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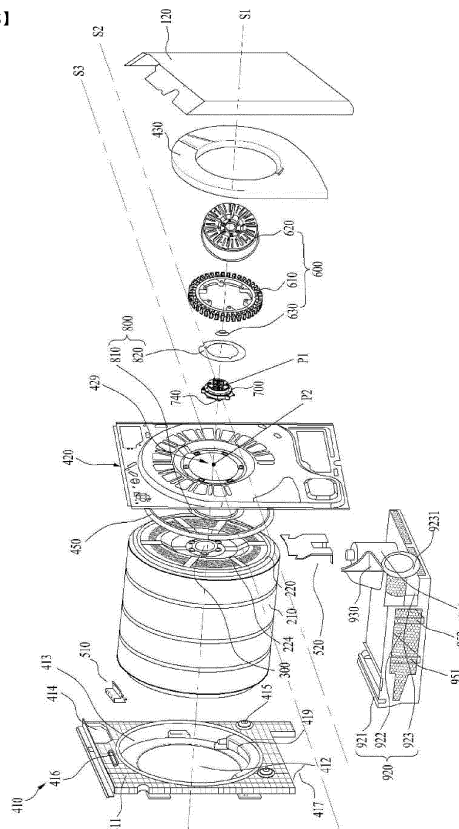
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(54) LAUNDRY TREATING APPARATUS

(57) The present disclosure relates to a laundry treating apparatus including a decelerator (700) that is disposed between a motor (600) and a drum (200), and converts power provided by the motor (600) to rotate the drum (200), wherein the motor (600) is coupled to and fixed to the decelerator (700).

【FIG 6】



Description

[Technical Field]

[0001] The present disclosure relates to a laundry treating apparatus. More specifically, the present disclosure relates to a laundry treating apparatus having a driver that may be directly connected to a drum for accommodating laundry therein to rotate the drum.

[Background Art]

[0002] A laundry treating apparatus, which is an apparatus capable of removing dust or foreign matters attached to laundry by applying a physical force to the laundry, includes a washing machine, a dryer, a refresher (styler), and the like.

[0003] The washing machine is provided to perform a washing process capable of separating and removing the foreign matters of the laundry by supplying water and detergent to the laundry.

[0004] Dryers are divided into exhaust-type dryers and circulation-type dryers. The exhaust-type dryers and the circulation-type dryers are commonly provided to perform a drying process to remove moisture contained in the laundry by producing high-temperature hot air through a heater and exposing the hot air to the laundry.

[0005] Recently, the dryer is provided to intensively perform a drying process by omitting a component for supplying or draining water into or from the laundry and also omitting a tub for accommodating the water inside a cabinet. Therefore, there was an advantage of improving drying efficiency by directly supplying the hot air to a drum accommodating the laundry therein while simplifying an internal structure of the dryer.

[0006] Such dryer may include the drum that accommodates the laundry therein, a hot air supplier that supplies the hot air into the drum, and a driver that rotates the drum. Thus, the dryer was able to dry the laundry accommodated in the drum by supplying the hot air into the drum, and evenly expose a surface of the laundry to the hot air by rotating the drum. As a result, the drying was able to be completed as an entirety of the surface of the laundry is evenly in contact with the hot air.

[0007] In one example, the driver needs to be fixed inside the cabinet in order to rotate the drum. In addition, when the driver is provided to rotate a rotation shaft coupled to the drum, the driver was necessary to be coupled in parallel with the rotation shaft. However, as the dryer does not have the tub fixed inside the cabinet, there is a limitation that the driver is not able to be fixed to the tub like the washing machine.

[0008] To solve such problem, a dryer that fixes the driver to a rear surface of the cabinet has emerged [see Japanese Patent Application Publication JPS55-081914A, Japanese Patent Application Publication JPS55-115455A, Japanese Patent Application Publication JPS57-063724A, Japanese Patent Application

Publication JPS57-124674A].

[0009] FIG. 1 shows a structure of the conventional dryer in which the driver is coupled to the rear surface of the cabinet.

[0010] Such dryer may include a cabinet 1 forming an appearance of the dryer, a drum 2 rotatably disposed inside the cabinet 1 for accommodating laundry therein, and a driver 3 provided to rotate the drum 2.

[0011] The driver 3 may be disposed on a rear surface of the drum 2 and may be provided to rotate the drum 2, and may be coupled to and fixed to a rear panel 11 forming a rear surface of the cabinet 1. Thus, the driver 3 was able to be fixed to the cabinet 1 and rotate the drum 2.

[0012] In the conventional dryers described above, the driver 3 was able to commonly include a stator 31 fixed to the rear panel 11, a rotor 32 rotated by the stator 31, and a rotation shaft 33 coupled with the rotor 32 to rotate the drum 2, and include a decelerator 37 provided to rotate the drum 2 by increasing torque while decreasing rpm of the rotation shaft 33.

[0013] In addition, the conventional dryer commonly further includes a fixing portion 4 for fixing the driver 3 to the rear panel 11. The fixing portion 4 may include at least one of a first fixing portion 41 for fixing the stator 31 to the rear panel 11, and a second fixing portion 42 for fixing the rotation shaft 33 to the rear panel 11. Accordingly, the conventional dryers were able to stably rotate the drum 2 by disposing the rotation shaft 33 coupled to the drum 2 and the driver 3 in parallel with each other.

[0014] However, because the rear panel 11 of the cabinet is made of a thin steel plate, the rear panel 11 is easily deformed or vibrated even with a fairly small external force. Moreover, because the rear panel 11 receives not only a load of the driver 3, but also a load of the drum 2 through the rotation shaft 33, the rear panel 11 may be difficult to maintain a shape thereof.

[0015] In addition, when the laundry inside the drum 2 is eccentric or repeatedly falls inside the drum 2 when the drum 2 rotates, repeated external force may be transmitted to the rear panel 11, so that the rear panel 11 may vibrate.

[0016] When the vibration or the external force is transmitted to the rear panel 11 and the rear panel 11 is bent or deformed even temporarily, the rotation shaft 33 connecting the driver 3 to the drum 2 may be distorted. Accordingly, unnecessary vibration or noise may occur in the driver 3, and in severe cases, the rotation shaft 33 may be damaged. In addition, there is a problem in that unnecessary noise is generated while the rear panel 11 is bent or deformed.

[0017] In addition, a distance between the rotor 32 and the stator 31 is temporarily changed while the rear panel 11 vibrates, so that the rotor 32 may collide with the stator 31 or the unnecessary vibration and noise are generated.

[0018] Moreover, when the driver 3 further includes the decelerator 37, the rotation shaft 33 coupled to the decelerator 37 and a decelerating shaft 33a connected from the decelerator 37 to the drum 2 are separated from each

other. In this connection, because the decelerator 37 is supported on the rear panel 11 through the stator 31 or the rotation shaft 33, when the rear panel 11 is deformed even a little, the decelerating shaft 33a and the rotation shaft 33 may be misaligned or displaced with each other.

[0019] In other words, an amount of change in position of the decelerating shaft 33a connected to the drum 33 may be smaller than that of the rotation shaft 33 coupled to the driver 3 because of the load of the drum 33. Therefore, when the rear panel 11 is temporarily bent or deformed, degrees of tilting of the rotation shaft 33 and the decelerating shaft 33a become different from each other, so that the rotation shaft 33 and the decelerating shaft 33a are misaligned with each other.

[0020] Therefore, every time the driver 33 operates, because the rotation shaft 33 and the decelerating shaft 33a are misaligned with each other, the conventional laundry treating apparatus was not able to guarantee reliability of the decelerator 37, and had a problem that the decelerator 37 may be damaged.

[0021] In one example, in order to directly connect the driver 33 to the drum 200 in the dryer, it is necessary to couple a rotation shaft that transmits the power of the driver 33 to the drum 200. However, as described above, in the conventional dryer, a specific structure for coupling the driver 33 to the drum 200 is not specified, so that it may be considered to apply a structure that couples the drum 200 and driver 33 of the washing machine to each other.

[0022] FIG. 2 shows a dryer that fixes the driver 3 to a bottom surface or a base of the cabinet 1.

[0023] The dryer may include a cabinet 1 and a drum 2, and may include a circulating flow channel 5 for circulating air in the drum 2 to the outside, and a heat pump 6 that is accommodated in the circulating flow channel 5 to condense the air and heat the air again. Water condensed in the heat pump 6 may be collected in a water storage tank 9 using a pump 8.

[0024] In one example, even when the driver 3 vibrates or a temporary external force is transmitted through the driver 3, a bottom surface 12 of the cabinet 1 may be prevented from being deformed or tilted.

[0025] Accordingly, the conventional dryer is provided to fix the driver 3 to the bottom surface 12 of the cabinet 1 or to the base disposed below the drum 2 and fixed to the bottom surface of the cabinet 1. In such dryer, because the driver 3 is not disposed parallel to a rotation shaft of the drum 2, a separate component is additionally used to rotate the drum 2.

[0026] Specifically, the driver 3 may include a motor 34 fixed to the bottom surface of the cabinet 1, a rotation shaft 37 rotating on the motor 34, a pulley 35 rotated by the rotation shaft 37, and a belt 36 provided to connect an outer circumferential surface of the drum 2 and an outer circumferential surface of the pulley 35 to each other.

[0027] Accordingly, when the motor 34 rotates the rotation shaft 37, the pulley 35 may rotate the belt 36, and

the belt 36 may rotate the drum 2. In this connection, because a diameter of the pulley 35 is much smaller than a diameter of the drum 2, the dryer may omit a decelerator.

[0028] However, in such dryer, because the diameter of the pulley 35 is much smaller than the diameter of the drum 2, when the motor 34 rotates rapidly, a slip phenomenon in which the belt 36 slides on the drum 2 or the pulley 35 occurs. Therefore, such dryer has a problem in that a rotational acceleration of the motor 34 is limited to a level equal to or lower than a certain level, and has a fundamental limitation in that the motor 34 must be slowly accelerated or decelerated such that the belt 36 does not slip when the drum 2 is rotated.

[0029] Therefore, the conventional dryer may not be able to control the rotation of the drum 2 because of not being able to rapidly change a rotation direction of the drum 2, or may not be able to change the rotation direction of the drum 2.

[0030] Accordingly, there was a limitation in that a drying efficiency is not able to be increased to the maximum because the dryer is not able to control the rotation direction and a rotation speed of the drum 2 as intended during a drying process.

[Technical Problem]

[0031] The present disclosure is to provide a laundry treating apparatus that may maintain a motor that provides rotational power to rotate a drum, and a rotation shaft of a decelerator that converts rpm and torque of the rotational power.

[0032] The present disclosure is to provide a laundry treating apparatus in which a decelerator and a motor may be tilted or vibrated at the same time.

[0033] The present disclosure is to provide a laundry treating apparatus in which a decelerator and a motor may be fixed at locations spaced apart from a rear surface of a cabinet.

[0034] The present disclosure is to provide a laundry treating apparatus in which a rotation shaft of a drum and a driving shaft of a driver are disposed or fixed based on a decelerator.

[0035] The present disclosure is to provide a laundry treating apparatus in which a decelerator may be fixed inside the cabinet and the driver may be fixed to and supported by the decelerator.

[0036] The present disclosure is to provide a laundry treating apparatus in which a driving shaft extending from a motor and rotating, and a rotation shaft of a decelerator rotating with converted rpm and torque may remain coaxial with each other.

[0037] The present disclosure is to provide a laundry treating apparatus that may control a rotation speed and a rotation direction of a drum even when a tub is omitted.

[0038] The present disclosure is to provide a laundry treating apparatus that may firmly fix a decelerator.

[0039] The present disclosure is to provide a laundry

treating apparatus in which a distance between a rotor and a stator in a motor may be maintained.

[Technical Solutions]

[0040] The invention is specified by the independent claim. Preferred embodiments are defined in the dependent claims. The present disclosure provides a laundry treating apparatus in which a motor for providing power to rotate a drum and a decelerator for converting the power of the motor are coupled to each other.

[0041] The motor may be supported by being directly coupled to the decelerator, and may be coupled only to and supported by the decelerator. Accordingly, the decelerator itself may be a vibration reference of the motor.

[0042] A stator for generating a rotating magnetic field in the motor may be coupled to and fixed to a housing forming an exterior of the decelerator.

[0043] The decelerator housing may be supported by being coupled to a rear cabinet coupled to a rear face of the drum. However, the stator may be separated from the rear cabinet, and may be disposed to be spaced apart from the rear cabinet.

[0044] The decelerator housing may be at least partially inserted into an interior space of the stator, and may be disposed to be accommodated in the stator. Accordingly, it is possible to reduce a space independently occupied by the decelerator by utilizing the internal space of the stator.

[0045] In addition, as the stator is directly coupled to the decelerator housing, and the decelerator housing is located inside the stator, a center of the rotating rotor and a center of the decelerator may become easily coincide with each other by the stator.

[0046] As a result, in the laundry treating apparatus according to the present disclosure, the drum, the decelerator, the stator, and the rotor may form one vibration system. The decelerator may be coupled to the stator, and the decelerator may be coupled to the drum. Accordingly, the decelerator, the stator, and the drum may form an integral vibration system.

[0047] The drum, the stator, and the rotor may be separated from and spaced apart from the rear cabinet.

[0048] That is, the drum, the stator, and the rotor may tilt in parallel with each other and may vibrate together with respect to the decelerator.

[0049] The decelerator may serve as an action point of a lever or a seesaw in the vibration system, and the decelerator may be supported on the rear cabinet, so that the rear cabinet may serve as the action point.

[0050] In one example, the drum may be made of a flexible material such that a shape thereof is somewhat variable, and may be made of a material having elasticity such that the shape thereof is restored. In addition, even a connecting shaft that connects the drum and the decelerator to each other may be partially made of the flexible material.

[0051] In this case, the drum is able to move independ-

ently by forming a vibration system independently of the decelerator and the stator/rotor. Accordingly, when severe unbalance occurs inside the drum, or excessive vibration occurs inside the drum, transmission of an external force to the stator and the motor may be prevented.

[0052] In one example, the decelerator and the motor may be separated from an external cover (a rear panel) in terms of vibration.

[0053] That is, the decelerator and the motor may be disposed to be spaced apart from the rear panel of the cabinet.

[0054] In other words, the decelerator and the motor are fixed and coupled to each other, but are able to be completely separated from the rear panel.

[0055] In one example, the decelerator and the motor may be at least in contact with and supported by the rear panel in the state of being coupled to each other, but may not be coupled to the rear panel using a fixing member or the like.

[0056] Therefore, the decelerator and the motor may remain coaxial with each other only with respect to the decelerator without being affected by a shape change or vibration of the rear panel.

[0057] That is, the components constituting the entire driving system may remain coaxial with each other, and may tilt or vibrate together.

[0058] Specifically, the decelerator and the motor may be fixed to each other in order to maximize concentricity of a rotor shaft and a drum shaft of the decelerator composed of two shafts.

[0059] When the rotor shaft and the drum shaft are not concentric, not only reliability of the decelerator itself may be greatly reduced, but also a distance between the stator and the rotor is not maintained, so that unnecessary noise and vibration may occur.

[0060] Therefore, the decelerator may become a reference for the coupling by coupling the stator to the decelerator housing, and a center of the decelerator and a center of the stator may coincide with each other. As a result, the reliability of the decelerator may be guaranteed. In addition, the concentricity of the drum shaft and the rotor shaft may be maintained, so that the gap between the rotor and stator may always be maintained.

[0061] The laundry treating apparatus according to the present disclosure may include the drum, the motor disposed at the rear of the drum, the rear cabinet disposed between the drum and the motor, and the decelerator coupled to the rear cabinet to transmit the power of the motor to the drum.

[0062] The laundry treating apparatus according to the present disclosure may include a front stopper for rotatably supporting a front portion of the drum, and may also include a rear stopper disposed at the rear of the drum.

[0063] The rear stopper may be in contact with the rear surface of the drum, and may support a rear portion of the drum.

[0064] The rear stopper may be disposed to be spaced apart from the rear surface of the drum by a reference

distance (e.g., 2 mm). This is to prevent abrasion of the rear stopper and to support the drum only when a weight of the drum is great.

[0065] The rear cabinet and the drum rear surface may be spaced apart from each other by a by a distance equal to or greater than the reference distance.

[0066] The rear stopper may be disposed between the rear cabinet and the drum, and the rear stopper may support a lower end of the drum. The rear stopper may be in a roller structure/felt structure.

[0067] The rear cabinet may be placed between the decelerator or the motor and the drum. The rear cabinet may be placed between the rear stopper and the decelerator or the motor.

[0068] The rear cabinet may have a greater thickness or rigidity than the front cabinet or the rear cover.

[0069] In the present disclosure, a belt for rotating the drum is omitted, and the driver is directly connected to the rear portion of the drum to rotate the drum. Therefore, a separate structure for installing and supporting the drum and the driver is required.

[0070] In this connection, the rotation shaft connecting the drum in the drum and the driver may ascend or descend during rotation.

[0071] The driver including the decelerator may be coupled to and fixed to a rear portion of the rear plate. Accordingly, the drum is disposed in front of the rear plate, and a driver is disposed at the rear of the rear plate, so that a self load may be distributed.

[0072] Because the rear plate itself supports a load of the drum or the driver, not only the load may be distributed forwardly and rearwardly of the rear plate, but also the rear plate may serve as the action point of the seesaw.

[0073] As a result, the drum and the driver may tilt or vibrate while remaining coaxial with each other.

[0074] In one example, because the rear plate is formed as a steel plate, a bracket that is coupled to the rear plate to reinforce the rigidity of the rear plate may be disposed.

[0075] The bracket may include at least one bracket, and may be formed in a ring shape to connect the decelerator and the rear plate to each other.

[0076] The bracket may also be disposed in front of and at the rear of the rear plate, so that the decelerator may be stably coupled to the rear plate, and the rigidity of the rear plate may be strengthened.

[0077] When the bracket is composed of a plurality of brackets, one bracket may be utilized to connect the decelerator and the rear plate to each other, to reinforce the rigidity of the rear plate, and to strengthen a coupling force between another bracket and the decelerator.

[Advantageous Effects]

[0078] The present disclosure has the effect of maintaining the motor that provides the rotational power to rotate the drum, and the rotation shaft of the decelerator that converts the rpm and the torque of the rotational

power.

[0079] The present disclosure has the effect that the decelerator and the motor may be tilted or vibrated at the same time.

[0080] The present disclosure has the effect that the decelerator and the motor may be fixed at the locations spaced apart from the rear surface of the cabinet.

[0081] The present disclosure has the effect that the rotation shaft of the drum and the driving shaft of the driver are disposed or fixed based on the decelerator.

[0082] The present disclosure has the effect that the decelerator may be fixed inside the cabinet and the driver may be fixed to and supported by the decelerator.

[0083] The present disclosure has the effect that the driving shaft extending from the motor and rotating, and the rotation shaft of the decelerator rotating with the converted rpm and torque may remain coaxial with each other.

[0084] The present disclosure has the effect of controlling the rotation speed and the rotation direction of the drum in the laundry treating apparatus from which the tub is omitted.

[0085] The present disclosure has the effect of firmly fixing the decelerator.

[0086] The present disclosure has the effect that the distance between the rotor and the stator in the motor may be maintained.

[Description of Drawings]

[0087]

FIG. 1 shows an embodiment of a conventional laundry treating apparatus.

FIG. 2 shows another embodiment of a conventional laundry treating apparatus.

FIG. 3 shows an appearance of a laundry treating apparatus according to the present disclosure.

FIG. 4 shows an interior of a laundry treating apparatus according to the present disclosure.

FIG. 5 shows a configuration of a drum of a laundry treating apparatus according to the present disclosure.

FIG. 6 shows an internal configuration of a laundry treating apparatus according to the present disclosure.

FIG. 7 shows an embodiment for supporting a drum of a laundry treating apparatus according to the present disclosure.

FIG. 8 shows a structure of a rear case of a laundry treating apparatus according to the present disclosure.

FIG. 9 shows a coupling structure of a decelerator and a motor in a laundry treating apparatus according to the present disclosure.

FIG. 10 shows a decelerator of a laundry treating apparatus according to the present disclosure.

FIG. 11 shows a process in which a motor is coupled

to a decelerator in a laundry treating apparatus according to the present disclosure.

FIG. 12 shows a state in which coupling of a decelerator and a motor is completed in a laundry treating apparatus according to the present disclosure.

FIG. 13 shows a structure in which a decelerator is coupled to a rear case in a laundry treating apparatus according to the present disclosure.

FIG. 14 shows a structure of a bracket of a laundry treating apparatus according to the present disclosure.

FIG. 15 shows a structure in which a bracket is coupled to a decelerator.

FIG. 16 shows a structure in which a bracket is coupled to a rear case.

FIG. 17 shows a structure in which a bracket fixes a decelerator to a rear case.

FIG. 18 shows an internal configuration of a driver of a laundry treating apparatus according to the present disclosure.

[0088] Hereinafter, embodiments disclosed herein will be described in detail with reference to the accompanying drawings. In this specification, even in different embodiments, the same and similar reference numerals are assigned to the same and similar components, and the description thereof is replaced with the first description. As used herein, the singular expression includes the plural expression unless the context clearly dictates otherwise. In addition, in describing the embodiments disclosed herein, when it is determined that detailed descriptions of related known technologies may obscure the gist of the embodiments disclosed herein, the detailed description thereof will be omitted. In addition, the accompanying drawings are only for easy understanding of the embodiments disclosed herein, and it should be noted that the technical idea disclosed herein should not be construed as being limited by the accompanying drawings.

[0089] FIG. 3 shows an appearance of a laundry treating apparatus 10 according to the present disclosure.

[0090] The laundry treating apparatus according to an embodiment of the present disclosure may include a cabinet 100 that forms the appearance thereof.

[0091] The cabinet 100 may include a front panel 110 defining a front surface of the laundry treating apparatus. The front panel 110 may have a laundry inlet 111 defined therein to communicate with a drum 200 to be described later, and a door 130 pivotally coupled to the cabinet to open and close the laundry inlet 111.

[0092] A control panel 117 may be installed on the front surface 110. The control panel 117 may include an input unit 118 for receiving a control command from a user, and a display 119 for outputting information such as a control command selectable by the user. The control command may include a drying course or a drying option capable of performing a series of drying processes. A main controller that controls a command for executing the drying course or the drying option may be installed

in the control panel 117.

[0093] The input unit 118 may be configured to include a power supply request unit for requesting power supply to the laundry treating apparatus, a course input unit for allowing the user to select a desired course among a plurality of courses, and an execution request unit for requesting start of a course selected by the user.

[0094] The display 119 may be configured to include at least one of a display panel capable of outputting a text and a figure, and a speaker capable of outputting an audio signal and a sound.

[0095] In one example, the laundry treating apparatus according to the present disclosure may include a water storage 7 provided to separately store therein moisture generated in the process of drying the laundry. The water storage 7 may include a water storage tank provided to be withdrawn from one side of the front surface 110 to the outside. The water storage tank may be provided to collect condensate delivered from a cleaning pump to be described later. Thus, the user may withdraw the water storage tank from the cabinet 100 to remove the condensate therefrom, and then, mount the water storage tank in the cabinet 100 again. Therefore, the laundry treating apparatus according to the present disclosure may be placed in any places where a sewer or the like is not installed.

[0096] In one example, the water storage 7 may be disposed above the door 130. Accordingly, when withdrawing the water storage tank from the front surface 110, the user is able to bend a waist relatively less.

[0097] In one example, the laundry treating apparatus according to the present disclosure may further include a steam supplier 195 capable of supplying steam to the laundry or into the cabinet. The steam supplier 195 may be provided to generate the steam with the condensate discharged from the laundry, or may be provided to generate the steam by receiving fresh water rather than the condensate. The steam supplier 195 may be provided to generate the steam by heating the water, using ultrasonic waves, or vaporizing the water.

[0098] Because the steam supplier 195 is provided to generate the steam by receiving a certain amount of water, the steam supplier 195 may occupy a certain volume. In this connection, the door and the control panel 117 are installed on the front surface 110 of the cabinet, and a duct that supplies or discharges air to/from the drum, a water supply, and the like may be installed on a rear panel 120 of the cabinet, so that the steam supplier 195 may be advantageously installed on an inner surface of a side panel 140 of the cabinet.

[0099] In addition, the laundry treating apparatus according to the present disclosure may include a steam controller 800 provided to separately control the steam supplier 195. The steam controller 800 may be installed on the control panel 117, but may be provided as a separate control panel to prevent overloading of the control panel 117 and to prevent increase a production cost.

[0100] The steam controller 800 may be disposed ad-

jacent to the steam supplier 195. The steam controller 800 may be disposed on the side panel 140 on which the steam supplier 200 is installed to reduce a length of a control line or the like connected to the steam supplier 200.

[0101] Because the steam supplier 195 supplies the steam that may contact the laundry, it is preferable to generate the steam with the fresh water. Because the water collected in the water storage 7 is generated from the laundry, there is a high possibility that lint or foreign matters are contained in the water collected in the water storage 7. Thus, the water collected in the water storage 7 may not be suitable for generating the steam.

[0102] Accordingly, the laundry treating apparatus according to the present disclosure may supply the water to the steam supplier 195, but may include a water supplier 160 provided separately from the water storage 7. The water supplier 160 may be provided to store the fresh water therein, or receive the fresh water from the outside and supply the fresh water to the steam supplier 195.

[0103] For example, the water supplier 160 may include an external water supplier 180 that may receive water from an external water supply source and deliver the water to the steam supplier 195, and an internal water supplier 170 that may separately store the fresh water therein and supply the fresh water to the steam supplier 195.

[0104] The internal water supplier 170 may further include a water tank 171 that is provided separately from the water storage 7 to store the fresh water therein. The laundry treating apparatus according to the present disclosure may also be provided such that the water tank 171 and the steam supplier 195 are installed at different vertical levels, so that the water in the water tank 171 is supplied to the steam supplier 195 by a self load.

[0105] When the difference in the installation vertical level between the water tank 171 and the steam supplier 195 is not secured, it may be desirable to additionally install the water pump 172. In addition, when the water pump 172 is additionally disposed, there is an advantage in that a space inside the cabinet 100 may be more densely utilized.

[0106] Thus, the water supplier 160 may further include a water pump 172 provided to supply the water in the water tank 171 to the steam supplier 195, and a tank housing 173 that seats the water tank 171 and the water pump 172 inside the cabinet.

[0107] The external water supplier 180 may include a direct water valve connected to the external water supply source to receive the water.

[0108] In addition, the laundry treating apparatus according to the present disclosure may further include a determination unit 196 that determines whether to supply the water to the steam supplier 195 by preferentially using which of the external water supplier 180 and the internal water supplier 170.

[0109] The determination unit 196 may be structurally provided to determine which of the external water sup-

plier 180 and the internal water supplier 170 is preferentially used.

[0110] In one example, the water tank 171 may be provided to store the fresh water therein. It is preferable that the water tank 171 is provided to be exposed to the outside of the cabinet 100 to be frequently filled with the fresh water.

[0111] In one example, the water tank 171 may be provided to be withdrawn from the cabinet 100. Accordingly, the user may easily fill water by withdrawing the water tank 171 from the cabinet 100.

[0112] The water tank 171 may be provided to be withdrawn through the front surface 110. However, when the water storage tank is also provided to be withdrawn through the front surface 110, because of an area occupied by the control panel 117 on the front surface 110, it may be difficult to secure an area for withdrawing the water tank 171.

[0113] Accordingly, the water tank 171 may be provided to be withdrawn through the top panel 130, so that interference with the control panel 117 may be prevented.

[0114] From another point of view, because both the water tank 171 and the water storage 7 are provided to store the water therein, the user may be confused. To this end, the laundry treating apparatus according to the present disclosure may be provided such that the water tank 171 and the water storage 7 are exposed from the cabinet in different directions and at different locations.

[0115] Thus, the water tank 171 may be provided to be exposed through the top panel 130, and the water storage 7 may be provided to be exposed through the front surface 11. Therefore, even when both the water tank 171 and the water storage 7 are arranged, the confusion of the user may be prevented. In addition, the water tank 171 may have a relatively smaller volume than the water storage 7 because the water tank 171 must store the fresh water therein and a freshness of the stored water must be maintained. Accordingly, the user may distinguish the water tank 171 and the water storage 7 from each other by the volume difference.

[0116] Because the water tank 171 has the smaller volume than the water storage 7, the water tank 171 may be easily withdrawn upward. Accordingly, the water tank 171 may be provided to be withdrawn upward from the top panel 130. As a result, because the withdrawal directions of the water tank 171 and the water storage 7 are different from each other, the possibility of user confusion may be further reduced.

[0117] The top panel 130 of the laundry treating apparatus according to the present disclosure may include a tank withdrawal hole or withdrawal hole 131 defined therein provided such that the water tank 171 may be exposed to the outside or the water tank 171 may be withdrawn to the outside of the cabinet. The tank withdrawal hole 131 may have a cross-sectional area corresponding to or slightly larger than a cross-sectional area of the water tank 171.

[0118] The top panel 130 may further include a with-

drawal cover 132 provided to shield the tank withdrawal hole 131 to prevent the water tank 420 from being arbitrarily withdrawn.

[0119] The laundry treating apparatus according to the present disclosure may further include a filter capable of removing foreign matters from a circulating flow channel. The front surface 110 may have a filter mounting hole 113 defined therein through which the filter is withdrawn or inserted.

[0120] FIG. 4 shows an interior of a laundry treating apparatus according to the present disclosure.

[0121] The laundry treating apparatus according to the present disclosure may include the drum 200 accommodated in the cabinet 100 for accommodating the laundry therein, a driver M that rotates the drum 200, and a hot air supplier 900 provided to supply hot air to the drum 200.

[0122] The drum 200 may be formed in a cylindrical shape to accommodate the laundry therein. In addition, because there is no need to put water into the drum 200, and the water condensed inside the drum 200 does not need to be discharged to the outside, a through-hole defined along a circumference of the drum 200 may be omitted.

[0123] The driver M may be disposed in direct connection with the drum 200 to rotate the drum 200. For example, the driver M may be of a direct drive unit (DD)-type. Accordingly, the driver M may control a rotation direction of the drum 200 or a rotation speed of the drum 200 by directly rotating the drum 200 by omitting a component such as a belt, a pulley, and the like.

[0124] In general, in a case of a DD-type washing machine, the driver M may be coupled to and fixed to a tub accommodating the drum 200 therein, and the drum 200 may be coupled to the driver M and supported by the tub. However, because the laundry treating apparatus according to the present disclosure is provided to intensively perform the drying process, the tub fixed to the cabinet 100 to accommodate the drum 200 therein is omitted.

[0125] Accordingly, the laundry treating apparatus according to the present disclosure may further include a support 400 provided to fix or support the drum 200 or the driver M inside the cabinet 100.

[0126] The support 400 may include a front case 410 disposed in front of the drum 200 and a rear case 420 disposed at the rear of the drum 200. The front case 410 and the rear case 420 may be formed in a plate shape and respectively disposed to face front and rear surfaces of the drum 200. A distance between the front case 410 and the rear case 420 may be the same as a length of the drum 200 or may be set to be larger than the length of the drum 200. The front case 410 and the rear case 420 may be fixed to and supported by a bottom surface of the cabinet 100 or the hot air supplier 900 to be described later.

[0127] Because the laundry inlet of the drum 200 is defined in a front surface of the drum 200, the driver M is preferably installed in the rear case 420 rather than in the front case. The rear case 420 may be provided such

that the driver M is mounted and supported in a region thereof facing the rear surface of the drum 200. Accordingly, the driver M may be provided to rotate the drum 200 in a state in which a position thereof is stably fixed through the rear case 420.

[0128] At least one of the front case 410 and the rear case 420 may rotatably support the drum 200. At least one of the front case 410 and the rear case 420 may rotatably accommodate a front end or a rear end of the drum 200 therein.

[0129] For example, a front portion of the drum 200 may be accommodated and rotatably supported in the front case 410, and a rear portion of the drum 200 may be spaced apart from the rear case 420 and may be indirectly supported by the rear case 420 by being connected to the driver M. Accordingly, a region in which the drum 200 is in contact with or rubbed against the support 400 may be minimized, and unnecessary noise or vibration may be prevented from occurring.

[0130] In one example, the drum 200 may be provided to be rotatably supported by both the front case 410 and the rear case 420.

[0131] The hot air supplier 900 may define the circulating flow channel for discharging air in the drum 200 to the outside and introducing air into the drum 200, and may dry the laundry accommodated in the drum 200 by heating the circulating air or condensing moisture of the circulating air.

[0132] It is preferable that the hot air supplier 900 is disposed below the drum 200 such that the laundry inlet of the drum 200 is disposed at a relatively high position, and the user is able to easily withdraw the laundry located inside the drum 200.

[0133] The hot air supplier 900 may have a plurality of heat exchangers installed therein that cool or heat the air flowing therein, and may have a washer 940 installed therein that removes foreign matters attached to the heat exchangers using condensate condensed in the air.

[0134] The hot air supplier 900 may be provided to receive the air inside the drum 200 through the front case 410 and discharge the air toward the rear case 420.

[0135] A duct cover 430 that guides the hot air supplied from the hot air supplier 900 to the rear surface of the drum 200 may be coupled to the rear case 420. The duct cover 430 may be provided to expose the driver M to the outside to cool the driver M. The cabinet 100 may further include a blocking plate 120 that prevents a safety accident by preventing the duct cover 430 and the driver M from being exposed to the outside.

[0136] A length T1 in a front and rear direction of the cabinet may be defined as a length from the front case 410 to the rear panel 120. Strictly speaking, a length from the front panel 120 to the rear panel 120 is the length of the cabinet. However, because the length from the front case 410 to the rear panel 120 corresponds to an allowable space in which internal components of the laundry treating apparatus according to the present disclosure may be installed, a length of the allowable space (T1=al-

lowable length) may be briefly referred to as the length of the cabinet.

[0137] When the allowable length T1 is determined, a length T2 of the drum 200 and a length T3 of the driver may be determined. In addition, the allowable length T1 may include the drum length T2 and the driver length T3, and may be equal to or smaller than a sum of the drum length T2 and the driver length T3.

[0138] In one example, when the rear panel 120 is omitted, the rear case 420 may form a rear surface of the cabinet.

[0139] FIG. 5 shows a drum of a laundry treating apparatus according to the present disclosure.

[0140] The drum 200 of the laundry treating apparatus according to the present disclosure is rotated by being directly coupled to the driver M rather than being indirectly rotated by being coupled to the belt or the like. Therefore, unlike a drum of a conventional dryer formed in a cylindrical shape with open front and rear surfaces, the drum 200 of the laundry treating apparatus according to the present disclosure is provided to be directly coupled to the driver M as the rear portion of the drum 200 is shielded.

[0141] Specifically, the drum 200 may include a drum body 210 formed in a cylindrical shape for accommodating the laundry therein, and a drum rear surface 220 coupled to a rear end of the drum body 210 to form the rear surface of the drum.

[0142] The drum rear surface 220 may be provided to shield a rear portion of the drum body 210 to provide a space directly coupled to the driver M. That is, the drum rear surface 220 may be provided to rotate the drum body 210 by being connected to the driver M and directly receiving power from the driver M. As a result, a laundry inlet 211 into which the laundry is put may be defined in a front surface of the drum body 210, and the rear portion of the drum body 210 may be shielded by the drum rear surface 220.

[0143] The drum rear surface 220 may have a bushing portion 300 that may be coupled to the driver M. The bushing portion 300 may be disposed in the drum rear surface 220 to form a rotation center of the drum 200. The bushing portion 300 may be formed integrally with the drum rear surface 220, but may be made of a material more rigid or durable than a material of the drum rear surface 220 in order to be firmly coupled to a rotation shaft extending from the driver M. The bushing portion 300 may be seated and coupled to a center of the drum rear surface 220.

[0144] The drum rear surface 220 may include a circumferential portion 221 coupled to an outer circumferential surface of the drum body 210 and a seating portion 223 disposed inwardly of the circumferential portion 221 and able to be coupled to the driver M. The bushing portion 300 may be accommodated in and coupled to the seating portion 223, and the seating portion 223 may include a through-hole defined therein through which the bushing portion 300 may pass and be accommodated.

[0145] A suction hole 224 that guides the hot air supplied from the hot air supplier 900 to be introduced into the drum body 210 may be defined between the circumferential portion 221 and the seating portion 223. The suction hole 224 may be composed of a plurality of holes defined to pass through the drum rear surface 220 or may be formed as a mesh-type net.

[0146] In order to prevent rigidity of the drum rear surface 220 from being reduced because of the suction hole 224, reinforcing ribs 225 that reinforce the rigidity of the drum rear surface 220 may be further disposed. The reinforcing ribs 225 may extend radially from an outer circumferential surface of the seating portion 223 toward an inner circumferential surface of the circumferential portion 221. In addition, a circumferential rib 226 extending in a circumferential direction of the drum rear surface 220 may be further disposed to connect the reinforcing ribs 225 to each other. The suction holes 224 may be defined between the reinforcing ribs 225, the circumferential rib 226, the seating portion 223, and the circumferential portion 221, and may maintain a shape thereof through the reinforcing ribs 225 and the circumferential ribs 226 even when the drum rear surface 220 receives a rotational force transmitted from the driver M.

[0147] In one example, one or more reinforcing beads 212 may be disposed on an outer circumferential surface of the drum body 210 to reinforce rigidity of the drum body 210. The reinforcing beads 212 may be recessed inwardly or protrude outwardly along a circumference of the drum body 210. The plurality of reinforcing beads 212 may be disposed to be spaced apart from each other in a longitudinal direction of the drum body 210.

[0148] Accordingly, even when a large amount of laundry is accommodated in the drum body 210 or the sudden rotational force is transmitted through the driver M, the drum body 210 may be prevented from being twisted.

[0149] As a result, the drum 200 of the laundry treating apparatus according to the present disclosure may not be rotated by the belt or the like, but may be rotated as the drum rear surface 220 is directly coupled to the driver M.

[0150] Therefore, even when the driver M changes a rotation direction or has a great rotational acceleration, the drum 200 of the laundry treating apparatus according to the present disclosure may be rotated by immediately reflecting this.

[0151] FIG. 6 shows an internal configuration of a laundry treating apparatus according to the present disclosure.

[0152] As described above, the drum 200 may include the drum body 210 that is formed in the cylindrical shape with the open front and rear surfaces, and the drum rear surface 220 coupled to the rear end of the drum body 210 to shield the rear portion of the drum body 210.

[0153] The rotation shaft extending from the driver M may be directly coupled to the bushing portion 300.

[0154] The front case 410 may include a front plate 411 that forms a main body, and an inlet communication

hole 412 that penetrates the front plate 411 to accommodate the front portion of the drum body 210 or the laundry inlet 211. A gasket 413 that accommodates the drum body 210 therein may be disposed on an outer circumferential surface of the inlet communication hole 412.

[0155] The gasket 413 may rotatably support the laundry inlet 211 of the drum body 210, and may be disposed to be in contact with the outer circumferential surface of the laundry inlet 211. The gasket 413 may prevent the hot air inside the drum 200 from leaking between the drum body 210 and the front plate 411. The gasket 413 may be made of a plastic resin-based material or may be formed as an elastic body. A separate sealing member may be additionally coupled to an inner circumferential surface of the gasket 413 to prevent the laundry or the hot air from deviating from the laundry inlet 211 of the drum body 210 to the front plate 411.

[0156] In one example, a duct communication hole 419 in communication with the drum body 210 and through which the air put into the drum body 210 may be discharged may be defined in an inner circumferential surface of the gasket 413 or the inlet communication hole 412. A flow channel that connects the duct communication hole 419 to the hot air supplier 900 may be defined in the front plate 411. Accordingly, the duct communication hole 419 may guide the air discharged from the drum body 210 to be supplied to the hot air supplier 900.

[0157] A filter member that blocks the foreign matters, lint, or the like discharged from the drum 200 from being put into the hot air supplier 900 may be installed in the duct communication hole 419.

[0158] A front wheel 415 which is disposed to be in contact with the outer circumferential surface of the drum body 210 to rotatably support the drum 200 may be installed on the front case 410. The front wheel 415 may be provided to support the outer circumferential surface of the laundry inlet of the drum body 210, and may include a plurality of front wheels disposed to be spaced apart from each other along an outer circumferential surface of the inlet communication hole 412. The front wheel 415 may be provided to rotate together when the drum 200 rotates while supporting a lower portion of the drum body 210.

[0159] In addition, a stopper 500 that prevents the drum body 210 from deviating may be coupled to the front case 410. The stopper 500 may be disposed on a stopper installation portion 416 disposed on the front case 410 and above the inlet communication hole 412.

[0160] The front case 410 may have a tank support hole 414 defined therein through which the water storage tank of the water storage 7 may be withdrawn or supported. The tank support hole 414 may be installed in a region corresponding to a portion where the water storage 7 is disposed in the front surface 110, and may be defined through the front case 410.

[0161] A cutout 417 capable of being supported by the hot air supplier 900 may be defined at a bottom of the front case 410. Because of the cutout 417, the front case

410 may be prevented from interfering with the hot air supplier 900. The cutout 417 may be provided to be in communication with a supply duct of the hot air supplier 900 to transfer the air inside the drum supplied to the duct communication hole 419 to the hot air supplier 900.

[0162] The hot air supplier 900 may include a circulating flow channel 920 through which the air discharged from the drum 200 may circulate. The circulating flow channel 920 may be formed in a shape of a duct disposed outside the drum 200. The circulating flow channel 920 may include a supply duct 921 in communication with the duct communication hole 419 and through which the air of the drum 200 is supplied, a flow duct 922 through which the air supplied from the supply duct 921 flows, and a discharge duct 923 through which the air that has passed through the flow duct 922 is discharged.

[0163] The supply duct 921 may be disposed to be in communication with the cutout 417 of the front case 410 to be in communication with the flow channel installed inside the front case 410. The flow duct 922 may be provided to extend from a distal end of the supply duct 921 toward the rear portion of the drum 200, and the discharge duct 923 may be disposed at a distal end of the flow duct 922 to guide the air to the drum 200.

[0164] In one example, the hot air supplier 900 may have a heat pump 950 installed therein capable of cooling and heating air therein. The heat pump 950 may include an evaporator 951 installed inside the flow duct 922 to cool the air to condense the moisture contained in the air, and a condenser 952 disposed to be spaced apart from the evaporator 951 downstream or toward the discharge duct 923 to heat the air again. The heat pump 950 may further include an expansion valve that cools a refrigerant that has passed through the condenser 952 and guides the refrigerant back to the evaporator 951, and a compressor 953 that pressurizes and heats the refrigerant that has passed through the evaporator 951 and supplies the pressurized and heated refrigerant to the condenser 952. The compressor 953 may be disposed outside the flow duct 922.

[0165] The evaporator 951 and the condenser 952 may be provided as a heat exchanger through which the refrigerant flows.

[0166] The hot air supplier 900 may further include a connector 930 that is in communication with the discharge duct 923 to guide the hot air to the rear portion of the drum 200 or to the duct cover 430. The connector 930 may be disposed above the discharge duct 923 to guide the hot air heated through the condenser 952 to a portion at the rear of the discharge duct 923.

[0167] In one example, the hot air supplier 900 may further include a blower fan 9531 that may flow the air inside the drum 200 to the supply duct 921 or put the air that has passed through the discharge duct 923 into the drum 200. The blower fan 9531 may be installed inside the discharge duct 923 and may be controlled together with the driver M by the main controller.

[0168] The rear case 420 may include a rear plate 421

disposed to face the front plate 411. The rear case 420 may include a mounting portion 429 to which the driver M is coupled and seated. The mounting portion 429 may be provided to pass through the rear case 420, and the driver M may be mounted on the mounting part 429 and fixed inside the cabinet 100. The mounting portion 429 may support a load of the driver M, and may install the driver M at a position corresponding to a position of the drum rear surface 220.

[0169] In one example, the rear plate 421 may further include an air flow hole 423 in communication with the connector 930 and through which the air is introduced, and a communication hole 424 that discharges the air that has passed through the air flow hole 423 to the drum rear surface 220.

[0170] The duct cover 430 that defines a flow channel for flowing the air introduced through the connector 930 to the suction hole 224 defined in the drum rear surface 220 may be coupled to a rear surface of the rear plate 421.

[0171] The duct cover 430 may be coupled to the rear plate 421 and may be spaced apart from the suction hole 224 to define a space in which the air flows between the rear plate 421 and the duct cover 430.

[0172] The duct cover 430 may be disposed to shield the communication holes 424 such that all the communication holes 424 are not exposed to the outside. Accordingly, an entirety of the air introduced into the duct cover 430 may be discharged to the communication holes 424 and may be prevented from leaking to the outside. The duct cover 430 may accommodate the driver M by being spaced apart from an outer circumferential surface of the driver M to prevent interference with the driver M, but may expose the driver M to the outside to induce cooling of the driver M.

[0173] In one example, the duct cover 430 may be heated by the hot air, and the driver M also has a rotating rotor, so that the rear panel 120 may be disposed at the rear of the duct cover 430 to shield the driver M. The rear panel 120 may be coupled to the rear case 420 to block the duct cover 430 and the driver M from being exposed to the outside. The rear panel 120 may be disposed to be spaced apart from the duct cover 430 and the driver M.

[0174] The driver M may include a motor 600 that provides power to rotate the drum 200. The motor 600 may include a stator 610 that generates a rotating magnetic field, and a rotor 620 that is rotated by the stator 610.

[0175] The rotor 620 may be of an outer rotor type for accommodating the stator 610 therein and rotating along a circumference of the stator 610. In this connection, the rotation shaft may be coupled to the rotor 620 and may be directly connected to the drum 200 through the stator 610 and the mounting portion 429. In this case, the rotor 620 may directly transmit the power to rotate the drum 200.

[0176] In one example, the rotor 620 may rotate at high RPM by the stator 610. For example, the rotor 620 may rotate at RPM much greater than RPM at which the laundry inside the drum 200 is able to rotate while being at-

tached to an inner wall of the drum 200.

[0177] However, when the laundry inside the drum 200 is rotated while being continuously attached to the inner wall of the drum 200, there is a problem in that drying efficiency decreases because a portion of the laundry attached to the inner wall of the drum is not exposed to the hot air.

[0178] When the rotor 620 is rotated at low RPM to roll or agitate the laundry inside the drum 200 without attaching the laundry inside the drum to the inner wall of the drum 200, there may be a problem in that an output or a torque that may be generated by the driver M is not able to be properly utilized.

[0179] Accordingly, the driver M of the laundry treating apparatus according to the present disclosure may further include a decelerator 700 capable of increasing the torque while utilizing a maximum output of the motor 600 by reducing the RPM.

[0180] The decelerator 700 may be provided to connect the motor 600 to the drum 200. The decelerator 700 may convert the power of the motor 600 to rotate the drum 200. The decelerator 700 may be disposed between the motor 600 and the drum 200 to receive power from the motor 600, convert the power, and transmit the converted power to the drum 200. The decelerator 700 is provided to convert the RPM of the rotor into small RPM, but increase the torque value and transmit power corresponding to the decreased RPM and the increased torque value to the drum 200.

[0181] Specifically, the decelerator 700 may be coupled to a driving shaft 630 that extends from the rotor 610 and rotates together with the rotor 610. The decelerator 700 includes a gearbox that rotates in engagement with the driving shaft 630 to change rpm of the driving shaft 630 but increase the torque, and the gearbox is coupled to a rotation shaft 740 that is coupled to the drum 200 to rotate the drum. Accordingly, when the driving shaft 630 rotates, the rotation shaft 740 rotates at RPM smaller than that of the driving shaft 630 but may rotate with a greater torque.

[0182] A performance of such decelerator 700 depends on whether the driving shaft 630 and the rotation shaft 740 may be remained coaxial with each other. That is, when the driving shaft 630 and the rotation shaft 740 are misaligned with each other, there is a risk that coupling of components constituting the gearbox inside the decelerator 700 to at least one of the driving shaft 630 and the rotation shaft 740 may loosen or may be released. Accordingly, the power of the driving shaft 630 may not be properly transmitted to the rotation shaft 740 or the driving shaft 630 may be in vain.

[0183] In addition, even when the driving shaft 630 and the rotation shaft 740 are temporarily misaligned, the gearboxes inside the decelerator 700 may be misaligned with each other and collide with each other, thereby generating unnecessary vibration or noise.

[0184] In addition, even when an angle at which the driving shaft 630 and the rotation shaft 740 are mis-

aligned with each other becomes temporarily greater, there is a risk that the gearbox inside the decelerator 700 may completely deviate from a regular position thereof or be damaged.

[0185] As a result, even when the driving shaft 630 and the rotation shaft 740 are not remained coaxial with each other or not arranged side by side to each other temporarily, there may be a problem that the performance of the decelerator 700 is not able to be guaranteed and the drum 200 is not able to be rotated as intended.

[0186] To this end, laundry treating apparatuses having the decelerator generally fix the decelerator and the motor to a support body that maintains an original state thereof without deformation even when an external force is generated.

[0187] For example, the washing machine may apply a scheme of primarily fixing the tub accommodating the drum therein to the cabinet, and then secondarily fixing the motor and the decelerator to a bearing housing made of a rigid body embedded in the tub in an injection molding scheme. In addition, a scheme of placing a fixed steel plate coupled to the tub outside the tub, and fixing the motor and the decelerator to the fixed steel plate may be applied.

[0188] Accordingly, even when significant vibration occurs in the tub, the decelerator and the driver may tilt or vibrate together with the bearing housing or the fixed steel plate. As a result, the decelerator and the driver themselves may be always coupled to each other, and the driving shaft and the rotation shaft may be remained coaxial with each other.

[0189] However, because the laundry treating apparatus according to the present disclosure is formed as the dryer, the tub fixed inside the cabinet is omitted. In addition, even when the rear panel 120 of the cabinet is formed as a relatively thin plate, and the stator 610 is fixed thereto, the rear panel 120 may easily vibrate or bend because of a repulsive force when the rotor 620 rotates or the driving shaft 630 rotates. When the rear panel 120 vibrates or bends even temporarily, the rotation shaft 740 and the driving shaft 630 that are disposed to be coupled to the drum 200 are bent, so that the rotation shaft 740 and the driving shaft 630 may be misaligned with each other.

[0190] In addition, because the rear panel 120 is formed as the thin steel plate, the rear panel 120 may be impossible to support both the decelerator 700 and the motor 600. For example, when the decelerator 700 and the motor 600 are coupled to the rear panel 120 in parallel, a rotational moment is generated because of a total length and self loads of the decelerator 700 and the motor 600, so that the decelerator 700 may sag downward. As a result, the rotation shaft 740 itself coupled to the drum may be misaligned with the decelerator 700, so that the rotation shaft 740 may not be remained coaxial with the driving shaft 630.

[0191] Even the rear panel 120 may not be able to support the motor 600 itself. One surface on which the motor

600 is installed of the rear panel 120 may bend downward by the self load of the motor 600. From the beginning, the rear panel 120 may not be a component suitable for coupling with the motor 600 itself.

[0192] In one example, it may be considered that the motor 600 is supported as the stator 620 is coupled to the rear case 420. When the large amount of laundry is accommodated inside the drum 200 or eccentricity occurs, the rotation shaft 740 may be misaligned along disposition of the laundry whenever the drum 200 rotates. In this connection, because the stator 610 is separated from the drum 200 and fixed to the rear case 420, the rotation shaft 740 may vibrate with an amplitude different from that of the stator 610 or may tilt at an angle different from that of the stator 610. Accordingly, the rotation shaft 740 may not be remained coaxial with the driving shaft 630.

[0193] From another point of view, the drum 200 may be supported by the front case 410 and the rear case 420, or a position at which the drum 200 is installed may be fixed at a certain level by a stopper 500 to be described later. Accordingly, a position of the rotation shaft 740 coupled to the drum 200 may also be fixed at a certain level. Accordingly, even when the vibration occurs in the drum 200, the vibration may be buffered by at least one of the front case 410 and the rear case 420, or by the stopper 500.

[0194] However, when the vibration generated in the drum 200 is transmitted to the motor 600, even when the decelerator 700 and the motor 600 are fixed to the rear case 420, vibration amplitudes of the motor 600 and the rear case 420 may be greater than a vibration amplitude of the rotation shaft 740. Even at this time, there may be a problem that the driving shaft 630 and the rotation shaft 740 are not able to be remained coaxial with each other.

[0195] In order to solve such problem, the laundry treating apparatus according to the present disclosure may fix the motor 600 by coupling the motor 600 to the decelerator 700. In other words, the decelerator 700 itself may serve as a reference point for an entirety of the driver M. That is, the decelerator 700 may serve as a reference for the vibration of the entirety of the driver M and the amount of tilting angle.

[0196] Because the motor 600 is fixed only to the decelerator 700 rather than to another component of the laundry treating apparatus, when the vibration is transmitted to the driver M or the external force is transmitted, the motor 600 may always tilt or vibrate simultaneously with the decelerator 700 when the decelerator 700 tilts or vibrates.

[0197] As a result, the decelerator 700 and the driver 600 may form one vibration system, and the decelerator 700 and the driver 600 may be maintained in a state of being fixed to each other without a relative movement.

[0198] The stator 610 of the driver 600 may be directly coupled to the decelerator 700 to be fixed. Accordingly, a position at which the driving shaft 630 is installed with respect to the decelerator 700 may not be changed. A

center of the driving shaft 630 and a center of the decelerator 700 may be arranged to coincide with each other, and the driving shaft 630 may rotate while being remained coaxial with the center of the decelerator 700.

[0199] The above-mentioned terms "coaxial" and "coincide" do not imply physically perfect coaxial and coincident states, but are a concept accepting an error range that may be accepted in terms of mechanical engineering or a range of a level that a person skilled in the art may accept as coaxial or coincident. For example, a range in which the driving shaft 630 and the rotation shaft 740 are misaligned with each other by equal to or less than 5 degrees may be defined as the coaxial or coincident state.

[0200] Because the driving shaft 630 rotates with respect to the decelerator 700, but is fixed to prevent the tilting, and the stator 610 is also fixed to the decelerator 700, a distance between the stator 610 and the rotor 620 may be always maintained. As a result, a collision of the stator 610 and the rotor 620 may be prevented, and noise or vibration that may occur as the rotor 620 rotates with respect to the stator 610 and a rotation center thereof changes may be fundamentally blocked.

[0201] The rotation shaft 740 may be provided to extend inside the decelerator 700 toward the drum 200, may vibrate together with the decelerator 700 and may tilt together with the decelerator 700. That is, the rotation shaft 740 may only be provided to rotate in the decelerator 700, and an installation position thereof may be fixed. As a result, the rotation shaft 740 and the driving shaft 630 may always be arranged in parallel with each other and may be coaxial with each other. In other words, the center of the rotation shaft 740 and the center of the driving shaft 630 may be maintained to coincide with each other.

[0202] The decelerator 700 and the motor 600 may be designed to be disposed along a first axis S1 parallel to the ground when there is no load on the drum 200 or the motor 600 does not operate. The driving shaft 630 and the rotation shaft 740 may also be disposed in parallel along the first axis S1.

[0203] However, when the vibration occurs in the drum 200 or the vibration occurs in the motor 600, the vibration is transmitted to the decelerator 700 and the decelerator 700 vibrates or tilts, so that the decelerator 700 may be temporarily in a state tilted toward a second axis S2.

[0204] In this connection, because the motor 600 is in a state of being coupled to the decelerator 700, the motor 600 may vibrate or tilt together with the decelerator 700 to be disposed in parallel with the second axis S2. Accordingly, the driving shaft 630 and the rotation shaft 740 may also be disposed in parallel along the second axis S2.

[0205] As a result, even when the decelerator 700 tilts, the motor 600 may move integrally with the decelerator 700, and the driving shaft 630 and the rotation shaft 740 may be remained coaxial with each other.

[0206] Accordingly, because the driving shaft 630 and

the rotation shaft 740 are always tilted with respect to the decelerator 700, the decelerator 700 may serve as an action point P1 of a lever or a seesaw. That is, the decelerator 700 may serve as the first action point P1 of the vibration system including the motor 600. In one example, the decelerator 700 is coupled to the drum 200 through the rotation shaft 740, and the drum 200 is spaced apart from the rear case 420, so that the load of the drum 200 may be transmitted to the decelerator 700. A system including the drum 200 as well as the motor 600 may form one vibration system, and the decelerator 700 may serve as a reference or the action point p1 of the vibration system.

[0207] The decelerator 700 must be fixed or supported inside the cabinet 100 even though the decelerator 700 itself serves as the center or the action point P1 of the vibration system.

[0208] To this end, the decelerator 700 may be fixedly coupled to the rear case 420. In this case, because the decelerator 700 will tilt or vibrate in the state coupled to the rear case 420, it may be seen that the rear case 420 serves as the center of the vibration system including the decelerator 700, the motor 600, and the drum 200. Even in this case, the motor 600 may be coupled to and fixed only to the decelerator 700 without being directly coupled to the rear case 420 even though the motor 600 is able to be in contact with the rear case 420.

[0209] Specifically, the mounting portion 429 of the rear case 420 may serve as a second action point P2 of the lever or the seesaw formed by the decelerator 700, the motor 600, and the drum 200.

[0210] The decelerator 700, the motor 600, and the drum 200 may become in parallel with a third axis S3 after being disposed in parallel along the first axis S1. The third axis S3 may pass through the decelerator 700 coupled to the rear case 420. In this connection, because the decelerator 700 and the motor 600 are coupled to each other, the motor 600 may also be disposed in parallel with the third axis S3.

[0211] As a result, the driver 600 and the drum 200 are coupled to the decelerator 700, so that the driver 600 and the drum 200 may tilt in parallel with each other or vibrate at the same time with respect to the decelerator 700.

[0212] The drum 200 of the laundry treating apparatus according to the present disclosure is supported by the decelerator 700 without being coupled to the belt. Accordingly, when the drum 200 is rotated by the decelerator 700, the drum 200 may be lifted upward or tilted downward by centrifugal force or the like.

[0213] To prevent this, the laundry treating apparatus according to the present disclosure may further include the stopper 500 for fixing the position of the drum 200. The stopper 500 may include a front stopper 510 disposed in front of the drum 200 and a rear stopper 520 disposed at the rear of the drum.

[0214] In this connection, the drum 200 may be lifted upward with respect to the rotation shaft 740. Accordingly, the front stopper 510 may be disposed so as to be in

contact with an upper front portion of the drum.

[0215] In addition, the drum 200 may sag downward by the weight of the laundry. Accordingly, the rear stopper 520 may be disposed so as to be in contact with a lower rear portion of the drum 200.

[0216] The front stopper 510 may be coupled to the installation portion 416 of the front case 410, and the rear stopper 520 may be supported on an upper portion of the heat exchanger 900.

[0217] FIG. 7 shows the stopper 500 supporting the drum 200 of the laundry treating apparatus according to the present disclosure.

[0218] The drum 200 is coupled to a free end of the rotation shaft 740 and rotates. The rotation shaft 740 may be fixed to the decelerator 700 so as to be prevented from being misaligned with the decelerator 700.

[0219] However, the drum 200 may be misaligned upward or downward because of the load of the laundry or fall of the laundry occurring during the rotation. As a result, the drum 200 may be misaligned upward or downward with respect to the free end of the rotation shaft 740.

[0220] In particular, the drum 200 may vibrate or tilt independently of the free end of the rotation shaft 740. That is, the drum 200 may be made of a material having an elastic force, so that a certain level of deformation thereof may be allowed. This is to prevent excessive vibration or external force from being transmitted to the rotation shaft 740 to prevent the rotation shaft 740 and the driving shaft 630 from being misaligned with each other.

[0221] In addition, because the drum 200 is not fixed by the belt or the like, excessive vibration energy may occur when the drum 200 rotates in a state of accommodating the laundry therein.

[0222] In one example, the front case 410 and the rear case 420 are respectively disposed in front of and at the rear of the drum 200. The front case 410 may avoid direct contact with the front surface of the drum 200 through the inlet communication hole 412 and the gasket 413. However, because the rear surface of the drum 200 is directly coupled to the rotation shaft 740, the rear portion of the drum body 210 is shielded by the drum rear surface 220, and the mounting portion 429 that should fix the driver M must be installed at a portion of the rear case 420 directly facing the drum rear surface 220. In other words, the rear case 420 is not able to have a surface facing the drum defined as a through-hole like the front case 410.

[0223] Accordingly, when the rear case 420 rotatably supports the rear portion or the rear surface of the drum 200 like the front case 410, there is a risk of direct friction and collision of the drum rear surface 220 and the rear case 420.

[0224] Specifically, the rear case 420 has a lot of parts that interfere with the drum rear surface 220 because of a drum accommodating groove 422 to be described later, an air flow hole 423, and the mounting portion 429. In such situation, when the rear case 420 directly supports

the drum 200, the drum rear surface 220 and the rear case 420 may be worn or damaged.

[0225] Therefore, the rear case 420 needs to be maintained spaced apart from the drum 200 by a certain distance, and it may be impossible for the rear case 420 itself to directly support the drum 200.

[0226] In addition, when the drum 200 rotates while accommodating the large amount of laundry therein, the drum 200 may rotate while moving in a direction of the front case 410 or the rear case 420 because there is no belt or the like.

[0227] Considering this comprehensively, the laundry treating apparatus of the present disclosure may further include the stopper 500 to limit the movement of the drum 200 within an allowed range.

[0228] The stopper 500 may include the front stopper 510 coupled to the front case 410 to support a front upper end of the drum, a support wheel 533 that is rotatably disposed on the front case 410 to support a front lower end of the drum, and a rear stopper 520 coupled to the rear case 420 to support a rear lower end of the drum.

[0229] The drum 200 may be rotated by being supported by the driver M and the support wheel 533, and the front stopper 510 and the rear stopper 520 may be provided to limit the drum 200 only when the drum 200 moves excessively. Therefore, the front stopper 510 and the rear stopper 520 may buffer the vibration or temporarily occurred impact of the drum 200, and it may be possible to prevent the front stopper 510 and the rear stopper 520 from rather damaging the drum 200.

[0230] Referring to (a) in FIG. 7, the front stopper 510 may include a fixed plate 5111 coupled to the stopper installation portion 416 of the front case 410, a lever plate 5112 extending rearward from the fixed plate 5111, an extension plate 5113 extending downward from the lever plate 5112, a support plate 512 extended from the extension plate 5113 and disposed at the front upper end of the drum 200, and a felt 513 coupled to a lower portion of the support plate 512 and in contact with the drum 200.

[0231] Accordingly, the front stopper 510 may absorb the impact of the drum 200 while the lever plate 5112 and the extension plate 5113 are lifted upward at a certain level when the drum 200 is lifted upward, and the felt 513 may rub against the front portion of the drum 200 to limit the drum 200 from being excessively lifted upward.

[0232] An outer circumferential surface of the laundry inlet 211 of the drum 200 may include a contact portion 213 having a diameter smaller than that of the drum body 210 to be in contact with the support wheel 533 or the felt 513. Accordingly, the felt 513 and the support wheel 533 are accurately seated on the contact portion 213 to limit the movement of the drum 200.

[0233] The front stopper 510 may be disposed to be spaced apart from the front upper end of the drum by a specific distance. The specific distance may correspond to a distance at which the drum 200 may deviate from the gasket 413 when rotating, or a range at which the drum 200 may excessively distort the rotation shaft 740.

[0234] Referring to (b) in FIG. 7, in the front stopper 510, the support plate 512 and the felt 513 may be formed as a contact wheel 532 rotatably contact the contact portion 213.

[0235] Accordingly, the support wheel 533 may support a lower portion of the contact portion 213 and the contact wheel may support an upper portion of the contact portion 213 to prevent the drum 200 from deviating the inlet communication hole 412.

[0236] Referring to (c) in FIG. 7, thus, the rear case 420 and the drum 200 may be disposed to be spaced apart from each other, the rear stopper 520 and the driver M may support the rear portion of the drum 200, and when the drum 200 approaches the rear case 420 excessively, the rear stopper 520 may block the excessive approach of the drum 200. As a result, it is possible to prevent damage resulted from friction or contact between the rear case 420 and the drum 200.

[0237] The rear stopper 520 may be disposed in front of the rear case 420 to prevent the drum rear surface 220 from coming into contact with and colliding with the rear case 420. When the drum 200 rotates while accommodating the laundry therein, because the drum 200 is not fixed with the belt, the drum 200 not only moves upward or downward, but also generates an external force for moving forward or rearward.

[0238] Because the rear case 420 supports the load of the driver M, the rear case 420 must be made of a material having a thickness greater than that of the front case 410 or having a rigidity greater than that of the front case 410. Accordingly, because the rear case 420 supports the drum 200 without buffering the movement of the drum 200 when the drum 200 moves downward, the rear case 420 may generate a repulsive force of pushing the drum 200 upward.

[0239] In this process, the drum 200 may be strongly pressed toward the front case 410, and in severe cases, the door 130 may be forcibly opened.

[0240] Accordingly, the rear stopper 520 may be spaced apart from the rear surface of the drum 200 by a reference distance to allow the drum 200 to move rearward at a certain level. Accordingly, it is possible to block the drum 200 from excessively pressing the front case 410.

[0241] The reference distance may be defined as a distance at which the rear surface of the drum 200 and the rear stopper 520 may come into contact with and be supported by each other when the drum 200 is pushed rearward while rotating as the laundry of an amount equal to or greater than a reference cloth amount is accommodated in the drum 200.

[0242] Accordingly, the rear stopper 520 supports the drum 200 only when the drum 200 moves rearward by the reference distance, thereby preventing the rear stopper 520 from being worn. A felt that may be in contact with the drum 200 may be attached to the rear stopper 520.

[0243] In addition, the drum 200 and the rear case 420

may be disposed to be spaced apart from each other by a distance equal to or greater than the reference distance.

[0244] The rear stopper 520 may include a support coupling portion 521 supported on the bottom surface of the cabinet 100 or the hot air supplier 900, a support leg 522 extending from the support coupling part 521 toward the drum 200, an extension 524 obliquely extending forward from the support leg 522, and a limiting portion 525 extending from the extension portion 524 to face the drum rear surface 220.

[0245] The support leg 522 may further have a cut-out groove 523 defined therein to enhance rigidity.

[0246] The extension 524 extends obliquely from the support leg 522 to strengthen rigidity of an entirety of the rear stopper 520 while buffering the external force applied from the drum 200 at a certain level.

[0247] The extension 524 may include an inclined extension 5241 extending frontward from the support leg 522, and a straight extension 5242 extending upward from the inclined extension 5241.

[0248] The limiting portion 525 may include a spacer 5251 extending rearward from the straight extension 5242 and spaced apart from the drum rear surface 220, and a load support 5252 extended from the spacer 5251 and disposed to face the lower portion of the drum rear surface 220.

[0249] In order to reinforce rigidity of the load support 5252, a curved portion 5253 provided by bending a free end of the load support 5252 may be further installed.

[0250] The rear stopper 520 may be blocked from directly contacting the rear surface of the drum 200 by the spacer 5251. Rather, it may allow the drum 200 to move rearward at the certain level.

[0251] Consequently, the rear case 420 may be disposed between the rear stopper 520 and the decelerator 700 or the driver 600.

[0252] In one example, the rear stopper 520 may be disposed to be spaced apart from the lower portion of the drum by a certain distance. The certain distance may correspond to a distance at which the drum 200 deviates from a sealing portion 450 or a distance at which the drum 200 excessively distorts the rotation shaft 740.

[0253] That is, the straight extension 5242 may be disposed to be spaced apart from the rear surface of the drum 200 by the certain distance.

[0254] FIG. 8 shows a structure of the rear case 420 of the present disclosure rear case.

[0255] The motor 600 is coupled to and fixed to the decelerator 700, so that, even when the decelerator 700 itself serves as a reference for the position and the vibration of the driver M, the decelerator 700 needs to be supported while being disposed on the rear surface of the drum 200 in order to rotate the drum 200.

[0256] Accordingly, the decelerator 700 may be seated on the rear case 420 and supported inside the cabinet 100. However, the motor 600 and the drum 200 may be disposed to be spaced apart from the rear case 420. This is to prevent the motor 600 or the drum 200 from inter-

fering with components other than the decelerator 700 and moving independently of the decelerator 700.

[0257] As a result, the rear case 420 may serve as an action point of a seesaw in a vibration system or a rotation system including the decelerator 700, the motor 600, and the drum 200.

[0258] The rear case 420 may include the rear plate 421 disposed on the rear surface of the drum 200 and disposed to face the front plate 411, and the drum accommodating groove 422 protruding from the rear plate 421 to have a shape corresponding to that of the drum rear surface 220. The drum accommodating groove 422 may be spaced apart from the drum rear surface 220, but may protrude from the rear plate 421 to have a diameter and a depth for partially accommodating the outer circumferential surface of the drum rear surface 220. That is, the drum accommodating groove 422 may protrude from the rear plate 421 by a first height L1 to induce the drum rear surface 220 to be partially accommodated in a front portion of the rear plate 421. A plurality of communication holes 424 that face the suction holes 224 of the drum rear surface 220 and allows air to pass there-through may be defined in the drum accommodating groove 422. Each reinforcing bent portion 426 capable of reinforcing rigidity may be disposed between two adjacent communication holes 424. Each reinforcing bent portion 426 is provided to be recessed or protruded between the two adjacent communication holes 424 to prevent rigidity of a portion of the rear plate 421 between the two adjacent communication holes 424 from being weakened. The plurality of communication holes 424 are components that allow the hot air supplied from the hot air supplier 900 to be supplied to the drum 200. In this connection, because the drum accommodating groove 422 accommodates the drum rear surface 220 therein, the hot air discharged from the communication holes 424 may be induced to be supplied to the suction holes 224. In one example, the laundry treating apparatus according to the present disclosure may further include a sealing portion 450 disposed to seal a space between the drum accommodating groove 422 and the drum rear surface 220, and the sealing portion 450 may be accommodated and mounted in the drum accommodating groove 422.

[0259] As a result, the drum accommodating groove 422 may provide a space in which the sealing portion 450 may be installed as well as reinforce the rigidity of the rear plate 421.

[0260] The mounting portion 429 may be provided by being recessed into the drum accommodating groove 422 in a direction opposite to a direction in which the drum accommodating groove 422 protrudes. The mounting portion 429 may be provided by being recessed by a depth L2 from an inner circumferential surface of the drum accommodating groove 422. The mounting portion 429 is provided by being recessed into the drum accommodating groove 422, so that the rigidity of the drum accommodating groove 422 may also be strengthened, and at the same time, an overall rigidity of the rear plate 421

may be strengthened.

[0261] In addition, the mounting portion 429 may be disposed closer to the drum rear surface 220 by being recessed frontward by L2 into the drum accommodating groove 422. Accordingly, a distance between the decelerator 700 mounted and fixed to the mounting portion 429 and the drum rear surface 220 may be reduced, and a length of the rotation shaft 740 connecting the decelerator 700 to the drum rear surface 220 is further reduced by that much, thereby not only guaranteeing durability of the rotation shaft 740, but also reducing an angular range in which the rotation shaft 740 may be distorted.

[0262] In addition, the mounting portion 429 may be recessed into the drum accommodating groove 422, but may have a diameter larger than diameters of the decelerator 700 and the driver 600. Accordingly, at least a portion of the decelerator 700 and the motor 600 may be accommodated in the mounting portion 429 to reduce an overall thickness of the cabinet 100.

[0263] The mounting portion 429 may include a shaft through-hole 4291 through which the rotation shaft 740 extending from the decelerator 700 through the rear plate 421 passes, a mounting surface 4292 disposed on an outer circumferential surface of the shaft through-hole 4291 to support the decelerator 700, and a mounting groove 4294 extending rearward from the mounting surface 4292 toward the drum accommodating groove. A fastening portion 4293 coupled to the decelerator 700 or a coupling portion 800 for coupling the decelerator 700 to the mounting surface 4292 may be installed on the mounting surface 4292.

[0264] In one example, at least a portion of the decelerator 700 or the motor 600 may be accommodated in the mounting groove 4294. Accordingly, an electric wire support groove 4295 in which an electric wire supplying current to the stator 610 may be seated may be defined by being recessed outwardly from the mounting groove 4294. The mounting groove 4294 may have a diameter larger than the diameter of the driver M.

[0265] In one example, the rear case 420 may further include the air flow hole 423 for transferring the hot air supplied from the connector 930 to the duct cover 430. The air introduced into the air flow hole 423 may be introduced into the communication hole 424 along the duct cover 430.

[0266] FIG. 9 shows that the motor 600 of the laundry treating apparatus according to the present disclosure is coupled to the decelerator 700.

[0267] The decelerator 700 may be mounted and supported on the mounting portion 429 to rotate the drum 200. The stator 610 may be directly coupled to and fixed to the decelerator 700, and may be spaced apart from the mounting portion 429. The rotor 620 may be supported by the decelerator 700 by the driving shaft 630 coupled to the decelerator 700, and may be provided to rotate with respect to the stator 610.

[0268] As the stator 610 is coupled to the decelerator 700, the decelerator 700 and the motor 600 may be dis-

posed in parallel with each other to be disposed along the same axis S. The motor 600 may have a rotation center disposed on the same axis S, and the decelerator 700 may also have a rotation center disposed on the same axis S.

[0269] As a result, the rotor 620 may also rotate with respect to the same axis S, and the rotation shaft 740 extending from the decelerator 700 may also rotate with respect to the same axis S.

[0270] The decelerator 700 may be directly coupled to fix the stator 610. The stator 610 may be disposed to be spaced apart from the rear case 420, and may be disposed to be spaced apart from the mounting portion 429.

[0271] In one example, the stator 610 may be supported by being in contact with the rear case 420, and may be additionally coupled to the rear case 420 when the stator 610 is directly fixed to the decelerator 700.

[0272] Because the stator 610 is coupled to the decelerator 700, and the decelerator 700 converts the rpm of the driving shaft 630 to rotate the rotation shaft 740, the drum 200 may also rotate with respect to the same axis S.

[0273] Even when the decelerator 700 vibrates or rotates and the same axis S is misaligned, the driving shaft 630 and the rotation shaft 740 may be disposed in parallel with the same axis S.

[0274] As a result, the decelerator 700 may be coupled to and fixed to the rear case 420.

[0275] Because the decelerator 700 is coupled to a rear portion of the rear case 420 and the drum 200 is disposed in front of the rear case 420, the rear case 420 may be disposed between the drum 200 and the decelerator 700.

[0276] The decelerator 700 may rotate the drum as the drum rotation shaft 740 passes through the rear case 420, and may support the load of the drum through the drum rotation shaft 740.

[0277] In addition, it may be seen that the rear case 420 is disposed between the drum 200 and the motor 600. The decelerator 700 may be disposed between the drum 200 and the motor 600 to be supported by the rear case 420.

[0278] In this connection, both the drum 200 and the motor 600 may be completely spaced apart from the rear case 420. Accordingly, the decelerator 700 may serve as a support center of the drum 200 and the motor 600.

[0279] In addition, it may be seen that the drum 200 is disposed in front of and spaced apart from the rear case 420, the motor is disposed at the rear of and spaced apart from the rear case 420, and the decelerator 700 is coupled to the rear case from the rear by passing through the rear case to connect the motor 600 and the drum 200 to each other.

[0280] Accordingly, the drum 200 and the motor 600 may be provided to transmit at least a portion of the load to the rear case 420 through the decelerator 700.

[0281] As a result, the motor 600, the decelerator 700, and the drum 200 may simultaneously tilt with respect to the rear case 420 or may simultaneously vibrate.

[0282] In addition, because the stator 610 is fixed to the decelerator 700, the driving shaft 630 may be tilted together with the decelerator 700 or vibrate simultaneously with the decelerator 700.

5 **[0283]** FIG. 10 shows an appearance of the decelerator 700.

[0284] The decelerator 700 may include a decelerator housing 710 and 720 that form the appearance of the decelerator 700 and accommodates a gearbox therein.

10 The decelerator housing may include a first housing 710 facing the motor 600, and a second housing 720 facing the drum 200.

[0285] Referring to (a) in FIG. 10, most of the gearbox inside the decelerator 700 may be accommodated in the first housing 710, and the second housing 720 may be provided to shield an interior of the decelerator 700. Accordingly, the length of the drum 200 may be further extended by reducing an overall thickness of the decelerator 700.

20 **[0286]** The second housing 720 may include a blocking body 722 provided to shield the first housing 710, a coupling body 721 extending along a circumference of the blocking body 722 and coupled to the first housing 710, and a shaft support 723 provided to support the rotation shaft 740 in the blocking body 722.

[0287] The blocking body 722 may be formed in a disk shape, and the coupling body 721 may extend toward a portion of the first housing 710 from the blocking body 722 while having a certain thickness.

30 **[0288]** In one example, the coupling body 721 may be disposed in the first housing 710 to couple the blocking body 722.

[0289] The shaft support 723 may prevent the rotation shaft 740 from being misaligned to maintain alignment between the rotation shaft 740 and the driving shaft 630.

35 **[0290]** A fastening portion 780 having a certain thickness to fix the decelerator 700 to the stator 610 or the mounting portion 429 may be installed on the coupling body 721.

40 **[0291]** The fastening portion 780 may protrude outward from the coupling body 721, and may be integrally formed with the coupling body 721. The fastening portion 780 may include at least one of a fastening protrusion 781 that may be coupled to the stator 610 and a coupling protrusion 782 that may be coupled to the mounting portion 429. The coupling protrusion 781 may include a plurality of coupling protrusions spaced apart from each other along an outer circumferential surface of the coupling body 721, and the plurality of coupling protrusions may be disposed to be spaced apart from each other at the same angle with respect to a shaft accommodating portion 713.

45 **[0292]** Referring to (b) in FIG. 10, the first housing 710 is formed in a multi-step shape to accommodate gears of various diameters. In general, the gearbox coupled to the decelerator 700 may include a sun gear, a planetary gear orbiting the sun gear, and a ring gear accommodating the planetary gear therein to induce the planetary

gear to rotate. The first housing 710 may include a ring gear housing 711 coupled to the second housing 720 and accommodating the ring gear therein, and a planetary gear housing 712 extending from the ring gear housing 711 to be away from the second housing 720 to accommodate one end of the planetary gear therein.

[0293] The planetary gear housing 712 may have a smaller diameter than the ring gear housing 711. However, a center of the planetary gear housing 712 and a center of the ring gear housing 711 may be designed to be disposed on the same axis S.

[0294] The driving shaft 630 rotatably coupled to the rotor 620 may be coupled to the planetary gear housing 712. The driving shaft 630 may be inserted into the first housing 710 and rotatably supported by the gearbox inside the first housing 710.

[0295] A washer 640 for rotatably supporting the rotor 620 may be seated on one surface of the planetary gear housing 712, and a washer protrusion 7121 to which the washer 640 is coupled and fixed may be installed. In addition, the planetary gear housing 712 may also include a washer coupling hole 7122 defined therein to which the washer 640 may be rotatably coupled.

[0296] The washer protrusion 7121 and the washer coupling hole 7122 may include a plurality of the washer protrusions and a plurality of washer coupling holes disposed to be spaced apart from each other at a certain angle with respect to the driving shaft 630, respectively.

[0297] The fastening protrusion 781 may have a larger cross-sectional area and a greater thickness than the coupling protrusion 782. Accordingly, a coupling force between the fastening protrusion 781 and the stator 610 may be strengthened, and the vibration transmitted from the stator 610 may be more easily tolerated.

[0298] The stator 610 may be seated on the fastening protrusion 781 and coupled to the fastening protrusion 781 with a separate fixing member. The fastening protrusion may have a fastening protrusion hole 7811 defined therein to which a fixing member fastened through the stator 610 may be fastened, and the fastening protrusion hole 7811 may have a thread formed therein that may be coupled to the fixing member.

[0299] FIG. 11 shows a structure in which the stator 610 is coupled to the decelerator 700.

[0300] The stator 610 may include a main body 611 fixed to the decelerator 600 and formed in a ring shape, a fixing rib 612 extending from an inner circumferential surface of the main body 611 and coupled to the fastening protrusion 781, teeth 614 extending from an outer circumferential surface of the main body 611 along a circumference of the main body 611 and to which coils are wound, a pole shoe 615 disposed at a free end of the tooth 614 to prevent the coil from deviating, and a terminal 616 that controls supply of current to the coil.

[0301] The main body 611 may have an accommodating space 613 therein, the fixing rib 612 may include a plurality of fixing ribs disposed inside the main body 611 and spaced apart from each other at a certain angle with

respect to the accommodating space 613, and a fixing rib hole 6121 into which a fixing member coupled to the fastening protrusion 781 is installed may be defined inwardly of the fixing rib 612.

[0302] Because the stator 610 is directly coupled to the decelerator 700, the decelerator 700 may be coupled to the stator 610 by being at least partially accommodated in the stator 610.

[0303] In particular, when the decelerator 700 is accommodated in the stator 610, a thickness of an entirety of the driver M may be reduced to further expand a volume of the drum 200. In addition, when the decelerator 700 is accommodated in the stator 610, the rotation shaft 740 of the decelerator 700 and the driving shaft 630 may be more precisely maintained coaxial with each other.

[0304] To this end, the decelerator 700 may have a diameter smaller than a diameter of the main body 611. That is, the largest diameter of the first housing 710 and the second housing 720 may be smaller than the diameter of the main body 611. Accordingly, at least a portion of the decelerator 700 may be accommodated and disposed in the main body 611. However, the fastening protrusion 781 may be extended to overlap the fixing rib 612 in the decelerator housing. Accordingly, the fastening protrusion 781 may be coupled to the fixing rib 612, and portions of the first housing 710 and the second housing 720 may be located inside the main body 611.

[0305] The fixing rib 612 may include a first fixing rib 612a directly coupled to the fastening protrusion 781, and a second fixing rib 612b that is not directly coupled to the fastening protrusion 781 but is able to support the fastening protrusion 781 or the first housing 710.

[0306] The coupling protrusion 782 may be disposed to be misaligned with the fastening protrusion 781 to prevent interference with the fastening protrusion 781.

[0307] FIG. 12 shows a structure in which the motor 600 is coupled to the decelerator 700.

[0308] The stator 610 is coupled to the decelerator 700. The stator 610 may be coupled to one surface of the decelerator 700, but may be coupled to the fastening protrusion 781 protruding outward from the housing of the decelerator 700, so that at least a portion of the decelerator housing may be accommodated inside the main body 611. Accordingly, a center of the main body 611, a center of the decelerator 700, and the rotation shaft 630 may always be coaxial with each other.

[0309] In one example, the rotor 620 may be disposed to accommodate the stator 610 while being spaced apart from the pole shoe 615 by a certain distance. Because the driving shaft 630 is fixed to the decelerator 700 accommodated in the main body 611, a gap G1 between the rotor 620 and the stator 610 may always be maintained.

[0310] Accordingly, the rotor 620 and the stator 610 may be prevented from colliding with each other or from rotating while being temporarily distorted in the stator 610, thereby preventing noise or unnecessary vibration from occurring.

[0311] In one example, all of a virtual first diameter line D1 passing through the center of the decelerator 700 and the center of the driving shaft 630, a virtual second diameter line D2 passing through the center of the main body 611, and a virtual third diameter line D3 passing through the center of the rotor 620 may be disposed at a rotation center of the driving shaft 630.

[0312] Accordingly, because the decelerator 700 itself becomes the rotation center of the driving shaft 630 and the stator 610 is directly fixed to the decelerator 700, the driving shaft 630 may be blocked from being misaligned with the decelerator 700. As a result, reliability of the decelerator 700 may be guaranteed.

[0313] FIG. 13 shows a structure in which the decelerator 700 is mounted on the rear case 420.

[0314] The motor 600 is coupled to and fixed to the decelerator 700, but the decelerator 700 is able to be fixed to a mounting portion 429 of the rear case 420.

[0315] In one example, as long as the motor 600 is able to be coupled to and fixed to the decelerator 700, in the laundry treating apparatus according to the present disclosure, the decelerator 700 may be supported by any component.

[0316] The decelerator 700 may be directly coupled to and fixed to the mounting portion 429, but the mounting portion 429 may have a small thickness because the mounting portion 429 is generally machined by press-molding the rear case 420. Therefore, when the decelerator 700 is directly coupled to the mounting portion 429, it may be difficult for the mounting portion 429 to fix the decelerator 700. In particular, when also the motor 600 is coupled to the decelerator 700, a load of the motor 600 is also transferred to the mounting portion 429. Therefore, the mounting portion 429 may be bent by the driver M, and durability of the mounting portion 429 may not be guaranteed.

[0317] Accordingly, the laundry treating apparatus according to the present disclosure may further include a bracket 800 capable of reinforcing rigidity of the mounting portion 429 and enhancing durability of an entirety of the rear case 420. The bracket 800 may have a thickness greater than that of the rear case 420, and may be made of a material having a greater rigidity than that the rear case 420.

[0318] The bracket 800 may be in surface contact with and coupled to the mounting portion 429 to reinforce rigidity of the mounting portion 429, and may be coupled to the decelerator 700 to fix the decelerator 700 to the mounting portion 429.

[0319] The decelerator 700 may also be coupled to the bracket 800 while coupled to the mounting portion 429, and may be coupled only to the bracket 800 to be fixed to the mounting portion 429.

[0320] The bracket 800 may include a main bracket 810 coupled to the mounting portion 429 and also coupled to the decelerator housing. The main bracket 810 may be provided to support the decelerator 700 while being seated on and fixed to the mounting surface 4292.

[0321] The main bracket 810 may include a plurality of installation ribs 814 that may be directly coupled to the decelerator 700, and the installation rib 814 may include an installation rib hole 8144 such that a fixing member fastened to the decelerator 700 may be coupled thereto.

[0322] The main bracket 810 may include a fixing protrusion 8111 provided to be engaged with a fastening portion 4293 installed in the mounting surface 4292. The fastening portion 4293 is recessed in the mounting surface 4292, and the fixing protrusion 8111 is inserted into the fastening portion 4293, so that the main bracket 810 may be prevented from rotating in the mounting portion 429 or from changing in an installation position by the vibration or the like.

[0323] The decelerator 700 may be coupled to the main bracket 810 and may be spaced apart from the mounting portion 429 to block noise and vibration that may occur when the mounting portion 429 and the decelerator 700 collide.

[0324] However, because the gearbox inside the decelerator 700 rotates while the decelerator 700 receives power from the motor 600, significant vibration may occur. Moreover, the decelerator 700 may receive vibration from the drum 200 as well. Accordingly, it may be necessary to improve a coupling force between the main bracket 810 and the decelerator 700.

[0325] To this end, the bracket 800 may further include an auxiliary bracket 820 coupled to both the main bracket 810 and the decelerator 700 to fix the decelerator 700 to the main bracket 810.

[0326] The main bracket 810 and the auxiliary bracket 820 may be coupled to each other to surround the decelerator 700. The main bracket 810 may be coupled to one surface of the decelerator 700, and the auxiliary bracket 820 may be coupled to the other surface of the decelerator 700 to fix both surfaces of the decelerator 700.

[0327] For example, the main bracket 810 may be coupled to one side of the coupling protrusion 782, and the auxiliary bracket 820 may be coupled to the other side of the coupling protrusion 782 to fix the decelerator 700.

[0328] The auxiliary bracket 820 may be coupled to the mounting portion 429 or may be coupled to and fixed to the main bracket 810. Because the main bracket 810 has greater rigidity than the mounting portion 429, it may be stable for the auxiliary bracket 820 to be coupled to the main bracket 810.

[0329] FIG. 14 shows an embodiment of a structure in which the bracket 800 and the decelerator 700 are coupled to each other.

[0330] Referring to (a) in FIG. 14, at least one of an area, a size, and a thickness of the coupling protrusion 782 may be smaller than that of the fastening protrusion 781, but the number of coupling protrusions 782 may be greater than the number of fastening protrusions 781.

[0331] The coupling protrusion 782 may be staggered from the fastening protrusion 781. In addition, the coupling protrusion 782 may be disposed in parallel with the

fastening protrusion 781 or may have a height different from that the fastening protrusion 781.

[0332] The coupling protrusion 782 may be formed in a plate shape to be supported by the bracket 800 or to be in surface-contact with the bracket 800, and may have a coupling protrusion hole 7821 to which a fastening member that may be fastened to the bracket 800 may be coupled.

[0333] Referring to (b) in FIG. 14, the main bracket 810 may include a main body 811 that is formed in a ring shape and is able to be mounted on the mounting surface 4292. The main body 811 may have a diameter corresponding to that of the mounting surface 4292 so as to be in surface-contact with the mounting surface 4292.

[0334] The fixing protrusion 8111 may include a plurality of fixing protrusions disposed along a circumference of the main body 811, and the fixing protrusions may be disposed to be spaced apart from each other at the same angle with respect to a center of the main body 811. The fixing protrusion 8111 may be supported by being seated on a fastening portion 4293 defined in the mounting surface 4292.

[0335] In one example, the main body 811 may be fixed to the mounting surface 4292 through the fastening member. In this connection, a fastening hole to which the fastening member is coupled may be defined through the main body 811.

[0336] However, because the fixing protrusion 8111 is bent or depressed into the main body 811, the fixing protrusion 8111 may have stronger an impact or vibration absorbing force than the main body 811. Accordingly, the fastening hole may be defined in the fixing protrusion 8111, and the fastening member may pass through the fixing protrusion 8111 to be coupled to the mounting surface 4292.

[0337] A seating body 912 formed in a disk shape may be disposed on an inner circumferential surface of the main body 811. The seating body 912 may have a diameter smaller than the diameter of the mounting surface 4242, and may be a region that does not contact the mounting surface 4242.

[0338] When a purpose of the main body 811 is to be fixedly coupled to the mounting portion 429, a purpose of the seating body 912 may be to be extended from the inner circumferential surface of the main body 811 to support a load of the decelerator 700.

[0339] The seating body 912 may be bent on and extended from the inner circumferential surface of the main body 811 to strengthen the rigidity of the main bracket 810, and effectively support the load of the decelerator 700.

[0340] The decelerator 700 may be directly coupled to the seating body 912. That is, the coupling protrusion 782 of the decelerator may be seated on and coupled to the seating body 912.

[0341] However, when the seating body 912 has a relatively large diameter, the installation rib 814 protruding inward may be disposed on an inner circumferential sur-

face of the seating body 912.

[0342] The installation rib 814 may have a larger area than the coupling protrusion 782, and a width of the installation rib 814 corresponding to a circumferential direction may be larger than a length of the installation rib 814 protruding from the seating body 912. Accordingly, the installation rib 814 may stably support the load of the decelerator 700. The number of installation ribs 814 may correspond to the number of coupling protrusions 782, and the installation rib 814 may have an installation rib hole 8143 defined therein to face the coupling protrusion hole 7821.

[0343] The installation rib 814 may extend in parallel with the seating body 912, but may protrude and extend axially from one surface of the seating body 912. The installation rib 814 may protrude from the seating body 912 in a direction toward the decelerator 700.

[0344] Accordingly, it is possible to prevent the decelerator 700 from excessively protruding out of the bracket 800. In addition, when the main bracket 810 is fastened with the auxiliary bracket 820, the coupling body 782 seated on the installation ribs 814 may be induced to be in a more close contact with or accommodated in the auxiliary bracket 820.

[0345] Referring to (c) in FIG. 14, the auxiliary bracket 820 may include an auxiliary body 821 that is formed in a ring shape and is able to be seated on the seating body 812, and a shielding body 822 extending inward from the auxiliary body 821.

[0346] The auxiliary body 821 may be seated on the seating body 812 without contacting the main body 811. To this end, the auxiliary body 821 may be manufactured to have a diameter corresponding to that of the seating body 812. Accordingly, even when the main bracket 810 and the auxiliary bracket 820 are coupled to each other with the mounting portion 429 therebetween, the auxiliary bracket 820 may be prevented from interfering with the mounting portion 429.

[0347] The auxiliary body 821 may be supported in direct contact with the seating body 812, and may be coupled to the seating body 812 by a separate fastening member. That is, the seating body 812 may have a seating body hole 8121 defined therein through which the fastening member passes to be coupled to the seating body 812, and the auxiliary body 821 may have an auxiliary body hole 8211 defined therein at a position corresponding to a position of the seating body hole 8121.

[0348] The shielding body 822 may be provided to shield the installation ribs 814. That is, the shielding body 822 may extend inwardly of the seating body 812 to have a thickness that may shield all of the installation ribs 814. The shielding body 822 may be provided to shield the coupling body 782 of the decelerator seated on the installation rib 814 and to shield one surface of the coupling body 782 at the same time.

[0349] The shielding body 822 may be provided to be in close contact with the installation ribs 814 and the coupling bodies 782 when the auxiliary body 821 is coupled

to the seating body 812. That is, the coupling body 782 may be disposed between the shielding body 822 and the installation rib 814, and the coupling body 782 may be fixed to and supported by the shielding body 822 and the installation rib 814.

[0350] In one example, the shielding body 822 may include a rib accommodating groove 8221 having an area corresponding to an area of the installation rib 814 and recessed to accommodate the installation rib 814 therein.

[0351] The number of rib accommodating grooves 8221 may correspond to the number of installation ribs 814, and the rib accommodating groove 8221 may be installed at a position corresponding to the position of the installation rib 814. The rib accommodating groove 8221 may be provided to accommodate an entirety of the installation rib 814, and may be provided to press one surface of the installation rib 814.

[0352] When the auxiliary bracket 820 is coupled to the main bracket 810, the installation rib 814 and the coupling protrusion 782 may be inserted into and fixed in the rib accommodating groove 8221.

[0353] The coupling protrusion 782 may be fixed by being in close contact with or pressed against the installation rib 814 and the rib accommodating groove 8221.

[0354] Therefore, the auxiliary bracket 820 may be prevented from being distorted on the main bracket 810, and the decelerator 700 may be stably fixed as the coupling protrusion 782 is also fixed to the rib accommodating groove 8221 and the installation rib 814.

[0355] The shielding body 822 may further include a deceleration avoidance hole 8222 that is prevented from overlapping with the fastening protrusion 781 and is able to expose the fastening protrusion 781. The fastening protrusion 781 may be exposed through the deceleration avoidance hole 8222, so that the stator 610 may be stably coupled to the fastening protrusion 781.

[0356] In addition, the shielding body 822 may further include an electric wire avoidance groove 8223 defined therein to allow the electric wire connected to the terminal 816 to pass therethrough.

[0357] In one example, the shielding body 822 may be provided to shield a portion of a surface of a first housing 710 of the decelerator 700. Accordingly, it is possible to prevent the decelerator 700 from deviating out of the bracket 800 even in case of the vibration or the impact.

[0358] The auxiliary bracket 820 may further include a support hole 824 defined therein into which a washer protrusion 7121 protruding from the first housing 710 of the decelerator 700 may be inserted, and may include a protrusion fastening hole 825 defined therein into which a penetrating protrusion 8141 that may protrude from the installation rib 814 and may be inserted into the auxiliary bracket 820 may be inserted.

[0359] FIG. 15 shows an aspect in which the bracket 800 is coupled to the decelerator 700.

[0360] Referring to (a) in FIG. 15, the main bracket 810 may be first coupled to the decelerator 700 to fix the decelerator 700. The coupling protrusion 782 extending

from the decelerator housing may be seated on installation rib 814 of the main bracket 810. The coupling protrusion 782 and the installation rib 814 may be coupled to each other through the fastening member.

5 [0361] In this connection, the fastening protrusion 781 may be disposed to avoid the installation rib 814, and may be exposed inside the main bracket 810.

[0362] Referring to (b) in FIG. 15, when the decelerator 700 is seated on the main bracket 810, the auxiliary bracket 820 may be coupled to the main bracket 810.

10 [0363] The auxiliary body 821 may be coupled to the seating body 812, and the shielding body 822 may shield the decelerator 700 and an internal space of the seating body 812.

15 [0364] The rib accommodating groove 824 in the shielding body 822 may accommodate therein the installation rib 814 on which the coupling rib 782 is seated. The coupling rib 782 may be disposed and supported between the rib accommodating groove 824 and the installation ribs 814. As a result, the coupling rib 782 may be prevented from being arbitrarily removed from the installation rib 814.

20 [0365] The shielding body 822 may be provided such that the fastening protrusion 781 is exposed to the outside because of the deceleration avoidance hole 8222. Accordingly, even when the bracket 800 fixes the decelerator 700, the coupling between the motor 600 and the decelerator 700 may not be prevented.

25 [0366] The decelerator 700 may be sufficiently fixed by being coupled to the main bracket 810. The auxiliary bracket 820 may strengthen the coupling force between the main bracket 810 and the decelerator 700 and prevent the decelerator 700 from being arbitrarily removed from the main bracket 810.

30 [0367] The decelerator 700 is fixed to the main bracket 810 and the auxiliary bracket 820, so that the decelerator 700 may be stably fixed to the mounting portion 429 without a separate component fixed to the mounting portion 429.

35 [0368] In addition, the decelerator 700 may be fixed and supported on the bracket 800 to be coupled to the mounting portion 429 without being directly coupled to the mounting portion 429. Accordingly, even when the decelerator 700 is coupled to the motor 600, the decelerator 700 may be stably fixed to the mounting portion 429.

40 [0369] FIG. 16 shows an aspect in which the bracket 800 is coupled to the rear case 420.

[0370] Referring to (a) in FIG. 16, the main bracket 810 may be coupled to the mounting portion 429 from a region in front of the rear case 420.

[0371] When the drum 200 rotates while the laundry is accommodated therein, the drum 200 may apply a pushing force toward the decelerator 700. In particular, the drum 200 may be designed to be prevented from being pressed or moved toward the front case 410 such that the door is not opened by the laundry.

45 [0372] In this connection, the main body 811 may be

coupled to a surface that does not face the motor 600 of the mounting surface 4292 such that the decelerator 700 does not escape rearwardly of the rear case 420. Accordingly, the main bracket 810 may fix the decelerator 700 to prevent the decelerator from being pushed toward the motor 600.

[0373] The main bracket 810 may be disposed to face the drum rear surface 220, and may be coupled to a front portion of the mounting portion 429. The mounting portion 429 may protrude from the rear case 420 toward the drum 200. Accordingly, in the main bracket 810, the main body 811 may be coupled to and fixed to one surface of the mounting surface 4292 protruding toward the drum 200 of the mounting portion 429.

[0374] The fixing protrusion 8111 protruding from the main body 811 may be accommodated in the fastening portion 4293 defined in the mounting surface 4292. In one example, the fastening portion 4293 may be provided to be accommodated on a side opposite to the fixing protrusion 8111. Because the fixing protrusion 8111 is pressed from the main body 811, the fastening portion 4293 on the opposite side may be defined as an accommodating groove.

[0375] Accordingly, the fastening portion 4293 may protrude from the mounting surface 4292 toward the drum 200, or may protrude away from the drum 200. The fixing protrusion 8111 may protrude in the same direction as the protruding direction of the fastening portion 4293 so as to be seated on the fastening portion 4293.

[0376] Because the main body 811 is in surface-contacted with and coupled to the mounting surface 4292, an effect of increasing a thickness of the mounting surface 4292 may be derived. In addition, because the main body 811 prevents the mounting surface 4292 from being bent, an effect of strengthening the rigidity of the mounting surface 4292 may be derived.

[0377] When the auxiliary bracket 820 is mounted on the main bracket 810, the shielding body 822 of the auxiliary bracket 820 may be exposed when the rear case 420 is viewed from the front.

[0378] Referring to (b) in FIG. 16, the auxiliary bracket 820 may be coupled to a region exposed to the mounting portion 429 of the main bracket 810 from a region at the rear of the rear case 420 to fix the decelerator 700. Because the main body 811 is coupled to the mounting surface 4292 of the rear case 420, only the seating body 812 may be exposed to the mounting portion 429.

[0379] Accordingly, the auxiliary bracket 820 may be coupled to the seating body 812 to fix the decelerator 700.

[0380] As a result, the main bracket 810 may be coupled to a front portion of the rear case 420, and the auxiliary bracket 820 may be coupled to the main bracket 810 from the region at the rear of the rear case 420.

[0381] As a result, the auxiliary bracket 820 may have a smaller diameter than the mounting surface 4292 to intensively support the coupling of the decelerator 700 to the main bracket 810.

[0382] FIG. 17 shows a structure in which the decel-

erator 700 is coupled to the rear case 420 and supported.

[0383] The main body 811 of the main bracket 810 may be coupled to a front surface of the mounting surface 4292, and the seating body 812 may form a step to the main body 811, or may have a groove in which a portion extending from the main body 811 is bent by a certain amount to enhance the overall rigidity of the main bracket 810.

[0384] The installation rib 814 may include an extension surface 8141 obliquely extending rearward of the rear case 420 from the seating body 812, and a support surface 8142 extending from the extension surface 8141 in a direction parallel to the rear plate 411 to support the coupling rib 782.

[0385] The support surface 8142 may have a fixing hole 8413 defined therein into which the fastening member may be coupled.

[0386] The installation rib 814 may further include a penetrating protrusion 8144 that extends from the support surface 8142 toward the auxiliary bracket 820.

[0387] In the decelerator 700, the coupling protrusion 782 extending from the decelerator housing 710 may be seated on and coupled to the support surface 8142.

[0388] In the auxiliary bracket 800, the auxiliary body 821 may be in contact with and coupled to the seating body 812. In addition, the shielding body 822 may include an inclined surface 824 that is recessed along an inclination of the extension surface 8141 in the installation rib. The inclined surface 824 may extend obliquely to the rib accommodating groove 8221 that accommodates the installation rib 814 therein.

[0389] The shielding body 822 has the protrusion fastening hole 825 defined therein into which the penetrating protrusion 8144 is inserted and fixed. The protrusion fastening hole 825 may be supported as the penetrating protrusion 8144 passes therethrough. Because of the penetrating protrusion 8144 and the protrusion fastening hole 825, a position at which the auxiliary bracket 820 and the main bracket 810 are coupled to each other may be easily determined. The penetrating protrusion 8144 may be provided to pass through the coupling body 782.

[0390] In one example, the mounting portion 429 may include the mounting groove 4294 that is recessed forward from the drum accommodating groove 423, and the mounting surface 4292 may extend inwardly of the mounting groove 4294.

[0391] In this connection, because the main bracket 810 and the auxiliary bracket 820 are fixed to the mounting surface 4292, at least a portion of the first housing 710 of the decelerator may be disposed to be accommodated in the mounting groove 4294.

[0392] For example, the gearbox 730 accommodated in the first housing 710 and the second housing 720 may be disposed inwardly of the mounting groove 4294.

[0393] As a result, a volume occupied by the rear case 420 and the decelerator 700 may be minimized.

[0394] FIG. 18 shows an embodiment of a driver M of a laundry treating apparatus according to the present dis-

closure.

[0395] The bracket 800 is coupled to the rear case 420, so that the decelerator 700 is coupled to and supported by the bracket 800. The motor 600 may be disposed at the rear of the rear case 420 together with the decelerator 700, and the drum rear surface 220 may be disposed in front of the rear case 420 and the decelerator 700.

[0396] The stator 610 of the motor 600 is disposed to be spaced apart from the rear case 420, and the terminal 616 supplying the current to the stator 610 is able to be disposed proximate to the rear case 420 or is able to be in contact with the rear case 420, but is not coupled to and fixed to the rear case 420.

[0397] The rotor 620 may include a permanent magnet 623 facing the stator 610, an installation body 622 to which the permanent magnet 623 is coupled, wherein the installation body 622 is disposed to be spaced apart from the outer circumferential surface of the stator 610, and a rotor body 621 extending from the installation body 622 and rotating while facing the stator 610. The rotor body 621 may be formed in a disk shape having a diameter larger than a diameter of the stator 610, and the installation body 622 may be provided such that the outer circumferential surface of the stator 610 is accommodated in the outer circumferential surface of the rotor body 621. The rotor body 621 may have the driving shaft 630 coupled to a center thereof, and a plurality of inlet holes that pass through a region between the driving shaft 630 and the installation body 622 to allow the air to be injected into the stator 610 may be defined.

[0398] The driving shaft 630 may be coupled to a stud 631 coupled to the center of the rotor body 621 and extend into the decelerator 700.

[0399] The washer 640 provided to rotatably support an inner surface of the rotor body 621 may be coupled to the driving shaft 630. The washer 640 may include a coupling washer 642 coupled to the driving shaft 630, and a support washer 641 for supporting the rotor body 620 from the coupling washer 642.

[0400] Because of the washer 640, the rotor 620 and the driving shaft 630 may be prevented from being distorted while rotating.

[0401] In one example, the washer 640 may not be coupled to the rotor 620, but may be coupled to the decelerator 700 to rotatably support the rotor 620.

[0402] The first housing 710 of the decelerator 700 may be disposed to face the rotor body 620, and the second housing 720 may be coupled to the first housing 710 to face the drum rear surface 220.

[0403] A gearbox 730 may be disposed inside the first housing 710 and the second housing 720. The gearbox 730 may include a sun gear 731 disposed at the free end of the driving shaft 630 or coupled to the free end of the driving shaft 630, at least one planetary gear 732 provided to rotate in engagement with the sun gear 731, a ring gear 733 coupled to an outer circumferential surface of the planetary gear 732 to induce rotation of the planetary gear 732, and a carrier 734 that rotatably supports the

plurality of planetary gears 732.

[0404] The planetary gear 732 may be disposed along a circumference of the sun gear 731. Each planetary gear 732 may include a first planetary body 7321 rotating in engagement with the sun gear 731 and the ring gear 733, a second planetary body 7322 that may have a smaller diameter than the first planetary body 7321, and a gear shaft 7323 that supports the first planetary body 7321 and the second planetary body 7322 rotatable to the carrier 734.

[0405] When the sun gear 731 rotates, the planetary gear 732 rotates to rotate the gear shaft 7323, thereby rotating the carrier 734.

[0406] The carrier 734 may include a first carrier 7341 coupled to one end of the gear shaft 7323 and a second carrier 7342 coupled to the other end of the gear shaft 7323.

[0407] The first carrier 7341 and the second carrier 7342 may be formed in a ring shape or a disk shape.

[0408] In one example, the rotation shaft 740 may extend from a rotation center of the second carrier 7342. The rotation shaft 740 may be formed integrally with the second carrier 7342 or may be coupled to the second carrier 7342 and extend.

[0409] The first housing 710 may include a ring gear housing 711 provided to fix an outer circumferential surface of the first planetary body 732 or an outer circumferential surface of the ring gear 733, a planetary gear housing 712 extending from the ring gear housing 711 to rotatably accommodate the second planetary body 732 and the first carrier 7341, and a shaft accommodating portion 713 extending from the planetary gear housing 712 to rotatably support the driving shaft 630.

[0410] The ring gear housing 711 may form a side surface of the first housing 710, and the planetary gear housing 712 may form at least a portion of the side surface and a surface facing the rotor 620 of the first housing 710. The shaft accommodating portion 713 may be formed in a shape of a pipe extending inwardly of the planetary gear housing 712. The shaft accommodating portion 713 may be disposed in a space defined as the second planetary body 732 has a smaller diameter than that of the first planetary body 731. A driving bearing 770 for rotatably supporting the driving shaft 630 may be included on an inner circumferential surface of the shaft accommodating portion 713. The driving bearing 770 may include a plurality of the driving bearings disposed to be spaced apart from each other along a longitudinal direction of the driving shaft 630.

[0411] Accordingly, the driving bearing 770 and the shaft accommodating portion 713 do not protrude outside the decelerator 700, but are disposed inside the decelerator 700 to reduce a length of a space in which the driving shaft 630 is disposed. That is, a volume of the decelerator 700 itself may be reduced, and a distance between the decelerator 700 and the motor 600 may also be reduced.

[0412] Accordingly, the overall thickness of the driver

M may be reduced, and the driving shaft 630 may be prevented from being distorted by coupling the stator 610 closer to the decelerator 700.

[0413] In addition, as the driving bearing 770 and the shaft accommodating portion 713 are disposed inside the decelerator 700, the driving shaft 630 becomes closer to the decelerator 700, so that the decelerator 700 may be accommodated and disposed inside the stator 610. As a result, at least a portion of the decelerator 700 may be disposed by utilizing the space of the motor 600.

[0414] As a result, the length of the drum 200 disposed between the rear case 420 and the front case 410 may be further extended, and the volume of the drum 200 may be enlarged.

[0415] In one example, the second housing 720 may include the coupling body 721 coupled to the ring gear housing 711, the blocking body 722 provided to shield the gearbox 730 from the coupling body 721, and the shaft support 723 extending from the blocking body 722 to rotatably support the rotation shaft 740. The shaft support 723 may be formed in a pipe shape extending from the blocking body 722, and a shaft bearing 760 for rotatably supporting the rotation shaft 740 may be installed inside the shaft support 723.

[0416] The shaft bearing 760 may include a plurality of shaft bearings spaced apart from each other at a certain distance along a longitudinal direction of the rotation shaft 740.

[0417] The free end of the rotation shaft 740 may be inserted into and coupled to the drum rear surface 220. In this connection, the rotation shaft 740 and the drum rear surface 220 may be disposed as close to each other as possible. At least one of the shaft bearings 760 may be disposed frontward of the drum rear surface 220.

[0418] When the driving shaft 630 is rotated by the rotor 620, the sun gear 731 rotates, and the planetary gear 732 rotates in engagement with the sun gear 731. The first planetary body 7321 rotates in engagement with the ring gear 733, but, because the ring gear 733 is fixed, the first planetary body 7321 rotates along a circumference of the sun gear 731 by reaction.

[0419] The planetary gear 732 rotates the gear shaft 7323, and consequently rotates the carrier 734. When the carrier 734 rotates, a rotation shaft 740 extending from the second carrier 734 rotates.

[0420] In this connection, because the planetary gear 732 is engaged with the sun gear 731, even when the planetary gear 732 rotates in an opposite direction in engagement with the sun gear 732, the carrier 734 rotates in the same direction as the sun gear 731 by a reaction as the planetary gear 732 rotates with respect to the ring gear 733, and consequently, the rotation shaft 740 rotates in the same direction as the sun gear 731.

[0421] In one example, because a diameter of the outer circumferential surface of the planetary gear 732 and a diameter of the carrier 734 are larger than a diameter of the sun gear 731, the rotation shaft 740 rotates at a smaller rpm than the sun gear 731. Accordingly, the rotation

shaft 740 rotates at a smaller rpm than the driving shaft 630. However, because energy is not wasted other than friction loss, the power transmitted to the driving shaft 630 may be transmitted to the rotation shaft 740. Accordingly, as the rpm of the rotation shaft 740 is reduced, the torque, which is the rotational force, may be amplified.

[0422] Because the decelerator 700 converts power corresponding to a low torque and a high rpm generated by the motor 600 into power corresponding to a high torque and a low rpm, it may be defined that the decelerator 700 converts the power of the motor 600 and transmits the converted power to the drum 200.

[0423] In one example, a direction a, which is an axial direction of the driving shaft 630, and a direction b, which is an axial direction of the rotation shaft 740, may be coaxial with each other. In this connection, because the driving shaft 630 is supported inside the decelerator 700, and the stator 610 is also fixedly coupled to the decelerator 700, the direction a formed by the driving shaft 630 with the decelerator 700 may be almost always maintained.

[0424] In this connection, because the gearbox 730 is fixed inside the decelerator 700 in a gear coupling scheme, and the rotation shaft 740 is also fixed by the decelerator housing 720 and the bearing 770 in the gearbox 730, the direction b in which the rotation shaft 740 extends from the decelerator 700 may almost always be maintained.

[0425] Accordingly, because the direction a and the direction b are coaxial with each other, the rotation shaft 740 and the driving shaft 630 may almost always remain coaxial with each other.

[0426] The rotation shaft 740 and the driving shaft 630 may tilt together with the decelerator housing or vibrate simultaneously with the decelerator housing.

Claims

1. A laundry treating apparatus comprising:

a drum (200) having a laundry inlet (211) defined in a front surface thereof and accommodating laundry therein;

a hot air supplier (900) disposed outside the drum (200) to supply hot air into the drum (200);
a motor (600) disposed at the rear of the drum (200) to provide power to rotate the drum (200);
and

a decelerator (700) disposed between the motor (600) and the drum (200) to convert the power to rotate the drum,
wherein the motor (600) is coupled or fixed to the decelerator (700).

2. The laundry treating apparatus of claim 1, wherein the motor (600) includes:

- a stator (610) disposed at the rear of the drum (200) and generating a rotating magnetic field; a rotor (620) rotated by the rotating magnetic field; and
a driving shaft (630) coupled to the rotor (620) and inserted into the decelerator (700) to rotate, wherein the stator (610) is coupled to the decelerator (700) such that a position of the driving shaft (630) disposed in the decelerator (700) is fixed.
3. The laundry treating apparatus of claim 2, wherein the stator (610) is coupled to the decelerator (700) to be fixed, and the position of the driving shaft (630) disposed in the decelerator (700) is fixed, so that a distance between the stator (610) and the rotor (620) is maintained.
4. The laundry treating apparatus of claim 2 or 3, wherein the decelerator (700) includes:
- a decelerator housing (710, 720) for accommodating the driving shaft (630) therein and rotatably supporting the driving shaft (630);
a gearbox (730) disposed inside the decelerator housing (710, 720) and engaged with the driving shaft (630) to change an RPM of the driving shaft (630); and
a rotation shaft (740) extending from the gearbox (730) outwardly of the decelerator housing (710, 720) to be coupled to the drum (200), wherein the stator (610) is coupled to and fixed to the decelerator housing (710, 720).
5. The laundry treating apparatus of claim 4, wherein the decelerator housing (710, 720) supports the rotation shaft (740) to maintain alignment of the rotation shaft (740) and the driving shaft (630).
6. The laundry treating apparatus of claim 4 or 5, wherein the decelerator housing (710, 720) includes a shaft support (723) extending in a longitudinal direction of the rotation shaft (740) to rotatably support the rotation shaft (740) such that distortion of the rotation shaft (740) is prevented.
7. The laundry treating apparatus of any one of the preceding claims, wherein the motor (600) includes:
- a stator (610) coupled to the decelerator (700) and generating a rotating magnetic field;
a rotor (620) rotated by the rotating magnetic field; and
a driving shaft (630) coupled to the rotor (620) and inserted into the decelerator (700) to rotate, wherein the stator (610) and the driving shaft (630) tilt together with the decelerator (700) or vibrate together with the decelerator (700).
8. The laundry treating apparatus of any one of the preceding claims, wherein the decelerator (700) includes:
- a decelerator housing (710, 720) for accommodating the driving shaft (630) therein and rotatably supporting the driving shaft (630);
a gearbox (730) disposed inside the decelerator housing (710, 720) and engaged with the driving shaft (630) to change an RPM of the driving shaft (630); and
a rotation shaft (740) extending from the gearbox (730) outwardly of the decelerator housing (710, 720) to be coupled to the drum (200), wherein the rotation shaft (740) and the driving shaft (630) tilt together with the decelerator housing (710, 720) or vibrate together with the decelerator housing (710, 720).
9. The laundry treating apparatus of any one of the preceding claims, wherein the motor (600) includes:
- a stator (610) coupled to the decelerator (700) and generating a rotating magnetic field;
a rotor (620) rotated by the rotating magnetic field; and
a driving shaft (630) coupled to the rotor (620) and inserted into the decelerator (700) to rotate, wherein the stator (610) is coupled to the decelerator (700) by accommodating at least a portion of the decelerator (700) therein.
10. The laundry treating apparatus of any one of the preceding claims, wherein at least a portion of the driving shaft (630) is disposed inside the stator (610).
11. The laundry treating apparatus of any one of the preceding claims, wherein a portion of the decelerator (700) is disposed inside the rotor (620).
12. The laundry treating apparatus of any one of the preceding claims, wherein the decelerator (700) includes at least one fastening protrusion (781) coupled to an inner circumferential surface of the stator (610).
13. The laundry treating apparatus of any one of the preceding claims, wherein the motor (600) and the drum (200) are coupled to the decelerator (700), so that at least two of the motor (600), the drum (200), and the decelerator (700) tilt in parallel with each other or vibrate together.
14. The laundry treating apparatus of any one of the preceding claims, further comprising a rear case (420) disposed between the drum (200) and the motor (600) to support the decelerator (700).

wherein the drum (200) and the motor (600) are provided to transmit at least a portion of a load to the rear case (420) via the decelerator, wherein the motor (600), the decelerator (700), and the drum (200) are provided to simultaneously tilt or vibrate with respect to the rear case, and
wherein the drum (200) and the motor (600) are disposed to be spaced apart from the rear case (420).

15. The laundry treating apparatus of any one of the preceding claims, wherein the decelerator (700) further includes a rotation shaft (740) coupled to the drum (200), and
wherein the drum (200) is provided to vibrate or tilt independently with respect to the rotation shaft (740).

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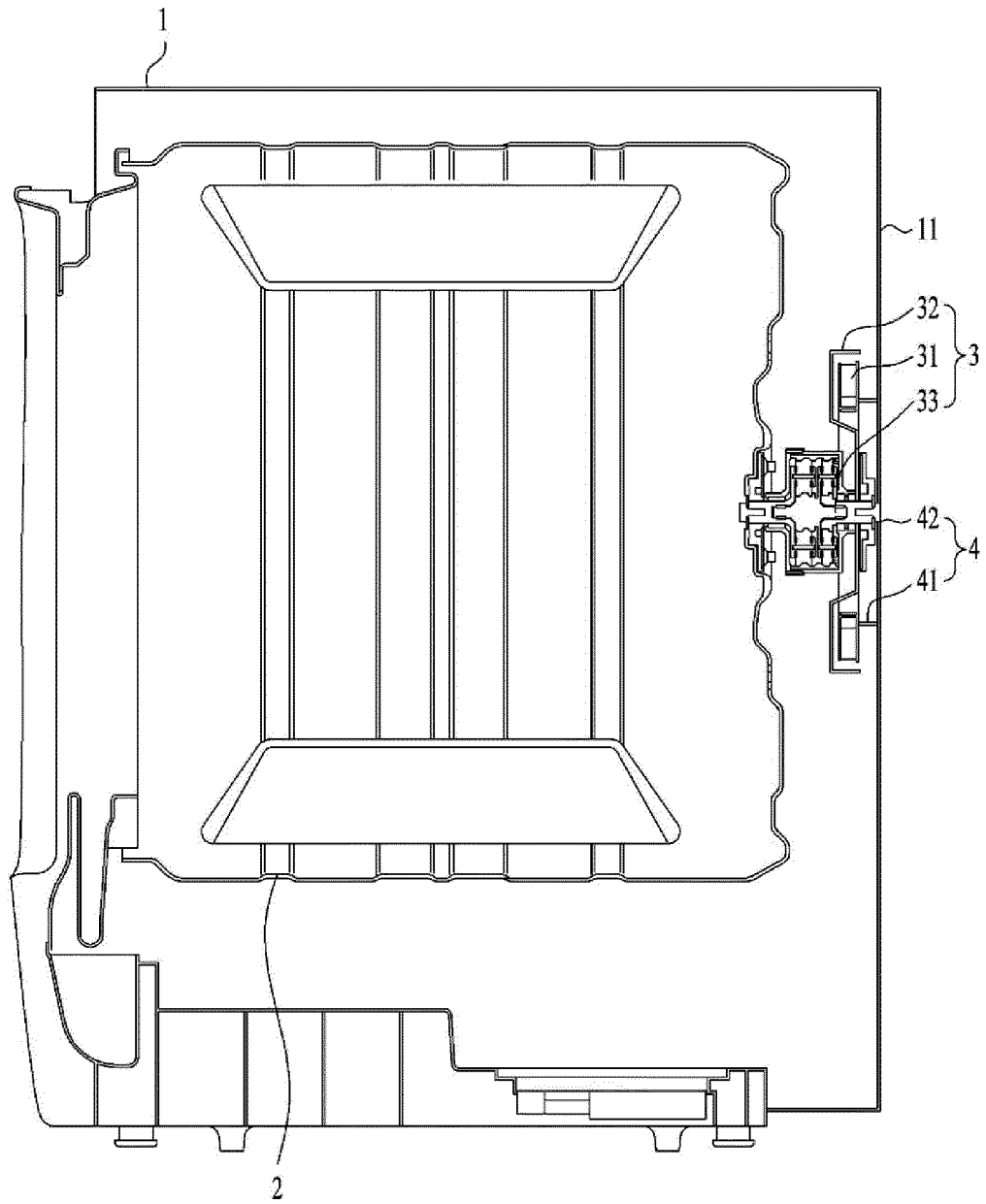
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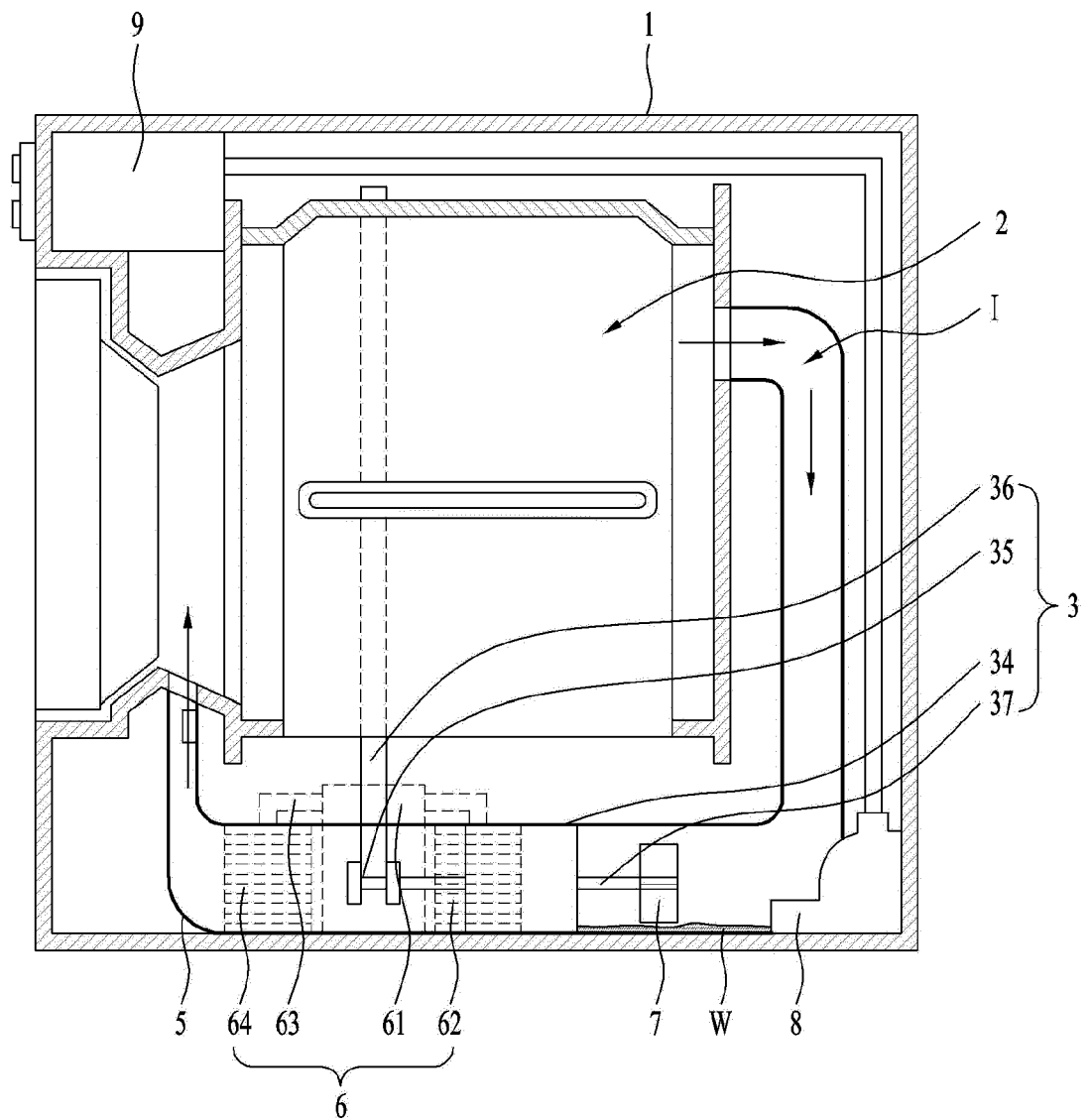
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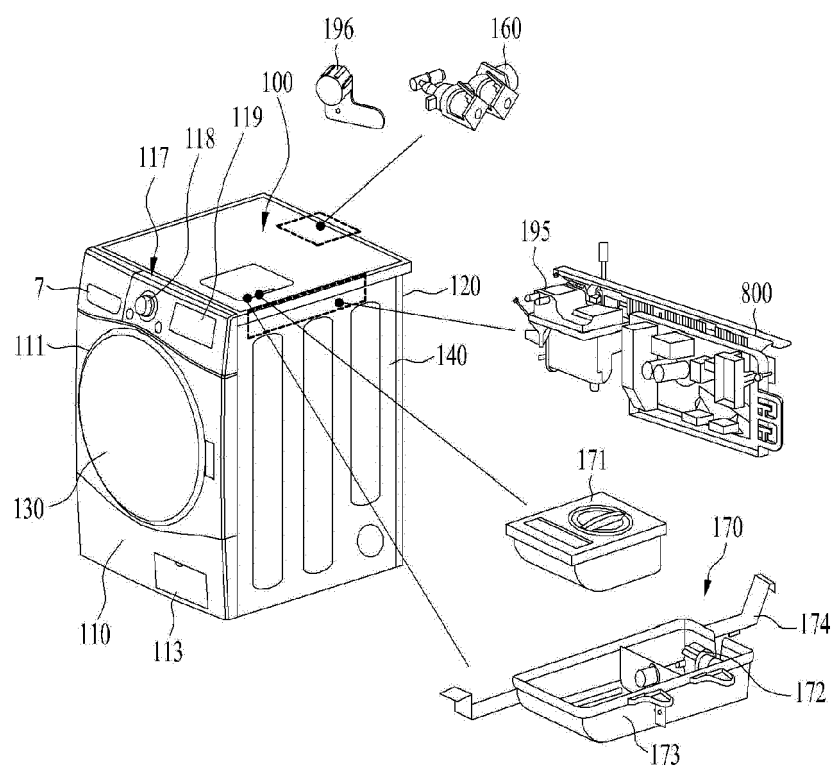
【FIG 1】



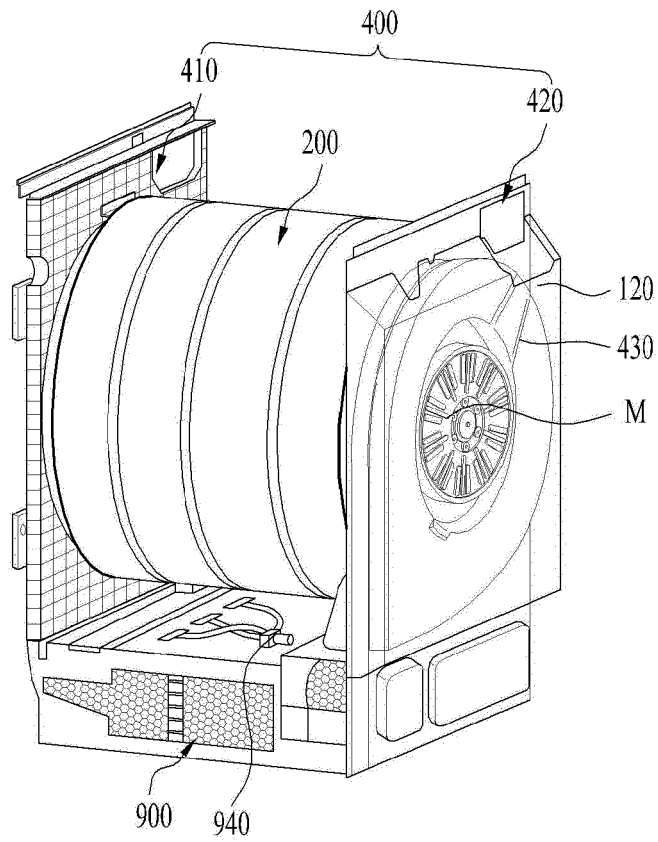
【FIG 2】



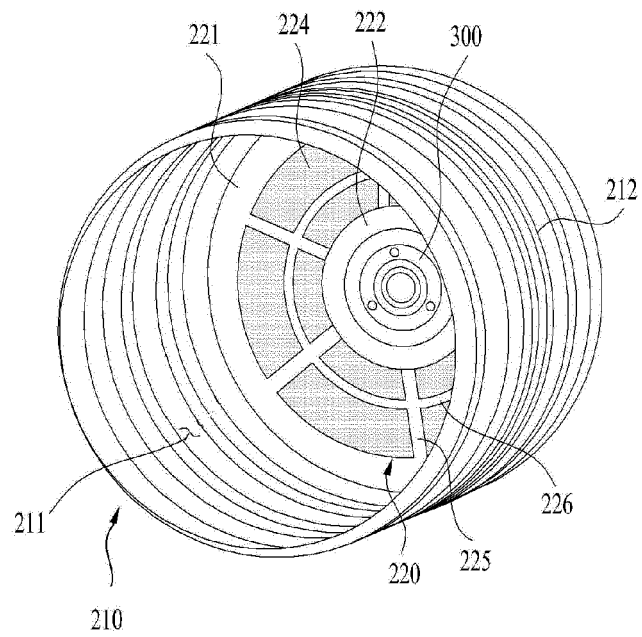
【FIG 3】



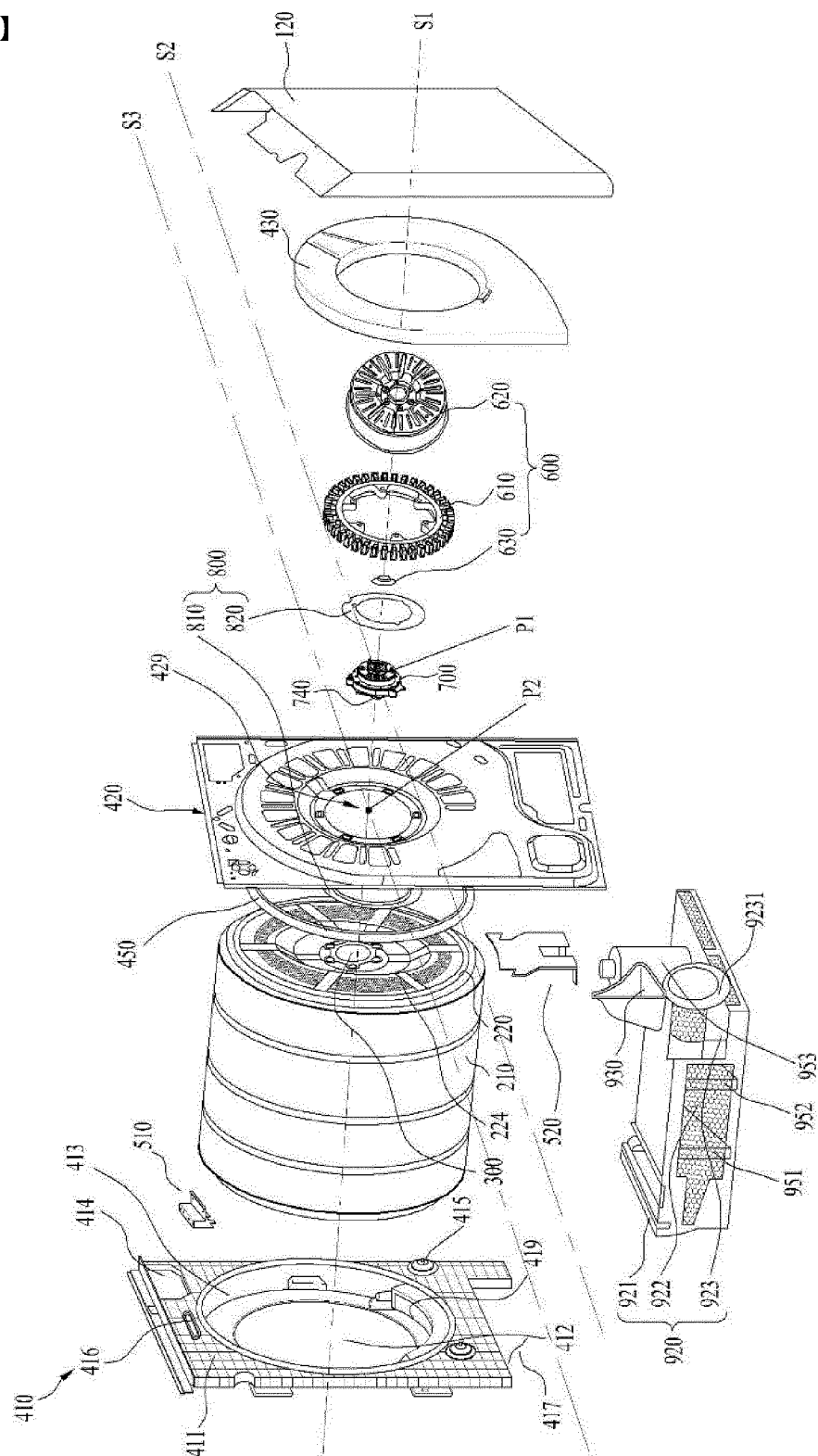
【FIG 4】



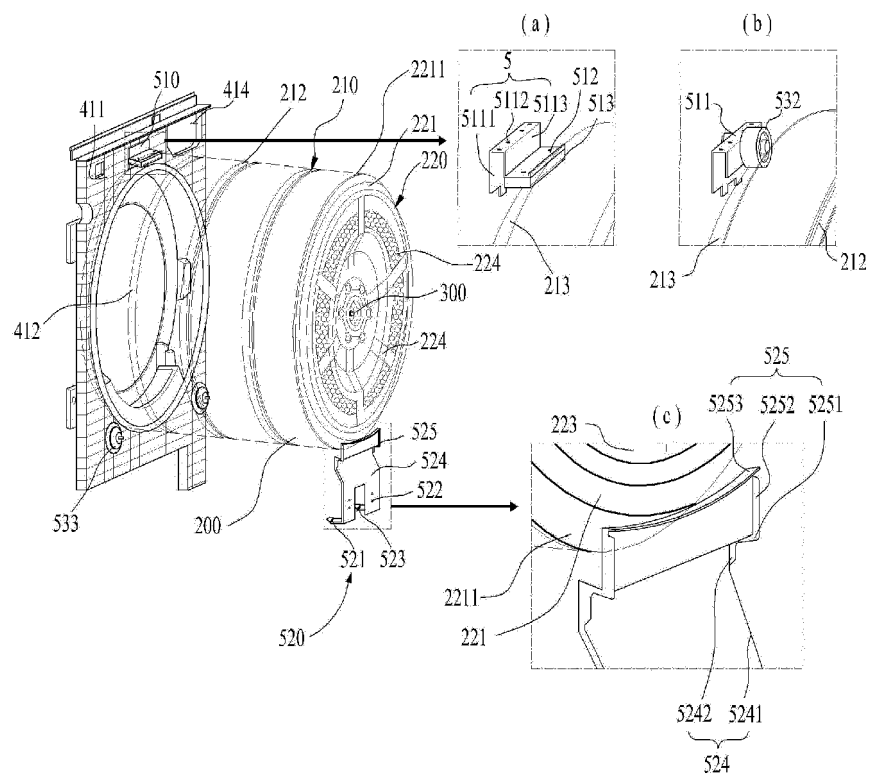
【FIG 5】



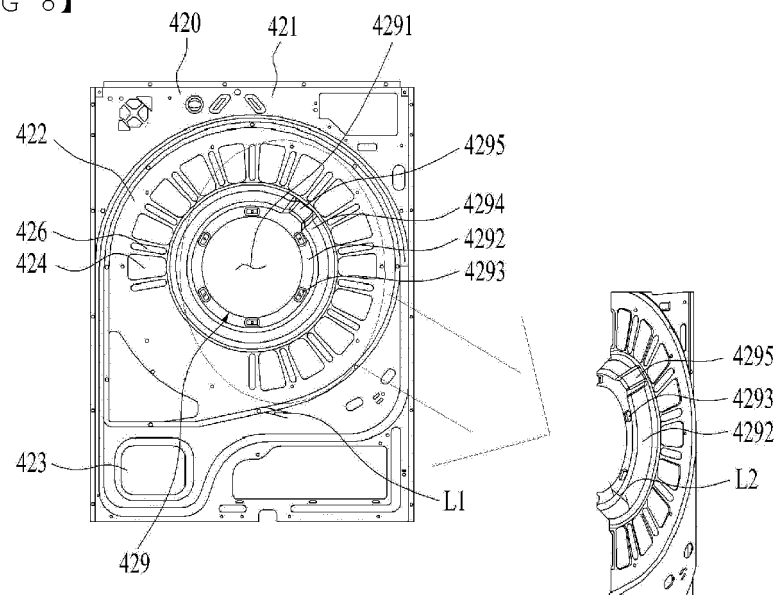
【FIG 6】



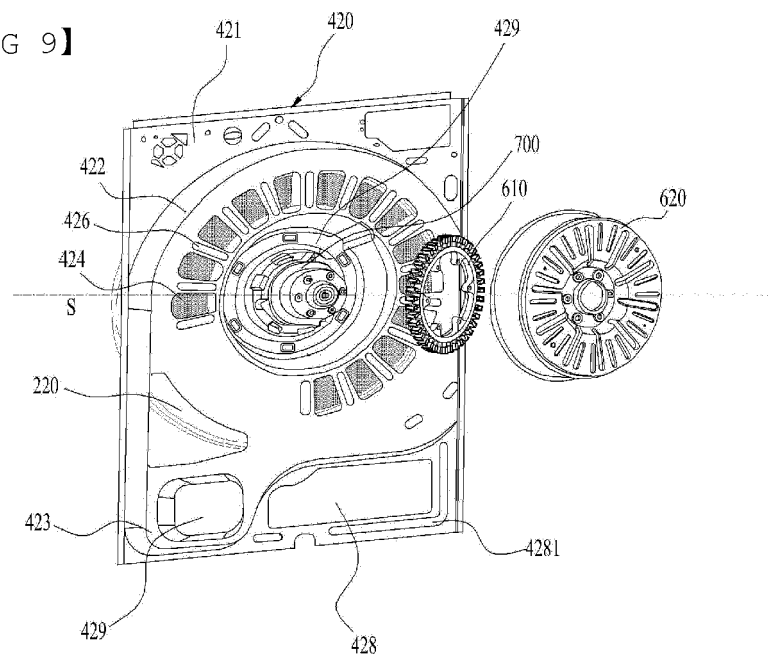
【FIG 7】



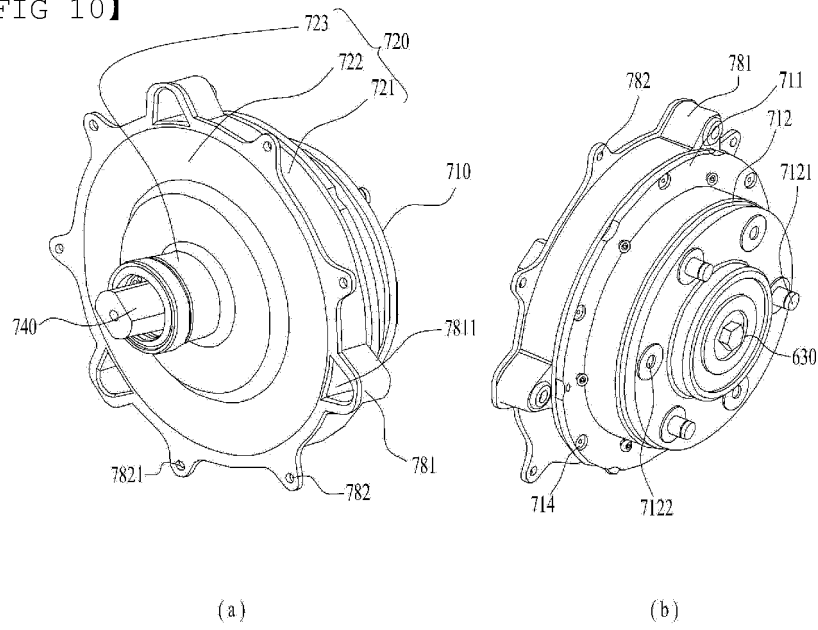
【FIG 8】



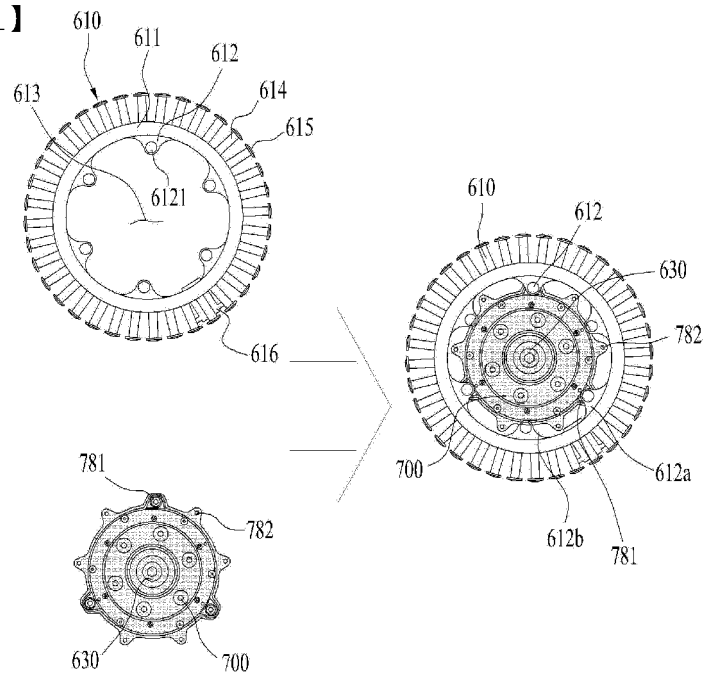
【FIG 9】



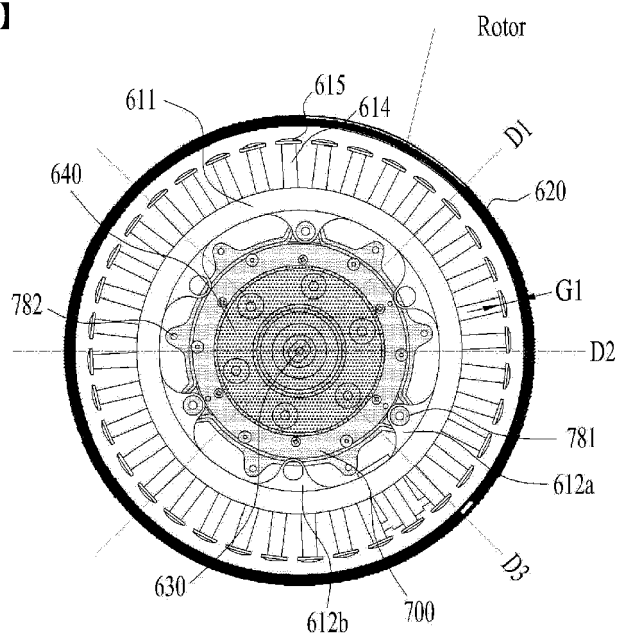
【FIG 10】



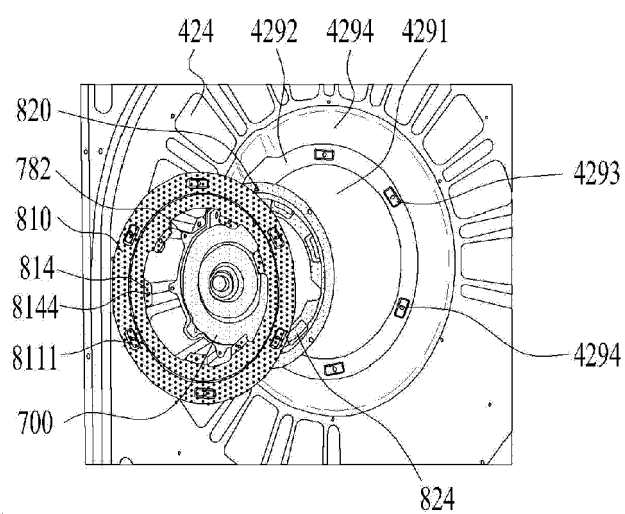
【FIG 11】



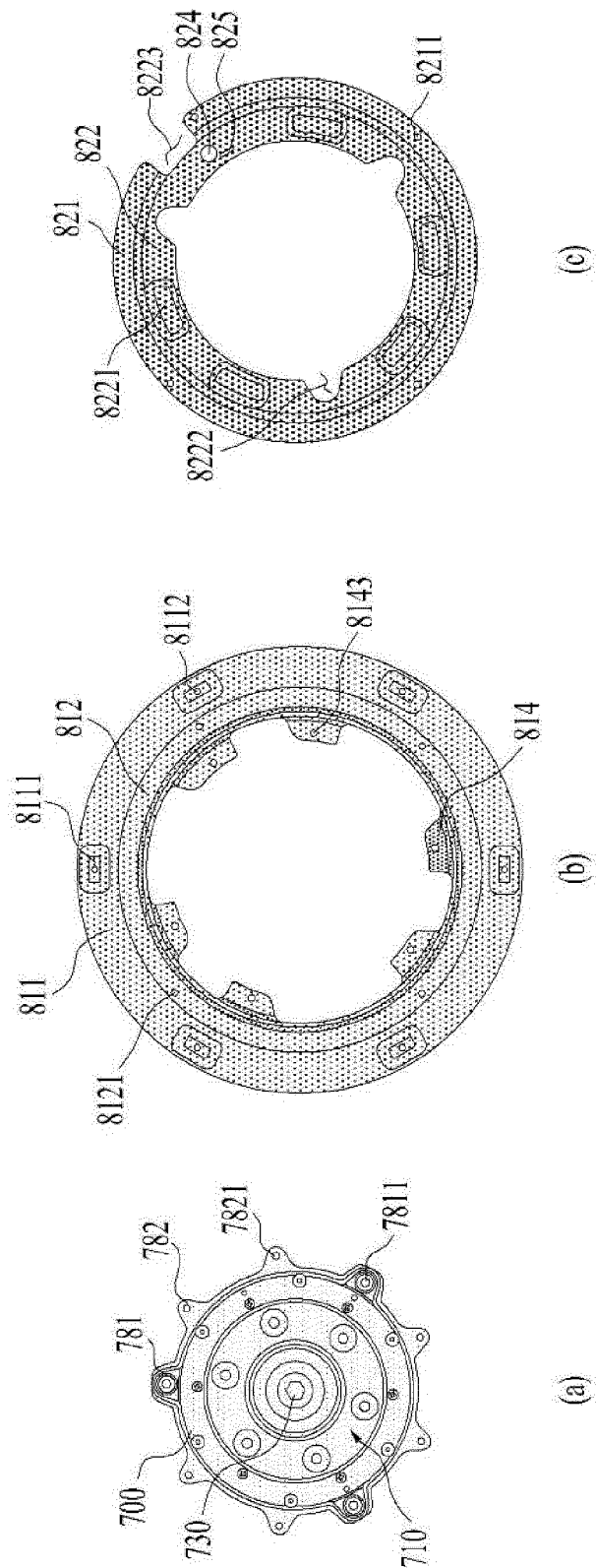
【FIG 12】



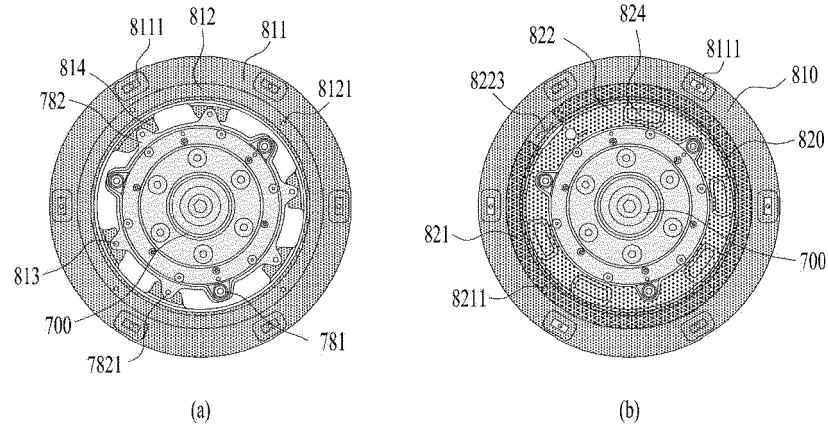
【FIG 13】



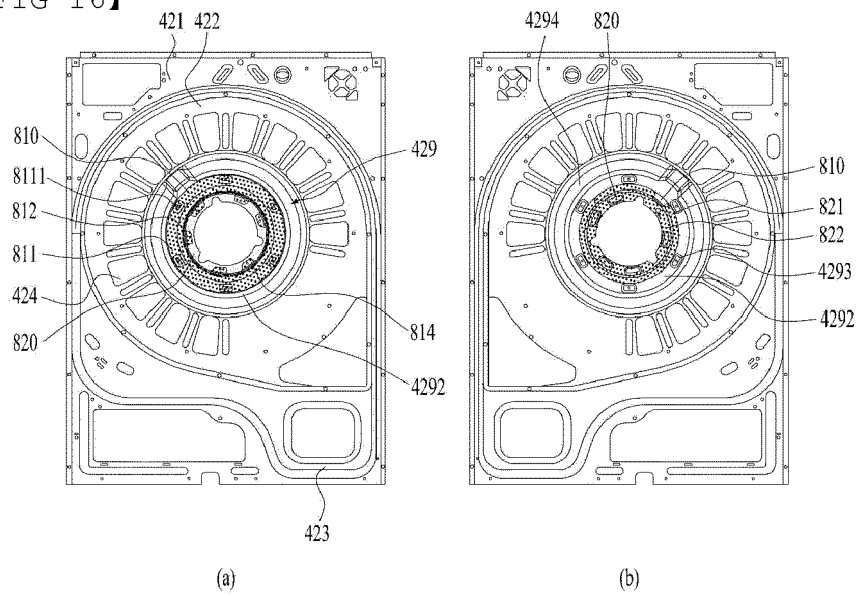
【FIG 14】



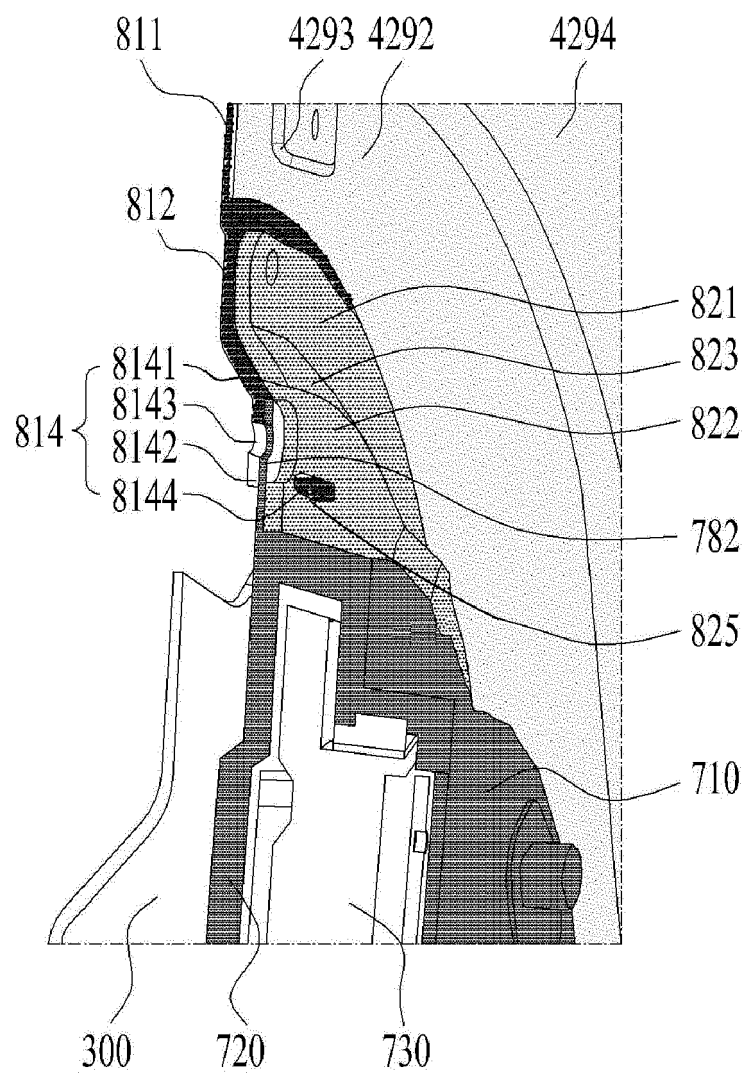
【FIG 15】



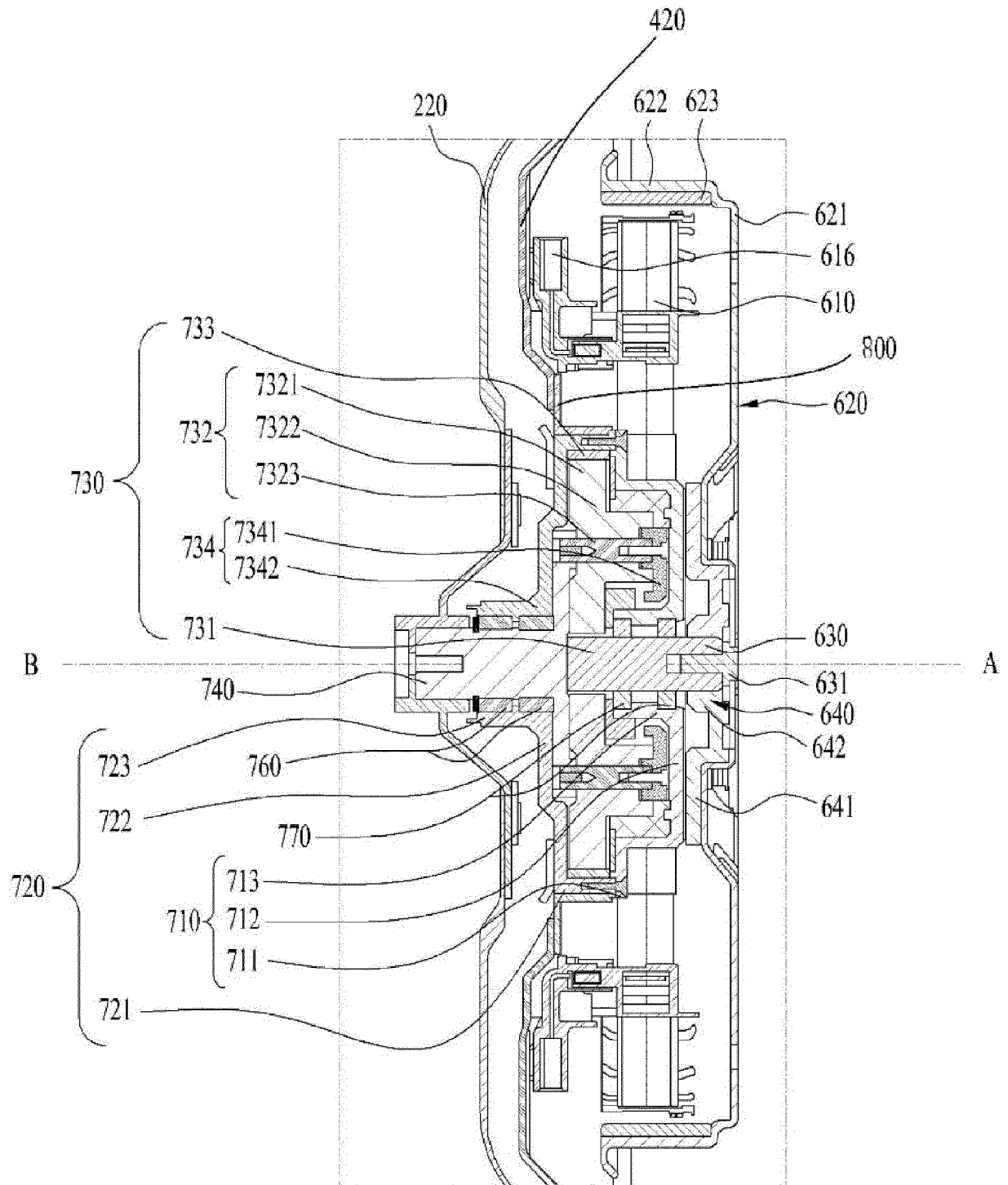
【FIG 16】



【FIG 17】



【FIG 18】





EUROPEAN SEARCH REPORT

Application Number

EP 21 19 4782

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A	* paragraphs [0076], [0107], [0186], [0221], [0240] - [0243], [0258], [0266], [0267], [0285], [0349], [0350] * * figures *	15	

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			D06F
Place of search Munich		Date of completion of the search 22 December 2021	Examiner Popara, Velimir
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