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(54) **LAUNDRY DEVICE**

(57) The present invention relates to the technical field of laundry; specifically provided is a laundry device, which aims to solve the problems that existing laundry devices have a complex structure when outside air is used to dry an outer drum, which is not conducive to simplified design of the product structure, and the air drying effect is limited and the air drying efficiency is extremely low. The laundry device of the present invention comprises a drum assembly, a valve assembly, a fan, and a ventilation pipeline, the ventilation pipeline directly connecting the drum assembly with the outside, the valve assembly comprising a blocking mechanism and a valve housing having an air intake cavity and an air outlet cavity, the air intake cavity and the air outlet cavity being arranged independently of one another, an air inlet pipeline connecting the outside with the drum assembly being connected to the air intake cavity, an air outlet pipeline connecting the outside with the drum assembly being connected to the air outlet cavity, the fan being arranged on the air intake pipeline, and the blocking mechanism

being arranged to be able to simultaneously block the air intake pipeline and the air outlet pipeline. The present invention can increase the discharge speed of moisture and improve the air drying effect and air drying efficiency, facilitating the overall structural layout of the product, and reducing the complexity of the product design.

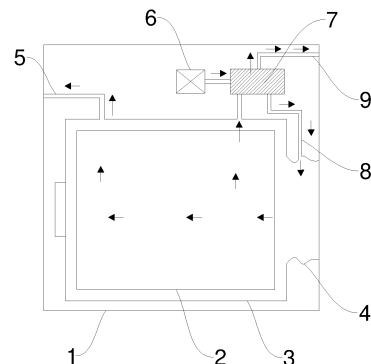


FIG.1

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Description**FIELD OF THE INVENTION**

[0001] The present disclosure relates to the technical field of clothing washing, and specifically provides a washing apparatus.

BACKGROUND OF THE INVENTION

[0002] A washing apparatus is a clothing treatment apparatus that can perform washing, rinsing, spinning and/or drying operations on clothing. Some washing apparatuses are further provided with functions such as air washing, disinfection, sterilization and fragrance enhancement. There are many types of washing apparatuses, such as the most common drum washing machines, pulsator washing machines, and washing-drying integrated machines.

[0003] Taking the drum washing machine as an example, an existing drum washing machine includes an outer cylinder and an inner cylinder. During washing, a certain amount of water is first injected into the outer cylinder, and then the inner cylinder drives the clothing to turn over, achieving washing of the clothing. The drum washing machine is designed by imitating the principle of striking the clothing with a bar hammer. After the clothing is washed, the outer cylinder and a window gasket connected to the outer cylinder are both moist, that is, there is residual water on an inner wall thereof. After long term use, growth of bacteria is very likely to occur. In case of only opening door glass to dry the outer cylinder and the window gasket naturally, the effect would be very limited; moreover, the window gasket includes a wrinkle part, which is very unfavorable for the release of water vapor. As the users operating the drum washing machine again, the bacteria and dirt on the inner wall of the outer cylinder and in the window gasket can easily cause a secondary pollution to the clothing, seriously affecting the washing effect and resulting in poor user experience. On the basis of traditional drum washing machines, the washing-drying integrated machines have at least a drying system added thereon, which enables the drum washing machines to have a drying function and some models to further achieve air washing. However, although the drying system can dry the outer cylinder and the window gasket by heating the residual water after the clothing is washed, all the drying systems of the washing-drying integrated machines adopt an internal circulation mode, which makes the water vapor still circulate between a drying air duct and the outer cylinder. Moreover, dehumidification of the washing-drying integrated machine mainly relies on a dehumidification device of the drying system. Therefore, if the residual water in the outer cylinder and the window gasket is to be further removed after a drying program is completed, the drying system has to remain in operation, which will seriously increase energy consumption of the washing machine and is very

unfavorable for energy saving.

[0004] A drum washing machine is disclosed in the patent No. 201922216894.9, which includes an air inflow pipeline and an air outflow pipeline with a fan. The air inflow pipeline and the air outflow pipeline are both communicated with the outer cylinder, and flowing air can enter the outer cylinder and air dry an inner surface of the outer cylinder and an outer surface of the inner cylinder. The flowing air is then discharged out of the body of the drum washing machine through the air outflow pipeline, that is, the interior of the outer cylinder is air dried by the external air, thus preventing the generation of dirt and growth of bacteria. However, this type of drum washing machine cannot guarantee that external dirt does not enter the drum washing machine, and it still has certain safety hazards.

[0005] A vent structure and a washing machine are disclosed in the patent No. 201810106076.0. The vent structure includes a vent and a rotating body. The rotating body is rotatably arranged at the vent, and the rotating body is radially provided with a first connecting hole that penetrates through the rotating body. When the rotating body rotates, the first connecting hole can be communicated with the vent or the rotating body can block the vent, thereby selectively communicating the first connecting hole with the vent, thus achieving the purpose of opening or closing the vent through the rotation of the rotating body. The vent structure can be arranged on a front panel of a housing of the washing machine, or also arranged in a rear vent at the same time. However, when the vent structure is only arranged on the front panel, external dirt can easily enter the drum washing machine from the rear vent. If the vent structure is also arranged in the rear vent at the same time, it is necessary to close the two vent structures respectively to achieve complete blocking of the drum washing machine from the outside, which is very unfavorable for the layout of the product structure and seriously increases the complexity of product design.

[0006] In addition to the above problems, the aforementioned two patent documents also have the problems of slow moisture discharge speed, limited air drying effect, and extremely low air drying efficiency.

[0007] Accordingly, there is a need for a new washing apparatus in the art to solve the above problem.

SUMMARY OF THE INVENTION

[0008] The present disclosure aims to solve the above technical problems, that is, to solve the problems in the existing washing apparatuses that when external air is used to air dry the outer cylinder, the complicated structure is not advantageous for a simplified design of product structure, the air drying effect is limited, and the air drying efficiency is extremely low.

[0009] The present disclosure provides a washing apparatus, which includes a cylinder assembly, a valve assembly, a fan and a ventilation pipeline; the ventilation

pipeline directly communicates the cylinder assembly with the outside, and the valve assembly includes a blocking mechanism, and a valve casing with an air inflow chamber and an air outflow chamber that are arranged independently from each other; the air inflow chamber is communicated with an air inflow pipeline that communicates the outside with the cylinder assembly, and the air outflow chamber is communicated with an air outflow pipeline that communicates the outside with the cylinder assembly; the fan is arranged on the air inflow pipeline, and the blocking mechanism is arranged to be capable of blocking the air inflow pipeline and the air outflow pipeline simultaneously.

[0010] In a preferred technical solution of the washing apparatus described above, the blocking mechanism includes a driving motor, a first blocking member, and a second blocking member; an output shaft of the driving motor is connected with the first blocking member and the second blocking member simultaneously, the first blocking member is arranged in the air inflow chamber, and the second blocking member is arranged in the air outflow chamber; the driving motor is capable of driving the first blocking member and the second blocking member to move simultaneously, so that the air inflow chamber and the air outflow chamber are blocked.

[0011] In a preferred technical solution of the washing apparatus described above, the driving motor is connected with a transmission shaft, the first blocking member is a first blocking plate, and the second blocking member is a second blocking plate; the first blocking plate and the second blocking plate are both arranged on the transmission shaft, and the driving motor can drive the transmission shaft to rotate so that the first blocking plate and the second blocking plate rotate simultaneously.

[0012] In a preferred technical solution of the washing apparatus described above, the transmission shaft extends from the outside through one side of the valve casing, the air outflow chamber and the air inflow chamber in sequence, and the transmission shaft is rotatably arranged on a spacer plate that separates the air inflow chamber from the air outflow chamber.

[0013] In a preferred technical solution of the washing apparatus described above, the air inflow pipeline includes a first air inflow pipe and a second air inflow pipe, and the fan is arranged on the first air inflow pipe; the first air inflow pipe communicates an air inlet of the air inflow chamber with the outside, and the second air inflow pipe communicates an air outlet of the air inflow chamber with the cylinder assembly; the air outflow pipeline includes a first air outflow pipe and a second air outflow pipe, the first air outflow pipe communicates the cylinder assembly with an air inlet of the air outflow chamber, and the second air outflow pipe communicates an air outlet of the air outflow chamber with the outside.

[0014] In a preferred technical solution of the washing apparatus described above, a first opening communicated with the outside is arranged on a front panel of a cabinet of the washing apparatus, and a second opening

communicated with the outside is arranged on a rear panel of the cabinet of the washing apparatus; the second air outflow pipe is communicated with the first opening, and the ventilation pipeline is communicated with the second opening.

[0015] In a preferred technical solution of the washing apparatus described above, a wind detection device is arranged at the first opening and/or the second opening.

[0016] In a preferred technical solution of the washing apparatus described above, an anti-foam overflow structure is arranged in the ventilation pipeline.

[0017] In a preferred technical solution of the washing apparatus described above, the cylinder assembly includes an outer cylinder and a window gasket that are connected, the air inflow pipeline is communicated with the window gasket, and the air outflow pipeline and the ventilation pipeline are both communicated with the outer cylinder.

[0018] In a preferred technical solution of the washing apparatus described above, the air outflow pipeline is communicated with a front portion or a middle portion of the outer cylinder, and the ventilation pipeline is communicated with a rear portion of the outer cylinder.

[0019] In case of adopting the above technical solutions, by turning on the fan in the present disclosure after the washing program of the washing apparatus is completed, the external air can enter the air inflow pipeline, then enters the cylinder assembly to achieve air drying of the interior of the cylinder assembly, and finally is discharged from the air outflow pipeline and the ventilation pipeline to increase the moisture discharge speed, improve the air drying effect and air drying efficiency, and avoid growth of bacteria inside the cylinder assembly due to residual water. In addition, the blocking mechanism can simultaneously block and separate the air inflow pipeline and the air outflow pipeline; the structure is simple, which facilitates the overall structural layout of the product, and reduces the complexity of product design.

[0020] Further, the driving motor can drive the first blocking member to block the air inflow chamber, and at the same time drive the second blocking member to block the air outflow chamber, thereby achieving simultaneous blocking of the air inflow pipeline and the air outflow pipeline. That is, the driving motor is used as a driving source to achieve simultaneous blocking of the air inflow pipeline and the air outflow pipeline. The overall structure is simple, which facilitates the overall structural layout of the product, and reduces the complexity of product design.

[0021] Further, the driving motor can drive the transmission shaft to rotate, thereby achieving the rotation of the first blocking plate and the second blocking plate, and further achieving simultaneous blocking of the air inflow chamber and the air outflow chamber. With such an arrangement, not only the air inflow pipeline and the air outflow pipeline can be blocked simultaneously, but also the space that the valve assembly needs to occupy can be reduced as much as possible by means of rotational driving, which is more advantageous for the layout design

of the overall spatial structure of the washing apparatus; moreover, the structure is simple and easy to manufacture.

[0022] Further, the driving motor is located outside the valve casing, allowing the transmission shaft to protrude into the valve casing to drive the first blocking plate and the second blocking plate to rotate. With such an arrangement, a structural basis is provided for the installation of the structure of the driving motor, and the arrangement of the driving motor outside the valve casing will not affect the flow of air; moreover, there is no safety hazard of the driving motor being covered by humid air, further improving the safety of the washing apparatus.

[0023] Further, as to the outlet of the ventilation pipeline and the outlet of the air outflow pipeline, one of them is arranged on the rear panel of the cabinet, and the other of them is arranged on the front panel of the cabinet. Such an arrangement is more advantageous for the layout of the pipeline structure, avoids affecting the internal arrangement of the washing apparatus due to excessive concentration of pipelines, and prevents the size of the cabinet of the washing apparatus from being too large.

[0024] Further, the wind detection device can detect whether the air outflow pipeline and/or the ventilation pipeline has wind coming out, so that it can be judged whether the wind outflow of the washing apparatus is normal, thereby facilitating users to know the wind outflow status, which is advantageous for the control of the washing apparatus, and further improves the user experience.

[0025] Further, the anti-foam overflow structure can prevent foam from overflowing out of the washing apparatus from the ventilation pipeline, and avoid foam overflowing from the washing apparatus when washing the clothing, which would otherwise lead to water accumulation around the washing apparatus and affect the environment in the user's home, thus further improving the user experience.

[0026] Further, the air inflow pipeline is communicated with the window gasket, and the air outflow pipeline and the ventilation pipeline are both communicated with the outer cylinder, allowing external air to enter from the window gasket so that the window gasket is air dried first, and then the outer cylinder is air dried. Finally, humid air is discharged through the air outflow pipeline and the ventilation pipeline, allowing the outer cylinder and the window gasket to be air dried simultaneously, avoiding secondary pollution and avoiding affecting the user experience during secondary washing of the clothing by the user.

[0027] Further, the air outflow pipeline is communicated with the front portion or the middle portion of the outer cylinder, and the ventilation pipeline is communicated with the rear portion of the outer cylinder, which not only increases the moisture discharge speed, but also enables the external air to air dry the outer cylinder without dead corners, further improving the drying effect and the user experience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] Preferred solutions of the present disclosure will be described below with reference to the accompanying drawings and in connection with a drum washing machine. In the drawings:

FIG. 1 is a schematic structural view of the drum washing machine of the present disclosure;

FIG. 2 is a first schematic structural view of a valve assembly and a fan of the drum washing machine of the present disclosure;

FIG. 3 is a second schematic structural view of the valve assembly and the fan of the drum washing machine of the present disclosure; and

FIG. 4 is a schematic structural view of an embodiment of an anti-foam overflow structure of the drum washing machine of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENT(S) OF THE INVENTION

[0029] First, it should be understood by those skilled in the art that these embodiments are only used to explain the technical principle of the present disclosure, and are not intended to limit the scope of protection of the present disclosure. For example, although the present disclosure is described in connection with a drum washing machine, the technical principle of the present disclosure is obviously also applicable to a washing-drying integrated machine, or a complex clothing treatment apparatus. Such adjustments or changes to the application object do not constitute limitations to the present disclosure, and should all be defined within the scope of protection of the present disclosure.

[0030] It should be noted that in the description of the present disclosure, terms indicating directional or positional relationships, such as "middle", "upper", "lower", "inner", "outer" and the like, are based on the directional or positional relationships shown in the accompanying drawings. They are only used for ease of description, and do not indicate or imply that the device or element must have a specific orientation, or be constructed or operated in a specific orientation; therefore, they should not be considered as limitations to the present disclosure. In addition, terms "first", "second" and "third" are only used for descriptive purpose, and should not be understood as indicating or implying relative importance.

[0031] In addition, it should also be noted that in the description of the present disclosure, unless otherwise clearly specified and defined, terms "arrange", "install", "connect" and "communicate" should be understood in a broad sense; for example, the connection may be a fixed connection, or may also be a detachable connection, or an integral connection; it may be a direct connection, or an indirect connection implemented through an intermediate medium, or it may be internal communication between two elements. For those skilled in the art,

the specific meaning of the above terms in the present disclosure can be interpreted according to specific situations.

[0032] In view of the problems pointed out in the "BACKGROUND OF THE INVENTION" that when external air is used to air dry the outer cylinder in the existing drum washing machines, the complicated structure is not advantageous for a simplified design of product structure, the air drying effect is limited, and the air drying efficiency is extremely low, the present disclosure provides a drum washing machine, aiming to increase the moisture discharge speed, improve the air drying effect and the air drying efficiency, facilitate the overall structural layout of the product, and reduce the complexity of product design.

[0033] Specifically, as shown in FIG. 1, the drum washing machine of the present disclosure includes a cabinet 1 and a cylinder assembly arranged inside the cabinet 1. The cylinder assembly includes an inner cylinder 2, an outer cylinder 3, and a window gasket 4. The inner cylinder 2 is rotatably arranged in the outer cylinder 3, and the window gasket 4 connects an opening of the outer cylinder 3 with a clothing throw-in port of the cabinet 1. The inner cylinder 2 can be directly driven to rotate by a direct driving motor, and can also be driven to rotate by a belt, which is driven by a motor. The outer cylinder 3 is configured to hold washing water, the inner cylinder 2 is configured to turn over the clothing, and the window gasket 4 ensures the sealing between the outer cylinder 3 and the cabinet 1.

[0034] It should be noted that the conventional washing programs of the drum washing machine include washing, rinsing, spinning and draining processes. In some drum washing machines, the spinning process may be omitted from the washing programs. Such adjustments or changes to the conventional washing programs of the drum washing machine do not constitute limitations to the present disclosure, and should all be defined within the scope of protection of the present disclosure. A large amount of foam will be generated during the washing process due to the presence of detergent/washing powder. Moreover, after the draining process is completed, there will be residual water on both an inner surface of the outer cylinder 3 and an inner surface of the window gasket 4.

[0035] As shown in FIGS. 1 to 3, the drum washing machine of the present disclosure further includes a ventilation pipeline 5, a valve assembly and a fan 6. One end of the ventilation pipeline 5 is communicated with the cylinder assembly, and the other end of the ventilation pipeline 5 is communicated with the outside. The valve assembly includes a blocking mechanism, and a valve casing 7 with an air inflow chamber 71 and an air outflow chamber 72. The air inflow chamber 71 and the air outflow chamber 72 are arranged independently from each other. The air inflow chamber 71 is communicated with an air inflow pipeline 8 that communicates the outside with the cylinder assembly, and the air outflow chamber 72 is communicated with an air outflow pipeline 9 that com-

municates the outside with the cylinder assembly. The fan 6 is arranged on the air inflow pipeline 8, and the blocking mechanism is arranged to be capable of simultaneously blocking the air inflow pipeline 8 and the air outflow pipeline 9. The air inflow chamber 71 has an air inlet 71a and an air outlet 71b, and the air outflow chamber 72 also has an air inlet 72a and an air outlet 72b. When the air inflow chamber 71 is communicated with the air inflow pipeline 8 that communicates the outside with the cylinder assembly, it is possible that the outside is directly communicated with the air inlet 71a of the air inflow chamber 71, and then the air outlet 71b of the air inflow chamber 71 is communicated with the cylinder assembly through the air inflow pipeline 8, or it is also possible that the air inflow pipeline 8 has two sections, one of which communicates the outside with the air inlet 71a of the air inflow chamber 71, and the other of which communicates the air outlet 71b of the air inflow chamber 71 with the cylinder assembly. Similarly, when the air outflow chamber 72 is communicated with the air outflow pipeline 9 that communicates the outside with the cylinder assembly, it is possible that the air outlet 72b of the air outflow chamber 72 is directly communicated with the outside, and then the cylinder assembly is communicated with the air inlet 72a of the air outflow chamber 72 through the air outflow pipeline 9, or it is also possible that the air outflow pipeline 9 has two sections, one of which communicates the cylinder assembly with the air inlet 72a of the air outflow chamber 72, and the other of which communicates the air outlet 72b of the air outflow chamber 72 with the outside. Preferably, the air inflow pipeline 8 is communicated with the window gasket 4, and the air outflow pipeline 9 and the ventilation pipeline 5 are both communicated with the outer cylinder 3. In practical applications, those skilled in the art can flexibly set the connection position of the air inflow pipeline 8 with the window gasket 4, the connection position of the air outflow pipeline 9 with the outer cylinder 3, and the connection position of the ventilation pipeline 5 with the outer cylinder 3. Preferably, the air inflow pipeline 8 is communicated with the top of the window gasket 4, and the air outflow pipeline 9 and the ventilation pipeline 5 are also both communicated with the top of the outer cylinder 3, so as to prevent water from entering the pipeline during washing of the drum washing machine. More preferably, the air outflow pipeline 9 is communicated with a front portion or a middle portion of the outer cylinder 3, and the ventilation pipeline 5 is communicated with a rear portion of the outer cylinder 3. It should be noted that the front portion, the middle portion and the rear portion of the outer cylinder 3 can be divided based on an axial length of the outer cylinder 3. For example, the first one-third of the outer cylinder 3 is called the front portion of the outer cylinder 3, the middle one-third of the outer cylinder 3 is called the middle portion of the outer cylinder 3, and the last one-third of the outer cylinder 3 is called the rear portion of the outer cylinder 3. In a possible situation, with continued reference to FIG. 1, the air inflow pipeline 8

includes a first air inflow pipe and a second air inflow pipe, the first air inflow pipe communicates the air inlet 71a of the air inflow chamber 71 with the outside, and the second air inflow pipe communicates the air outlet 71b of the air inflow chamber 71 with the cylinder assembly; the air outflow pipeline 9 includes a first air outflow pipe and a second air outflow pipe, the first air outflow pipe communicates the cylinder assembly with the air inlet 72a of the air outflow chamber 72, and the second air outflow pipe communicates the air outlet 72b of the air outflow chamber 72 with the outside. After the washing program of the drum washing machine is completed, a controller of the drum washing machine can send a signal to the fan 6 to turn on the fan 6. The fan 6 rotates to allow air to enter the cylinder assembly through the first air inflow pipe, the air inflow chamber 71 and the second air inflow pipe in sequence, achieving air drying of the cylinder assembly. Then, a part of the humid air is discharged through the first air outflow pipe, the air outflow chamber 72 and the second air outflow pipe in sequence, and another part of the humid air is discharged through the ventilation pipeline 5, so that the humid air is discharged to the outside.

[0036] In the above, the ventilation pipeline 5 is preferably provided therein with an anti-foam overflow structure. It should be noted that the anti-foam overflow structure needs to allow air to flow when air drying the cylinder assembly. In a possible situation, the anti-foam overflow structure may be a combination of a rotatable pipe section, a one-way valve and a rotating motor. The rotatable pipe section can be a part of the ventilation pipeline 5, or a pipe section separately connected at an inlet or outlet of the ventilation pipeline 5. The rotatable pipe section is connected with an output shaft of the rotating motor and is arranged to be rotatable through the rotating motor, that is, both ends of the rotatable pipe section are each provided with a pipe opening, i.e., a first pipe opening and a second pipe opening respectively. The one-way valve is provided in the rotatable pipe section. When the rotating motor drives the rotatable pipe section to rotate, the first pipe opening and the second pipe opening can be normally or reversely connected to the ventilation pipeline 5. For example, when the rotatable pipe section is normally connected to the ventilation pipeline 5, the first pipe opening is a windward opening, the second pipe opening is a leeward opening, and the one-way valve allows air to flow from the windward opening to the leeward opening. When the rotatable pipe section is reversely connected to the ventilation pipeline 5, the second pipe opening is a windward opening, and the first pipe opening is a leeward opening; at this time, the one-way valve is reversed to prevent air from flowing from the windward opening to the leeward opening. With such an arrangement, when the drum washing machine executes the washing program, such as washing and rinsing, the rotatable pipe section can be reversely connected to the ventilation pipeline 5, so as to prevent foam from overflowing; and when the drum washing machine executes

the ventilation program, the rotatable pipe section can be normally connected to the ventilation pipeline 5, allowing air to be discharged to achieve dehumidification inside the cylinder assembly. Moreover, when using the air outflow pipeline 9 separately to dehumidify the cylinder assembly, the rotatable pipe section can also be reversely connected to the ventilation pipeline 5 to prevent the air in the ventilation pipeline 5 from flowing out. In another possible situation, as shown in FIG. 4, the anti-foam overflow structure includes a chamber structure 20, a door 30, a first permanent magnet 40 and a second permanent magnet 50. The chamber structure 20 is arranged inside the ventilation pipeline 5, and a side of the chamber structure 20 that faces the door 30 is formed with a notch 20a. The door 30 is rotationally arranged in the ventilation pipeline 5, and a protruding end of the door 30 can cooperate with the notch 20a to close/open the ventilation pipeline 5. The first permanent magnet 40 is arranged on the door 30, and the second permanent magnet 50 is arranged on an upstream side of the door 30 in an air flow direction of the ventilation pipeline 5. The magnetic properties of the first permanent magnet 40 and the second permanent magnet 50 are opposite to each other. When the fan 6 rotates within a preset rotational speed range, the air flow generated by the fan 6 can overcome an attraction force between the first permanent magnet 40 and the second permanent magnet 50 to keep the protruding end of the door 30 between a windward end 20b and a leeward end 20c of the notch 20a, so that part of the air in the outer cylinder 3 is discharged to the outside through the ventilation pipeline 5. When the drum washing machine executes the washing program and the foam enters the ventilation pipeline 5, the door 30 overcomes the attraction force between the first permanent magnet 40 and the second permanent magnet 50 when pushed by the foam, and maintains at the leeward end 20c of the notch 20a to close the ventilation pipeline 5, so as to prevent the foam from overflowing. The door 30 can be connected to an inner wall of the ventilation pipeline 5 or to an installation structure of the ventilation pipeline 5 through a rotating shaft. Those skilled in the art can flexibly set the way in which the door 30 is rotationally arranged in the ventilation pipeline 5 in practical applications. In the direction of incoming air flow, the second permanent magnet 50 is located on the upstream side of the door 30, so that when the fan 6 stops operating, the second permanent magnet 50 attracts the first permanent magnet 40 to maintain the door 30 in the closed position (i.e., the door 30 is located at the position of the windward end 20b of the notch 20a), thereby closing the ventilation pipeline 5 and forming a barrier from the outside to prevent external dust from entering. When the fan 6 rotates within the preset rotational speed range, the attraction force of the second permanent magnet 50 to the first permanent magnet 40 can be overcome to enable the door 30 to rotate and the protruding end of the door 30 to be maintained between the windward end 20b and the leeward end 20c of the

notch 20a so that the ventilation pipeline 5 is clear, allowing part of the air in the outer cylinder 3 to be discharged to the outside through the ventilation pipeline 5. When the drum washing machine executes the washing program, the force generated by the foam is very large, which will push the door 30 at the position of the leeward end 20c of the notch 20a, thus ensuring that the door 30 closes the ventilation pipeline 5 and preventing the foam from overflowing. It should be noted that the preset rotational speed range can be flexibly set based on the magnitude of the attraction force between the first permanent magnet 40 and the second permanent magnet 50, and the rotational speed of the fan 6 can control the wind force, which in turn controls a rotational angle of the door 30, i.e., the opening angle, thereby controlling the air flow rate. Preferably, the preset rotational speed range is a range between two values (that is, the preset rotational speed range has a lower limit value and an upper limit value), and the preset rotational speed range can be between 500rpm and 800rpm. When the rotational speed of the fan 6 is below 500rpm, the wind force of the fan 6 is not able to open the door 30. When the rotational speed of the fan 6 reaches and exceeds 500rpm, the wind force of the fan 6 can overcome the attraction force between the first permanent magnet 40 and the second permanent magnet 50 so that the door 30 is opened and maintained between the windward end 20b and the leeward end 20c of the notch 20a. When the rotational speed of the fan 6 exceeds 800rpm, the wind force will push the door 30 against the leeward end 20c of the notch 20a. Therefore, the setting of this range can ensure that the door 30 will make the ventilation pipeline 5 clear. Of course, the preset rotational speed range described above is only illustrative, and it can also be another range. Those skilled in the art can flexibly set the preset rotational speed range in practical applications based on specific application situations. In other examples, the anti-foam overflow structure can also be another structure, which can be flexibly set by those skilled in the art.

[0037] In the above, the fan 6 is preferably arranged on the first air inflow pipe, so that air can be drawn in from the first air inflow pipe immediately after the fan 6 is turned on. The foam generated in the washing process of the drum washing machine will also be blocked in the air inflow chamber 71, so that the operation of the fan 6 will not be affected. A first opening communicated with the outside is arranged on a front panel of the cabinet 1, and a second opening communicated with the outside is arranged on a rear panel of the cabinet 1. The second air outflow pipe is communicated with the first opening, and the ventilation pipeline 5 is communicated with the second opening. Alternatively, it is also possible that the second air outflow pipe is communicated with the second opening, and the ventilation pipeline 5 is communicated with the first opening. Moreover, a third opening is preferably arranged on the rear panel of the cabinet 1, and the first air inflow pipe is communicated with the third opening. An air filtration device can be arranged at the

position of the third opening, and the air filtration device can block dust from entering the fan 6, the outer cylinder 3 and the window gasket 4. The air filtration device may be of a structure of multi layers of equal-efficiency filter screens, or a structure of a combination of primary-efficiency filter screen, medium-efficiency filter screen and high-efficiency filter screen, or another filtration structure, which can be flexibly set by those skilled in the art in practical applications.

[0038] Further, a wind detection device is provided at the first opening and/or the second opening, and the wind detection device can be a flow sensor or another device capable of detecting wind outflow. Through the wind detection device, it can be judged whether the drum washing machine is executing the ventilation program normally. Preferably, each of the first opening and the second opening is provided with a wind detection device, so that when one of the wind detection devices fails, the other can still work, thus ensuring that the detection can always be carried out. More preferably, humidity sensors are arranged at both the first opening and the second opening. For example, a first humidity sensor is arranged at the first opening, and a second humidity sensor is arranged at the second opening. The first humidity sensor and the second humidity sensor can detect the wind humidity of the air outflow pipeline 9 and the wind humidity of the ventilation pipeline 5 respectively. When the humidities of the two are substantially the same, or the difference between the two is within a set range or smaller than a set humidity value, it indicates that both the ventilation pipeline 5 and the air outflow pipeline 9 are normally having wind coming out. Of course, an ambient humidity sensor in communication with the controller of the drum washing machine (such as through WiFi, Bluetooth communication, etc.) can also be arranged in the room. By comparing the ambient humidity detected by the ambient humidity sensor with the humidity detected by the first humidity sensor or the second humidity sensor, if the difference between the humidity detected by the ambient humidity sensor and the humidity detected by the first humidity sensor or the second humidity sensor is smaller than a preset humidity value (which can be a relative humidity value of 5%), it indicates that the wind humidity is roughly consistent with or close to the ambient humidity, and the drum washing machine can stop executing the ventilation program.

[0039] Preferably, as shown in FIGS. 2 and 3, the blocking mechanism includes a driving motor 10, a first blocking member 11, and a second blocking member 12; an output shaft of the driving motor 10 is connected with the first blocking member 11 and the second blocking member 12 simultaneously, the first blocking member 11 is arranged in the air inflow chamber 71, and the second blocking member 12 is arranged in the air outflow chamber 72; the driving motor 10 is capable of driving the first blocking member 11 and the second blocking member 12 to move simultaneously, so that the air inflow chamber 71 and the air outflow chamber 72 are blocked. The driv-

ing motor 10 can be a rotating motor that eventually outputs a rotational force, or a linear motor that eventually outputs a linear driving force. For example, in a preferred situation, the driving motor 10 is connected with the transmission shaft, the first blocking member 11 is a first blocking plate, and the second blocking member 12 is a second blocking plate. The first blocking plate and the second blocking plate are both arranged on the transmission shaft, and the driving motor 10 can drive the transmission shaft to rotate so that the first blocking plate and the second blocking plate rotate simultaneously. That is, the driving motor 10 is a rotating motor, and the driving motor 10 can drive the transmission shaft to rotate. The transmission shaft drives the first blocking plate and the second blocking plate to rotate simultaneously. The air inlet 71a and the air outlet 71b of the air inflow chamber 71 can be located on opposite sides of the air inflow chamber 71 respectively, or on adjacent sides of the air inflow chamber 71 respectively. Similarly, the air inlet 72a and the air outlet 72b of the air outflow chamber 72 can be located on opposite sides of the air outflow chamber 72 respectively, or on adjacent sides of the air outflow chamber 72 respectively. According to the respective arrangement positions of the air inlet and the air outlet of the air inflow chamber 71 as well as the air inlet and the air outlet of the air outflow chamber 72, the ways of blocking the first blocking plate and the second blocking plate can be flexibly set respectively. In a preferred situation, as shown in FIGS. 2 and 3, the air outlet 71b of the air inflow chamber 71 and the air inlet 72a of the air outflow chamber 72 are located on the same side of the valve casing 7, that is, the air outlet 71b of the air inflow chamber 71 is located on the same side as the air inlet 72a of the air outflow chamber 72. The driving motor 10 drives the transmission shaft to rotate so that the first blocking plate can cover the air outlet 71b of the air inflow chamber 71, thereby achieving the blocking of the air inflow pipeline 8, and at the same time, the second blocking plate can cover the air inlet 72a of the air outflow chamber 72, thereby achieving the blocking of the air outflow pipeline 9. Moreover, since it is the air outlet 71b of the air inflow chamber 71 and the air inlet 72a of the air outflow chamber 72 that are covered respectively, even if foam is generated in the washing process of the drum washing machine, it will not enter the air inflow chamber 71 and the air outflow chamber 72. Moreover, it is further preferred that one side of the first blocking plate that faces the air outlet 71b of the air inflow chamber 71 and one side of the second blocking plate that faces the air inlet 72a of the air outflow chamber 72 are each provided with a sealing gasket, so that sealing can be achieved when the first blocking plate covers the air outlet 71b of the air inflow chamber 71, and sealing can also be achieved when the second blocking plate covers the air inlet 72a of the air outflow chamber 72. In other examples, the sealing gasket on the first blocking plate can be replaced with a sealing ring that can correspond to the shape of the air outlet 71b of the air inflow chamber 71, and the sealing gasket

on the second blocking plate can be replaced with a sealing ring that can correspond to the shape of the air inlet 72a of the air outflow chamber 72.

[0040] Preferably, as shown in FIG. 2, the transmission shaft extends from the outside through one side of the valve casing 7, the air outflow chamber 72 and the air inflow chamber 71 in sequence, and the transmission shaft is rotatably arranged on a spacer plate that separates the air inflow chamber 71 from the air outflow chamber 72. In a possible situation, a first through hole is formed on one side of the valve casing 7 that forms the air outflow chamber 72, a second through hole is formed on the spacer plate, and the transmission shaft passes through the first through hole and the second through hole in sequence. The part of the transmission shaft that is located between the first through hole and the second through hole (i.e., the part inside the air outflow chamber 72) is connected with the second blocking plate, and the part of the transmission shaft that protrudes out of the second through hole (i.e., the part inside the air inflow chamber 71) is connected with the first blocking plate. In addition, the transmission shaft can be connected with an edge of the first blocking plate and also connected with an edge of the second blocking plate, so that the rotation of the transmission shaft can achieve synchronous swinging of the first blocking plate and the second blocking plate. Moreover, a third through hole can also be provided on a side of the valve casing 7 opposite to the side on which the first through hole is provided, and the protruding end of the transmission shaft can be located in the third through hole. With such an arrangement, the transmission shaft can be supported by the first through hole, the second through hole and the third through hole altogether, thus improving the stability of the support. The driving motor 10 is located outside the valve casing 7, and it can be connected with the cabinet 1 of the drum washing machine through an installation bracket, or it can be directly welded to the cabinet 1 of the drum washing machine. In other examples, it is also possible that the transmission shaft extends from the outside through one side of the valve casing 7, the air inflow chamber 71 and the air outflow chamber 72.

[0041] Alternatively, the driving motor 10 is a linear motor, the first blocking member 11 is a first blocking plate, and the second blocking member 12 is a second blocking plate. A first slot communicated with the air inflow chamber 71 and a second slot communicated with the air outflow chamber 72 are respectively formed on the same side of the valve casing 7. The first blocking plate is inserted into and matched with the first slot, and the second blocking plate is inserted into and matched with the second slot. The linear motor can drive the first blocking plate and the second blocking plate to move linearly and synchronously. When it is necessary to block the air inflow chamber 71 and the air outflow chamber 72, the linear motor drives the first blocking plate to be inserted into the air inflow chamber 71 from the first slot so that the first blocking plate blocks the air inlet 71a of the air inflow

chamber 71 from the air outlet 71b of the air inflow chamber 71, and at the same time, the linear motor drives the second blocking plate to be inserted into the air outflow chamber 72 from the second slot so that the second blocking plate blocks the air inlet 72a of the air outflow chamber 72 from the air outlet 72b of the air outflow chamber 72. In the above, the linear motor can also be replaced with a structure such as a hydraulic cylinder or a pneumatic cylinder.

[0042] In a preferred situation, a third humidity sensor is provided on the outer cylinder 3, and a detection end of the third humidity sensor is located inside the outer cylinder 3 to detect the humidity in the outer cylinder 3. After the drum washing machine finishes washing, the third humidity sensor detects the humidity in the outer cylinder 3. When the humidity is larger than a set humidity threshold (e.g., a relative humidity of 100%), it indicates that the interior of the outer cylinder 3 is very humid, and the controller of the drum washing machine can control the drum washing machine to send a prompt to start fresh air or automatically start the fresh air function, so as to air dry the cylinder assembly through external air. The prompt to start fresh air can be a buzzing prompt, or the drum washing machine can communicate and interact with a mobile terminal of the user (such as a mobile phone, a tablet or a smart bracelet) to send prompt information to the mobile terminal of the user. The user can query the prompt information in the APP. Alternatively, the third humidity sensor can also be arranged on the window gasket 4, and the detection end of the third humidity sensor is located inside the window gasket 4 to detect the humidity in the window gasket 4. The third humidity sensor can also be replaced with an odor sensor. The odor sensor can detect the odor in the cylinder assembly, and the controller can judge whether it is a peculiar smell based on the detected odor. If the odor is a peculiar smell, the controller of the drum washing machine can control the drum washing machine to send a prompt to start fresh air or automatically start the fresh air function.

[0043] Hitherto, the technical solutions of the present disclosure have been described in connection with the preferred embodiments shown in the accompanying drawings, but it is easily understood by those skilled in the art that the scope of protection of the present disclosure is obviously not limited to these specific embodiments. Without departing from the principles of the present disclosure, those skilled in the art can make equivalent changes or replacements to relevant technical features, and all the technical solutions after these changes or replacements will fall within the scope of protection of the present disclosure.

Claims

1. A washing apparatus, comprising a cylinder assembly, a valve assembly, a fan and a ventilation pipe-

line; wherein the ventilation pipeline directly communicates the cylinder assembly with the outside, and the valve assembly comprises a blocking mechanism, and a valve casing with an air inflow chamber and an air outflow chamber that are arranged independently from each other; the air inflow chamber is communicated with an air inflow pipeline that communicates the outside with the cylinder assembly, and the air outflow chamber is communicated with an air outflow pipeline that communicates the outside with the cylinder assembly; the fan is arranged on the air inflow pipeline, and the blocking mechanism is arranged to be capable of blocking the air inflow pipeline and the air outflow pipeline simultaneously.

2. The washing apparatus according to claim 1, wherein the blocking mechanism comprises a driving motor, a first blocking member, and a second blocking member; an output shaft of the driving motor is connected with the first blocking member and the second blocking member simultaneously, the first blocking member is arranged in the air inflow chamber, and the second blocking member is arranged in the air outflow chamber; the driving motor is capable of driving the first blocking member and the second blocking member to move simultaneously, so that the air inflow chamber and the air outflow chamber are blocked.
3. The washing apparatus according to claim 2, wherein the driving motor is connected with a transmission shaft, the first blocking member is a first blocking plate, and the second blocking member is a second blocking plate; the first blocking plate and the second blocking plate are both arranged on the transmission shaft, and the driving motor can drive the transmission shaft to rotate so that the first blocking plate and the second blocking plate rotate simultaneously.
4. The washing apparatus according to claim 3, wherein the transmission shaft extends from the outside through one side of the valve casing, the air outflow chamber and the air inflow chamber in sequence, and the transmission shaft is rotatably arranged on a spacer plate that separates the air inflow chamber from the air outflow chamber.
5. The washing apparatus according to claim 1, wherein the air inflow pipeline comprises a first air inflow pipe and a second air inflow pipe, and the fan is arranged on the first air inflow pipe; the first air inflow pipe communicates an air inlet of the air inflow chamber with the outside, and the second air inflow pipe communicates an air outlet of the air inflow chamber with the cylinder assembly; the air outflow pipeline comprises a first air outflow pipe and a second air outflow pipe, the first air outflow pipe communicates the cylinder assembly with an air inlet of the air out-

flow chamber, and the second air outflow pipe communicates an air outlet of the air outflow chamber with the outside.

6. The washing apparatus according to claim 5, wherein a first opening communicated with the outside is arranged on a front panel of a cabinet of the washing apparatus, and a second opening communicated with the outside is arranged on a rear panel of the cabinet of the washing apparatus; the second air outflow pipe is communicated with the first opening, and the ventilation pipeline is communicated with the second opening. 5
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7. The washing apparatus according to claim 6, wherein a wind detection device is arranged at the first opening and/or the second opening. 15
8. The washing apparatus according to claim 1, wherein an anti-foam overflow structure is arranged in the ventilation pipeline. 20
9. The washing apparatus according to any one of claims 1 to 8, wherein the cylinder assembly comprises an outer cylinder and a window gasket that are connected, the air inflow pipeline is communicated with the window gasket, and the air outflow pipeline and the ventilation pipeline are both communicated with the outer cylinder. 25
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10. The washing apparatus according to claim 9, wherein the air outflow pipeline is communicated with a front portion or a middle portion of the outer cylinder, and the ventilation pipeline is communicated with a rear portion of the outer cylinder. 35

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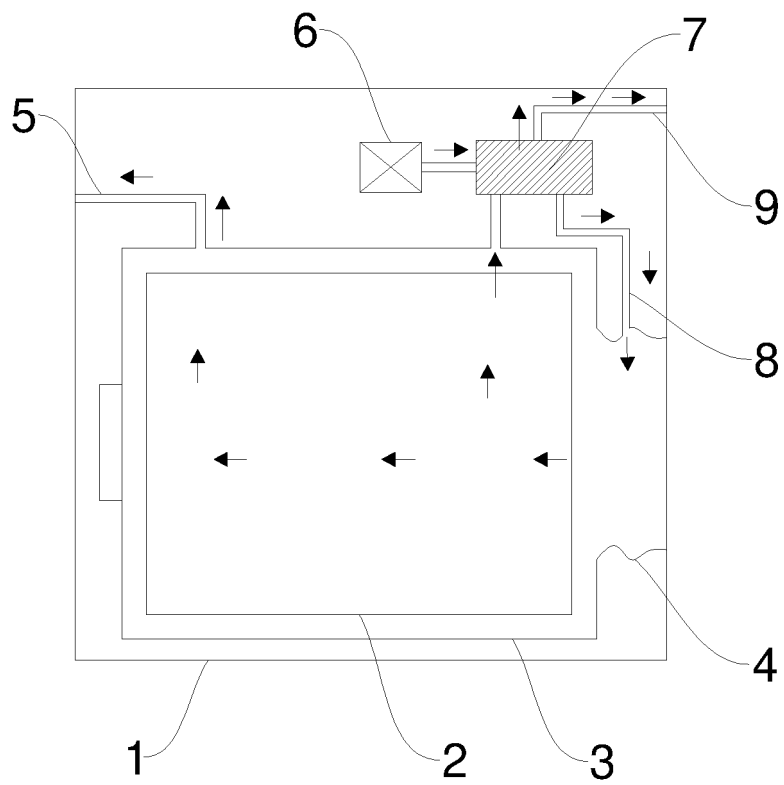


FIG.1

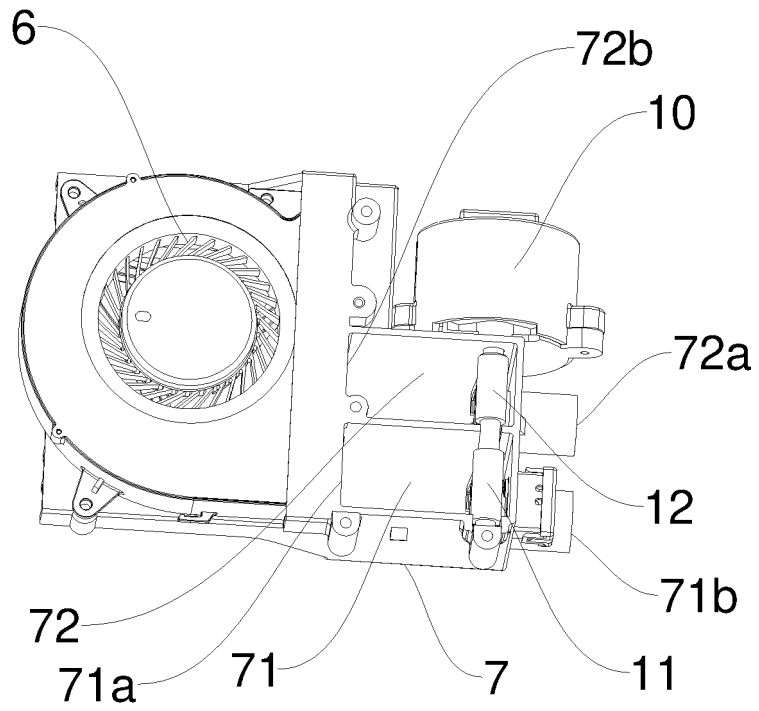


FIG. 2

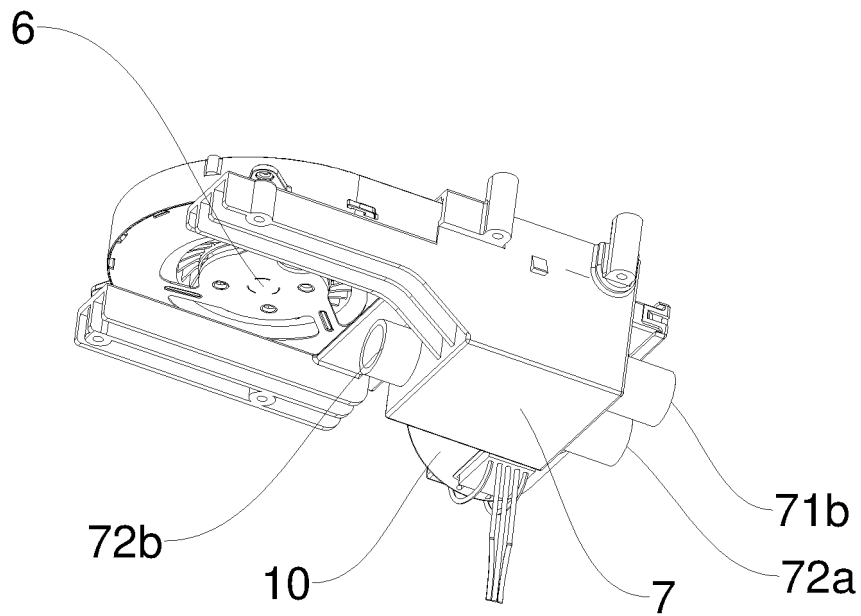


FIG. 3

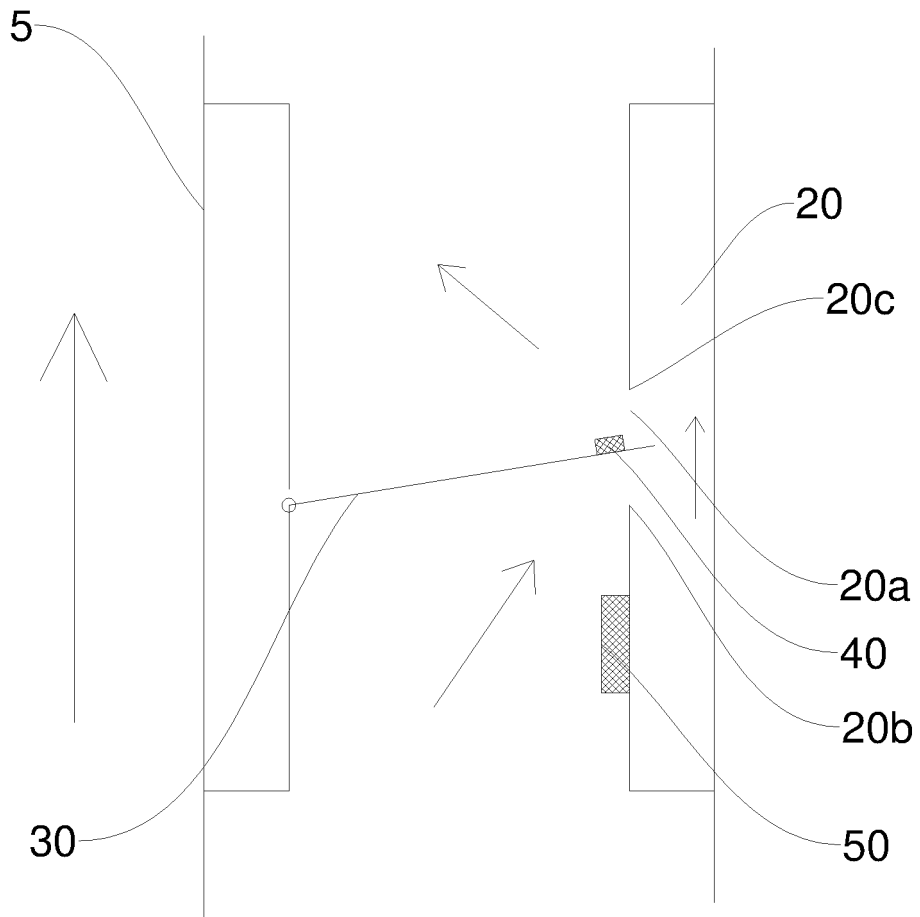


FIG.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/099309

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A. CLASSIFICATION OF SUBJECT MATTER		
D06F 39/00(2020.01)i; D06F 58/20(2006.01)i; D06F 103/56(2020.01)i; D06F 105/32(2020.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) D06F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT: ENTXTC; CNKI: 洗衣, 烘干, 滚筒, 窗垫, 通风, 进风, 出风, 透气, 阀, 阻隔, 遮挡, 转动, 管路, 泵, 风机; VEN: ENTXT: wash, dry, drum, air, inlet, outlet, valve, rotate, separate, pipe, pump, fan.		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 215887609 U (QINGDAO HAIER WASHING ELECTRIC APPLIANCE CO., LTD. et al.) 22 February 2022 (2022-02-22) claims 1-10	1-10
A	CN 106521876 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 22 March 2017 (2017-03-22) description, paragraphs 54-58, and figure 4	1-10
A	CN 213740119 U (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD. et al.) 20 July 2021 (2021-07-20) description, paragraph 25, and figures 1-2	1-10
A	CN 211972793 U (HAIER SMART HOME CO., LTD. et al.) 20 November 2020 (2020-11-20) entire document	1-10
A	CN 110552173 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 10 December 2019 (2019-12-10) entire document	1-10
A	JP 2014014529 A (HITACHI APPLIANCES INC.) 30 January 2014 (2014-01-30) entire document	1-10
<input type="checkbox"/> Further documents are listed in the continuation of Box C.		<input checked="" type="checkbox"/> See patent family annex.
* Special categories of cited documents:	"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 "A" document defining the general state of the art which is not considered to be of particular relevance "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "E" earlier application or patent but published on or after the international filing date "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
08 August 2022	30 August 2022	
Name and mailing address of the ISA/CN	Authorized officer	
China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China		
Facsimile No. (86-10)62019451	Telephone No.	

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/099309

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CN	215887609	U	22 February 2022	None			
CN	106521876	A	22 March 2017	None			
CN	213740119	U	20 July 2021	None			
CN	211972793	U	20 November 2020	None			
CN	110552173	A	10 December 2019	WO	2019228244	A1	05 December 2019
JP	2014014529	A	30 January 2014	None			

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

REFERENCES CITED IN THE DESCRIPTION

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