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(71) Applicant: **Samsung Electronics Co., Ltd.**
Yeongtong-gu
Suwon-si, Gyeonggi-do (KR)

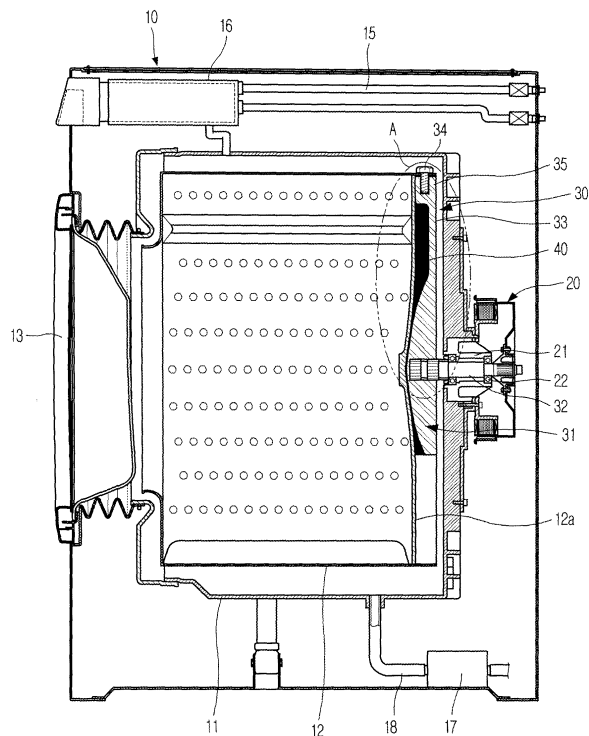
(72) Inventors:
• **Lee, Geun Ho**
Giheung-Gu, Yongin-Si
Gyeonggi-Do (KR)
• **Lee, Jun Young**
Yongin-Si
Gyeonggi-Do (KR)
• **Kang, Sung Wook**
Seoul (KR)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser
Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) **Drum type washing machine and shaft system assembling method**

(57) A drum type washing machine, and a method for assembling its shaft system (30) are disclosed. The shaft system (30) comprises a flange shaft (31) coupled to a rear side of the drum (12) to transmit the rotational force of the motor (20) to the drum (12). A buffering material (40) is provided between the drum (12) and the flange shaft (31) to distribute or absorb load or vibration transmitted from the drum (12) to the flange shaft (31). The buffering material (40) comprises a material having a liquid phase initially and changing to a solid phase having elasticity a predetermined period of time after contacting air. The buffering material (40) is applied to a rear side of the drum (12) or to a rear side of the flange shaft (31) when assembling the shaft system (30).

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a drum type washing machine, and, more particularly, to a drum type washing machine, which can reduce damage of a shaft system serving to transmit rotational force of a motor to a drum, and a method for assembling the shaft system thereof.

2. Description of the Related Art

[0002] Generally, a washing machine is an apparatus which washes laundry using electric power. The washing machine can be generally classified into a vertical type washing machine which has a rotating tub installed vertically in a body, and a drum type washing machine which has the rotating tub installed horizontally therein. The drum type washing machine comprises a drum positioned horizontally therein such that, as the drum rotates alternately in the clockwise direction and the counter-clockwise direction, laundry can be washed while moving up and down along with water in the inner portion of the rotating tub.

[0003] The drum type washing machine generally comprises a motor to supply power to rotate the drum, and a shaft system to transmit rotational force of the motor to the drum. FIG. 1 is a perspective view illustrating a drum, and a shaft system of a conventional drum type washing machine. As shown in FIG. 1, a shaft system 1 of the drum type washing machine comprises a flange shaft 3 installed at a rear side of a drum 2, and a drum rotating shaft 4 inserted into and integrally formed with the center of the flange shaft 3. Here, the flange shaft 3 comprises a plurality of wings 3a, each of which extends radially from the center, and has a distal end fixed to the drum 2 by means of a fastening member such as a bolt 5.

[0004] Accordingly, when the drum rotating shaft 4 is rotated by a motor (not shown), rotational force is transmitted to the flange shaft 3 integrally formed with the drum rotating shaft 4, and is then delivered to the drum 2 connected with the flange shaft 3 via the bolts 5, so that the drum rotating shaft 4, the flange shaft 3, and the drum 2 perform the same rotational movement.

[0005] However, since the flange shaft 3 is assembled at the distal end of each wing 3a to the drum only by the bolts 5 in the conventional washing machine, there is a problem in that load of the laundry is concentrated on a specific portion of the shaft system of the washing machine instead of being adequately distributed. Additionally, if the laundry is biased to one side of the drum while the drum is rotated, a centrifugal force is invoked by the rotating laundry, applying unequal load to the drum. The unequal load is transmitted to the shaft system 1 via fastening portions of the bolts at the distal

end of the flange shaft 3, and concentrated on a portion where the flange shaft 3 is coupled to the drum rotating shaft 4, so that the flange shaft 3 and the drum rotating shaft 4 are damaged due to fatigue. Furthermore, since the shaft system 1 of the conventional washing machine does not have a self-buffering system to allow reduction of vibration by itself, the shaft system 1 is damaged due to vibration and/or noise is generated therefrom. Such problem is especially evident when the drum rotates at high speeds and/or when the laundry load is heavy.

SUMMARY OF THE INVENTION

[0006] Accordingly, it is an aspect of the present invention to provide a drum type washing machine, which can reduce damage of a shaft system caused by load applied thereto, and a method for assembling the shaft system thereof.

[0007] It is another aspect of the present invention to provide the drum type washing machine, which can reduce damage and noise of the shaft system due to vibration being generated upon rotation of a drum, and the method for assembling the shaft system thereof.

[0008] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

[0009] The foregoing and other aspects of the present invention are achieved by providing a drum type washing machine, comprising a drum, a motor to rotate the drum, and a flange shaft coupled to a rear side of the drum to transmit rotational force of the motor to the drum, wherein a buffering material is provided between the drum and the flange shaft to distribute or absorb load or vibration transmitted from the drum to the flange shaft.

[0010] The buffering material may fill up a gap formed between the drum and the flange shaft to bond the drum and the flange shaft.

[0011] The buffering material may comprise a material having a liquid phase initially and changing to a solid phase having elasticity a predetermined period of time after contacting air. The buffering material may comprise a silicon material.

[0012] The flange shaft may be formed with a recess to be filled with the buffering material.

[0013] In accordance with another aspect of the present invention, there is provided a method for assembling a shaft system of a drum type washing machine in which the shaft system comprises a flange shaft installed at a rear side of a drum to transmit rotational force of a motor to the drum, and a drum rotating shaft, the method comprising: applying a buffering material to a portion at the rear side of the drum corresponding to an installation position of the flange shaft; and installing the flange shaft to the drum having the buffering material applied thereto.

[0014] In accordance with yet another aspect of the present invention, there is provided a method for assembling a shaft system of a drum type washing machine in

which the shaft system comprises a flange shaft installed at a rear side of a drum to transmit rotational force of a motor to the drum, and a drum rotating shaft, the method comprising: applying a buffering material to a surface of the flange shaft brought into contact with the drum; and installing the flange shaft having the buffering material to the drum.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

FIG. 1 is a perspective view illustrating a drum, and a shaft system of a conventional drum type washing machine;

FIG. 2 is a perspective view illustrating an appearance of a drum type washing machine in accordance with the present invention;

FIG. 3 is a side sectional view illustrating the construction of the drum type washing machine;

FIG. 4 is an enlarged view of Part A of FIG. 3 for illustrating a gap between a drum and a flange shaft excluding a buffering material; and

FIGS. 5 and 6 are perspective views illustrating a shaft system assembled to the drum of the washing machine in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The embodiments are described below to explain the present invention by referring to the figures.

[0017] FIG. 2 is a perspective view illustrating an appearance of a drum type washing machine in accordance with the present invention, and FIG. 3 is a side sectional view illustrating the construction of the drum type washing machine.

[0018] Referring to FIGS. 2 and 3, a drum type washing machine according to the present invention comprises a housing 10 defining an outer appearance of the washing machine, a water tub 11 installed in the housing 10 to contain water for washing laundry, and a drum 12 rotatably installed in the water tub 11 to receive the laundry which will be washed by operation of the washing machine therein. The housing 10 has a door 13 attached to a front side thereof to open or close an opening through which the laundry is accessed, and a control panel 14 provided at the front side to control the operation of the washing machine.

[0019] The housing 10 is provided at an upper portion therein with a water supply pipe 15 and a detergent sup-

ply device 16 to supply water and detergent to the tub 11, respectively, and provided at a lower portion therein with a water discharge pump 17 and a water discharge pipe 18 to discharge water from the tub 11 to an outside of the housing 10.

[0020] The housing 10 is further provided with a motor 20 at an outside of the tub 11 to rotate the drum 12 in the clockwise direction or the counterclockwise direction, and a shaft system 30 at an outside of a rear side 12a of the drum 12. The shaft system 30 comprises a flange shaft 31, and a drum rotating shaft 32 to transmit rotational force of the motor 20 to the drum 12. The drum rotating shaft 32 is coupled to the center of the flange shaft 31, and extends outwardly from the tub 11 so as to engage with the motor 20. The flange shaft 31 has a plurality of wings 33, each of which extends radially from the center of the flange shaft 31 coupled to the drum rotating shaft 32, and has a distal end fixed to the drum 12 by means of a fastening member such as a bolt 34.

[0021] A cylindrical bearing housing 21 is provided at the rear side of the tub 11, and has bearings 22 on the drum rotating shaft 32 such that the drum rotating shaft 32 can be rotatably supported thereby.

[0022] Accordingly, as the drum rotating shaft 32 is rotated by the motor 20, the flange shaft 31 coupled to the drum rotating shaft 32 is also rotated, so that the drum 12 coupled to the flange shaft 31 is rotated, causing the laundry to be washed or extracted of water therein. In the meantime, if unequal load is applied because the laundry is biased to one side of the drum 12 during rotation of the drum 12, or if vibration is generated due to high speed rotation of the drum 12, the load and vibration are transmitted to the shaft system 30, and accumulate fatigue on the flange shaft 31 and the drum rotating shaft 32.

[0023] In this regard, the drum type washing machine of the present invention comprises a buffering material 40 between the drum and the flange shaft 31 to distribute or absorb the load or the vibration transmitted from the drum 12 to the flange shaft 31.

[0024] FIG. 4 is an enlarged view of Part A of FIG. 3 for illustrating a gap between a drum and a flange shaft excluding a buffering material, and FIGS. 5 and 6 are perspective views illustrating a shaft system assembled to the drum of the washing machine in accordance with the present invention.

[0025] As shown in FIGS. 3 and 4, a buffering material 40 serves to allow the drum 12 and the flange shaft 31 to be bonded to each other over a wide contact area by filling up a gap G created between the drum 12 and the flange shaft 31 when assembling the shaft system 30. Then, when load is transmitted from the drum 12 to the shaft system 30, the load is transmitted in a distributed state over the wide contact area via the buffering material 40 rather than in a concentrated state on a bolt fastening portion 35 of the flange shaft 31, thereby reducing stress applied to the flange shaft 31 due to the load. In addition, when vibration is transmitted to the shaft system 30 due

to the rotation of the drum 12, the buffering material 40 absorbs the vibration between the drum 12 and the shaft system 30, thereby reducing damage or noise of the shaft system due to the vibration. Although preferably, the entire gap portion is filled with the buffering material, certain portions may be left empty.

[0026] In consideration of the structural characteristics or the weight of the flange shaft 31, a recess 36 is formed on the flange shaft 31, and filled with the buffering material 40 such that the flange shaft 31 and the drum 12 are bonded to each other over the wide contact area via the buffering material 40.

[0027] In order to allow the buffering material 40 to effectively fill up the gap G between the drum 12 and the flange shaft 31 while allowing the buffering material 40 to effectively reduce the vibration transmitted from the drum 12 therethrough, the buffering material 40 is preferably composed of a material, which has a liquid phase initially, i.e., before being applied to the recess 36, and changes to a solid phase with a predetermined elasticity in a state of contacting air. For example, such a material includes silicon materials such as a silicon bond, a silicon rubber, and the like. However, the buffering material 40 is not limited to the silicon materials, but any other types of material having the properties as described above may be used for the buffering material 40.

[0028] As shown in FIGS. 3 and 5, when assembling the shaft system 30 to the drum 12, the buffering material 40 is applied to a portion at the rear side 12a of the drum 12 corresponding to an installation position of the flange shaft 31. Then, the flange shaft 31 is mounted to the drum 12 having the buffering material 40 applied thereto such that the buffering material 40 fills up the gap between the drum 12 and the flange shaft 31.

[0029] Alternatively, as shown in FIGS. 3 and 6, it is possible to assemble the shaft system 30 to the drum 12 in such a manner that, after applying the buffering material 40 to a rear surface 31a of the flange shaft 31, that is, a surface of the flange shaft 31 which will be brought into contact with the drum 12, the flange shaft 31 having the buffering material 40 applied thereto is mounted to the drum 12.

[0030] As apparent from the above description, the present invention has an advantageous effect in that, when the buffering material applied to the drum or the flange shaft of the shaft system, it causes the load to be distributed and absorbs the vibration transmitted from the drum to the shaft system upon rotation of the drum, thereby reducing damage or noise of the shaft system.

[0031] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that various modifications, additions and substitutions may be made in these embodiments without departing from the principle and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. A drum type washing machine comprising:

a drum,
a motor to rotate the drum, and
a flange shaft coupled to a rear side of the drum to transmit rotational force of the motor to the drum,

wherein a buffering material is provided between the drum and the flange shaft to distribute or absorb load or vibration transmitted from the drum to the flange shaft.

2. The washing machine according to claim 1, wherein the buffering material fills up a gap formed between the drum and the flange shaft to bond the drum and the flange shaft.

3. The washing machine according to claim 2, wherein the buffering material comprises a material having a liquid phase initially and changing to a solid phase having elasticity a predetermined period of time after contacting air.

4. The washing machine according to claim 3, wherein the buffering material comprises a silicon material.

5. The washing machine according to claim 2, wherein the flange shaft is formed with a recess to be filled with the buffering material.

6. A method for assembling a shaft system of a drum type washing machine, the shaft system comprising a flange shaft installed at a rear side of a drum to transmit rotational force of a motor to the drum, and a drum rotating shaft, the method comprising:

applying a buffering material to a portion at the rear side of the drum corresponding to an installation position of the flange shaft; and
installing the flange shaft to the drum having the buffering material applied thereto.

7. The method according to claim 6, wherein the buffering material comprises a material having a liquid phase initially and changing to a solid phase having elasticity a predetermined period of time after contacting air.

8. The method according to claim 7, wherein the buffering material comprises a silicon material.

9. A method for assembling a shaft system of a drum type washing machine, the shaft system comprising a flange shaft installed at a rear side of a drum to transmit rotational force of a motor to the drum, and

a drum rotating shaft, the method comprising:

applying a buffering material to a surface of the flange shaft brought into contact with the drum; and
installing the flange shaft having the buffering material to the drum.

10. A washing machine comprising:

a container for holding a load of clothes for washing;
a motor providing a rotational driving force; and
a flange shaft coupled to said motor and said container for transmitting the rotational driving force of said motor to said container;

wherein a buffering material is provided between said container and said flange shaft.

11. The washing machine as claimed in claim 10 further comprising a shaft for coupling said motor to said flange shaft.

12. The washing machine as claimed in claim 11 wherein said washing machine is a drum type.

13. The washing machine as claimed in claim 12 wherein said flange shaft has a plurality of arms extending outwardly from a center portion of said flange shaft.

14. The washing machine as claimed in claim 13 wherein said buffering material is provided between said container and at least one of said extending arms.

15. The washing machine as claimed in claim 14 wherein said buffering material fills up a gap formed between said container and said flange shaft.

16. The washing machine as claimed in claim 15 wherein said buffering material bonds said container and said flange shaft.

17. The washing machine as claimed in claim 16 wherein said buffering material has a substantial elasticity for absorbing shock.

18. The washing machine as claimed in claim 17 wherein said buffering material comprises of a material having a liquid phase initially and changing to a solid phase a predetermined period of time after contacting air.

19. The washing machine as claimed in claim 18 wherein said buffering material comprises of silicon material.

20. The washing machine as claimed in claim 19 wherein said flange is formed with a recess to be filled with

said buffering material.

21. The washing machine as claim in claim 10 wherein said flange shaft has a recess for receiving said buffering material.

22. The washing machine as claimed in claim 11 wherein said buffering material is a silicon material.

23. The washing machine as claimed in claim 10 wherein said washing machine is a drum type and said container is a drum.

24. The washing machine as claimed in claim 23 wherein said buffering material has a substantial elasticity for absorbing vibration generated by said drum.

25. The washing machine as claimed in claim 23 wherein said buffering material provides distribution of load to various portions of the flange shaft.

26. The washing machine as claimed in claim 10 wherein said flange shaft has a plurality of arms extending away from a center portion of said flange shaft.

27. The washing machine as claimed in claim 26 wherein said flange shaft has a fastener on said arms for fixing said flange shaft to said container.

28. The washing machine as claimed in claim 10 further comprising a water closet, wherein said container is disposed within said water closet.

29. The washing machine as claimed in claim 28 wherein said container has a plurality of perforations for allowing water to be moved between said container and said water closet.

30. The washing machine as claimed in claim 29 wherein said flange shaft is directly coupled to said container so as to rotate in unison.

FIG. 1

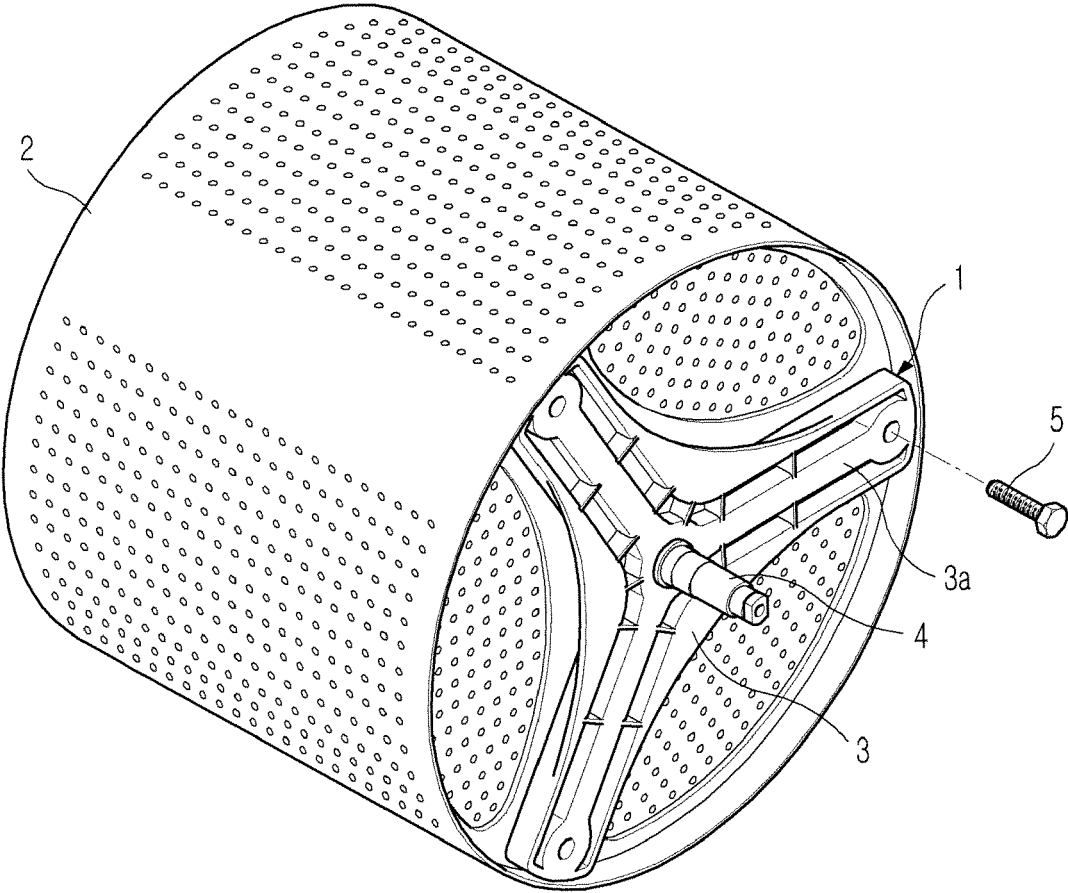


FIG. 2

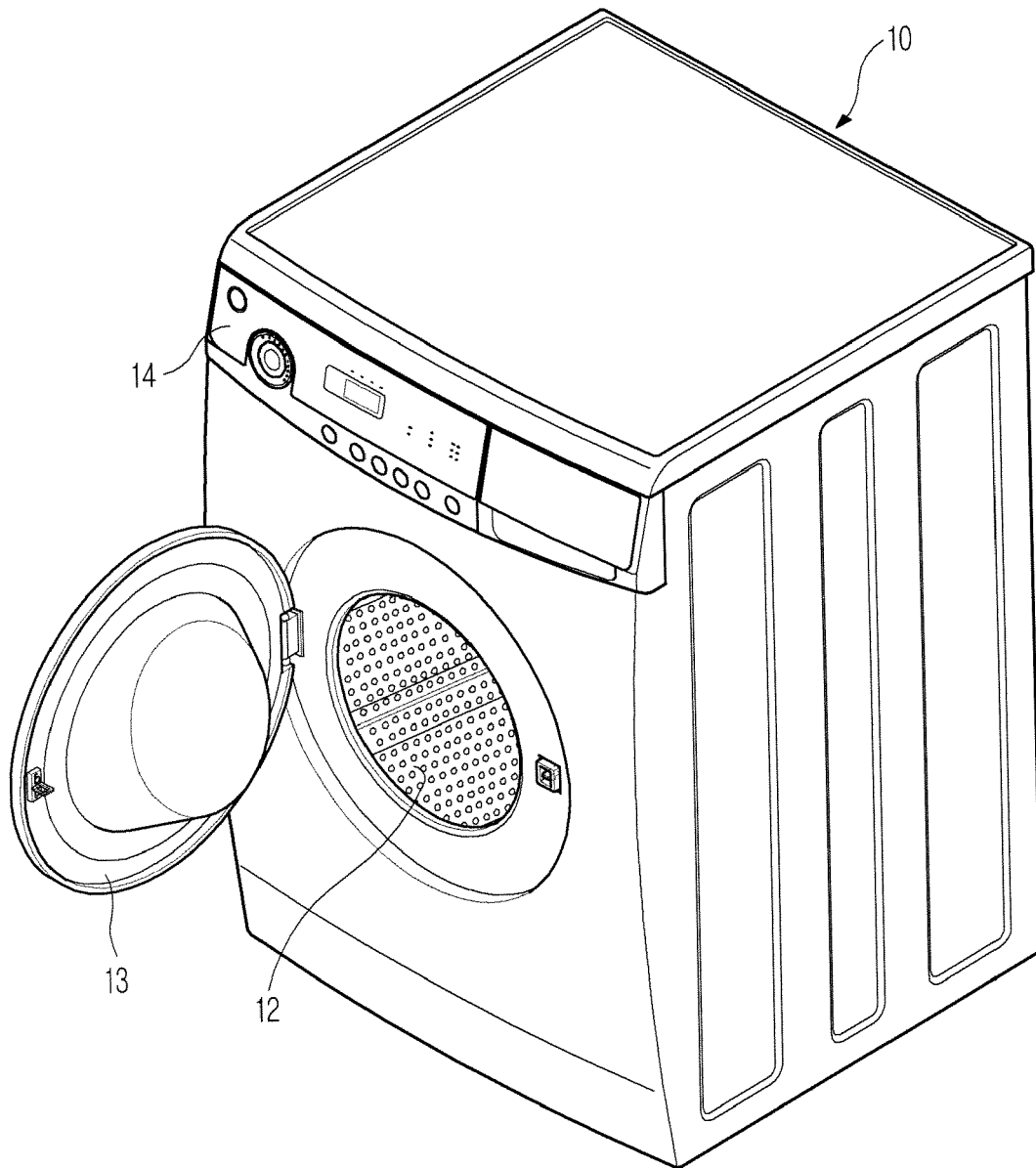


FIG. 4

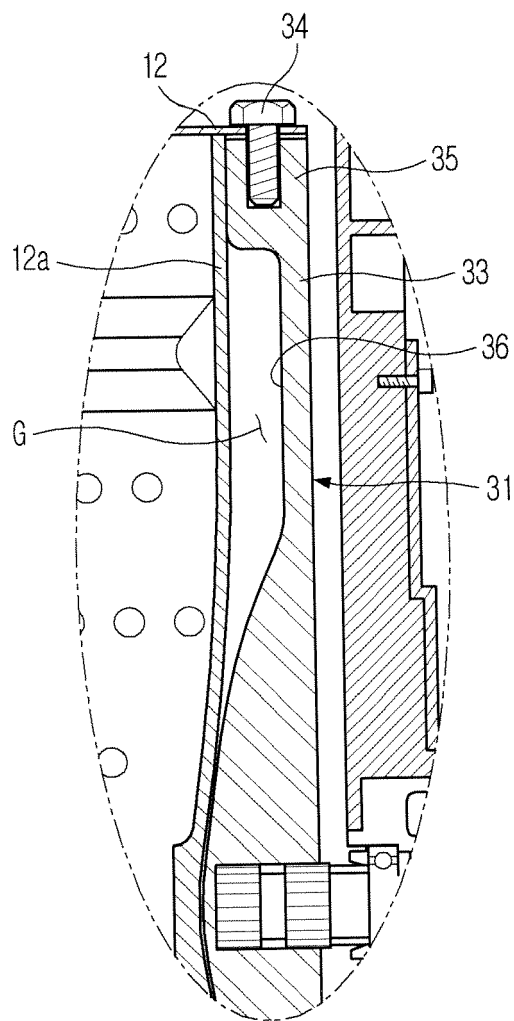


FIG. 5

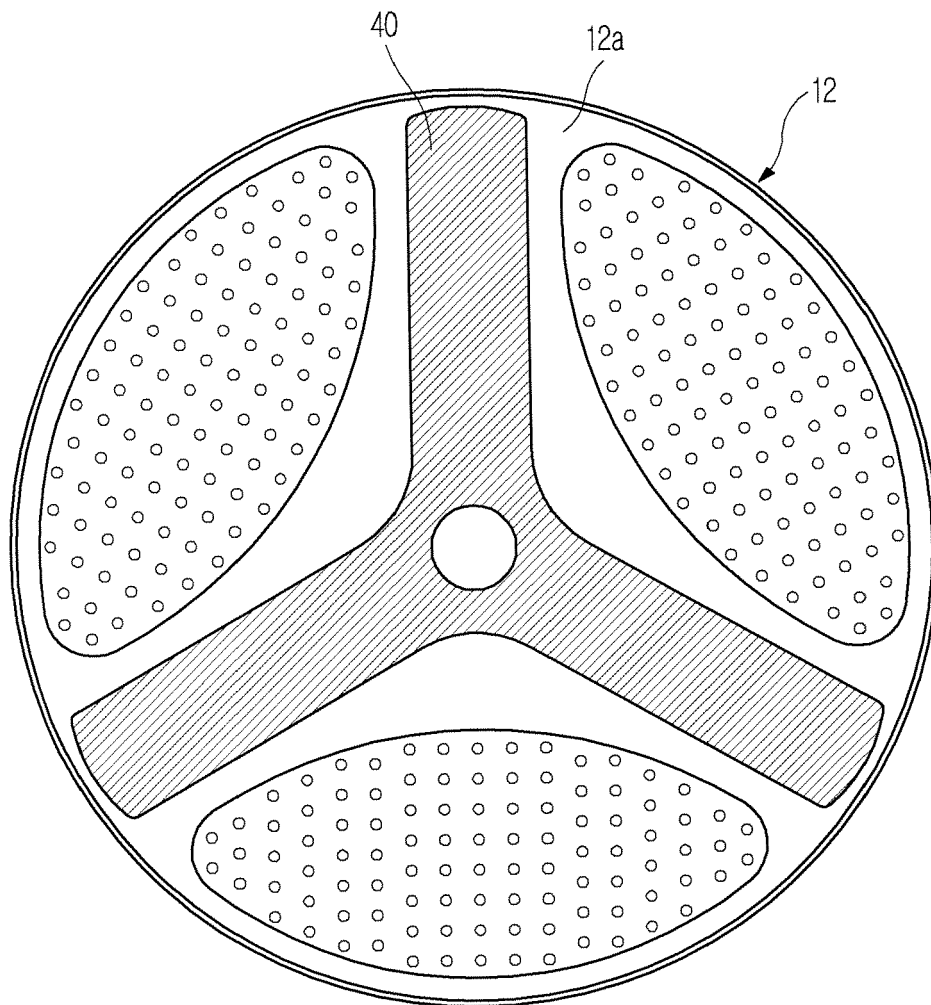
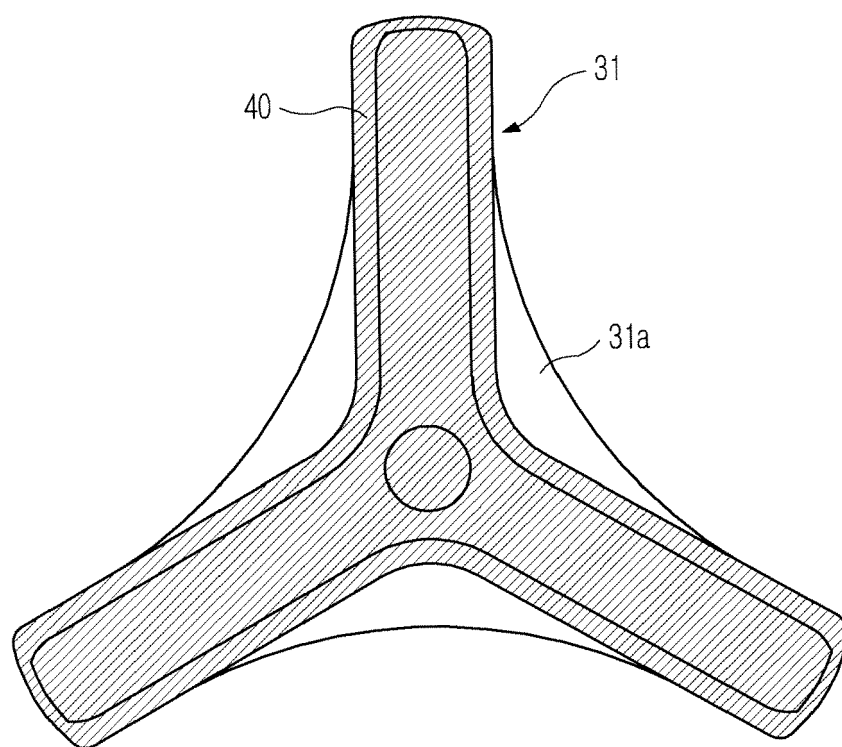


FIG. 6





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 11 9320

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 March 2007	Examiner Clivio, Eugenio
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 11 9320

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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