(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 805 442 A1**

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

(43) Date of publication:
14.04.2021 Bulletin 2021/15

(21) Application number: **19815573.1**

(22) Date of filing: **24.05.2019**

(51) Int Cl.:
D06F 37/10 *(2006.01)* *D06F 37/26* *(2006.01)*
D06F 39/14 *(2006.01)*

(86) International application number:
PCT/CN2019/088284

(87) International publication number:
WO 2019/233294 (12.12.2019 Gazette 2019/50)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **04.06.2018 CN 201810562419**

(71) Applicants:
- **Qingdao Haier Washing Machine Co., Ltd.**
  Qingdao, Shandong 266101 (CN)
- **Qingdao Haier Smart Technology R&D Co., Ltd.**
  Qingdao, Shandong 266101 (CN)
- **Haier Smart Home Co., Ltd.**
  Qingdao, Shandong 266101 (CN)

(72) Inventors:
- **LI, Yimin**
  Qingdao
  Shandong 266101 (CN)
- **LAO, Chunfeng**
  Qingdao
  Shandong 266101 (CN)
- **LIU, Haitao**
  Qingdao
  Shandong 266101 (CN)
- **HAO, Xinghui**
  Qingdao
  Shandong 266101 (CN)

(74) Representative: **Ziebig & Hengelhaupt Patent- und Rechtsanwaltskanzlei PartG mbB**
Leipziger Straße 49
10117 Berlin (DE)

(54) CLOTHES WASHING MACHINE

(57) A washing machine includes a drum (200) installed in a shell (100); a side wall (1) of the drum (200) is provided with a laundry entrance opening (3), and the laundry entrance opening (3) is provided with an openable door body (300). Through the above arrangement, the purposes that the laundry entrance opening (3) is formed on the side wall (1) of the washing machine drum (200), and the laundry entrance opening (3) formed on the drum (200) is correspondingly sealed and closed by the door body (300) or opened for taking and putting laundry are achieved. Meanwhile, the laundry entrance opening (3) is formed on the side wall (1) of the drum (200), thus a user can open the door body (300) from the upper portion of the washing machine and take laundry from and put laundry into the drum (200). More particularly, the laundry entrance opening (3) of the drum (200) is sealed through the door body (300), therefore the drum (200) can be arranged as a sealed container. During the washing process, the two ends of the drum (200) are supported by rotating shafts (11), and the drum (200) is prevented from eccentrically rotating.

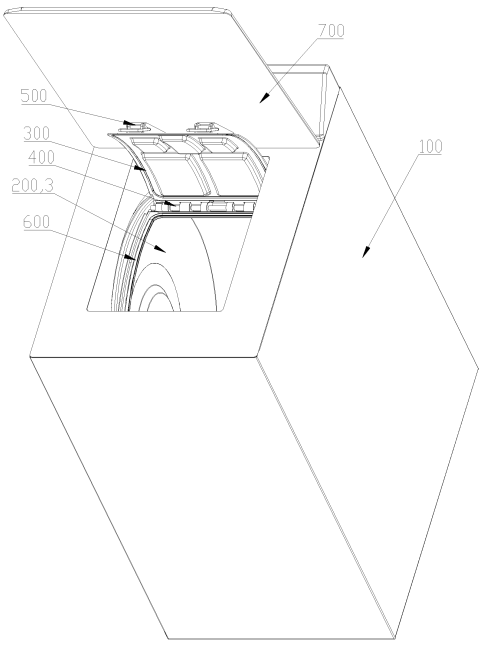

Fig. 1

EP 3 805 442 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to washing machine equipment of household appliances, in particular to a top-openable drum washing machine, in particular to a drum washing machine with a drum composed of an inner drum without dehydration holes and a port for feeding laundry formed in the top.

BACKGROUND

[0002] Washing machines can be typically divided into pulsator washing machines, agitator washing machines and drum washing machines. Generally speaking, washing machines remove stains from laundry through the action of water and detergents.

[0003] A pulsator washing machine performs washing operations by rotating a pulsator in the center of a washing tub clockwise and counter-clockwise. An agitator washing machine performs washing operations through friction between water flow and laundry by rotating a rotating fin in the center of a washing tub clockwise and counter-clockwise. A drum washing machine performs washing operations by rotating a drum to tumble the laundry.

[0004] A drum washing machine is generally provided with an outer shell, an outer tub installed inside for accommodating washing water, and a drum arranged in the interior of the outer tub for accommodating the laundry. A motor and a shaft which are used for rotating the drum are arranged on the back of the outer tub.

[0005] In addition, a control unit which is used for controlling the washing process and usually is a control panel, a water inlet mechanism, a drainage mechanism and other parts are further arranged. A drum washing machine removes stains contained in the laundry through friction between the washing water stored in a water tank and laundry in the drum, and the chemical action of the detergents contained in the washing water.

[0006] As an important part of a washing machine, a washing drum is not only used to hold the laundry and constitute a washing container, but also participate in the washing operations. Especially a drum washing machine mainly relies on the rotation of a washing drum to lift and drop the laundry to achieve an tumble effect, and meanwhile, the washing drum also has a certain rubbing effect on the laundry, so that the washing effect is achieved through tumble and washing. In addition to pulsator washing, many existing pulsator washing machines may also adopt washing drums for washing, such as so-called "dual power" washing machines popular on the market.

[0007] Compared with the pulsator washing machine, the defect of the drum washing machine is that, since the machine door is arranged on the front side, it is inconvenient to open the machine door to add laundry again after water input, and users must bend down or squat down to take out the laundry during laundry putting and taking,, which is inconvenient for the elderly or pregnant women. As a result, a top-openable drum washing machine has been invented and combines the advantages of the drum washing machine with high washing cleanliness and less abrasion of and the pulsator washing machine with the convenience of laundry taking and putting and laundry adding during the operation via the opening in the top

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

SUMMARY

[0009] An objective to be achieved by the present invention is to overcome the defects of the prior art, and the present invention provides a washing machine to achieve the objective of arranging a top-openable door body on a drum washing machine. Another objective is to provide a washing machine to achieve smooth operation of the drum and prevent eccentric operation. Another objective of the present invention is to provide a washing machine to achieve the effects that the drum has the dual functions of containing input washing water and washing the laundry through own rotation, then dirt is prevented from remaining in the drum of the washing machine and the drum of the washing machine is cleaning-free.

[0010] In order to solve the above technical problems, the basic idea of the technical solutions adopted by the present invention is as follows:

A washing machine includes a drum installed in a shell; wherein a side wall of the drum is provided with a port for feeding laundry, and an openable door body is arranged at the port for feeding laundry.

[0011] Further, the two ends of the drum are closed.

[0012] Further, the drum is a sealed container with no dehydration holes and only the port for feeding laundry formed on a side wall of an inner drum.

[0013] Further, at least one of the two ends of the drum in the axial direction is installed on the shell through a rotating shaft and connected to a rotor of a driving motor, so that the drum is installed in the shell and configured to rotate around the rotating shaft. Preferably, the rotating shaft is arranged coaxially with the axis of the drum.

[0014] Further, a side of the door body is hinged to a drum wall, and the other opposite side of the door body is provided with a locking structure for fixing with the drum; and preferably, the axis of a rotating shaft arranged at the hinge joint of the door body and the drum is parallel to the axis of the drum.

[0015] Further, the locking structure includes a lock hook arranged on an outer wall of the drum and being radially projecting, an extension end of the lock hook is bent towards away from the door body. The door body is provided with a handle hinged with the door body. The handle is provided with a lock bolt configured to rotate around a turning shaft. The handle is further provided with an elastic clamping jaw which can be elastically con-

tracted. After the door body is turned and closed, the lock bolt and the lock hook are locked and buckled, and the handle is fixed to the door body through the elastic clamping jaw, so that the door body and the drum are fixedly buckled.

[0016] Further, a rotating shaft is arranged on one side of the laundry inlet of the drum. Two ends of the rotating shaft are hinged and fixed to the drum. Hinge joints are respectively provided with dynamic seals. The side of the door body is correspondingly provided with rotating ribs being cylindrical and protruding outwards. The rotating ribs are provided with perforations which allow the rotating shaft to penetrate through and extend along the axis, so that the door body is installed on the rotating shaft in a relatively rotatable mode.

[0017] Further, the side of the door body which can turn outwards around a hinge shaft to open the door is installed on the drum., The peripheral edge of the door body correspondingly extends beyond the laundry entrance opening, so that the door body correspondingly covers a whole area of the laundry entrance opening after being closed. A circle of sealing ring is arranged at the contact position of the door body and the outer wall of the drum. The sealing ring extends along the edge of the laundry entrance opening. And preferably, the sealing ring is made of an elastic material, and the sealing ring is correspondingly fixed on the outer wall of the drum and arranged along the outer side of the laundry entrance opening, so that the sealing ring is clamped between the door body and the outer wall of the drum after the door body is buckled at the laundry entrance opening.

[0018] Further, the drum is arranged in a water containing part. A top of the water containing part is provided with an opening. The opening and the laundry entrance opening formed on an inner tub are correspondingly arranged in the same vertical cross section so that a user can open and close the laundry entrance opening through the opening. Preferably, the water containing part is an outer drum arranged coaxially with the drum, and the drum is provided with dehydration holes communicating with the outer drum. Or the water containing part is a groove which at least covers the lower half of the drum and is provided with an open upper portion.

[0019] Further, the opening of the water containing part is provided with a sealing door cover independently arranged; or the washing machine shell is provided with a door cover which can be opened by being turned outwards. The door cover closes the opening formed on the water containing part after being buckled. Preferably, a flexible sleeve is arranged between the water containing part and the shell. One end of the flexible sleeve is in sealed connection with the opening of the water containing part, and the other end of the flexible sleeve is in sealed connection with an opening formed on the shell, so that the water containing part is communicated with the outside through the flexible sleeve, and the door cover arranged on the shell is correspondingly buckled at the corresponding opening formed on the shell in an openable mode.

[0020] After being adopted the above technical solutions, the washing machine has the following beneficial effects compared with the prior art:

Through the above arrangement, the purposes are achieved, specifically, the laundry entrance opening is formed on the side wall of the drum of the washing machine, and the laundry entrance opening formed on the drum is correspondingly closed in a sealing mode by the door body or opened for taking or putting laundry. Meanwhile, the laundry entrance opening is formed on the side wall of the drum, thus a user can open the door body from the upper portion of the washing machine and take laundry from and put laundry into the drum. More particularly, the laundry inlet drum is sealed through the door body, therefore the drum can be arranged as a sealed container. During the washing process, the two ends of the drum are supported by rotating shafts, and the drum is prevented from eccentrically rotating.

[0021] By forming the laundry entrance opening on the drum side wall of the washing machine, which can be correspondingly opened and closed by the door body, the purpose of taking and putting laundry from the side wall of the drum by a user is realized. The overall structural layout of the drum washing machine is improved, and the user can conveniently observe the inside of the drum, and put laundry in and take laundry out. In addition, the drum is an inner drum without dehydration holes, which simplifies the structure of the whole washing machine, the two ends of the drum are supported and fixed by the rotating shafts, the rotation stability of the drum is improved, and noise and vibration during the operation of the washing machine are reduced.

[0022] Due to the drum of the washing machine being a sealed container without dehydration holes, the drum has the dual functions being as an outer drum for containing water and an inner drum capable of rotating at the same time. The situation that dirt remains on the outer wall of the inner drum and the inner wall of the outer drum due to the flow of washing water between the inner drum and the outer drum is avoided, the cleanliness of the drum of the washing machine is improved, and the purpose that the washing machine is cleaning-free is achieved.

[0023] The washing machine is simple in structure, significant in effect and suitable for application and popularization.

[0024] The specific embodiments of the present invention are described in further detail below in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The accompanying drawings are used as a part of the application for further understanding the present invention. The exemplary embodiments and descriptions of the present invention are used to explain the present invention, but do not constitute an improper limitation of the present invention. Apparently, the accompanying

drawings in the following description are only some embodiments, and those skilled in the art can also obtain other accompanying drawings based on these accompanying drawings without creative work. Wherein:

Fig. 1 is a schematic structural diagram of a washing machine in an embodiment of the present invention;
Fig. 2 is a schematic structural diagram of a washing machine with a machine door in a closed state in an embodiment of the present invention;
Fig. 3 is a schematic structural diagram of a washing machine with a machine door in an open state in an embodiment of the present invention;
Fig. 4 is a schematic structural diagram of a drum with a machine door in a closed state in an embodiment of the present invention;
Fig. 5 is a schematic structural diagram of a drum with a machine door in an open state in an embodiment of the present invention;
Fig. 6 is a schematic structural diagram of a port for feeding laundry of a washing machine drum in an embodiment of the present invention;
Fig. 7 is a schematic structural diagram of a cross section of a port for feeding laundry of a drum in an embodiment of the present invention; and
Fig. 8 is an enlarged schematic structural diagram of A in Fig. 7 in an embodiment of the present invention.

[0026] Wherein: 100. Shell; 200. Drum; 300. Door body; 400. Hinge structure; 500. Locking structure; 6. Sealing structure; 700. Door cover; 800. Outer drum; 1. Side wall; 2. Sealing part; 3. Port for feeding laundry; 4. Lock hook; 5. Handle; 6. Lock bolt; 7. Hinge shaft; 8. Protruding part; 9. Limiting rib; 10. Rotating rib; 11. Rotating shaft; 12. Sealing ring; 13. Groove; 14. Rotating shaft; and 15. Rotating groove.

[0027] It should be noted that these accompanying drawings and descriptions are not intended to limit the scope of the present invention in any way, but to explain the concept of the present invention for those skilled in the art by referring to specific embodiments.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0028] In order to make the objectives, technical solutions and advantages of the embodiments of the present invention clearer, the technical solutions in the embodiments are described clearly and completely in conjunction with the accompanying drawings in the embodiments of the present invention. The following embodiments are used to illustrate the present invention, but not to limit the scope of the present invention.

[0029] In the description of the present invention, it should be noted that the orientation or positional relationship indicated by the terms such as "upper", "lower", "inner", "outer" are based on the orientation or positional relationship shown in the accompanying drawings, are only for the convenience of describing the present invention and simplifying the description, rather than indicating or implying that referred devices or elements must have a specific orientation or be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation on the present invention.

[0030] In the description of the present invention, it should be noted that unless otherwise clearly specified and limited, the terms "installation" and "connection" should be interpreted in a broad sense. For example, it may be fixed connection, detachable connection or integral connection; it may be mechanical connection or electrical connection; and it may be direct connection or indirect connection through an intermediate medium. For those of ordinary skill in the art, the specific meaning of the above-mentioned terms in the present invention can be understood in specific situations.

[0031] Referring to Figs. 1 to 8, an embodiment of the present invention provides a washing machine which includes a drum 200 installed in a washing machine shell 100. The drum 200 includes a side wall 1 forming a cylindrical structure in an enclosing mode, and the two ends of the side wall 1 with cylindrical shape are blocked and sealed by sealing parts 2 correspondingly. The side wall 1 of the drum 200 is provided with a port for feeding laundry 3, the port for feeding laundry 3 is provided with an openable door body 300, and thus a user can perform taking and putting laundry from the port for feeding laundry 3 on the side wall 1 of the drum.

[0032] Through the above arrangement, it is achieved to form the port for feeding laundry on the side wall of the washing machine drum, and seal and close the port for feeding laundry by the door body and take and put laundry by opening the port for feeding laundry formed on the drum through the door body. Meanwhile, the port for feeding laundry is formed on the side wall of the drum, thus, the user can open the door body from the upper portion of the washing machine and take laundry from and put laundry into the drum. More specifically, the port for feeding laundry of the drum is sealed through the door body, therefore the drum can be set as a sealed container. During the washing process of the drum, both ends of the drum can be supported by rotating shafts, which avoids eccentric rotation of the drum.

Embodiment 1

[0033] As shown in Fig. 1, Fig. 4 and Fig. 5, the embodiment discloses a washing machine. A side wall 1 of a drum 200 is provided with a port for feeding laundry 3, and the port for feeding laundry 3 is provided with an openable door body 300.

[0034] By arranging the port for feeding laundry which can be correspondingly opened and closed through the door body on the side wall of the washing machine drum, the purpose of taking and putting laundry from the side wall of the drum is achieved. The overall structural layout of the drum washing machine is improved, and it is con-

venient for the user to observe the inside of the drum from top to bottom, and to put in and take out the laundry.

[0035] In the embodiment, the two ends of the side wall 1 with cylindrical shape of the drum 200 are sealed by sealing parts 2 correspondingly, so that the drum forms a sealed cylindrical chamber. The drum 200 may be a sealed container with no dehydration holes and only have the port for feeding laundry 3 formed on the side wall 1 of an inner tub, so that the drum in the embodiment has the dual purposes of rotating to beat and wash laundry and sealing and holding washing water, and the effect of integrating the inner tub with an outer tub of the drum washing machine into a single drum is achieved.

[0036] In the embodiment, in order to achieve the water inlet function of the drum forming the sealed container, any existing water inlet structure can be adopted. For example, sleeves are adopted as rotating shafts 11 connected to the center of the drum 200, and the two ends of each sleeve are communicated with a water inlet structure of the washing machine and the inside of the drum for inputting water into the drum through the sleeves. In order to achieve the dehydration and drainage functions of the drum being the sealed container, any existing dehydration and drainage structure can be arranged on the drum 200. For example: a drainage port is formed on the side wall 1, a centrifugal valve is installed at the drainage port correspondingly, so that a valve element of the centrifugal valve is opened by centrifugal force when the drum rotates at a high speed and the valve element of the centrifugal valve is closed by own braking force when the drum rotates at a low speed.

[0037] In the embodiment, at least one of the two ends of the drum 200 in the axial direction is installed on the shell 100 through the corresponding rotating shaft 11 and connected with a rotor of a driving motor, thus the drum 200 can be installed in the shell 100 in a mode of rotating around the shafts 11. Preferably, the rotating shafts 11 are arranged coaxially with the axis of the drum 200. Further preferably, the two sealed ends of the drum 200 are connected to the shell 100 through the rotating shafts 11 correspondingly, so that the two ends of the drum 200 are supported, and then the drum 200 does not rotate eccentrically during the rotating process. The washing machine may no longer be provided with a balance ring and other correction structures, the whole structure of the washing machine is simplified, the smooth operation of the whole machine is improved, and vibration and noise are reduced.

Embodiment 2

[0038] As shown in Figs. 1 to 5, an embodiment discloses a washing machine which includes a drum 200 installed in a shell 100. The axis of the drum 200 is horizontal or inclined, and a side wall of the drum 200 is provided with a port for feeding laundry 3, and the drum 200 is provided with a door body 300 which can be turned over to open and close the port for feeding laundry 3.

[0039] In the embodiment, the drum 200 includes a side wall 1 with cylindrical shape, and the two ends of the cylindrical side wall 1 are sealed by sealing parts 2 on the corresponding sides, so that the drum 200 forms a sealed cylindrical container. The side wall 1 with cylindrical shape is provided with an opening, the opening forms a port for feeding laundry 3, and the door body 300 can be turned outwards to open and cover the opening. Preferably, the axis of the drum 200 extends horizontally, and the two sealed ends of the drum 200 are hinged to the shell 100 of a washing machine through rotating shafts 11 respectively, so that the drum 200 is installed inside the shell 100 of a washing machine in a mode of rotating around the shafts.

[0040] In the embodiment, one side of the door body 300 is hinged to the drum 200 through a hinge structure 400, so that the door body is installed on the drum 200 in a mode of rotating around the shaft 14.

[0041] In the embodiment, the middle portion of the door body 300 protrudes toward the interior of the drum 200 to form protruding parts 8 extending from the port for feeding laundry 3 into the interior of the drum 200. The protruding parts 8 protrudes into the drum relative to the inner wall of the drum 200, so that the protruding parts 8 drive the laundry in the drum 200 to rotate along with the drum 200 and to generate lifting and throwing movements for washing laundry. The protruding part 8 has the function of drum lifting rib.

[0042] In the embodiment, the door body 300 is provided with at least one additive feeding part, and the additive feeding parts are communicated with the interior of the drum 200 through automatic feeding structures correspondingly, so that additives contained in the additive feeding parts are correspondingly fed into the drum 200. Preferably, the protruding parts 8 arranged on the door body 300 are hollow inside, and hollow chambers form one additive feeding part or more additive feeding parts mutually independent from each other.

[0043] In the embodiment, the outer periphery of the door body 300 is a smooth annular curved surface, and the annular curved surface is in close contact with the outer wall of the part, at the outer edge of the port for feeding laundry 3, of the drum 200. In the embodiment, a sealing ring 12 made of an elastic material is arranged at the corresponding contact position of the door body 300 and the drum 200 for correspondingly sealing the buckled contact position of the door body 300 and the drum 200.

[0044] In the embodiment, the top of the washing machine shell 100 is provided with a door cover 700 which can be turned upwards to open. The laundry entrance opening 3 formed on the drum 200 and the door cover 700 are overlapped in the vertical direction, so that a user can open and close the door body 300 located in the shell 100 and located at the laundry entrance opening inlet 3 of the drum through the opened door cover 700.

Embodiment 3

[0045] The embodiment is based on Embodiment 2, and further has the following technical characteristics. As shown in Figs. 2 and 3, in the embodiment, a shell 100 of a washing machine is further provided with an outer drum 800, and the upper end and the lower end of the outer drum 800 are connected to the upper portion and the lower portion of the shell of the washing machine correspondingly through hanging springs 82 and supporting parts 83, so that the outer drum 800 is installed in the shell 100 in a mode of generating vibration displacement. A drum 200 is coaxially arranged in the outer drum 800, and the two ends of the outer drum 800 are closed, so that the outer drum 800 forms a sealed container for containing water fed in washing machine.

[0046] In the embodiment, an opening is formed at the top of a side wall of the outer drum 800, and the opening corresponds to a laundry entrance opening 3 formed on a side wall 1 of the drum. As a result, after the drum 200 stops rotating, a user can control a door body 300 at the laundry entrance opening 3 to be opened and closed through the opening formed at the top of the side wall of the outer drum so as to put in and take out the laundry.

[0047] In the embodiment, the drum 200 arranged in the outer drum 800 is provided with a plurality of dehydration holes, and the interior of the drum 200 is communicated with a chamber between the drum 200 and the outer drum 800 via the dehydration holes.

[0048] In the embodiment, the opening on the top of the side wall of the outer tub 800 is correspondingly provided with an outer drum cover which is openable and can correspondingly seal the opening, so that the outer drum forms an independent sealed container during the operation of the washing machine. Alternatively as shown in Figs. 2 and 3, a door cover 700 is arranged on the top of the shell 100 of the washing machine. After the door cover 700 is buckled to the shell 100, the door cover 700 can correspondingly seal and close the opening formed on the outer drum 800, which can also achieve the purpose of correspondingly sealing the opening of the outer drum of the washing machine.

[0049] In the embodiment, in order to ensure the sealing of the outer drum and prevent washing water contained in the outer drum from flowing out of the opening, the following arrangement is further made.

[0050] In the embodiment, a flexible sleeve 81 extending upwards is connected to the opening of the outer drum 800, and the flexible sleeve 81 is composed of a corrugated pipe which can telescopically move axially and radially. One end of the flexible sleeve 81 is in sealed connection with the inner wall of the opening formed on the outer drum 800, and the other end of the flexible sleeve 81 is in sealed connection with the inner wall of a corresponding opening of the shell 100, so that the opening of the outer drum 800 is communicated with the corresponding opening on the shell 100 through the flexible sleeve 81, and the situation that the washing water in the outer drum flows from the opening to a space between the outer drum and the shell is avoided.

[0051] Meanwhile, in order to improve the convenience of operating the washing machine, a drum positioning device can be additionally arranged on the washing machine, so that when the drum stops rotating, the rotation stop position of the drum is always in the position where the laundry entrance opening formed on the drum faces the opening at the top of the shell. So a user controls the door body at the laundry entrance opening, and puts laundry into and takes laundry out of the drum through the laundry entrance opening.

Embodiment 4

[0052] As shown in Figs. 1 to 6, the embodiment discloses a locking structure applied to a drum door body of a washing machine described in any one of Embodiments 1-3. A side wall 1 of a drum is provided with a laundry entrance opening 3. A lock hook 4 of which an extension end is bent towards the opposite side of the door body 300 is arranged on the side wall 1 of the drum in a radially projecting mode. The door body 300 is provided with a handle 5 which is connected with door body in a hinge manner and can be locked and fixed. A lock bolt 6 which can rotate around turning shafts is arranged on the handle 5. After the door body 300 is turned over and closed, the lock blot 6 is locked and buckled with the lock hook 4, and the handle 5 is fixed to the door body 300, so that the door body 300 and the drum 200 are locked and fixed.

[0053] By arranging the locking structure, the door body at the laundry entrance opening on the side wall of the drum can be locked and fixed with the drum after being buckled, and the situation that the door body opens during the rotation process of the drum is avoided. Meanwhile, the aforementioned locking structure is stable, reliable, simple and suitable for application and popularization.

[0054] In the embodiment, the lock hook 4 is in a sheet shape, one end of the lock hook 4 is attached and fixed to the outer side wall of the drum 200 correspondingly, and the other end of the lock hook 4 is provided with an arc part bent toward the outside of the drum 200 and away from the door body 300.

[0055] In the embodiment, one end of the handle 5 with a strip-shaped is close to the corresponding lock hook 4 and is rotationally connected to the door body 300 through a hinge shaft 7. The other end of the handle 5 is provided with a lock structure for being locked and fixed with the drum 200.

[0056] In the embodiment, the lock structure includes an elastic clamping jaw which is arranged on the drum 200 and can be elastically contracted. The handle 5 is provided with a clamping hole corresponding to the elastic clamping jaw, so that the elastic clamping jaw is correspondingly clamped in the clamping hole after the two ends of the handle 5 are in close contact with the outer

wall of the drum 200 correspondingly, and then the handle 5 and the drum 200 are locked and fixed.

[0057] In the embodiment, a fixing base 16 is installed on the outer wall of the drum 200.

[0058] One end of the handle 5 is connected to the fixing base through the hinge shaft 7, the fixing base 16 is provided with the elastic clamping jaw, and the other end of the handle 5 is provided with the clamping hole correspondingly clamped with the elastic clamping jaw. Preferably, the two sides of the fixing base 16 are respectively provided with folded edges bent toward the outside of the drum 200. The two sides of the handle 5 are respectively attached to the outer walls of the folded edges for limiting. The two folded edges are respectively provided with elastic clamping jaws which can elastically telescope radially outwards, and the handle 5 is provided with clamping holes corresponding to the elastic clamping jaws on the sides.

[0059] In the embodiment, the lock bolt 6 is annular, one end of the lock bolt 6 with an annular shape penetrates through the handle 5 to form a turning shaft, and the opposite other end of the lock bolt 6 are correspondingly buckled into the bent part of the lock hook 4. The turning shaft around which the locking bolt 6 rotate is arranged away from the lock hook 4 relative to the hinge shaft 7 around which the handle 5 rotate, so that the lock bolt 6 and the lock hook 4 are tightened and locked when the handle 5 are rotated to attach to the drum 200, and the locking bolt 6 is separated from the lock hook 4 when the handle 5 is rotated to separate from the drum 200.

[0060] In the embodiment, the axes of the lock bolt 6, the handle 5 and the lock hook 4 are all set in any same section of the drum 200.

[0061] A washing machine according to the embodiment includes a drum 200 installed in a shell 100. A side wall 1 of the drum 200 is provided with a laundry entrance opening 3. The drum 200 is provided with a door body 300 capable of opening and closing the laundry entrance opening 3 in a turnable mode, one side of the door body 300 is hinged to the drum 200 through a hinge structure 400, and the opposite side of the door body 300 is connected to the drum 200 through one or more aforesaid locking structure 500.

[0062] In the embodiment, one side of the door body 300 is connected to the drum 200 through the locking structure 500. Meanwhile, in order to improve the locking stability of the door body and prevent the door body from opening during the rotation process of the drum in the embodiment, at least two locking structures 500 arranged at intervals are arranged on one side of the door body 300; and preferably, the portions, close to the two ends, of the same side of the door body 300 are each provided with one locking structure 500.

Embodiment 5

[0063] The difference between the embodiment and embodiment 4 is that: a lock hook 4 of a locking structure 500 is fixedly installed on the door body 300, and a lock bolt 6 is fixedly installed on a drum 200. The purpose of locking and fixing the door body 300 through the locking structures 500 after the door body 300 is buckled is also achieved.

[0064] The embodiment discloses the locking structure 500 for the door body of the drum of a washing machine. The side wall 1 of the drum is provided with the laundry entrance opening 3, and the lock hook 4 of which the extension end is bent towards the center of the door body 300 is arranged on one side of the door body in a radially projecting mode. The side wall 1 of the drum 200 is provided with the handle 5 which is hinged with the drum and can be locked and fixed. The lock bolt 6 which rotates around the turning shaft is arranged on the handle 5. After the door body 300 is turned over and closed, the lock blot 6 is locked and buckled with the lock hook 4, and the handle 5 is turned to lock and fix with the drum 200, so that the door body 300 and the drum 200 are locked and fixed (not specified in the drawings).

Embodiment 6

[0065] As shown in Figs. 1 to 8, the embodiment discloses a sealing structure 600 for a door body of a drum of a washing machine described in any one of Embodiments 1-3. The side wall 1 of a drum 200 is provided with a laundry entrance opening 3, and the laundry entrance opening 3 is provided with a door body 300 correspondingly buckled with each other. The joint of the door body 300 and the drum 200 is provided with a circle of sealing ring 12 extending along the outer edge of the laundry entrance opening 3, so that the joint of the door body 300 and the drum 200 is sealed by the sealing ring 12.

[0066] By arranging the above-mentioned sealing structure, the door body at the laundry entrance opening formed on the side wall of the drum is in sealed contact with the drum, which effectively prevents water in the drum from leaking from the laundry entrance opening to the outside of the drum.

[0067] In the embodiment, the outer periphery of the door body 300 is annular, and the lower side of the outer periphery with an annular shape is a smooth arc surface. The arc surface is in close contact with the outer wall of the drum 200 correspondingly. A circle of sealing ring 12 around the edge of the laundry entrance opening 3 is arranged at the close contact position, and the upper side and the lower side of the sealing ring 12 are sealed and fitted with the door body 300 and the drum 200 correspondingly.

[0068] In the embodiment, the drum is provided with a groove 13 inwardly recessed, and the groove bottom of the groove 13 is provided with a laundry entrance opening 3. There is space between the outer peripheral contour of the laundry entrance opening 3 and the outer periphery of the groove bottom by a certain gap. The door body 300 is correspondingly buckled in the groove 13, so that the outer periphery of the door body 300 after being buck-

led is correspondingly attached to the side wall of the groove 13; and the sealing ring 12 is correspondingly arranged at the groove bottom of the groove 13 corresponding to the outer periphery of the door body 300.

[0069] In the embodiment, the side wall of the groove 13 is provided with a circle of auxiliary sealing ring protruding toward the center of the groove, and the end of the auxiliary sealing ring is in close contact with the side wall of the door body 300 correspondingly, so that the side wall of the door body is in sealed contact with the drum correspondingly (not specified in the drawings).

[0070] In the embodiment, the sealing ring 12 is made of an elastically-deformable material.

[0071] Preferably, the sealing ring is made of a hollow sealing ring internally provided with at least one annular cavity. Further preferably, the sealing ring is made of an elastically-deformable rubber material.

[0072] In the embodiment, a plurality of sealing rings 13 are arranged at the position of the drum 200 where the door body 300 is buckled, and the two sides of each sealing ring 13 are sealed and attached to the door body 300 and the drum 200 correspondingly.

[0073] In the embodiment, the middle of the door body 300 is provided with a protruding part 8 protruding from the laundry entrance opening 3 to the interior of the drum 200, and the outer periphery of the protruding part 8 is in close contact with the inner wall of the laundry entrance opening 3 correspondingly when the door body 300 is buckled, so that the buckle sealing performance of the door body is further improved. Preferably, at least one sealing ring is arranged between the side wall of the door body and the inner wall of the laundry entrance opening, so that the joint of the side wall of the door body and the inner wall of the laundry inlet is additionally sealed, which significantly improves the sealing performance of the door body.

Embodiment 7

[0074] The difference between the embodiment and Embodiment 6 is that a sealing ring is fixedly installed on a door body correspondingly. The purpose of fixedly installing the sealing ring and performing corresponding sealing connection on the joint of the door body and a drum is also achieved.

[0075] In the embodiment, on a smooth arc surface of the outer periphery of the door body 300 is provided with a circle of groove 13 which extends along an opening of a laundry entrance opening 3 and is open toward the drum, and a sealing ring 12 is correspondingly pressed into the groove 13. The lower end of the sealing ring 12 protrudes from a groove opening so as to be in close contact with the outer wall of the drum after the door body is buckled (not specified in the drawings).

Embodiment 8

[0076] As shown in Figs. 1 to 8, the embodiment discloses a hinge structure applied to the door body of a drum of a washing machine according to any one of the above Embodiments 1-3. The drum is provided with a rotating shaft, and the rotating shaft penetrates one side of the door body correspondingly, so that the door body is hinged and installed on the drum in a mode of rotating around the rotating shaft, and then the door body is turned over to open and close and buckled to the laundry entrance opening formed on a side wall of the drum.

[0077] By arranging the above-mentioned hinge structure on the door body at the laundry entrance opening on the side wall of the drum, the door body which is opened by being turned outwards is installed on the drum, so that the smoothness of the door opening and closing process is ensured. Meanwhile, the drum is not provided with a through hole hinged to the door body, thus, the sealing performance of the drum is effectively ensured, and water is prevented from leaking from the hinged joint of the drum.

[0078] In the embodiment, the corresponding side of the door body 300 is provided with a rotating rib 10 protruding outward, and the rotating rib 10 is provided with perforation which allow the rotating shaft 14 to penetrate through and extend along the axis, so that the door body 300 is installed on the rotating shaft 14 in a relatively rotatable mode.

[0079] In the embodiment, the drum 200 is provided with a rotating shaft groove 15 recessed inwards. The rotating shaft 14 is arranged in the rotating shaft groove 15, and the two ends of the rotating shaft 14 are respectively connected to the groove wall of the rotating shaft groove 15. The rotating shaft groove 15 is a groove of which the upper portion is open. The rotating rib 10 arranged on the corresponding side of the door body 300 is correspondingly installed in the rotating shaft groove 15, and the rotating shaft 14 penetrates through the through hole on the rotating rib 10.

[0080] In the embodiment, the two ends of the rotating rib 10 in the axial direction are in limiting contact with the side walls of the rotating shaft groove 15, so that the rotating rib 10 is prevented from moving axially during rotation.

[0081] In the embodiment, on the corresponding side of the door body 300 is provided with a plurality of rotating ribs 10 arranged at intervals. The rotating shaft groove 15 of the drum 200 is internally provided with a plurality of limiting ribs 9 protruding outward at intervals along the axis direction, and the rotating ribs 10 and the limiting ribs 9 are arranged alternately.

[0082] In the embodiment, the two ends of each rotating rib 10 are in limiting contact with the corresponding ends of the limiting ribs 9 adjacent to the two sides for further improving the stability of the door body 300 during the rotation process and effectively preventing the door body 300 from moving axially.

[0083] In the embodiment, the rotating shaft 14 sequentially penetrates through the through holes formed at the ends of the rotating shaft groove 15, the through

holes formed on the rotating ribs 10 on the corresponding side of the door body 300, and the through holes formed on the limiting ribs 9 arranged in the rotating shaft groove 15. Preferably, the through holes formed on the rotating shaft groove 15, the rotating ribs 10 and the limiting ribs 9 are coaxial.

[0084] In the embodiment, the rotating shaft 14 sequentially penetrates through the through holes formed at the ends of the rotating shaft groove 15, the through holes formed on the rotating ribs 10 on the corresponding side of the door body 300, and the through holes formed on the limiting ribs 9 arranged in the rotating shaft groove 15. Preferably, the through holes formed on the rotating shaft groove 15, the rotating ribs 10 and the limiting ribs 9 are coaxial. Alternatively, in the embodiment, the two ends of the rotating shaft 14 are fixedly connected to the corresponding side walls of the rotating shaft groove 15, so that the rotating shaft 14 is fixedly installed in the rotating shaft groove 15. So the door body 300 rotates around the rotating shaft 14, the rotating shaft 14 does not penetrate into the interior of the drum 200. The sealing performance of the drum at the joint of the rotating shaft 14 is ensured, and the purpose of rotating the door body 300 around the shaft is achieved.

[0085] The above embodiments are only the preferred embodiments of the present invention, and do not limit the present invention in any form. Although the present invention has been disclosed as above in preferred embodiments, the present invention is not limited thereto. Any skilled person in the art familiar with this patent application can make some equivalent changes such as variations or modifications into equivalent embodiments according to the content described above without departing from the scope of the technical solutions of the present invention. Any simple variations, equivalent changes and modifications made to the above embodiments based on the technical essence of the present invention without departing from the content of the technical solutions of the present invention still fall within the scope of the present invention.

Claims

1. A washing machine, comprising, a drum installed in a shell; wherein, a side wall of the drum is provided with a laundry entrance opening , and an door body being openable is arranged on the laundry entrance opening .

2. The washing machine according to claim 1, wherein two ends of the drum are closed.

3. The washing machine according to claim 2, wherein the drum is a sealed container with no dehydration holes and only the laundry entrance opening formed on the side wall of an inner drum.

4. The washing machine according to any one of claims 1 to 3, wherein at least one of the two ends of the drum in an axial direction is installed on the shell through a rotating shaft and connected with a rotor of a driving motor, so that the drum is installed in the shell and configured to rotate around the rotating shaft.

5. The washing machine according to claim 4, wherein the rotating shaft is arranged coaxially with an axis of the drum.

6. The washing machine according to any one of claims 1 to 3, wherein a side of the door body is hinged to the side wall of the drum, and the other opposite side of the door body is provided with a locking structure for fixing with the drum.

7. The washing machine according to claim 6, wherein an axis of a rotating shaft arranged at a hinge joint of the door body and the drum is parallel to the axis of the drum.

8. The washing machine according to claim 6, wherein the locking structure comprises a lock hook arranged on an outer wall of the drum and being radially projecting, an extension end of the lock hook is bent towards away from the door body,
the door body is provided with a handle hinged with the door body, the handle is provided with a lock bolt configured to rotate around a turning shaft,
the handle is provided with an elastic clamping jaw configured to be elastically contracted,
after the door body is turned and closed, the lock bolt and the lock hook are locked and buckled, and the handle is fixed to the door body through the elastic clamping jaw, and the door body and the drum are fixedly buckled.

9. The washing machine according to claim 8, wherein a rotating shaft is arranged on one side of the laundry entrance opening of the drum, two ends of the rotating shaft are hinged and fixed to the drum, hinge joints are respectively provided with dynamic seals, the side of the door body is provided with a rotating rib being cylindrical and protruding outwards, and the rotating rib is provided with a through hole which allows the rotating shaft to penetrate through and extend along the axis, so that the door body is installed on the rotating shaft in a relatively rotatable mode.

10. The washing machine according to claim 6, wherein, the side of the door body which is configured to turn outwards around a hinge shaft is installed on the drum, a peripheral edge of the door body is configured to correspondingly extend beyond the laundry entrance opening, so that the door body covers a

whole area of the laundry entrance opening after being closed; and
a circle of sealing ring is arranged at a contact position of the door body and the outer wall of the drum, and the sealing ring is configured to extend along the edge of the laundry entrance opening.

11. The washing machine according to claim 10, wherein the sealing ring is made of an elastic material, and the sealing ring is fixed on the outer wall of the drum and arranged along an outer side of the laundry entrance opening, so that the sealing ring is clamped between the door body and the outer wall of the drum after the door body is buckled at the laundry entrance opening.

12. The washing machine according to any one of claims 1 to 3, wherein, the drum is arranged in a water containing part, a top of the water containing part is provided with an opening, and the opening and the laundry entrance opening formed on the inner drum are correspondingly arranged in a same vertical cross section so that a user open and close the laundry entrance opening through the opening.

13. The washing machine according to claim 12, wherein the water containing part is an outer drum arranged coaxially with the drum, and the drum is provided with dehydration holes communicating with the outer drum; or the water containing part is a groove of which at least covers a lower portion of the drum and is provided with an opening on an upper portion.

14. The washing machine according to claim 12, wherein the opening of the water containing part is provided with a sealing door cover independently arranged; or the shell of the washing machine is provided with a door cover configured to be opened by being turned outwards, and the door cover correspondingly closes the opening formed on the water containing part after being buckled.

15. The washing machine according to claim 14, wherein a flexible sleeve is arranged between the water containing part and the shell, one end of the flexible sleeve is in sealed connection with the opening of the water containing part, and another end of the flexible sleeve is in sealed connection with an opening formed on the shell, so that the water containing part is communicated with the outside through the flexible sleeve, and the door cover arranged on the shell is buckled at the opening formed on the shell in an openable mode.

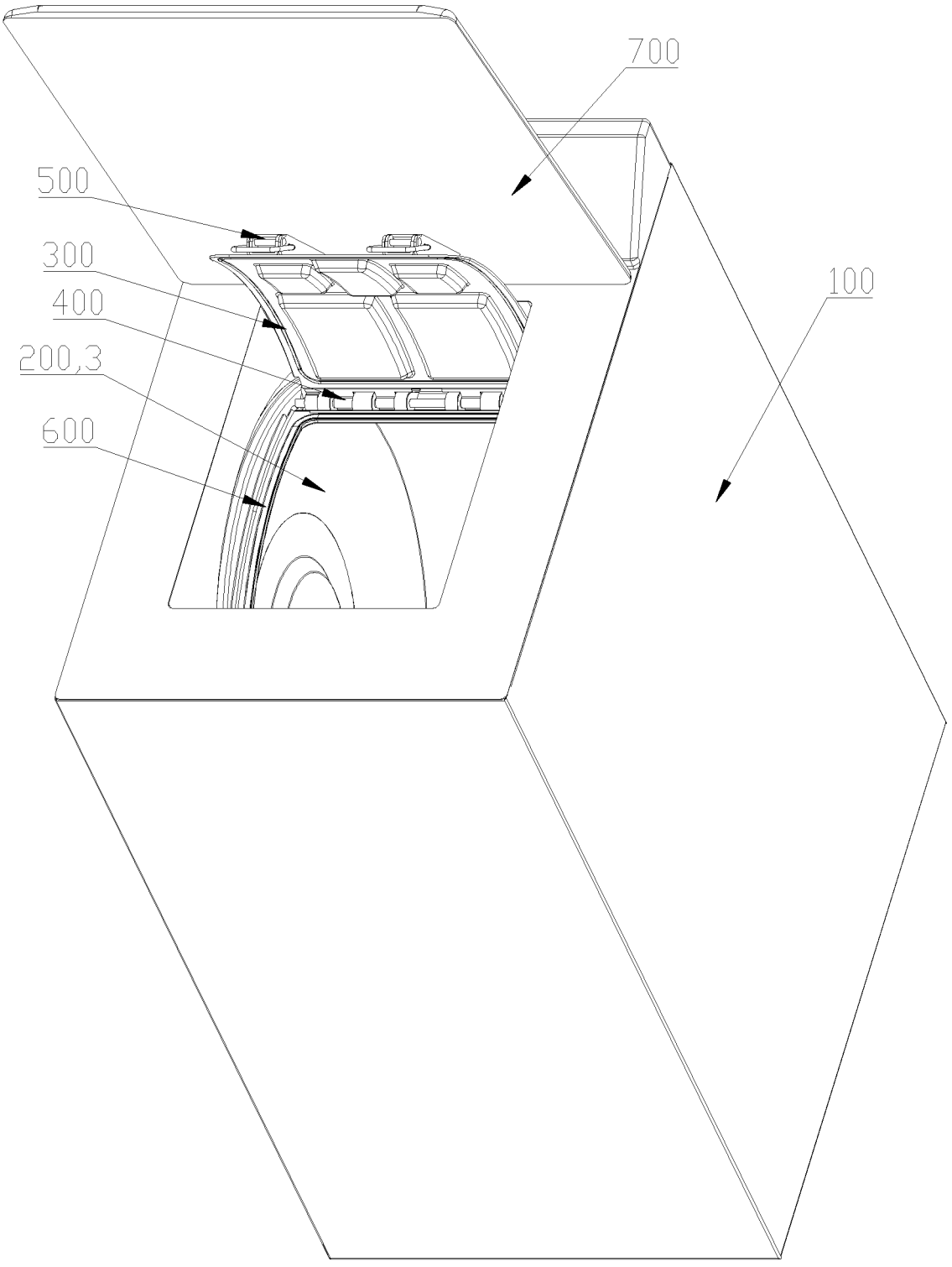

Fig. 1

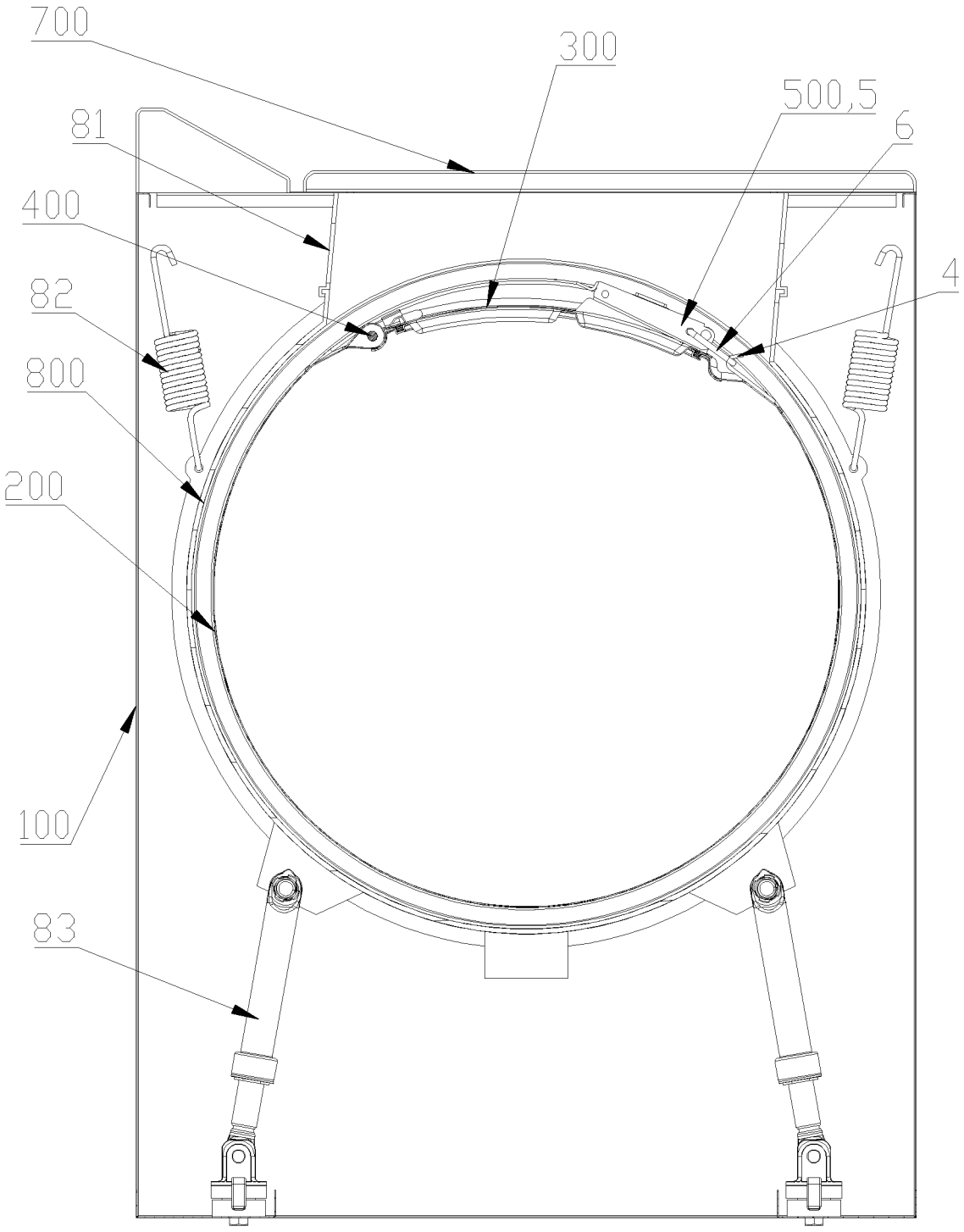

Fig. 2

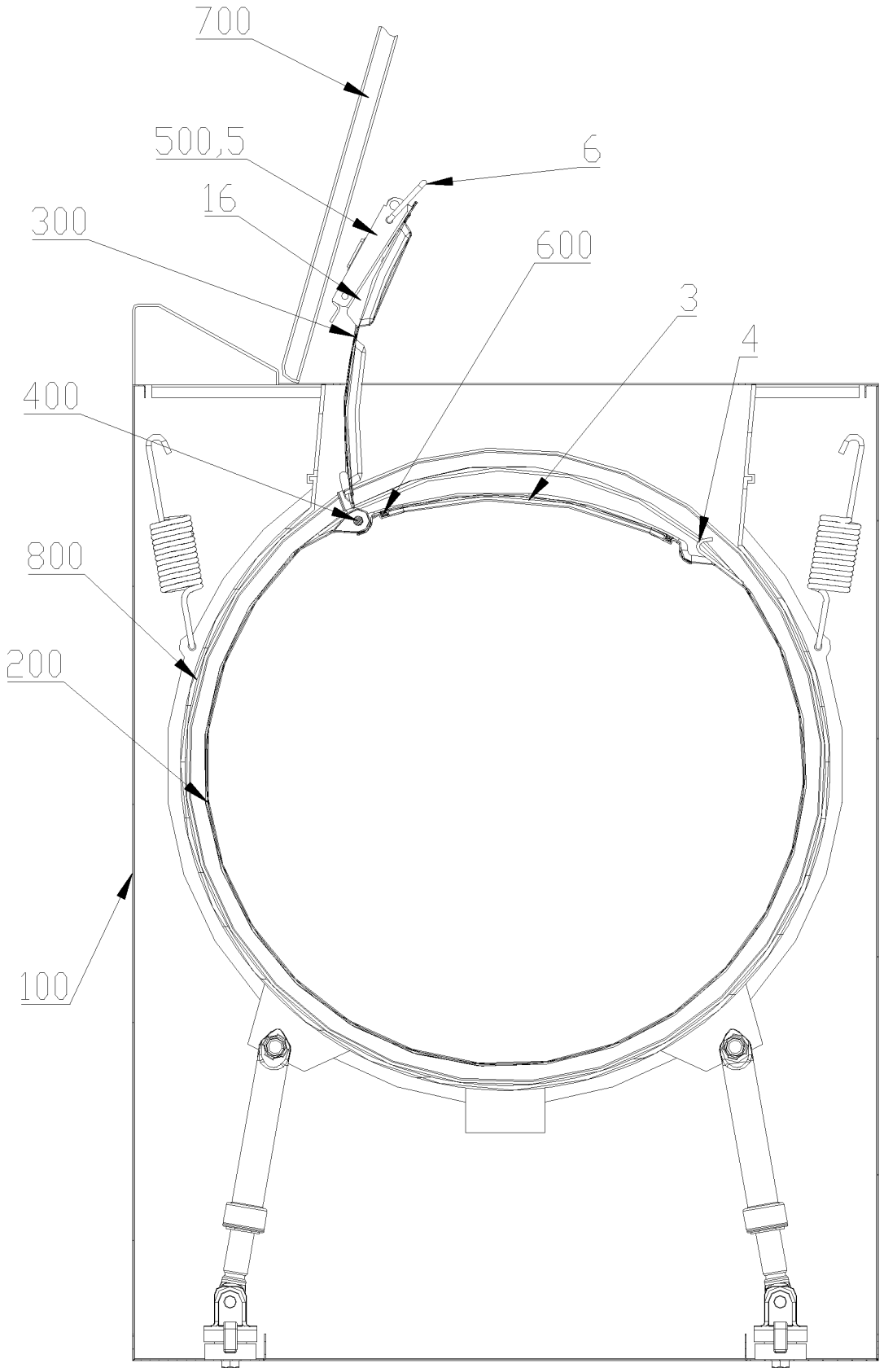

Fig. 3

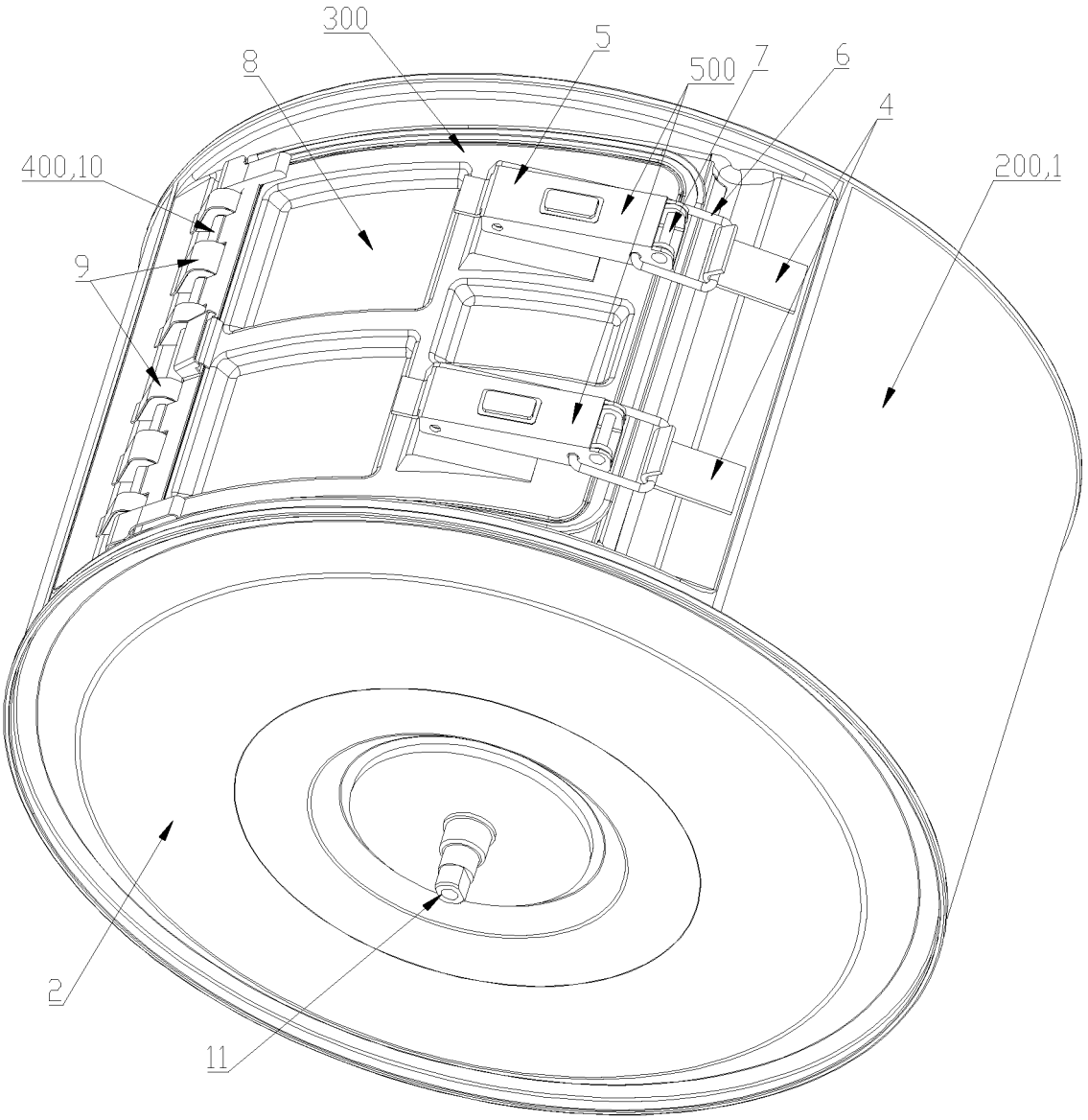

Fig. 4

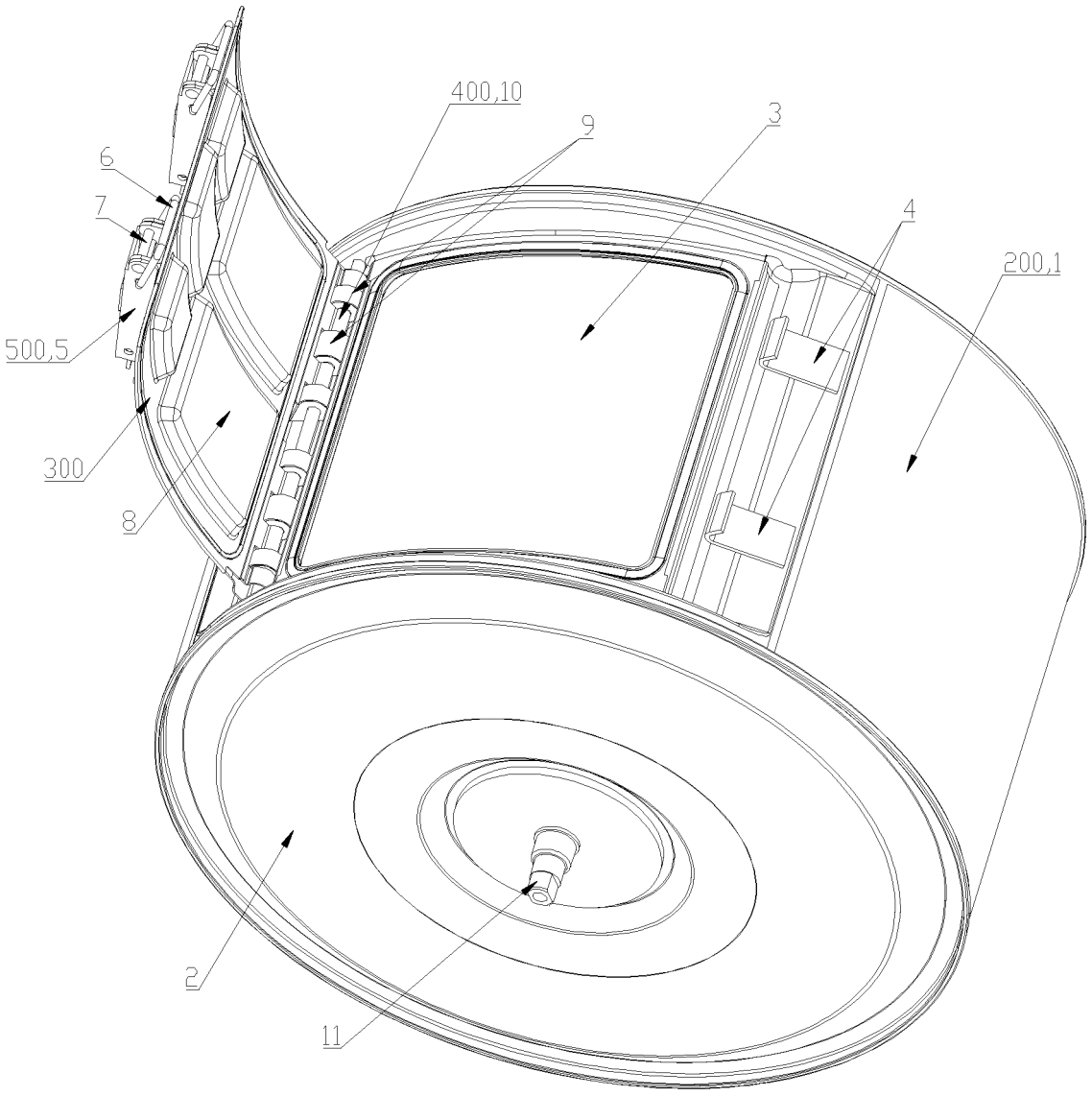

Fig. 5

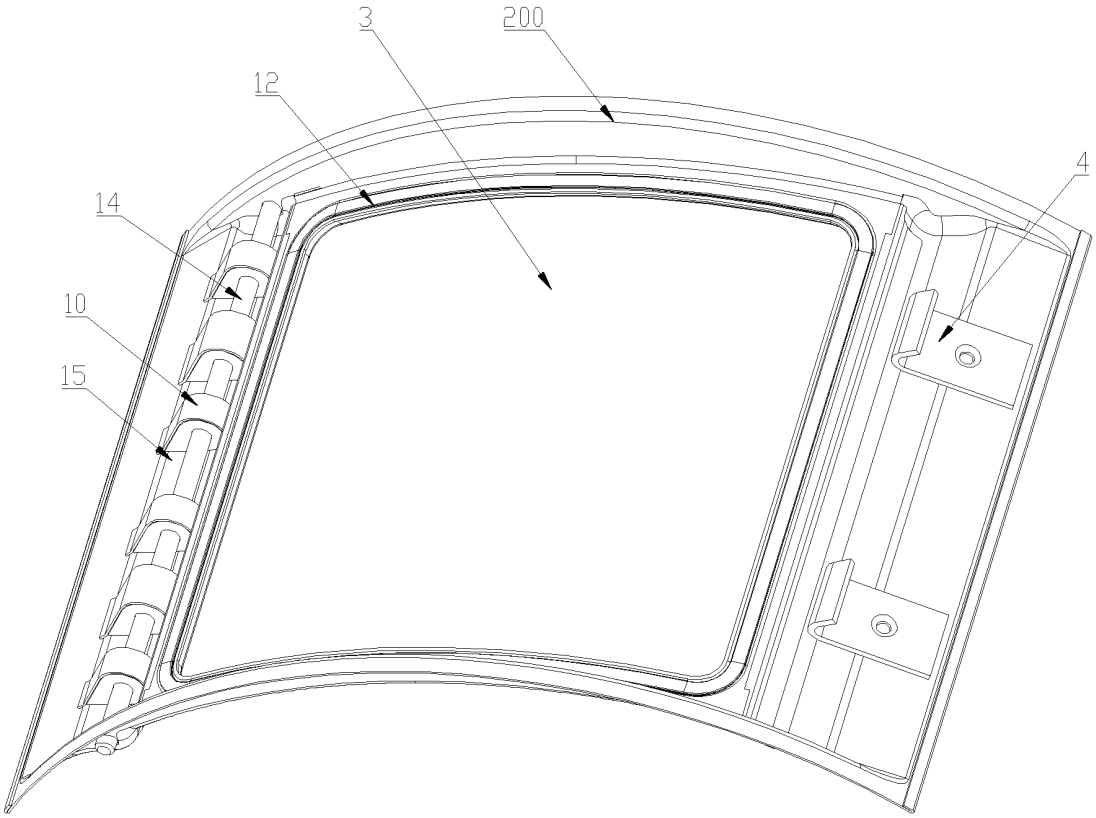

Fig. 6

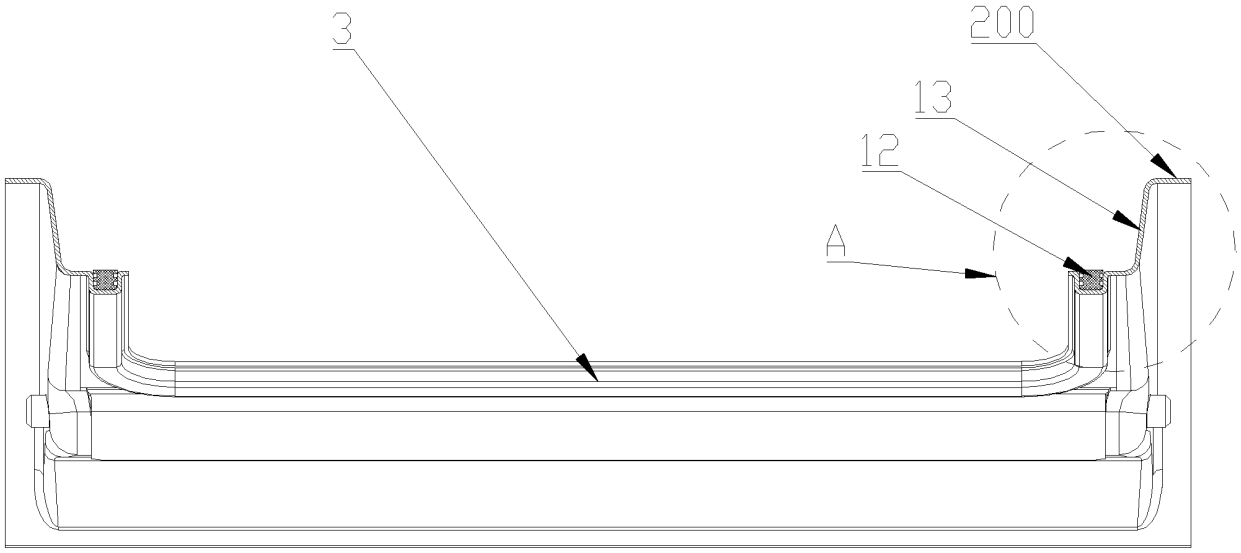

Fig. 7

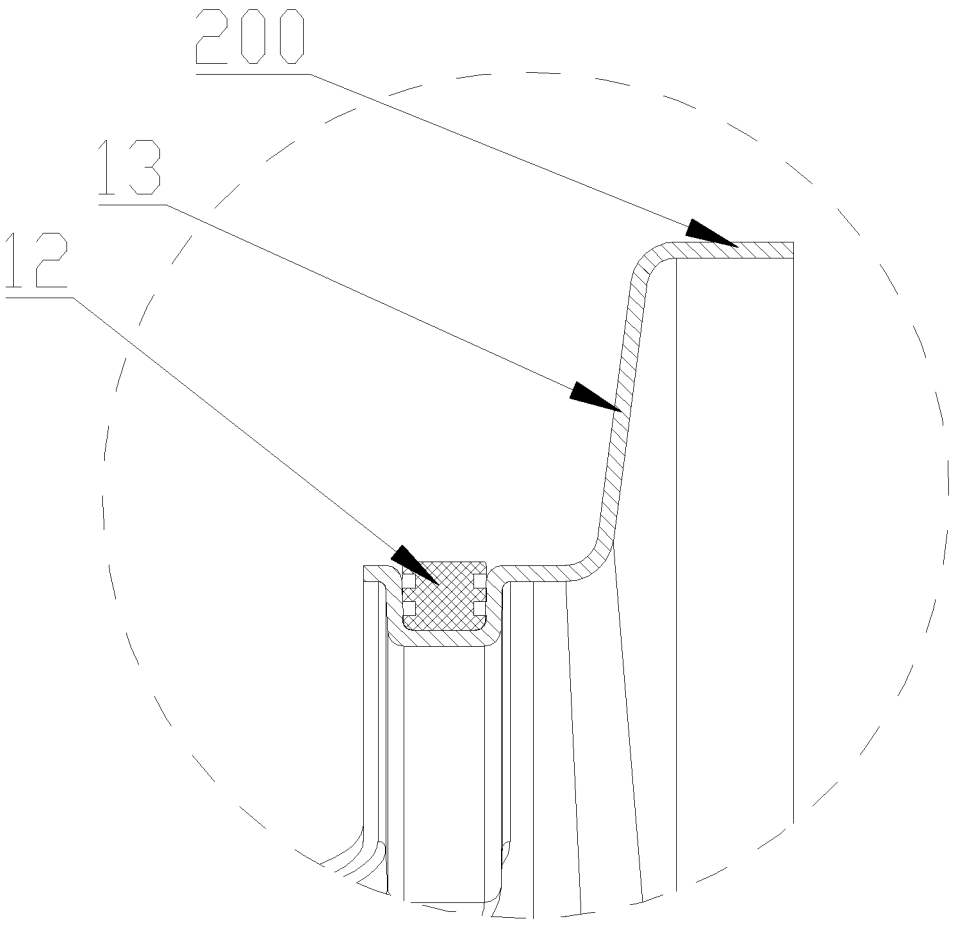

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/088284

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/14(2006.01)i; D06F 37/10(2006.01)i; D06F 37/26(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F

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

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

CNPAT, CNKI, WPI, EPODOC: 海尔, 洗衣机, 滚筒, 侧, 顶开, 上开, 锁, 柔性套筒, 波纹管, wash+, drum?, side?, peripheral, top, load+, lock+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004231062 A1 (EQUATOR CORP.) 25 November 2004 (2004-11-25) description, paragraphs 24-42, and figures 1-6	1-7, 10, 11
Y	US 2004231062 A1 (EQUATOR CORP.) 25 November 2004 (2004-11-25) description, paragraphs 24-42, and figures 1-6	8, 9, 12-15
Y	CN 204199903 U (SUZHOU D SNAP TECHNOLOGIES CO., LTD.) 11 March 2015 (2015-03-11) description, paragraphs 29-34, and figures 1-9	8, 9
Y	EP 2415924 A1 (ELECTROLUX HOME PRODUCTS CORPORATION N.V.) 08 February 2012 (2012-02-08) description, paragraphs 16-22, and figure 1	12-15
A	CN 102619066 A (TANG, XIANGYUN) 01 August 2012 (2012-08-01) entire document	1-15
A	CN 101333754 A (JIANGSU SEA-LION MACHINERY GROUP) 31 December 2008 (2008-12-31) entire document	1-15

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"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
07 August 2019	**28 August 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/088284

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 207391826 U (QINGDAO HAIER WASHING MACHINE CO., LTD.) 22 May 2018 (2018-05-22) entire document	1-15
A	CN 207031791 U (QINGDAO HAIER WASHING MACHINE CO., LTD.) 23 February 2018 (2018-02-23) entire document	1-15
A	CN 202450300 U (REN, QICHENG) 26 September 2012 (2012-09-26) entire document	1-15

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/088284

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
US 2004231062 A1	25 November 2004	WO 2004106612 A2	09 December 2004
CN 204199903 U	11 March 2015	None	
EP 2415924 A1	08 February 2012	RU 2011133126 A	10 February 2013
CN 102619066 A	01 August 2012	None	
CN 101333754 A	31 December 2008	None	
CN 207391826 U	22 May 2018	None	
CN 207031791 U	23 February 2018	None	
CN 202450300 U	26 September 2012	None	

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