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(54) ALL-IN-ONE WASHER AND DRYER COMBO

(57) The present application relates to the field of household appliances, in particular to an all-in-one washer and dryer combo. The all-in-one washer and dryer combo comprises a tub (2), a drying module (3), and an air outlet pipeline (4) provided between the tub (2) and the drying module (3); the air outlet pipeline (4) is used for guiding airflow flowing from the tub (2) to the drying module (3); the air outlet pipeline (4) extends along the outer surface of the tub (2); and a filter screen (6) used for filtering the airflow flowing through the air outlet pipeline (4) is provided in the air outlet pipeline (4). According to the all-in-one washer and dryer combo of the present disclosure, since the filter screen used for filtering the airflow flowing through the air outlet pipeline is arranged in the air outlet pipeline, the use of the filter screen in the air outlet pipeline can prevent foreign matters such as fluff entrained in the airflow from entering the drying module, thereby avoiding the influence on the dehumidification and heating effects and then on the drying effect.

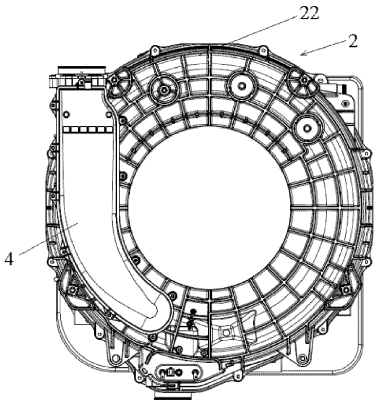

FIG. 2

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to the Chinese patent application filed on August 31, 2022, with application number 202222324411.9 and titled "Washer-dryer machine", the Chinese patent application filed on August 31, 2022, with application number 202222310435.9 and titled "Washer-dryer machine", the Chinese patent application filed on August 31, 2022, with application number 202222324412.3 and titled "Washer-dryer machine", the Chinese patent application filed on August 31, 2022, with application number 202222327250.9 and titled "Washer-dryer machine", the Chinese patent application filed on August 31, 2022, with application number 202222310440.X and titled "Washer-dryer machine", and the Chinese patent application filed on August 31, 2022, with application number 202222310919.3 and titled "Washer-dryer machine", the disclosures of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention belongs to the technical field of household appliances, and particularly relates to a washer-dryer machine.

BACKGROUND OF THE INVENTION

[0003] The washer-dryer machine can not only wash laundry, but also dry them after washing, which greatly facilitates people's lives and is therefore increasingly popular among consumers. The washer-dryer machine is equipped with a drum and a drying module. The drying module blows dry and hot air into the drum to dry the laundry, and on the other hand, it recovers the wet air discharged from the drum and dehumidifies and heats it, so that the air circulates continuously between the drum and the drying module to dry the laundry.

[0004] During the drying of laundry, especially in the later stages of drying, a large amount of lint will be generated. In order to capture the lint, a filter box is usually provided in the existing washer-dryer machines near the door inside the drum, and the filter box can be taken out and cleaned by the user.

[0005] However, such a filter box arranged in the drum can only capture a limited portion of the lint, and most of the lint will enter the drying module from the drum along with the humid air, thereby clogging the components therein, affecting the dehumidification and heating effects and even damaging these components.

SUMMARY OF THE INVENTION

[0006] The present disclosure provides a washer-dryer machine that can alleviate the blockage of a drying module to a certain extent.

[0007] The washer-dryer machine provided in the present disclosure includes: a drum, a drying module and an air outlet duct arranged between the drum and the drying module, the air outlet duct is configured to guide an air flow passing from the drum to the drying module, the air outlet duct extends along an outer surface of the drum, and a filter screen is arranged in the air outlet duct for filtering the air flow passing through the air outlet duct.

[0008] According to the washer-dryer machine provided in the present disclosure,

[0009] On the one hand, according to the washer-dryer machine disclosed in the present invention, a filter screen is provided in the air outlet duct for filtering the air flow passing through the air outlet duct. The use of the filter screen in the air outlet duct can prevent foreign matter such as lint entrained in the air flow from entering the drying module, which would otherwise affect the dehumidification and heating effects and thus the drying effect.

[0010] On the other hand, the air outlet duct of the washer-dryer machine according to the present disclosure extends from bottom to top along the outer surface of the rear wall of the drum. The way in which the air outlet duct extends from bottom to top along the outer surface of the rear wall of the drum can reduce the overall height of the washer-dryer machine compared to the way in which the air outlet duct extends along an outer surface of the upper side wall of the drum, and more space can be reserved above the drum to arrange various components of the drying module.

BRIEF DESCRIPTION OF DRAWINGS

[0011] In order to more clearly illustrate the technical solutions in the embodiments of the present invention, the following briefly introduces the drawings required for use in the description of the embodiments. Obviously, the drawings described below are only some embodiments of the present invention. For ordinary technicians in this field, other drawings can be obtained based on these drawings without creative work.

[0012] In the drawings:

FIG. 1 schematically shows a structural diagram of a washer-dryer machine;

FIG. 2 schematically shows a schematic diagram of the relative arrangement of an air outlet duct and a drum of a washer-dryer machine according to some embodiments of the present disclosure;

FIG. 3 schematically shows a schematic diagram of the relative arrangement of an air outlet duct and a drum of a washer-dryer machine according to other embodiments of the present disclosure;

FIG. 4 schematically shows a longitudinal cross-sectional view of an air outlet duct of a washer-dryer machine according to some embodiments of the present disclosure;

FIG. 5 schematically shows a longitudinal cross-sectional view of an air outlet duct provided with a

first exemplary filter screen self-cleaning device;
FIG. 6 schematically shows a partial enlarged cross-sectional view taken along line A-A of FIG. 5;
FIG. 7 schematically shows a plan view of another nozzle of the first exemplary filter screen self-cleaning device according to the present disclosure;
FIG. 8 schematically shows a partial enlarged view of another air outlet duct of the first exemplary filter screen self-cleaning device;
FIG. 9 schematically shows a longitudinal cross-sectional view of an air outlet duct provided with a second exemplary filter screen self-cleaning device;
FIG. 10 schematically shows a structural diagram of a washer-dryer machine with an improved air outlet duct;
FIG. 11 schematically shows a cross-sectional view of the air outlet duct taken along line A-A in FIG. 10;
FIG. 12 schematically shows a partial enlarged view of FIG. 11;
FIG. 13 schematically shows a schematic cross-sectional view of another bracket for fixing the filter screen self-cleaning device and the filter screen according to the present disclosure;
FIG. 14 schematically shows a cross-sectional view of the air outlet duct taken along line B-B in FIG. 11;
FIG. 15 schematically shows a structural diagram of a washer-dryer machine having a filter box in some embodiments;
FIG. 16a and FIG. 16b schematically show the structure of the air outlet duct in some embodiments of the present disclosure;
FIG. 17 schematically shows a longitudinal cross-sectional view of an air outlet duct and a cooling channel of a washer-dryer machine according to some embodiments of the present disclosure;
FIG. 18 schematically shows a perspective view of an air outlet duct and a cooling channel of a washer-dryer machine according to other embodiments of the present disclosure;
FIG. 19 schematically shows a schematic diagram of a composite water circuit system of a washer-dryer machine according to an embodiment of the present disclosure; and
FIG. 20 schematically shows an enlarged view of a pipe assembly of the composite water path system of FIG. 19.

DETAILED DESCRIPTION

[0013] FIG. 1 schematically shows a structural diagram of a washer-dryer machine. In conjunction with FIG. 1, the washer-dryer machine 1 includes at least a drum 2, a drying module 3 and an air outlet duct 4. The air outlet duct 4 is arranged between the drum 2 and the drying module 3. Specifically, one end of the air outlet duct 4 is connected to an air outlet 21 of the drum 2, and the other end of the air outlet duct 4 is connected to an air inlet 31 of the drying module 3. The drum 2 has a storage space for accommodating laundry such as clothes. In a drying mode, the air outlet duct 4 is configured to guide a humid air flow from the drum 2 to the drying module 3, and the drying module 3 is configured to dehumidify and heat the humid air flow from the drum 2, and then guide a dry and hot air flow back to the drum 2 for continuous circulation to dry the clothes, etc.

[0014] FIG. 2 schematically shows a schematic diagram of the relative arrangement of the air outlet duct and the drum of the washer-dryer machine according to some embodiments of the present disclosure, and FIG. 3 schematically shows a schematic diagram of the relative arrangement of the air outlet duct and the drum of the washer-dryer machine according to some other embodiments of the present disclosure. Combining FIG. 2 and FIG. 3, the air outlet duct 4 extends from bottom to top along an outer surface of a rear wall 22 of the drum 2. This extension method can reduce the overall height of the washer-dryer machine 1, so that the washer-dryer machine 1 can be conveniently placed under a countertop.

[0015] In conjunction with FIG. 2 and FIG. 3, a wall of the air outlet duct 4 is in close contact with the outer surface of the rear wall 22 of the drum 2, and the air outlet duct 4 can be constructed as a flat duct, thereby reducing the overall thickness of the washer-dryer machine 1. Of course, the air outlet duct 4 can also extend along an opening provided at a middle position of the drum 2, in close contact with the drum, to the air inlet of the drying module 3. In some embodiments, the air outlet duct 4 can also extend from a side of the drum 2 from bottom to top until it is communicated with the air inlet 31 of the drying module 3. Such a configuration can further reduce the size of the entire machine in the front-to-back thickness direction.

[0016] In some embodiments according to FIG. 2, the air outlet duct 4 is disposed at the left rear of the drum 2. In other embodiments according to FIG. 3, the air outlet duct 4 is disposed at the right rear of the drum 2. That is, the air outlet duct 4 can be disposed at a side portion at the rear of the drum 2. It can be understood that the air outlet duct 4 can also extend from the left rear of the drum 2 to the left front side of the drum 2 or from the right rear of the drum 2 to the right front side of the drum 2. This extension method is conducive to the arrangement of a manual cleaning device of a filter screen to be discussed below, because this extension method can facilitate a user to take out the filter screen from the air outlet duct from the front side.

[0017] In some embodiments, the air outlet duct 4 is flexibly connected to the air inlet 31 of the drying module 3, so as to prevent the vibration of the drum 2 from being transmitted to the air outlet duct 4 and then to the drying module 3, which would otherwise damage the components of the drying module 3. In specific implementation, the air outlet duct 4 and the air inlet 31 of the drying module 3 can be connected through a flexible bellows.

[0018] FIG. 4 schematically shows a longitudinal cross-sectional view of the air outlet duct of the washer-dryer machine according to some embodiments

of the present disclosure. In conjunction with FIG. 4, the air outlet duct 4 includes a first half shell 41 and a second half shell 42, between which an air flow chamber Q1 for air flow F to flow is formed, and a flow direction of air flow F is indicated by an arrow. The air outlet duct 4 includes a first end and a second end. The first end of the air outlet duct 4 is provided as an air inlet end 43 of the air outlet duct 4, and the second end of the air outlet duct 4 is provided as an air outlet end 44 of the air outlet duct 4. The air inlet end 43 of the air outlet duct 4 is connected to the air outlet 21 of the drum 2, and the air outlet end 44 is connected to the air inlet 31 of the drying module 3.

[0019] In conjunction with FIG. 4, a filter screen 6 is provided in the air outlet duct 4 for filtering the air flow F passing through the air outlet duct 4, thereby reducing or even preventing foreign matter such as lint entrained in the air flow from entering the drying module 3.

[0020] In conjunction with FIG. 4, the filter screen 6 is arranged obliquely in the air outlet duct 4. An inclined arrangement of the filter screen 6 increases the filtering area of the filter screen 6 when the cross-section of the air outlet duct 4 is constant, thereby reducing the risk of clogging of the filter screen 6, thereby extending the service life of the filter screen 6 and reducing the frequency of cleaning the filter screen 6.

[0021] In some embodiments, an angle α between the filter screen 6 and a longitudinal axis of the air outlet duct 4 is between 15° and 80°, preferably between 15 and 45°. An inclination angle of the filter screen 6 within this range further increases the filtering area of the filter screen 6 and further reduces the risk of clogging of the filter screen 6. In addition, the inclination angle of the filter screen 6 within this range is conducive to a filter screen self-cleaning device discussed below to remove foreign matter such as lint embedded in the filter screen 6.

[0022] In conjunction with FIG. 4, the air outlet duct 4 is also provided with an arc-shaped bracket 63 for supporting the filter screen 6. Specifically, an upper end of the bracket 63 is disposed at an upper end plate of the first half shell 41, a lower end of the bracket 63 is fixedly connected to an upper end of the filter screen 6, and a lower end of the filter screen 6 is disposed at the second half shell 42. The arc-shaped bracket 63 also serves to guide the filtered air flow and prevent turbulence. In other embodiments, the filter screen 6 itself spans an entire cross-section of the air outlet duct 4 for filtering all air flow flowing through the air outlet duct. The filter screen 6 spans the entire cross-section of the air outlet duct 4 so that the filtering area of the filter screen 6 can be maximized, thereby improving filtration efficiency.

[0023] A large amount of lint accumulates on an air inlet surface of the filter screen 6 (that is, a surface that first contacts the air flow of hot and humid air) over time, which not only reduces the flow rate of hot and humid air, but also significantly reduces the filtration efficiency of the filter screen 6.

[0024] In conjunction with FIG. 4, a filter screen self-cleaning device 7 for cleaning the filter screen 6 is also provided in the air outlet duct 4, so as to automatically remove foreign matter such as lint intercepted by the filter screen, and always ensure the filtering capacity of the filter screen. The self-cleaning frequency can be provided as required, for example, the filter screen 6 is self-cleaned once after each drying of laundry, or after drying laundry for multiple times. Alternatively, a sensor is provided on the filter screen 6, and the filter screen 6 is self-cleaned only when it is detected that the filter screen is blocked beyond a set threshold.

[0025] FIG. 5 schematically shows a longitudinal cross-sectional view of the air outlet duct provided with a first exemplary filter screen self-cleaning device. In conjunction with FIG. 5, the air outlet duct 4 includes the first half shell 41 and the second half shell 42 to define an air flow cavity therebetween. At the air inlet end 43 of the air outlet duct 4, the second half shell 42 is connected to the air outlet 21 of the drum 2, and the first half shell 41 has an arc-shaped inner surface at an end for guiding the air flow entering the cavity. At the air outlet end 44 of the first half shell 41, an arc-shaped bracket 63 is provided, which is attached to a top panel 45 of the first half shell 41 at the air inlet end 43, and the air outlet end 44 extends into the air flow cavity. The arc-shaped bracket 63 is conducive to guiding the filtered air flow to prevent turbulence. With the help of a second end of the arc-shaped bracket 63, the filter screen 6 is arranged in the air flow cavity in an inclined posture (detachably or fixedly) from a lower part of the second half shell 42 to an upper part of the first half shell 41, thereby dividing the air flow cavity into an uncleaned space S1 and a clean space S2. In other embodiments, the bracket 63 may have other configurations and shapes, such as a flat plate, one end of which is fixed to the upper part of the first half shell 41 (e.g., integrally formed with the first half shell 41 or threadedly connected), and the other end of which extends into the uncleaned space S1 to fix a top edge of the filter screen 6 at the edge. The inclination angle of the filter screen 6 can be adjusted as needed to improve the flushing efficiency.

[0026] In conjunction with FIG. 5, all air flow F entering the cavity from the air inlet end 43 of the air outlet duct 4 first enters the uncleaned space S1, passes through an air inlet surface 61 and a clean surface 62 of the filter screen 6 in sequence, enters the clean space S2, and then is transferred to the drying module 3 via the air outlet end 44 of the air outlet duct 4. Due to the arrangement of the filter screen 6, the inclusions filtered on the filter screen 6 are mainly deposited on the air inlet surface 61.

[0027] In conjunction with FIG. 4, in order to clean the filter screen 6, a first exemplary filter screen self-cleaning device 7 is provided at the air outlet end 44 of the air outlet duct 4, which sprays a cleaning fluid from the air inlet surface 61 of the filter screen 6 onto the filter screen 6 on the side of the uncleaned space S1 to wash away the lint and other inclusions attached to the filter screen 6. The cleaning fluid may be tap water (which may contain a detergent). After the filter screen 6 is rinsed, the used tap

water flows out of the air inlet end 43 of the air outlet duct 4 and is discharged from the washer-dryer machine 1, for example, through a discharge outlet specially provided for the self-cleaning liquid, or through a drain port of the drum 2 to be discharged from the washer-dryer machine 1. It is understandable that the cleaning fluid may also be pressurized air or other fluids that can be used for cleaning. At the air outlet end 44 of the air outlet duct 4, a condensation mechanism 9 is also provided adjacent to the filter screen self-cleaning device 7, which is configured to guide cooling water to flow to an inner wall of the air outlet duct 4 to cool and liquefy the air flow passing therethrough.

[0028] FIG. 6 schematically shows a partial enlarged cross-sectional view taken along line A-A of FIG. 5. In conjunction with FIG. 6, the filter screen self-cleaning device 7 includes a first fluid supply pipe 71 and a nozzle 72 connected to the fluid supply pipe. The first fluid supply pipe 71 is integrally formed with the top panel 45 of the air outlet duct 4 on one side of the uncleaned space S1, and is connected to a fluid supply source, for example, via a hose spanning the drum 2. In other embodiments, the first fluid supply pipe 71 can be sealingly fixed to the top panel 45, for example, by a combination of threaded fit and sealant. The nozzle 72 is connected to the first half shell 41 through a plurality of connection holes 80 provided at its edge and is configured to spray tap water (which may contain a detergent) onto the air inlet surface 61 of the filter screen 6 at the top of the filter screen 6. In other embodiments, a boosting structure (such as a boosting valve) is provided in or upstream of the first fluid supply pipe 71 to pressurize the tap water entering the filter screen self-cleaning device so that the filter screen 6 is rinsed with pressurized tap water, which is conducive to improving cleaning efficiency and cost-effectiveness. In other embodiments, the first fluid supply pipe 71 may be fixed to the first half-shell 41 in other ways, such as by means of the aforementioned bracket 63.

[0029] In conjunction with FIG. 6, the nozzle 72 includes an adapter 73 connected to the first fluid supply pipe 71 and a first gradually widening extension 74 integrally formed with the adapter 73. The adapter 73 is fixedly connected to the first fluid supply pipe 71, for example, by threaded connection, interference fit, adhesive or other means. The first gradually widening extension 74 is arranged to be inclined at a certain angle relative to the filter screen 6, and its free end has a cavity across the air outlet duct 4 to cover the outlet of the filter screen 6 substantially throughout the width, so as to ensure the cleaning coverage rate. In some embodiments, an angle between the first gradually widening extension 74 and the filter screen 6 is between 0° and 80°, preferably between 5° and 45°. An angle that is too large is not conducive to the flow of tap water from the top of the filter screen 6 to the bottom of the filter screen 6, thereby reducing the cleaning efficiency. In some embodiments, the first gradually widening extension 74 is gradually narrowed along its length (i.e., along its inclination direction) to form a flat opening at the free end of the first gradually widening extension 74, so as to increase the water pressure, increase the impact force on the filter screen 6, and thus improve the cleaning efficiency. In other embodiments, an inner surface of the interconnected first fluid supply pipe 71 and an inner surface of the adapter 73 can form a venturi tube shape to increase the speed of the tap water flowing out of the adapter 73, which is beneficial to improving the cleaning efficiency, and/or the adapter 73 and the first gradually widening extension portion 74 can be formed separately and then matched together, and/or the width of the free end of the first gradually widening extension portion 74 and the width of the flat opening can be selected as needed, but the width of the flat opening is at least 90% of the width of the filter screen 6, preferably at least 95% or more, to ensure the cleaning coverage rate.

[0030] In some embodiments, the activation and deactivation of the first exemplary filter screen self-cleaning device 7 can be controlled by a controller. In other embodiments, the nozzle 72 may spray pressurized air or other fluids that can be used for cleaning, which are supplied to the first fluid supply pipe 71 from a fluid source.

[0031] FIG. 7 schematically shows a plan view of another nozzle of the first exemplary filter screen self-cleaning device according to the present disclosure. Where possible, similar numbers have been used to represent similar parts. In this embodiment, the adapter 73 and the first gradually widening extension 74 of the nozzle are integrally formed, such as by injection molding. Similarly, the free end of the first gradually widening extension 74 has a flat opening to spray a cleaning fluid to the filter screen 6. Along the width of the flat opening (similarly, at least 90% of the width of the filter screen), a plurality of channels 76 are spaced apart to evenly distribute the cleaning fluid in the width direction of the flat opening.

[0032] FIG. 8 schematically shows a partial enlarged view of another air outlet duct provided with the first exemplary filter screen self-cleaning device. In the air outlet duct 4 shown in FIG. 8, a condensation mechanism 9 described below is omitted, so that the filter screen self-cleaning device 7 is closely attached to an inner surface of the first half shell 41 of the air outlet duct 4. On an outer surface of a second end portion of the bracket 63 extending into the air flow cavity, a groove capable of matching with multiple protrusions on an outer surface of the nozzle 72 of the filter screen self-cleaning device 7 is provided, so as to seal and fix the nozzle 72 by means of a seal 66, so that a water outlet 75 of the filter screen self-cleaning device 7 is disposed at the top of the filter screen 6 and on the side of the air inlet surface 61.

[0033] FIG. 9 schematically shows a longitudinal cross-sectional view of the air outlet duct provided with a second exemplary filter screen self-cleaning device. Where possible, similar numbers have been used to represent similar parts, except that a prefix "100" has been added to indicate that these features belong to the

second exemplary filter screen self-cleaning device.

[0034] In conjunction with FIG. 9, a second exemplary filter screen self-cleaning device 7 includes a fluid supply pipe 171 and at least two rotatable spray heads 172 spaced apart and arranged on one side of the fluid supply pipe facing the filter screen 6, so as to spray a cleaning fluid onto the filter screen from one side of the air inlet surface 61 of the filter screen 6, and the cleaning fluid may be tap water (which may contain a detergent). Similarly, the cleaning fluid may be pressurized air or other fluids that can be used for cleaning. In the uncleaned space S1, the fluid supply pipe 171 extends along the inner surface of the first half shell 41 of the air outlet duct 4 to a position flush with the substantially middle part of the filter screen 6, and is fixed to the inner surface of the first half shell 41 by a plurality of fixings 177. The fixings 177 may be elastic buckles that match the shape of the fluid supply pipe 171. In addition, the fixing of the fluid supply pipe 171 to the inner surface of the first half shell 41 is conducive to cooling the air outlet duct 4.

[0035] In conjunction with FIG. 9, the two rotatable spray heads 172 are arranged along the length of the first fluid supply pipe 717 at positions corresponding to the top and middle of the filter screen 6, so as to spray tap water from the air inlet surface 61 side of the filter screen 6 onto the filter screen through 360° rotation. In other embodiments, the fluid supply pipe 171 may be further extended to a position flush with about three-quarters or the bottom edge of the filter screen 6, and 3 or 4 rotatable spray heads 172 are evenly spaced along the length of the fluid supply pipe, as shown by the dotted line in FIG. 9. It is understood that the length of the corresponding fluid supply pipe 171 and the number and arrangement of the rotatable spray heads 172 can be selected as needed. In some embodiments, all the rotatable spray heads 172 can be used simultaneously by the controller as needed, or at least one of them can be used selectively.

[0036] In some embodiments, a sensor may be provided on the filter screen 6. When it is detected that the filter screen blockage degree reaches a predetermined value, a signal is sent to a controller of the washer-dryer machine to display a prompt on a control panel that the filter screen needs to be cleaned. According to the prompt, a user can operate the control panel to start the aforementioned filter screen self-cleaning device 7 to clean the filter screen 6.

[0037] In other embodiments, the filter screen self-cleaning device 7 may be a vibration mechanism for vibrating the filter screen (e.g., using a vibration motor to vibrate the filter screen), or a blower mechanism for blowing air onto the filter screen (e.g., generating a reverse air flow by the reverse rotation of a fan in the drying module, or a fan specially provided for reverse blowing air onto the filter screen), or a scraping mechanism for scraping the filter screen (e.g., a scraper, a brush, etc.). It is understood that these different filter screen self-cleaning devices may be used alone or in any combination.

[0038] The washer-dryer machine with a filter screen self-cleaning device according to the present disclosure achieves automatic cleaning of the filter screen arranged in the air outlet duct through a simple structural arrangement, which not only ensures the filtering efficiency of the filter screen, but also advantageously reduces the inclusions such as lint entering the drying module, and prolongs the service life of the filter screen, thereby achieving improved cost-effectiveness.

[0039] FIG. 10 schematically shows a structural schematic diagram of the washer-dryer machine with an improved air outlet duct, FIG. 11 schematically shows a cross-sectional schematic diagram of the air outlet duct taken along line A-A in FIG. 10, and FIG. 12 schematically shows a partial enlarged view of FIG. 11. In conjunction with FIG. 10 to FIG. 12, the air outlet duct 4 is arranged at the rear of the drum 2 in close contact with the drum 2 and extends from bottom to top. This extension method can reduce the overall height of the washer-dryer machine 1, so that the washer-dryer machine 1 can be conveniently placed under a countertop. The air outlet duct 4 is connected to the air outlet 21 of the drum 2 at its air inlet end 43, and is connected to the drying module 3 at the air outlet end 44. The filter screen self-cleaning device 7 is arranged at the air outlet end 44 of the air outlet duct 4, and is connected to a tap water pipe 12 of the washer-dryer machine 1 through a water guide pipe 11. The air outlet duct 4 and the tap water pipe 12 are arranged on both sides of the drum 2, so that the water guide pipe 11 communicating a water inlet 71 of the filter screen self-cleaning device 7 with the tap water pipe 12 spans the drum 2. The water guide pipe 11 can be a rigid pipe or a hose. In other embodiments, the air outlet duct 4 and the tap water pipe 12 can also be arranged on the same side of the drum 2, so the water inlet 71 of the filter screen self-cleaning device 7 and the tap water pipe 12 can be connected directly or through an adapter on this side.

[0040] In some embodiments, the air outlet duct 4 has a flat cross-section, thereby reducing the overall thickness of the washer-dryer machine 1.

[0041] In conjunction with FIGS. 10-12, the air outlet duct 4 includes a first half shell 41 and a second half shell 42 to define an air flow cavity therebetween. The second half shell 42 is connected to the air outlet 21 of the drum 2 at the air inlet end 43 of the air outlet duct 4, and the first half shell 41 has an arc-shaped inner surface 47 at the opposite end to guide the air flow entering the air flow cavity to prevent turbulence. An arc-shaped bracket 63 is provided at the air outlet end 44 of the first half shell 41. The top end of the bracket 63 is attached to the top panel 45 of the first half shell 41, and the bottom end of the bracket 63 extends into the air flow cavity. The arc-shaped bracket 63 is conducive to guiding the filtered air flow to prevent turbulence. With the help of the bottom end of the arc-shaped bracket 63, the filter screen 6 is obliquely arranged in the cavity from the lower part of the second half shell 42 to the upper part of the first half shell 41, thereby dividing the cavity into the uncleaned space

S1 and the clean space S2. The second half shell 42 is provided with supporting ribs 46 for supporting the filter screen 6 to prevent the filter screen 6 from bending, breaking, etc. due to excessive air flow.

[0042] In some embodiments, the support ribs 46 are integrally formed on the second half shell 42, for example, by 3D printing technology.

[0043] In conjunction with FIGS. 10 to 12, all air flow F entering the air flow cavity from the air inlet end 43 of the air outlet duct 4 first enters the uncleaned space S1, passes through the air inlet surface 61 and the clean surface 62 of the filter screen 6 in sequence, enters the clean space S2, and then passes to the drying module via the air outlet end 44 of the air outlet duct 4. Due to the arrangement of the filter screen 6, the inclusions filtered on the filter screen 6 are mainly deposited on the air inlet surface 61.

[0044] In order to clean the filter screen 6, the filter screen self-cleaning device 7 is provided at the air outlet end 44 of the air outlet duct 4. On the outer surface of the bottom of the bracket 63 extending into the air flow cavity, a groove capable of cooperating with a plurality of protrusions on the outer surface of the nozzle 72 of the filter screen self-cleaning device 7 is provided to fix the nozzle 72, so that the water outlet 75 of the filter screen self-cleaning device 7 is disposed at the top of the filter screen 6 and on the side of the air inlet surface 61. In other embodiments, the bracket 63 has other settings and shapes, such as a flat plate form, as shown in FIG. 13. One end of the bracket 163 in a flat plate form is fixed to the upper part of the first half shell 41 (for example, integrally formed with the first half shell 41 or threadedly connected), and the other end extends into the cavity to fix the top edge of the filter screen 6 at the edge. The nozzle 72 of the filter screen self-cleaning device 7 is sealed and fixed to the bracket 163, so that the water outlet 75 of the filter screen self-cleaning device 7 is disposed at the top of the filter screen 6 and on the side of the air inlet surface 61.

[0045] Through the above-mentioned arrangement, the filter screen self-cleaning device 7 and the air inlet end of the air outlet duct 4 can be disposed at opposite ends of the filter screen 6, and the water outlet of the filter screen self-cleaning device 7 and the air inlet end of the air outlet duct 4 can be disposed on a same side of the filter screen 6, so that the washer-dryer machine can pretreat the hot and humid air flow flowing out of the drum through the improved air outlet pipe, which is beneficial to shortening the time required for drying and achieving improved economic benefits.

[0046] When the filter screen 6 needs to be cleaned, tap water (which may contain a detergent) is sprayed onto the filter screen 6 from the air inlet surface 61 of the filter screen 6 through the water outlet 75 of the filter screen self-cleaning device 7 to wash away the lint and other foreign matter attached to the filter screen 6. After washing the filter screen 6, the used tap water flows out of the air inlet end 43 of the air outlet duct 4 and is discharged from the washer-dryer machine, for example, through a discharge outlet specially provided for the self-cleaning liquid, or through the drain outlet of the drum 2 to be discharged from the washer-dryer machine.

[0047] FIG. 14 schematically shows a cross-sectional view of the air outlet duct taken along line B-B in FIG. 11. In conjunction with FIG. 14, the first half shell 41 and the second half shell 42 of the air outlet duct 4 respectively have an arc section 49 starting from a first end and a straight section 48 connected to the arc section 49. The arc sections 49 of the first half shell 41 and the second half shell 42 gradually widen from the air inlet end 43 to the straight sections 48 of the first half shell 41 and the second half shell 42. The filter screen 6 is obliquely arranged in the straight sections 48 of the first half shell 41 and the second half shell 42, so as to have a larger filtering area. The first half shell 41 and the second half shell 42 are provided with an outwardly protruding mounting portion 50 at intervals at the edge along their length, so as to fasten the first half shell 41 and the second half shell 42 together by a screw member, thereby forming an air flow cavity. In some embodiments, a sealing ring may be provided along the entire edge of the first half shell 41 and/or the second half shell 42 to improve the sealing of the cavity and prevent the leakage of humid and hot air.

[0048] In conjunction with FIG. 14, the arc section 49 extends approximately along one sixth of the outer circumference of a drive unit 22 of the drum 2. In some embodiments, the arc section 49 extends approximately along one quarter of the outer circumference of the drive unit 22 of the drum 2. Compared with a fully linear air outlet duct, the air outlet duct 4 has a longer length, thereby extending the flow path of the humid and hot air before entering the drying module 3, allowing a longer time for cooling and possible condensation, thereby being able to reduce the humidity and temperature of the humid and hot air flow to a certain extent before entering the drying module 3, and thereby reducing the load of the drying module 3 and shortening the time required for drying. In some embodiments, projections, pits, ribs, etc. may be arranged at intervals on the outer surfaces of the first half shell 41 and the second half shell 42 to increase the surface area of the outer wall, increase the heat dissipation rate of the air outlet duct, and thereby increase the temperature difference between the humid and hot air entering and the humid and hot air flowing out of the air outlet duct. In other embodiments, a condensation mechanism may also be arranged inside or outside the air outlet duct 4 to condense and pre-dehumidify the humid and hot air flow flowing out of the drum 2 before entering the drying module 3.

[0049] The washer-dryer machine according to the present invention improves the pretreatment of the humid and hot air flow flowing out of the drum 2 by the air outlet duct 4, which is beneficial to shortening the time required for drying and achieving improved economic benefits.

[0050] In addition to the self-cleaning setting of the filter screen 6, in other embodiments, the filter screen 6 can

also be cleaned manually. In this case, the filter screen 6 is detachably arranged in the air outlet duct 4, and the air outlet duct 4 is provided with an opening at a position corresponding to the filter screen 6 for loading and removing the filter screen 6.

[0051] FIG. 15 schematically shows a schematic diagram of the structure of the washer-dryer machine with a filter box in some embodiments. In conjunction with FIG. 15, the air outlet duct 4 is arranged on a side portion of the drum 2. The air outlet duct 4 includes a first section 51, a second section 52, and a filter screen placement section 53 connecting the first section 51 and the second section 52. The filter screen 6 is arranged in the filter screen placement section 53. A first end 511 of the first section 51 defines the air inlet end 43 of the air outlet duct 4, and the air inlet end 43 is connected to the air outlet 21 of the drum 2. A first end 521 of the second section 52 defines the air outlet end 44 of the air outlet duct 4, and the air outlet end 44 is connected to the air inlet 31 of the drying module 3. The filter screen placement section 53 is sealingly connected to a second end 512 of the first section 51 and a second end 522 of the second section 52 to form the entire air outlet duct 4, and can be accessed from the outside of the housing of the washer-dryer machine to operate the filter screen placement section.

[0052] In conjunction with FIG. 15, the filter screen 6 is obliquely (removably or fixedly) installed in a filter box 8, and the filter box 8 is removably and sealingly installed in the filter screen placement section 53. The filter box 8 has two open ends so that when installed at the filter screen placement section 53, the two open ends of the filter box 8 are respectively connected to the second end 512 of the first section 51 and the second end 522 of the second section 52, so that the filter box 8 is communicated with the first section 51 and the second section 5 to form the air outlet duct 4.

[0053] In some embodiments, the filter box 8 is flexible and connected between the first section 51 and the second section 52 by interference fit to achieve a sealed connection under a certain pressure. In other embodiments, the filter box 8 can also be rigid and connected to the first section 51 and the second section 52 by snap fit and/or a seal.

[0054] In some embodiments, at least one surface of the filter box 8 is transparent to enable observation of the state of the filter screen 6 disposed therein.

[0055] In conjunction with FIG. 15, the filter screen 6 is arranged obliquely from a lower part of the filter box 8 to an the upper part of the filter box 8, thereby dividing the space in the air outlet duct 4 into the uncleaned space S1 and the clean space S2. It will be understood that the inclination angle of the filter screen 6 can be adjusted as needed to improve the filtering efficiency. The filter screen 6 itself optionally spans the entire cross-section of the air outlet duct 4 to filter all air flow flowing through the air outlet duct 4. The spanning of the filter screen 6 across the entire cross-section of the air outlet duct 4 maximizes the filtering area of the filter screen, thereby improving the filtering efficiency. All air flow F entering from the air inlet end 43 of the air outlet duct 4 first enters the uncleaned space S1, and then enters the clean space S2 after passing through the air inlet surface 61 and the clean surface 62 of the filter screen 6, and then is transferred to the drying module 3 via the air outlet end 44 of the air outlet duct 4.

[0056] In some embodiments, such as downstream of the filter screen 6 in the filter box 8, at least one filter screen 6 is also provided parallel to the cross section of the air outlet duct 4 (i.e., perpendicular to a longitudinal axis of the filter screen placement section 53), and its mesh holes are smaller than the mesh holes of the filter screen 6 to further filter the air flow.

[0057] In some embodiments, the washer-dryer machine is provided with a first closable opening on a side panel of its housing, and its position corresponds to the filter screen placement section 53, so that the filter box 8 can be taken out by approaching the filter screen placement section 53. In other embodiments, the filter screen placement section 53 of the air outlet duct 4 can be arranged on the front side or rear side of the drum of the washer-dryer machine, and accordingly, the first closable opening can be arranged on the front panel or rear panel of the housing of the washer-dryer machine, so as to approach the filter screen placement section 53 for cleaning operation. When cleaning is required, for example, a sensor is arranged on the filter screen 6, and when it is detected that the filter screen blockage degree reaches a predetermined value, a signal is sent to a controller of the washer-dryer machine to display a prompt that the filter screen needs to be cleaned on a control panel, and then a user can open the first closable opening and then take out the filter box 8 to clean the filter screen 6.

[0058] FIGS. 16a and 16b schematically illustrate schematic diagrams of the structure of the air outlet duct according to other embodiments the present disclosure. Where possible, similar numbers have been used to represent similar parts, except that a prefix "100" has been added to indicate that these features belong to the second exemplary air outlet duct. In conjunction with FIGS. 16a and 16b, the second exemplary air outlet duct 40 can be arranged at the side, front or rear side of the drum 2 of the washer-dryer machine, and includes the first section 151, the second section 152 and the filter screen placement section 153. The filter screen placement section 153 is arranged between the first section 151 and the second section 152 and has a second closable opening 154.

[0059] In some embodiments, the first section 151, the second section 152 and the filter screen placement section 153 are integrally formed (such as injection molding), so each section is schematically divided only by dotted lines. The bottom of the first section 151 defines the air inlet end of the air outlet duct 40 to be connected to the air outlet 21 of the drum 2. The top of the second section 152 defines the air outlet end of the air outlet duct 40 to be

connected to the air inlet 31 of the drying module 3.

[0060] As shown in FIG. 16b, the second closable opening 154 of the filter screen placement section 153 is sealed by a movable plate 155 to close the air outlet duct 40, preventing the hot and humid air from overflowing to other parts of the washer-dryer machine and causing adverse effects such as corrosion. The movable plate 155 can move between the second section 152 and the filter screen placement section 153 through a slide rail, a flip mechanism, etc. In some embodiments, the movable plate 155 can be configured to slide between the first section 151 and the filter screen placement section 153. In some other embodiments, the second closable opening 154 can be opened and closed by a rotating flap hinged to one or both sides of the second closable opening 154 of the filter screen placement section 153.

[0061] In some embodiments, at least a portion of the filter screen placement section 153 is transparent, for example, the movable plate 155 is transparent, so that the state of the filter screen therein can be observed. The filter screen 6 is obliquely (detachably or fixedly) installed in the filter screen placement section 153 from a lower part of the filter screen placement section 153 to an upper part of the filter screen placement section 153, for example, by being tightly inserted into a slot provided in the filter screen placement section or detachably installed by threaded connection, or fixedly installed by, for example, sealant. In other embodiments, the filter screen 6 can be arranged in the filter box 8, and the filter box 8 is removably fixed in the filter screen placement section 153 by snap fit, magnet, chute, etc. When the filter screen 6 needs to be cleaned (such as through the prompt of the aforementioned sensor or through observation through the transparent part of the filter screen placement section 153), the user can open the first closable opening correspondingly arranged on the side panel, front panel or rear panel of the housing of the washer-dryer machine, and then operate the movable panel 155 to open the filter screen placement section 153, so that the filter screen 6 can be directly cleaned by scraping or the like, or the filter screen 6 or the filter box can be taken out for cleaning.

[0062] The washer-dryer machine with a filter screen placement section according to the present disclosure achieves quick removal of the filter screen arranged in the air outlet duct for cleaning through a simple structural arrangement, which not only ensures the filtering efficiency of the filter screen, but also advantageously reduces the inclusions such as lint entering the drying module, and extends the service life of the filter screen, thereby achieving improved cost-effectiveness.

[0063] It should be noted that the automatic cleaning and manual cleaning schemes of the filter screen can be set separately or in combination. The specific design can be made according to the actual structure of the washer-dryer machine, which will not be elaborated here.

[0064] The humid air discharged from the drum has a large water content. In order to remove the moisture in the humid air, in existing washer-dryer machines, a dehumidifier disposed in the drying module is usually used. However, if the humid air is dehumidified only by the dehumidifier in the drying module, the load on the dehumidifier will be very large, and even insufficient dehumidification will be caused, which will eventually prolong the drying time.

[0065] In conjunction with FIG. 4, a condensation mechanism 9 is further provided in the air outlet duct 4 for guiding cooling water to flow to the inner wall of the air outlet duct 4 to cool and liquefy the air flow flowing therethrough. The condensation mechanism 9 can be arranged at the air outlet end 44 of the air outlet duct 4 adjacent to the filter screen self-cleaning device 7. In other embodiments, a condensation mechanism for guiding cooling water to flow to the outer wall of the air outlet duct 4 to cool and liquefy the air flow flowing therethrough can also be provided at the air outlet duct 4. It can be understood that these two different condensation mechanisms can be used alone or in combination.

[0066] FIG. 17 schematically shows a longitudinal cross-sectional view of the air outlet duct and the cooling channel of the washer-dryer machine according to some embodiments of the present disclosure. In conjunction with FIG. 17, the air outlet duct 4 includes the first half shell 41 and the second half shell 42, between which the air flow chamber Q1 for air flow F to flow is formed, and the flow direction of air flow F is indicated by an arrow. The air outlet duct 4 includes the air inlet end 43 and the air outlet end 44. The air inlet end 43 is connected to the air outlet 21 of the drum 2, and the air outlet end 44 is connected to the air inlet 31 of the drying module 3. A cooling channel 8 includes an inner shell 81 and an outer shell 82, between which an air flow chamber Q2 for cooling water flow W to flow is formed, and the flow direction of water flow W is indicated by an arrow. The flow direction of water flow W is opposite to the flow direction of air flow F, which is conducive to the cooling and liquefaction of air flow. The cooling channel 8 is configured to cool the air flow flowing through the air outlet duct 4. The cooling channel 8 guides cooling water to flow to the outer wall of the air outlet duct 4 to cool and liquefy the air flow passing therethrough, so that the humid air discharged from the drum 2 has been pre-dehumidified before entering the drying module 3, thereby reducing the load of the dehumidification device in the drying module and improving the dehumidification effect.

[0067] In some embodiments, the first half shell 41 and the second half shell 42 of the air outlet duct 4 at least partially constitute the inner shell 81 of the cooling channel 8, that is, the cooling channel 8 completely covers the first half shell 41 and the second half shell 42 of the air outlet duct 4 in the circumferential direction. In other embodiments, the cooling channel 8 may only cover at least a portion of the first half shell 41 of the air outlet duct 4 in the circumferential direction without covering the second half shell 42 of the air outlet duct 4.

[0068] In some embodiments, the outer shell 82 of the

cooling channel 8 is also formed by the air outlet duct 4. In this case, at least a portion of the first half shell 41 or the second half shell 42 of the air outlet duct 4 includes two layers of walls, and the air flow chamber Q2 for cooling water to flow in the cooling channel 8 is formed between the two layers of walls. In other embodiments, the outer shell 82 of the cooling channel 8 is formed by a separate outer tube. In this case, the outer shell 82 is sleeved outside the air outlet duct 4, and the air outlet duct 4 is sealingly connected to the outer shell to form the air flow chamber Q2 for cooling water to flow in the cooling channel 8 between the outer wall of the air outlet duct 4 and the inner wall of the outer shell.

[0069] In conjunction with FIG. 17, a condensing mechanism 9 is provided at a first end 83 of the cooling channel 8 near the drying module 3, and the condensing mechanism 9 includes a second fluid supply pipe 91 and a water spray nozzle 92 connected to the second fluid supply pipe 91. The second fluid supply pipe 91 is sealingly fixed at the first end 83 of the cooling channel 8, for example, by a combination of threaded fitting and sealant, and the second fluid supply pipe 91 is connected to the tap water pipe 12 of the washer-dryer machine 1, for example, through a solenoid valve. In some embodiments, the second fluid supply pipe 91 of the condensing mechanism 9 also constitutes a first water inlet 91 of the air outlet duct 4 or the cooling channel 8. The water spray nozzle 92 is configured to spray cooling water onto the outer wall of the air outlet duct 4 to enhance the cooling effect of the cooling water on the outer wall. The water spray nozzle 92 includes a second gradually widening extension 921, which gradually narrows along its length to form a second flat opening at its free end, thereby increasing the spray coverage and increasing the water pressure, so as to further enhance the cooling effect on the outer wall of the air outlet duct 4.

[0070] In some embodiments, a plurality of water spray nozzles 92 may be provided in the cooling channel 8. For example, the plurality of water spray nozzles 92 may be provided at intervals along the outer wall of the air outlet duct 4 in the circumferential direction of the cooling channel 8, which is particularly advantageous when the cooling channel 8 completely covers the first half shell 41 and the second half shell 42 of the air outlet duct 4 in the circumferential direction. In addition, the water spray nozzles 92 may be provided as a 360° automatic rotating nozzle, thereby increasing the spray coverage rate, so as to enhance the cooling effect on the outer wall of the air outlet duct. The cooling water is discharged at the second end 84 of the cooling channel 8 close to the drum 2.

[0071] In other embodiments, in order to reduce the flow rate of cooling water on the outer wall of the air outlet duct 4 and thereby prolong the contact time between the cooling water and the outer wall of the air outlet duct 4 to enhance the cooling effect, obstacles such as protrusions, pits, ribs, and grooves may be provided on the outer wall of the air outlet duct 4, or the roughness of the outer wall may be directly increased. In other embodiments, the cooling channel 8 is a spiral channel provided on the outer wall of the air outlet duct 4.

[0072] FIG. 18 schematically shows a perspective view of the air outlet duct and cooling channel of the washer-dryer machine according to other embodiments of the present disclosure. The only difference between the embodiment according to FIG. 18 and the embodiment according to FIG. 17 is that thin fins 86 are also provided on an outer surface of the cooling channel 8, and the air flow blown by a blower 87 flows to the thin fins 86. In some embodiments, the wet air flow flowing through the air outlet duct 4 is not only subjected to water cooling but also to air cooling, so that the liquefaction efficiency of the wet air flow is higher. For example, multiple layers of spiral thin fins 86 are arranged at intervals on the outer surface of the cooling channel 8, and each layer of spiral thin fins 86 has several spiral thin fins 86 arranged along the circumferential direction, and the adjacent two layers of spiral thin fins 86 are staggered from each other in the circumferential direction. It can be understood that in the absence of the cooling channel 8, the thin fins 86 can be directly arranged on the outer wall of the air outlet duct 4, thereby using air cooling instead of water cooling to cool and liquefy the air flow flowing through the air outlet duct 4.

[0073] In conjunction with FIG. 10, in some embodiments, a temperature sensor 13 and/or a humidity sensor 14 can be provided on the air outlet duct 4 to detect the temperature and/or humidity of the air flow passing through the air outlet duct 4, and the water flow rate and/or water flow velocity of the cooling channel 8 can be controlled according to the detected temperature and/or humidity, thereby accurately controlling the intensity of pre-dehumidification.

[0074] As shown in FIG. 17, the filter screen 6 is obliquely arranged in the air outlet duct 4 by means of the arc-shaped bracket 63, which is configured to filter screen the air flow passing through the air outlet duct 4, thereby reducing or even preventing foreign matter such as lint entrained in the air flow from entering the drying module 3.

[0075] The filter screen self-cleaning device 7 for spraying the filter screen 6 is also provided in the air outlet duct 4. The filter screen self-cleaning device 7 includes the first fluid supply pipe 71 and the nozzle 72 connected to the first fluid supply pipe 71. The first fluid supply pipe 71 of the filter screen self-cleaning device 7 is connected to the tap water pipe 12 of the washer-dryer machine 1, for example, through a solenoid valve. In some embodiments, the first fluid supply pipe 71 of the filter screen self-cleaning device 7 also constitutes the second water inlet 71 of the air outlet duct 4. The nozzle 72 of the filter screen self-cleaning device 7 is configured to spray water onto the actual filtering surface of the filter screen 6, so that foreign matter such as lint adsorbed on the filter screen can be more easily detached from the filter screen. The tap water after cleaning the filter screen

and the condensed water of the air flow flowing through the air outlet duct 4 can be discharged through the air outlet duct 4 and the drainage channel of the drum 2.

[0076] In other embodiments, instead of or in addition to the cooling channel 8 and the condensing mechanism 9, a cold water pipe is provided in the air outlet duct 4 upstream and/or downstream of the filter screen 6, in order to condense and pre-dehumidify the humid air flow flowing out of the drum 2 before entering the drying module 3. In addition, a condenser 30 described below is provided between the drum 2 and the air outlet duct 4, or between the drying module 3 and the air outlet duct 4.

[0077] FIG. 19 schematically shows a schematic diagram of a composite water circuit system of the washer-dryer machine according to an embodiment of the present disclosure, and FIG. 20 schematically shows an enlarged view of a pipe assembly of the composite water circuit system of FIG. 19. In combination with FIG. 19 and FIG. 20, the washer-dryer machine 1 includes the drum 2, the drying module 3, the air outlet duct 4 disposed between the drum 2 and the drying module 3, a detergent dispenser box 15 and a pipe assembly 10. The drying module 3 includes a condenser 30, and the condenser 30 is configured to cool and liquefy the wet air flow in the drying module 2. The air outlet duct 4 is configured to guide the air flow from the drum 2 to the drying module 3. The pipe assembly 10 includes a fluid supply pipe 101, a first water outlet pipe 103, a second water outlet pipe 105 and a third water outlet pipe 104. One end of the fluid supply pipe 101 is connected to a tap water pipe. The other end of the fluid supply pipe 101 is respectively connected to one end of the first water outlet pipe 103, one end of the second water outlet pipe 105 and one end of the third water outlet pipe 104. The other end of the first water outlet pipe 103 is connected to the water inlet 301 of the condenser 30. The other end of the second water outlet pipe 105 is connected to a clean water inlet 151 of the detergent dispenser box 15. The other end of the third water outlet pipe 104 is connected to the water inlet 71 of the air outlet duct 4. Through this composite piping system, water from the tap water pipe can be respectively transported to the condenser 30, the detergent dispenser box 15 and the air outlet duct 4 to meet their water needs.

[0078] The condenser 30, the detergent dispenser box 15, the water inlet 71 of the air outlet duct 4 and the pipe assembly 10 are all arranged at the upper part of the drum 2. Such an arrangement can make full use of the upper space of the drum 2, making the overall arrangement of the washer-dryer machine 1 very compact. Such an arrangement is also conducive to the arrangement of the pipelines from the pipe assembly 10 to the water inlet of each component, minimizing the overall pipeline length. Specifically, the condenser 30, the detergent dispenser box 15, the water inlet 71 of the air outlet duct 4 and the pipe assembly 10 can be arranged at the four corners of the washer-dryer machine 1, respectively. In other embodiments, the condenser 30, the detergent dispenser box 15, the water inlet 71 of the air outlet duct 4 and the pipe assembly 10 are respectively arranged at the three corners of the washer-dryer machine 1. In this case, the air outlet duct 4 is arranged at the right rear of the drum 2, and the water inlet 71 of the air outlet duct 4 and the pipe assembly 10 are arranged together at the right rear corner of the washer-dryer machine 1, so that the length of the pipeline from the third water outlet pipe 104 of the pipe assembly 10 to the water inlet 71 of the air outlet duct 4 can be shortened. Solenoid valves are provided on the fluid supply pipe 101, and/or the first water outlet pipe 103, and/or the second water outlet pipe 105, and/or the third water outlet pipe 104 to control the on-off and/or flow rate of the water pipe. In some embodiments, the pipe assembly 10 and the solenoid valve are configured as an integrated structure.

[0079] The fluid supply pipe 101 is connected to the tap water pipe through a hose, and/or the first water outlet pipe 103 is connected to the water inlet 301 of the condenser 30 through a hose, and/or the second water outlet pipe 105 is connected to the clean water inlet 151 of the detergent dispenser box 15 through a hose, and/or the third water outlet pipe 104 is connected to the water inlet 71 of the air outlet duct 4 through a hose. The use of the hose allows the pipelines to be flexibly arranged in the gaps between the various components.

[0080] A filter screen is provided in the fluid supply pipe 101 for filtering the water flowing through the fluid supply pipe 101. The filter screen can filter out impurities and other harmful substances in the tap water to ensure the quality of the water supplied to the washer-dryer machine, thereby improving the washing capacity and protecting various components that use water.

[0081] In conjunction with FIG. 10, in addition to a moisture absorption channel 32 for air circulation with the drum 2, the drying module 3 also includes a moisture absorption and dehumidification component for absorbing moisture in the air flow flowing from the drum 2 to the drying module 3 and a regeneration channel 33. The regeneration channel 33 is configured to discharge the moisture absorbed by the moisture absorption and dehumidification component through the dehumidification air flow. The condenser 30 is arranged on the regeneration channel 33. The condenser 30 is configured to cool down the dehumidification air flow in the regeneration channel 33 to dry the dehumidification air flow. The condenser 30 can be arranged in an air inlet section of the regeneration channel 33, and can also be arranged in an air outlet section of the regeneration channel 33.

[0082] A water outlet of the detergent dispenser box 15 is connected to a water inlet of the drum 2, and a water outlet of the drum 2 is connected to a drain pipe. Therefore, at the beginning of washing, tap water first reaches the detergent dispenser box 15, and then the tap water carrying the detergent is flushed into the drum 2. After washing, the waste water is discharged through the water outlet of the drum 2 via the drain pipe.

[0083] In conjunction with FIG. 17, the air outlet duct 4 includes the first half shell 41 and the second half shell 42,

between which the air flow chamber Q1 for air flow F is formed, and the flow direction of air flow F is indicated by an arrow. The air outlet duct 4 includes the air inlet end 43 and the air outlet end 44. The air inlet end 43 is connected to the air outlet 21 of the drum 2. The air outlet end 44 is connected to the air inlet 31 of the drying module 3. The filter screen 6 is obliquely arranged in the air outlet duct 4 by means of the arc-shaped bracket 63, and is configured to filter the air flow passing through the air outlet duct 4, thereby reducing or even preventing foreign matter such as lint entrained in the air flow from entering the drying module 3. The filter screen self-cleaning device 7 for spraying the filter screen 6 is also arranged in the air outlet duct 4. The filter screen self-cleaning device 7 includes the first fluid supply pipe 71 and the nozzle 72 connected to the first fluid supply pipe 71. The nozzle 72 of the filter screen self-cleaning device 7 is configured to spray water onto the actual filtering surface of the filter screen 6, so that foreign matter such as lint adsorbed on the filter screen is more easily detached from the filter screen. In this embodiment, the first fluid supply pipe 71 of the filter screen self-cleaning device 7 also constitutes the second water inlet 71 of the air outlet duct 4, and the second water inlet 71 is connected to the third water outlet pipe 104 of the pipe assembly 10.

[0084] In conjunction with FIG. 17, the cooling channel 8 is also provided at the air outlet duct 4. The cooling channel 8 includes the inner shell 81 and the outer shell 82. The air flow chamber Q2 for cooling water flow W is formed between the inner shell 81 and the outer shell 82. The flow direction of the water flow W is indicated by an arrow. The flow direction of the water flow W is opposite to the flow direction of the air flow F, which is conducive to the cooling and liquefaction of the air flow. The cooling channel 8 guides cooling water to the outer wall of the air outlet duct 4 to cool and liquefy the air flow flowing therethrough, so that the wet air discharged from the drum 2 has been pre-dehumidified before entering the drying module 3, thereby reducing the load of the dehumidification device in the drying module and improving the dehumidification effect. The condensation mechanism 9 is provided at the first end 83 of the cooling channel 8 near the drying module 3. The condensation mechanism 9 includes the second fluid supply pipe 91 and the water spray nozzle 92 connected to the water inlet pipe 91. The water spray nozzle 92 is configured to spray cooling water to the outer wall of the air outlet duct 4 to enhance the cooling effect of the cooling water on the outer wall. In some embodiments, the second fluid supply pipe 91 of the condensing mechanism 9 also constitutes the first water inlet of the air outlet duct 4, and the first water inlet is also connected to the third water outlet pipe 104 of the pipe assembly 10.

[0085] Although the preferred embodiments of the present application have been described, those skilled in the art may make other changes and modifications to these embodiments once they have learned the basic creative concept. Therefore, the appended claims are intended to be interpreted as including the preferred embodiments and all changes and modifications that fall within the scope of the present application.

[0086] Obviously, those skilled in the art can make various changes and modifications to the present application without departing from the spirit and scope of the present application. Thus, if these modifications and variations of the present application fall within the scope of the claims of the present application and their equivalents, the present application is also intended to include these modifications and variations.

Claims

1. A washer-dryer machine, comprising: a drum, a drying module and an air outlet duct arranged between the drum and the drying module, wherein the air outlet duct is configured to guide an air flow from the drum to the drying module, the air outlet duct extends along an outer surface of the drum, and a filter screen is arranged in the air outlet duct for filtering the air flow passing through the air outlet duct.

2. The washer-dryer machine according to claim 1, wherein the air outlet duct is disposed on a side portion at the rear of the drum.

3. The washer-dryer machine according to claim 1, wherein the air outlet duct is flexibly connected to an air inlet of the drying module.

4. The washer-dryer machine according to claim 1, wherein the filter screen is obliquely and/or detachably arranged in the air outlet duct.

5. The washer-dryer machine according to claim 4, wherein an angle α between the filter screen and a longitudinal axis of the air outlet duct is between 15° and 80°.

6. The washer-dryer machine according to claim 1, wherein the filter screen spans an entire cross-section of the air outlet duct so as to filter the entire air flow passing through the air outlet duct.

7. The washer-dryer machine according to any one of claims 1 to 6, further comprising a filter screen self-cleaning device configured to guide cleaning fluid onto the filter screen for cleaning.

8. The washer-dryer machine according to claim 7, wherein the filter screen self-cleaning device is arranged at an end of the air outlet duct away from an air outlet of the drum.

9. The washer-dryer machine according to claim 7,

wherein the filter screen self-cleaning device comprises a first fluid supply pipe and a nozzle connected to the first fluid supply pipe, and the nozzle is configured to distribute the cleaning fluid onto an air inlet surface of the filter screen.

10. The washer-dryer machine according to claim 9, wherein the first fluid supply pipe and the nozzle connected to each other form a venturi tube shape.

11. The washer-dryer machine according to claim 9, wherein a free end of the nozzle forms a flat opening.

12. The washer-dryer machine according to claim 11, wherein a width of the flat opening is equal to a width of the filter screen or at least 90% of the width of the filter screen.

13. The washer-dryer machine according to any one of claims 10 to 12, wherein an angle between the nozzle and the filter screen is between 0° and 80°.

14. The washer-dryer machine according to any one of claims 11 to 12, wherein a plurality of channels are formed in the nozzle so that the cleaning fluid is distributed along the width of the flat opening.

15. The washer-dryer machine according to any one of claims 10 to 12, wherein the filter screen self-cleaning device is further configured to vibrate, blow and/or scrape the filter screen.

16. The washer-dryer machine according to claim 9, wherein the first fluid supply pipe extends along an inner surface of the air outlet duct to a middle part of the filter screen.

17. The washer-dryer machine according to claim 9, wherein the first fluid supply pipe extends along a length direction of the inner surface of the air outlet duct and is fixed on the inner surface, and the nozzle is a plurality of rotatable spray heads which are spaced apart and connected to the fluid supply pipe to spray the fluid onto the air inlet surface of the filter screen.

18. The washer-dryer machine according to any one of claims 7 to 16, wherein the filter screen self-cleaning device and an air inlet end of the air outlet duct are disposed at opposite ends of the filter screen, and a water outlet of the filter screen self-cleaning device and an air inlet of the air outlet duct are on a same side of the filter screen.

19. The washer-dryer machine according to claim 18, wherein a water inlet of the filter screen self-cleaning device is connected to a tap water pipe of the washer-dryer machine via a water guide pipe or directly to a tap water outlet pipe.

20. The washer-dryer machine according to claim 19, wherein the air outlet duct is disposed on a side of the drum away from the tap water pipe, and a water guide pipe communicating the water inlet of the filter screen self-cleaning device with the tap water pipe extends across the drum.

21. The washer-dryer machine according to claim 20, wherein the air outlet duct and the water pipe are disposed on a same side of the drum.

22. The washer-dryer machine according to claim 21, wherein the air outlet duct comprises an arc section, the air inlet end of the air outlet duct is connected to the air outlet of the drum, and the air outlet end of the air outlet duct is connected to an air inlet of the drying module.

23. The washer-dryer machine according to any one of claims 18 to 22, wherein the air outlet duct comprises a first half shell and a second half shell that together define an air flow cavity, and the filter screen is obliquely arranged in the air flow cavity so as to filter all air flow flowing from the air inlet end to the air outlet end of the air outlet duct.

24. The washer-dryer machine according to claim 23, wherein the filter screen extends obliquely from a lower part of the second half shell to an upper part of the first half shell, and extends to an edge of a bracket in the cavity, so that the filter screen covers a cross-section of the cavity, and the nozzle of the filter screen self-cleaning device is sealed and fixed on the bracket.

25. The washer-dryer machine according to claim 24, wherein the bracket is arc-shaped, one end of the bracket is mounted on a top panel of the first half shell, and the other end extends into the air flow cavity for fixing the filter screen.

26. The washer-dryer machine according to claim 24, wherein the bracket is in the form of a flat plate, is integrally formed with the first half shell and extends into the air flow cavity.

27. The washer-dryer machine according to any one of claims 1 to 26, wherein the air outlet duct comprises a first section connected to the drum, a second section connected to the drying module, and a filter screen placement section connecting the first section and the second section, the filter screen is arranged in the filter screen placement section to guide the air flow from the drum to the drying module, and wherein the filter screen placement section is accessible from outside the housing of the washer-dryer machine for

operation.

28. The washer-dryer machine according to claim 27, wherein at least one of the filter screens is installed in a filter box, and the filter box is removably and sealingly installed in the filter screen placement section, so that the filter box is in fluid communicated with the first section and the second section to form the air outlet duct.

29. The washer-dryer machine according to claim 28, wherein the filter box is flexible and is fitted into to the filter screen placement section with an interference fit.

30. The washer-dryer machine according to claim 28, wherein the filter box is rigid and is mounted to the filter screen placement section by a snap fit.

31. The washer-dryer machine according to claim 30, wherein a first closable opening is provided on a front panel, a side panel or a rear panel of the washer-dryer machine for accessing the filter screen placement section.

32. The washer-dryer machine according to claim 27, wherein the filter screen placement section comprises a second closable opening to open and close the filter screen placement section.

33. The washer-dryer machine according to claim 32, wherein at least one of the filter screens is removably or fixedly fitted into the filter screen placement section, or at least one of the filter screens is installed in a filter box, and the filter box is removably and sealingly installed to the filter screen placement section.

34. The washer-dryer machine according to claim 32 or 33, wherein the second closable opening is opened and closed by a sliding or flipping movable panel.

35. The washer-dryer machine according to any one of claims 27 to 34, wherein at least one of the filter screens is obliquely arranged in the filter screen placement section.

36. The washer-dryer machine according to any one of claims 27 to 34, wherein at least one of the filter screens is arranged in the filter screen placement section perpendicular to a longitudinal axis of the filter screen placement section.

37. The washer-dryer machine according to any one of claims 27 to 36, wherein at least a portion of the filter screen placement section is transparent.

38. The washer-dryer machine according to any one of claims 1 to 37, further comprising a cooling channel to cool the air flow passing through the air outlet duct.

39. The washer-dryer machine according to claim 38, wherein an outer shell is arranged outside the air outlet duct, and the cooling channel is defined between an outer wall of the air outlet duct and an inner wall of the outer shell.

40. The washer-dryer machine according to claim 38, wherein at least a portion of the housing of the air outlet duct comprises two layers of walls, and the cooling channel is defined between the two layers of walls.

41. The washer-dryer machine according to claim 38, wherein the cooling channel covers at least a portion of the air outlet duct.

42. The washer-dryer machine according to any one of claims 38 to 41, wherein the cooling channel comprises a first water inlet for introducing cooling water into the cooling channel and a drain outlet for discharging cooling water.

43. The washer-dryer machine according to claim 42, wherein a water spray nozzle connected to the first water inlet is further provided, and the water spray nozzle is configured to spray the cooling water onto the outer wall of the air outlet duct.

44. The washer-dryer machine according to claim 38, wherein the cooling channel is a spiral channel arranged on the outer wall of the air outlet duct.

45. The washer-dryer machine according to claim 38, wherein thin fins are provided on an outer surface of the cooling channel, and the air flow blown by a blower flows toward the thin fins.

46. The washer-dryer machine according to claim 38, wherein a temperature sensor and/or a humidity sensor is provided on the air outlet duct for detecting temperature and/or humidity of the air flow in the air outlet duct.

47. The washer-dryer machine according to claim 38, wherein a filter screen and a filter screen self-cleaning device for spraying water onto the filter screen are provided in the air outlet duct, and the air outlet duct comprises a second water inlet for guiding water into the filter screen self-cleaning device.

48. The washer-dryer machine according to claim 51, wherein the cooling channel comprises a cold water pipe or a condenser, and the cooling channel is arranged at at least one position of upstream or downstream of the filter screen, between the drum and the air outlet duct, and/or between the drying

module and the air outlet duct.

49. The washer-dryer machine according to any one of claims 1 to 48, further comprising a detergent dispenser box and a pipe assembly arranged between the drum and the drying module, the drying module comprising a condenser, the air outlet duct being configured to guide an air flow from the drum to the drying module, the pipe assembly comprising a water inlet pipe, a first water outlet pipe, a second water outlet pipe and a third water outlet pipe, one end of the water inlet pipe being connected to a tap water pipe, the other end of the water inlet pipe being respectively connected to one end of the first water outlet pipe, one end of the second water outlet pipe and one end of the third water outlet pipe, the other end of the first water outlet pipe being connected to a water inlet of the condenser, the other end of the second water outlet pipe being connected to a cleaning fluid inlet of the detergent dispenser box, and the other end of the third water outlet pipe being connected to a water inlet of the air outlet duct.

50. The washer-dryer machine according to claim 49, wherein the condenser, the detergent dispenser box, the water inlet of the air outlet duct and the pipe assembly are arranged on an upper part of the drum.

51. The washer-dryer machine according to claim 50, wherein the condenser, the detergent dispenser box, the water inlet of the air outlet duct and the pipe assembly are respectively arranged at at least three corners of the washer-dryer machine.

52. The washer-dryer machine according to claim 49, wherein the drying module comprises a regeneration channel, the condenser is arranged on the regeneration channel, and the condenser is configured to cool dehumidification air flow in the regeneration channel to dry the dehumidification air flow.

53. The washer-dryer machine according to claim 49, wherein a water outlet of the detergent dispenser box is connected to the water inlet of the drum.

54. The washer-dryer machine according to claim 49, wherein a filter screen and a filter screen self-cleaning device for cleaning the filter screen are provided in the air outlet duct, the air outlet duct comprises a second water inlet for guiding water into the filter screen self-cleaning device, and the third water outlet pipe is connected to the second water inlet.

55. The washer-dryer machine according to claim 53, wherein the air outlet duct comprises a first water inlet for guiding cooling water into a cooling channel, the cooling channel is configured to guide cooling water to an outer wall of the air outlet duct for cooling, and the third water outlet pipe is connected to the first water inlet.

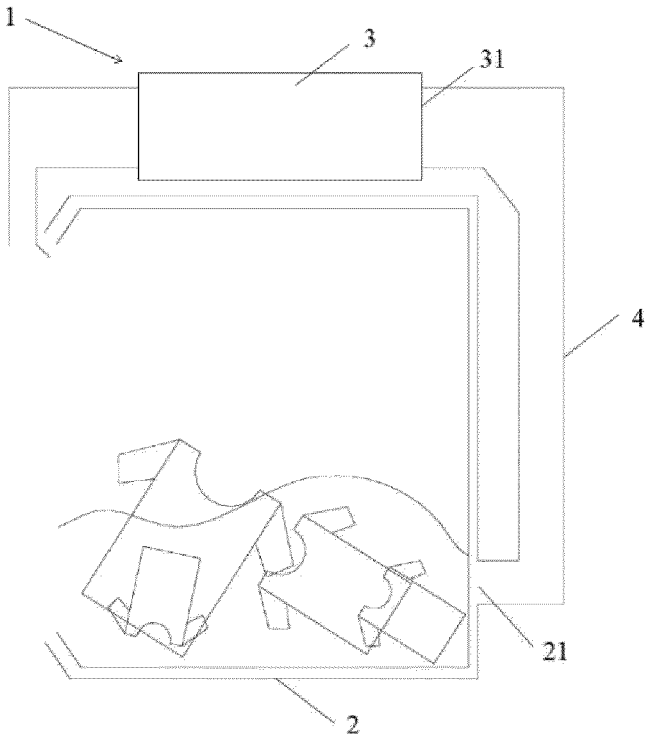

FIG. 1

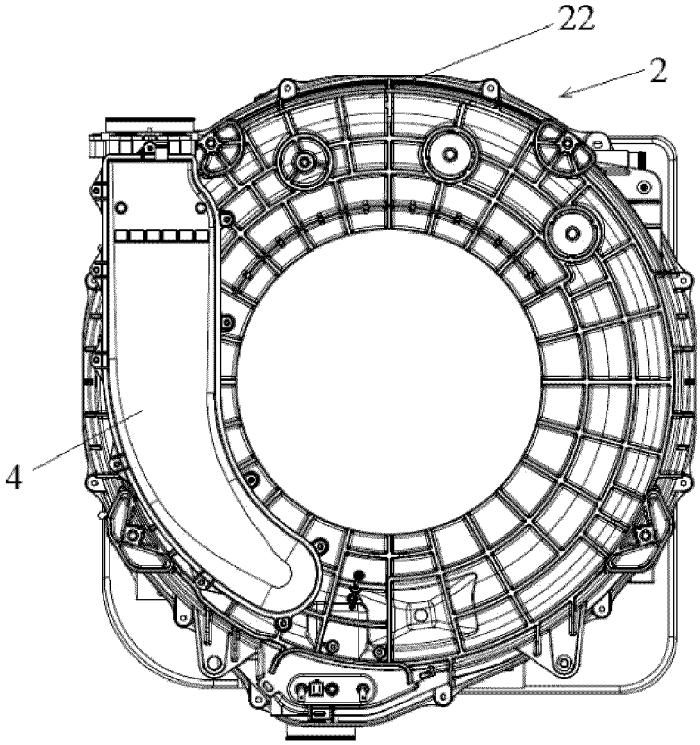

FIG. 2

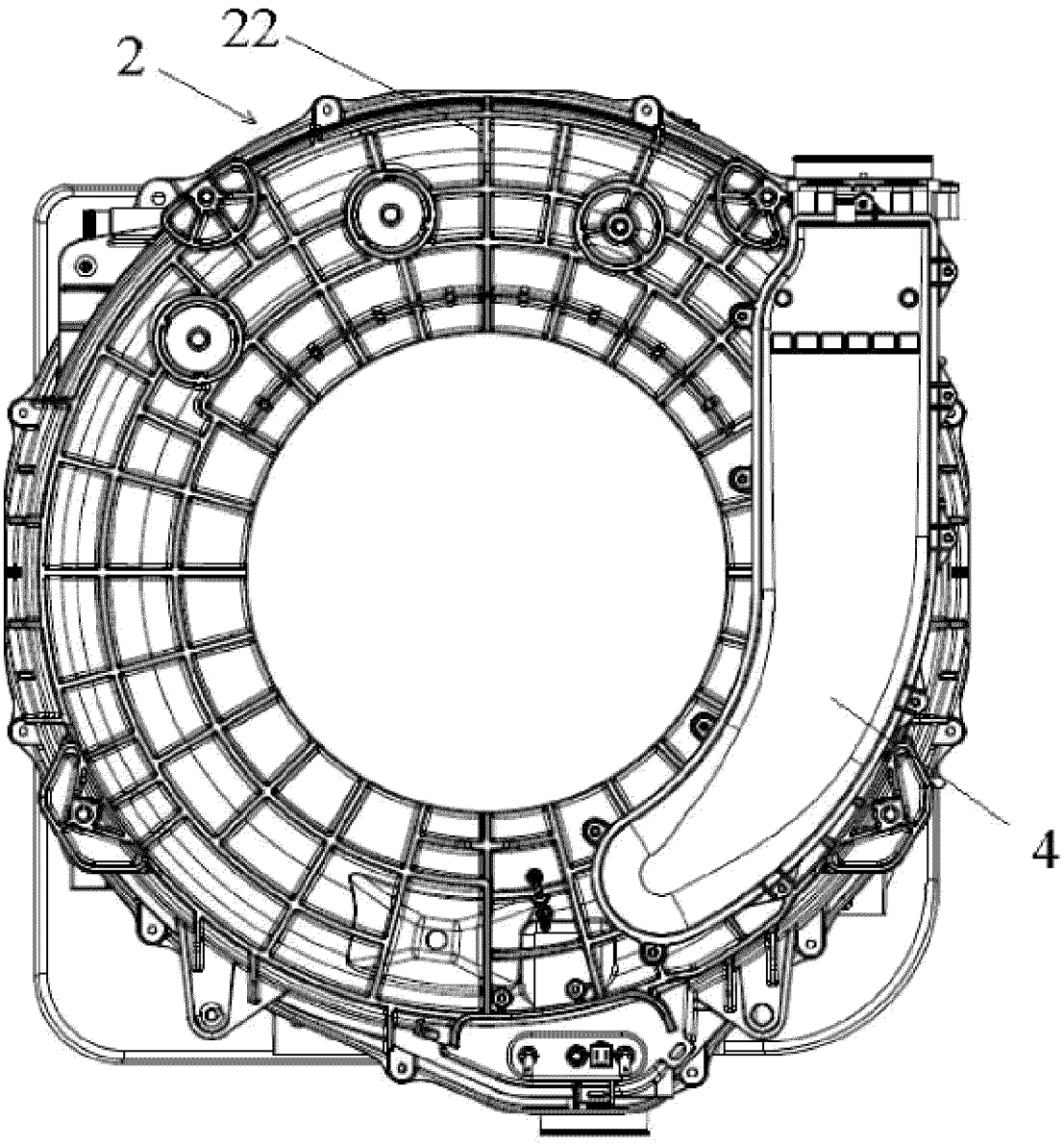

FIG. 3

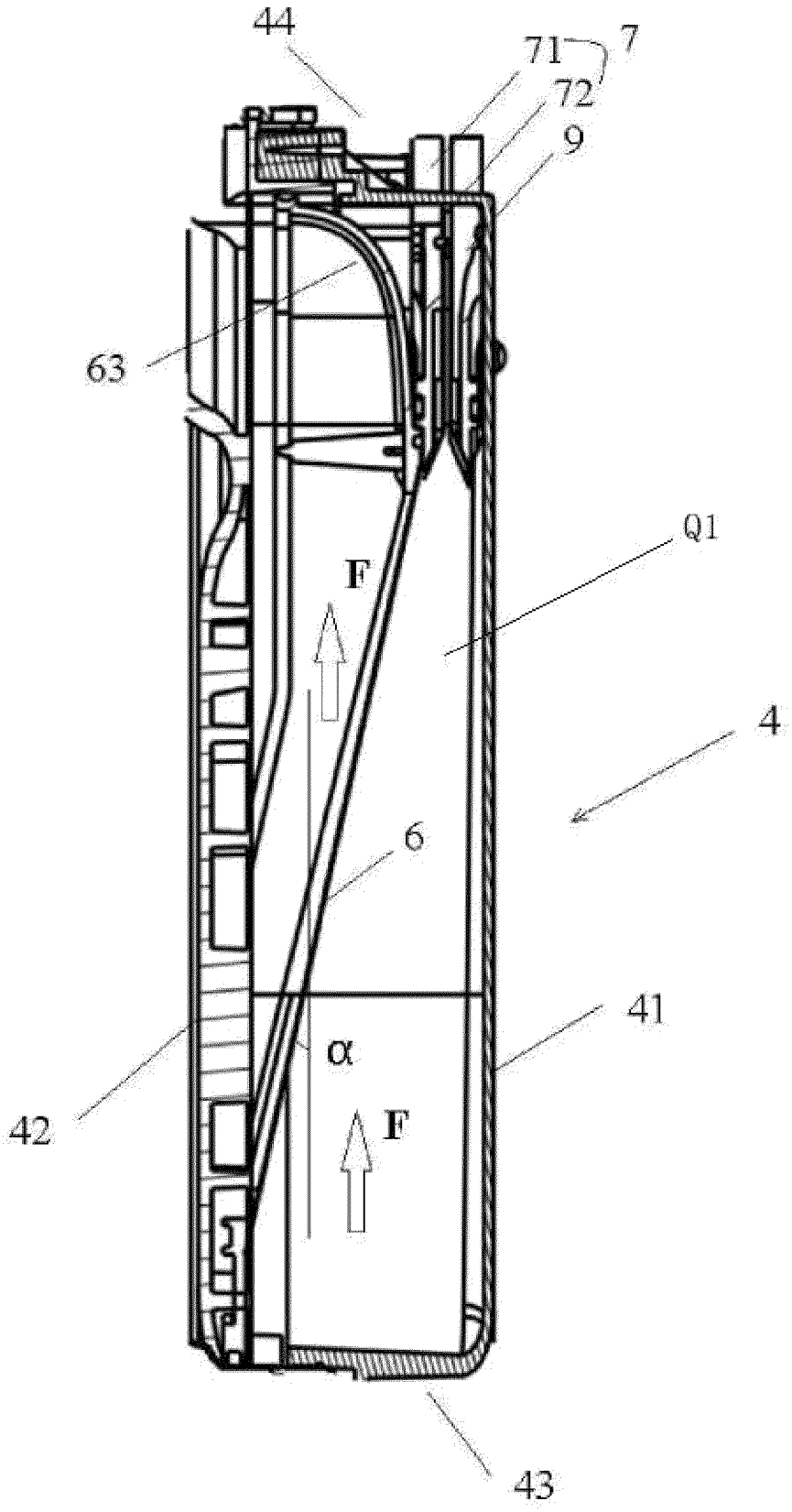

FIG. 4

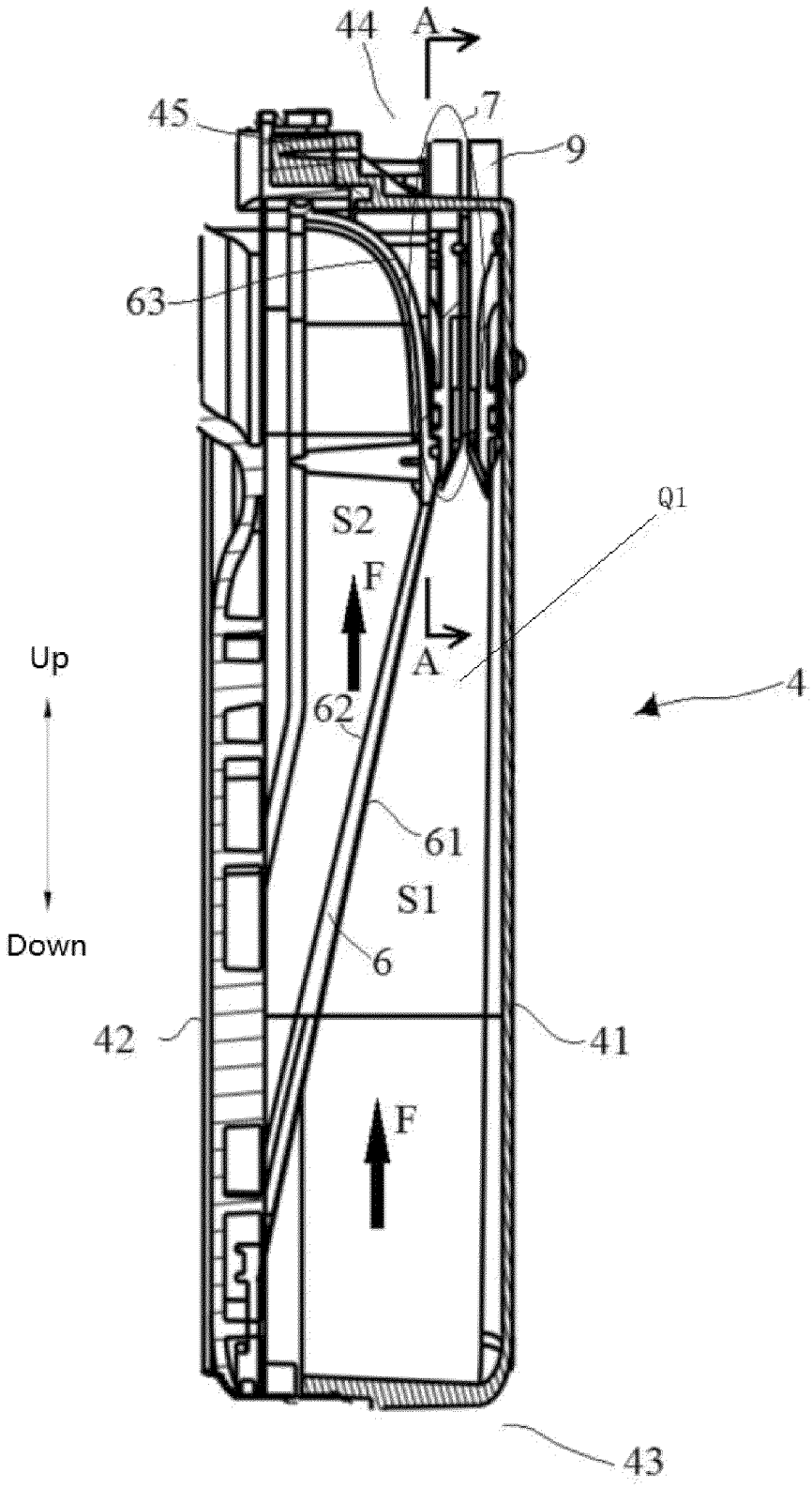

FIG. 5

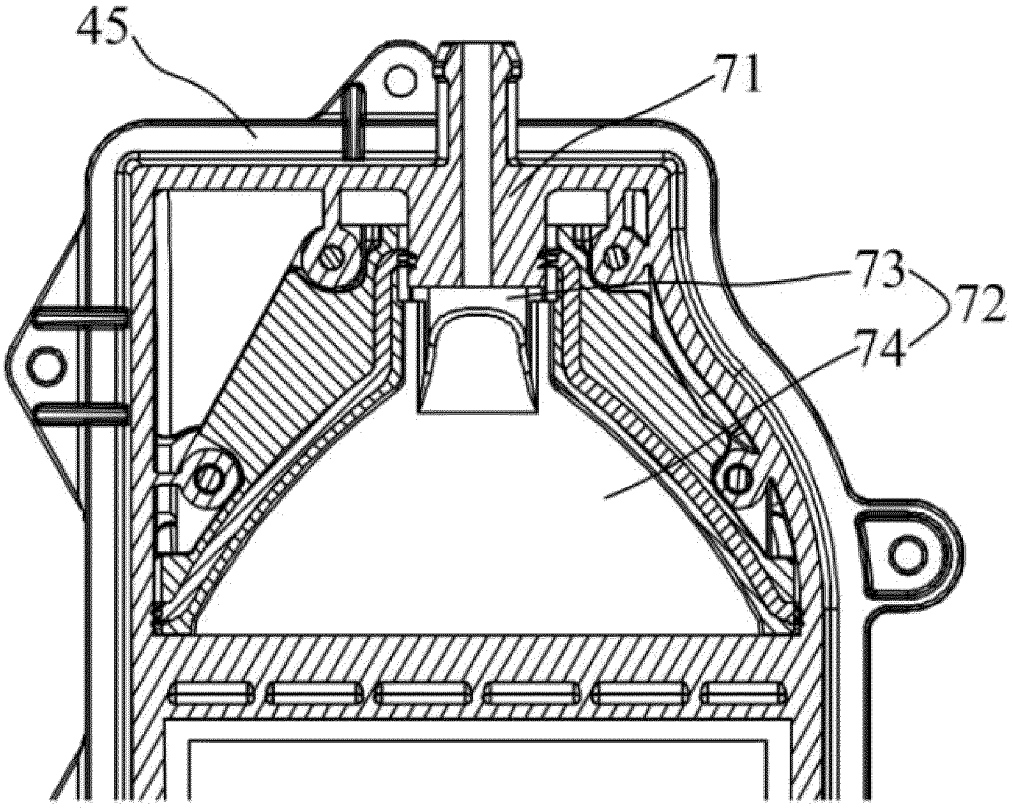

FIG. 6

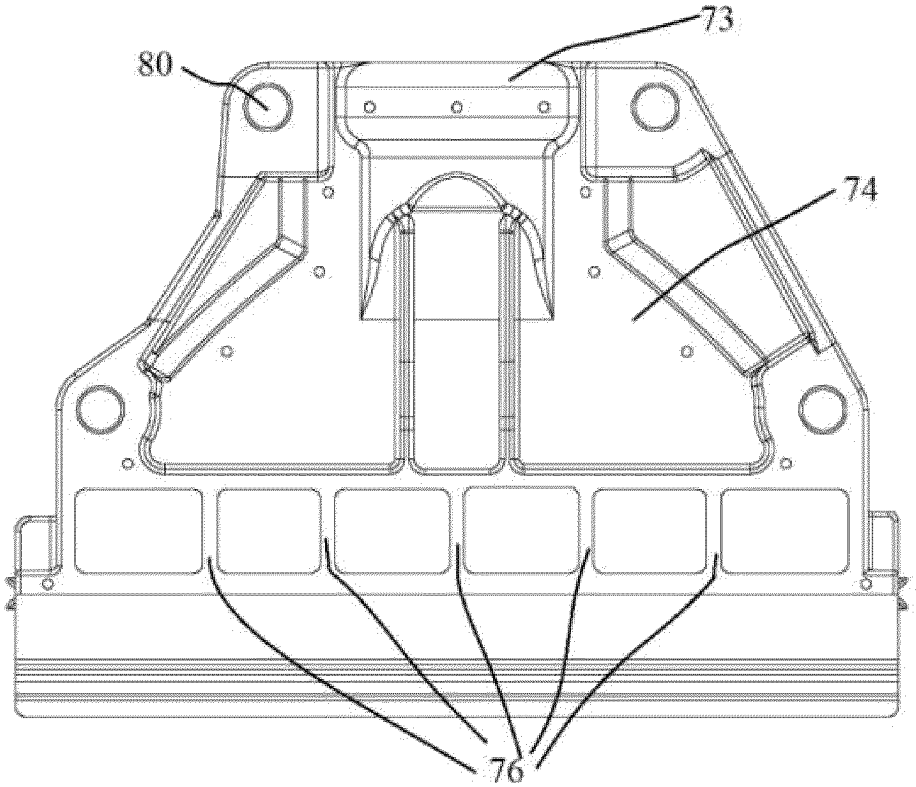

FIG. 7

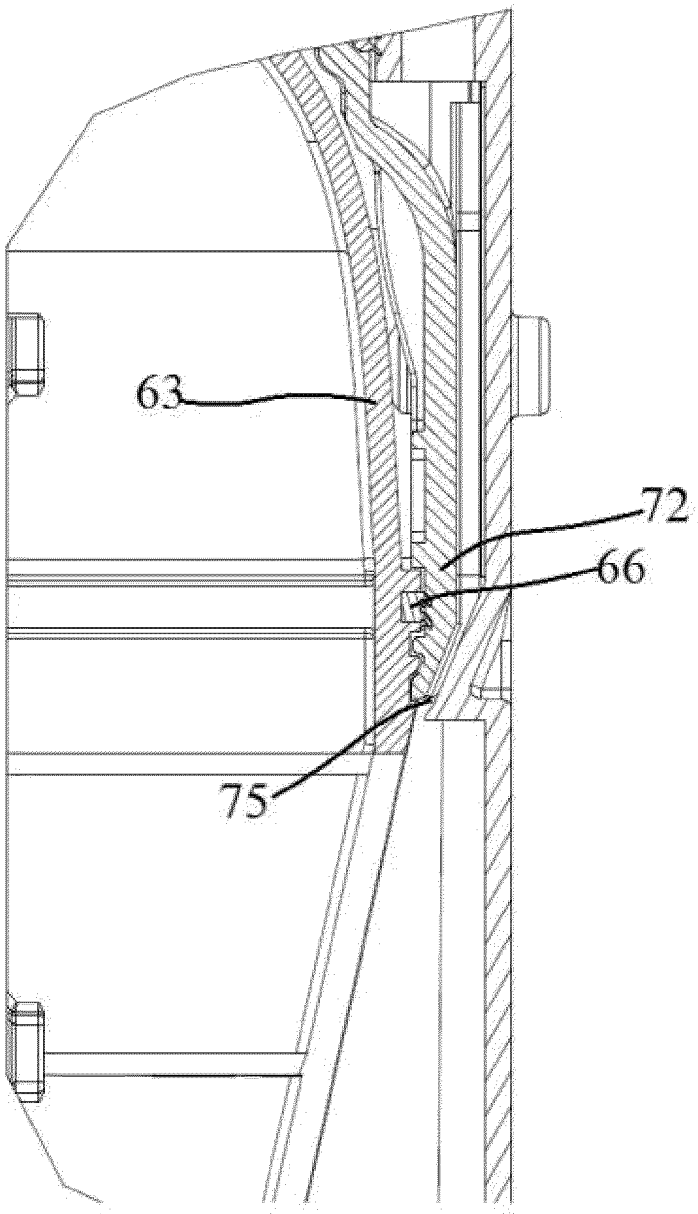

FIG. 8

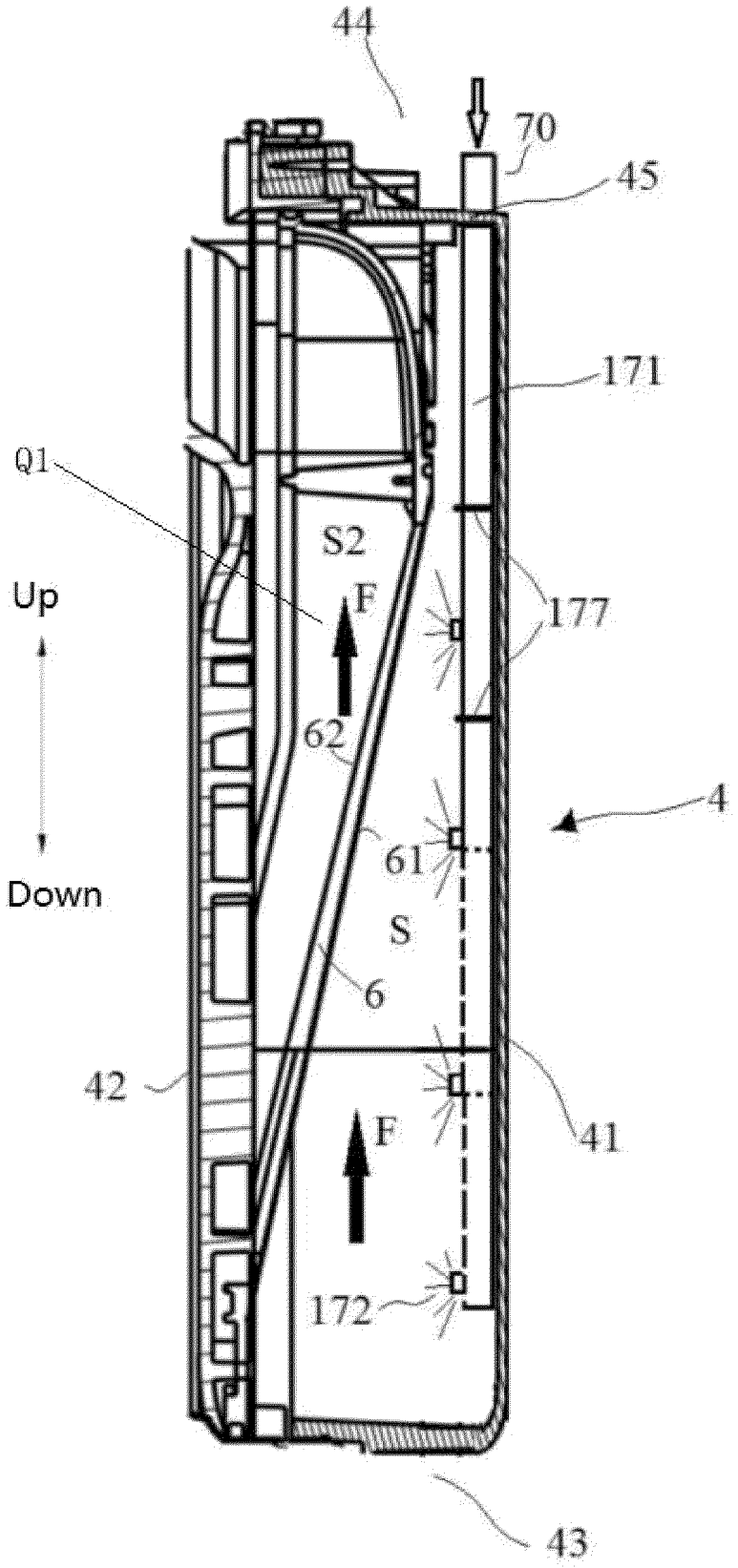

FIG. 9

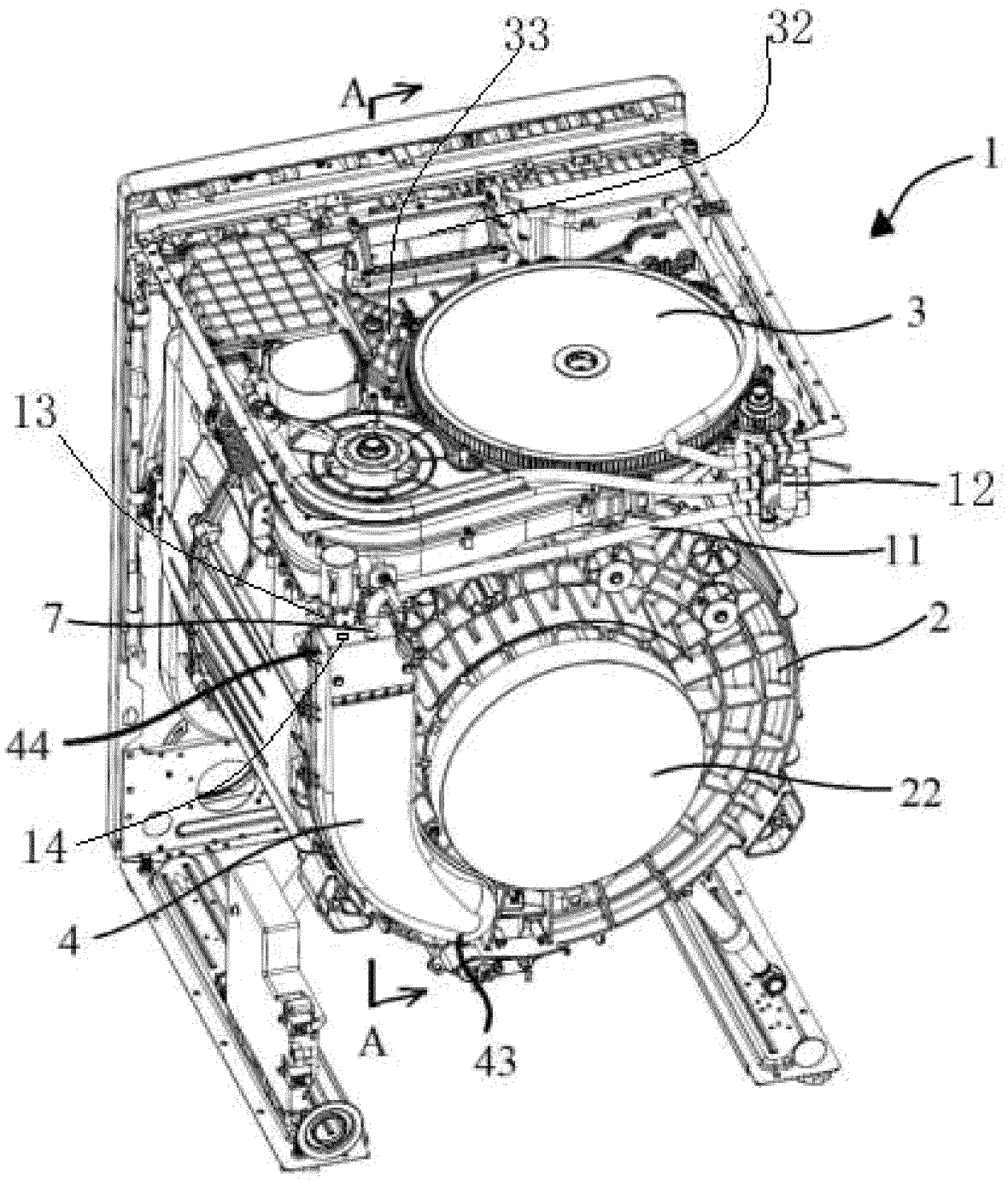

FIG. 10

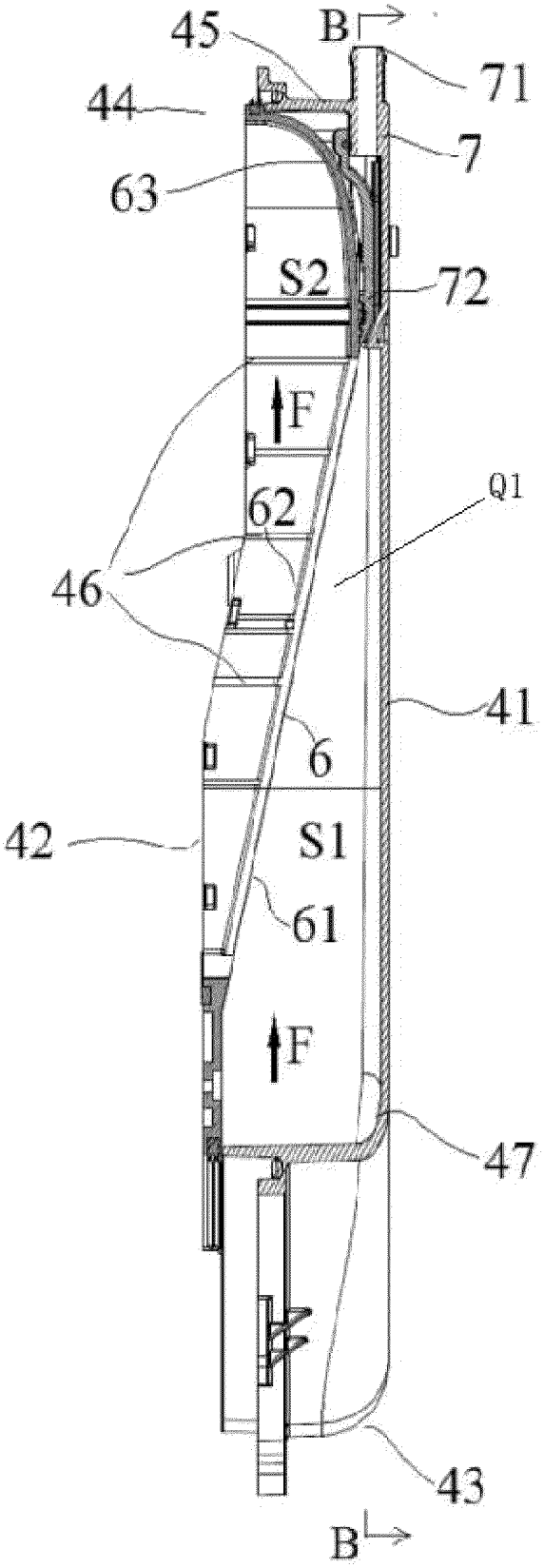

FIG. 11

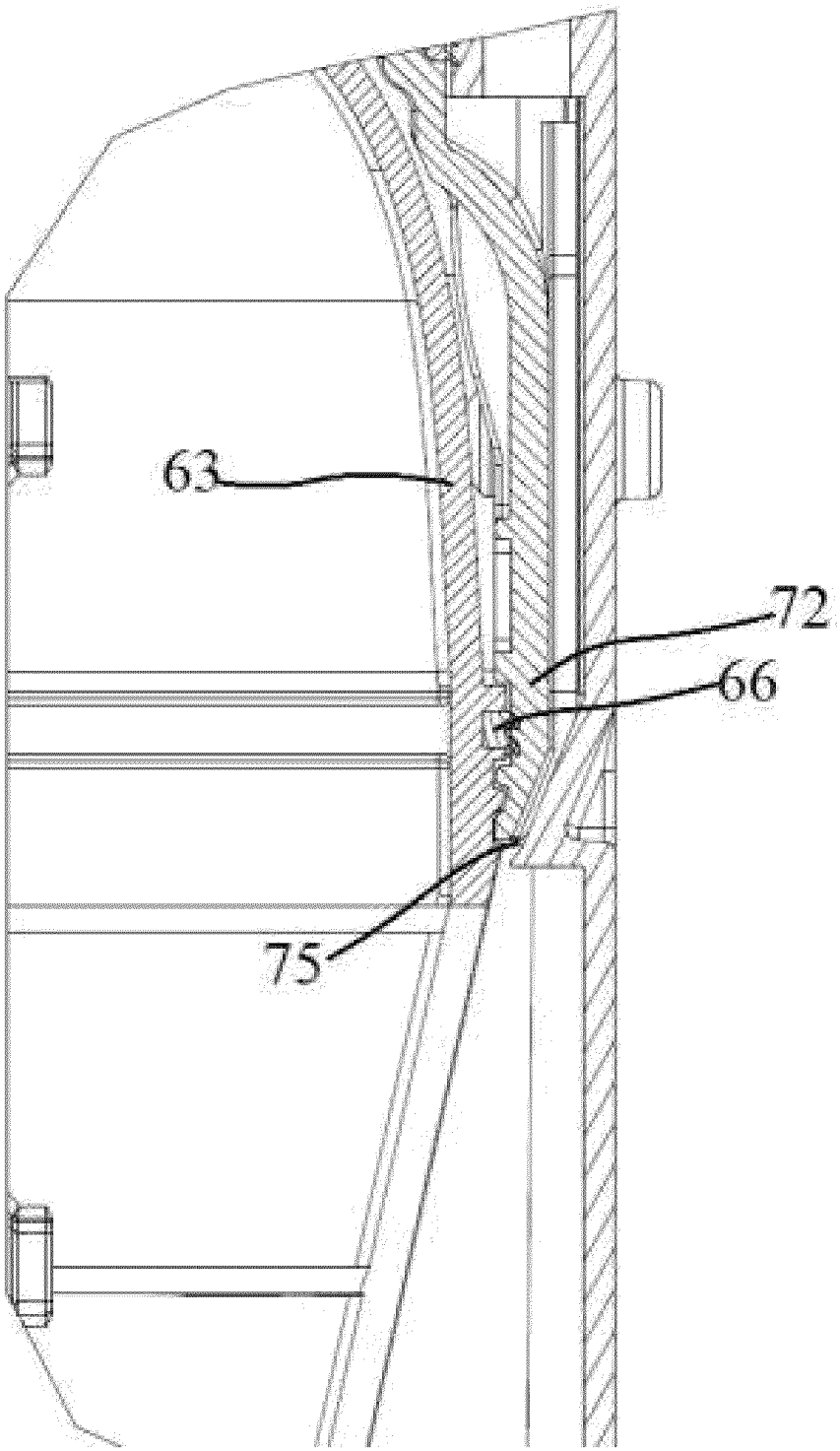

FIG. 12

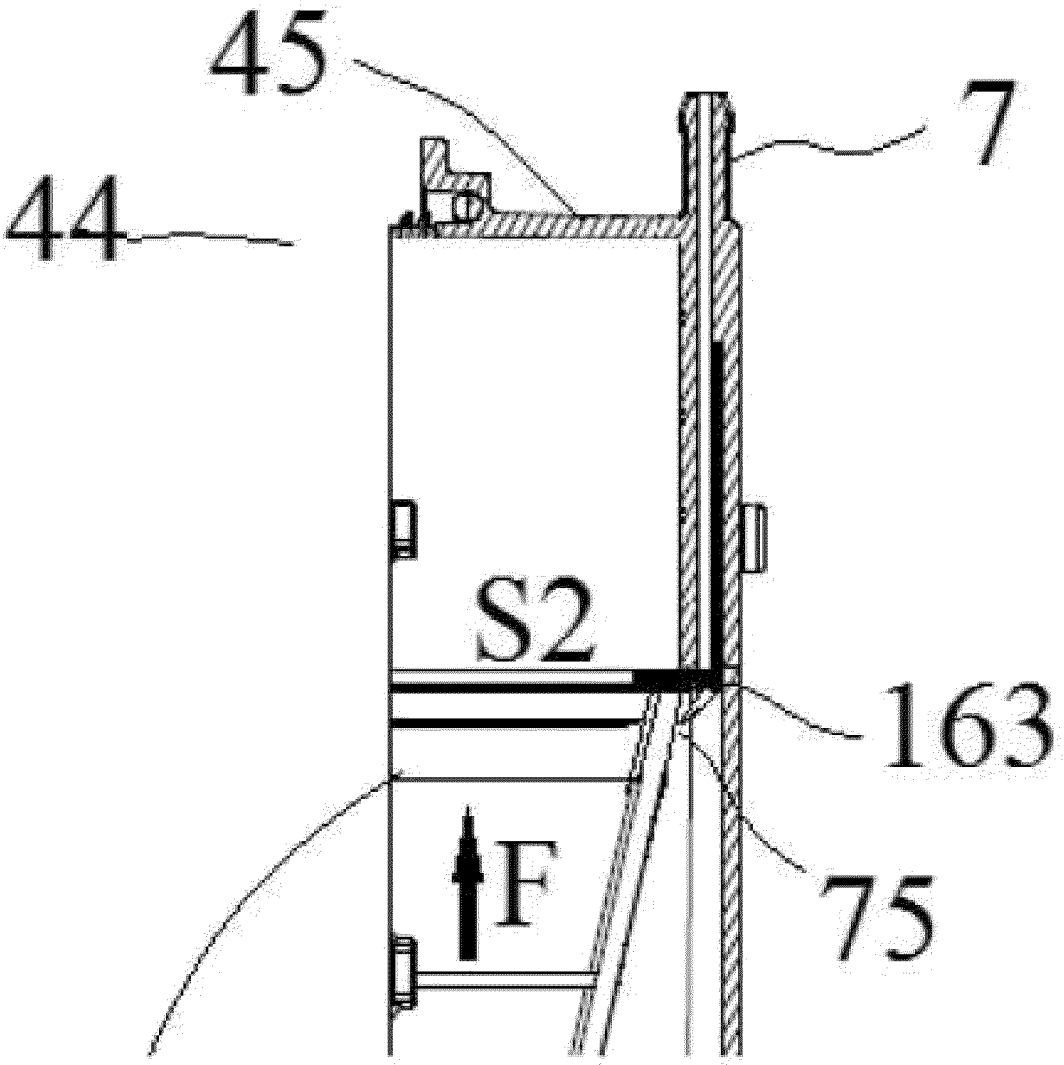

FIG. 13

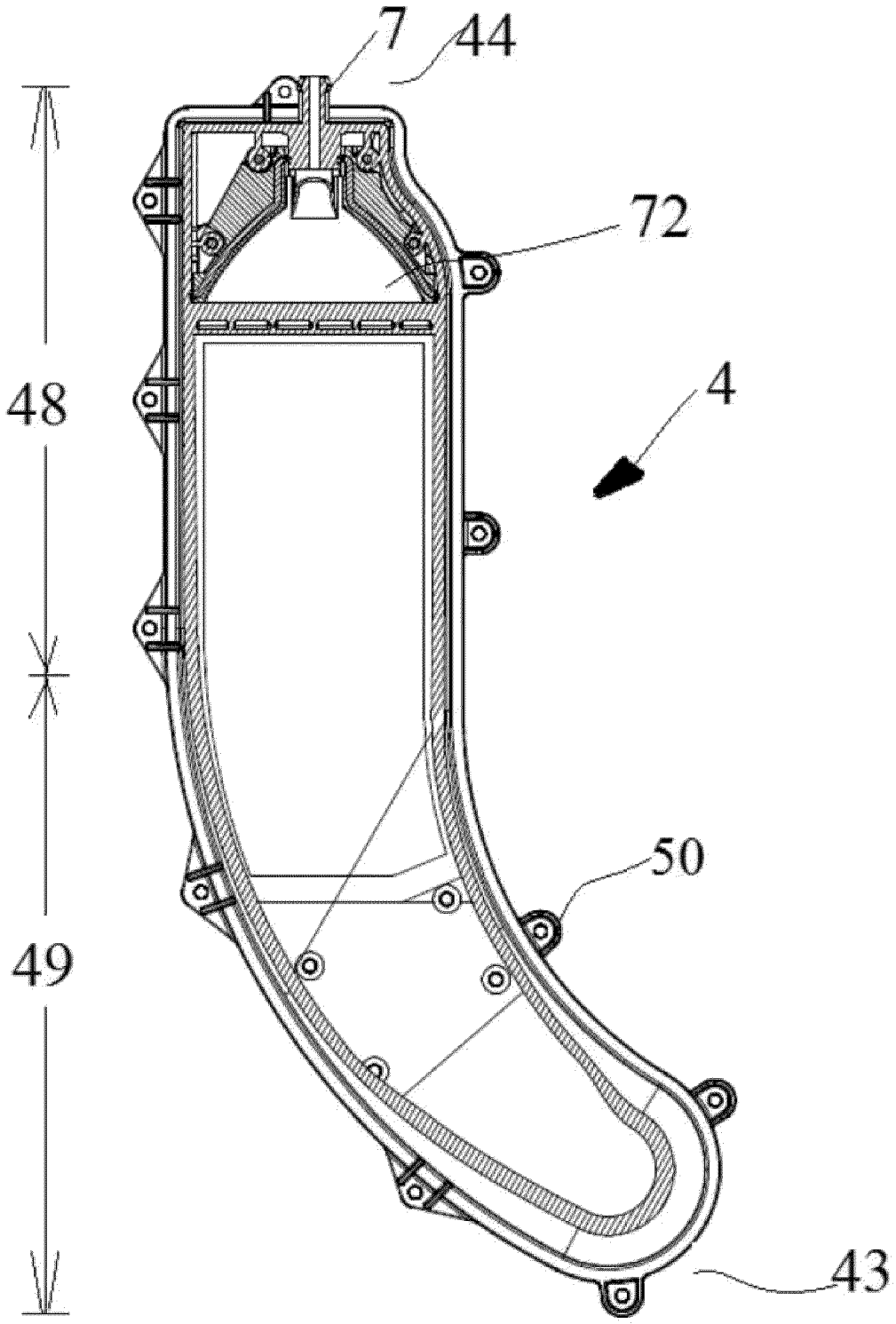

FIG. 14

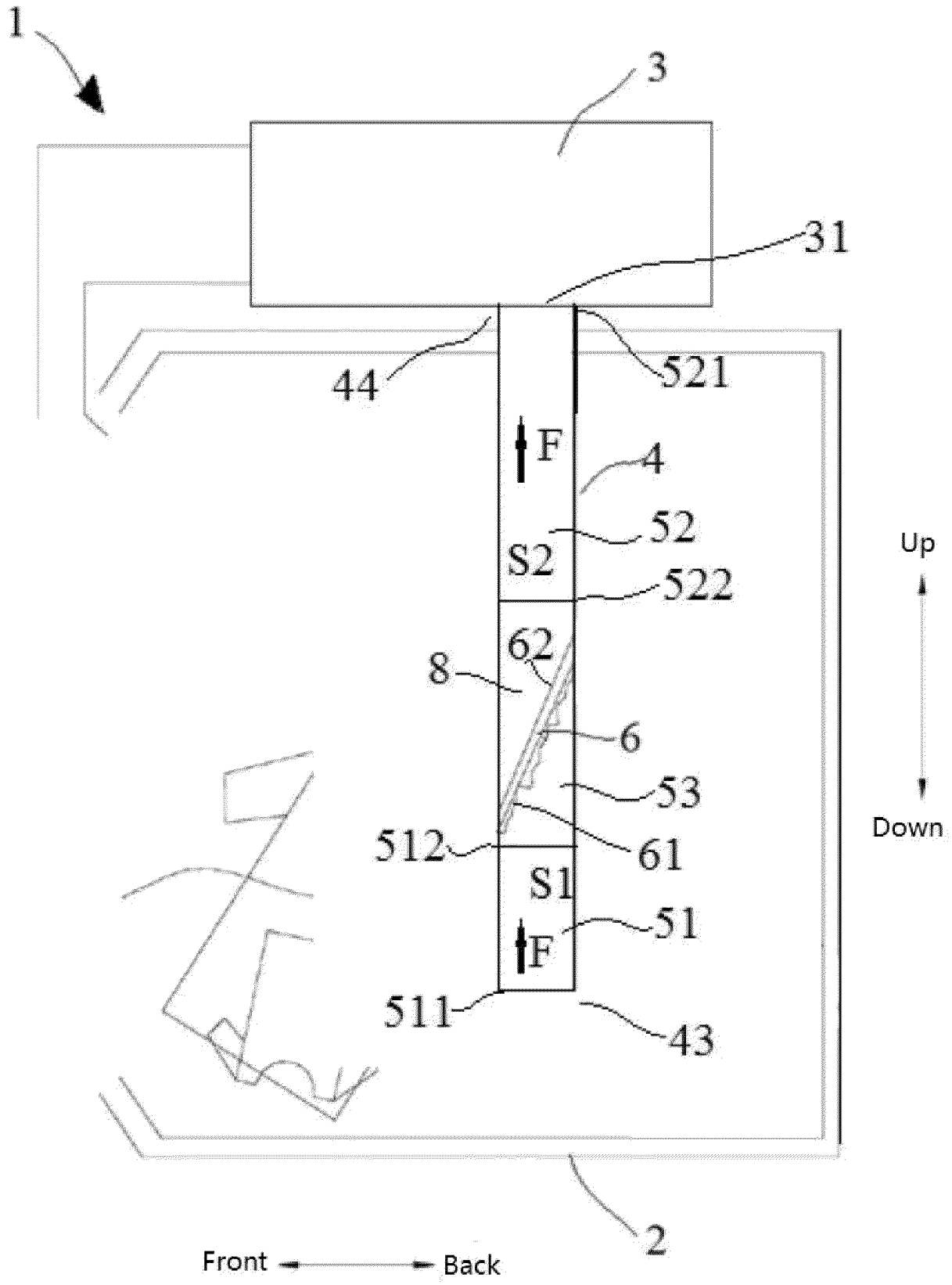
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FIG. 15

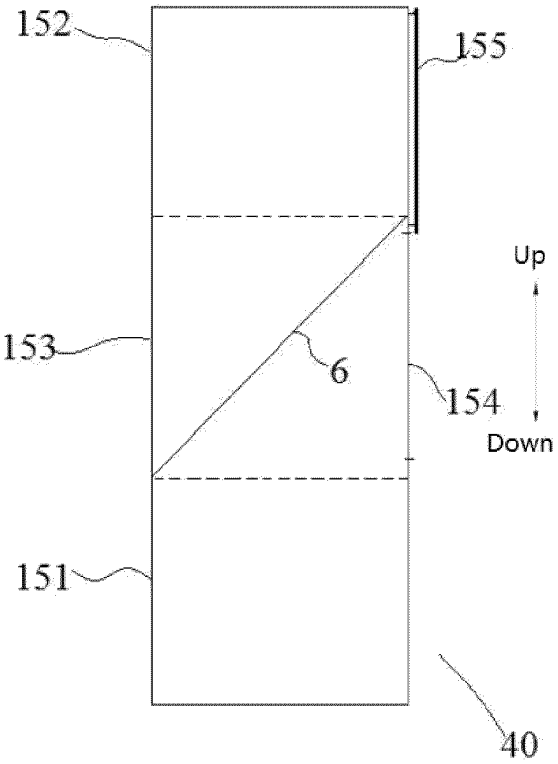

FIG. 16a

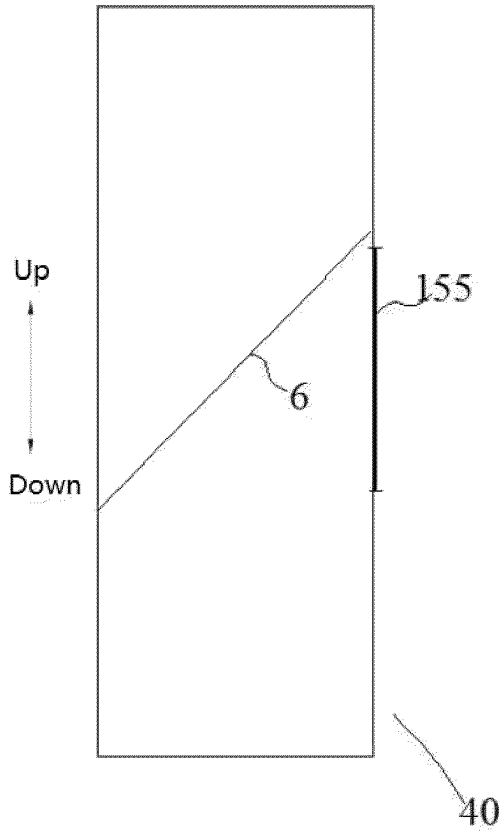

FIG. 16b

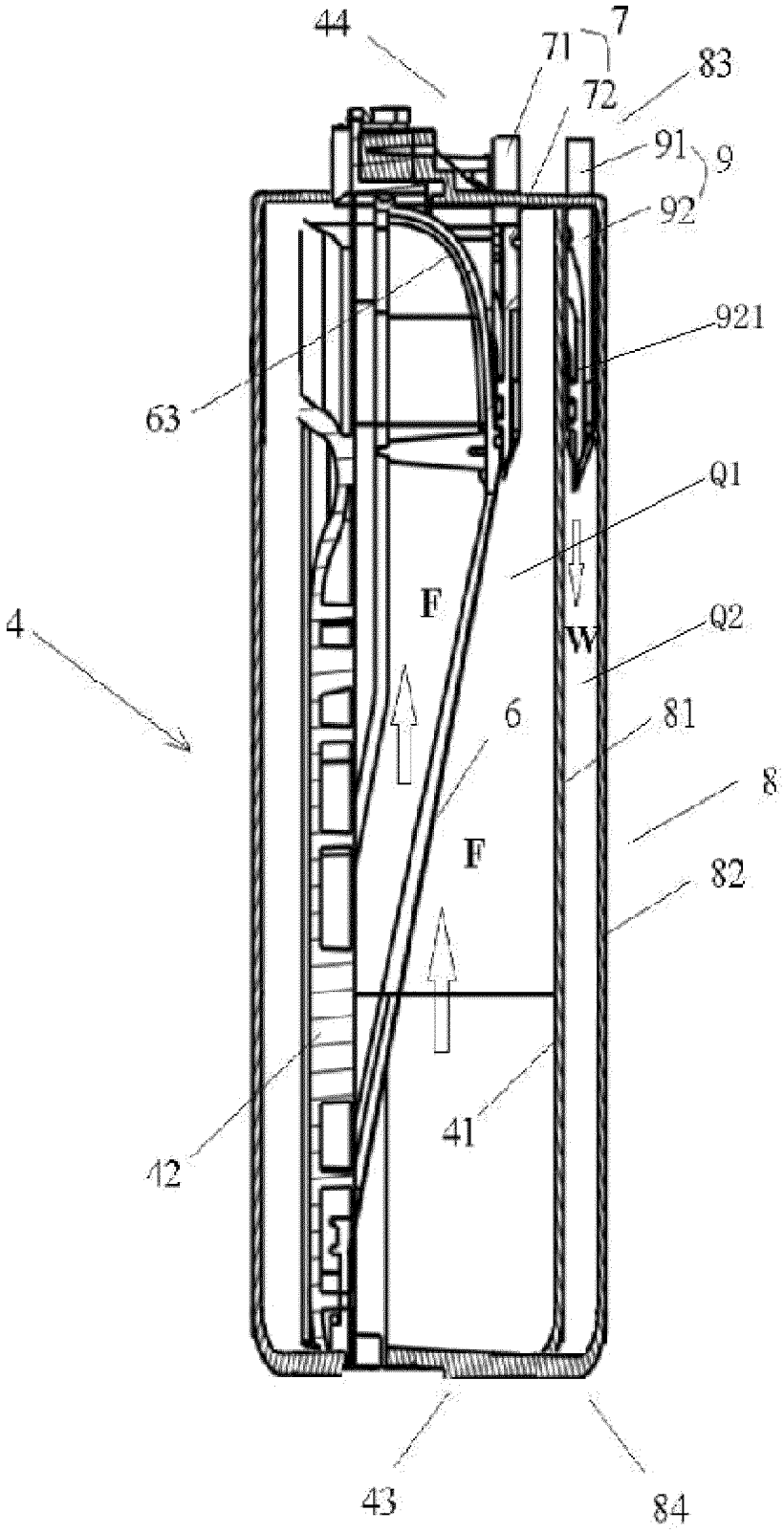

FIG. 17

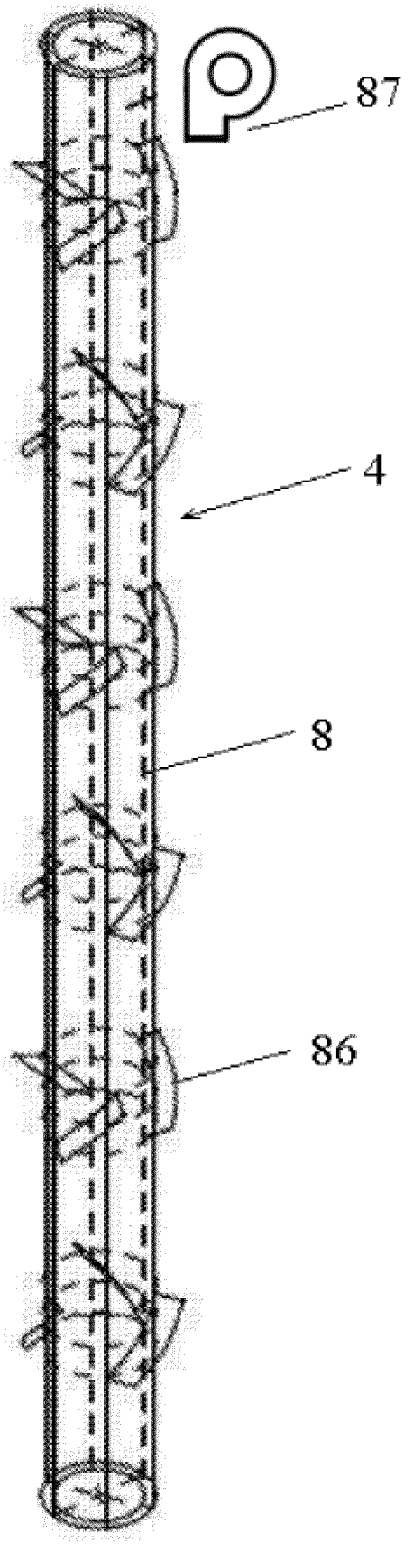

FIG. 18

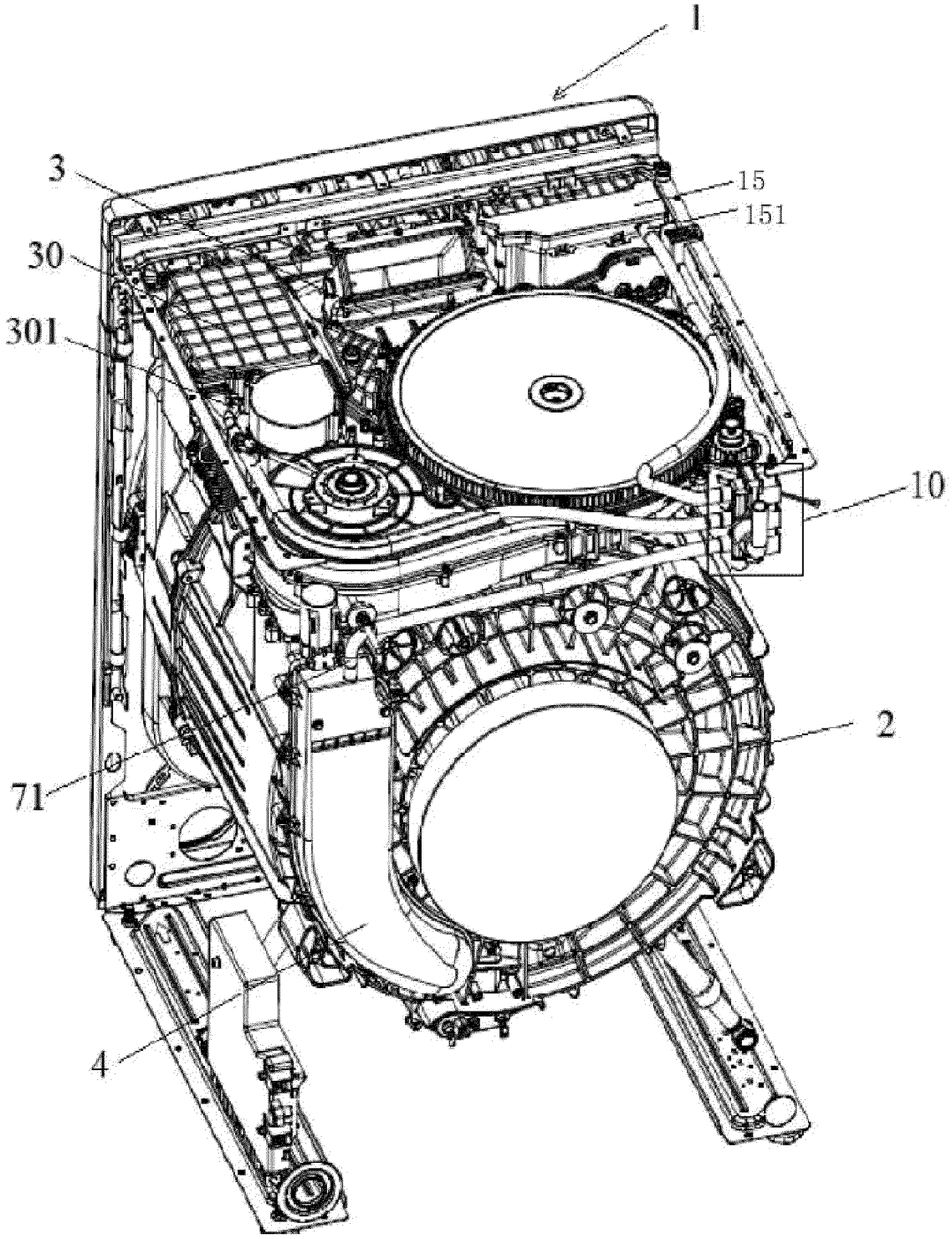

FIG. 19

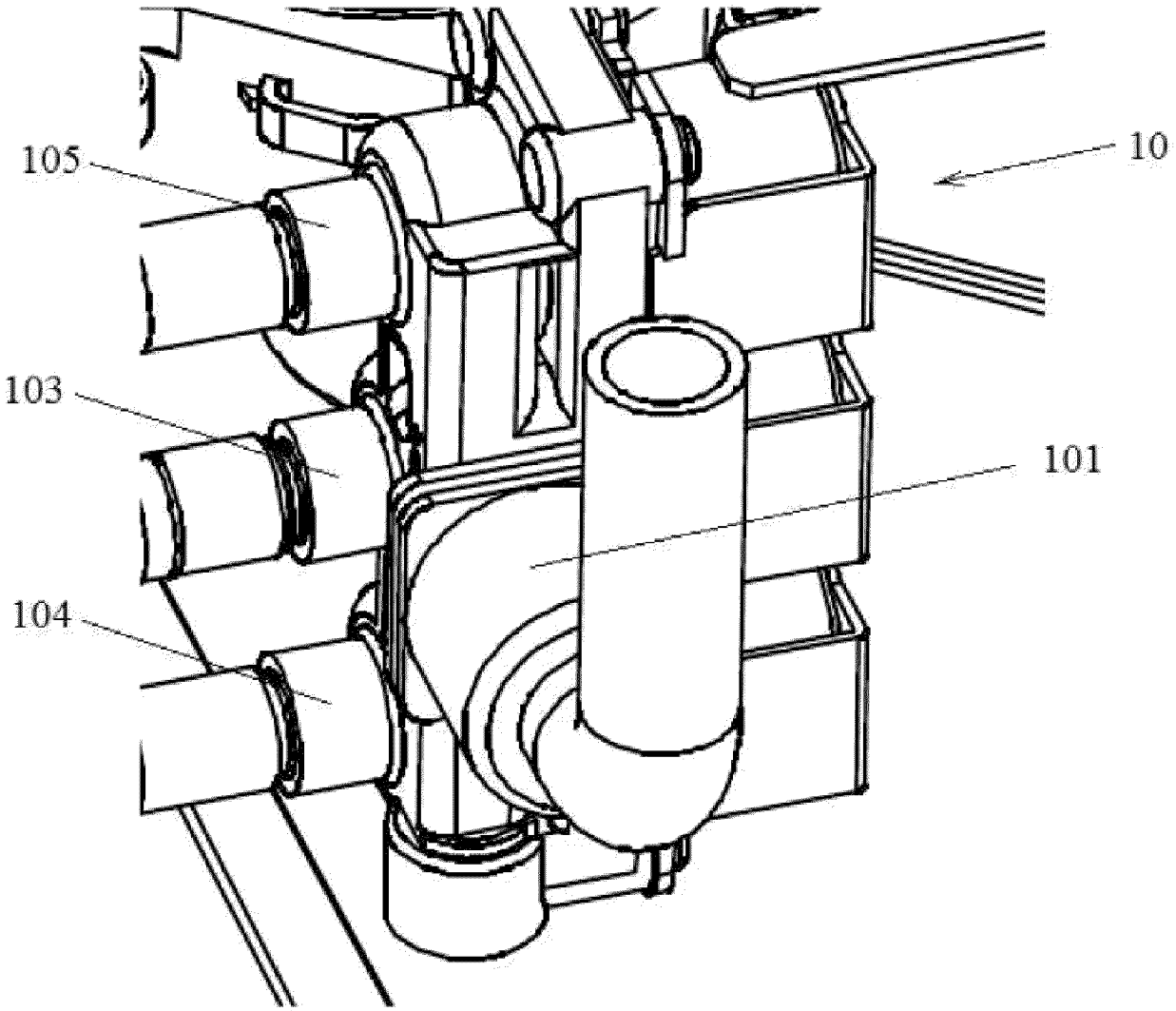

FIG. 20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/114751

A. CLASSIFICATION OF SUBJECT MATTER

D06F25/00(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)

IPC: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)

CNABS, CNTXT, CNKI: 洗烘一体, 洗衣机, 干衣机, 烘干机, 滤网, 过滤, 清洁, 冲洗, 冷却, 冷凝; WPABS, DWPI, EPTXT, USTXT, WOTXT: washing, dry, heater, filter, cleaning, flushing, cool, condenser.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 218508058 U (SHENZHEN LUOKE INNOVATION TECHNOLOGY CO., LTD.) 21 February 2023 (2023-02-21) description, paragraphs 22-33, and figures 1-4	1-55
X	CN 106592184 A (HANGZHOU SANHUA HOME APPLIANCE THERMAL MANAGEMENT SYSTEM CO., LTD.) 26 April 2017 (2017-04-26) description, paragraphs 32-58, and figures 1-10	1-37, 49-55
Y	CN 106592184 A (HANGZHOU SANHUA HOME APPLIANCE THERMAL MANAGEMENT SYSTEM CO., LTD.) 26 April 2017 (2017-04-26) description, paragraphs 32-58, and figures 1-10	38-48
Y	CN 109281118 A (DONGBU DAEWOO ELECTRONICS CORPORATION) 29 January 2019 (2019-01-29) description, paragraphs 46-77, and figures 1-7	38-48
X	CN 106592183 A (HANGZHOU SANHUA HOME APPLIANCE THERMAL MANAGEMENT SYSTEM CO., LTD.) 26 April 2017 (2017-04-26) description, paragraphs 28-45, and figures 1-8	1-37, 49-55

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

* Special categories of cited documents:
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"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 November 2023	**23 November 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/114751

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 106592183 A (HANGZHOU SANHUA HOME APPLIANCE THERMAL MANAGEMENT SYSTEM CO., LTD.) 26 April 2017 (2017-04-26) description, paragraphs 28-45, and figures 1-8	38-48
Y	CN 107083640 A (DONGBU DAEWOO ELECTRONICS CORPORATION) 22 August 2017 (2017-08-22) description, paragraphs 30-56, and figures 1-5	38-48
A	JP 2008289647 A (TOSHIBA CORPORATION et al.) 04 December 2008 (2008-12-04) entire document	1-55

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/114751

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 218508058 U	21 February 2023	WO 2023098763A1 A1	08 June 2023
CN 106592184 A	26 April 2017	CN 106592184 B	03 April 2020
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Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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- CN 202222327250 **[0001]**
- CN 202222310440X **[0001]**
- CN 202222310919 **[0001]**