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(54) **FRONT-LOADING WASHING MACHINE**

(57) The present disclosure provides a front-loading washing machine. The front-loading washing machine 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 laundry, 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 provided in the cabinet, coupled to the tub, and configured to drive the tub to rotate.

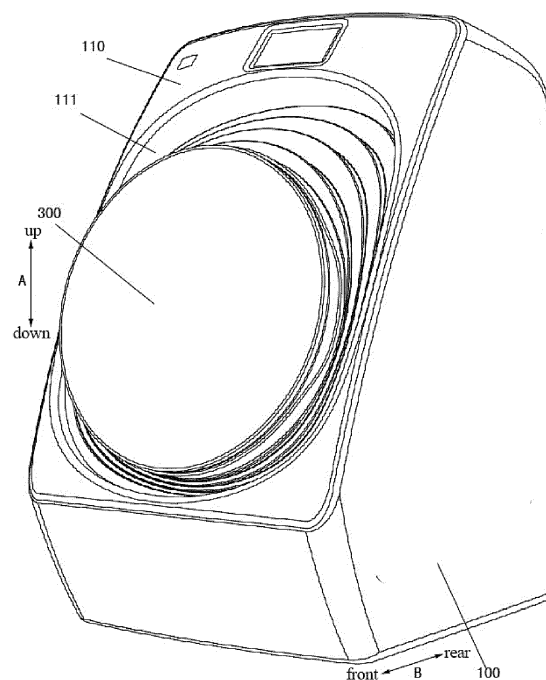


Fig. 1

Description

FIELD

[0001] The present disclosure relates to an electrical appliance manufacturing technology field, and more particularly to a front-loading washing machine.

BACKGROUND

[0002] In the related art, the washing machine includes a front-loading washing machine and a pulsator washing machine. When the pulsator washing machine operates, the laundry needs to be completely immersed in water, so that the water saving effect is poor. Moreover, when loading or unloading the laundry with the front-loading washing machine, a user needs to bend and squat down, and thus it is much inconvenient for use and is particularly difficult for operations of special populations, such as the aged.

SUMMARY

[0003] The present disclosure seeks to solve at least one of the problems existing in the related art to at least some extent. Thus, the present disclosure provides a front-loading washing machine, the front-loading washing machine has advantages of an easy usage, a low laundry abrasion and a less water cost.

[0004] In order to achieve the above objective, embodiments of the present disclosure provide a front-loading washing machine, and the front-loading washing machine includes: a cabinet has a front panel, in which the front panel is provided with an opening; a tub has an access port for loading and unloading laundry, 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 provided in the cabinet, coupled to the tub, and configured to drive the tub to rotate.

[0005] The front-loading washing machine according to embodiments of the present disclosure has advantages of an easy usage, a low laundry abrasion and a less water cost.

[0006] In addition, the front-loading washing machine according to embodiments of the present disclosure may further include following additional 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, the driving mechanism includes a longitudinal pushrod disposed at a front side of the tub, a transverse shaft disposed at a rear side of 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.

[0011] According to an embodiment of the present disclosure, the front-loading washing machine further includes a damping shock absorber supported between the cabinet and the support frame.

[0012] According to an embodiment of the present disclosure, the damping shock absorber includes at least one group of: a damper supported between the cabinet and the support frame; and an elastic shock-absorbing member connected to the damper and one of the cabinet and the support frame.

[0013] According to an embodiment of the present disclosure, the damper is configured as a friction damper.

[0014] According to an embodiment of the present disclosure, the friction damper includes: an inner damping rod connected to the one of the support frame and the cabinet; and an outer damping cylinder movably fitted over the inner damping rod along an axial direction of the inner damping rod, and connected to the other one of the support frame and the cabinet, in which the elastic shock-absorbing member is connected to the outer damping cylinder and the one of the support frame and the cabinet respectively.

[0015] According to an embodiment of the present disclosure, the elastic shock-absorbing member is configured as a spring and fitted over the inner damping rod.

[0016] According to an embodiment of the present disclosure, the inner damping rod is mounted to the cabinet, the outer damping cylinder is mounted to the support frame, and the elastic shock-absorbing member is connected with the outer damping cylinder and the cabinet respectively.

[0017] According to an embodiment of the present disclosure, the cabinet is provided with a support foot, an inserting hole is formed in the support foot, and the inner damping rod is inserted in the inserting hole.

[0018] According to an embodiment of the present disclosure, four groups of the damper and the elastic shock-absorbing member are provided and distributed at four corners of a same rectangle.

[0019] According to an embodiment of the present disclosure, the cabinet includes a base plate located at a bottom thereof, and the damping shock absorber is mounted on the base plate.

[0020] According to an embodiment of the present disclosure, the base plate is configured as a plastic member.

[0021] According to an embodiment of the present disclosure, the front-loading washing machine further includes an adjustable foot configured to support the cabinet and adjust a height of the cabinet, wherein the adjustable foot is threadedly fitted to the base plate and is provided with a shock absorbing cushion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] These and other aspects and advantages of embodiments of the present disclosure will become apparent and more readily appreciated from the following descriptions made with reference to the drawings, in which:

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

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

Fig. 3 is a partial schematic view of a front-loading washing machine according to embodiments of the present disclosure, in which an access port is located in a non-washing position;

Fig. 4 is a partial schematic view of a front-loading washing machine according to embodiments of the present disclosure; and

Fig. 5 is a partial schematic view of a front-loading washing machine according to embodiments of the present disclosure.

Reference numerals:

[0023] front-loading washing machine 1, cabinet 100, front panel 110, opening 111, base plate 120, tub 200, door unit 300, driving mechanism 400, longitudinal push-rod 410, driving part 411, driving-part mounting bracket 4110, mounting plate 4111, mounting ear 4112, driving-part positioning pin 4113, extending and retracting part 412, extending-and-retracting-part mounting bracket 4120, extending-and-retracting-part positioning pin 4123, transverse shaft 420, support frame 430, hole 431, longitudinal bracket 432, protruding part 4320, transverse bracket 433, main part 4330, arc-shaped part 4331, damping shock absorber 500, damper 510, inner damping rod 511, outer damping cylinder 512, elastic shock-absorbing member 520, support foot 530, adjustable foot 600, shock absorbing cushion 610, counterweight 700.

DETAILED DESCRIPTION

[0024] Reference will be made in detail to embodiments of the present disclosure. 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. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions.

[0025] A front-loading washing machine will be described with reference to accompanying drawings in the following.

[0026] As shown in Figs. 1-5, the front-loading washing machine 1 according to embodiments of the present disclosure includes a cabinet 100, a tub 200, a rotatable drum (not shown), a door unit 300 and a driving mechanism 400.

[0027] The cabinet 100 includes a front panel 110 (a front-and-rear direction is shown by arrow B in Figs. 1-3), and an opening 111 is formed in the front panel 110. The tub 200 has an access port for loading and unloading laundry, and 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 (an up-and-down direction is shown by arrow A in Figs. 1-3). The drum is disposed in the tub 200. The door unit 300 is mounted to the tub 200, and configured to cover the access port. The driving mechanism 400 is provided in the cabinet 100, coupled to the tub 200 and used to drive the tub 200 to move.

[0028] In the front-loading washing machine 1 according to embodiments of the present disclosure, the tub 200 is configured in such a manner that the access port is capable of being moved up and down in the opening 111, and thus the front-loading washing machine 1 can move the access port to a position suitable for a user to load and unload laundry when the user needs to load or unload the laundry, compared with a front-loading washing machine having the access port disposed in a front surface thereof in the related art. For example, the access port may be moved upwards. In this way, when loading or unloading laundry through the access port, the user does not need to squat down or bend, which thus facilitates loading and unloading laundry through the access port by the user, and also enables the user inconvenient to bend (such as the aged) to load and unload laundry successfully, thus improving the use convenience of the front-loading washing machine 1.

[0029] Moreover, since the access port can be moved up and down in the opening 111, the access port may be moved to a position suitable for washing laundry after the laundry has been loaded. For example, the access port may be moved downwards. In this way, when washing laundry, the drum may roll to tumble the laundry up and down so as to wash the laundry, thus reducing abrasion of the laundry during washing thereof. Moreover, because the laundry needs not to be completely immersed in water when being washed, but only a small amount of water is needed to accomplish the washing thereof, a corresponding water cost is reduced, which is more environmentally friendly.

[0030] In addition, by disposing the driving mechanism

400, the tub 200 may be driven by using the driving mechanism 400. In this way, when the user needs to adjust a position of the access port, the driving mechanism 400 may be used to drive the tub 200. Thereby, the user can adjust the position of the tub 200 with less effort, so that it is convenient for the user to adjust the position of the tub 200, and further for the user (such as the aged) to use the front-loading washing machine 1.

[0031] That is to say, by providing the tub 200 configured in such a manner that the access port is capable of being moved up and down in the opening 111 and providing the driving mechanism 400 configured to drive the tub 200 to move, the front-loading washing machine 1 can achieve a desired effect of an ordinary front-loading washing machine when washing the laundry, and the access port can be adjusted to the position suitable for loading and unloading laundry when the laundry needs to be loaded or unloaded or additional laundry needs to be loaded during the washing, so that a problem that it is inconvenient to load and unload laundry for the traditional front-loading washing machine in the related art is overcome, thereby facilitating use for the user.

[0032] Therefore, the front-loading washing machine 1 according to embodiments of the present disclosure has advantages of the convenient use, the low laundry abrasion and the reduced water cost.

[0033] The front-loading washing machine 1 according to embodiments of the present disclosure will be described with reference to accompanying drawings in the following.

[0034] In some specific embodiments of the present disclosure, as shown in Figs. 1-5, the front-loading washing machine 1 according to embodiments of the present disclosure includes a cabinet 100, a tub 200, a rotatable drum, a door unit 300 and a driving mechanism 400.

[0035] The driving mechanism 400 drives the access port to move up and down between the washing position and the non-washing position in the opening 111. In this way, when the laundry needs to be washed, the driving mechanism 400 may be used to drive the tub 200, so that the access port can be moved to the washing position, thus facilitating washing the laundry. When the laundry does not need to be washed, the driving mechanism 400 may be used to drive the tub 200, so that the access port can be moved to the non-washing position, thus facilitating loading and unloading the laundry by the user.

[0036] Specifically, as shown in Figs. 1-3, 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 Figs. 1 and 2), the access port is driven to move close to a lower edge of the front panel 110. Thereby, when the user needs to load or unload laundry, the access port may be moved close to the upper edge of the front panel 110, so as to facilitate loading and unloading laundry from top by the user, and when the user needs to wash laundry, the access port may be moved close to the lower edge

of the front panel 110, so as to facilitate washing the laundry through the rolling of the drum.

[0037] Specifically, as shown in Fig. 1, the front panel 110 may be inclined backwards from bottom to top. Thereby, it may be further convenient for the user to load and unload laundry when the access port is moved to the non-washing position.

[0038] Advantageously, as shown in Figs. 2 and 3, the driving mechanism 400 is configured to drive the access port to move upwards to close to the upper edge of the front panel 110 and move downwards to close to the lower edge of the front panel 110. In this way, when the laundry needs to be loaded or unloaded, the driving mechanism 400 may be operated to move the access port upwards close to the upper edge of the front panel 110, thereby facilitating loading and unloading the laundry; and when the laundry needs to be washed, the driving mechanism 400 may be operated to move the access port downwards close to the lower edge of the front panel 110, thereby facilitating washing the laundry through the rolling of the drum.

[0039] Optionally, 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°. In other words, the access port may be moved between a horizontal position and a vertical position of the central axis thereof. Specifically, when the access port is located at the non-washing position suitable for loading and unloading laundry, the central axis of the access port is oriented in a vertical direction; and when the access port is located at the washing position suitable for washing laundry, the central axis of the access port is oriented in a horizontal direction. Thereby, it is convenient for the user to load and unload the laundry through the access port from top, and also to wash the laundry by the rolling of the drum.

[0040] It can be understood by those skilled in the art that, the motion range of the access port may be adjusted according to the actual conditions. 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 may be inclined forwards from bottom to top, and thus it is convenient for the user to load and unload the laundry as well. When the access port is located at the washing position (as shown in Figs. 1 and 2), the central axis of the access port may be oriented at a predetermined angle with respect to the horizontal direction, in condition of ensuring the laundry in the drum to be washed in a rolling manner.

[0041] Preferably, the motion range of the access port may be configured in such a manner that the included angle between the central axis of the access port and the horizontal plane ranges from 13° to 45°, so that it is convenient for the user to load and unload laundry from top, and a washing effect of the laundry can be ensured as well. In addition, it is convenient for the driving mechanism 400 to drive the tub 200, so as to reduce the time needed for the tub 200 to move between the above two

positions, thus improving a washing efficiency for the user.

[0042] The front-loading washing machine 1 according to a specific example of the present disclosure is shown in Figs. 2-5. As shown in Figs. 2-5, 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 to the tub 200, and a support frame 430 disposed in the cabinet 100 and having an hole 431, in which the transverse shaft 420 may rotate in the hole 431 of the support frame 430. In this way, the tub 200 may be disposed rotatably to the support frame 430 by the transverse shaft 420, so that the access port is capable of being moved up and down in the opening 111; moreover, the tub 200 may be driven to move by the longitudinal pushrod 410, so as to achieve a position adjustment of the access port. In addition, by disposing the longitudinal pushrod 410 at the front side of the tub 200 and the transverse shaft 420 at the rear side of the tub 200, it is convenient for the longitudinal pushrod 410 to push the front side of the tub 200 to move in the up-and-down direction, thus further facilitating the position adjustment of the access port.

[0043] Specifically, as shown in Figs. 2-4, the longitudinal pushrod 410 includes a driving part 411 and an extending and retracting part 412. The extending and retracting part 412 is mounted to the driving part 411 and driven to extend and retract by the driving part 411. One of the driving part 411 and the extending and retracting part 412 is mounted in the cabinet 100 and the other one thereof is coupled to the tub 200. Thus, the driving part 411 may be used to drive the extending and retracting part 412 to extend and retract, so as to achieve the extending and retracting of the longitudinal pushrod 410. Therefore, with the longitudinal pushrod 410 driving the front side of tub 200 to move in the up-and-down direction, the position adjustment of the access port can be obtained.

[0044] It could be understood by those skilled in the related art that, the tub 200 may be driven only by the longitudinal pushrod 410. For example, by disposing the longitudinal pushrod 410, the whole tub 200 can be moved in the up-and-down, and thus the position adjustment of the access port can be achieved as well.

[0045] Advantageously, as shown in Figs. 2-4, the driving part 411 is coupled to the tub 200 by a driving-part mounting bracket 4110, the extending and retracting part 412 is mounted in the cabinet 100 by an extending-and-retracting-part mounting bracket 4120. Specifically, the extending and retracting part 412 may be mounted on the support frame 430 by the extending-and-retracting-part mounting bracket 4120. In this way, it is convenient to mount the driving part 411 to the tub 200, and also to mount the extending and retracting part 412 in the cabinet 100.

[0046] Specifically, the driving part 411 may drive the extending and retracting part 412 by hydraulic pressure.

[0047] Optionally, as shown in Figs. 2-4, at least one

of the connection between the driving part 411 and the driving-part mounting bracket 4110 and the connection between the extending and retracting part 412 and the extending-and-retracting-part mounting bracket 4120 is a pivotable connection. Thus, the tub 200 can be moved more smoothly to facilitate the position adjustment of the access port, and also a movement range of the tub 200 is increased to ensure the motion range of the access port.

[0048] Specifically, the driving part 411 is pivotably mounted to the driving-part mounting bracket 4110 and the extending and retracting part 412 is pivotably mounted to the extending-and-retracting-part mounting bracket 4120.

[0049] As shown in Figs. 2-4, the driving part 411 is connected with the driving-part mounting bracket 4110 by a driving-part positioning pin 4113, and the extending and retracting part 412 is connected with the extending-and-retracting-part mounting bracket 4120 by an extending-and-retracting-part positioning pin 4123. Thus, the pivotable connection between the driving part 411 and the driving-part mounting bracket 4110 and the pivotable connection between the extending and retracting part 412 and the extending-and-retracting-part mounting bracket 4120 can be achieved.

[0050] More specifically, as shown in Figs. 2-4, each of the driving-part mounting bracket 4110 and the extending-and-retracting-part mounting bracket 4120 includes a mounting plate 4111 and two mounting ears 4112. The mounting ear 4112 is used to assemble the driving-part positioning pin 4113 or the extending-and-retracting-part positioning pin 4123, and the two mounting ears 4112 are disposed on the mounting plate 4111 and spaced apart from each other. Specifically, the mounting ear 4112 may be provided with a pin hole, and the driving-part positioning pin 4113 or the extending-and-retracting-part positioning pin 4123 may be fitted in the corresponding pin hole. The mounting plate 4111 may be mounted to the cabinet 100 or the tub 200 by a threaded fastener (such as a screw or a bolt), or integral with the tub 200 by injection molding. In this way, a contact area between the driving-part mounting bracket 4110 and the tub 200 is increased, and also a contact area between the extending-and-retracting-part mounting bracket 4120 and the cabinet 100 is increased, so as to facilitate the mounting of the driving-part mounting bracket 4110 and the extending-and-retracting-part mounting bracket 4120, and to ensure the connection strength and stability of the driving-part mounting bracket 4110 and the extending-and-retracting-part mounting bracket 4120 after being mounted. Moreover, it is convenient for the pivotable connection between the driving part 411 and the driving-part mounting bracket 4110 and for the pivotable connection between the extending and retracting part 412 and the extending-and-retracting-part mounting bracket 4120, so as to ensure the connection strength and stability between the driving part 411 and the driving-part mounting bracket 4110 and the connec-

tion strength and stability between the extending and retracting part 412 and the extending-and-retracting-part mounting bracket 4120.

[0051] Specifically, two ends of the driving-part positioning pin 4113 and two ends of the extending-and-retracting-part positioning pin 4123 may be provided with anti-drop structures to prevent the driving-part positioning pin 4113 and the extending-and-retracting-part positioning pin 4123 from dropping off from the pin holes where they are located.

[0052] The front-loading washing machine 1 according to a specific example of the present disclosure is shown in Figs. 2 and 3. As shown in Figs. 2 and 3, the driving mechanism 400 includes the longitudinal pushrod 410, the transverse shaft 420 and the support frame 430.

[0053] Advantageously, the transverse shaft 420 is integrally formed with the tub 200. Thus, the connection strength between the transverse shaft 420 and the tub 200 can be ensured, and the assembly process of the transverse shaft 420 is simplified, thus improving the producing efficiency of the front-loading washing machine 1.

[0054] Specifically, the transverse shaft 420 may be integral with the tub 200 by the injection molding.

[0055] Specifically, as shown in Figs. 2 and 3, the support frame 430 includes two longitudinal brackets 432 and one transverse bracket 433. The two longitudinal brackets 432 are disposed on the cabinet 100 and spaced apart from each other, and the hole 431 is formed in the longitudinal bracket 432. Two ends of the transverse bracket 433 are respectively connected to the two longitudinal brackets 432, and the longitudinal pushrod 410 is mounted on the transverse bracket 433. Thus, it is convenient to use the support frame 430 to support the tub 200, thereby facilitating improving the stability of the tub 200.

[0056] More specifically, as shown in Figs. 2 and 3, the transverse bracket 433 includes a main part 4330 lower than the two longitudinal brackets 432, and two arc-shaped parts 4331 located respectively at two ends of the main part 4330 and connected with the two longitudinal brackets 432 respectively. The longitudinal pushrod 410 is mounted on the main part 4330. In other words, the transverse bracket 433 may have a U shape. When the front-loading washing machine 1 washes laundry, the rotation of the drum brings about vibration and displacement of the tub 200, and the vibration and displacement of the tub 200 will be transferred to the transverse bracket 433 through the two longitudinal brackets 432. By providing the transverse bracket 433 including the main part 4330 and the two arc-shaped parts 4331, an impact of the vibration on the transverse bracket 433 can be reduced, and the transverse bracket 433 can be used to buffer the vibration and the displacement of the longitudinal bracket 432, thus reducing a vibration amplitude of the front-loading washing machine 1, and also decreasing an operation noise of the front-loading washing machine 1.

[0057] More advantageously, as shown in Figs. 2 and

3, a protruding part 4320 is provided at an upper surface of each longitudinal bracket 432 and protrudes upwards, and the hole 431 is formed in the protruding part 4320 of each longitudinal bracket 432. In this way, it is convenient for the hole 431 to be formed, and the structural strength of the longitudinal bracket 432 at the hole 431 can be ensured, so as to guarantee the overall structural strength of the longitudinal bracket 432, and further to improve the stability of the tub 200.

[0058] Specifically, the hole 431 may run through the longitudinal bracket 432 along a thickness direction of the longitudinal bracket 432.

[0059] The front-loading washing machine 1 according to a specific example of the present disclosure is shown in Figs. 2 and 3. As shown in Figs. 2 and 3, the transverse shaft 420 is rotatably fitted in the hole 431 by a bearing, so that a friction force suffered by the transverse shaft 420 when the transverse shaft 420 rotates can be reduced, and thus the tub 200 can rotate more smoothly, and a force needed by the longitudinal pushrod 410 to drive the tub 200 can be decreased. Furthermore, a wear speed of the transverse shaft 420 and the hole 431 can be reduced, to extend a service life of the front-loading washing machine 1.

[0060] Specifically, a position limiting projection and an assembling groove are provided at an inner circumferential wall of the hole 431 and spaced apart from each other along an axial direction of the hole 431, in which a split washer is disposed in the assembling groove and the bearing is stopped between the position limiting projection and the split washer. In this way, the split washer and the position limiting projection may be used to limit a position of the bearing, to prevent the bearing from dropping off from the hole 431, thus improving the reliability of the front-loading washing machine 1.

[0061] More specifically, the split washer includes an open ring portion and two stopping portions, in which the open ring portion is disposed in the corresponding assembling groove, and the two stopping portions are disposed at two ends of the open ring portion and extend out from the assembling groove where the open ring portion is located, respectively. In this way, the two stopping portions may be used to stop the bearing, so as to achieve the position limitation of the bearing, and thus to prevent the bearing from dropping off from the hole 431.

[0062] The front-loading washing machine 1 according to a specific example of the present disclosure is shown in Figs. 2, 3 and 5. As shown in Figs. 2, 3 and 5, the driving mechanism 400 includes the longitudinal pushrod 410, the transverse shaft 420 and the support frame 430.

[0063] Advantageously, as shown in Figs. 2, 3 and 5, the front-loading washing machine 1 further includes a damping shock absorber 500 supported between the cabinet 100 and the support frame 430. Thereby, the damping shock absorber 500 may be used to support the support frame 430, and also to buffer the vibration of the support frame 430, so as to damp the displacement of the support frame 430, thus making the front-loading

washing machine 1 stable when the front-load washing machine 1 is washing laundry.

[0064] Specifically, as shown in Figs. 2, 3 and 5, the damping shock absorber 500 includes at least one group of a damper 510 and an elastic shock-absorbing member 520. The damper 510 is supported between the cabinet 100 and the support frame 430. The elastic shock-absorbing member 520 is connected to the damper 510 and one of the cabinet 100 and the support frame 430, respectively. In this way, the elastic shock-absorbing member 520 can be used to buffer the vibration of the support frame 430, and the damper 510 can be used to damp the displacement of the support frame 430. If an elastic member is used alone to absorb shock, in order to ensure an shock absorbing effect, the rigidity of the elastic member needs to be reduced, thus resulting in a shortened life and a premature failure of the elastic member. If a damper is used alone to absorb shock, a force large enough is needed to achieve the shock absorbing effect, thus causing difficulties in speeding up the front-loading washing machine 1, and resulting in the heavy vibration, the loud noise, the poor washing effect and the reduced washing efficiency. That is to say, by simultaneously using the damper 510 and the elastic shock-absorbing member 520 to buffer the vibration and the displacement of the support frame 430, the damping shock absorber 500 can offset and lessen the stiff impact caused by the unbalanced load, thus improving a shock absorbing effect on the support frame 430, and lowering the vibration and the noise when the front-loading washing machine 1 operates. Furthermore, the transverse and longitudinal stability of the front-loading washing machine 1 can be ensured, so that the front-loading washing machine 1 can keep a dynamically controllable posture within a pre-determined range, thus improving the controllability of the front-loading washing machine 1 and guaranteeing the washing effect of the front-loading washing machine 1.

[0065] Optionally, the damper 510 is configured as a friction damper. In this way, the vibration energy may be reduced relying on the friction of the damper 510, which facilitates performing a vibration control on the support frame 430. For example, by adjustments, the damper 510 may have a slippage or a deformation under a pre-determined load, under which load main structural parts in the front-loading washing machine 1 have not yielded, to provide a damping effect, so that the main structural parts are ensured not to yield due to the vibration and the displacement, and thus a motion range in which the front-loading washing machine 1 keeps the dynamically controllable posture can be enlarged.

[0066] More specifically, as shown in Fig. 5, the friction damper includes an inner damping rod 511 and an outer damping cylinder 512. The inner damping rod 511 is connected to the one of the support frame 430 and the cabinet 100. The outer damping cylinder 512 is movably fitted over the inner damping rod 511 along an axial direction of the inner damping rod 511, the outer damping cylinder

512 is connected to the other one of the support frame 430 and the cabinet 100, and the elastic shock-absorbing member 520 is connected to the outer damping cylinder 512 and the one of the support frame 430 and the cabinet 100 respectively. Thus, the friction between the inner damping rod 511 and the outer damping cylinder 512 may be used to provide a damping force on the support frame 430, so as to ensure the shock absorbing effect on the support frame 430.

[0067] As shown in Fig. 5, the elastic shock-absorbing member 520 is configured as a spring and is fitted over the inner damping rod 511. In this way, it is convenient to mount the elastic shock-absorbing member 520, and the inner damping rod 511 may be used to position the elastic shock-absorbing member 520, so as to prevent the elastic shock-absorbing member 520 from being displaced.

[0068] The front-loading washing machine 1 according to a specific example of the present disclosure is shown in Figs. 2, 3 and 5. As shown in Figs. 2, 3 and 5, the inner damping rod 511 is mounted to the cabinet 100 and the outer damping cylinder 512 is mounted to the support frame 430, and the elastic shock-absorbing member 520 is connected with the outer damping cylinder 512 and the cabinet 100 respectively. In this way, the mounting of the damping shock absorber 500 can be achieved, and also, the shock absorbing effect of the damping shock absorber 500 can be ensured.

[0069] Advantageously, as shown in Fig. 5, the cabinet 100 is provided with a support foot 530, an inserting hole is formed in the support foot 530, and the inner damping rod 511 is inserted in the inserting hole. In this way, it is convenient to mount the damping shock absorber 500, and also, the inserting hole may be used to position the damping shock absorber 500, so as to prevent the damping shock absorber 500 from being displaced. In some embodiments of the present disclosure, a plurality of the support feet 530 may be provided. For example, four support feet 530 are provided as shown in Fig. 5.

[0070] Optionally, as shown in Fig. 5, four groups of the dampers 510 and the elastic shock-absorbing members 520 are provided and distributed at four corners of a same rectangle. Thus, the four groups of the dampers 510 and the elastic shock-absorbing members 520 may be used to buffer the vibration of the support frame 430, so as to improve the shock absorbing effect on the support frame 430. Moreover, the support frame 430 is more uniformly forced, thus further improving the shock absorbing effect on the support frame 430.

[0071] Specifically, as shown in Figs. 2 and 3, the cabinet 100 includes a base plate 120 located at a bottom thereof, and the damping shock absorber 500 is mounted on the base plate 120, so that it is convenient for the damping shock absorber 500 and other parts to be mounted.

[0072] More advantageously, the base plate 120 is configured as a plastic member, so that the base plate 120 can absorb the noise in the cabinet 100, thus further

decreasing the operation noise of the front-loading washing machine 1.

[0073] More specifically, as shown in Figs. 2 and 3, the front-loading washing machine 1 further includes an adjustable foot 600, and the adjustable foot 600 may be used to support the cabinet 100 and adjust a height of the cabinet 100. The adjustable foot 600 is threadedly fitted to the base plate 120 and is provided with a shock absorbing cushion 610. In this way, a height of the base plate 120 can be adjusted by adjusting the adjustable foot 600, and the shock absorbing cushion 610 may be used to further buffer the vibration of the base plate 120, so as to further decrease the vibration and the noise of the front-loading washing machine 1. In some embodiments of the present disclosure, a plurality of the adjustable feet 600 may be provided. For example, four adjustable feet 600 are provided as shown in Figs. 2 and 3.

[0074] Furthermore, the tub 200 is provided with a counterweight 700. Thus, the counterweight 700 may be used to balance a central position of the tub 200, to add the inertia of the tub 200, and to decrease the vibration amplitude in a high-speed dewatering.

[0075] Specifically, the tub 200 may include a front tub portion and a rear tub portion, and the front tub portion is connected with the rear tub portion by a flange. A plurality of the counterweights 700 may be provided and distributed on the front tub portion and the rear tub portion according to actual requirements.

[0076] Other components and operations of the front-loading washing machine 1 according to embodiments of the present disclosure are known to those skilled in the art, and will not be described in detail herein.

[0077] In the specification, it is to be understood that terms such as "central," "longitudinal," "lateral," "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.

[0078] 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 comprise one or more of this feature. In the description of the present disclosure, "a plurality of" means two or more than two, unless specified otherwise.

[0079] 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 of two elements, which

can be understood by those skilled in the art according to specific situations.

[0080] 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.

[0081] Reference throughout this specification to "an embodiment," "some embodiments," "one embodiment," "another example," "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 such as "in some embodiments," "in one embodiment," "in an embodiment," "in another example," "in an example," "in a specific example," or "in some examples," 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.

[0082] 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 laundry, 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) provided in the cabinet (100), coupled to the tub (200) and configured to drive the tub (200) to rotate.
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 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 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 and coupled to the tub (200); and
 - a support frame (430) disposed in the cabinet (100) and having a hole (431), wherein the transverse shaft (420) is configured to rotate in the hole (431) of the support frame (430).
 6. The front-loading washing machine (1) according to claim 5, further comprising a damping shock absorber (500) supported between the cabinet (100) and the support frame (430).
 7. The front-loading washing machine (1) according to claim 6, wherein the damping shock absorber (500) comprises at least one group of:
 - a damper (510) supported between the cabinet (100) and the support frame (430); and
 - an elastic shock-absorbing member (520) connected to the damper (510) and one of the cabinet (100) and the support frame (430), respectively.
 8. The front-loading washing machine (1) according to claim 7, wherein the damper (510) is configured as a friction damper (510).
 9. The front-loading washing machine (1) according to claim 8, wherein the friction damper (510) comprises:
 - an inner damping rod (511) connected to the one of the support frame (430) and the cabinet (100); and
 - an outer damping cylinder (512) movably fitted over the inner damping rod (511) along an axial direction of the inner damping rod (511), and connected to the other one of the support frame (430) and the cabinet (100),
 wherein the elastic shock-absorbing member (520) is connected to the outer damping cylinder (512) and the one of the support frame (430) and the cabinet (100) respectively.
 10. The front-loading washing machine (1) to claim 9, wherein the elastic shock-absorbing member (520) is configured as a spring and fitted over the inner damping rod (511).
 11. The front-loading washing machine (1) according to claim 9, wherein the inner damping rod (511) is mounted to the cabinet (100), the outer damping cylinder (512) is mounted to the support frame (430), and the elastic shock-absorbing member (520) is connected with the outer damping cylinder (512) and the cabinet (100) respectively.
 12. The front-loading washing machine (1) according to claim 11, wherein the cabinet (100) is provided with a support foot (530), an inserting hole is formed in the support foot (530), and the inner damping rod (511) is inserted in the inserting hole.
 13. The front-loading washing machine (1) according to claim 7, wherein four groups of the damper (510) and the elastic shock-absorbing member (520) are provided and distributed at four corners of a same rectangle.
 14. The front-loading washing machine (1) according to claim 6, wherein the cabinet (100) comprises a base plate (120) located at a bottom thereof, and the damping shock absorber (500) is mounted on the base plate (120).
 15. The front-loading washing machine (1) according to claim 14, further comprising an adjustable foot (600) configured to support the cabinet (100) and adjust a height of the cabinet (100), wherein the adjustable foot (600) is threadedly fitted to the base plate (120) and is provided with a shock absorbing cushion (610).

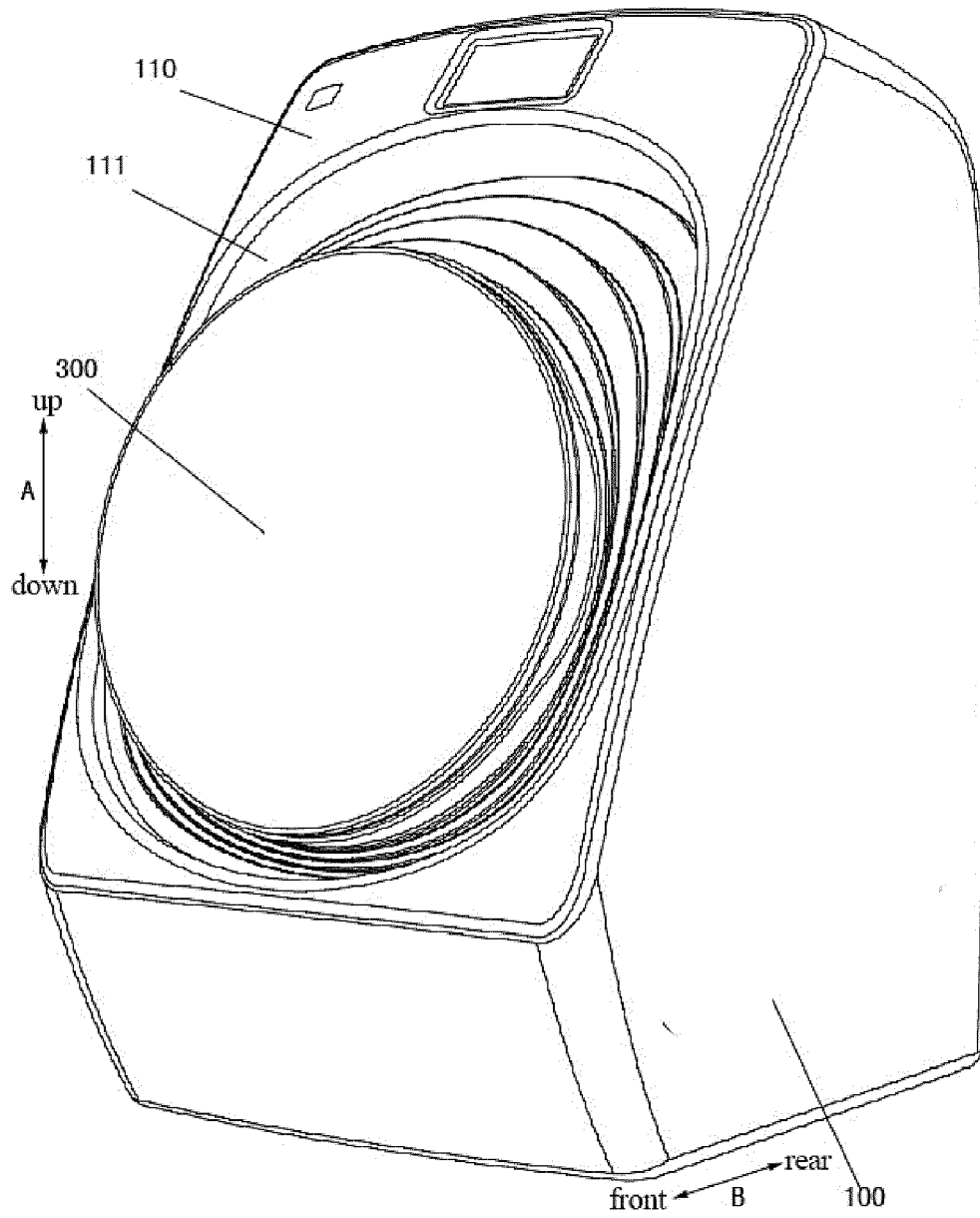


Fig. 1

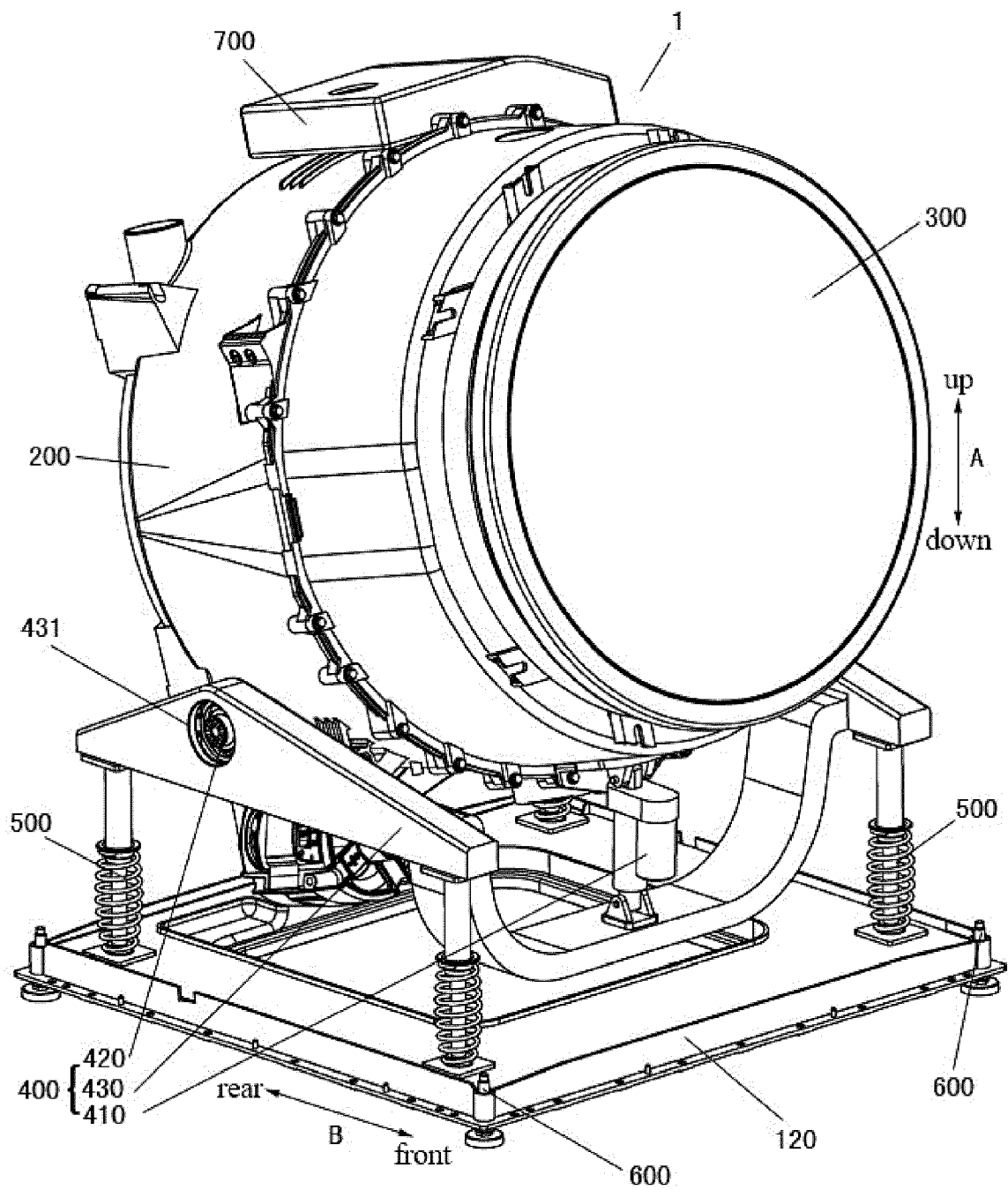


Fig. 2

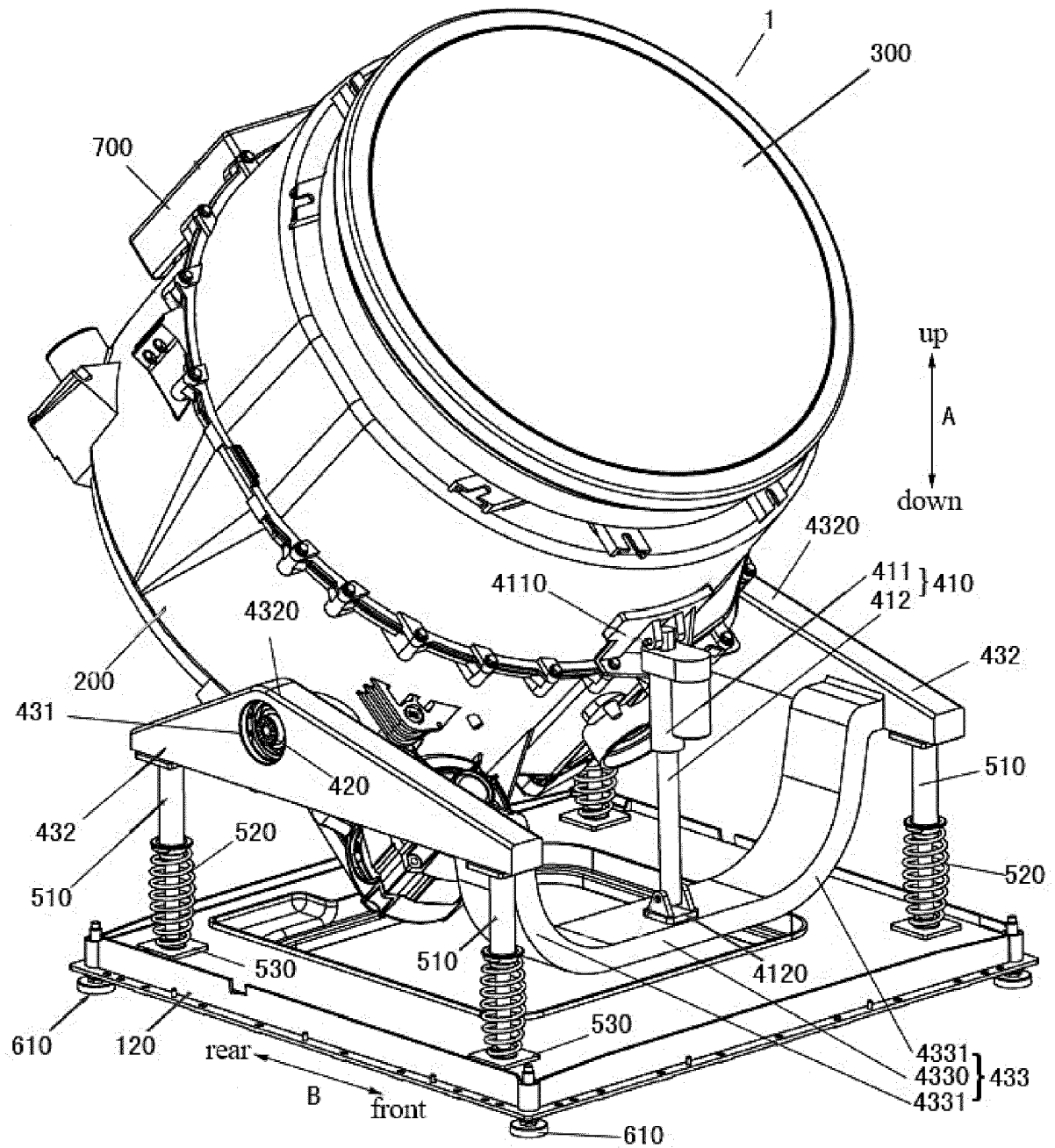


Fig. 3

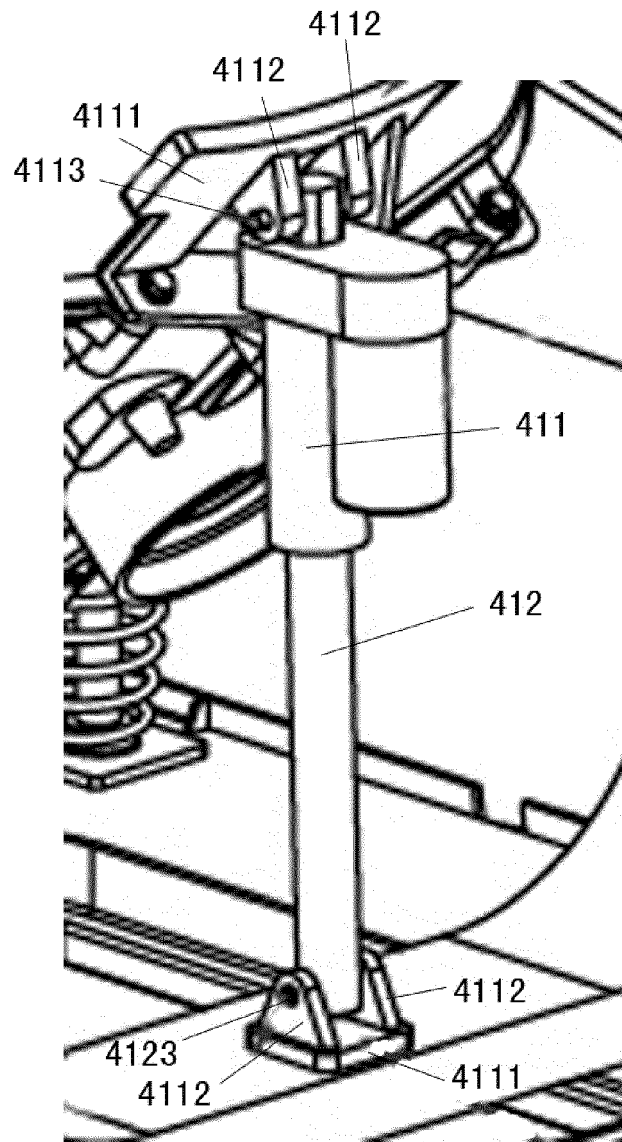


Fig. 4

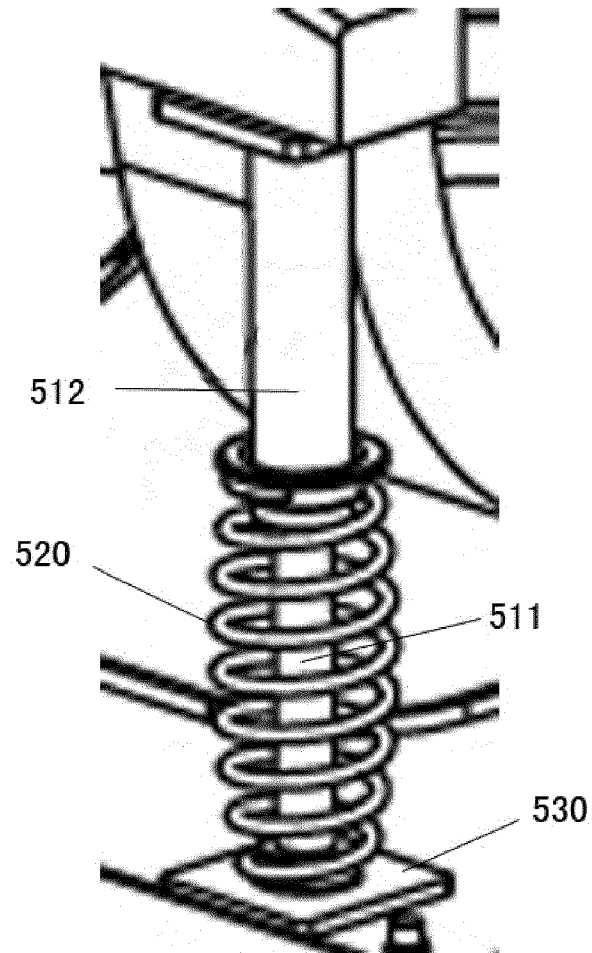


Fig. 5



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