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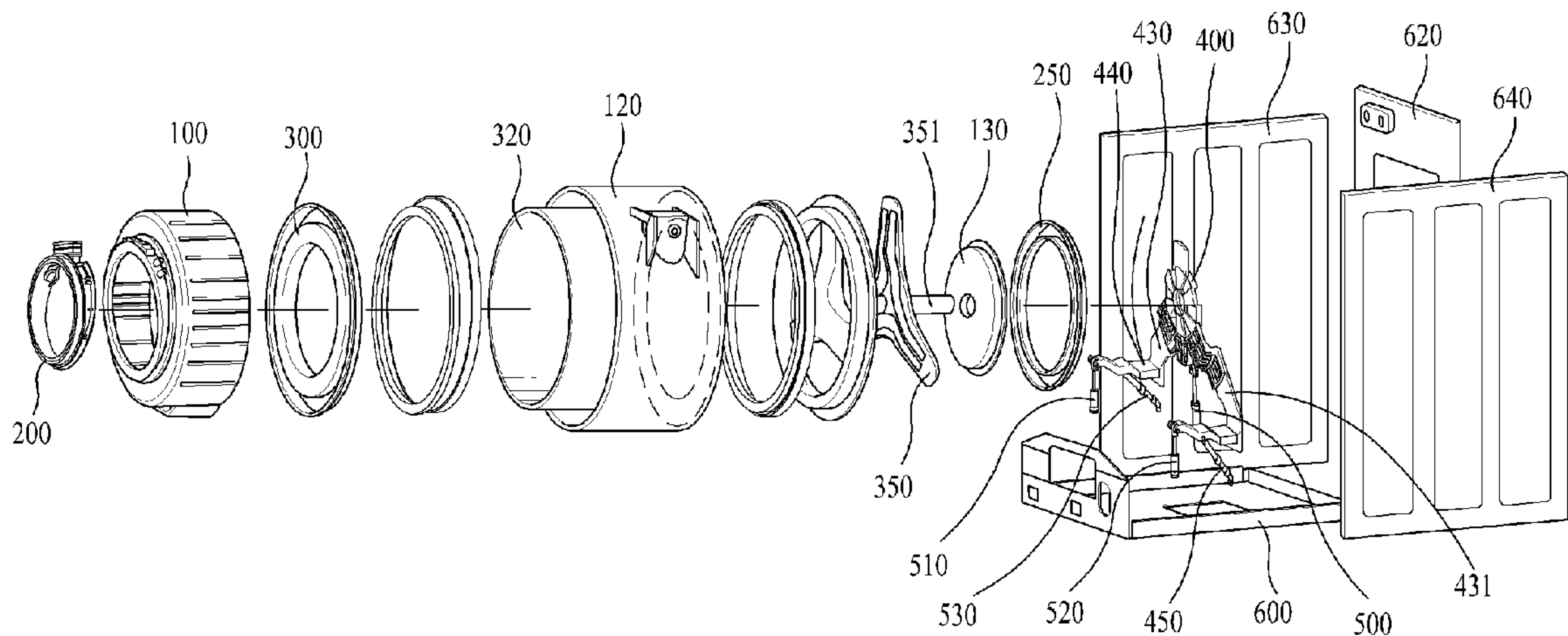
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(54) **Titre : MACHINE A LAVER AVEC REDUCTION DE VIBRATION**

(54) **Title: LAUNDRY MACHINE WITH VIBRATION REDUCTION**



(57) **Abrégé/Abstract:**

A laundry machine comprises a cabinet; a tub fixed to the cabinet to hold water therein; a drive assembly and a suspension unit. The drive assembly comprises a shaft connected to the drum, a bearing housing rotatably supporting the shaft, and a motor to rotate the shaft. The suspension unit is attached to the bearing housing to reduce vibration of the drum and is separated from the tub. The laundry machine further includes a means for adding mass to any one of the drive assembly and the suspension units supporting the drum to reduce vibrations generated by the drum. The motor and the overall mass center of the means are located distant from a center of the drum in a same axial direction of the shaft.



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ABSTRACT

A laundry machine comprises a cabinet; a tub fixed to the cabinet to hold water therein; a drive assembly and a suspension unit. The drive assembly comprises a shaft connected to the drum, a bearing housing rotatably supporting the shaft, and a motor to rotate the shaft. The suspension unit is attached to the bearing housing to reduce vibration of the drum and is separated from the tub. The laundry machine further includes a means for adding mass to any one of the drive assembly and the suspension units supporting the drum to reduce vibrations generated by the drum. The motor and the overall mass center of the means are located distant from a center of the drum in a same axial direction of the shaft.

LAUNDRY MACHINE WITH VIBRATION REDUCTION

Technical Field

- [1] The present invention relates to a laundry machine.
- [2] Generally, laundry machines are categorized into washers and dryers. Such washers include pulsator type washing machines and drum type washing machines and washing machines having washing and drying functions. Here, dryers are electric appliances that dry washed washing objects (hereinafter, laundry), using hot air and the like.

Background Art

- [3] Such a washing machine, especially, a drum type washing machine includes a tub arranged horizontally therein and also a drum arranged in the tub. Washing objects (hereinafter, laundry) are located within the drum and they are tumbled together with the rotation of the drum to be washed.
- [4] Here, the tub is employed to hold wash water and the drum to have laundry located therein only to be washed.
- [5] The drum is rotatably located in the tub.
- [6] A shaft is connected to a rear surface of the drum and the shaft receives a rotational force from a predetermined motor. As a result, the motor is rotated to transmit its rotational force to the drum and the rotational force rotates the drum.
- [7] The drum is rotated during rinsing and drying-spinning cycles as well as a washing cycle and it is vibrated during its rotation.
- [8] The shaft is projected outside the tub, passing through a rear surface of the tub. The conventional washing machine would include a bearing housing insert-molded in the rear surface of the tub or a bearing housing secured to the rear wall surface of the tub.
- [9] The above bearing housing supports the shaft and the vibration of the drum is transmitted to the tub and the bearing housing via the shaft.
- [10] Because of that, the tub is vibrated together with the drum and a damping supporting material is connected to the tub to dampen such the vibration.
- [11] The conventional washing machine includes a plurality of weights attached to the tub and the weights are for balancing the mass center of the above vibrating parts including the tub and the drum. Typically, the weights are attached to a front portion of the tub.

Disclosure of Invention

- [12] Embodiments of the present invention may provide a laundry machine that is different from the conventional laundry machine in an aspect of weights.
- [13] Especially, the laundry machine according to some embodiments of the present invention may include

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weighing means having a different location of an overall gravity weight, by extension, a structure of a weight in comparison to the conventional laundry machine. The change of the location or structure relating to the weights may stabilize the vibration of the vibrating system.

[14] One embodiment laundry machine may include a tub to hold water therein; a
5 drum rotatably placed in the tub; a drive assembly comprising a motor; and means for adding mass to a vibration system in which the drum is a vibrating system.

[14a] Another embodiment may include a laundry machine comprising: a cabinet; a tub fixed to the cabinet to hold water therein; a drum rotatably placed in the tub; a drive assembly comprising a shaft connected to the drum, a bearing housing rotatably supporting
10 the shaft, and a motor to rotate the shaft; a suspension unit attached to the bearing housing to reduce vibration of the drum and separated from the tub; means for adding mass to any one of the drive assembly and the suspension unit supporting the drum to reduce vibrations generated by the drum, wherein the motor and the overall mass center of the means are located distant from a center of the drum in a same axial direction of the shaft.

15 [15] The motor and the overall mass center of the means are located distant from a center of the drum in a same axial direction (longitudinal direction) of the shaft. The drive assembly may include a shaft connected to the drum, a bearing housing rotatably supporting the shaft and the motor to rotate the shaft.

[16] The laundry machine may further comprises a suspension unit to reduce
20 vibration of the drum. Here, the motor may be connected with the shaft directly or indirectly.

[17] The laundry machine may include means for adding mass to the vibration system in which the drum is a vibrating object.

[18] The means may be a single weight or a plurality of weights.

[19] The overall mass center of the means may be located spaced toward the motor
25 apart from a center of the drum in the longitudinal direction. That is, the overall mass of the means and the motor may be placed at the same side with respect to the center of the drum.

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[20] The center of the drum may be a weight center of the drum or a center of the longitudinal length of the drum.

[21] In case a door is provided in a front of the drum and the motor is provided behind the drum, the overall mass center of the means may be located behind the center of the drum.

[22] The overall mass center may be located behind the drum or tub.

[23] The center of the drum may be a longitudinal center of the drum. Namely, the center may be at the middle point of the drum in the longitudinal direction (or the rotational axis direction).

10 [24] The at least one weight of the means may be attached to or integrally configured of a bracket included in the suspension unit.

[25] The suspension unit may include a radial bracket or axial bracket.

[26] The radial bracket may be a bracket extended from the bearing housing toward the radial direction with respect to the shaft. The axial bracket may be a bracket extended from the bearing housing toward the axial direction.

[27] The at least one weight of the means may be located in the bearing housing.
For

example, the bearing housing and the at least one weight may be integrally configured or the at least one weight may be attached to the bearing housing.

[28] In the laundry machine, the tub may be fixedly supported, or be supported by a flexible support structure, such as the suspension unit.

[29] Further, the tub may be supported in an interim state between the fixed support and the flexible support.

[30] That is, the tub may be flexibly supported by the suspension unit or be rigidly supported. For example, the tub may be supported by the suspensions, be supported by rubber bushings to provide less flexible movement than when supported by the suspensions, or be fixedly supported by being fixed somewhere by screws or so.

[31] For another instance, the cases where the tub is supported more rigidly than when supported by the suspension unit are as follows.

[32] Firstly, the tub may be made integrally with the cabinet.

[33] Next, the tub may be supported by being fastened by screws, ribets, rubber bushings, etc. Also, the tub may be welded or bonded to the cabinet. In this cases, the supporting or fastening members have larger stiffnesses than a stiffness of the suspension unit with respect to the main direction of the vibration of the drum.

[34] The tub may be expanded within the limits of a space in which the tub is placed. That is, the tub may be expanded until the circumferential surface thereof reaches(or almost reaches) a side wall or a side frame (for example, a left or right plate of a cabinet) restricting the size of the space at least in the lateral direction (the direction laterally perpendicular to the axial direction of the rotary shaft when the rotary shaft is horizontally placed). The tub may be made integrally with the lateral side walls of the cabinet.

[35] The tub may be formed to be closer in the lateral direction to the wall or the frame than the drum. For example, the tub may be spaced away from the wall or the frame by an interval of less than 1.5 times an interval with the drum. Under the condition that the tub is enlarged in the lateral direction, the drum may also be enlarged in the lateral direction. Further, if the lateral interval between the tub and drum is reduced, the drum may be expanded in the lateral direction in direct proportion. When the lateral interval between the tub and the drum is reduced, the vibration of the drum in the lateral direction may be considered. The weaker the vibration of the drum in the lateral direction, the more expanded is the diameter of the drum. Therefore, the suspension unit to reduce the vibration of the drum may be designed such that rigidity of the suspension unit in the lateral direction is greater than rigidities of the suspension unit in other directions. For example, the suspension unit may be designed such that rigidity of the suspension unit against displacement in the lateral direction is greatest compared with rigidities of the suspension unit against displacements in other directions.

[36] Further, the suspension unit may be directly connected to the bearing housing

supporting the rotary shaft. That is, the bearing housing comprises a supporting portion to rotatably support the shaft and an extended portion extended from the supporting portion, and the suspension unit is attached to the supporting portion of the bearing housing or the extended portion of the bearing housing.

[37] The suspension unit may include brackets extended in the axial direction. In a front loading type laundry machine, the brackets may be extended forward, namely towards a door.

[38] The suspension unit may comprises at least two suspensions which are arranged distant from each other in the axial direction of the shaft.

[39] The suspension unit may comprise suspensions placed below the shaft for standing support. The supported object(for example, the drum) is supported by the suspensions to stand alone.

[40] Alternately, the suspension unit may comprise suspensions placed over the shaft for hanging support. In this case, the supported object is supported to be hung.

[41] The mass center of the vibrating object(for example, a combination of the drum, the shaft, the bearing housing, and the motor) may be located, with respect to the center of the longitudinal length of the drum, at a side where the motor is located. In a front loading type laundry machine, the mass center may be located behind the longitudinal center of the drum. In this case, at least one suspension may be placed in front of or behind the mass center. One suspension may be placed in front of the mass center and another suspension behind the mass center.

[42] The tub may be provided with an opening at a rear portion thereof. The drive assembly may be connected to the tub by a flexible member. The flexible member may seal between the tub and the drive assembly to prevent water from leaking through the opening of the rear portion of the tub, and allow the drive assembly to move relatively to the tub. The flexible member may be made of a flexible material which can do the sealing, for example, a gasket material like a front gasket. In this case, the flexible member may be referred to as a rear gasket for convenience. The rear gasket may be connected to the drive assembly under the condition that the rotation of the rear gasket at least in the rotational direction of the rotary shaft is constrained. In one embodiment, the flexible material may be directly connected to the shaft. In another embodiment, the flexible material may be connected to a portion of the bearing housing.

[43] Further, a portion of the drive assembly, which is located radially inside the rear gasket and thus is likely to be exposed to the water in the tub, may be made so as not to be corroded by the water. For example, the portion of the drive assembly may be coated, or be surrounded with a separate member made of plastic such as the tub back(which will be described below). In a case where the portion of the drive assembly is made of metal, the portion may not be directly exposed to water by the coating or the

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separate plastic member, and thus corrosion of the portion may be prevented.

- [44] Further, the cabinet may not be necessary. For example, in a built-in laundry machine, the laundry machine without the cabinet may be installed within a space of a wall structure. However, even in this case, a front plate forming the front face of the laundry machine may be required.

- [46] The overall weight of the vibrating system provided in the laundry machine according to the exemplary embodiment of the present invention may be reduced and the vibration of the drum may be stabilized by new means for adding weights. In addition, the front of the drum may be prevented from falling downward because of the introduction of laundry.

Brief Description of Drawings

- [47] The accompanying drawings, which are included to provide further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiments of the disclosure and together with the description serve to explain the principle of the disclosure.
- [48] In the drawings:
- [49] FIG. 1 is a perspective view partially illustrating a laundry machine according to the present invention;
- [50] FIG. 2 is a diagram illustrating an exemplary embodiment of the present invention;
- [51] FIG. 3 is a diagram illustrating a radial bracket of the laundry machine shown in FIG. 2;
- [52] FIG. 4 is a diagram illustrating another embodiment of the present invention; and
- [53] FIG. 5 is a diagram illustrating a further embodiment of the present invention.

Mode for the Invention

- [54] FIG. 1 is a partially perspective view illustrating a laundry machine according to an exemplary embodiment of the present invention.
- [55] The laundry machine includes a tub fixedly supported to a cabinet. The tub includes a tub front 100 defining a front portion thereof and a tub rear 120 defining a rear portion thereof.
- [56] The tub front 100 and the tub rear 120 may be assembled by a screw and a predetermined space is formed inside the assembly of the tub front and rear 100 and 120 to hold a drum. The tub rear 120 includes an opening formed in a rear portion thereof and the opening is connected to a rear gasket 250 that is a flexible member. The rear gasket 250 may be connected to a tub back 130 in its inner radial portion. A through hole is formed in a center of the tub back 130 and a shaft passes through the hole. The rear

gasket 250 may be flexible enough not to transmit the vibration of the tub back 130 to the tub rear 120.

[57] The rear gasket 250 is sealedly connected with the tub back 130 and the tub rear 120 such that wash water held in the drum may not leak. The tub back 130 is vibrating together with the drum when the drum is rotated and it is spaced apart a predetermine distance from the tub rear 120 enough to prevent interference with the tub rear 120. Since the rear gasket 120 is transformed flexibly, the tub back 130 is allowed to relatively move without interfering with the tub rear 120. The rear gasket 120 may include a curvature or wrinkle portion 252 extendible to a predetermined length enough to allow such the relative motion.

[58] The tub includes an introduction opening formed in a front portion thereof to introduce laundry. A front gasket 200 may be installed in the front portion of the tub in which the introduction opening is formed to prevent the laundry or foreign substances from being stuck between the tub and the drum or to prevent wash water from leaking toward the introduction opening or to perform another function.

[59] The drum includes a drum front 300, a drum center 320 and a drum back 340. A ball balancer may be installed in each of front and rear portions of the drum, respectively. The drum back 340 is connected to a spider 350 and the spider 350 is connected to the shaft 351. Here, the drum is rotatable within the tub by the rotational force transmitted via the shaft 351.

[60] The shaft 351 is connected to a motor, passing through the tub back 130. According to this embodiment, the motor is connected to the shaft in a concentric circle. That is, according to this embodiment, the motor, specifically, a rotor of the motor is directly connected to the shaft 351. A bearing housing 400 is secured to a rear surface 128 of the tub back 130. The bearing housing 400 is provided between the motor and the tub back 130 and it rotatably supports the shaft 351.

[61] A stator 80 is fixedly secured to the bearing housing 400 and the rotor is located around the stator 80. As mentioned above, the rotor is directly connected to the shaft 351. Here, the motor is an outer rotor type and it is directly connected to the shaft 351.

[62] The bearing housing 400 is supported by a base 600 of the cabinet via a suspension unit. The suspension unit may include a plurality of brackets connected to the bearing housing and the suspension unit may include a plurality of suspensions connected to the plurality of the brackets.

[63] According to this embodiment, the suspension may include three perpendicular suspension and two oblique suspensions installed oblique with respect to a forward/rearward direction. The suspension unit is connected to the cabinet base 600 not fixedly but flexibly enough to allow the drum to move in forward/rearward and leftward/rightward directions. That is, the suspension unit is supported by the cabinet

base 600, with being flexible enough to allow a predetermined rotation forward/rearward and leftward/rightward with respect to the supported location. For such the flexible support, the suspension vertically installed may be installed in the base 600 by rubber-bushing. Predetermined ones of the suspensions installed vertically are configured to suspend the vibration of the drum flexibly and the other ones installed obliquely may be configured to damp the vibration. That is, in a vibrometer including a spring and damping means, the vertically installed ones are employed as spring and the obliquely installed ones are employed as damping means.

- [64] The tub is fixed to the cabinet and the vibration of the drum is suspended by the suspension unit. The front and rear portions of the tub may be fixed to the cabinet and the tub is seatedly supported by the cabinet base or fixed to the cabinet base.
- [65] The laundry machine according to this embodiment includes the supporting structure of the tub and that of the drum that are substantially independent. In addition, the laundry machine has the structure in which the tub is not vibration during the vibration of the drum. Here, the quantity of vibration transmitted to the drum may be variable according to the rear gasket.
- [66] As the vibration of the tub is noticeably small in the laundry machine according to the present invention, the space maintained because of the vibration is unnecessary and thus an outer surface of the tub may be located close to the cabinet as much as possible. This enables the enlarged size of the tub, without the enlarged size of the cabinet, and also it enables the capacity of the laundry machine to be increased, in the same external size.
- [67] Substantially, the distance between a cabinet right 630 or a cabinet left 640 and the tub may be only 5mm in the laundry machine according to this embodiment of the present invention. In contrast, the distance is 300mm to prevent the vibration of the tub from interfering with the cabinet in the conventional laundry machine. Considering a diameter of the tub, the laundry machine according to this embodiment may lengthen the diameter of the tub by 500mm in comparison with the conventional laundry machine. This results in noticeable difference enabling the capacity of the laundry machine to be one-stepped up in the identical external size.
- [68] The weight according to this embodiment is located in the suspension unit and this technical feature is different from the technical feature of the conventional laundry machine that the weight is located in the tub.
- [69] The weight may be integrally formed with predetermined elements of the suspension unit or it may be secured to the suspension unit. For example, the weight may be integrally formed with or secured to a bracket included in the suspension unit. The bracket may be an element for connecting the bearing housing with the suspension. The bearing housing and one of the suspensions may be spaced apart in a radial

direction with respect to the shaft as well as in an axial direction of the shaft. As a result, the bracket may include a radial bracket extended toward the radial direction and an axial bracket extended toward the axial direction.

[70] FIGS. 2 and 3 are diagrams illustrating the weight integrally formed with the radial bracket of the suspension unit.

[71] As shown in FIG. 2, the suspension unit includes first second radial brackets 431 and 430 and first and second axial brackets 450 and 440 and the suspension unit is secured to the base 600.

[72] The suspension unit may include a perpendicular suspension for perpendicular suspending and a forward/rearward suspension for forward/rearward suspending. A single perpendicular suspension may be placed in a rear portion and two perpendicular suspensions may be placed in both opposite sides of a front portion with respect to a center of the base, respectively. Furthermore, two suspensions may be placed oblique from left and right sides in a forward/rearward direction.

[73] As shown in FIG. 2, the suspension unit includes a first suspension 520, a second suspension 510, a third suspension 500, a first damper 540 and a second damper 530.

[74] The suspension is configured of a cylinder and a piston connected by a spring installed there between. The length of the suspension configured of the cylinder and piston is stably variable during the suspending. Such the suspension may be configured to have a damping effect as well. That is, the suspension may be made of a spring damper.

[75] The first damper 540 and the second damper 530 may be made of simple dampers and they are not limited thereto. The first and second dampers may be made of spring dampers.

[76] The first suspension 520 is connected between the first axial bracket 450 and the base 600. The second suspension is connected between the second axial bracket 440 and the base 600.

[77] The third suspension 500 is directly connected between the bearing housing 400 and the base.

[78] The suspensions are installed vertically and the first and second dampers are installed obliquely in a forward/rearward direction.

[79] The third suspension is installed in a center of the rear portion and the first and second suspensions are in right and left sides of a front portion, respectively. The first and second dampers are installed between the third suspension and the first and second suspensions, respectively, symmetrical bilaterally.

[80] The suspensions are connected to the base by rubber-bushing.

[81] FIG. 3 is a diagram illustrating the weight more specifically. The first radial bracket 431 is connected to the left portion of the bearing housing 400 and the second radial

bracket 430 is connected to the right portion of the bearing housing 400. The first and second radial brackets 431 and 430 are symmetrical to each other with respect to the axial direction.

[82] The first and second radial brackets 431 and 430 are formed as weights and as bracket connecting the first and second axial brackets 450 and 440 to the bearing housing 400, respectively.

[83] The first and second radial brackets 3410 and 430 are extended toward a radial direction with respect to the shaft 351 and they are extended toward a forward reaction. A coupling hole is formed in an upper portion of each above weight to couple each weight is coupled to a corresponding weight coupling part. Four coupling holes are formed in each upper portion of the weights.

[84] Position determining grooves 430b and 431b are formed in the radial brackets 431 and 430, respectively, to be inserted in the bearing housing.

[85] Bracket connecting parts 430c and 431c are formed in the first and second radial brackets 431 and 430, respectively, to be connected to the first and second axial brackets. The bracket connecting part is heavier than the other parts of the weight. The lower the mass center of the weight is, the more stable the vibrating system is.

[86] Such the first and second radial brackets 431 and 430 may be fabricated of iron by casting.

[87] In reference to FIG. 3, the first and second radial brackets 431 and 430 include first and second coupling parts 431d and 430d formed in the upper portions thereof to be connected with the bearing housing 400. The coupling parts 431d and 430d are fixedly coupled to first and second extended portions 406a and 406b of the bearing housing by coupling members, respectively. Here, when the first and second coupling parts 431d and 430d are coupled to the first and second extended portion 406a and 406b of the bearing housing 400, the angle between the first and second coupling parts 431d and 430d is maintained identical to the angle between the first and second extended portions 406a and 406b. For this coupling, the coupling holes are formed in the coupling parts 431d and 430d and each of the coupling holes 431d and 430d includes four coupling holes to secure the coupling rigidity.

[88] The radial brackets 431 and 430 include middle portions 431e and 430e extended from the first and second coupling parts 431d and 430d, respectively. The middle portions 431e and 430e are located between the first and second coupling parts 431d and 430d and the bracket connecting parts 431c and 430c.

[89] The middle portions 431e and 430e are spaced apart a predetermined distance rearward from the rear wall of the tub enough not to interfere with the rear wall because of the vibration of the drum during the operation of the laundry machine. Here, the rear wall of the tub is referenced to as the rear surface connected by the tub

back and the rear gasket. That is, the though hole having a diameter larger than the diameter of the tub back is formed in a center of the rear wall of the tub and an inner circumference of the rear wall is connected with an outer circumference of the tub back by the rear gasket.

[90] The bracket connecting portions 431c and 430c are extended forward from the middle portions 431e and 430e. The bracket connecting portions 431c and 430c are located in an outer portion of the outer circumferential surface of the tub with respect to the radial direction. The bracket connecting portions 431c and 430c may interfere with the rear wall of the tub. However, the bracket connection members are extended forwardly to be connected with the brackets 440 and 450 and thus they may be fabricated in consideration of the possibility of interference with the outer circumferential surface of the side of the tub.

[91] The middle portions 431e and 430e are extended toward the radial direction, with maintaining the identical angle to the angle of the first and second coupling parts 430d and 431d, and they are curved downward to meet the bracket connecting portions 4301c and 430c.

[92] The mass center of the radial bracket may be located relatively in a rear portion, compared with the mass center of the combination of the drum, spider, shaft, bearing housing, motor and the like (hereinafter, drum assembly). Once the laundry is introduced into the drum, rotation displacement may occur, with a front end of the drum falling down. Because of that, it is advantageous to locate the mass center of each weight in rear of the mass center of the drum such that the front end of the drum is less displaced downward.

[93] Each of the weights has the mass of 3kg. If the weights weight too much, the displacement of the third suspension would increase only to cause falling of a rear portion of the drum.

[94] FIG. 4 is a diagram illustrating another embodiment of the present invention. According to this embodiment, the weight is provided in the radial brackets 1430 and 1431. A first weight 1431a is coupled to a first radial bracket 1431 and a second weight 1430a is coupled to a second radial bracket 1430.

[95] In this case, the first and second radial brackets 1431 and 1430 may be fabricated by pressing.

[96] The gravity centers of the first and second weights 1431a and 1430a are located at a location distant from a center of the drum in a forward/rearward(or longitudinal) direction. Further, the gravity centers may be located behind the drum or tub.

[97] Here, the mass center takes the first and second weights 1431a and 1430a into consideration (hereinafter, overall weight center). According to this embodiment, the first and second weights 1431a and 1430a are symmetrical with respect to the axial

direction. As a result, the mass center of each weight and the overall mass center of the weights are located in equal positions at least with respect to the axial direction.

[98] Although not shown in the drawings, the weights may be in the axial brackets. In this case, the weights may be integrally formed with or attached to the axial brackets. In addition, the weights may be located in the first and second axial brackets 450 and 440, respectively, with being symmetrical with respect to the axial direction.

[99] In case the brackets and the weights are formed integrally according to the above embodiments, the brackets may be fabricated by casting. As metal, especially, iron has relatively much weight, the brackets and weights may be made by casting. Iron may be typically categorized based on Carbon contents into Armco, Pig Iron and Steel.

[100] FIG. 5 is a diagram illustrating a further embodiment.

[101] According to this embodiment, weights 1000 may be provided in the bearing housing 400. Here, the weight 1000 may be fabricated heavier than the bearing housing 400.

[102] The bearing housing 400 may be made of non-iron metal, for example, aluminum and the weight 1000 may be made of iron. Also, the bearing housing 400 may be made of a thin steel sheet by pressing.

[103] Although not shown in the drawings, weights may be formed integrally with the bearing housing according to a still further embodiment. In this case, the bearing housing itself may be made heavy. For example, the bearing housing is made of iron by casting to be employed as weight.

Industrial Applicability

[104] The present invention has an industrial applicability. The overall weight of the vibrating system of the laundry machine according to the exemplary embodiment of the present invention may be relatively light and new weighing means presented as mentioned above may stabilize the vibration of the drum. In addition, rotation displacement of falling down of the front of the drum may be reduced to a predetermined degree.

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CLAIMS:

1. A laundry machine comprising:
 - a cabinet;
 - a tub fixed to the cabinet to hold water therein;
 - 5 a drum rotatably placed in the tub;
 - a drive assembly comprising a shaft connected to the drum, a bearing housing rotatably supporting the shaft, and a motor to rotate the shaft;
 - a suspension unit attached to the bearing housing to reduce vibration of the drum and separated from the tub;
- 10 means for adding mass to any one of the drive assembly and the suspension unit supporting the drum to reduce vibrations generated by the drum,
 - wherein the motor and the overall mass center of the means are located distant from a center of the drum in a same axial direction of the shaft.
2. The laundry machine as claimed in claim 1, wherein the means comprises at
15 least one weight attached to the suspension unit.
3. The laundry machine as claimed in claim 2, wherein the at least one weight is attached to a bracket of the suspension unit.
4. The laundry machine as claimed in claim 3, wherein the bracket is a radial bracket or an axial bracket.
- 20 5. The laundry machine as claimed in claim 1, wherein the means comprises at least one weight which is integrally made with a bracket of the suspension unit.
6. The laundry machine as claimed in claim 5, wherein the bracket is a radial bracket or an axial bracket.

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7. The laundry machine as claimed in claim 5, wherein the bracket is made of iron by casting.
8. The laundry machine as claimed in claim 1, wherein the means comprises a couple of brackets of which the total mass is larger than the mass of the bearing housing.
- 5 9. The laundry machine as claimed in claim 8, wherein the couple of brackets are a couple of radial brackets or axial brackets which are comprised in the suspension unit.
10. The laundry machine as claimed in claim 1, wherein the overall mass center of the means is located between the center of the drum and an end of the motor.
11. The laundry machine as claimed in claim 1, wherein the overall mass center of
10 the means is located distant from the drum or the tub in the axial direction.
12. The laundry machine as claimed in claim 11, wherein the laundry machine further comprises a door at a front portion thereof to close and open a front opening of the tub, and the overall mass center of the means is located behind the drum or the tub.
13. The laundry machine as claimed in claim 1, wherein the overall mass center of
15 the means is located under the shaft.
14. The laundry machine as claimed in claim 1, wherein the means comprises a couple of weights which are located opposite to each other with respect to the axial direction.
15. The laundry machine as claimed in claim 14, wherein each of the weights weighs 2.5~3.5kg.
- 20 16. The laundry machine as claimed in claim 1, wherein the means comprises the bearing housing which is made of iron by casting.
17. The laundry machine as claimed in claim 1, wherein the means comprises at least one weight attached to the bearing housing.
18. The laundry machine as claimed in claim 1, further comprising:

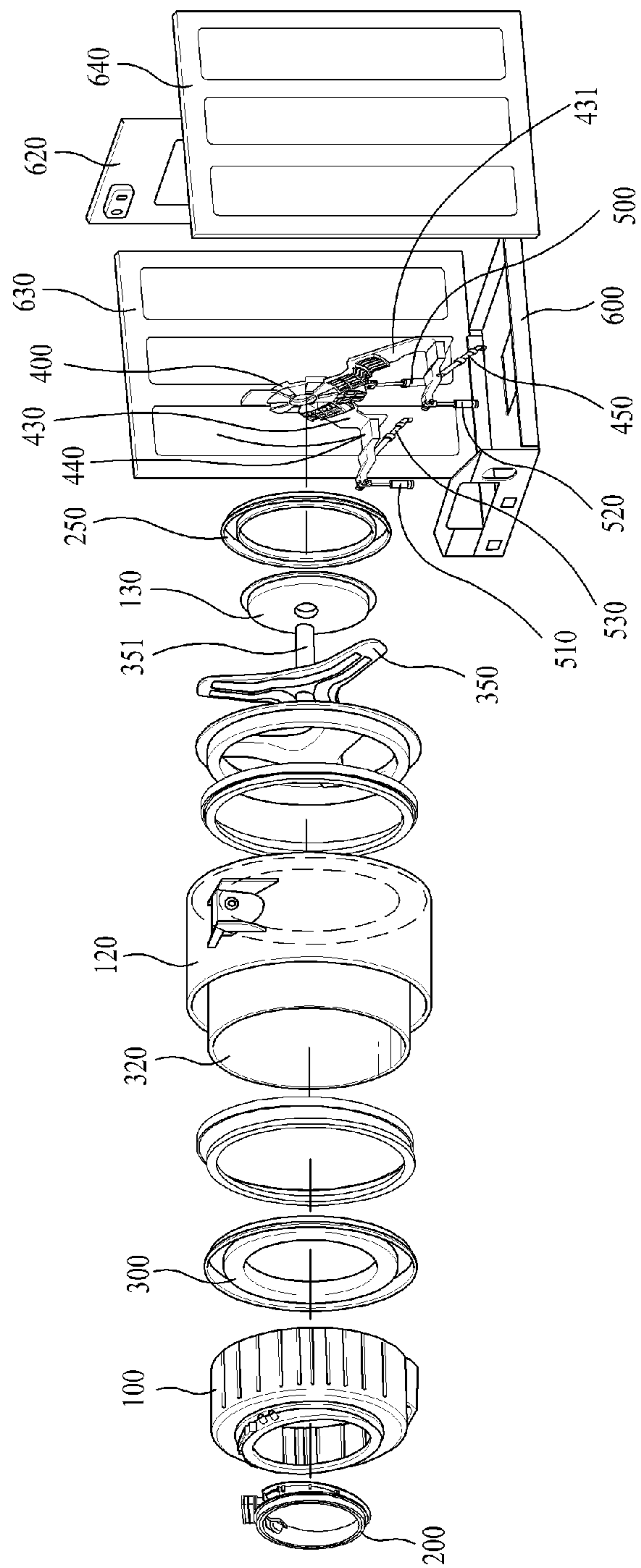
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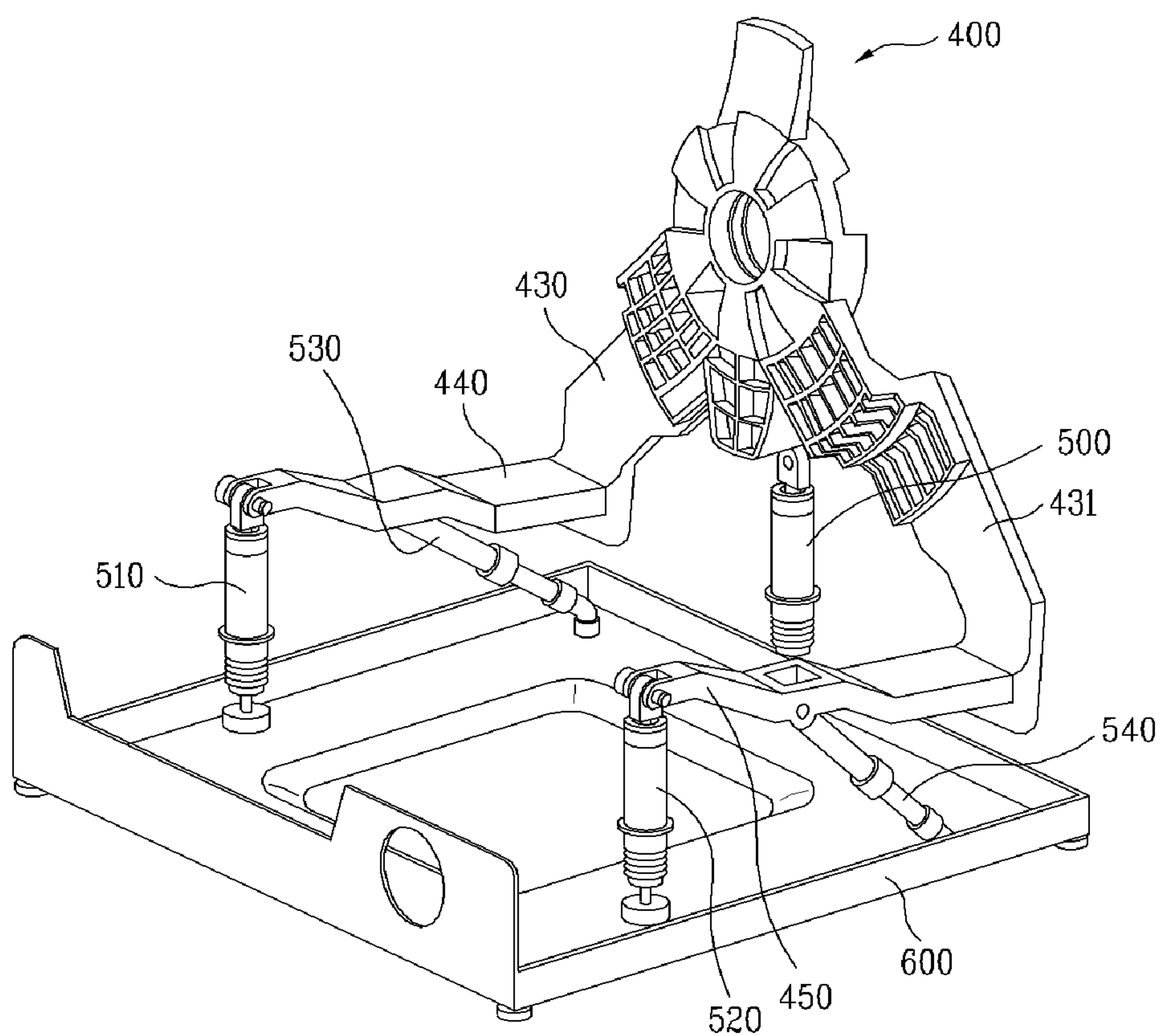
a flexible material to prevent the water inside the tub from leaking toward the drive assembly and allow the drive assembly to move relatively to the tub.

19. The laundry machine as claimed in claim 1, wherein the tub is supported more rigidly than the drum is supported by the suspension unit.

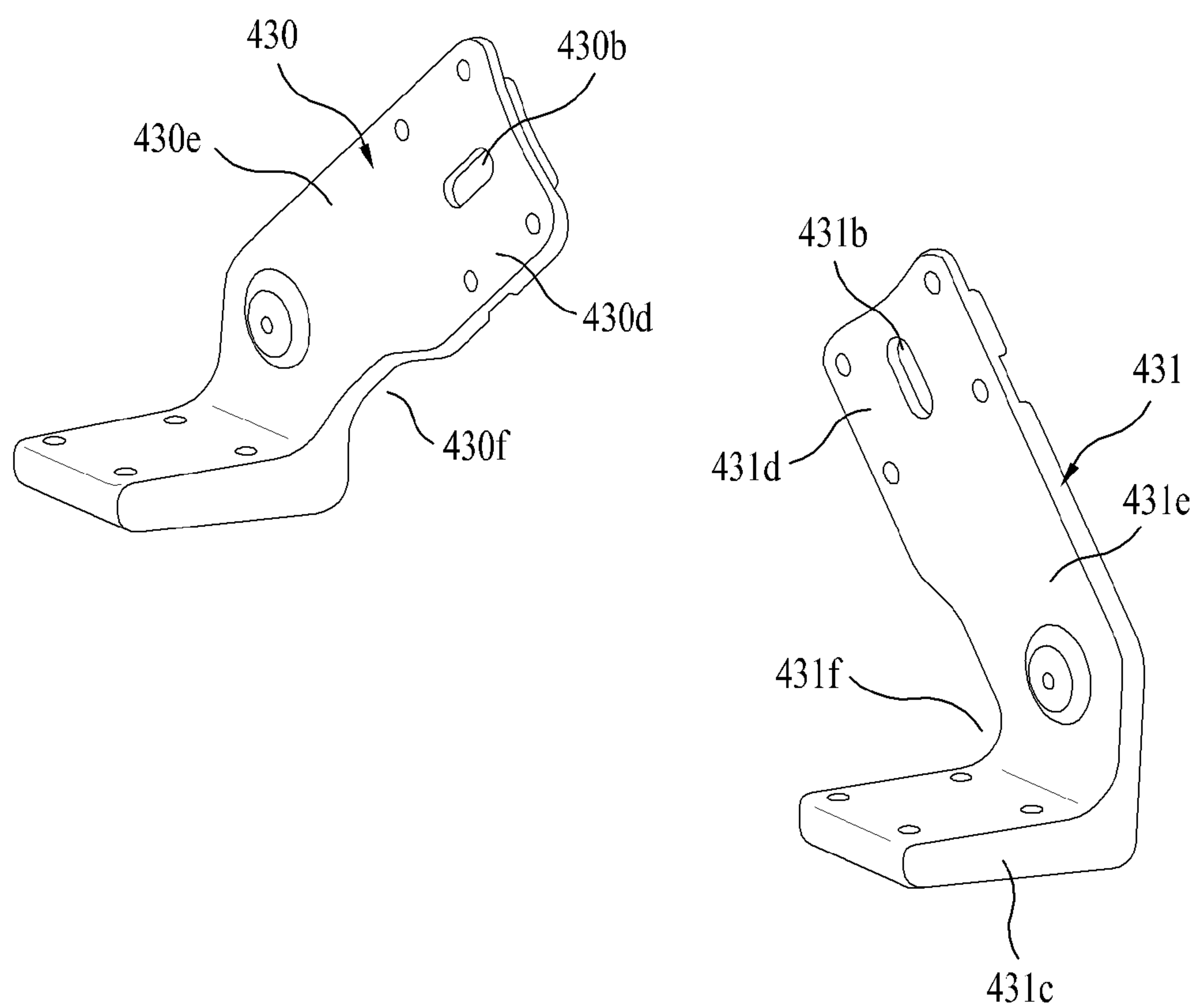
[Fig. 1]



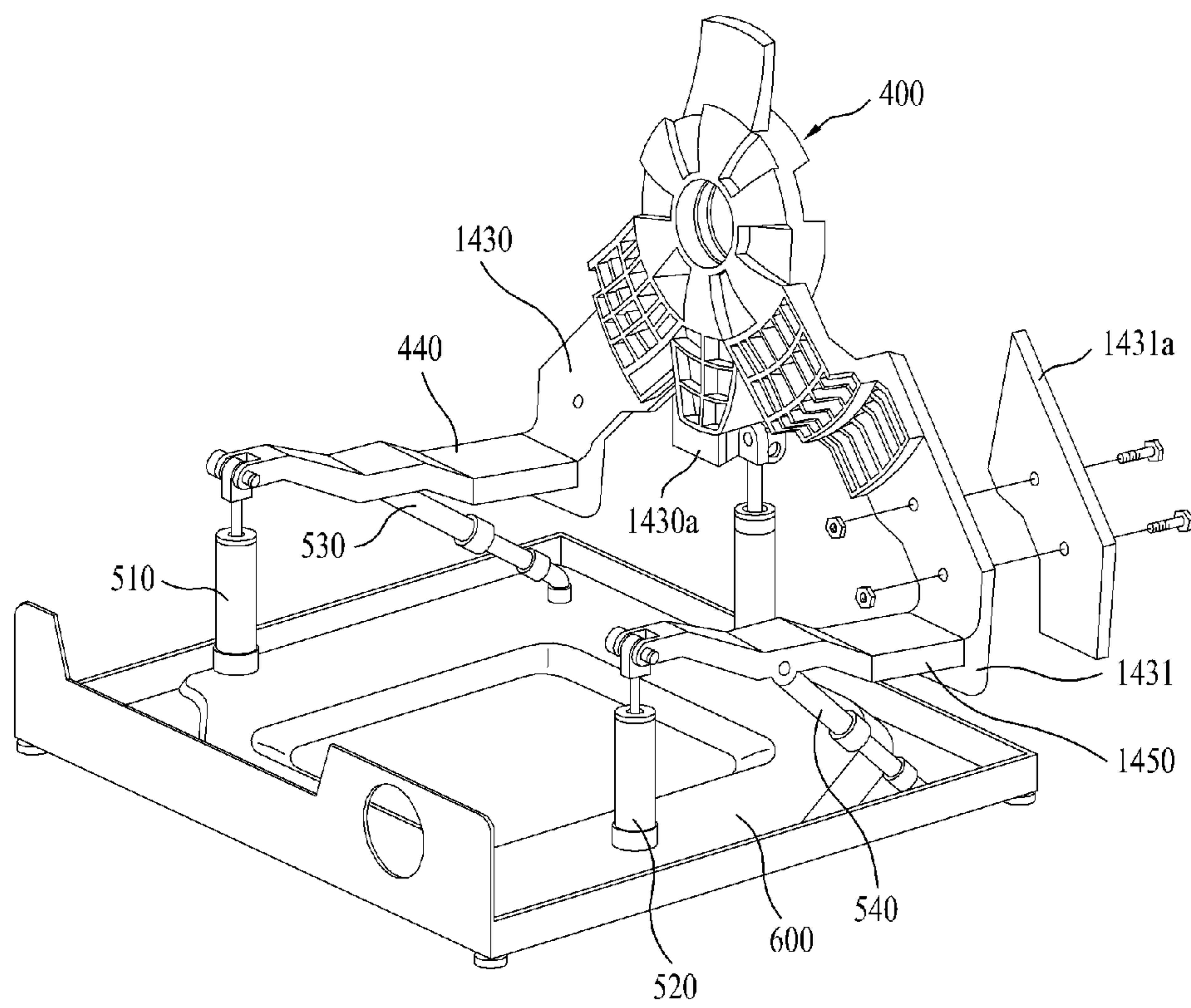
[Fig. 2]



[Fig. 3]



[Fig. 4]



[Fig. 5]

