



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.05.2014 Bulletin 2014/19

(51) Int Cl.:
D06F 17/06 (2006.01)

(21) Application number: **12837898.1**

(86) International application number:
PCT/KR2012/008104

(22) Date of filing: **05.10.2012**

(87) International publication number:
WO 2013/051902 (11.04.2013 Gazette 2013/15)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

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(30) Priority: **06.10.2011 KR 20110101803**

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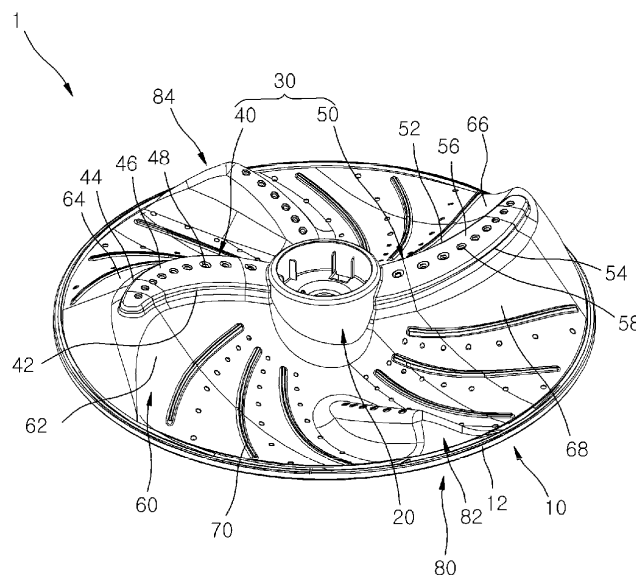
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(54) **PULSATOR FOR WASHING MACHINE**

(57) A pulsator for a washing machine includes a base; a rotating shaft positioned at a center of the base; a washing protrusion supported by the base, connected to the rotating shaft, and that protrudes upward; and a

curved surface portion supported by the based, and having convex and concave curved surfaces in succession thereon.

FIG. 1



Description

[Technical Field]

[0001] The present invention relates to a pulsator for a washing machine, and more particularly, to a pulsator for a washing machine, which is capable of generating water streams to rotate laundry items in forward and backward directions and to move the laundry items in a vertical direction, thereby improving washing efficiency and reducing damage to the laundry items.

[Background Art]

[0002] In general, a washing machine is a device that removes stains from laundry items by applying energy, such as impact to the laundry items. Depending on washing methods, washing machines may be divided into a drum-type washing machine and a pulsator-type washing machine.

[0003] The drum-type washing machine washes laundry items through friction between the laundry items and an inner surface of a washing tub, or impact caused by fall of the laundry items, when the laundry items are placed into and rotated in a rotating tub with water.

[0004] The pulsator-type washing machine washes laundry items through water streams, which are generated as the rotating tub rotates in a vertical direction from the ground, and a pulsator inside the rotating tub rotates.

[0005] The pulsator-type washing machine includes a tub, a rotating tub, and a driving unit inside a housing forming the exterior thereof. The tub stores water required for a washing process, the rotating tub is installed in the tub and has a pulsator provided at the bottom thereof, and the driving unit provides power for driving the rotating tub and the pulsator.

[0006] The related art of the present invention is disclosed in Korean Patent Laid-open Publication No. 1999-0021443 published on June 25, 1999 and titled "Pulsator of washing machine".

[Disclosure]

[Technical Problem]

[0007] The pulsator of the conventional washing machine forms only water streams to rotate laundry items in forward and backward directions, while rotating in the forward and backward directions. Thus, there is a limitation in increasing the washing power, and the laundry items may become tangled and thus damaged.

[0008] Therefore, there is a demand for a structure capable of solving such problems.

[0009] The present invention is conceived to solve such problems of the related art, and an aspect of the invention is to provide a pulsator for a washing machine, which is capable of generating water streams to rotate laundry items in forward and backward directions and to

move the laundry items in a vertical direction through the rotations of the pulsator, thereby improving washing efficiency and reducing damage to the laundry items.

5 [Technical Solution]

[0010] According to an aspect of the invention, a pulsator for a washing machine includes a base; a rotating shaft portion at a center of rotation of the base; a washing protrusion supported by the base, connected to the rotating shaft, and protruding upward; and a curved surface portion supported by the base and having convex and concave curved surfaces in succession thereon.

[0011] The washing protrusion may be formed on the curved surface portion.

[0012] The base may include a base body having a circular ring shape that surrounds the curved surface portion; and a rib member connecting the base body and the rotating shaft, and supporting the curved surface portion.

[0013] The washing protrusion may include a first washing protrusion having a spiral shape that protrudes from the rotating shaft toward the base body; and a second washing protrusion that is rotationally symmetrical with the first washing protrusion around the rotating shaft, and having a spiral shape that protrudes from the rotating shaft toward the base body.

[0014] The first washing protrusion may include a first wing member connected to the rotating shaft and protruding upward; a first concave side portion forming a concave side surface at the first wing member; and a first convex side portion forming a convex side surface at the first wing member.

[0015] The second washing protrusion may include a second wing member that is rotationally symmetrical with the first washing wing member around the rotating shaft, connected to the rotating shaft, and protruding upward; a second concave side portion forming a concave side surface at the second wing member; and a second convex side portion forming a convex side surface at the second wing member.

[0016] The curved surface portion may include a first rotation guide having one side in a concave curved shape and another side in a convex curved shape; a first rising guide having one side connected to the first rotation guide and in a convex curved shape and another side in a concave curved shape; a second rotation guide having one side connected to the first rising guide and in a concave curved shape and another side in a convex curved shape; and a second rising guide having one side connected to the second rotation guide and in a convex curved shape and another side connected to the first rotation guide and in a concave curved shape.

[0017] Furthermore, an inclined angle between the first rotation guide and the base body may be equal to an inclined angle between the second rotation guide and the base body.

[0018] Furthermore, an inclined angle between the first

rising guide and the base body may be equal to an inclined angle between the second rising guide and the base body.

[0019] The inclined angle between the first rotation guide and the base body may be smaller than the inclined angle between the first rising guide and the base body.

[0020] The pulsator may further include an auxiliary protrusion separate from the rotating shaft and on the curved surface portion.

[0021] The auxiliary protrusion may include a first auxiliary wing connected between the first rotation guide and the second rising guide; and a second auxiliary wing that is rotationally symmetrical with the first auxiliary wing around the rotating shaft, and connected between the second rotation guide and the first rising guide.

[0022] Each of the first and second auxiliary wings may be in a spiral shape and protrude from the rotating shaft toward the base body.

[0023] The pulsator may further include a guide protrusion on the curved surface portion, disposed between the washing protrusion and the auxiliary protrusion, having a spiral shape and protruding from the rotating shaft toward the base body.

[Advantageous Effects]

[0024] According to an embodiment of the invention, when the rotations of the pulsator for a washing machine are alternately performed in forward and backward directions, the rotations and vertical agitations of wash water are alternately performed. Thus, since the rotations and vertical agitations of the laundry items are alternately performed, the laundry items may be washed in a three-dimensional manner.

[0025] Furthermore, as the washing operation is performed in a three-dimensional manner, the washing efficiency of laundry items may be improved, and the laundry items may be prevented from being tangled and damaged.

[Best mode]

[0026] The above and other aspects, features and advantages of the invention will become apparent from the following detailed description in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic perspective view of a pulsator for a washing machine in accordance with an embodiment of the present invention;

FIG. 2 is a schematic plan view of the pulsator for a washing machine in accordance with an embodiment of the present invention;

FIG. 3 is a schematic perspective view illustrating a bottom surface of the pulsator for a washing machine in accordance with an embodiment of the present invention;

FIG. 4 is a schematic front view of the pulsator for a

washing machine in accordance with an embodiment of the present invention;

FIG. 5 schematically illustrates water streams that are generated when the pulsator for a washing machine is rotated in one direction in accordance with an embodiment of the present invention; and

FIG. 6 schematically illustrates water streams that are generated when the pulsator for a washing machine is rotated in a backward direction in accordance with an embodiment of the present invention.

[Detailed Description]

[0027] Embodiments of the invention will hereinafter be described in detail with reference to the accompanying drawings. It should be noted that the drawings are not to precise scale and may be exaggerated in thickness of lines or sizes of components for descriptive convenience and clarity only. Furthermore, the terms as used herein are defined by taking functions of the invention into account and can be changed according to the custom or intention of users or operators. Therefore, definition of the terms should be made according to the overall disclosures set forth herein.

[0028] FIG. 1 is a schematic perspective view of a pulsator for a washing machine in accordance with an embodiment of the present invention. FIG. 2 is a schematic plan view of the pulsator for a washing machine in accordance with an embodiment of the present invention. FIG. 3 is a schematic perspective view illustrating a bottom surface of the pulsator for a washing machine in accordance with an embodiment of the present invention. FIG. 4 is a schematic front view of the pulsator for a washing machine in accordance with an embodiment of the present invention. FIG. 5 schematically illustrates water streams that are generated when the pulsator for a washing machine is rotated in one direction in accordance with an embodiment of the present invention. FIG. 6 schematically illustrates water streams that are generated when the pulsator for a washing machine is rotated in a backward direction in accordance with an embodiment of the present invention.

[0029] Referring to FIGS. 1 to 4, the pulsator 1 for a washing machine in accordance with an embodiment of the present invention includes a base 10, a rotating shaft 20, a washing protrusion 30, a curved surface portion 60, a guide protrusion 70, and an auxiliary protrusion 80.

[0030] As shown in FIG. 1, the base 10 supports a bottom of the washing protrusion 30 and a bottom of the curved surface portion 60. The base 10 may be formed in various shapes including a disk shape.

[0031] In the present embodiment, the base 10 includes a base body 12 and a rib member 14. The base body 12 is formed in a circular ring shape to surround the washing protrusion 30 and the curved surface portion 60. The rib member 14 connects the base body 12 and the rotating shaft 20, and supports the bottom of the washing protrusion 30 and the bottom of the curved sur-

face portion 60.

[0032] The rib member 14 may support the washing protrusion 30 and the curved surface portion 60, while directly contacting the bottom of the washing protrusion 30 and the bottom of the curved surface portion 60. Furthermore, the rib member 14 may support the washing protrusion 30 and the curved surface portion 60, with a separate support provided between the bottom of the washing protrusion 30 and the bottom of the curved surface portion 60.

[0033] Referring to FIG. 3, the rib member 14 is formed as a vertical partition, and is radially distributed around the rotating shaft 20.

[0034] The rotating shaft 20 is at the center of rotation of the base 10. That is, the rotating shaft 20 is in the center of the base 10 to be coupled to a shaft member, which is rotated by a motor. Thus, the pulsator 1 for a washing machine is rotated about the rotating shaft 20.

[0035] The washing protrusion 30 is disposed over the rib member 14 and supported by the rib member 14. The washing protrusion 30 is connected to the rotating shaft 20, and protrudes in an upward direction, in an opposite direction to the rib member 14.

[0036] In the present embodiment, the washing protrusion 30 includes a first washing protrusion 40 and a second washing protrusion 50. The first washing protrusion 40 is formed in a spiral shape from the rotating shaft 20 toward the base body 12. The second washing protrusion 50 is formed in an opposite direction to the first washing protrusion 40 around the rotating shaft 20, and formed in a spiral shape from the rotating shaft 20 toward the base body 12, similar to the first washing protrusion 40.

[0037] That is, the first and second washing protrusions 40 and 50 protrude upward and are in a spiral shape. Furthermore, when the first washing protrusion 40, the rotating shaft 20, and the second washing protrusion 50 are connected to each other, an S-shape or reverse S-shape is formed.

[0038] The first washing protrusion 40 includes a first concave side portion 42, a first convex side portion 44, and a first wing member 46.

[0039] The first wing member 46 is connected to the rotating shaft 20 and protrudes in the upward direction corresponding to the opposite direction of the rib member 14. Specifically, the first wing member 46 is formed in a spiral shape from the rotating shaft 20 toward the base body 12. The top surface of the first wing member 46 may have a planar or curved shape.

[0040] The first concave side portion 42 and the first convex side portion 44 are provided at opposite sides of the first wing member 46. Specifically, the first concave side portion 42 has a concave side portion formed at the first wing member 46. The first convex side portion 44 has a convex side portion that faces the first concave side portion 42 and is formed at the first wing member 46.

[0041] The first wing member 46 includes a plurality of first through-holes 48 formed therein. In the present embodiment, the plurality of first through-holes 48 are ar-

ranged in a line from one end to an opposite end of the first wing member 46. Through the first through-holes 48, wash water or air bubbles are moved.

[0042] The second washing protrusion 50 is rotationally symmetrical with the first washing protrusion 40 around the rotating shaft 20. The second washing protrusion 50 includes a second concave side portion 52, a second convex side portion 54, and a second wing member 56.

[0043] The second wing member 56 is connected to the rotating shaft 20 in an opposite direction to the first wing member 46, and protrudes in the upward direction from the rib member 14. Specifically, the second wing member 56 is formed in a spiral shape from the rotating shaft 20 toward the base body 12. The top surface of the second wing member 56 may have a planar or curved shape.

[0044] The second concave side portion 52 and the second convex side portion 54 are provided at opposite sides of the second wing member 56. Specifically, the second concave side portion 52 has a concave side portion formed at the second wing member 56. The second convex side portion 54 has a convex side portion that faces the second concave side portion 52 and is formed at the second wing member 56.

[0045] The second wing member 56 includes a plurality of second through-holes 58 formed therein. In the present embodiment, the plurality of second through-holes 58 are arranged in a line from one end to an opposite end of the second wing member 56. Through the second through-holes 58, wash water or air bubbles are moved.

[0046] Since the first and second concave side portions 42 and 52 are rotationally symmetrical with each other around the rotating shaft 20, the first and second concave side portions 42 and 52 generate the same type of water streams when the pulsator 1 for a washing machine is rotated. Similarly, since the first and second convex side portions 44 and 54 are rotationally symmetrical with each other around the rotating shaft 20, the first and second convex side portions 44 and 54 generate the same type of water streams during the rotation of the pulsator 1.

[0047] When the pulsator 1 for a washing machine is rotated in a forward direction (the counterclockwise direction in FIG. 2), water streams are generated by the first wing member 46. At this time, the first concave side portion 42 at the front in the rotation direction of the pulsator 1 first comes in contact with wash water, before the first convex side portion 44 in the rear in the rotation direction of the pulsator 1. Thus, the water streams are generated mainly by the first concave side portion 42, forming one side surface of the first wing member 46.

[0048] Similarly, when the pulsator 1 for a washing machine is rotated in the forward direction, water streams are generated by the second wing member 56. At this time, the second concave side portion 52 at the front in the rotation direction of the pulsator 1 first comes in contact with wash water, before the second convex side por-

tion 54 in the rear in the rotation direction of the pulsator 1. Thus, the water streams are generated mainly by the second concave side portion 52, forming one side surface of the second wing member 56.

[0049] As such, when the pulsator 1 for a washing machine is rotated in the forward direction, laundry items are washed through the water streams generated by the first concave side portion 42 and the second convex side portion 52.

[0050] When the pulsator 1 for a washing machine is rotated in a backward direction (the clockwise direction in FIG. 2), water streams are generated by the first wing member 46. At this time, the first convex side portion 44 at the front in the rotation direction of the pulsator 1 first comes in contact with wash water, before the first concave side portion 42 in the rear in the rotation direction of the pulsator 1. Thus, the water streams are generated mainly by the first convex side portion 44, forming the other side surface of the first wing member 46.

[0051] Similarly, when the pulsator 1 for a washing machine is rotated in the backward direction, water streams are generated by the second wing member 56. At this time, the second convex side portion 54 at the front in the rotation direction of the pulsator 1 first comes in contact with wash water, before the second concave side portion 52 in the rear in the rotation direction of the pulsator 1. Thus, the water streams are generated mainly by the second convex side portion 54, forming the other side surface of the second wing member 56.

[0052] As such, when the pulsator 1 for a washing machine is rotated in the backward direction, laundry items are washed through the water streams generated by the first convex side portion 44 and the second convex side portion 54.

[0053] In the present embodiment, it has been described that the first concave side portion 42 is formed at the left side surface of the first wing member 46 and the first convex side portion 44 is formed at the right side surface of the first wing member 46, based on FIG. 2. However, the present invention is not limited thereto. Thus, the first convex side portion may be formed at the left side surface of the first wing member 46, and the first concave side portion may be formed at the right side surface of the first wing member 46.

[0054] Similarly, in the present invention, it has been described that the second concave side portion 52 is formed at the right side surface of the second wing member 56 and the second convex side portion 54 is formed at the left side surface of the second wing member 56, based on FIG. 2. However, the present invention is not limited thereto. Thus, the second convex side portion may be formed at the right side surface of the second wing member 56, and the second concave side portion may be formed at the left side surface of the second wing member 56.

[0055] The curved surface portion 60 is supported by the base 10, or more specifically, the rib member 14. The curved surface portion 60 includes a convex curved sur-

face and a concave curved surface in succession, like a wave, in one rotational direction around the rotating shaft 20. In accordance with the present embodiment, the curved surface portion 60 includes a first rotation guide 62, a first rising guide 64, a second rotation guide 66, and a second rising guide 68.

[0056] One side of the first rotation guide 62 is connected to the second rising guide 68, and another side of the first rotation guide 62 is connected to the first concave side portion 42. That is, the first rotation guide 62 connects the second rising guide 68 and the first concave side portion 42. The first rotation guide 62 has a concave curved shape at a portion in contact with the second rising guide 68, that gradually protrudes upward, and has a convex curved shape at a portion in contact with the first concave side portion 42.

[0057] One side of the first rising guide 64 is connected to the first convex side portion 44, and another side of the first rising guide 64 is connected to the second rotation guide 66. That is, the first rising guide 64 connects the first convex side portion 44 and the second rotation guide 66. The first rising guide 64 has a convex curved shape at a portion in contact with the first convex side portion 44, that gradually slopes downward, and has a concave curved shape at a portion in contact with the second rotation guide 66.

[0058] One side of the second rotation guide 66 is connected to the first rising guide 64, and another side of the second rotation guide 66 is connected to the second concave side portion 52. That is, the second rotation guide 66 connects the first rising guide 64 and the second concave side portion 52. The second rotation guide 66 has a concave curved shape at a portion in contact with the first rising guide 64 which gradually protrudes upward, and has a convex curved shape at a portion in contact with the second concave side portion 52.

[0059] One side of the second rising guide 68 is connected to the second convex side portion 54, and another side of the second rising guide 68 is connected to the first rotation guide 62. That is, the second rising guide 68 connects the second convex side portion 54 and the first rotation guide 62. The second rising guide 68 has a convex curved shape at a portion in contact with the second convex side portion 54 that gradually slopes downward, and has a concave curved shape at a portion in contact with the first rotation guide 62.

[0060] An inclined angle A1 between the first rotation guide 62 and the base body 12 is equal to an inclined angle A2 between the second rotation guide 66 and the base body 12. Thus, when the pulsator 1 for a washing machine is rotated, the shape of water streams generated by the first rotation guide 62 and the first concave side portion 42 is identical to the shape of water streams generated by the second rotation guide 66 and the second concave side portion 52.

[0061] An inclined angle B1 between the first rising guide 64 and the base body 12 is equal to an inclined angle B2 between the second rising guide 68 and the

base body 12. Thus, when the pulsator 1 for a washing machine is rotated, the shape of water streams generated by the first rising guide 64 and the first convex side portion 44 is identical to the shape of water streams generated by the second rising guide 68 and the second convex side portion 54.

[0062] In the present embodiment, the inclined angle A1 between the first rotation guide 62 and the base body 12 is smaller than the inclined angle B1 between the first rising guide 64 and the base body 12. Similarly, the inclined angle A2 between the second rotation guide 66 and the base body 12 is smaller than the inclined angle B2 between the second rising guide 68 and the base body 12.

[0063] When the pulsator 1 for a washing machine is rotated in the forward direction (the counterclockwise direction in FIG. 2), the shape of the water streams generated by the first rotation guide 62 and the first concave side portion 42 is identical to the shape of the water streams generated by the second rotation guide 66 and the second concave side portion 52.

[0064] When the pulsator 1 for a washing machine is rotated in the forward direction (the counterclockwise direction in FIG. 2), the water streams are generated mainly by the first rotation guide 62 of the curved surface portion 60, the first concave side portion 42 of the first washing protrusion 40, the second rotation guide 66 of the curved surface portion 60, and the second concave side portion 52 of the second washing protrusion 50. The water streams generated in such a manner mainly rotate wash water and laundry items in the rotation direction, but do not significantly move the wash water and the laundry items in a vertical direction.

[0065] On the other hand, when the pulsator 1 for a washing machine is rotated in the backward direction (the clockwise direction in FIG. 2), the water streams are generated mainly by the first rising guide 64 of the curved surface portion 60, the first convex side portion 44 of the first washing protrusion 40, the second rising guide 68 of the curved surface portion 60, and the second convex side portion 54 of the second washing protrusion 50. The water streams generated in such a manner mainly move the wash water and the laundry items in the vertical direction, but do not significantly rotate the wash water and the laundry items in the rotation direction.

[0066] As such, when the pulsator 1 is rotated in the forward direction, the wash water and the laundry items are rotated in the rotation direction of the pulsator 1, and when the pulsator 1 is rotated in the backward direction, the wash water and the laundry items are moved in a vertical direction. As the rotations and vertical agitations of the laundry items are alternately performed, the wash operation may be performed in a three-dimensional manner, which makes it possible to improve the washing efficiency.

[0067] The guide protrusion 70 has a spiral shape from the rotating shaft 20 toward the base body 12. In the present embodiment, a plurality of guide protrusions 70

are on the curved surface portion 60, and protrude upward in a shape corresponding to the shape of the first or second washing protrusion 40 or 50.

[0068] The guide protrusions 70 serve to apply an additional rotating force to the wash water and laundry items that are rotated by the curved surface portion 60 and the washing protrusion 30. As the guide protrusions 70 are additionally formed, the rotating force for the laundry items is further increased, and the washing efficiency is also improved.

[0069] The auxiliary protrusion 80 has a spiral shape from the rotating shaft 20 toward the base body 12. In the present embodiment, one or more auxiliary protrusions 80 are on the curved surface portion 60. As the auxiliary protrusions 80 protrude upward, the auxiliary protrusions 80, the washing protrusion 30, and the curved surface portion 60 influence the generation of the water streams. As the auxiliary protrusion portions 80 are additionally formed, the rotating force for the laundry items is further increased, and the laundry items are significantly moved in the vertical direction. Thus, the washing efficiency is further improved.

[0070] In the present embodiment, since the auxiliary protrusion 80 has a smaller height than the washing protrusion 30, the auxiliary protrusion 80 performs an auxiliary role in the generation of water streams by the washing protrusion 30 and the curved surface portion 60.

[0071] The auxiliary protrusion 80 includes a first auxiliary wing 82 and a second auxiliary wing 84. The plurality of guide protrusions 70 are between the first wing member 46 and the first auxiliary wing 82, between the first auxiliary wing 82 and the second wing member 56, between the second wing member 56 and the second auxiliary wing 84, and between the second auxiliary wing 84 and the first wing member 46, respectively.

[0072] The first auxiliary wing 82 is formed on the curved surface portion 60 between the first concave side portion 42 of the first washing protrusion 40 and the second convex side portion 54 of the second washing protrusion 50. That is, the first auxiliary wing 82 protrudes upward at a connection between the first rotation guide 62 and the second rising guide 68.

[0073] The second auxiliary wing 84 is formed on the curved surface portion 60 between the first concave side portion 52 of the second washing protrusion 50 and the first convex side portion 44 of the first washing protrusion 40. That is, the second auxiliary wing 84 protrudes upward at a connection between the second rotation guide 66 and the first rising guide 64.

[0074] The first auxiliary wing 82 and the second auxiliary wing 84 are rotationally symmetrical with each other around the rotating shaft 20.

[0075] As described above, the first washing protrusion 40 and the second washing protrusion 50 are rotationally symmetrical with each other around the rotating shaft 20, the plurality of guide protrusions 70 are rotationally symmetrical with each other around the rotating shaft 20, and the first auxiliary wing 82 and the second

auxiliary wing 84 are rotationally symmetrical with each other around the rotating shaft 20. Thus, when the pulsator 1 for a washing machine is rotated, the same type of water streams may be generated by both sides.

[0076] Since the curved surface portion 60 has a plurality of through-holes formed therein, wash water and air bubbles may move through the through-holes.

[0077] Hereinafter, an operation of the pulsator for a washing machine in accordance with an embodiment of the present invention will be described in detail.

[0078] Referring to FIG. 5, when the pulsator 1 for a washing machine is rotated in the forward direction (the counterclockwise direction), water streams are generated mainly by the first rotation guide 62 of the curved portion 60, the first concave side portion 42 of the first washing protrusion 40, the second rotation guide 66 of the curved surface portion 60, and the second concave side portion 52 of the second washing protrusion 50.

[0079] The inclined angle A1 of the first rotation guide 62 is smaller than the inclined angle B1 of the first rising guide 64, and the inclined angle A2 of the second rotation guide 66 is smaller than the inclined angle B2 of the second rising guide 68. Thus, when the pulsator 1 for a washing machine is rotated in the forward direction, a rotating force rather than a rising force is mainly applied to the wash water by the first rotation guide 62 and the second rotation guide 66.

[0080] Furthermore, since the first and second concave side portions 42 and 52 are concave in the rotation direction, the wash water reaching the first and second concave side portions 42 and 52 does not disperse in different directions, but is pulled in the rotation direction by the first and second concave side portions 42 and 52.

[0081] Therefore, when the pulsator 1 for a washing machine is rotated in the forward direction, the water streams rotating in the forward direction are stronger than the water streams rising in the upward direction. Thus, the wash water and laundry items are rotated in the forward direction rather than moved in the vertical direction.

[0082] On the other hand, referring to FIG. 6, when the pulsator 1 for a washing machine is rotated in the backward direction (the clockwise direction), water streams are generated mainly by the first rising guide 64 of the curved surface portion 60, the first convex side portion 44 of the first washing protrusion 40, the second rising guide 68 of the curved surface portion 60, and the second convex side portion 54 of the second washing protrusion 50.

[0083] The inclined angle B1 of the first rising guide 64 is larger than the inclined angle A1 of the first rotation guide 62, and the inclined angle B2 of the second rising guide 68 is larger than the inclined angle A2 of the second rotation guide 66. Thus, when the pulsator 1 for a washing machine is rotated in the backward direction, a rising force rather than a rotating force is mainly applied to the wash water by the first and second rising guides 64 and 68.

[0084] Furthermore, since the first and second convex

side portions 44 and 54 are convex in the rotation direction, the wash water reaching the first and second convex side portions 44 and 54 disperses in different directions and is lifted upward by the first and second convex side portions 44 and 54.

[0085] Therefore, when the pulsator 1 for a washing machine is rotated in the backward direction, the water streams rising in the upward direction are stronger than the water streams rotating in the backward direction. Thus, the wash water and laundry items are moved in the vertical direction rather than rotated in the backward direction.

[0086] As described above, when the rotations of the pulsator 1 for a washing machine are alternately performed in the forward and backward directions, the rotations and vertical agitations of wash water are alternately performed. Thus, since the rotations and vertical agitations of laundry items are alternately performed, the laundry items may be washed in a three-dimensional manner. Therefore, it is possible to improve the washing efficiency of the laundry items, and prevent the laundry items from being tangled and damaged.

[0087] Although some embodiments have been provided to illustrate the invention in conjunction with the drawings, it will be apparent to those skilled in the art that the embodiments are given by way of illustration only, and that various modifications and equivalent embodiments can be made without departing from the spirit and scope of the invention. The scope of the invention should be limited only by the accompanying claims.

[0088] In the present embodiment, a pulsator used for a domestic washing machine has been taken as an example for description. However, this is only an example, and the pulsator for a washing machine in accordance with the embodiment of the present invention may be applied to washing machines for industrial use and washing machines for business use.

Claims

1. A pulsator for a washing machine, comprising:

a base;
a rotating shaft positioned at a center of rotation of the base;
a washing protrusion supported by the base connected to the rotating shaft and protruding upward; and
a curved surface portion supported by the base, having convex and concave curved surfaces in succession thereon.

2. The pulsator of claim 1, wherein the washing protrusion is on the curved surface portion.

3. The pulsator of claim 1, wherein the base comprises:

- a base body having a circular ring shape surrounding the curved surface portion; and a rib member connecting the base body and the rotating shaft and supporting the curved surface portion.
4. The pulsator of claim 3, wherein the washing protrusion comprises:
- a first washing protrusion that protrudes in a spiral shape from the rotating shaft toward the base body; and
- a second washing protrusion that is rotationally symmetrical with the first washing protrusion around the rotating shaft, and that protrudes in a spiral shape from the rotating shaft toward the base body.
5. The pulsator of claim 4, wherein the first washing protrusion comprises:
- a first wing member connected to the rotating shaft and that protrudes upward;
- a first concave side portion having a concave side surface at the first wing member; and
- a first convex side portion having a convex side surface at the first wing member.
6. The pulsator of claim 5, wherein the second washing protrusion comprises:
- a second wing member that is rotationally symmetrical with the first washing wing member around the rotating shaft, connected to the rotating shaft, and that protrudes upward;
- a second concave side portion having a concave side surface at the second wing member; and
- a second convex side portion having a convex side surface at the second wing member.
7. The pulsator of claim 6, wherein the curved surface portion comprises:
- a first rotation guide having one side in a concave curved shape and another side in a convex curved shape;
- a first rising guide having one side connected to the first rotation guide and in a convex curved shape and another side in a concave curved shape;
- a second rotation guide having one side connected to the first rising guide and in a concave curved shape and another side formed in a convex curved shape; and
- a second rising guide having one side connected to the second rotation guide and in a convex curved shape and another side connected to the first rotation guide and in a concave curved
- shape.
8. The pulsator of claim 7, wherein an inclined angle between the first rotation guide and the base body is equal to an inclined angle between the second rotation guide and the base body.
9. The pulsator of claim 8, wherein an inclined angle between the first rising guide and the base body is equal to an inclined angle between the second rising guide and the base body.
10. The pulsator of claim 9, wherein the inclined angle between the first rotation guide and the base body is smaller than the inclined angle between the first rising guide and the base body.
11. The pulsator of claim 7, further comprising an auxiliary protrusion separate from the rotating shaft and on the curved surface.
12. The pulsator of claim 11, wherein the auxiliary protrusion comprises:
- a first auxiliary wing at a connection between the first rotation guide and the second rising guide; and
- a second auxiliary wing that is rotationally symmetrical with the first auxiliary wing around the rotating shaft, and at a connection between the second rotation guide and the first rising guide.
13. The pulsator of claim 12, wherein each of the first and second auxiliary wings protrudes in a spiral shape from the rotating shaft toward the base body.
14. The pulsator of claim 11, further comprising a guide protrusion on the curved surface portion, between the washing protrusion and the auxiliary protrusion, which protrudes in a spiral shape from the rotating shaft toward the base body.

FIG. 1

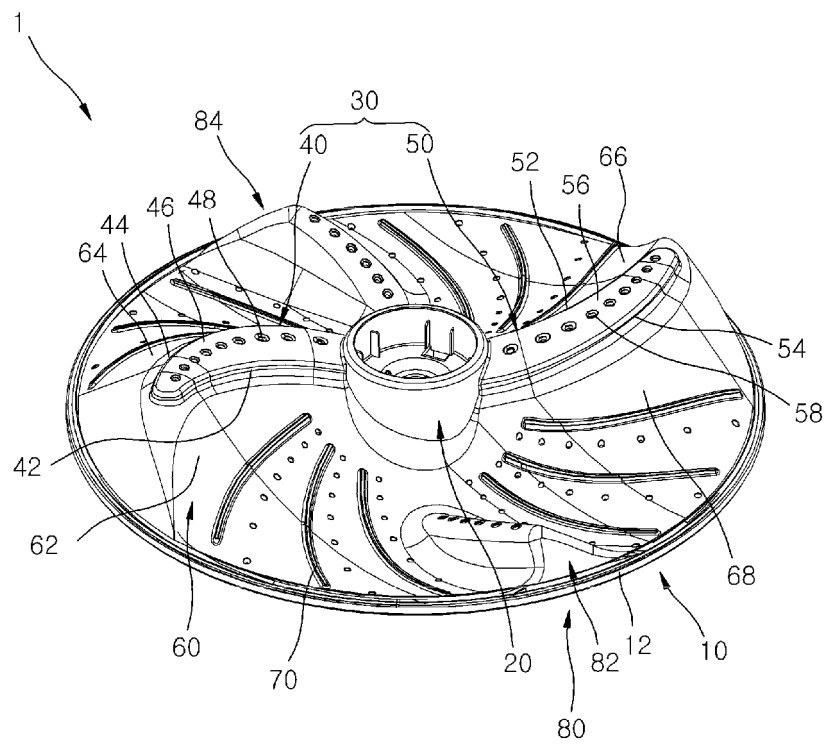


FIG. 2

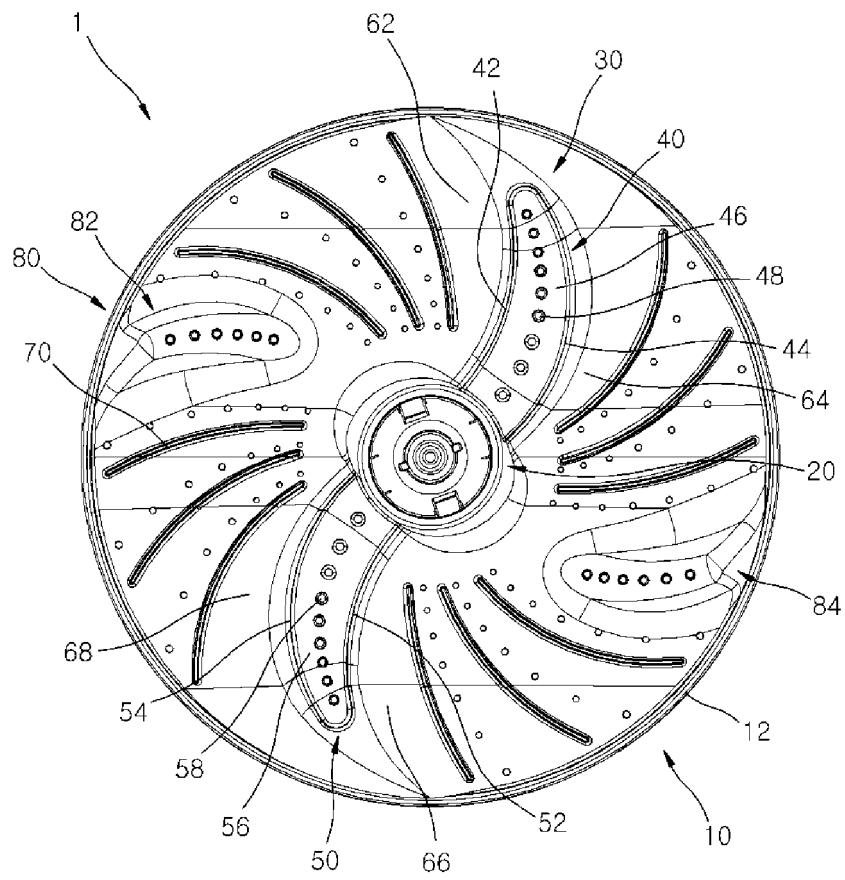


FIG. 3

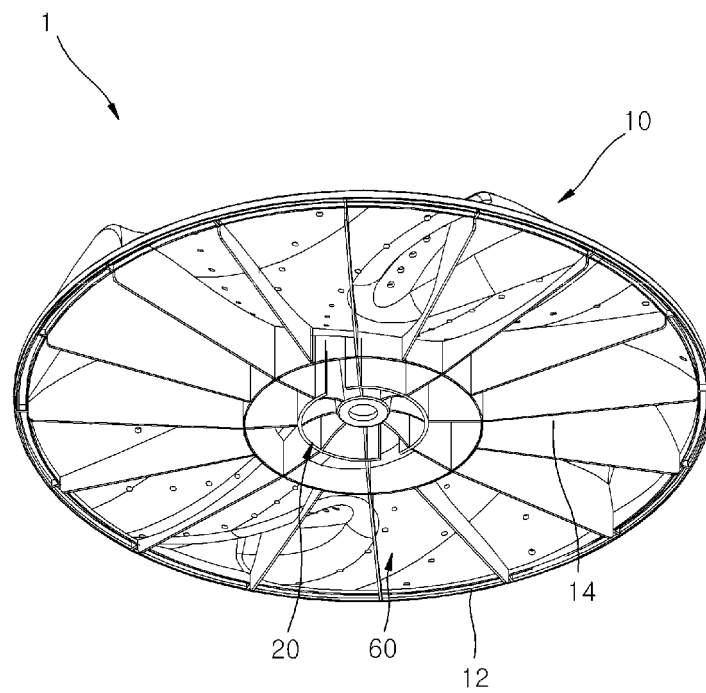


FIG. 4

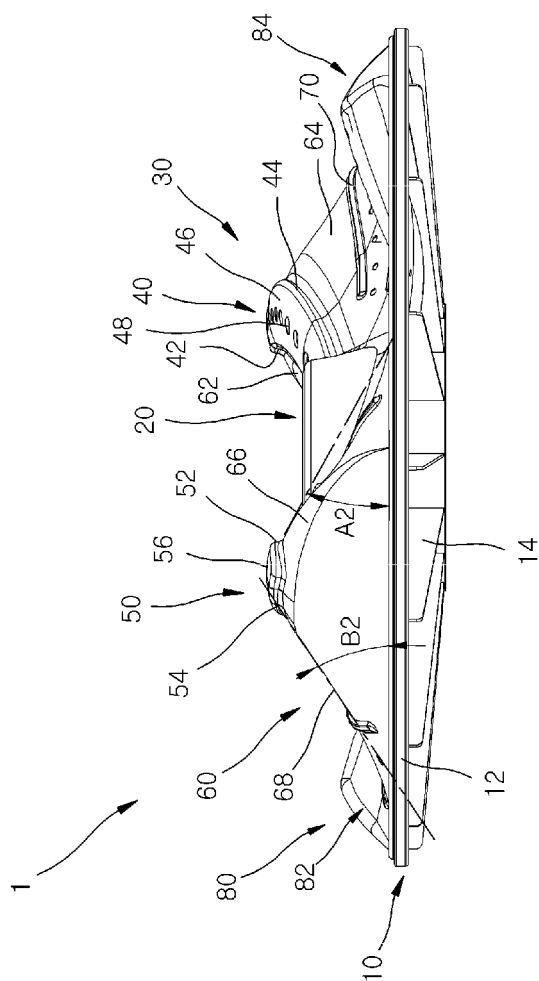


FIG. 5

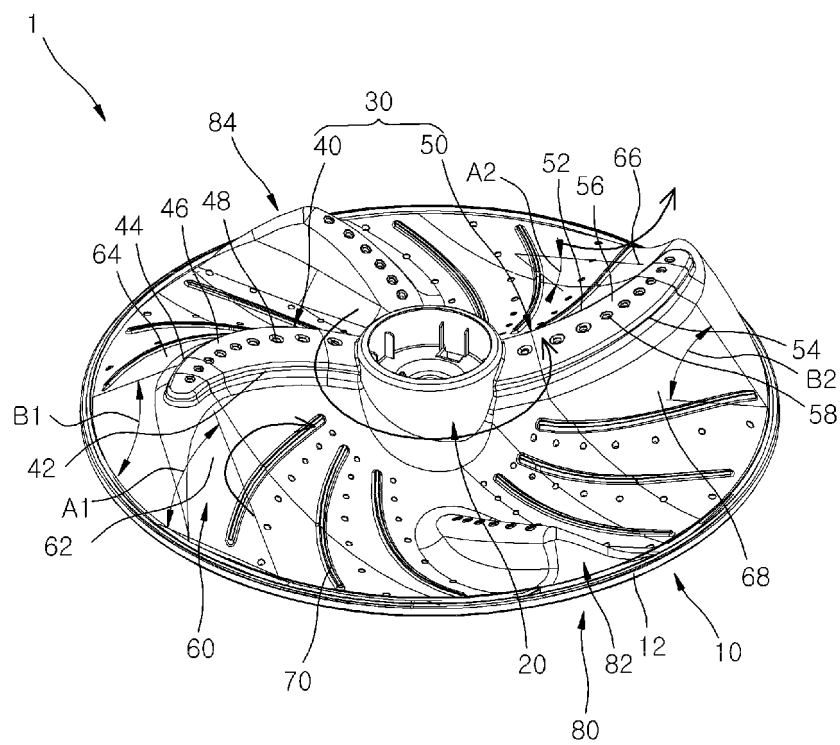
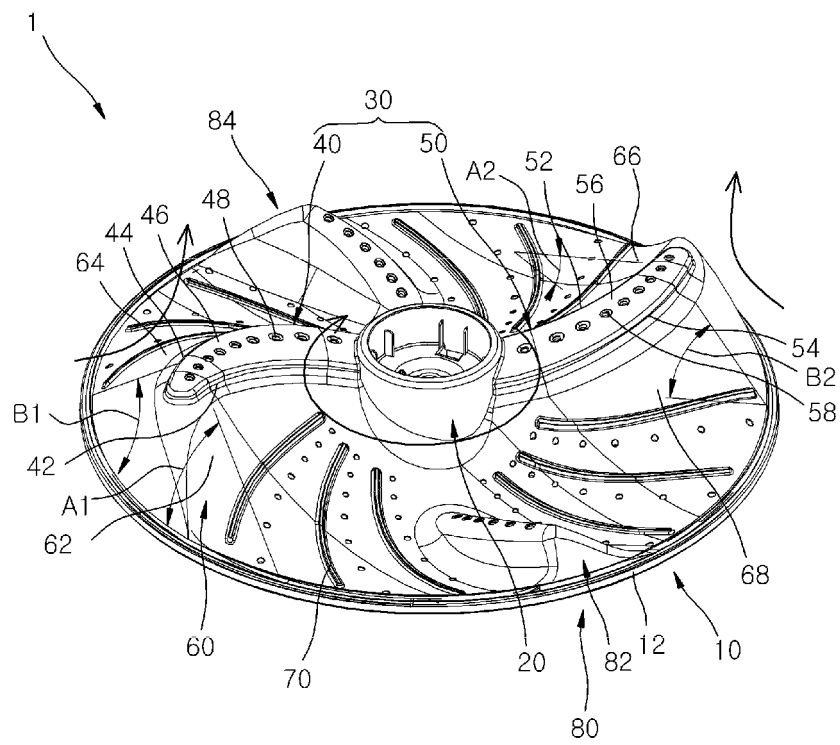


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/008104**A. CLASSIFICATION OF SUBJECT MATTER****D06F 17/06(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F 17/06; D06F 17/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & Keywords: pulsator*, washing vane*, rotary wing*, agitating vane*, impeller*, block*, concave*, curved surface *, incline*.**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-0190678 B1 (KABUSHIKI KAISHA TOSHIBA) 01 June 1999 See abstract, page 4, figures 1,2.	1-14
Y	JP 2007-007091 A (TOSHIBA CORP et al.) 18 January 2007 See abstract, paragraph [0042], figures 6,7,8.	1-14
Y	JP 08-164290 A (TOSHIBA CORP) 25 June 1996 See abstract, paragraph [0023], figure 1b.	3-14
Y	JP 56-121584 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 24 September 1981 See abstract, page 2, figures 2,5.	11-14

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

31 JANUARY 2013 (31.01.2013)

Date of mailing of the international search report

01 FEBRUARY 2013 (01.02.2013)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2012/008104

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REFERENCES CITED IN THE DESCRIPTION

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