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(54) FRONT-LOADING WASHING MACHINE

(57) The present disclosure discloses a front-loading washing machine (1) including a cabinet (100) having a front panel (110), wherein the front panel (110) is provided with an opening (111); a tub having an access port for loading and unloading clothes, wherein the tub is disposed in the cabinet (100) and configured in such a manner that the access port is capable of being moved up and down in the opening; a rotatable drum disposed in the tub; a door unit (300) mounted to the tub and configured to cover the access port; and a driving mechanism configured to drive the tub to rotate, wherein the driving mechanism is provided in the cabinet (100) and coupled with the tub. Compared with a front-loading washing machine having an access port disposed in a front surface in the related art, the front-loading washing machine according to embodiments of the present disclosure can make the access port move to a suitable position for a user to load clothes or unload them, and make the access port move to a suitable position for washing the clothes, such that the clothes can be loaded or unloaded, and washed conveniently.

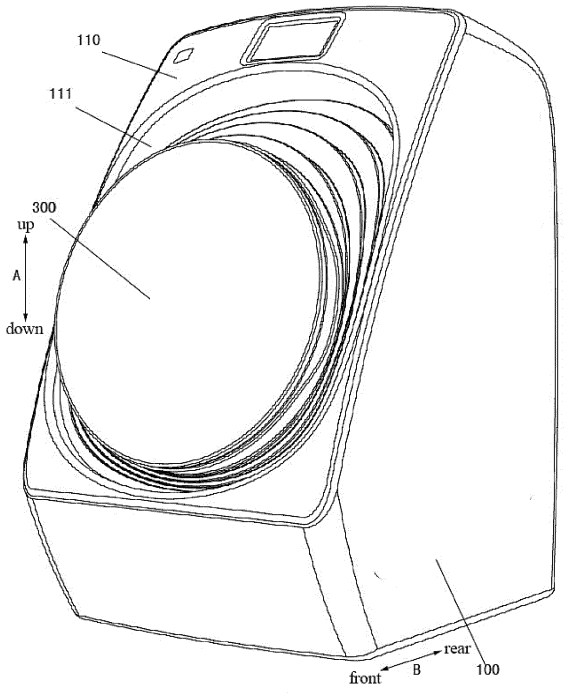

Fig. 1

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Description

FIELD

[0001] The present disclosure relates to a technical field of washing machine, and more particularly to a front-loading washing machine.

BACKGROUND

[0002] In the related art, a washing machine includes a front-loading washing machine and a pulsator type washing machine. When a pulsator type washing machine is used for washing clothes, the clothes need to be fully soaked in water, so the pulsator type washing machine is poor in water conservation. A user has to stoop and crouch for loading clothes or unloading them when using the front-loading washing machine, so the front-loading washing machine is very inconvenient to use, particularly difficult for elderly people and other special populations to operate.

SUMMARY

[0003] The present disclosure seeks to solve at least one of the problems existing in the related art to at least some extent. Therefore, the present disclosure provides a front-loading washing machine which has advantages of high space utilization rate, convenient usage, small clothes abrasion, and water saving.

[0004] The front-loading washing machine according to embodiments of the present disclosure includes a cabinet having a front panel, in which the front panel is provided with an opening; a tub having an access port for loading and unloading clothes, in which the tub is disposed in the cabinet and configured in such a manner that the access port is capable of being moved up and down in the opening; a rotatable drum disposed in the tub; a door unit mounted to the tub and configured to cover the access port; and a driving mechanism configured to drive the tub to rotate, in which the driving mechanism is provided in the cabinet and coupled with the tub.

[0005] Compared with a front-loading washing machine having an access port disposed in a front surface in the related art, the front-loading washing machine according to the embodiments of the present disclosure can make the access port move to a suitable position for a user to add clothes or take clothes out when the user needs to load the clothes or unload them, and make the access port move to a suitable position for washing the clothes, such that the clothes can be loaded or unloaded, and washed conveniently. The washing machine is simple and compact in structure, convenient to use and low in clothes abrasion, and can save water.

[0006] In addition, the front-loading washing machine according to the embodiments of the present disclosure may further have following additional technical features.

[0007] According to an embodiment of the present disclosure, the driving mechanism is configured to drive the access port to move up and down between a washing position and a non-washing position in the opening.

[0008] According to an embodiment of the present disclosure, when the access port is located at the non-washing position, the access port is driven to move close to an upper edge of the front panel, and when the access port is located at the washing position, the access port is driven to move close to a lower edge of the front panel.

[0009] According to an embodiment of the present disclosure, the driving mechanism is configured to drive the access port to move upwards to close to an upper edge of the front panel and move downwards to close to a lower edge of the front panel.

[0010] According to an embodiment of the present disclosure, a motion range of the access port in the opening is configured in such a manner that an included angle between a central axis of the access port and a horizontal plane ranges from 0° to 90°.

[0011] According to an embodiment of the present disclosure, the driving mechanism includes: a longitudinal pushrod disposed at a front side of the tub; a transverse shaft disposed at a rear side of the tub and coupled to the tub; and a support frame disposed in the cabinet and having a hole, in which the transverse shaft is configured to rotate in the hole of the support frame.

[0012] According to an embodiment of the present disclosure, the front-loading washing machine further includes a drain pump, mounted to the tub; a drain internal tube mounted to the tub and connected with an inlet of the drain pump; and a drain external tube, configured to be a flexible elastic tube, connected with an outlet of the drain pump and extending out of the cabinet.

[0013] According to an embodiment of the present disclosure, the drain internal tube and the drain pump are mounted to a bottom of the tub.

[0014] According to an embodiment of the present disclosure, the drain internal tube is connected with the inlet of the drain pump through an internal tube hoop, and the drain external tube is connected with the outlet of the drain pump through an external tube hoop.

[0015] According to an embodiment of the present disclosure, the drain pump is mounted to the tub through a threaded fastener.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

Fig. 1 is a schematic view of a front-loading washing machine according to embodiments of the present disclosure, in which the access port is located at a washing position;

Fig. 2 is a partially schematic view of a front-loading washing machine according to embodiments of the present disclosure, in which the access port is located at the washing position;

Fig. 3 is a partially schematic view of a front-loading

washing machine according to embodiments of the present disclosure, in which the access port is located at a non-washing position;

Fig. 4 is an assembly view of a tub and a drain assembly of a front-loading washing machine according to embodiments of the present disclosure.

Fig. 5 is a top view of the tub and the drain assembly of the front-loading washing machine shown in Fig. 4.

Reference numerals:

[0017]

front-loading washing machine 1 ;
cabinet 100; front panel 110; opening 111;
tub 200;
door unit 300;
driving mechanism 400; longitudinal pushrod 410; transverse shaft 420; support frame 430; hole 431;
drain assembly 500; drain pump 510; drain internal tube 520; drain external tube 530.

DETAILED DESCRIPTION

[0018] Reference will be made in detail to embodiments of the present disclosure. Examples of the embodiments are shown in the drawings. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to drawings are explanatory, illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

[0019] In the following, a front-loading washing machine according to embodiments of the present disclosure will be described with reference to Fig. 1 to Fig. 5.

[0020] As shown in Fig. 1 to Fig. 3, the front-loading washing machine 1 according to the embodiments of the present disclosure includes a cabinet 100, a tub 200, a rotatable drum (not shown in the figures), a door unit 300 and a driving mechanism 400.

[0021] The cabinet 100 has a front panel 110 (a front-and-back direction is indicated by an arrow B shown in Fig. 1 to Fig. 3), and the front panel 110 has an opening 111 formed therein. The tub 200 has the access port, and is disposed in the cabinet 100 and configured to make the access port move up and down (an up-and-down direction is indicated by an arrow A shown in Fig. 1 to Fig. 3) in the opening 111. The drum is disposed in the tub 200. The door unit 300 is mounted to the tub 200 and covers the access port. The driving mechanism 400 is used for driving the tub 200 to move, and the driving mechanism 400 is configured in the cabinet 100 and coupled with the tub 200.

[0022] In the front-loading washing machine 1 according to the embodiments of the present disclosure, the tub 200 is configured to make the access port move up and down in the opening 111. Hence, compared with a front-loading washing machine having an access port disposed in a front surface in the related art, the washing machine 1 can make the access port move to a suitable position for a user to load clothes or unload them, for example, making the access port move upwards. The user does not need to stoop or crouch when loading clothes or unloading them. Therefore, not only ordinary users can conveniently add clothes or take clothes out via the access port, but also elderly people and other users who cannot stoop easily can load clothes or unload them successfully, which improves convenience of the washing machine 1.

[0023] Furthermore, as the access port may move up and down in the opening 111, the access port can be moved to a position for washing clothes after the clothes are added. For example, the access port can be moved downwards. When the clothes are washed, the drum can roll to drive the clothes to be beaten up and down so as to be washed, which not only reduces abrasion on the clothes, but also no longer needs to fully soak the clothes in water - instead, only needs a small amount of water for washing, thus reducing water consumption and facilitating environment protection.

[0024] In addition, the driving mechanism 400 is provided to drive the tub 200. The user can operate the driving mechanism 400 to drive the tub 200 when the user needs to adjust a position of the access port. The user can adjust a position of the tub 200 more effortlessly, to facilitate adjusting the position of the tub 200, so as to further improve convenience when the elderly people and similar users use the washing machine 1.

[0025] That is, in the washing machine 1, the tub 200 is configured to make the access port move up and down in the opening 111, and the driving mechanism 400 is provided to drive the tub 200 to move. In such a way, the washing machine 1 can not only achieve a washing effect as a common front-loading washing machine when washing clothes, but also adjust the access port to a suitable position for loading clothes or unloading them, which overcomes the problem that clothes cannot be conveniently loaded or unloaded from a front-loading washing machine in the related art, and hence makes it convenient for the user to use.

[0026] Accordingly, the front-loading washing machine 1 according to the embodiments of the present disclosure has the advantages of user-friendliness, little clothes abrasion, water saving and the like.

[0027] In the following, the front-loading washing machine 1 according to specific embodiments of the present disclosure will be described with reference to the drawings.

[0028] In some specific embodiments of the present disclosure, as shown in Fig. 1 to Fig. 3, the front-loading washing machine 1 according to the embodiments of the present disclosure includes the cabinet 100, the tub 200, the rotatable drum, the door unit 300 and the driving mechanism 400.

[0029] The driving mechanism 400 drives the access port to move up and down between a non-washing position and a washing position in the opening 111. Thus, the driving mechanism 400 can be used for driving the tub 200 to make the access port move to the washing position so as to wash clothes, when the clothes needs washing; and the driving mechanism 400 can be used for driving the tub 200 to make the access port move to the non-washing position convenient for the user to add clothes or take clothes out, when the clothes does not need washing.

[0030] Specifically, as shown in Fig. 1 to Fig. 3, when the access port is located at the non-washing position (as shown in Fig. 3), the access port is driven to move close to an upper edge of the front panel 110. When the access port is located at the washing position (as shown in Fig. 1 and Fig. 2), the access port is driven to move close to a lower edge of the front panel 110. Hence, when the user needs to load the clothes or unload them, the access port can be moved close to the upper edge of the front panel 110 to make it convenient for the user to load the clothes or unload them from above; and when the user needs to wash the clothes, the access port can be moved close to the lower edge of the front panel 110 to wash the clothes through rolling of the drum.

[0031] Specifically, as shown in Fig. 1, the front panel 110 can incline backwards from the bottom up, so as to further make it convenient for the user to load the clothes or unload them when the access port moves to the non-washing position.

[0032] Advantageously, as shown in Fig. 2 and Fig. 3, the driving mechanism 400 is configured to drive the access port to move upwards to approach the upper edge of the front panel 110 and move downwards to approach the lower edge of the front panel 110. When the user needs to load the clothes or unload them, the user can operate the driving mechanism 400 to make the access port move upwards to approach the upper edge of the front panel 110, so as to adjust the position of the access port conveniently; and when the user needs to wash the clothes, the user can operate the driving mechanism 400 to make the access port move downwards to approach the lower edge of the front panel 110, so as to wash the clothes through rolling of the drum.

[0033] Optionally, the access port has a motion scope in the opening 111 configured in such a way that an included angle between a central axis of the access port and a horizontal plane is 0 degree to 90 degrees. In other words, the access port can move between a first position where the central axis thereof lies horizontally and a second position where the central axis thereof stands vertically. Specifically, when the access port is located at the non-washing position suitable for loading clothes or unloading them, the central axis of the access port can be oriented along a vertical direction; and when the access port is located at the washing position suitable for washing the clothes, the central axis of the access port can be oriented along a horizontal direction. Thus, it is convenient for the user to load or unload the clothes from above and to wash the clothes through rolling of the drum.

[0034] Those skilled in the related art should understand that a motion standard of the access port can be adjusted according to actual needs. For example, when the access port is located at the non-washing position (as shown in Fig. 3), the central axis of the access port can incline forwards from the bottom up, which can also make it convenient for the user to load the clothes or unload them . When the access port is located at the washing position (as shown in Fig. 1 and Fig. 2), the central axis of the access port can also have a predetermined included angle relative to the horizontal direction on the premise that the clothes in the drum can be washed in a rolling way.

[0035] Figs. 1-3 show the front-loading washing machine 1 according to a specific embodiment of the present disclosure. As shown in Fig. 1 to Fig. 3, the driving mechanism 400 includes a longitudinal pushrod 410 disposed at a front side of the tub 200, a transverse shaft 420 disposed at a rear side of the tub 200 and coupled with the tub 200, and a support frame 430 disposed to the cabinet 100 and having a hole 431, in which the transverse shaft 420 rotates in the hole 431 of the support frame 430. The tub 200 can be rotatably disposed to the support frame 430 by the transverse shaft 420, to make the access port move up and down in the opening 111, and the tub 200 can be driven to move by the longitudinal pushrod 410, to adjust the position of the access port.

[0036] Accordingly, the washing machine 1 can adjust the height and positon of the access port, which eliminates the need to stoop to operate, and thus provides great convenience for the user and good user experience.

[0037] The washing machine 1 further includes a drain pump 510, a drain internal tube 520 and a drain external tube 530. Specifically, the drain pump 510 is mounted to the tub 200, the drain internal tube 520 is mounted to the tub 200 and connected with the drain pump 510, the drain external tube 530 is configured to be a flexible elastic tube, and the drain external tube 530 is connected with the drain pump 510 and extends out of the cabinet 100.

[0038] That is, the washing machine 1 further includes a drain assembly 500, and the drain assembly is mainly composed of the drain pump 510, the drain internal tube 520 and the drain external tube 530. As shown in Fig. 4 and Fig. 5, an inlet of the drain pump 510 is connected with one end of the drain internal tube 520, and an outlet of the drain pump 510 is connected with one end of the drain external tube 530. When the washing machine 1 needs draining, the drain pump pumps washing water in the tub 200 out by the drain internal tube 520, and drains the washing water out of the tub 200 by the drain external tube 530.

[0039] Optionally, the drain pump 510 is mounted to the tub 200 through a threaded fastener. The drain external tube 530 and the drain pump 510 are connected through a simple structure that is easy to mount and dis-

mount, convenient to maintain and replace, and low in cost.

[0040] Under the action of the driving mechanism 400, the tub 200 of the washing machine 1 makes the access port of the washing machine 1 move up and down between the non-washing position and the washing position. During this process, the drain pump 510 and the drain internal tube 520 of the drain assembly 500 can move up and down synchronously with the tub 200 of the washing machine 1, and the drain assembly 500 can still work when the washing machine 1 starts washing.

[0041] Preferably, the drain external tube 530 may be made of a flexible and elastic material. As the drain external tube 530 itself is flexible and has a certain elasticity, the drain external tube 530 may have a certain elastic deformation in the washing machine 1 when the tub 200 of the washing machine 1 moves, which will not affect the movement of the tub 200 of the washing machine 1 and can also guarantee normal work of the drain assembly 500.

[0042] As the tub 200 is located at different angles during washing and static processes, the drain assembly 500 of the washing machine 1 will move up and down along with the tub 200 of the washing machine 1 compared with a front-loading washing machine in the related art. If a traditional mounting and fixing mode is adopted, the drain internal tube will be overlong, faults such as falling off, friction and snapping may easily occur, and the lower space of the washing machine cannot be utilized effectively.

[0043] Accordingly, in the front-loading washing machine 1 according to the embodiments of the present disclosure, by disposing the drain assembly 500 to the tub 200 of the washing machine 1 and making the drain assembly 500 move synchronously with the tub 200, a length of the drain internal tube 520 can be reduced, and the faults such as falling off, friction and snapping can be avoided. Further, by adopting a flexible and elastic tube as the drain external tube 530, faults such as falling off and snapping can be effectively avoided when the drain external tube 530 moves with the tub 200, and the reliability of the drain assembly 500 during movement can be improved.

[0044] Advantageously, according to an embodiment of the present disclosure, the drain internal tube 520 and the drain pump 510 are mounted to a bottom of the tub 200, such that a lower space below the tub 200 in the washing machine 1 can be effectively utilized, and the space use efficiency in the washing machine 1 can be raised. With reference to Fig. 5, the drain assembly 500 is detachably mounted to the bottom of the tub 200, and moves together with the tub 200 when the tub 200 moves, so lengths of the drain internal tube 520 and the drain external tube 530 can be greatly shortened, to reduce a cost. Furthermore, the drain external tube 530 is configured to be the flexible elastic tube, so the drain external tube 530 may have a certain elastic deformation when the tub 200 rotates and moves, to prevent a tube body from being snapped so as to improve reliability of the drain external tube 530 during usage.

[0045] In some specific embodiments of the present disclosure, the drain internal tube 520 is connected with the inlet of the drain pump 510 through an internal tube clamp hoop (not shown), and the drain external tube 530 is connected with the outlet of the drain pump 510 through an external tube clamp hoop (not shown).

[0046] Specifically, one end of the drain internal tube 520 is fitted over the inlet of the drain pump 510, and then the internal tube clamp hoop is disposed at an inlet position of the drain pump 510 to clamp the drain internal tube 520; in the same way, one end of the drain external tube 530 is fitted over the outlet of the drain pump 510, and then the external tube clamp hoop is disposed at an outlet position of the drain pump 510 to clamp the drain external tube 530. The reliability between the drain internal tube 520 and the inlet of the drain pump 510 and the reliability between the drain external tube 530 and the outlet of the drain pump 510 can be guaranteed, times of maintenance can be reduced, and the cost can be reduced. Moreover, the drain internal tube 520 and the drain external tube 530 can be prevented from falling off the drain pump 510, and normal draining of the washing machine 1 can be guaranteed.

[0047] Other configurations and operation of the front-loading washing machine according to embodiments of the present disclosure are known for those skilled in the art, which will not be described in detail herein.

[0048] In the specification, it is to be understood that terms such as "central," "longitudinal," "transverse," "length," "width," "thickness," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," "clockwise," and "counterclockwise" should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present disclosure be constructed or operated in a particular orientation.

[0049] In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with "first" and "second" may include one or more of this feature. In the description of the present disclosure, "a plurality of" means at least two, e.g. two or three and etc., unless specified otherwise.

[0050] In the present disclosure, unless specified or limited otherwise, the terms "mounted," "connected," "coupled," "fixed" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications or interaction of two elements, which can be understood by those skilled in the art according to specific situations.

[0051] In the present disclosure, unless specified or limited otherwise, a structure in which a first feature is "on" or "below" a second feature may include an embodiment in which the first feature is in direct contact with the second feature, and may also include an embodiment in which the first feature and the second feature are not in direct contact with each other, but are contacted via an additional feature formed therebetween. Furthermore, a first feature "on," "above," or "on top of" a second feature may include an embodiment in which the first feature is right or obliquely "on," "above," or "on top of" the second feature, or just means that the first feature is at a height higher than that of the second feature; while a first feature "below," "under," or "on bottom of" a second feature may include an embodiment in which the first feature is right or obliquely "below," "under," or "on bottom of" the second feature, or just means that the first feature is at a height lower than that of the second feature.

[0052] Reference throughout this specification to "an embodiment," "some embodiments," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples. Furthermore, different embodiments or examples in thus specification can be jointed and combined by those skilled in the art.

[0053] Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

Claims

1. A front-loading washing machine (1), comprising:

a cabinet (100) having a front panel (110), wherein the front panel (110) is provided with an opening (111);
a tub (200) having an access port for loading and unloading clothes, wherein the tub (200) is disposed in the cabinet (100) and configured in such a manner that the access port is capable of being moved up and down in the opening (111);
a rotatable drum disposed in the tub (200);
a door unit (300) mounted to the tub (200) and configured to cover the access port; and
a driving mechanism (400) configured to drive the tub (200) to rotate, wherein the driving mechanism (400) is provided in the cabinet (100) and coupled with the tub (200).

2. The front-loading washing machine (1) according to claim 1, wherein the driving mechanism (400) is configured to drive the access port to move up and down between a washing position and a non-washing position in the opening (111).

3. The front-loading washing machine (1) according to claim 2, wherein when the access port is located at the non-washing position, the access port is driven to move close to an upper edge of the front panel (110), and when the access port is located at the washing position, the access port is driven to move close to a lower edge of the front panel (110).

4. The front-loading washing machine (1) according to claim 1, wherein the driving mechanism (400) is configured to drive the access port to move upwards to close to an upper edge of the front panel (110) and move downwards to close to a lower edge of the front panel (110).

5. The front-loading washing machine (1) according to claim 1, wherein a motion range of the access port in the opening (111) is configured in such a manner that an included angle between a central axis of the access port and a horizontal plane ranges from 0° to 90°.

6. The front-loading washing machine (1) according to claim 1 or 2, wherein the driving mechanism (400) comprises:

a longitudinal pushrod (410) disposed at a front side of the tub (200);
a transverse shaft (420) disposed at a rear side of the tub (200) and coupled to the tub (200); and
a support frame (430) disposed in the cabinet (100) and having an hole (431),
wherein the transverse shaft (420) is configured to rotate in the hole (431) of the support frame (430).

7. The front-loading washing machine (1) according to claim 1 or 2, further comprising:

a drain pump (510), mounted to the tub (200);
a drain internal tube (520), mounted to the tub (200) and connected with an inlet of the drain pump (510); and
a drain external tube (530), configured to be a flexible elastic tube, connected with an outlet of the drain pump (510) and extending out of the cabinet (100).

8. The front-loading washing machine (1) according to claim 7, wherein the drain internal tube (520) and the drain pump (510) are mounted to a bottom of the tub (200).

9. The front-loading washing machine (1) according to claim 7, wherein the drain internal tube (520) is connected with the inlet of the drain pump (510) through an internal tube clamp hoop, and the drain external tube (530) is connected with the outlet of the drain pump (510) through an external tube clamp hoop.

10. The front-loading washing machine (1) according to claim 7, wherein the drain pump (510) is mounted to the tub (200) through a threaded fastener.

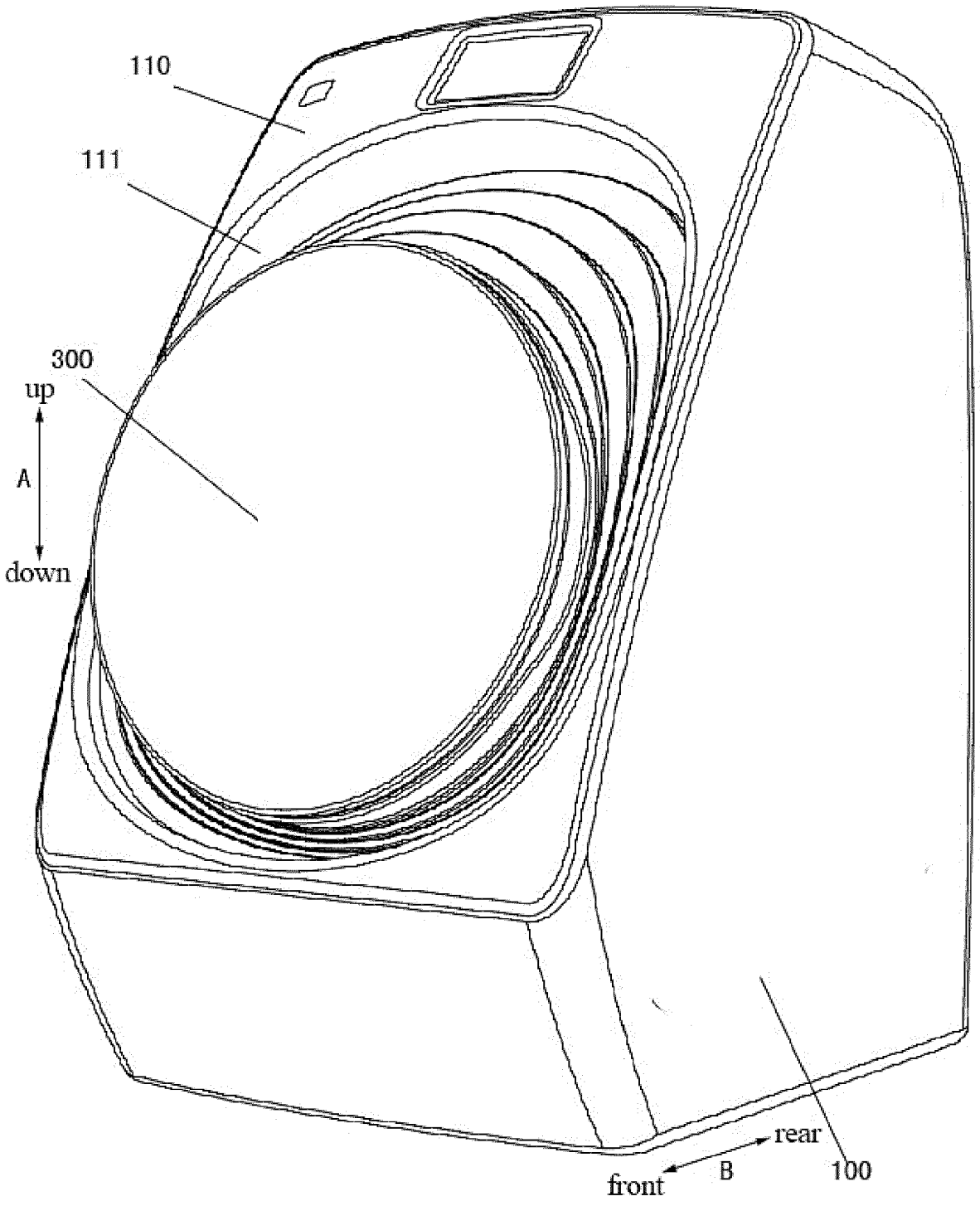

Fig. 1

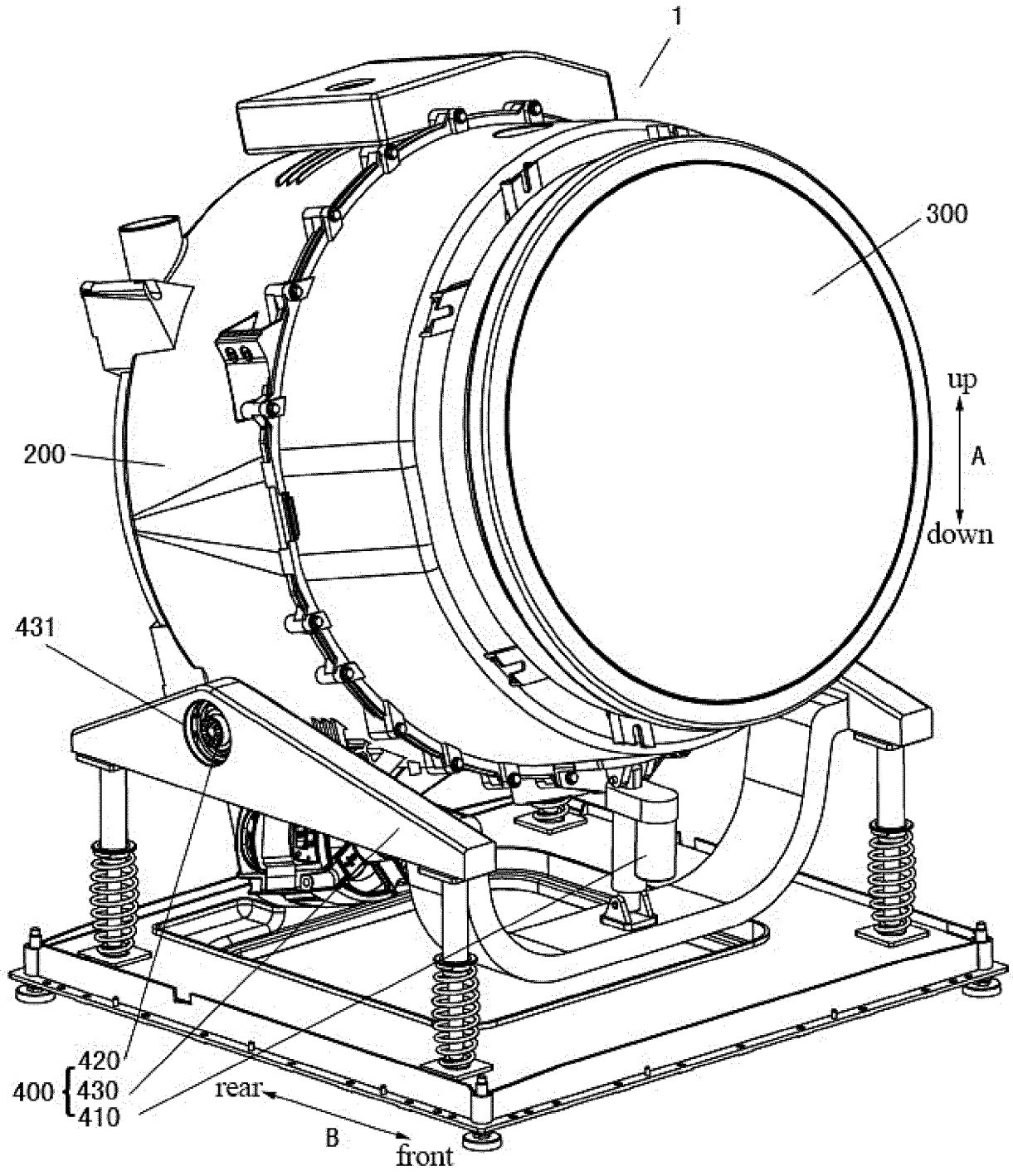

Fig. 2

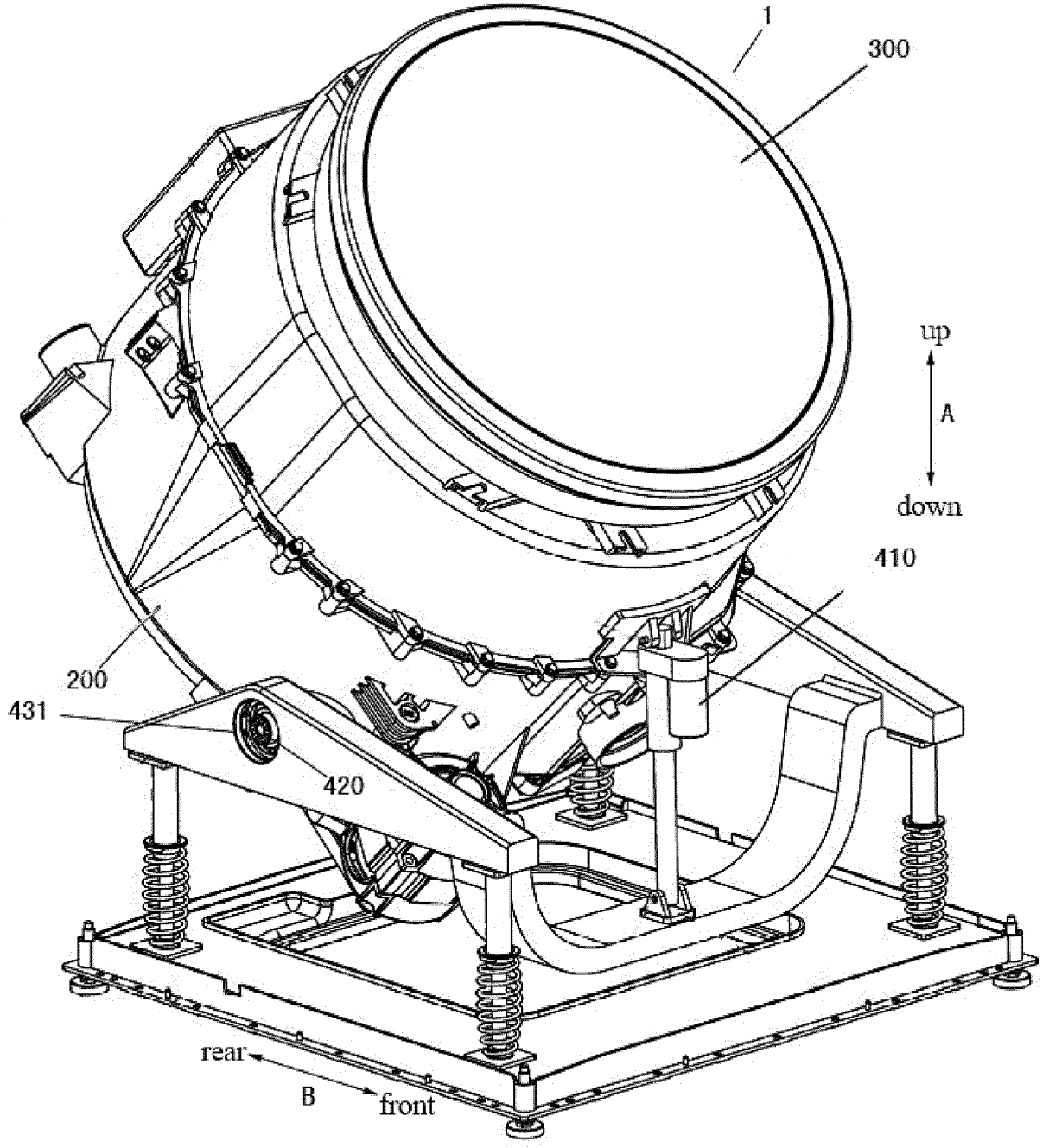

Fig. 3

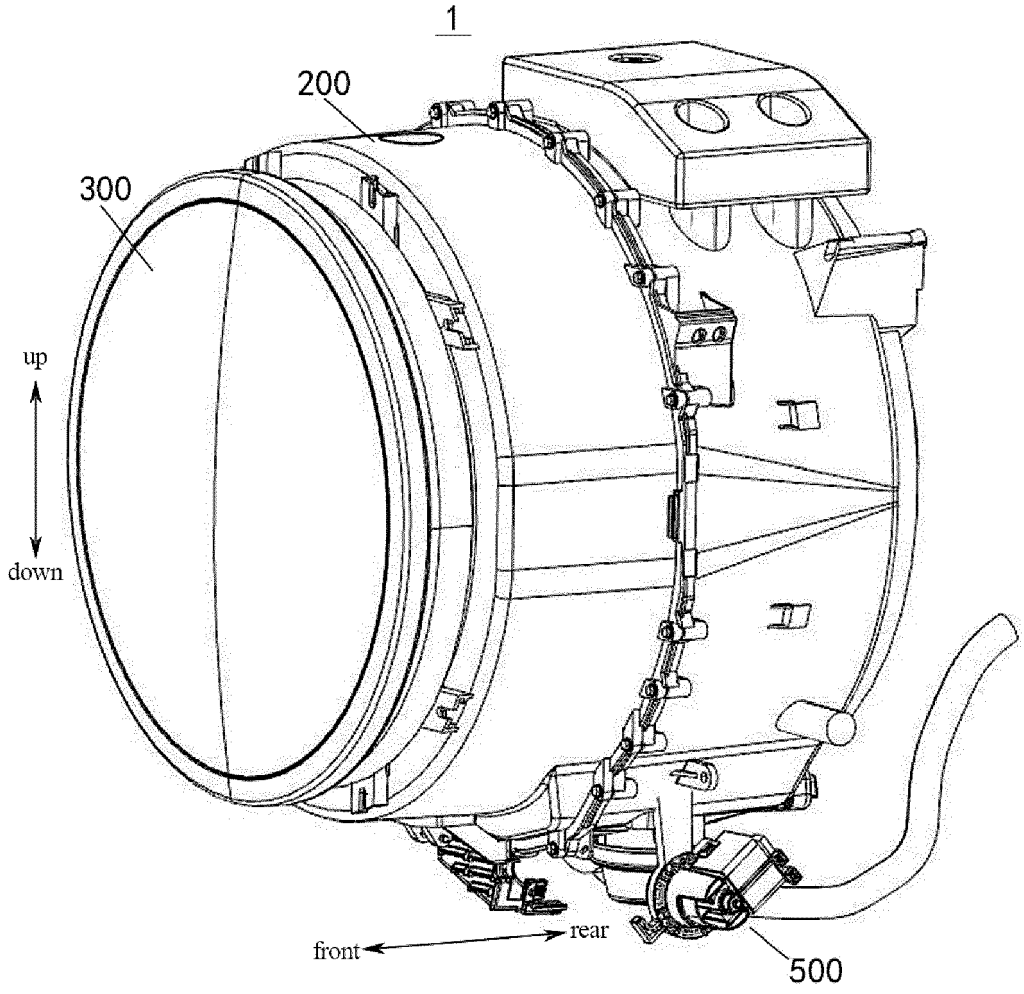

Fig. 4

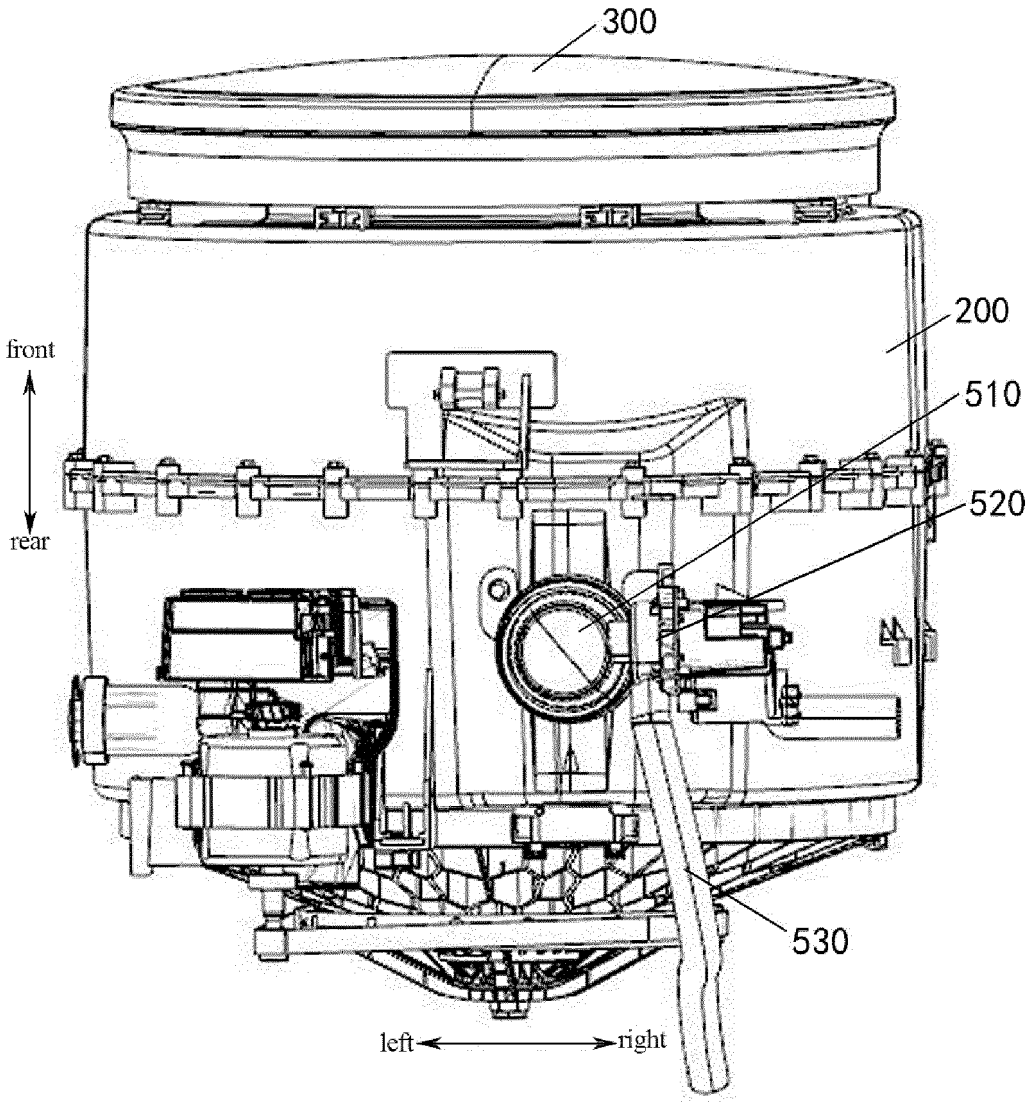

Fig. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 19 9206

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2011/016009 A1 (INDESIT CO SPA [IT]; CALVI RICCARDO [IT]; BONGINI DINO [IT]) 10 February 2011 (2011-02-10) * page 5, line 15 - line 24 * * page 6, line 2 - page 7, line 18; figures 1, 7 * * page 8, line 5 - line 12; figure 2 * * page 9, line 12 - page 10, line 14; figures 2, 4 * * page 11, line 14 - page 12, line 25 * * page 13, line 4 - page 15, line 2; figures 9-12 * * page 18, line 9 - page 22, line 25 *	1-10	INV. D06F95/00 ADD. D06F39/08 D06F37/04
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 May 2017	Sabatucci, Arianna

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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 9206

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