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(54) **Front-loading-type washing machine**

Frontlader-Waschmaschine

Machine à laver à chargement frontal

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(56) References cited:
EP-A1- 1 881 099 JP-A- S5 066 974
JP-U- S60 171 281 US-A- 3 509 742
US-A1- 2011 023 554

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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a front-loading-type washing machine which performs each process of washing, rinsing and spin-drying by rotating a rotary drum accommodated in a water tub.

BACKGROUND ART

[0002] In the related art, there is provided a front-loading-type washing machine in which a vibration isolating damper is disposed in a bottom portion of a water tub in order to control vibrations, and the vibrations of a water tub unit are suppressed by utilizing dampening thereof (for example, refer to Japanese Patent Unexamined Publication No. 2012-170678).

[0003] Fig. 7 illustrates a configuration of the front-loading-type washing machine in the related art.

[0004] In Fig. 7, rotary drum 101 which accommodates and rotates laundry is rotatably arranged inside water tub 103. Drum driving motor 105 for rotatably driving rotary drum 101 is disposed in the bottom portion of water tub 103. Lid body 108 is disposed in an opening of rotary drum 101 so as to be openable and closeable. A posture of water tub 103 is held by spring member 110 disposed between washing machine housing 109 and water tub 103. Water tub 103 is supported and isolated from vibrations by support damper 111 and vibration isolating damper 112 so that the vibrations during spin-drying are not transmitted to washing machine housing 109. In addition, seal packing 107 for closing a gap is disposed between a laundry loading port on a front surface of water tub 103 and washing machine housing 109.

[0005] Vibration detection device 106 using an acceleration sensor is arranged in water tub 103. In response to an output from vibration detection device 106, control unit 113 controls an operation of drum driving motor 105 and controls the vibrations of water tub 103.

[0006] However, in the front-loading-type washing machine in the related art, a direction in which a dampening force of a damper acts is limited, and thus, an unbalanced load is generated due to unevenly distributed laundry during a spin-drying process. Consequently, when the vibrations are increased in the water tub unit, there is a problem in that it is not possible to stop the vibrations required for the dampening in multiple directions, such as oscillating movements where a front portion and a rear portion of a water tub unit are respectively moved in vertically opposite

[0007] A front-loading-type washing machine with the features of the preamble of claim 1 is known from EP 1 881 099 A1.

SUMMARY OF THE INVENTION

[0008] To solve the problem in the related art, the present invention provides a front-loading-type washing machine which enables dampening of vibrations in multiple directions.

[0009] A front-loading-type washing machine according to the present invention includes a washing machine housing, a water tub formed in a bottomed cylindrical shape, and a rotary drum whose front surface side is open, and which is arranged inside the water tub and has a bottomed cylindrical shape. In addition, the front-loading-type washing machine includes a rotary shaft which is fixed to a center on a bottom surface of the rotary drum and pivotally supported by a bearing fixed to the bottom surface of the water tub. In addition, the front-loading-type washing machine includes a drum driving motor which rotatably drives the rotary drum via the rotary shaft, and a water tub unit which includes the water tub, the rotary drum, the bearing, the rotary shaft, and the drum driving motor. In addition, the front-loading-type washing machine includes multiple suspensions whose lower end is connected to an upper portion of the water tub unit, whose upper end is connected to an upper portion of the washing machine housing, and which elastically supports the water tub unit inside the washing machine housing. In addition, the front-loading-type washing machine includes multiple vibration isolating dampers whose respective upper ends are connected to a water tub connecting portion disposed in a lower portion of the water tub via a first cushioning member, whose respective lower ends are connected to a housing connecting portion in a lower portion of the washing machine housing via a second cushioning member, and which suppress vibrations of the water tub unit. The water tub unit is arranged inside the washing machine housing so that the rotary shaft of the rotary drum is tilted downward or substantially horizontal from a front surface side to a rear surface side. Multiple vibration isolating dampers have at least a first vibration isolating damper which is disposed in a direction in which a rotary drum is rotated during a spin-drying process and is arranged at a position close to a front surface side from a center of gravity of a water tub unit. In addition, the multiple vibration isolating dampers have at least a second vibration isolating damper which is disposed in the direction in which the rotary drum is rotated during the spin-drying process and is arranged at a position close to a rear surface side from the center of gravity of the water tub unit. In addition, the multiple vibration isolating dampers have at least a third vibration isolating damper which is arranged on an opposite side to the direction in which the rotary drum is rotated during the spin-drying process. The respective housing connecting portions to which the first vibration isolating damper and the second vibration isolating damper are connected are attached to the washing machine housing via a third cushioning member.

[0010] According to this configuration, the first vibra-

tion isolating damper, the second vibration isolating damper and the respective third cushioning members in the attachment portion of the washing machine housing can dampen the vibrations of the water tub unit which are generated due to unevenly distributed laundry in longitudinal and lateral directions.

[0011] According to the front-loading-type washing machine of the present invention, it is possible to realize the front-loading-type washing machine which enables dampening of vibrations in the other direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a longitudinal cross-sectional view of a front-loading-type washing machine according to an embodiment of the present invention.

Fig. 2 is an internal front view of a front-loading-type washing machine according to an embodiment of the present invention.

Fig. 3 is a view when an interior of a front-loading-type washing machine according to an embodiment of the present invention is viewed from an upper surface.

Fig. 4 is a longitudinal cross-sectional view of a vibration isolating damper and a housing connecting portion of a front-loading-type washing machine according to an embodiment of the present invention.

Fig. 5 is a longitudinal cross-sectional view illustrating another configuration of a vibration isolating damper and a housing connecting portion of a front-loading-type washing machine according to an embodiment of the present invention.

Fig. 6 is a view when a housing connecting portion of a front-loading-type washing machine according to an embodiment of the present invention is viewed from above.

Fig. 7 is a view illustrating a configuration of a front-loading-type washing machine in the related art.

DETAILED DESCRIPTION OF EMBODIMENTS

[0013] Hereinafter, an embodiment of the present invention will be described with reference to the drawings. The present invention is not limited to this embodiment.

[0014] Fig. 1 is a longitudinal cross-sectional view of a front-loading-type washing machine according to the embodiment of the present invention. Fig. 2 is an internal front view of the front-loading-type washing machine. Fig. 3 is a view when an interior of the front-loading-type washing machine is viewed from an upper surface. Fig. 4 is a longitudinal cross-sectional view of a vibration isolating damper and a housing connecting portion of the front-loading-type washing machine. Fig. 5 is a longitudinal cross-sectional view illustrating another configuration of the vibration isolating damper and the housing connecting portion of the front-loading-type washing ma-

chine.

[0015] In Figs. 1, 2, and 3, rotary drum 17 is formed in a bottomed cylindrical shape, and is rotatably arranged inside water tub 19 via bearing 16 inside bearing case 15 attached to a bottom portion of water tub 19. Multiple water passing holes 18 are disposed on an entire surface of an outer peripheral portion of rotary drum 17. Water tub 19 is formed in a bottomed cylindrical shape. Rotary shaft 20 is disposed in a rotation center of rotary drum 17. An axial direction of rotary drum 17 is tilted downward from a front surface side to a rear surface side. Rotary shaft 20 is fixed to a bottom surface center of rotary drum 17, and is pivotally supported by bearing 16 fixed to the bottom surface of water tub 19. Drum pulley 28 is connected to the rear surface of water tub 19. Rotary drum 17 is rotatably driven in a forward direction and a rearward direction by drum driving motor 21 connected by belt 29 and drum pulley 28. Several projection plates 22 for agitating laundry are disposed on an inner wall surface of rotary drum 17. Water tub unit 37 is configured to have bearing case 15, bearing 16, rotary drum 17, water tub 19, rotary shaft 20, drum driving motor 21, and drum pulley 28.

[0016] Water tub unit 37 is elastically supported inside washing machine housing 23 in such a manner that a lower end thereof is connected to a lower portion of washing machine housing 23, and an upper end thereof is connected to an upper portion of washing machine housing 23 by multiple suspensions 31. Furthermore, vibration isolating dampers 25, 26, and 27 are configured so that respective upper ends thereof are connected to water tub connecting portions 43a, 43b, and 43c disposed in a lower portion of water tub 19 via first cushioning member 44, and respective lower ends thereof are connected to housing connection portions 34d, 34e, and 34f via second cushioning member 45. As a material of first cushioning member 44 and second cushioning member 45, a thermoplastic elastomer (TPE) is used, for example. Water tub connecting portions 43a, 43b, and 43c are disposed in a lower portion of water tub 19. Housing connecting portions 34d, 34e, and 34f are disposed in base bottom 24 of a lower portion of washing machine housing 23. In this manner, the vibrations of water tub unit 37 are suppressed by multiple vibration isolating dampers 25, 26, and 27 arranged in an oblique direction.

[0017] As illustrated in Fig. 1, water tub connecting portion 43a to which first vibration isolating damper 25 is connected is positioned above water tub connecting portion 43c to which third vibration isolating damper 27 is connected. Water tub connecting portion 43b to which second vibration isolating damper 26 is connected is positioned below water tub connecting portion 43c to which third vibration isolating damper 27 is connected.

[0018] Housing connecting portion 34d to which first vibration isolating damper 25 is connected is positioned above housing connecting portion 34f to which third vibration isolating damper 27 is connected. Housing connecting portion 34e to which second vibration isolating

damper 26 is connected is positioned below housing connecting portion 34f to which third vibration isolating damper 27 is connected.

[0019] Vibration isolating dampers 25, 26, and 27 are arranged as illustrated in Figs. 2 and 3. First vibration isolating damper 25 and second vibration isolating damper 26 are arranged in a rotating direction (in a case of rightward rotation when viewed from a front surface (clockwise, arrow A in Fig. 2), the right side when viewed from the front surface) of rotary drum 17 during a spin-drying process. Third vibration isolating damper 27 is arranged in a direction opposite to the rotating direction (in a case of rightward rotation when viewed from the front surface (clockwise, arrow A), the left side when viewed from the front surface) of rotary drum 17 during the spin-drying process. First vibration isolating damper 25 is arranged in front of center of gravity G of water tub unit 37. Second vibration isolating damper 26 is arranged behind center of gravity G of water tub unit 37. In this manner, respective vibration isolating dampers 25 and 26 support water tub unit 37 with good balance and dampen the vibrations during the spin-drying process. When the rotating direction of rotary drum 17 is set to be a leftward rotating direction (counterclockwise), an arrangement position of vibration isolating dampers 25, 26, and 27 may be a position laterally opposite to an arrangement position of the vibration isolating damper when the above-described rotating direction of rotary drum 17 is a rightward rotating direction (clockwise) when viewed from the front surface.

[0020] Furthermore, heavy components such as bearing case 15 and drum driving motor 21 are arranged on the rear surface side of water tub unit 37. Accordingly, center of gravity G of water tub unit 37 is positioned behind center 33 of rotary drum 17 (refer to Fig. 1).

[0021] Therefore, if an unbalanced load is generated in front of rotary drum 17, a distance from center of gravity G of water tub unit 37 to a point of the unbalanced load becomes farther. Consequently, a so-called oscillating movement where a front portion and a rear portion of water tub unit 37 are respectively vibrated in vertically opposite directions is likely to occur. Therefore, an angle of first vibration isolating damper 25 is caused to be closer to a vertical direction when viewed from the front surface than an angle of third vibration isolating damper 27 (refer to Fig. 2). In this manner, the oscillating movement can be suppressed by actively suppressing the vibrations in the vertical direction.

[0022] If the point of the unbalanced load is generated behind rotary drum 17, the distance from center of gravity G of water tub unit 37 to the point of the unbalanced load becomes closer, and thus, a lateral swinging movement in the rear portion of water tub unit 37 is increased. Therefore, the angle of second vibration isolating damper 26 is caused to be closer to a horizontal direction when viewed from the front surface than the angle of third vibration isolating damper 27 (refer to Fig. 2). This can suppress the lateral swinging movement.

[0023] That is, as illustrated in Fig. 2, if the angle formed between first vibration isolating damper 25 and the vertical direction is set to be α , the angle formed between second vibration isolating damper 26 and the vertical direction is set to be β , and the angle formed between third vibration isolating damper 27 and the vertical direction is set to be γ , the relationship is expressed by $\alpha < \gamma < \beta$. In this manner, first vibration isolating damper 25, second vibration isolating damper 26, and third vibration isolating damper 27 are arranged.

[0024] In this manner, first vibration isolating damper 25 shows a vibration dampening effect, particularly for the vibrations in the vertical direction (vertical direction in Fig. 2), and second vibration isolating damper 26 shows the vibration dampening effect, particularly for the vibrations in the horizontal direction (lateral direction in Fig. 2), thereby performing efficient vibration isolation.

[0025] Here, the dampening force of first vibration isolating damper 25 and second vibration isolating damper 26 is set to be weaker than the dampening force of third vibration isolating damper 27 in order to keep a lateral balance. In addition, in order to reduce the oscillating movement, the dampening force of first vibration isolating damper 25 is set to be stronger than the dampening force of second vibration isolating damper 26. In addition, in order to prevent the vibration from being transmitted to base bottom 24 of washing machine housing 23 or the floor, the dampening force of first vibration isolating damper 25, second vibration isolating damper 26, and third vibration isolating damper 27 is set as weak as possible within a range which can sufficiently suppress the vibrations of water tub unit 37 in the above-described range.

[0026] An attachment configuration between first vibration isolating damper 25 and base bottom 24 of washing machine housing 23 is as illustrated in Fig. 4. That is, first vibration isolating damper 25 is attached to housing connecting portion 34d via second cushioning member 45. Fixing member 35 is attached to base bottom 24 of washing machine housing 23. Third cushioning member A 38 is arranged between housing connecting portion 34d and fixing member 35. As a material of third cushioning member A 38, a chlorinated butyl rubber is used, for example. Furthermore, third cushioning member B 39 is arranged between washer 36 and fixing member 35. As a material of third cushioning member B 39, a chlorinated butyl rubber is used, for example. Housing connecting portion 34d and washer 36 are fastened by stepped bolt 40 and nut 41.

[0027] Therefore, when first vibration isolating damper 25 is vibrated around fixing member 35 in the lateral direction when viewed from the front surface, housing connecting portion 34d and washer 36 are also vibrated. However, third cushioning member A 38 and third cushioning member B 39 are compressed to cause the dampening, thereby reducing the vibrations of water tub unit 37. The attachment method of second vibration isolating damper 26 is the same as the attachment method of first

vibration isolating damper 25.

[0028] Here, when rotary drum 17 is rotated clockwise during the spin-drying, the vibrations of water tub unit 37 are greater due to the influence of gravity when the point of the unbalanced load moves to the right side in Fig. 3, and are smaller when the point of the unbalanced load moves to the left side in Fig. 3. Therefore, the vibrations are effectively suppressed by arranging a cushioning member in respective fastening portions of first vibration isolating damper 25 and second vibration isolating damper 26 which are attached to the right side in Fig. 3.

[0029] Fig. 5 is a longitudinal cross-sectional view illustrating another configuration of vibration isolating damper 25 and housing connecting portion 34d of the front-loading-type washing machine according to the present embodiment. In this configuration, first vibration isolating damper 25 is attached to housing connecting portion 34d via second cushioning member 45. Fixing member 35 is attached to base bottom 24 of washing machine housing 23. Third cushioning member A 38 is arranged between housing connecting portion 34d and fixing member 35. Furthermore, third cushioning member B 39 is arranged between washer 36 and fixing member 35, and housing connecting portion 34d and washer 36 are fastened by stepped bolt 40 and nut 41.

[0030] Therefore, when first vibration isolating damper 25 is vibrated around fixing member 35 in the lateral direction when viewed from the front surface, housing connecting portion 34d and washer 36 are also vibrated. However, third cushioning member A 38 and third cushioning member B 39 are compressed to cause the dampening, thereby reducing the vibrations of water tub unit 37. The attachment method of second vibration isolating damper 26 is the same as the attachment method of first vibration isolating damper 25.

[0031] Here, when rotary drum 17 is rotated clockwise during the spin-drying, the vibrations of water tub unit 37 are greater due to the influence of gravity when the point of the unbalanced load moves to the right side in Fig. 3, and are smaller when the point of the unbalanced load moves to the left side in Fig. 3. Therefore, the vibrations are effectively suppressed by arranging a cushioning member in respective fastening portions of first vibration isolating damper 25 and second vibration isolating damper 26 which are attached to the right side in Fig. 3.

[0032] Furthermore, housing connecting portion 34d is bent in a U-shape from a surface in contact with third cushioning member A 38. Bolt 46 passes through second side surface 34b from bent first side surface 34a, and nut 47 and bolt 46 are fastened together. In this manner, first vibration isolating damper 25 and second vibration isolating damper 26 are respectively fixed to base bottom 24. In addition, in third cushioning member A 38, convex portion 38a having substantially the same shape as the shape of the bottom portion of housing connecting portions 34d and 34e is disposed on the outer periphery of housing connecting portions 34d and 34e. Convex portion 38a surrounds the periphery of housing connecting

portions 34d and 34e. Therefore, when first vibration isolating damper 25 and second vibration isolating damper 26 start to be rotated around the axis of stepped bolt 40 under the influence of the vibrations of water tub unit 37, housing connecting portions 34d and 34e also start to be rotated. However, respective housing connecting portions 34d and 34e come into contact with convex portion 38a of third cushioning member A 38, thereby regulating the rotation of housing connecting portions 34d and 34e. In this manner, according to the configuration illustrated in Fig. 5, as compared to the configuration illustrated in Fig. 4, the vibrations of water tub unit 37 are further reduced by disposing convex portion 38a.

[0033] In convex portion 38a of the outer peripheral portion of third cushioning member A 38, groove 38b having substantially the same height as that of the bottom surface to which housing connecting portions 34d and 34e are attached is disposed in two lateral positions. Therefore, water such as dew condensation accumulated inside convex portion 38a is discharged outward from groove 38b. If water gathers inside convex portion 38a, third cushioning member A 38 or housing connecting portions 34d and 34e may be corroded. In addition, a contact portion between third cushioning member A 38 and housing connecting portions 34d and 34e is slippery due to water, and the slipperiness makes a sliding sound, in some cases. In order to prevent this case, groove 38b is disposed in convex portion 38a of third cushioning member A 38. In this manner, it is possible to suppress the corrosion of the above-described components or the occurrence of abnormal noises by discharging the water such as the dew condensation accumulated inside convex portion 38a outward.

[0034] Fig. 6 is a view when housing connecting portions 34d and 34e of the front-loading-type washing machine according to the present embodiment are viewed from above.

[0035] Housing connecting portions 34d and 34e bent in a U-shape are disposed so as to interpose stepped bolt 40 therebetween. Convex portion 38a of third cushioning member A 38 is disposed so as to surround the periphery of housing connecting portions 34d and 34e. Groove 38b is disposed in the lateral direction at a position of a gap in convex portion 38a when housing connecting portions 34d and 34e are viewed from above. The water accumulated inside convex portion 38a is discharged outward from groove 38b.

[0036] In the front-loading-type washing machine configured as described above, an operation and actuation thereof will be described.

[0037] In a washing process, lid body 30 is opened, laundry is loaded into rotary drum 17, and the operation is started. Rotary drum 17 is rotatably driven at a low speed by drum driving motor 21. The laundry inside rotary drum 17 is lifted and then dropped onto the water surface. In this manner, the washing process proceeds.

[0038] After the washing process is performed for a predetermined time period, the washing water inside wa-

ter tub 19 is drained. Intermediate spin-drying is performed, and then a rinsing process is performed. Even in the rinsing process, an operation similar to that of the washing process is performed. In a spin-drying process, rotary drum 17 is rotatably driven at a high speed, and the laundry is centrifugally spin-dried.

[0039] When the laundry loaded inside rotary drum 17 is unevenly distributed in the spin-drying process, water tub unit 37 is pivotally supported in a vibration isolating manner so as to perform spin-drying rotations by absorbing the biasing, thereby preventing the vibrations from being transmitted to washing machine housing 23. However, when the biasing is abnormally severe, water tub unit 37 is abnormally vibrated, and loud noises may be generated from the washing machine.

[0040] In the present embodiment, first vibration isolating damper 25 is arranged in front of center of gravity G of water tub unit 37 in the rotating direction of rotary drum 17, and second vibration isolating damper 26 is arranged behind center of gravity G. Third vibration isolating damper 27 is arranged in a direction opposite to the rotating direction of rotary drum 17. In addition, third vibration isolating damper 27 is disposed near center of gravity G of water tub unit 37. The first, second, and third vibration dampers dampen the vibrations with good balance.

[0041] Furthermore, first vibration isolating damper 25 is arranged more vertically, and second vibration isolating damper 26 is arranged more horizontally. Accordingly, it is possible to reduce the vibrations in the vertical direction and the horizontal direction. In addition, each lower portion of first vibration isolating damper 25 and second vibration isolating damper 26 is attached to washing machine housing 23 via the cushioning member. Accordingly, without being limited to each stroke direction of first vibration isolating damper 25 and second vibration isolating damper 26, it is also possible to allow the dampening in the longitudinal direction and the lateral direction. Therefore, the vibrations of water tub unit 37 are efficiently reduced.

[0042] In the present embodiment, in each fastening portion of first vibration isolating damper 25 and second vibration isolating damper 26, the cushioning member is disposed on housing connecting portions 34d and 34e side of base bottom 24 in the lower portion of washing machine housing 23. However, even when the cushioning member is disposed on water tub connecting portions 43a and 43b side, the same effect can be obtained.

[0043] Convex portion 38a having substantially the same shape as that of housing connecting portions 34d and 34e arranged on the outer periphery is disposed in third cushioning member A 38, thereby regulating the rotation of housing connecting portions 34d and 34e. In this manner, it is possible to regulate the rotation of first vibration isolating damper 25 and second vibration isolating damper 26. Therefore, it is possible to reduce the occurrence of abnormal noises caused by the rotation or the load on the vibration isolating damper. In addition,

housing connecting portions 34d and 34e can be guided when mounted on third cushioning member A 38. Therefore, it is possible to improve the assembly efficiency.

[0044] Furthermore, it is possible to prevent the water from being gathered inside convex portion 38a by disposing groove 38b in convex portion 38a on the outer peripheral portion of third cushioning member A 38. Therefore, it is possible to suppress the corrosion of the components or the occurrence of abnormal noises.

[0045] In the present embodiment, the axial direction of rotary drum 17 is tilted downward from the front surface side to the rear surface side. However, even when the axial direction is substantially horizontal, the same effect can be obtained.

[0046] As described above, the front-loading-type washing machine according to the present embodiment includes washing machine housing 23, water tub 19 formed in a bottomed cylindrical shape, and rotary drum 17 whose front surface side is open, which is arranged inside water tub 19, and which has a bottomed cylindrical shape. In addition, the front-loading-type washing machine includes rotary shaft 20 which is fixed to the center on the bottom surface of rotary drum 17 and is pivotally supported by bearing 16 fixed to the bottom surface of water tub 19. In addition, the front-loading-type washing machine includes drum driving motor 21 which rotatably drives rotary drum 17 via rotary shaft 20, and water tub unit 37 including water tub 19, rotary drum 17, bearing 16, rotary shaft 20, and drum driving motor 21. In addition, the front-loading-type washing machine includes multiple suspensions 31 whose lower end is connected to the upper portion of water tub unit 37, whose upper end is connected to the upper portion of washing machine housing 23, and which elastically support water tub unit 37 inside washing machine housing 23. In addition, the front-loading-type washing machine includes multiple vibration isolating dampers 25, 26, and 27 whose respective upper ends are connected to water tub connecting portions 43a, 43b, and 43c disposed in the lower portion of water tub via first cushioning member 44, whose respective lower ends are connected to housing connecting portions 34d, 34e, and 34f in the lower portion of washing machine housing 23, and which suppress the vibrations of water tub unit 37 via second cushioning member 45. Water tub unit 37 is arranged inside washing machine housing 23 so that rotary shaft 20 of rotary drum 17 is tilted downward from the front surface side to the rear surface side or substantially horizontally. Multiple vibration isolating dampers 25, 26, and 27 includes at least first vibration isolating damper 25 which is disposed in the direction in which rotary drum 17 is rotated during the spin-drying process, and which is arranged at the position close to the front surface side from a center of gravity of water tub unit 37. In addition, multiple vibration isolating dampers 25, 26, and 27 includes at least second vibration isolating damper 26 which is disposed in the direction in which rotary drum 17 is rotated during the spin-drying process, and which is arranged at the position close to

the rear surface side from the center of gravity of water tub unit 37. In addition, multiple vibration isolating dampers 25, 26, and 27 includes at least third vibration isolating damper 27 which is arranged on the side opposite to the direction in which rotary drum 17 is rotated during the spin-drying process. Respective housing connecting portions 34d and 34e to which first vibration isolating damper 25 and second vibration isolating damper 26 are connected are attached to washing machine housing 23 via third cushioning members 38 and 39. This configuration reduces the vibrations of water tub unit 37.

[0047] In the front-loading-type washing machine according to the present embodiment, respective housing connecting portions 34d and 34e to which first vibration isolating damper 25 and second vibration isolating damper 26 are connected are fastened to fixing member 35 attached to the base bottom of washing machine housing 23 by bolt 40, nut 41 and washer 36. Third cushioning members 38 and 39 are formed of third cushioning member A 38 disposed between housing connecting portions 34d and 34e and fixing member 35, and third cushioning member B 39 disposed between fixing member 35 and washer 36. Bolt 40 passes through housing connecting portions 34d and 34e, third cushioning member A 38, fixing member 35, third cushioning member B 39, and washer 36, and is clamped by nut 41. This configuration reduces the vibrations of water tub unit 37.

[0048] In the front-loading-type washing machine according to the present embodiment, respective water tub connecting portions 43a and 43b to which first vibration isolating damper 25 and second vibration isolating damper 26 are connected are attached to water tub 19 via fourth cushioning members. As a material of the fourth cushioning member, a chlorinated butyl rubber is used, for example. This configuration reduces the vibrations of water tub unit 37.

[0049] In the front-loading-type washing machine according to the present embodiment, third vibration isolating damper 27 is disposed near the center of gravity of water tub unit 37. This configuration dampens the vibrations of water tub unit 37 with good balance.

[0050] In the front-loading-type washing machine according to the present embodiment, the angle of first vibration isolating damper 25 is arranged to be closer to the vertical direction than the angle of third vibration isolating damper 27. The angle of second vibration isolating damper 26 is arranged to be closer to the horizontal direction than the angle of third vibration isolating damper 27. This configuration can suppress the vertical vibrations and the lateral swinging movement of water tub unit 37.

[0051] In the front-loading-type washing machine according to the present embodiment, water tub connecting portion 43a to which first vibration isolating damper 25 is connected is positioned above water tub connecting portion 43c to which third vibration isolating damper 27 is connected. Water tub connecting portion 43b to which second vibration isolating damper 26 is connected is po-

sitioned below water tub connecting portion 43c to which third vibration isolating damper 27 is connected. This configuration suppresses the vibrations of water tub unit 37.

[0052] In the front-loading-type washing machine according to the present embodiment, housing connecting portion 34d to which first vibration isolating damper 25 is connected is positioned above housing connecting portion 34f to which third vibration isolating damper 27 is connected. Housing connecting portion 34e to which second vibration isolating damper 26 is connected is positioned below housing connecting portion 34f to which third vibration isolating damper 27 is connected. This configuration suppresses the vibrations of water tub unit 37.

[0053] In the front-loading-type washing machine according to the present embodiment, housing connecting portions 34d and 34e are attached to fixing member 35 attached to the base bottom of washing machine housing 23 by bolt 40, nut 41, and washer 36. Third cushioning members 38 and 39 are formed of third cushioning member A 38 disposed between housing connecting portions 34d and 34e and fixing member 35, and third cushioning member B 39 disposed between fixing member 35 and washer 36. Bolt 40 passes through housing connecting portions 34d and 34e, third cushioning member A 38, fixing member 35, third cushioning member B 39, and washer 36, and is clamped by nut 41. Convex portion 38a having substantially the same shape as the shape of the bottom portion of housing connecting portions 34d and 34e is disposed on the outer peripheral portion of third cushioning member A 38. This configuration allows housing connecting portions 34d and 34e to come into contact with convex portion 38a of third cushioning member A 38, thereby regulating the rotation of first vibration isolating damper 25 and second vibration isolating damper 26.

[0054] In the front-loading-type washing machine according to the present embodiment, at least one groove 38b having substantially the same height as that of the bottom surface to which housing connecting portions 34d and 34e are attached is disposed in convex portion 38a of third cushioning member A 38. This configuration allows the water such as the dew condensation accumulated inside convex portion 38a to be discharged outward, and thus, it is possible to suppress the corrosion of the components or the occurrence of abnormal noises.

[0055] As described above, the front-loading-type washing machine according to the present invention dampens the vibrations of the water tub unit which are generated due to the unevenly distributed laundry in the longitudinal direction and the lateral direction by using the third cushioning member of the attachment portion between the respective first vibration isolating damper and second vibration isolating damper and the washing machine housing. Therefore, the front-loading-type washing machine according to the present invention is advantageously used in a washing machine which dem-

onstrates low vibration and low noise.

Claims

1. A front-loading-type washing machine comprising:

a washing machine housing (23);
 a water tub (19) formed in a bottomed cylindrical shape;
 a rotary drum (17) whose front surface side is open, and which is arranged inside the water tub (19) and has a bottomed cylindrical shape;
 a rotary shaft (20) which is fixed to a center on a bottom surface of the rotary drum (17) and pivotally supported by a bearing (16) fixed to the bottom surface of the water tub (19) ;
 a drum driving motor (21) which rotatably drives the rotary drum (17) via the rotary shaft (20);
 a water tub unit (37) which includes the water tub (19), the rotary drum (17), the bearing (16), the rotary shaft (17), and the drum driving motor (21);

multiple suspensions (31) whose lower end is connected to an upper portion of the water tub unit (37), whose upper end is connected to an upper portion of the washing machine housing (23), wherein the multiple suspensions (31) are configured to elastically support the water tub unit (37) inside the washing machine housing (23); and

multiple vibration isolating dampers (25, 26, 27) whose respective upper ends are connected to a water tub connecting portion (43a, 43b, 43c) disposed in a lower portion of the water tub (19) via a first cushioning member (44), whose respective lower ends are connected to a housing connecting portion (34d, 34e, 34f) in a lower portion of the washing machine housing (23) via a second cushioning member (45), wherein the multiple vibration isolating dampers (25, 26, 27) are configured to suppress vibrations of the water tub unit (37),

wherein the water tub unit (37) is arranged inside the washing machine housing (23) so that the rotary shaft (20) of the rotary drum (17) is tilted downward or substantially horizontal from a front surface side to a rear surface side, **characterized in that**

the multiple vibration isolating dampers (25, 26, 27) include at least a first vibration isolating damper (25) arranged at a position between a front surface of the washing machine housing (23) and a center of gravity (G) of the water tub unit (37), a second vibration isolating damper (26) arranged at a position between a rear surface of the washing machine housing (23) and the center of gravity (G), and a third vibration isolating damper (27), arranged near the center of gravity,

when the rotary drum (17) rotates clockwise, the first

and the second vibration isolating dampers (25, 26) are arranged at a right side of the rotary drum (17), viewed from the front surface,

when the rotary drum (17) rotates anti-clockwise, the first and the second vibration isolating dampers (25, 26) are arranged at a left side of the rotary drum (17), viewed from the front surface,

the third vibration isolating damper (27) is arranged at an opposite side of the rotary drum (17) relative to the first and the second vibration isolating dampers, viewed from the front surface, and

the respective housing connecting portions (34d, 34e) to which the first vibration isolating damper (25) and the second vibration isolating damper (26) are connected are attached to a fixing member (35) that is attached to a base bottom (24) of the washing machine housing (23) via third cushioning members (38, 39).

2. The front-loading-type washing machine of claim 1, wherein the respective housing connecting portions (34d, 34e) to which the first vibration isolating damper (25) and the second vibration isolating damper (26) are connected are fastened to a fixing member (35) attached to a base bottom (24) of the washing machine housing (23) by a bolt (40), a nut (41), and a washer (36),

wherein the third cushioning member is formed of a third cushioning member (A38) disposed between the housing connecting portion (34d, 34e) and the fixing member (35), and a third cushioning member (B39) disposed between the fixing member (35) and the washer (36), and

wherein the bolt (40) passes through the housing connecting portion, the third cushioning member (A38), the fixing member (35), the third cushioning member (B39), and the washer (36), and is clamped by the nut (41).

3. The front-loading-type washing machine of claim 1, wherein the respective water tub connecting portions (43a, 43b) to which the first vibration isolating damper (25) and the second vibration isolating damper (26) are connected are attached to the water tub (19) via fourth cushioning members.

4. The front-loading-type washing machine of claim 1, wherein an angle of the first vibration isolating damper (25) is arranged so as to be closer to a vertical direction than an angle of the third vibration isolating damper (27), and an angle of the second vibration isolating damper (26) is arranged so as to be closer to a horizontal direction than the angle of the third vibration isolating damper (27).

5. The front-loading-type washing machine of claim 4, wherein the water tub connecting portion (43a) to which the first vibration isolating damper (25) is con-

nected is positioned above the water tub connecting portion (43c) to which the third vibration isolating damper (27) is connected, and the water tub connecting portion (43b) to which the second vibration isolating damper (26) is connected is positioned below the water tub connecting portion (43c) to which the third vibration isolating damper (27) is connected.

6. The front-loading-type washing machine of claim 4 or 5, wherein the housing connecting portion (34d) to which the first vibration isolating damper (25) is connected is positioned above the housing connecting portion (34f) to which the third vibration isolating damper (27) is connected, and the housing connecting portion (34e) to which the second vibration isolating damper (26) is connected is positioned below the housing connecting portion (34f) to which the third vibration isolating damper (27) is connected.
7. The front-loading-type washing machine of claim 1, wherein the housing connecting portion (34d, 34e) is attached to a fixing member (35) attached to a base bottom (24) of the washing machine housing (23) by a bolt (40), a nut (41), and a washer (36), wherein the third cushioning member is formed of a third cushioning member (A38) disposed between the housing connecting portion (34d, 34e) and the fixing member (35), and a third cushioning member (B39) disposed between the fixing member (35) and the washer (36), wherein the bolt (40) passes through the housing connecting portion, the third cushioning member (A38), the fixing member (35), the third cushioning member (B39), and the washer (36), and is clamped by the nut (41), and wherein a convex portion (38a) having substantially the same shape as a bottom portion shape of the housing connecting portion (34d, 34e) is disposed on an outer peripheral portion of the third cushioning member (A38).
8. The front-loading-type washing machine of claim 7, wherein at least one groove (38b) having substantially the same height as that of the bottom surface to which the housing connecting portion (34d, 34e) is attached is disposed in the convex portion of the third cushioning member (A38).

Patentansprüche

1. Frontlader-Waschmaschine, umfassend:

ein Waschmaschinengehäuse (23);
eine Wasserwanne (19), gebildet in einer zylindrischen Form mit einem Boden;
eine Drehtrommel (17), deren Vorderflächen-

seite offen ist und die innerhalb der Wasserwanne (19) angeordnet ist und eine zylindrische Form mit einem Boden hat;
eine Drehwelle (20), die an einem Mittelpunkt auf einer Bodenfläche der Drehtrommel (17) befestigt ist und die schwenkbar von einem Lager (16) getragen wird, das an der Bodenfläche der Wasserwanne (19) befestigt ist;
einen Trommelantriebsmotor (21), der die Drehtrommel (17) mittels der Drehwelle (20) drehbar antreibt;
eine Wasserwanneneinheit (37), die die Wasserwanne (19), die Drehtrommel (17), das Lager (16), die Drehwelle (17) und den Trommelantriebsmotor (21) umfasst;

mehrfache Aufhängungen (31), deren unteres Ende mit einem oberen Abschnitt der Wasserwanneneinheit (37) verbunden ist, deren oberes Ende mit einem oberen Abschnitt des Waschmaschinengehäuses (23) verbunden ist, wobei die mehrfachen Aufhängungen (31) konfiguriert sind, die Wasserwanneneinheit (37) innerhalb des Waschmaschinengehäuses (23) elastisch zu tragen; und mehrfache vibrationsisolierende Dämpfer (25, 26, 27), deren entsprechende obere Enden mittels eines ersten Dämpfungselements (44) mit einem Wasserwannenverbindungsabschnitt (43a, 43b, 43c) verbunden sind, der in einem unteren Abschnitt der Wasserwanne (19) angeordnet ist, deren entsprechende untere Enden mittels eines zweiten Dämpfungselements (45) mit einem Gehäuseverbindungsabschnitt (34d, 34e, 34f) in einem unteren Abschnitt des Waschmaschinengehäuses (23) verbunden sind, wobei die mehrfachen vibrationsisolierenden Dämpfer (25, 26, 27) konfiguriert sind, Vibrationen der Wasserwanneneinheit (37) zu unterdrücken,

wobei die Wasserwanneneinheit (37) innerhalb des Waschmaschinengehäuses (23) angeordnet ist, so dass die Drehwelle (20) der Drehtrommel (17) von einer Vorderflächenseite zu einer Rückflächenseite nach unten oder im Wesentlichen horizontal geneigt wird, **dadurch gekennzeichnet, dass** die mehrfachen vibrationsisolierenden Dämpfer (25, 26, 27) mindestens einen ersten vibrationsisolierenden Dämpfer (25), der an einer Position zwischen einer Vorderfläche des Waschmaschinengehäuses (23) und einem Schwerpunkt (G) der Wasserwanneneinheit (37) angeordnet ist, einen zweiten vibrationsisolierenden Dämpfer (26), der an einer Position zwischen einer Rückfläche des Waschmaschinengehäuses (23) und dem Schwerpunkt (G) angeordnet ist, und einen dritten vibrationsisolierenden Dämpfer (27), der in der Nähe des Schwerpunkts angeordnet ist, umfassen, wenn sich die Drehtrommel (17) im Uhrzeigersinn dreht, die ersten und zweiten vibrationsisolierenden

- Dämpfer (25, 26) an einer rechten Seite der Drehtrommel (17) angeordnet werden, von der Vorderfläche aus betrachtet, wenn sich die Drehtrommel (17) gegen den Uhrzeigersinn dreht, die ersten und zweiten vibrationsisolierenden Dämpfer (25, 26) an einer linken Seite der Drehtrommel (17) angeordnet werden, von der Vorderfläche aus betrachtet, der dritte vibrationsisolierende Dämpfer (27) an einer gegenüberliegenden Seite der Drehtrommel (17) relativ zu den ersten und zweiten vibrationsisolierenden Dämpfern angeordnet ist, von der Vorderfläche aus betrachtet, und die entsprechenden Gehäuseverbindungsabschnitte (34d, 34e), mit denen der erste vibrationsisolierende Dämpfer (25) und der zweite vibrationsisolierende Dämpfer (26) verbunden sind, an einem Befestigungselement (35) angebracht sind, das mittels dritter Dämpfungselemente (38, 39) an einem Unterboden (24) des Waschmaschinengehäuses (23) angebracht ist.
2. Frontlader-Waschmaschine nach Anspruch 1, wobei die entsprechenden Gehäuseverbindungsabschnitte (34d, 34e), mit denen der erste vibrationsisolierende Dämpfer (25) und der zweite vibrationsisolierende Dämpfer (26) verbunden sind, an einem Befestigungselement (35) befestigt sind, das mittels eines Bolzens (40), einer Mutter (41) und eines Dichtungsringes (36) an einem Unterboden (24) des Waschmaschinengehäuses (23) angebracht ist, wobei das dritte Dämpfelement aus einem dritten Dämpfelement (A38), das zwischen dem Gehäuseverbindungsabschnitt (34d, 34e) und dem Befestigungselement (35) angeordnet ist, und einem dritten Dämpfelement (B39), das zwischen dem Befestigungselement (35) und dem Dichtungsring (36) angeordnet ist, gebildet ist, und wobei der Bolzen (40) durch den Gehäuseverbindungsabschnitt, das dritte Dämpfelement (A38), das Befestigungselement (35), das dritte Dämpfelement (B39) und den Dichtungsring (36) verläuft und von der Mutter (41) eingespannt wird.
 3. Frontlader-Waschmaschine nach Anspruch 1, wobei die entsprechenden Wasserwannenverbindungsabschnitte (43a, 43b), mit denen der erste vibrationsisolierende Dämpfer (25) und der zweite vibrationsisolierende Dämpfer (26) verbunden sind, mittels vierter Dämpfelemente an der Wasserwanne (19) angebracht sind.
 4. Frontlader-Waschmaschine nach Anspruch 1, wobei ein Winkel des ersten vibrationsisolierenden Dämpfers (25) so angeordnet ist, dass er näher an einer vertikalen Richtung ist als ein Winkel des dritten vibrationsisolierenden Dämpfers (27), und ein Winkel des zweiten vibrationsisolierenden Dämpfers (26) so angeordnet ist, dass er näher an einer horizontalen Richtung ist als der Winkel des dritten vibrationsisolierenden Dämpfers (27).
 5. Frontlader-Waschmaschine nach Anspruch 4, wobei der Wasserwannenverbindungsabschnitt (43a), mit dem der erste vibrationsisolierende Dämpfer (25) verbunden ist, sich über dem Wasserwannenverbindungsabschnitt (43c) befindet, mit dem der dritte vibrationsisolierende Dämpfer (27) verbunden ist, und der Wasserwannenverbindungsabschnitt (43b), mit dem der zweite vibrationsisolierende Dämpfer (26) verbunden ist, sich unter dem Wasserwannenverbindungsabschnitt (43c) befindet, mit dem der dritte vibrationsisolierende Dämpfer (27) verbunden ist.
 6. Frontlader-Waschmaschine nach Anspruch 4 oder 5, wobei der Gehäuseverbindungsabschnitt (34d), mit dem der erste vibrationsisolierende Dämpfer (25) verbunden ist, sich über dem Gehäuseverbindungsabschnitt (34f) befindet, mit dem der dritte vibrationsisolierende Dämpfer (27) verbunden ist, und der Gehäuseverbindungsabschnitt (34e), mit dem der zweite vibrationsisolierende Dämpfer (26) verbunden ist, sich unter dem Gehäuseverbindungsabschnitt (34f) befindet, mit dem der dritte vibrationsisolierende Dämpfer (27) verbunden ist.
 7. Frontlader-Waschmaschine nach Anspruch 1, wobei der Gehäuseverbindungsabschnitt (34d, 34e) an einem Befestigungselement (35) angebracht ist, das mittels eines Bolzens (40), einer Mutter (41) und eines Dichtungsringes (36) an einem Unterboden (24) des Waschmaschinengehäuses (23) angebracht ist, wobei das dritte Dämpfelement aus einem dritten Dämpfelement (A38), das zwischen dem Gehäuseverbindungsabschnitt (34d, 34e) und dem Befestigungselement (35) angeordnet ist, und einem dritten Dämpfelement (B39), das zwischen dem Befestigungselement (35) und dem Dichtungsring (36) angeordnet ist, gebildet ist, wobei der Bolzen (40) durch den Gehäuseverbindungsabschnitt, das dritte Dämpfelement (A38), das Befestigungselement (35), das dritte Dämpfelement (B39) und den Dichtungsring (36) verläuft und von der Mutter (41) eingespannt wird, und wobei ein gewölbter Abschnitt (38a), der im Wesentlichen dieselbe Form hat wie eine Bodenabschnittsform des Gehäuseverbindungsabschnittes (34d, 34e), auf einem Außenperipherieabschnitt des dritten Dämpfelements (A38) angeordnet ist.
 8. Frontlader-Waschmaschine nach Anspruch 7, wobei mindestens eine Nut (38b) mit im Wesentlichen derselben Höhe wie die der Bodenfläche, an der der Gehäuseverbindungsabschnitt (34d, 34e)

angebracht ist, im gewölbten Abschnitt des dritten Dämpfelements (A38) angeordnet ist.

Revendications

1. Machine à laver à chargement frontal comprenant :

un bâti de machine à laver (23) ;
 une cuve à eau (19) de forme cylindrique à fond ;
 un tambour rotatif (17) dont le côté de surface avant est ouvert, et qui est agencé à l'intérieur de la cuve à eau (19) en présentant une forme cylindrique à fond ;
 un arbre rotatif (20) qui est fixé au centre d'une surface de fond du tambour rotatif (17) et supporté pivotant par un palier (16) fixé à la surface de fond de la cuve à eau (19) ;
 un moteur d'entraînement de tambour (21) qui fait tourner le tambour rotatif (17) par le biais de l'arbre rotatif (20) ;
 une unité de cuve à eau (37) qui comporte la cuve à eau (19), le tambour rotatif (17), le palier (16), l'arbre rotatif (17) et le moteur d'entraînement de tambour (21) ;

de multiples suspensions (31) dont l'extrémité inférieure est reliée à une partie supérieure de l'unité de cuve à eau (37) et dont l'extrémité supérieure est reliée à une partie supérieure du bâti de machine à laver (23), les multiples suspensions (31) étant configurées pour supporter de manière élastique l'unité de cuve à eau (37) à l'intérieur du bâti de machine à laver (23) ; et

de multiples amortisseurs de vibrations (25, 26, 27) dont les extrémités supérieures respectives sont reliées à une partie de liaison à la cuve à eau (43a, 43b, 43c) disposée dans une partie inférieure de la cuve à eau (19) par le biais d'un premier élément amortisseur (44), dont les extrémités inférieures respectives sont reliées à une partie de liaison au bâti (34d, 34e, 34f) dans une partie inférieure du bâti de machine à laver (23) par le biais d'un deuxième élément amortisseur (45), les multiples amortisseurs de vibrations (25, 26, 27) étant configurés pour supprimer les vibrations de l'unité de cuve à eau (37), dans laquelle l'unité de cuve à eau (37) est agencée à l'intérieur du bâti de machine à laver (23) de manière que l'arbre rotatif (20) du tambour rotatif (17) soit penché vers l'arrière ou soit sensiblement à l'horizontale entre un côté de surface avant et un côté de surface arrière,

caractérisée en ce que

les multiples amortisseurs de vibrations (25, 26, 27) comprennent au moins un premier isolateur de vibrations (25) agencé en une position située entre une surface avant du bâti de machine à laver (23) et le centre de gravité (G) de l'unité de cuve à eau

(37), un deuxième isolateur de vibrations (26) agencé en une position située entre une surface arrière du bâti de machine à laver (23) et le centre de gravité (G), et un troisième isolateur de vibrations (27) agencé à proximité du centre de gravité, lorsque le tambour rotatif (17) tourne dans le sens des aiguilles d'une montre, les premier et deuxième amortisseurs de vibrations (25, 26) sont agencés sur un côté droit du tambour rotatif (17), vu depuis la surface avant, lorsque le tambour rotatif (17) tourne dans le sens contraire des aiguilles d'une montre, les premier et deuxième amortisseurs de vibrations (25, 26) sont agencés sur un côté gauche du tambour rotatif (17), vu depuis la surface avant, le troisième isolateur de vibrations (27) est agencé sur un côté opposé du tambour rotatif (17), par rapport aux premier et deuxième amortisseurs de vibrations, vu depuis la surface avant, et les parties de liaison au bâti (34d, 34e) respectives auxquelles le premier isolateur de vibrations (25) et le deuxième isolateur de vibrations (26) sont reliés sont rattachées à un élément de fixation (35) qui est rattaché à un fond de base (24) du bâti de machine à laver (23) par le biais de troisièmes éléments amortisseurs (38, 39).

2. Machine à laver à chargement frontal selon la revendication 1,

dans laquelle les parties de liaison au bâti (34d, 34e) respectives auxquels le premier isolateur de vibrations (25) et le deuxième isolateur de vibrations (26) sont reliés sont fixées à un élément de fixation (35) rattaché à un fond de base (24) du bâti de machine à laver (23) par un boulon (40), un écrou (41) et une rondelle (36),

le troisième élément amortisseur étant constitué par un troisième élément amortisseur (A38) disposé entre la partie de liaison au bâti (34d, 34e) et l'élément de fixation (35), et un troisième élément amortisseur (B39) disposé entre l'élément de fixation (35) et la rondelle (36), et

le boulon (40) traversant la partie de liaison au bâti, le troisième élément amortisseur (A38), l'élément de fixation (35), le troisième élément amortisseur (B39) et la rondelle (36), et étant maintenu par l'écrou (41).

3. Machine à laver à chargement frontal selon la revendication 1,

dans laquelle les parties de liaison à la cuve à eau (43a, 43b) respectives auxquelles le premier isolateur de vibrations (25) et le deuxième isolateur de vibrations (26) sont reliés sont rattachées à la cuve à eau (19) par le biais de quatrièmes éléments amortisseurs.

4. Machine à laver à chargement frontal selon la revendication 1,

dans laquelle l'angle du premier isolateur de vibrations (25) est agencé de manière à être plus approchant d'un sens vertical que l'angle du troisième isolateur de vibrations (27), et l'angle du deuxième isolateur de vibrations (26) est agencé de manière à être plus approchant d'un sens horizontal que l'angle du troisième isolateur de vibrations (27).

5. Machine à laver à chargement frontal selon la revendication 4,
 - 10 dans laquelle la partie de liaison à la cuve à eau (43a) à laquelle le premier isolateur de vibrations (25) est relié est disposée au-dessus de la partie de liaison à la cuve à eau (43c) à laquelle le troisième isolateur de vibrations (27) est relié, et la partie de liaison à la cuve à eau (43b) à laquelle le deuxième isolateur de vibrations (26) est relié est disposée au-dessous de la partie de liaison à la cuve à eau (43c) à laquelle le troisième isolateur de vibrations (27) est relié.
 - 15
 - 20
6. Machine à laver à chargement frontal selon la revendication 4 ou 5,
 - 25 dans laquelle la partie de liaison au bâti (34d) à laquelle le premier isolateur de vibrations (25) est relié est disposée au-dessus de la partie de liaison au bâti (34f) à laquelle le troisième isolateur de vibrations (27) est relié, et la partie de liaison au bâti (34e) à laquelle le deuxième isolateur de vibrations (26) est relié est disposée au-dessous de la partie de liaison au bâti (34f) à laquelle le troisième isolateur de vibrations (27) est relié.
 - 30
7. Machine à laver à chargement frontal selon la revendication 1,
 - 35 dans laquelle la partie de liaison au bâti (34d, 34e) est rattachée à un élément de fixation (35) rattaché au fond de base (24) du bâti de machine à laver (23) par un boulon (40), un écrou (41) et une rondelle (36), le troisième élément amortisseur étant constitué par un troisième élément amortisseur (A38) disposé entre la partie de liaison au bâti (34d, 34e) et l'élément de fixation (35), et un troisième élément amortisseur (B39) disposé entre l'élément de fixation (35) et la rondelle (36),
 - 40
 - 45
 - 50
 - 55 dans laquelle une partie convexe (38a) présentant sensiblement la même forme que la partie de fond de la partie de liaison au bâti (34d, 34e) est disposée sur une partie périphérique extérieure du troisième élément amortisseur (A38).
8. Machine à laver à chargement frontal selon la revendication 7,

dans laquelle au moins une rainure (38b), présentant sensiblement la même hauteur que la surface de fond à laquelle la partie de liaison au bâti (34d, 34e) est rattachée, est disposée dans la partie convexe du troisième élément amortisseur (A38).

FIG. 1

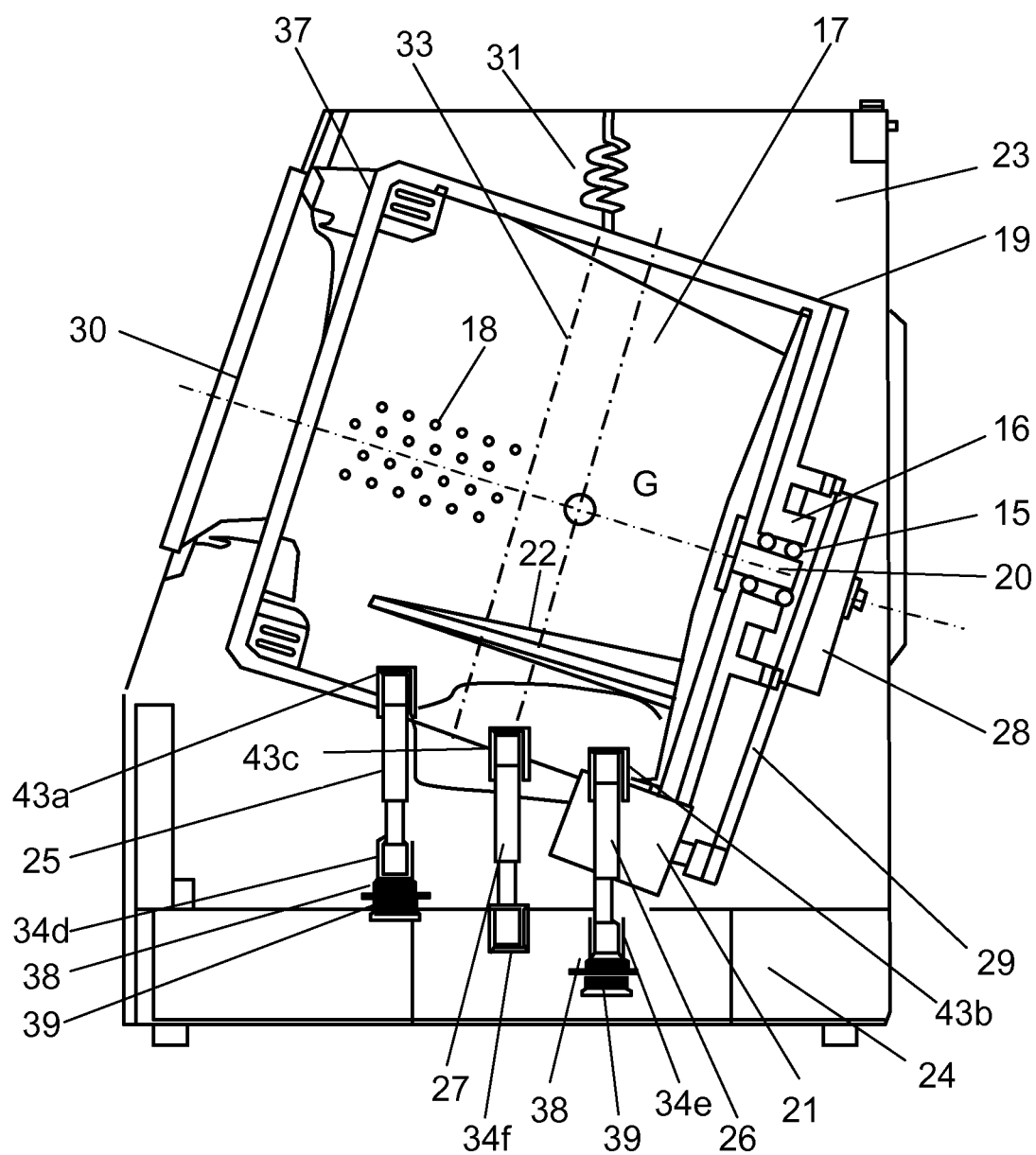


FIG. 2

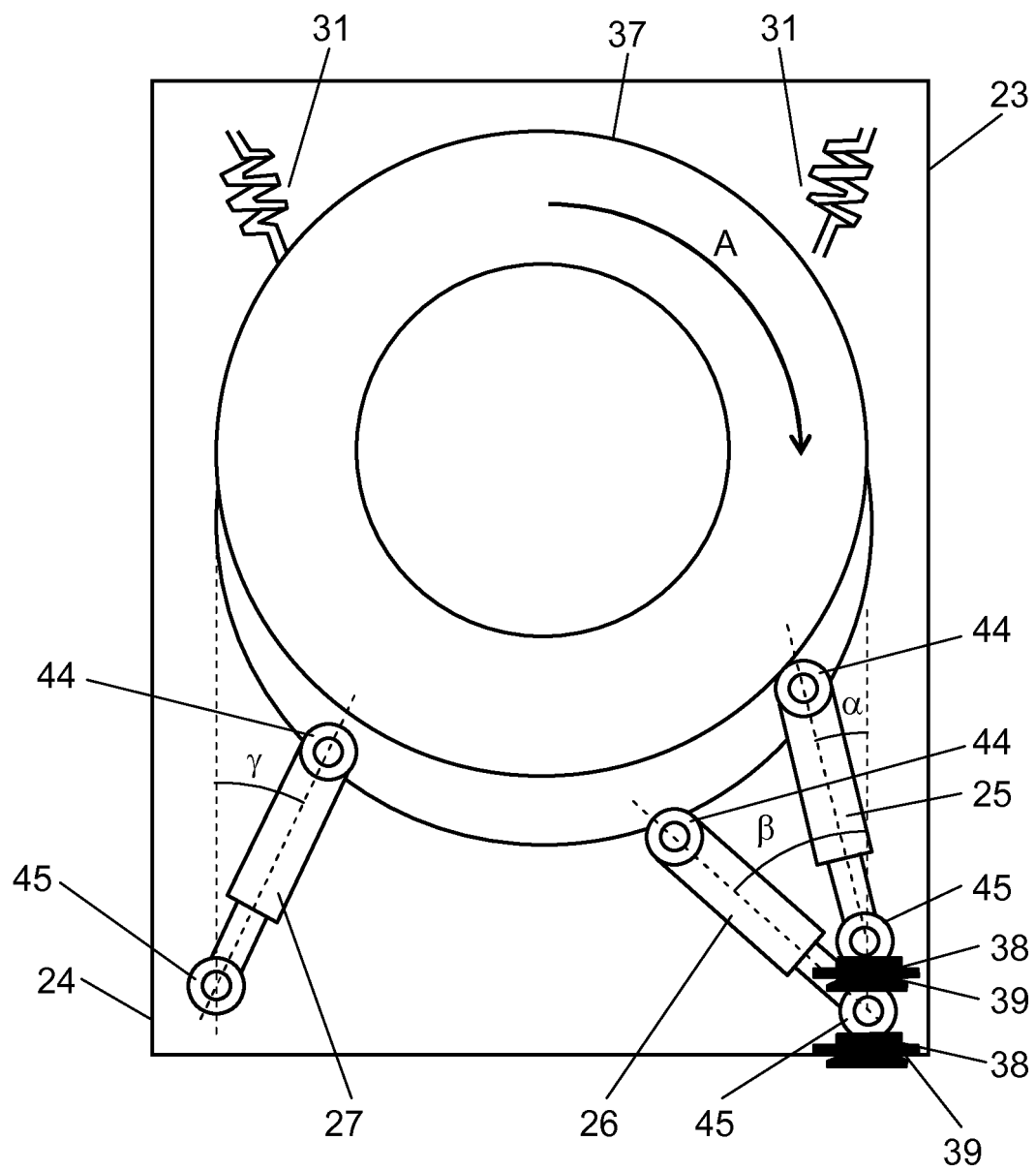


FIG. 3

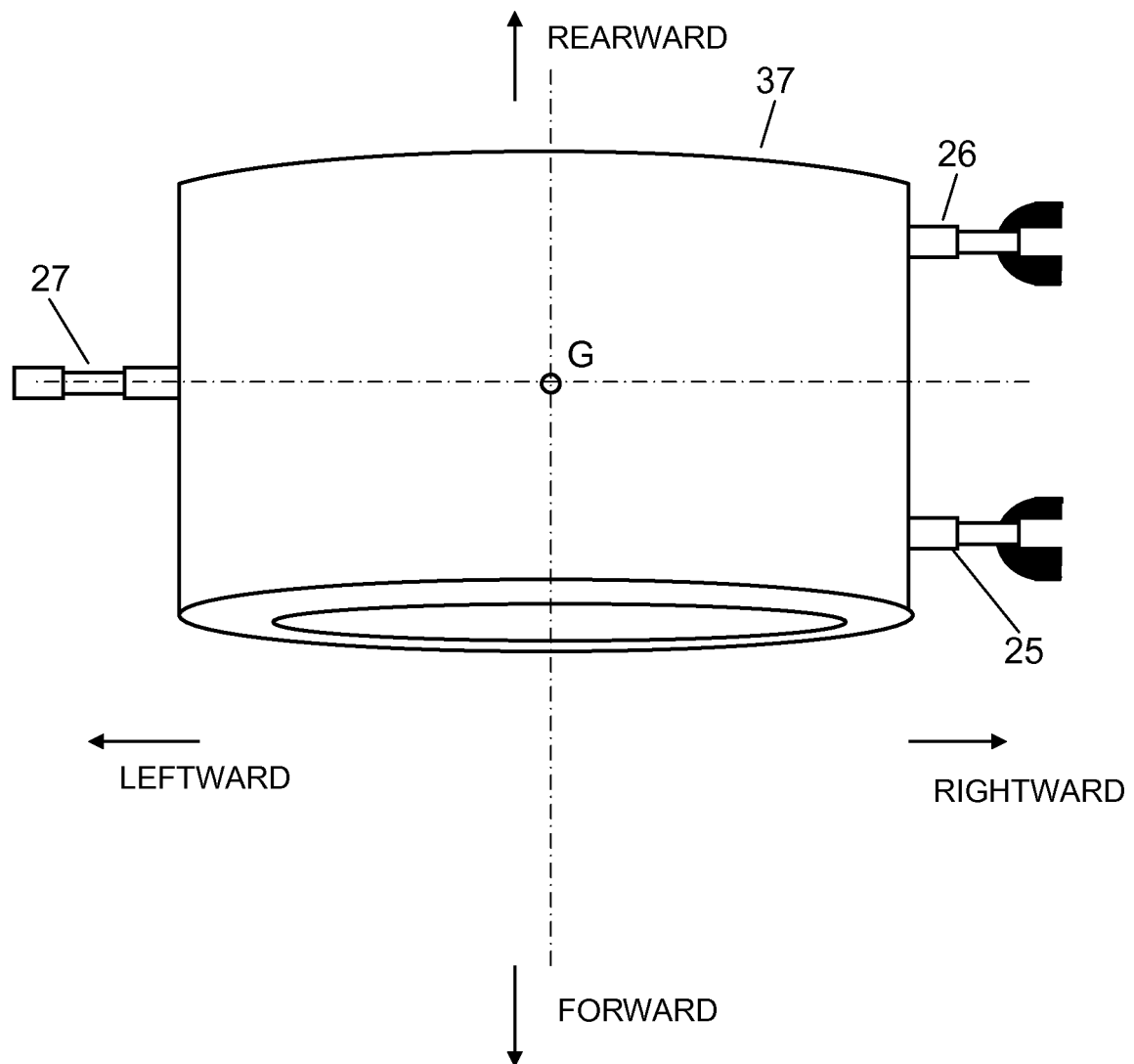


FIG. 4

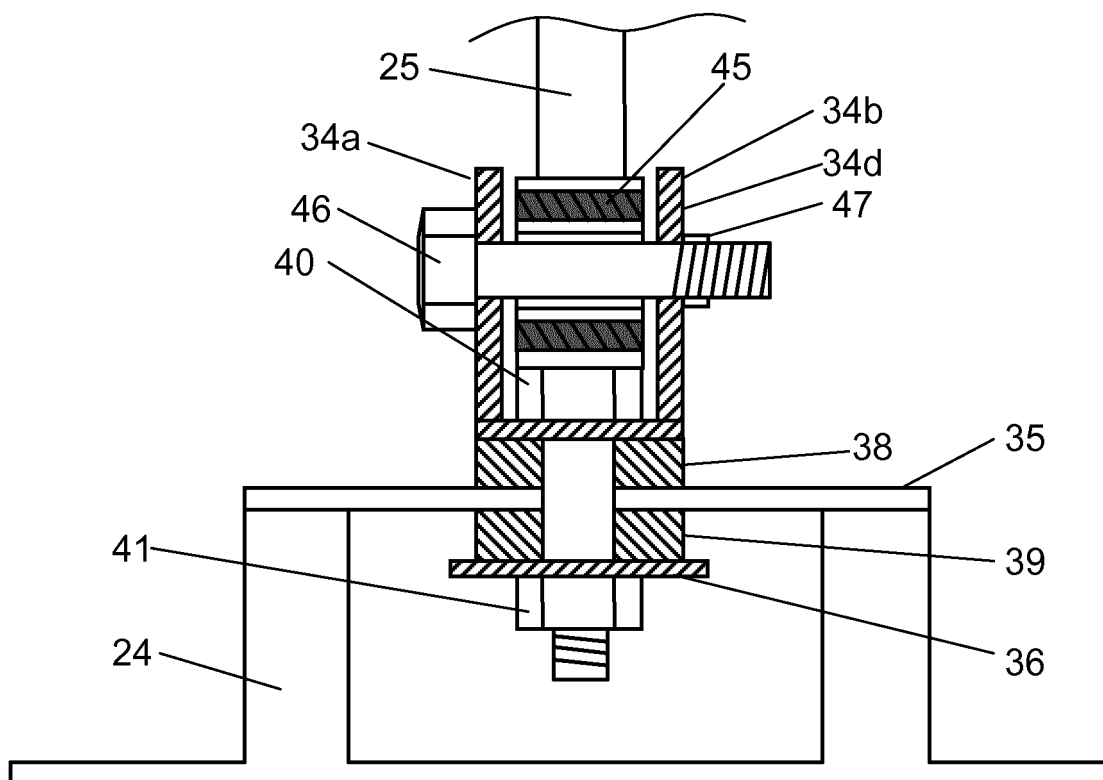


FIG. 5

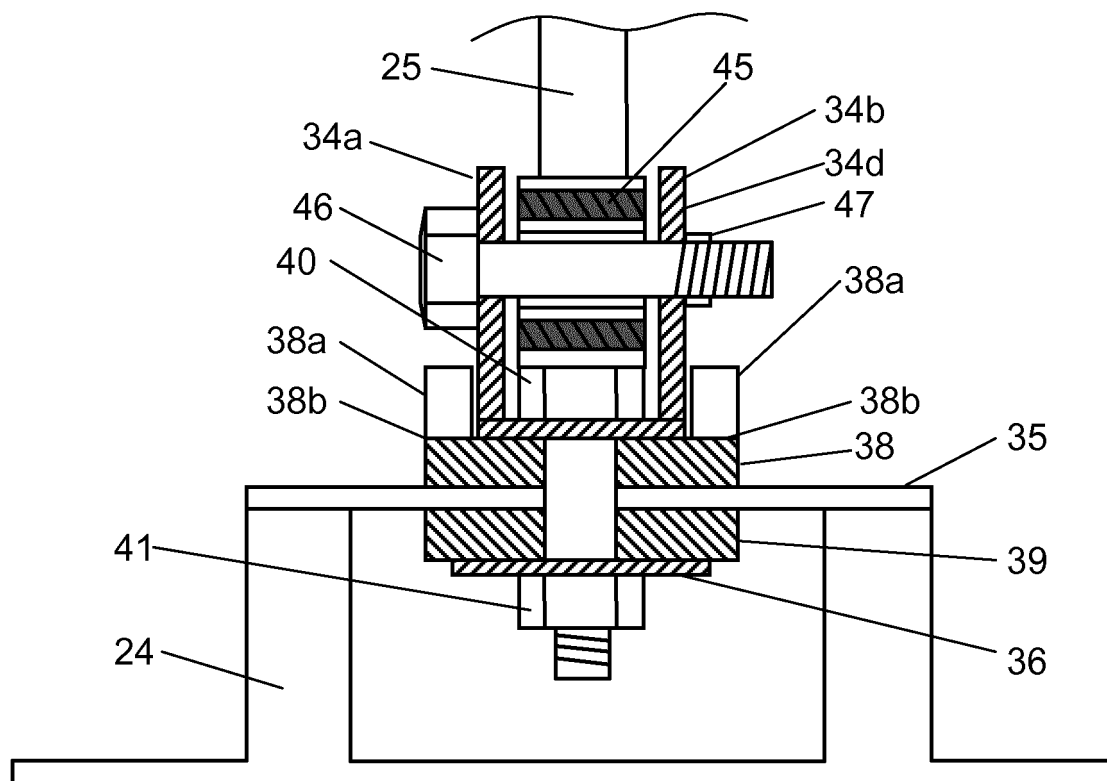


FIG. 6

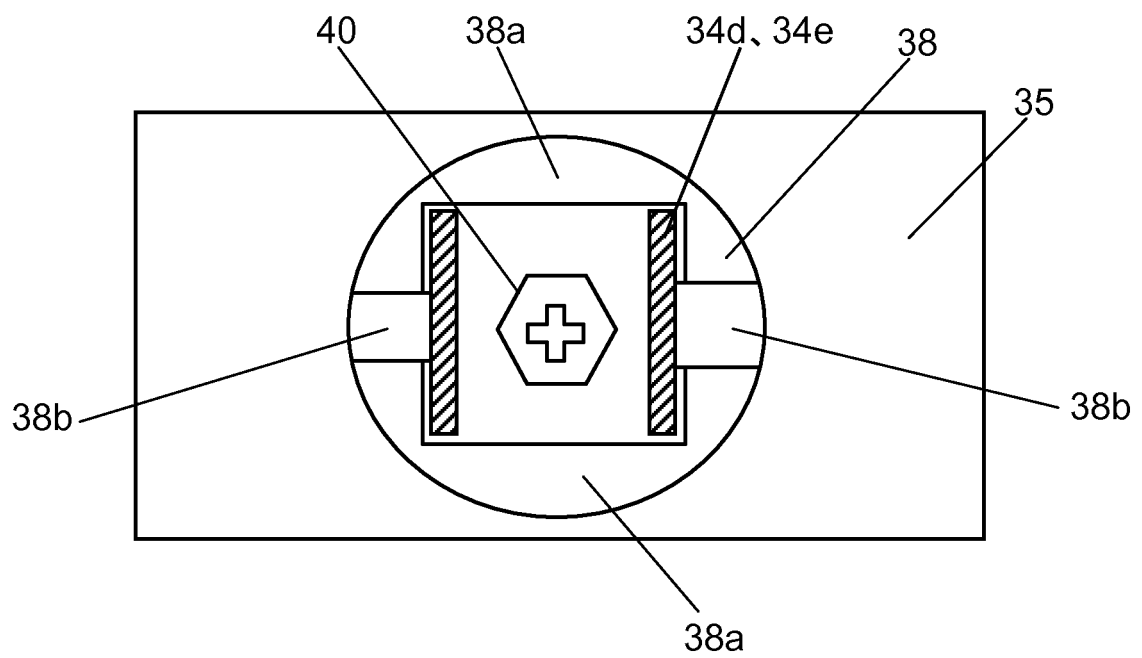
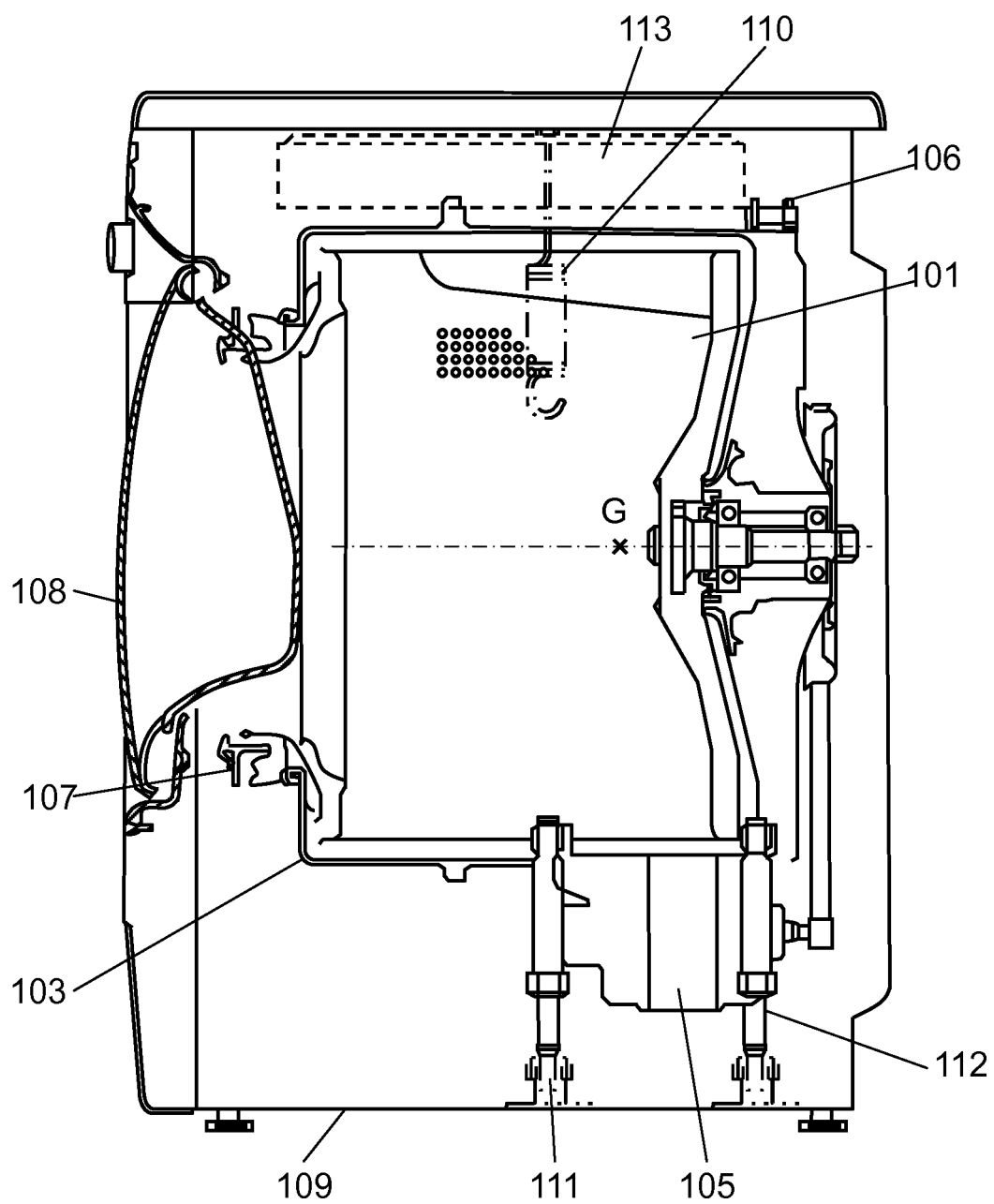


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2012170678 A [0002]
- EP 1881099 A1 [0007]