 2019
				CN	208604368	U	15 March 2019

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/095507

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		CN 209941321 U	14 January 2020
		CN 110359231 A	22 October 2019
		CN 208829967 U	07 May 2019
		CN 209798340 U	17 December 2019
		CN 208604370 U	15 March 2019
		CN 209941320 U	14 January 2020
		CN 208604369 U	15 March 2019
		CN 110359214 A	22 October 2019
		CN 110359229 A	22 October 2019
		CN 208829961 U	07 May 2019
		CN 208472396 U	05 February 2019
CN 205821767 U	21 December 2016	CN 107663750 A	06 February 2018
CN 109281117 A	29 January 2019	None	
EP 0844324 A2	27 May 1998	EP 0844324 A3	21 October 1998
		DE 19648201 A1	28 May 1998
CN 106436135 A	22 February 2017	CN 106436135 B	22 March 2019
CN 108442077 A	24 August 2018	CN 208309211 U	01 January 2019
		WO 2019227895 A1	05 December 2019
CN 107974795 A	01 May 2018	WO 2018072625 A1	26 April 2018
		EP 3530794 A1	28 August 2019
		EP 3530794 A4	24 June 2020
		US 2019264362 A1	29 August 2019
		JP 2019536512 A	19 December 2019

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201410215346 [0003]