



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.03.2007 Bulletin 2007/10

(51) Int Cl.:
D06F 37/30 (2006.01)

(21) Application number: **06017907.4**

(22) Date of filing: **28.08.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(72) Inventors:
• **Kim, Sung Min**
Yangcheon-gu,
Seoul (KR)
• **Min, Byoung Wook**
Seoul (KR)

(30) Priority: **30.08.2005 KR 20050079905**

(74) Representative: **Urner, Peter**
TER MEER STEINMEISTER & PARTNER GbR
Patentanwälte
Mauerkircherstrasse 45
81679 München (DE)

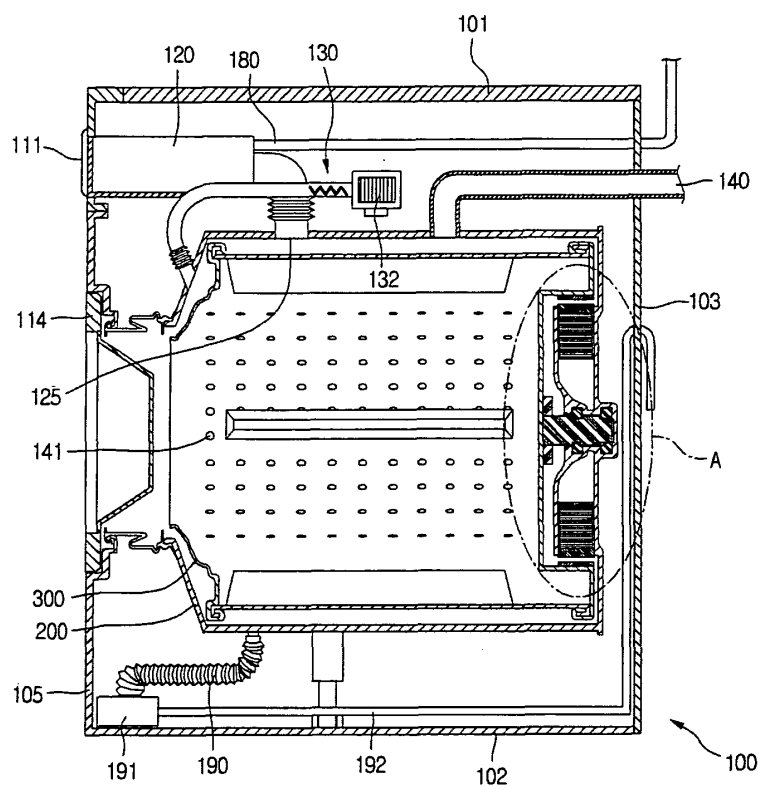
(71) Applicant: **LG Electronics Inc.**
Yongdungpo-gu
Seoul (KR)

(54) **Washing machine**

(57) A washing machine is described. The washing machine described comprises; a tub (200), a drum (300) placed the tub (200) therein, a permanent magnet (320)

placed on the drum (300) and a stator (202) interacting with the permanent magnet (320) to generate a rotary power to the drum (300).

Figure 1



Description

Background of the invention

Field of the invention

[0001] The present invention relates to a washing machine, and particularly, to a washing machine having a driving motor.

Description of the Related art

[0002] Washing machine is a device using a motor as a main power; operating a process of rinsing, washing and drying soiled material using water and detergent. The washing machine comprises; a motor as a driving device, a mechanical unit delivering energy to the laundry, a control unit controlling the washing process, a water supplying unit and a water discharging unit which supplies and discharges the water. Typical commercially produced washing machines designs are divided into a drum-method, an agitating-method and a winding-method.

[0003] A drum washing machine washes soiled material by putting the laundry with water and a detergent in the drum having a plurality of the protrusions, and the washing machine slowly rotates the drum horizontally. The soiled material are agitated and lifted by rotating the drum, and the rotation of the drum causes the soiled material to agitate and streak on the protrusion.

[0004] The drum is a space to accommodate the laundry, placed in the tub. The tub is a space to accommodate the water for washing fabrics and soiled material. The drum is rotated by a driving motor. A driving motor comprises a stator attached on the inner circumference a permanent magnet, and a rotor having a winding part wound a winding coil around.

[0005] In the related art, the driving motor is installed outside of the tub, and the motor is connected to the rotating shaft. The stator is installed on the outer surface of the tub, and the rotor is placed on the periphery of the stator.

[0006] Further, according to the related art, the driving motor 201 takes the additional space outside of the tub. Therefore, the space of the tub and drum decrease as to the space of the driving motor, which deteriorate space utilization.

[0007] Also, according to the related art, the driving power of the driving motor is delivered to the drum by the rotating shaft. That is, the rotating shaft becomes a main delivery means. Therefore, Heavy loads can be placed on the rotating shaft

[0008] Further, in the prior art, many different parts are necessary to assemble the washing machine, and the process of manufacturing becomes complex. Therefore, in the prior art, various parts are needed to assemble a washing machine, and the process of manufacturing the parts becomes more complicated. Also, the operation of

the rotor and stator causes a lot of vibration and noise to a washing machine.

Summary of the invention

[0009] The purpose of the present invention is proposed to provide a washing machine with a driving motor structure improving space utilization.

[0010] Another object of the present invention is to provide a washing machine with a driving motor structure having reduction in load on the power transmission of the rotating shaft.

[0011] Another purpose of the present invention is to provide a washing machine with a driving motor structure having a simple manufacturing process.

[0012] The washing machine according to the present invention comprises: a tub; a drum installed inside of the tub; a permanent magnet installed on the drum; and a stator interacting with the permanent magnet to generate a rotary power to the drum.

[0013] The washing machine according to another aspect of the invention comprises: a tub accommodating washing water therein; a drum placed inside of the tub; a permanent magnet installed on the drum; and a stator comprising a winding part, a winding coil wound to the winding part and interacting with the permanent magnet to generate a rotary power to the drum.

[0014] The washing machine according to another aspect of the invention comprises: a drum; a groove portion formed on the drum; a permanent magnet installed on the groove portion; a stator interacting with the permanent magnet to generate a rotary power to the drum.

[0015] In accordance with the washing machine according to the invention, without additional part such as a rotor frame, the permanent magnet is installed to the drum, and the stator is installed to the tub, so the drum becomes a rotor. Therefore, the space for the driving motor in the related art can be utilized for the space of the drum and tub, increasing the capacity of the drum and tub. Thus, the space for the washing machine increases as well. Also, the washing machine according to the invention simplifies the manufacturing process of washing machine and decreases the manufacturing cost by decreasing various parts, as the additional parts such as a rotor frame are not required.

[0016] In addition, the washing machine according to the invention generates rotary power from the interaction between the permanent magnet installed on the drum and the rotor installed on the tub, therefore the rotary power is directly applied to the drum. Accordingly, in the conventional method, the rotating power generated by the driving motor is transmitted through the rotating shaft. However, in the present invention, the load on the rotating shaft is relatively reduced comparing to the prior art, which increases reliability on the drum operation.

Brief description of the drawings

[0017] FIG 1 is a vertical cross-section view of drum washing machine according to this invention of embodiment 1.

[0018] FIG 2 is a magnified view of A part illustrated on FIG 1.

[0019] FIG 3 is a perspective view of the rear side of the drum according to this invention of embodiment 1.

[0020] FIG 4 is a perspective view of the partial front side of the tub according to this invention of embodiment 1.

[0021] FIG 5 is a vertical cross-section view of drum washing machine according to this invention of embodiment 2.

[0022] FIG 6 is a magnified view of the B part illustrated on FIG 5.

[0023] FIG 7 is a perspective view of the rear side of the drum according to this invention of embodiment 2.

[0024] FIG 8 is a perspective view of the partial front side of the tub according to this invention of embodiment 2.

Detailed description of the invention

[0025] The following is a detailed explanation of this sample of invention referring with each figure. However, this idea invention is not limited to the presented example and other example can be easily be proposed, by adding, modifying, deleting and etc, which retrogresses to another invention or make other examples with the elements in this invention extent of idea.

[0026] FIG. 1 is a vertical cross-section view of drum washing machine according to this invention of embodiment 1. FIG 2 is a magnified view of A part illustrated on FIG 1.

[0027] Referring to FIG. 1 and FIG. 2, on a main body 100 of the drum washing machine, an upper plate 101 and lower plate 102 is fixed onto a cabinet to form an inner space, devices such as drum 300 or driving motor 201 is installed in the inner space. The drum 300 is driven by the driving power generated by the driving motor 201. The driving power generated by the driving motor 201 is delivered to the drum by the rotating shaft 350.

[0028] The driving motor 201 comprises a permanent magnet 320 formed on the drum 300 and a stator 202 formed on the tub 200. A winding part 220 wound with a plurality of winding coil 230 is formed on the stator 202. When the electric current flows through winding coil 230, the winding part 220 gets magnetized and interacts with the permanent magnet 320. By the interaction, the driving power is delivered to the driving motor 201.

[0029] A groove portion 310 depressed at a predetermined depth is formed on the drum 300. The groove portion 310 consists of a bottom surface of the groove portion 311 and a side surface of the groove portion 312. The groove portion 310 is opened to the direction of the stator 202.

[0030] The bottom surface of groove portion 311 and the side surface of groove portion 312 can be a transform of the part of the drum 300. The permanent magnet 320 is installed on the side surface of groove portion 312. Also, a rotating shaft fixing portion 330 that fixes the rotor to the groove portion 310 is installed. The rotating shaft fixing portion 330 can be an injection mould.

[0031] The permanent magnet 320 is formed to be a magnetized single element, and is continuously magnetized at a predetermined width to the North pole and South pole. The Permanent magnet 320 is manufactured such that a mixture of strong magnetic materials, such as rare earth metal and rubber, is manufactured to a belt formation at a predetermined length, and then magnetized.

[0032] A rear panel of the stator 211, a front panel of the stator 210 spaced with a predetermined distance from the front of the rear panel of the stator 211, and side panel of the stator 212 formed to be a side surface of the stator 202 is formed on the stator 202. The rear panel of the stator 211, the front panel of the stator 210 and the side panel of the stator 212 assemble each other to be a closed space to the outside. In the closed space, a winding part 220 and a winding coil 230 winds many times to the winding part 220 is installed. A one side of winding part 220 is supported by a supporting portion 222 and is fixed on to the stator 202.

[0033] An end 221 of the winding part 220, exposed to the outside, is combined with the side panel of the stator 212. Then, the end part 221 is magnetized by the winding coil 230 where electronic current flows, then interacts with the permanent magnet 320. The winding part 220 and the side panel of the stator 212 are sealed so that the washing water inside of the tub does not introduce to the inside of the stator.

[0034] In this embodiment, the permanent magnet 320 is installed to the side of groove portion 312, and the winding part 220 is installed to the radius direction of the driving motor 201 or the drum 300 to correspond to the permanent magnet 320. Also, the end part 221 is exposed to the outside from the side panel of the stator 212. Then, the permanent magnet 320 and the stator 202 interact to the radius direction.

[0035] The first bearing 250 and the second bearing 251 are installed on the stator 202. The first bearing 250 and the second bearing 251 are combined, and the rotating shaft 350 is able to rotate through the stator 202. The first bearing 250 and the second bearing 251 are placed on a predetermined gap so that they can stably support the rotating shaft 350.

[0036] The sealing member 240 is installed on the front of the first bearing 250. The sealing member 240 seals the gap between the rotating shaft 350 and the side panel of the stator 210. Then, the water for washing the clothes inside of the tub does not introduce to the bearing 250, 251. Therefore, the water does not mix with the lubricant oil generally used on the bearing. Also, it is prevented that the washing water is not leaked into the stator 202, which might cause a short circuit.

[0037] On the other hand, the tub 200 installed on the inside of the main body 100 and funneled with a one side of ventilation duct, has a cylinder form, opened at the front and has a structure that the backward of the rotating shaft 350 is penetrated. Also, the tub 200 needs to maintain airtight to sump the washing water when operates.

[0038] A plurality of opening 141 is formed on the drum, and the opening 141 is installed where the drum 300 is installed on the tub 200 so that when the washing water supplies the water inlet 125, the washing water can be supplied to a certain part of the drum. Also, after the washing process and when drying process is operated, the opening 141 makes washing water to drain easily from the rotating the drum 300. In addition, in drying process, the hot wind supplied from the ventilating ducts 130, introduces to the tub 200, the hot wind passes through the opening 141 formed on the drum 300 to dry the laundry.

[0039] The one side of the tub 200 is funneled with ventilation duct 130. Inside of the ventilating duct 130, a ventilation fan 132 is installed to produce an air movement. The ventilation duct 130 can provide the head to the tub 200 to perform the drying. On the other side of the tub 200, discharging duct 140 is formed. The discharging duct 140 discharges the heat provided to the tub 200 from ventilating duct 130, to the outside of the washing machine. The discharging duct 140 is extended to the outside of the washing machine.

[0040] On the other hand, a detergent input box 120 is installed along the water supply passage, where the detergent input box 120 is located on the lower part of the upper plate 101 on the front of the washing machine, and is a removable structure having opening on a one side of the box 120. The other side of the detergent input box 120 is combined to the water supply passage 180 where cold/hot water is supplied, and the cold/hot water introduces from the water supply passage 180 so that the detergent and conditioner are mixed and connected to the water inlet 125 that supplies to the tub.

[0041] FIG. 3 is a perspective view of the rear side of the drum according to this invention of embodiment 1.

[0042] Referring to FIG 3, the groove portion 310 depressed at a predetermined depth is formed on the center part of the drum 300. On the side of the above groove portion 310, the permanent magnet 320 is a long belt shape and magnetized alternately North and South Pole. The groove portion 310 consists of the bottom surface of the groove portion 311 and the side surface of the groove portion 312. In this embodiment, the permanent magnet 320 is formed on the side surface of the groove portion 312. On the center part of groove portion 310, the rotating shaft 350 is fixed by the rotating shaft fixing portion 330.

[0043] As mentioned above, when the permanent magnet 320 is installed on the groove portion 310, which is a part of the drum 300, additional rotor is not required, and the drum 300 functions like the rotor. Then, the space for installation of the rotor and the driving motor 201 including the rotor and the stator in the related art may be

a part of the drum 300. Therefore, the capacity of the drum 300 may be enlarged compared to the washing machines 100 of the same sizes. Further, the additional parts such as rotor frame are not required, the manufacturing process for the washing machine 100 can be simplified and the manufacturing cost is decreased.

[0044] In addition, when the groove portion 310 is formed like the above and the permanent magnet 320 is installed on the side surface of the groove portion 310, the drum 300 requires only the minimum space for the driving motor 201 to be installed. Therefore, the capacity of the drum 300 is maximized.

[0045] Particularly, to maximize the capacity of the drum 300, the whole of the permanent magnet 320 can be installed inside of the groove portion 310. Then, the permanent magnet 320 is not projected outside of the groove portion 310, such that space for installation of the driving motor 201 of the drum 300 can be minimized.

[0046] On the other hand, the permanent magnet 320 forms a continuous belt shape; the permanent magnet 320 is magnetized homogeneously. Therefore, the noise and vibration produced by the uneven magnetization from the segmentation of permanent magnet decrease.

[0047] FIG 4 is a perspective view of the partial front side of the tub according to this invention of embodiment 1.

[0048] Referring to FIG 4, the center part of the tub 200 is projected at a predetermined height and each part of stator 202 is installed on the rear surface of the projected part. The top surface of the projected part becomes the front panel of the stator 210 and the side surface of the projected part becomes the side panel of the stator 212. On the center part of the front panel of the stator 210, the rotating shaft 350 is passed through a formed hole. Between the rotating shaft 350 and the front panel of the stator 210, sealing member 240 is installed.

[0049] On the side surface of the side panel of stator 212, a plurality of the end of the winding part 220 is projected. On the side surface of the side panel of stator 212, only the end part of the winding part 220 is exposed so that the body of the winding part 220, and the winding coil 230 wound onto the winding part 220 is not exposed. The water for washing clothes inside of the tub 200 does not affect the internal parts of the stator such as the winding part 220 and the winding coil 230, etc. Leakage of electricity caused by the water for washing to the winding coil 230 where electric current flows, can be prevented.

[0050] Hereafter, the washing machines 100 like the above is described mainly on the driving motor 201.

[0051] First, when the winding coil 230 is approved to electric current, the winding part 220 is magnetized. Then, the magnetic on the winding part 220 interacts with the permanent magnet 320, causes attraction/reaction force between the permanent magnet 320 and the stator 202. By the attraction/reaction force, the drum 300 installing the permanent magnet rotates. Then, the laundry inside of the drum 300 is washed.

[0052] FIG 5 and FIG 8 is the second embodiment view

of the washing machine according to this invention. The below explains about the second embodiment of this invention referring to the figures. The repeated explanation with the first example will be omitted, and will be explained on the key features for this embodiment.

[0053] FIG. 5 is a vertical cross-section view of drum washing machine according to this invention of embodiment 2. FIG. 6 is a magnified view of the B part illustrated on FIG. 5.

[0054] Referring to FIG. 5 and FIG. 6, the groove portion 310 comprising the bottom surface of the groove portion 311 and the side surface of the groove portion 312, is formed on the drum 300. the Stator 202 is installed on the tub 200. The stator 202 is sealed on the inside thereof to the washing water by the front panel 210, the rear panel 211 and the side panel 212 of the stator, and parts such as the winding part 224 and the winding coil 231 etc. is installed on the sealed space.

[0055] In this embodiment, the permanent magnet 320 is installed on the bottom surface of the groove portion 311. Further, the winding part 220 is installed to the direction of the rotating shaft length to correspond to the location of the permanent magnet 320. Also, the winding coil 231 is wound onto the winding part 224. If installed like the above, the end part 223 of the winding part 224 is exposed to the outside of the front panel of the stator 210, facing the permanent magnet 320. Of course, the gap between the end part 223 and the front panel of the stator 210 is sealed.

[0056] Placed as mentioned above, the permanent magnet 321 interacts to the shaft direction with the stator 202 to generate a rotary power.

[0057] The permanent magnet 320 and the stator 202 are installed as mentioned above, so that the space of drum 300 can be increased and the space utilization is maximized. The permanent magnet 320 is magnetized continuously in North and South Pole alternately and also magnetized homogeneously, so that the noise and vibration of the rotation is decreased.

[0058] FIG. 7 is a perspective view of the rear side of the drum according to this invention of embodiment 2. FIG. 8 is a perspective view of the partial front side of the tub according to this invention of embodiment 2.

[0059] Referring to FIG 7 and FIG 8, the groove portion 310 of the drum 300 comprises the bottom surface of the groove portion 311 and the side surface of the groove portion 312. The permanent magnet 321 is installed on the bottom surface of the groove portion 311.

[0060] The permanent magnet 321 forms a continuous belt shape. Consisting of rare earth element metals such as ferromagnetic material, by mixing with rubber and etc, it can be formed like the above. The permanent magnet 321 is magnetized alternately on North and South Pole. Then, by the continuous feature, the permanent magnet 321 can be magnetized homogeneously.

[0061] The Stator 202 installed on the tub 200 is sealed by the front panel of the stator 210, the rear panel of the stator 211 and the side panel of the stator 212. On the

front panel of the stator 210, the end part 223 of the winding part 220 is exposed.

[0062] In this embodiment, the exposed end part 223 confronts the permanent magnet 320. When the winding part 224 is magnetized by approving to electric current, the magnetic force of the winding part 224 interacts with the permanent magnet 321 through the end part 223. Then, the permanent magnet 321 and stator 202 interacts each other to the shaft direction to generate a rotary power.

[0063] The washing machine comprised as mentioned above according to the present invention, the permanent magnet is installed to the drum and stator is installed to the tub, where the additional parts such as the rotor frame etc. is not required and drum becomes a rotor. Then, the driving motor comprising the rotor and the stator is manufactured in addition to the drums, and the tub can be utilized for the space of the drum and the tub. Therefore, the capacity for the drum and the tub is increased, and the space utilization for the washing machine is increased.

[0064] According to the above washing machine, as the additional rotor frame is not required, the number of the parts is reduced. Therefore, there is an effect that the manufacturing process is simplified, and the manufacturing cost is decreased.

[0065] In addition, according to the above washing machine, the rotary power is generated by the interaction between the permanent magnet installed on the drum, and the stator installed on the tub, the rotary power can be directly operated to the drum. accordingly, the load on the rotating shaft decreases compared to the method of related art that transmitting the rotating power generated by the driving motor, mainly by rotating shaft, which increase reliability on the drum operation.

Claims

1. A washing machine comprising;
a tub,
a drum installed the tub therein,
a permanent magnet installed on the drum, and
a stator interacting with the permanent magnet to generate a rotary power to the drum.
2. A washing machine according to claim 1, wherein the stator is installed on the tub.
3. A washing machine according to claim 1, wherein the stator is water proof to the washing water.
4. A washing machine according to claim 1, wherein the permanent magnet and the stator interacts in the radial direction of the drum.
5. A washing machine according to claim 1, wherein the permanent magnet and the stator interacts in the

shaft direction of the drum.

6. A washing machine according to claim 1, wherein the permanent magnet is in a close loop form. 5
7. A washing machine according to claim 1, wherein a groove portion is formed on the drum, and the permanent magnet is placed therein.
8. A washing machine according to claim 7, wherein the whole of the permanent magnet is placed on the inside of the groove portion. 10
9. A washing machine according to claim 7, wherein the groove portion is opened to the direction of the stator. 15
10. A washing machine according to claim 1, wherein the stator includes a winding part and a winding coil wound onto the winding part, and an end of the winding part is exposed to the part facing the permanent magnet of the tub. 20

25

30

35

40

45

50

55

Figure 1

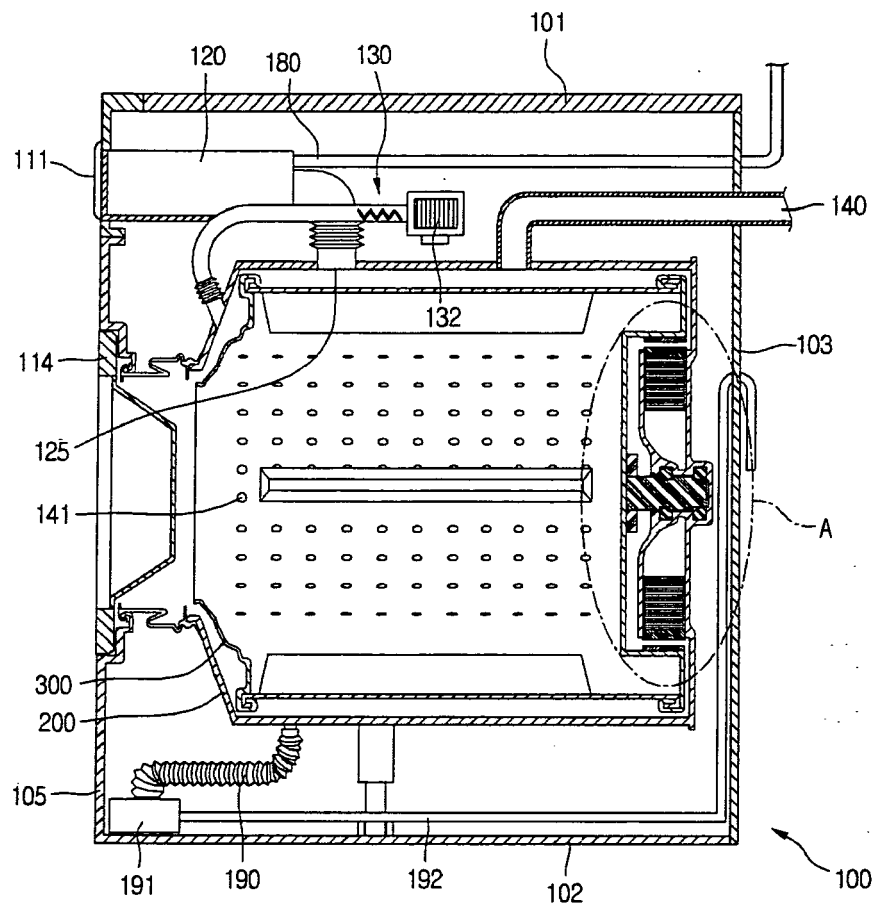


Figure 2

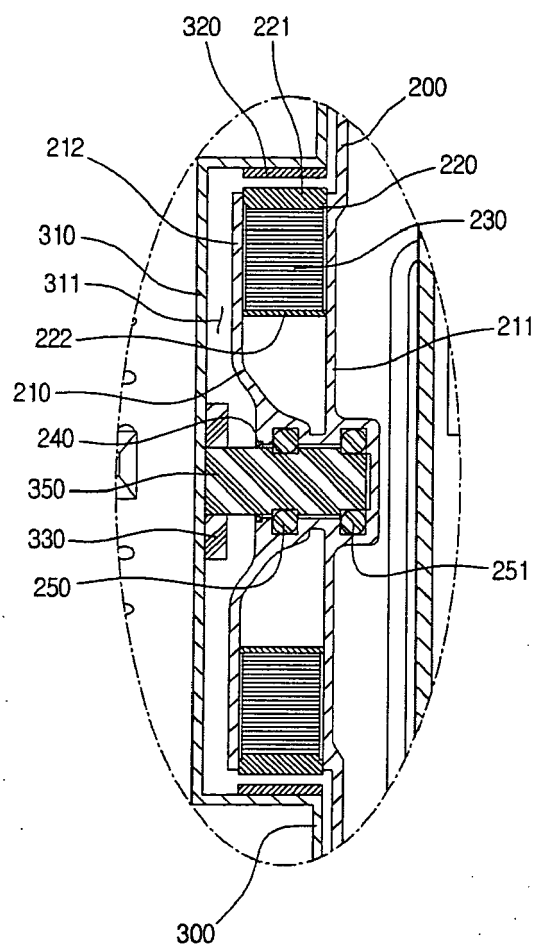


Figure 3

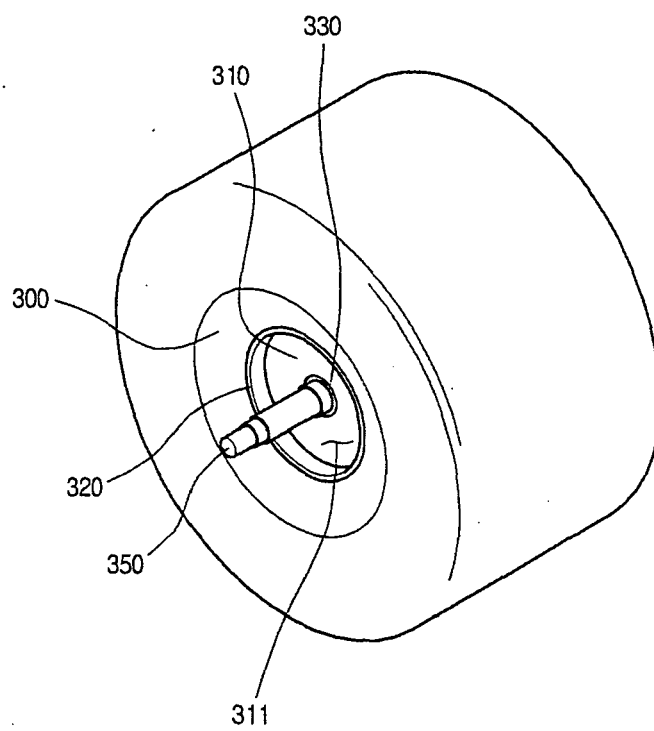


Figure 4

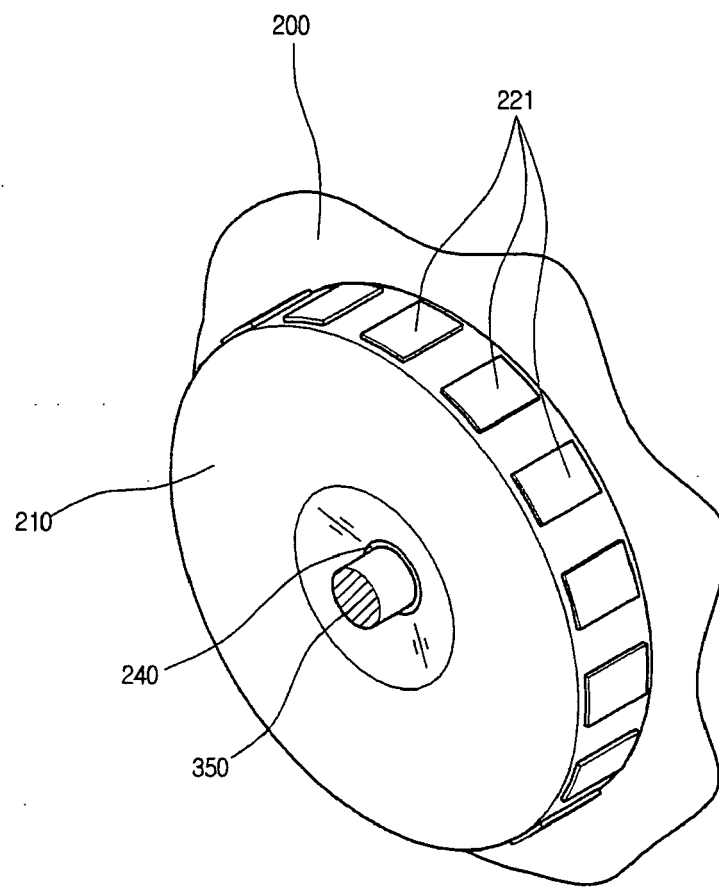


Figure 5

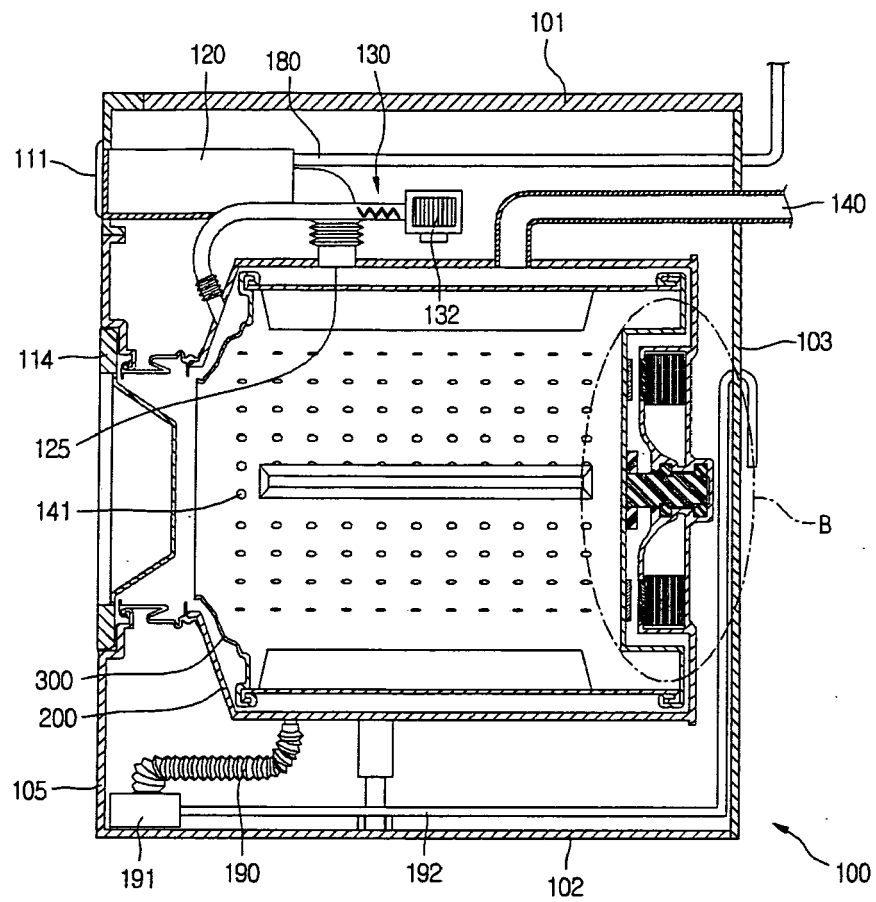


Figure 6

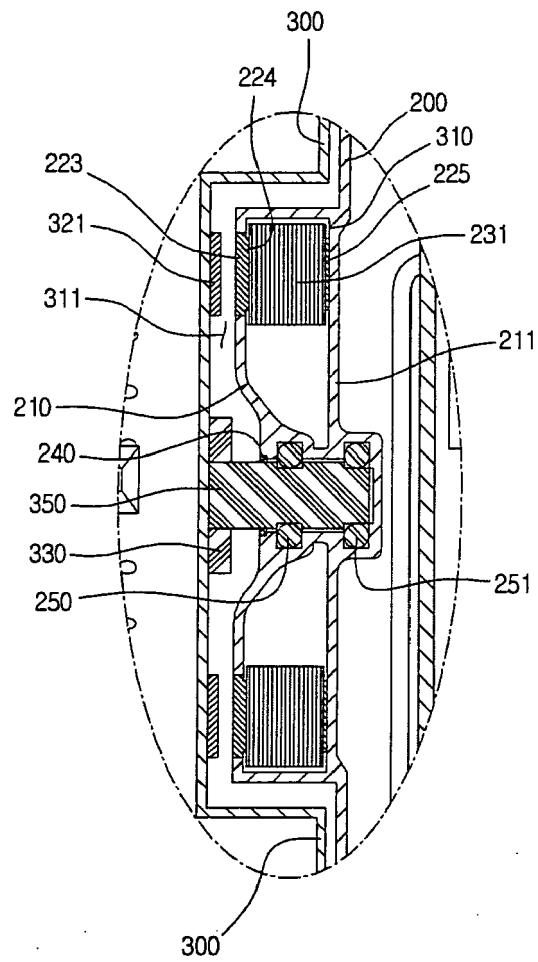


Figure 7

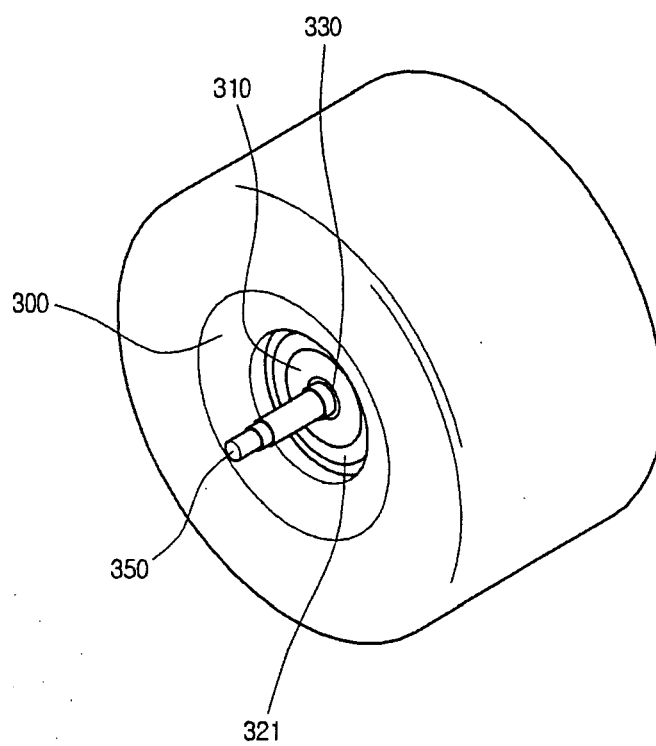


Figure 8

