



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

(43) Date of publication:
18.10.2017 Bulletin 2017/42

(51) Int Cl.:
D06F 39/08 (2006.01)

(21) Application number: **15867159.4**

(86) International application number:
PCT/CN2015/095670

(22) Date of filing: **26.11.2015**

(87) International publication number:
WO 2016/091081 (16.06.2016 Gazette 2016/24)

(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
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **09.12.2014 JP 2014249099**

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(54) **WASHING MACHINE**

(57) The present invention provides a washing machine capable of sprinkling water on washings contained in a washing tank without dead angle. The washing machine (1) includes an outer tank (3) capable of storing water, a cylindrical washing tank (5) contained in the outer tank (3), used for containing the washings and capable of rotating, and a water path (4) for absorbing water stored in the outer tank (3) and discharging the water into the washing tank (5) from an upper side (Z1). The washing tank (5) is provided with through holes (23) for allowing water to flow between the washing tank (5) and the outer tank (3). Discharging ports (43) for discharging water into the washing tank (5) from the upper side (Z1) through the water path (4) are arranged around whole area of the circumferential direction S of the washing tank (5).

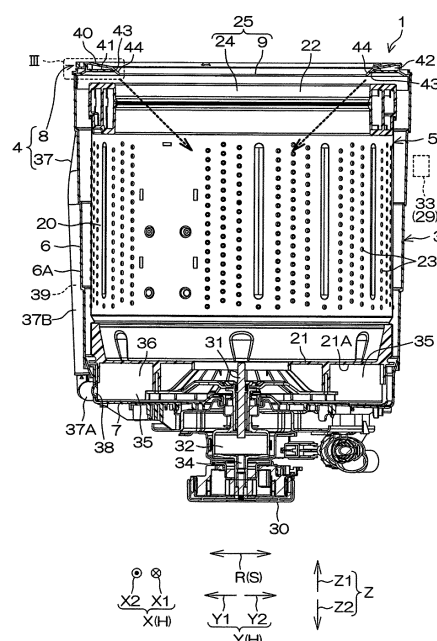


FIG. 2

Description

TECHNICAL FIELD

[0001] The present invention relates to a washing machine.

BACKGROUND

[0002] The washing machine in the following patent literature 1 has an impeller arranged at a bottom of the washing tank and one or more circulating water paths arranged at a side wall of the washing tank. A back blade is arranged on a back surface of the impeller.

[0003] When the back blade of the impeller rotates, washing water from the back surface of the impeller passes through the circulating water path, is discharged into the washing tank from the discharging ports at an upper end of the circulating water path and is sprinkled onto clothes in the washing tank.

Existing technical literature

Patent literature

Patent literature 1: Japan specifically disclosed No. 10-33883 Bulletin

Problems to be solved by the invention

[0004] In the washing machine of the patent literature 1, under a condition that only one circulating water path is arranged, the discharging port only exists at one circumferential position of the washing tank. Under a condition that a plurality of circulating water paths are arranged, a plurality of discharging ports are configured at intervals in the circumferential direction of the washing tank. Therefore, the washing water discharged from all the discharging ports only can reach limited positions in the circumferential direction in the washing tank. In this way, the washing water is hard to wholly sprinkle onto the clothes in the washing tank.

SUMMARY

[0005] The present invention is completed on the basis of the background and aims at providing a washing machine capable of sprinkling water on washings contained in a washing tank without dead angle.

Solution for solving the problems

[0006] The present invention provides a washing machine, including an outer tank capable of storing water, a cylindrical washing tank contained in the outer tank, having through holes for allowing water to flow between the washing tank and the outer tank, used for containing the washings and capable of rotating, and a water path

for absorbing water stored in the outer tank and discharging water into the washing tank from the upper side. Discharging ports for discharging water into the washing tank from the upper side through the water path are arranged around the whole area of the circumferential direction of the washing tank.

[0007] In addition, the present invention includes trimming parts for trimming local parts of the discharging ports. The trimming parts are separated from the water path.

[0008] In addition, the present invention includes a cover forming the outer tank. The cover is also used as at least one part of the water path.

[0009] In addition, the present invention includes a dispersing unit. The dispersing unit is used for dispersing and discharging water absorbed from the water path to a central side and an outer circumferential side of the washing tank from the discharging ports.

[0010] In addition, in the present invention, the dispersing unit includes ribs. The ribs are arranged in the water path and are used for distributing water from the discharging ports to the central side and the outer circumferential side of the washing tank.

[0011] In addition, in the present invention, the dispersing unit includes a changing unit for changing a rotating speed of the washing tank.

[0012] In addition, the present invention includes light sources lighted according to an operating state of the washing machine.

Effects of invention

[0013] According to the present invention, in the washing machine, the washing tank for containing washings is rotatably contained in the outer tank. Water in the outer tank generates centrifugal force and the like with the rotation of the washing tank. Therefore, the water path absorbs water stored in the outer tank. The discharging ports on the water path discharge water absorbed from the upper side into the washing tank. Water in the washing tank can flow between the washing tank and the outer tank through the through holes of the washing tank. Therefore, water can be used for washing while circulating, so that water can be saved.

[0014] Since the discharging ports are arranged around the whole area of the circumferential direction of the cylindrical washing tank, water can be discharged into the washing tank from the whole area of the circumferential direction of the washing tank. Therefore, water can be sprinkled on the washings contained in the washing tank without dead angle from the whole area of the circumferential direction of the washing tank..

[0015] In addition, a great amount of water can be discharged by the discharging ports arranged around the whole area of the circumferential direction of the washing tank. Thus, when the washings are cleaned, due to strong falling of a great amount of water discharged from the discharging ports into the washing tank, a water potential

in a falling process of water can be used for foaming detergent in the washing tank. Therefore, the washings can be cleaned effectively by the foamed detergent. Furthermore, due to strong falling of a great amount of water discharged from the discharging ports into the washing tank, the mechanical force acting on the washings is increased, and the cleaning capability of the washing machine can be improved. Besides, since the washings can be rinsed efficiently by a great amount of water discharged from the upper side into the washing tank, the time of rinsing operation can be shortened.

[0016] In addition, according to the present invention, the local parts of the discharging ports are trimmed by the trimming parts separated from the water path. Therefore, under a condition of blockage of the discharging ports due to dirt and the like, even though the water path is not split, the discharging ports can be widened by bending the trimming parts, thereby realizing easy cleaning for the discharging ports.

[0017] In addition, according to the present invention, since the cover forming the outer tank is also used as one part of the water path, the quantity of parts can be reduced.

[0018] In addition, according to the present invention, the dispersing unit disperses and discharges water absorbed from the water path to the central side and the outer circumferential side of the washing tank. Therefore, water can be further sprinkled onto the washings in the washing tank from the discharging ports without dead angle. Thus, the washings can be cleaned or rinsed more effectively.

[0019] In addition, according to the present invention, the dispersing unit also can be ribs arranged in the water path.

[0020] In addition, according to the present invention, the centrifugal force generated by water in the outer tank can be adjusted by utilizing the changing unit to change the rotating speed of the washing tank. Thus, the potential of water absorbed from the water path can be adjusted. Therefore, water with strong potential can be discharged to the central side of the washing tank from the discharging ports or water with weak potential can be discharged to the outer circumferential side from the discharging ports.

[0021] In addition, according to the present invention, the light sources are lighted according to the operating state of the washing machine. Therefore, the operating state of the washing machine can be visually transferred to a user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a stereoscopic diagram illustrating an internal structure of a washing machine 1 of one embodiment observed from an upper side in the present invention;

Fig. 2 is a vertical section view illustrating an internal structure of the washing machine 1;

Fig. 3 is an enlarged diagram of a part represented by III in Fig. 2;

Fig. 4 is a diagram illustrating the washing machine 1 observed from an upper side;

Fig. 5 is a diagram illustrating removal of a cover from an outer tank in the washing machine 1 of Fig. 4;

Fig. 6 is a diagram illustrating a first variation example of the present invention applied in Fig. 5;

Fig. 7 is a diagram illustrating a second variation example of the present invention applied in Fig. 3;

Fig. 8 is a diagram illustrating a third variation example of the present invention applied in Fig. 3;

Fig. 9 is a diagram illustrating a fourth variation example of the present invention applied in Fig. 2;

Fig. 10 is a diagram illustrating a fifth variation example of the present invention applied in Fig. 2;

Fig. 11 is a diagram illustrating a sixth variation example of the present invention applied in Fig. 5.

A list of reference numerals:

[0023] 1: washing machine; 3: outer tank; 4: water path; 5: washing tank; 23: through hole; 29: dispersing unit; 33: control part; 40: cover; 43: discharging port; 61: first rib; 62: second rib; 63: trimming part; 64: trimming part; 81: light source; 82: light source; 83: light source; S: circumferential direction; Z1: upper side.

DETAILED DESCRIPTION

[0024] An implementation mode of the present invention is described in detail below with reference to drawings. Fig. 1 is a stereoscopic diagram illustrating an internal structure of a washing machine 1 of one embodiment observed from an upper side in the present invention.

[0025] It should be noted that a gesture of the washing machine 1 in Fig. 1 prevails under a condition of mentioning directions of the washing machine 1. An up-down direction in Fig. 1 is consistent with an up-down direction Z (vertical) of the washing machine 1. In the up-down direction Z, an upper side is called as an upper side Z1 and a lower side is called as a lower side Z2. A left-right direction in Fig. 1 is consistent with a left-right direction X of the washing machine 1. In the left-right direction X, a left side is called as a left side X1 and a right side is called as a right side X2. A direction orthogonal to the up-down direction Z and the left-right direction X is a front-rear direction Y of the washing machine 1. In the front-rear direction Y, a front side is called as a front side Y1 and a rear side is called as a rear side Y2. The left-right direction X and the front-rear direction Y are included in a horizontal direction H (transverse).

[0026] Referring to Fig. 1, the washing machine 1 includes an enclosure 2, an outer tank 3 and a washing tank 5. The enclosure 2 is a hollow body in a roughly

cuboid shape, and the outer tank 3 and the washing tank 5 are contained in the enclosure 2.

[0027] The outer tank 3 is supported by the enclosure 2 through a plurality of hanger rods (not shown in the drawings) with springs and damping mechanisms. The outer tank 3 is formed in a cylindrical shape having an axis extending along the up-down direction Z, and is made from resin. A circumferential direction of the cylindrical outer tank 3 is called as a circumferential direction S. In the circumferential direction S, a clockwise side observed from the upper side Z1 is called as a clockwise side S1, and an anticlockwise side observed from the upper side Z1 is called as an anticlockwise side S2. A radial direction of the outer tank 3 is called as a radial direction R. In the radial direction R, an inner side close to the axis of the outer tank 3 is called as a radial inner side R1, and an outer side far away from the axis is called as a radial outer side R2.

[0028] The outer tank 3 has a cylindrical side wall 6 extending along the up-down direction Z, a disc-shaped bottom wall 7 extending flatly along the horizontal direction H and blocking a lower end of the side wall 6, and a hollow annular wall 8 protruding from an upper end part of the side wall 6 to the radial inner side R1 around the whole area of the circumferential direction S. The outer circumferential surface 6A of the side wall 6 is an outer side surface of the outer tank 3. In the outer tank 3, water is stored from the side of the bottom wall 7.

[0029] A round opening 9 divided by the inner circumferential edge of the annular wall 8 is formed at an upper end of the outer tank 3. Due to the opening 9, the inner part of the outer tank 3 is exposed to the upper side Z1. The annular wall 8 has a plurality of (four herein) protrusions 10. The plurality of protrusions 10 are arranged at intervals in the circumferential direction S. Observed from the upper side Z1, the protrusions form a roughly triangular shape from an outer circumferential part of the annular wall 8 to the radial outer side R2. The protrusions 10 are respectively configured at four corners of the enclosure 2 forming a roughly quadrangular shape when being viewed from the upper side. All the protrusions 10 are hollow.

[0030] The washing tank 5 is formed in a cylindrical shape with an axis extending along the up-down direction Z, and is slightly smaller than the outer tank 3. The washings are contained in the washing tank 5. The washing tank 5 has a cylindrical side wall 20 made of metal and extending along the up-down direction Z, a disc-shaped bottom wall 21 made of resin and flatly extending along the horizontal direction H and blocking the lower end of the side wall 20, and a balancing ring 22 made of resin and arranged at the upper end of the washing tank 5. A plurality of through holes 23 are respectively formed in the side wall 20 and the bottom wall 21.

[0031] The balancing ring 22 is an annular hollow body having an inner space for containing liquid and is arranged coaxially to the upper end part of the side wall 20. When the washing tank 5 rotates like the after-men-

tioned content, the balance of rotation of the washing tank 5 is maintained by movement of the liquid in the balancing ring 22. A round opening 24 divided by the inner circumferential edge of the balancing ring 22 is formed at the upper end of the washing tank 5. Due to the opening 24, the inner part of the washing tank 5 is exposed to the upper side Z1.

[0032] The washing tank 5 is contained in the outer tank 3, and is roughly coaxial to the outer tank 3. Therefore, the circumferential direction of the washing tank 5 is the above-mentioned circumferential direction S, and the radial direction of the washing tank 5 is the above-mentioned radial direction R. The radial inner side R1 is a direction towards the central axis of the washing tank 5, and the radial outer side R2 is a direction far away from the axis of the washing tank 5 and towards the side wall 20 of the outer circumferential side. The opening 24 of the washing tank 5 is communicated with the opening 9 of the outer tank 3 from the lower side Z2. The openings 9 and 24 in a communication state form an access 25 of the washings. A user of the washing machine 1 puts the washings into the washing tank 5 or takes the washings out of the washing tank 5 through the access 25 from the upper side Z1. In the washing tank 5 contained in the outer tank 3, the bottom wall 21 is opposite to the bottom wall 7 of the outer tank 3 from the upper side Z across a gap.

[0033] Water stored in the outer tank 3 flows between the outer tank 3 and the washing tank 5 through the through holes in the side wall 20 and the bottom wall 21 of the washing tank 5. Therefore, a water level in the outer tank 3 is roughly consistent to that in the washing tank 5.

[0034] Fig. 2 is a longitudinal section view illustrating an internal structure of the washing machine 1. Specifically, Fig. 2 is a view of the section when a roughly central part of the left-right direction X of the washing machine 1 observed from the right part X2 is sectioned along the front-rear direction Y.

[0035] Referring to Fig. 2, the washing machine 1 includes a motor 30, a transmission shaft 31, a transmission mechanism 32 formed by a speed reducing mechanism and the like, and a dispersing unit 29.

[0036] The motor 30 is electrically driven to generate torque. The motor 30 is arranged in the enclosure 2 and configured at the lower side Z2 of the bottom wall 7 of the outer tank 3. The motor 30 is provided with an output shaft 34 for outputting torque. The output shaft 34 extends from the motor 30 to the upper side Z1.

[0037] The transmission shaft 31 penetrates through the circle center part of the bottom wall 7 of the outer tank 3 and extends towards the upper side Z1. The transmission shaft 31 is coaxially arranged with the output shaft 34 at the upper side Z1 of the output shaft 34. The output shaft 34 and the transmission shaft 31 are connected by the transmission mechanism 32.

[0038] The upper end part of the transmission shaft 31 is connected with the circle center part of the bottom wall

21 of the washing tank 5. Torque generated by the motor 30 is transmitted to the transmission shaft 31 via the output shaft 34 and the transmission mechanism 32. Therefore, the washing tank 5 rotates together with the transmission shaft 31 by adopting the transmission shaft 31 as a center of rotation. A rotating direction of the washing tank 5 is consistent with the circumferential direction S.

[0039] The dispersing unit 29 is a member for dispersing water to the central side and the outer circumferential side of the washing tank 5 and includes a control part 33 as a changing unit. The control part 33 is a microcomputer including CPU, ROM, RAM and the like, for example, and is configured in the enclosure 2 (referring to Fig. 1). The control part 33 is connected with the motor 30 by a signal circuit not shown in the drawings. The control part 33 can change the rotating speed of the washing tank 5 by controlling torque generated by the motor 30.

[0040] Under a state that detergent is dissolved in water stored in the outer tank 3, the washing operation for the washings contained in the washing tank 5 is executed by rotation of the washing tank 5. After the washing operation, under a state that the outer tank 3 supplies water, the rinsing operation for the washings contained in the washing tank 5 is executed by rotation of the washing tank 5. Under a state of drainage from the outer tank 3, the dewatering operation for the washings contained in the washing tank 5 is executed by high-speed rotation of the washing tank 5.

[0041] A plurality of blades 35 protruding towards the lower side Z2 are integrally arranged on the lower surface 21A of the bottom wall 21 of the washing tank 5. All the blades 35 form a plate shape linearly extending along the thin radial direction R in the circumferential direction S, and are radially configured by adopting the circle center of the bottom wall 21 as a reference. The blades 35 are configured in a gap 36 in the up-down direction Z between the bottom wall 21 and the bottom wall 7 of the outer groove 3 under a state of non-contacting with the outer tank 3.

[0042] The washing machine 1 includes a water path 4 contained in the enclosure 2. The water path 4 includes thin and long pipelines 37 made of resin. A plurality of pipelines 37 are arranged on the outer circumferential surface 6A of the side wall 6 in such a manner that quantity of pipelines 37 are same (four herein) as that of the above-mentioned protrusions 10 (referring to Fig. 1). The pipelines 37 have lower end parts 37A extending out along the horizontal direction H from the lower end part of the side wall 6 of the outer tank 3 to the radial outer side R2, middle parts 37B bending from the lower end parts 37A and extending along the outer circumferential surface 6A towards the upper side Z1, and upper end parts 37C (referring to Fig. 1) extending from the middle parts 37B to the upper side X and connected with the protrusions 10 from the lower side Z2. The middle parts 37B also may not need to extend linearly along the up-down direction Z, but extend towards the upper side Z1 while bending or folding as needed.

[0043] Like the protrusions 10, the pipelines 37 are respectively arranged at the four corners (referring to Fig. 1) of the enclosure 2. All the pipelines 37 have receiving ports 38 at the connecting parts between the lower end parts 37A and the side wall 6 of the outer tank 3, and the inner spaces 39 of the pipelines 37 are communicated with the inner part of the outer tank 3 through the receiving ports 38, specifically, communicated with the above-mentioned gap 36.

[0044] Besides the pipelines 37, the water path 4 further includes an annular wall 8 of the outer tank 3 as a component of the water path 4. The annular wall 8 includes a cover 40 and a bottom part 41. The cover 40 and the bottom part 41 form a ring shape extending along the circumferential direction S respectively. The cover 40 is in a thin plate shape in the up-down direction Z, and the closer to the radial inner side R1 the more inclination towards the lower side Z2 relative to the horizontal direction H. The bottom part 41 is in a thin plate in the up-down direction Z, and is configured along the horizontal direction H. The bottom part 41 is integrated with the upper end part of the side wall 6 of the outer tank 3. Therefore, since the cover 40 and the bottom part 41 forming the annular wall 8 of the outer tank 3 are used as part of the water path 4, the quantity of the parts can be reduced.

[0045] The cover 40 coaxially covers the bottom part 41 from the upper side Z1. An inner space 42 is formed between the cover 40 and the bottom part 41, the inner space 42 is a hollow part of the annular wall 8 and forms a ring shape extending along the circumferential direction S.

[0046] Fig. 3 is an enlarged diagram illustrating a part represented by III in Fig. 2. In Fig. 3, a right side of the paper is a radial inner side R1, and a left side of the paper is a radial outer side R2.

[0047] Referring to Fig. 3, the cover 40 includes a first part 44 at the radial inner side R1 and a second part 45 continuously extending from the first part 44 to the radial outer side R2. The inclination of the cover 40 relative to the horizontal direction H is different at a boundary of a connecting part 40A of the first part 44 and the second part 45. Inclination of the first part 44 relative to the horizontal direction H is more inclined than inclination of the second part 45 relative to the horizontal direction H. An outer side rib 40B protruding towards the lower side Z2 is arranged at the end part of the radial outer side R2 of the cover 40. An outer side rib 41A forming an arc shape protruding towards the upper side Z1 and extending along the circumferential direction S is arranged at the end part of the radial outer side R2 of the bottom part 41.

[0048] The outer side rib 40B of the cover 40 is contacted with the outer side rib 41A of the bottom part 41 from the radial outer side R2. In the cover 40, the connecting part 40A of the first part 44 and the second part 45 is opposite to the end part 41B of the radial inner side R1 of the bottom part 41 in a manner of closest to but not contact with the upper side Z1. An end part 44A of

the radial inner side R1 of the first part 44 is positioned at a lower side Z3 of the end part 41B of the bottom part 41 and is closer to the radial inner side R1.

[0049] The inner space 42 of the annular wall 8 includes a first space 46 closer to the radial inner side R1 than the outer side rib 41A of the bottom part 41 and formed by clamping of the second part 45 and the bottom part 41 of the cover 40 from the up-down direction Z. The first space 46 is in a ring shape extending along the circumferential direction S, and with inclination of the second part 45 of the cover 40, the closer to the radial inner side R1 the first space 46 is, the narrower in the up-down direction Z the first space 46 is.

[0050] Gaps between the connecting part 40A and the first part 44 of the cover 40, and the end part 41B of the radial inner side R1 of the bottom part 41 are discharging ports 43. The discharging ports 43 are formed in an annular slit shape extending along the circumferential direction S. That is to say, the discharging ports 43 are arranged at the end part of the radial inner side R1 of the annular wall 8 and around the whole area of the circumferential direction S. The discharging ports 43 are inclined along the first part 44 of the cover 40, and face the radial inner side R1 and the lower side Z2. Due to the discharging ports 43, the first space 46 of the inner space 42 is exposed towards the radial inner side R1 and around the whole area of the circumferential direction S (referring to Fig. 2).

[0051] Fig. 4 is a diagram of the washing machine 1 observed from the upper side Z1. Fig. 5 is a diagram illustrating removal of the cover 40 from the outer tank 3 in Fig. 4.

[0052] Referring to Fig. 4, the cover 40 has protrusions 48 protruding towards the radial outer side R2 to form a roughly triangular shape. The bottom part 41 has protrusions 49 (referring to Fig. 5) protruding towards the radial outer side R2 to form a roughly triangular shape. The protrusions 48 and the protrusions 49 are respectively in a thin plate shape in the up-down direction Z, and are same with the protrusions 10 in quantity (four, herein). The four protrusions 48 are arranged at a roughly-equal interval at the outer circumferential part of the cover 40 and along the circumferential direction S. The four protrusions 49 are arranged at a roughly-equal interval at the outer circumferential part of the bottom part 41 and along the circumferential direction S.

[0053] Referring to Fig. 5, as a part of the outer side rib 41A, the bottom part 41 is provided with ribs 49A protruding towards the radial outer side R2. The ribs 49A are arranged at all the protrusions 49 and form a roughly V shape observed from the upper side Z1 in a mode of trimming the roughly-triangular protrusions 49 from the radial outer side R2.

[0054] Referring to Fig. 4, in the cover 40 arranged at the bottom part 41, all the protrusions 48 are respectively overlapped with the protrusions 49 of the bottom part 41 from the upper side Z1. The protrusions 48 and 49 in an overlapped state are integrated by means of screws 51

installed at all the outer edge parts so as to form the above-mentioned protrusions 10. The cover 40 and the bottom part 41 are also connected by means of screws 52 installed at the positions staggered from the protrusions 10 in the circumferential direction S.

[0055] The inner space 42 of the annular wall 8 includes second spaces 55 forming hollow parts of the protrusions 10. Referring to Fig. 5, the second spaces 55 of the protrusions 10 are spaces formed by clamping of the protrusions 48 and 49 from the up-down direction Z and blocked by the ribs 49A from the radial outer side R2, and are communicated with the first space 46 from the radial outer side R2.

[0056] The inner spaces 39 of all the pipelines 37 are communicated with the second spaces 55 of the protrusions 10 by connecting parts 56 of the upper end parts 37C and the protrusions 10. The inner spaces 39 of the pipelines 37 are communicated with the first space 46 by the second spaces 55.

[0057] Referring to Fig. 2, when the washing tank 5 receives torque of the motor 30 to rotate, the blades 35 of the bottom wall 21 of the washing tank 5 rotates integrally with the washing tank 5. Therefore, the blades 35 feed water stored in the outer tank 3, i.e., water stored in the gap 36 between the bottom wall 21 of the washing tank 5 and the bottom wall 7 of the outer tank 3, into the inner spaces 39 from the receiving ports 38 of all the pipelines 37. In addition, water stored in the gap 36 generates centrifugal force due to rotation of the blades 35 so as to be fed into the inner spaces 39 from the receiving ports 38 of the pipelines 37. Water fed into the inner spaces 39 rises in the pipelines 37 by pushing and pressing of follow-up water.

[0058] Referring to Fig. 5, water rising to the upper end parts 37C of all the pipelines 37 flows into the second spaces 55 corresponding to the inner space 42 of the annular wall 8. Water flowing into all the second spaces 55 is guided by the ribs 49A, as shown by a solid arrow, and flows into the first space 46 when being radially diffused from the connecting parts 56 to the radial inner side R1.

[0059] As mentioned above, the closer to the radial inner side R1 the first space 46 is, the narrower in the up-down direction Z the first space 46 is (referring to Fig. 3). Thus, water flowing into the first space 46 flows towards the radial inner side R1 without deviating from any area of the circumferential direction S when being diffused along the circumferential direction S. Therefore, seen from the whole circumferential direction S, water flowing from all the pipelines 37 into the first space 46 through the second spaces 55 flows towards the radial inner side R1 from the whole area of the circumferential direction S in the first space 46.

[0060] As mentioned above, the discharging ports 43 positioned at an end of a water flow towards the radial inner side R1 in the first space 46 are arranged around the whole area of the circumferential direction S. Therefore, water flowing from the whole area of the circumfer-

ential direction S to the radial inner side R1 in the first space 46, as shown by a dotted arrow, is discharged from the whole area of the circumferential direction S of the discharging ports 43. Water discharged from the discharging ports 43, as shown by a dotted arrow in Fig. 2, flows into the washing tank 5 towards the inclined and lower side from the center of the washing tank 5 along inclination of the first part 44 of the cover 40.

[0061] In this way, water stored in the outer tank 3 is absorbed by the water paths 4, and water absorbed by the water paths 4 is discharged into the washing tank 5 from the upper side Z1 by the discharging ports 43 of the water paths 4. Water in the washing tank 5 flows between the washing tank 5 and the outer tank 3 through the through holes 23 of the washing tank 5.

[0062] Therefore, since water also can be used for washing while in circulation, water can be saved. As mentioned above, since the discharging ports 43 are arranged in the whole area of the circumferential direction S of the cylindrical washing tank 5, water can be discharged into the washing tank 5 from the whole area of the circumferential direction S of the washing tank 5. Thus, water can be sprinkled onto the washings contained in the washing tank 5 from the whole area of the circumferential direction S of the washing tank 5 without dead angle.

[0063] In addition, a great amount of water can be discharged by the discharging ports 43 arranged around the whole area of the circumferential direction S of the washing tank 5. Therefore, due to strong falling of a great amount of water discharged from the discharging ports 43 into the washing tank 5 when the washings are cleaned, detergent in the washing tank 5 can be foamed by means of water potential in the falling process of water. Thus, the washings can be cleaned effectively by means of the foamed detergent. Besides, due to strong falling of a great amount of water discharged from the discharging ports 43 into the washing tank 5, the mechanical force acting on the washings may be increased, and the cleaning capability of the washing machine can be improved. Furthermore, the washings can be rinsed efficiently by a great amount of water discharged from the upper side Z1 into the washing tank 5, so that the time of rinsing operation can be shortened.

[0064] Moreover, water absorbed from the water paths 4 and water from the discharging ports 43 can be dispersed and discharged to the central side (the radial inner side R1) and the outer circumferential side (the radial outer side R2) of the washing tank 5 by the following structure. For example, the control part 33 (referring to Fig. 2) controls the motor 30 to change the rotating speed of the washing tank 5, so that the centrifugal force generated by water in the outer tank 3 can be adjusted, and the potential of water absorbed from the water paths 4 can be adjusted. Specifically, the larger the centrifugal force is, the stronger the potential of water absorbed from the water paths 4 is, and the smaller the centrifugal force is, the weaker the potential of water absorbed from the

water paths 4 is. Therefore, water with strong potential can be discharged from the discharging ports 43 to the central side of the washing tank 5, and water with weak potential can be discharged to the outer circumferential side of the washing tank 5. That is to say, water absorbed from the water paths 4 and water from the discharging ports 43 can be dispersed and discharged to the central side and the outer circumferential side of the washing tank 5 by the control part 33 of the dispersing unit 29. Thus, water can be sprinkled onto the washings in the washing tank 5 from the discharging ports 43 arranged around the circumferential direction S and the radial direction R in a manner of full range without dead angle. Thus, the washings can be cleaned or rinsed more effectively.

[0065] Next, a first variation example about the present invention will be described.

[0066] Fig. 6 is a diagram illustrating the first variation example of the present invention applied in Fig. 5. In Fig. 6, same reference marks are endowed for members same as the above-described members so as to omit the description, and the same mode is adopted in the following Fig. 7-Fig. 11.

[0067] Referring to Fig. 6, in the first variation example, the dispersing unit 29 includes a pair of first ribs 61 and a pair of second ribs 62 formed at the bottom part 41 of the annular wall 8 as a part of the water path 4. The pair of first ribs 61 and the pair of second ribs 62 are arranged in the water path 4. Corresponding to all the protrusions 49, components (four groups in total, herein) formed by one pair of first ribs 61 and one pair of second ribs 62 are respectively arranged one by one. In all the components, one pair of second ribs 62 is arranged at the position closer to the clockwise side S1 than one pair of first ribs 61. The first ribs 61 and the second ribs 62 protrude from the upper surface of the bottom part 41 to the upper side Z1 respectively and extend into rib shapes.

[0068] The pair of first ribs 61 extends along the radial direction R roughly between the end parts 49B of the radial inner sides R1 of the protrusions 49 and the end part 41B of the radial inner side R1 of the bottom part 41. From the end parts 49B of the radial inner sides R1 of the protrusions 49, the closer to the end part 41B of the radial inner side R1 of the bottom part 41 the pair of second ribs 62 is, the more extension towards the clockwise side S1 the pair of second ribs 62 is.

[0069] In the pair of first ribs 61, the protrusion 49 at the end part of the radial outer side R2 of the first rib 61 at the anticlockwise side S2 is connected with the end part of the anticlockwise side S2 of the trimming rib 49A. In the pair of second ribs 62, the end part of the radial outer side R2 of the second rib 62 at the clockwise side S1 is connected with the end part of the clockwise side S1 of the rib 49A. The part 62A of the clockwise side S1 of the second rib 62 is convexly bent towards the radial outer side R2.

[0070] The end part of the radial outer side R2 of the first rib 61 at the clockwise side S1 in the pair of first ribs

61 is connected with the end part of the radial outer side R2 of the second rib 62 at the anticlockwise side S2 in the pair of second rib 62 at the position closer to the radial inner side R1 than the connecting part 56.

[0071] In the first variation example, a plurality of first spaces 46 (four, herein) are divided in the circumferential direction S. Each first space 46 includes a space 46A formed by clamping of the pair of first ribs 61 from the circumferential direction S and a space 46B formed by clamping of the pair of second ribs 62 from the circumferential direction S.

[0072] In all the first spaces 46, the spaces 46A extend towards the radial inner side R1 from the second spaces 55 along the roughly radial direction R, and from the second spaces 55, the closer to the radial inner side R1 the spaces 46B are, the more extension towards the clockwise side S1 the spaces 46B are. Therefore, a whole body of all the first spaces 46 and the second spaces 55 communicated with the first spaces 46 from the radial outer side R2 is divided into two strands in a roughly V shape from the second spaces 55 to the radial inner side R1 by observation from the upper side Z1. A distance from the second spaces 55 to the discharging ports 43 in the spaces 46A is shorter than a distance from the second spaces 55 to the discharging ports 43 in the spaces 46B.

[0073] Water fed into the water paths 4 by rotation of the washing tank 5 and rising to the upper end parts 37C of all the pipelines 37 flows into the second spaces 55 of the protrusions 10 of the annular wall 8 of the outer tank 3. Water flowing into all the second spaces 55, as shown by a solid arrow, is divided by the first ribs 61 and the second ribs 62 to flow into the spaces 46A and the spaces 46B of the first spaces 46 respectively.

[0074] A moving distance of water flowing into the spaces 46A to the discharging ports 43 is shorter. Therefore, as shown by a dashed line arrow, water moving in the spaces 46A is discharged from the discharging ports 43 with almost no loss of water potential, and is sprinkled onto the washings at the central side of the washing tank 5.

[0075] The moving distance of water flowing into the spaces 46B to the discharging ports 43 is longer. Therefore, as shown by a dashed line arrow, since water in the spaces 46B is discharged from the discharging ports 43 while water potential is reduced, water cannot reach the central side of the washing tank 5, but flows along the clockwise side S1 and is sprinkled onto the washings at the outer circumferential side of the washing tank 5.

[0076] In this way, by means of the plurality of first ribs 61 and the plurality of second ribs 62 arranged in the water paths 4, water discharged from the discharging ports 43 can be distributed to the central side and the outer circumferential side of the washing tank 5. Therefore, water can be sprinkled onto the washings in the washing tank 5 from the discharging ports 43 without dead angle, so that the washings can be cleaned or rinsed more effectively.

[0077] It should be noted that, in the above description, although the pair of second ribs 62 are closer to the clockwise side S1 than the pair of first ribs 61, conversely, the pair of second ribs 62 may also be closer to the anticlockwise side S2 than the pair of first ribs 61.

[0078] In addition, a flowing direction of water discharged from the discharging ports 43 can be freely adjusted by adjusting extending directions of the pair of first ribs 61 and the pair of second ribs 62.

[0079] Next, the second variation example about the present invention will be described. Fig. 7 is a diagram illustrating a second variation example of the present invention applied in Fig. 3.

[0080] Referring to Fig. 7, the cover 40 of the second variation example does not have the first part 44. In the second variation example, the end part 45A of the radial inner side R1 of the second part 45 of the cover 40 is closer to the radial outer side R2 than the end part 41B of the radial inner side R1 of the bottom part 41. The cover 40 of the second variation example is provided with a trimming part 63 formed by elastically-deformed members such as rubber and the like. The trimming part 63 is separated from the cover 40, i.e., from the water path 4, and observed from the upper side Z1, the trimming part 63 is annular.

[0081] The closer to the radial inner side R1 the trimming part 63 is, the more inclination towards the lower part Z2 relative to the horizontal direction H the trimming part 63 is. At a position closer to the radial outer side R2 than the end part 41B of the radial inner side R1 of the bottom part 41 of the cover 40, the inclination of the trimming part 63 relative to the horizontal direction H is consistent with that of the second part 45 relative to the horizontal direction H. In the trimming part 63, the inclination of a part 63A closer to the radial inner side R1 than the end part 41B of the bottom part 41 relative to the horizontal direction H is steeper than that of the second part 45 relative to the horizontal direction H.

[0082] The trimming part 63 is installed to the second part 45 of the cover 40 from the upper side Z1. The trimming part 63 is jointed with the end part 45A of the second part 45 by the end part of the radial outer side R2. In the second variation example, the gaps between the part 63A of the radial inner side R1 of the trimming part 63 and the end part 41B of the radial inner side R1 of the bottom part 41 are used as the discharging ports 43. Parts of the discharging ports 43 are trimmed by the trimming part 63 from the upper side Z1. The end part 63B of the radial inner side R1 of the trimming part 63 is closer to the lower part Z2 and the radial inner side R1 than the bottom part 41.

[0083] If a structure of the trimming part 63 is arranged, under a condition that the discharging ports 43 are blocked by dirt and the like, even though the water paths 4 are not split, as shown by the dashed line in Fig. 7, the discharging ports 43 also can be widened by bending the trimming part 63 to the upper side Z1, so that the discharging ports 43 are easy to clear.

[0084] Next, a third variation example about the present invention will be described.

[0085] Fig. 8 is a diagram illustrating the third variation example of the present invention applied in Fig. 3.

[0086] Referring to Fig. 8, a difference between the third variation example and the second variation example lies in arrangement of the trimming part 64 to replace the trimming part 63 in the second variation example.

[0087] Different from the trimming part 63, the trimming part 64 is separated from the cover 40, and is annular when being observed from the upper side Z1. The closer to the radial inner side R1 the trimming part 64 is, the more inclination towards the lower part Z2 relative to the horizontal direction H the trimming part 64 is. The middle part of the trimming part 64 in the radial direction R has a step 65 bending towards the lower part Z2. The step 65 is contacted with the end part of the radial inner side R1 of the second part 45 from the radial inner side R1. In the trimming part 64, the part closer to the radial inner side R1 than the step 65 is set as a first part 66, and the part closer to the radial outer side R2 than the step 65 is set as a second part 67.

[0088] In the first part 66, the inclination of the outer side part 66A closer to the radial outer side R2 than the end part 41B of the radial inner side R1 of the bottom part 41 relative to the horizontal direction H is consistent with that of the second part 45 relative to the horizontal direction H. In the first part 66, the inclination of the inner side part 66B closer to the radial inner side R1 than the end part 41B of the radial inner side R1 of the bottom part 41 relative to the horizontal direction H is steeper than that of the second part 45 relative to the horizontal direction H. The inclination of the second part 67 is consistent with that of the second part 45 relative to the horizontal direction H.

[0089] The trimming part 64 is installed to the second part 45 of the cover 40 from the upper side Z1. The trimming part 64 is jointed with the cover 40 by the step 65 and the second part 67. In the third variation example, the gaps between the inner side part 66B of the first part 66 of the trimming part 64 and the end part 41B of the radial inner side R1 of the bottom part 41 are used as the discharging ports 43. Parts of the discharging ports 43 are trimmed by the trimming part 64 from the upper side Z1. The end part 66C of the radial inner side R1 of the inner side part 66B of the first part 66 is positioned at the lower part Z2 of the bottom part 41 and is closer to the radial inner side R1.

[0090] The third variation example is similar. Under a condition that the discharging ports 43 are blocked by dirt and the like, even though the water paths 4 are not split, as shown by the double-dot line in Fig. 8, the discharging ports 43 also can be widened by bending the whole first part 66 of the trimming part 64 to the upper side Z1, so that the discharging ports 43 are easy to clear.

[0091] Next, a fourth variation example about the present invention will be described.

[0092] Fig. 9 is a diagram illustrating the fourth varia-

tion example of the present invention applied in Fig. 2.

[0093] Referring to Fig. 9, the enclosure 2 includes a door 71 and an upper panel 72 at an upper end part. An opening 74 is formed in an upper surface of the enclosure 2.

5 The access 25 is positioned at the lower part Z2 of the opening 74. The door 71 blocks the opening 74 of a main body 70 from the upper side Z1. The upper panel 72 is fixed at the part of a rear side Y2 of the opening 74 at the upper end part of the enclosure 2 so as to support the rear end of the door 71.

10 **[0094]** The user of the washing machine 1 can open the door 71 from a front side Y1 of the washing machine 1. The user of the washing machine 1 can put the washings into the washing tank 5 or take the washings out of the washing tank 5 from the upper side Z1 through the access 25 under a condition that the door 71 is opened. Since the door 71 is transparent or semitransparent, the user can determine the condition in the washing tank 5 through the closed door 71 by visual inspection.

15 **[0095]** The side wall 6 of the outer tank 3 is made of semitransparent resin. The whole outer tank 3 also can be semitransparent. A water discharging port not shown in the drawings and used for discharging water in the outer tank 3 is formed in the bottom wall 7 of the outer tank 3. A water discharging path 76 for discharging water out of the washing machine 1 is connected at water discharging port. The water discharging path 76 is provided with a dirt sensor 77 for detecting the dirty degree of water discharging out of the washing machine 1. A known structure can be used as the dirt sensor 77. The dirt sensor 77 is electrically connected with the control part 33. A detection result of the dirt sensor 77 is input into the control part 33.

20 **[0096]** The washing machine 1 includes a light source 81. The light source 81 includes one or more LEDs for example and can emit lights with various colors. The light source 81 is electrically connected with the control part 33 which can control a light emitting mode of the light source 81.

25 **[0097]** The light source 81 is installed, for example, on the outer circumferential surface 6A of the side wall 6 of the outer tank 3 from the rear side Y2. Light emitted from the light source 81 irradiates to water in the washing tank 5 from the rear side Y2. Specifically, the light emitted from the light source 81 permeates through the semitransparent side wall 6 of the outer tank 3 and irradiates to water in the washing tank 5 from the rear side Y2 by penetrating through the through holes 23 of the side wall 20 of the washing tank 5.

30 **[0098]** Another light source 82 also can be arranged for replacing the light source 81. The light source 82 is composed of, for example, one or more LEDs, and can emit lights with various colors. The light source 82 is electrically connected with the control part 33. The control part 33 can control the light emitting mode of the light source 82. The light source 82 is installed, for example, on a lower surface of the upper panel 72 from the lower part Z2. The light emitted from the light source 82 irradi-

ates to water in the washing tank 5 from the upper side Z1 or to water discharged from the discharging ports 43 into the washing tank 5.

[0099] Other light sources 83 also can be arranged for replacing the light source 81. A plurality of light sources 83 are arranged. Each light source 83 is composed of, for example, one or more LEDs, and can emit lights with various colors. The light sources 83 are electrically connected with the control part 33 which can control the light emitting mode of the light sources 83.

[0100] Under a condition that the light sources 83 are arranged, the outer tank 3 includes a supporting member 73 which is annular by observation from the upper side Z1. The supporting member 73 is installed on the cover 40 of the annular wall 8 from the upper side Z1. The plurality of light sources 83 are installed, for example, on the upper surface of the supporting member 73 from the upper side Z1, and are configured in parallel along the circumferential direction S. The plurality of light sources 83 also can be installed on a lower surface of the supporting member 73 from the lower side Z2. The lights emitted from the light sources 83 irradiate to water in the washing tank 5 or water discharged from the discharging ports 43 into the washing tank 5 from the upper side Z1.

[0101] The light sources 81, 82 and 83 not only can be separately arranged, but also can be combined. Water in the washing tank 5 or water discharged from the discharging ports 43 into the washing tank 5 has a color of the lights emitted from the above light sources 81, 82 and 83.

[0102] According to an operating state of the washing machine 1, i.e., washing and rinsing states of the washings, the time spent for completion of washing and rinsing of the washings, etc., the light sources 81, 82 and 83 are lighted, or the colors of the lights emitted from the light sources 81, 82 and 83 are changed. Therefore, the operating state of the washing machine 1 can be transferred to the user in a visual mode.

[0103] The dirty degree of water also can be detected according to the dirt sensor 77 during rinsing operation, and the colors of the lights emitted from the light source 81, 82 or 83 are changed. For example, under a condition that dirty degree of the discharged water is high, all the light sources 81, 82 and 83 emit red lights. When the dirty degree of the discharged water is reduced, the colors of the lights become yellow from red. When the dirty degree of the discharged water is further reduced, the colors of the lights become blue from yellow. Thus, the rinsing state of the washings can be transferred to the user of the washing machine 1 in a visual mode.

[0104] Next, a fifth variation example about the present invention will be described.

[0105] Fig. 10 is a diagram illustrating the fifth variation example of the present invention applied in Fig. 2.

[0106] Referring to Fig. 10, the washing machine 1 includes a water pumping wing 84 separated from the washing tank 5. The water pumping wing 84 can rotate relative to the washing tank 5 along the circumferential

direction S. In the fifth variation example, different from the present implementation mode, the plurality of blades 35 are not formed on the washing tank 5. Observed from the upper side Z1, the water pumping wing 84 is round, and the plurality of above-mentioned blades 35 are formed at the upper surface of the water pumping wing 84. The water pumping wing 84 is configured in the gap 36.

[0107] The washing machine 1 of the fifth variation example includes a first transmission shaft 85 and a second transmission shaft 86 to replace the transmission shaft 31 in the present implementation mode. The first transmission shaft 85 extends towards the upper side Z1. The second transmission shaft 86 is cylindrical and extends towards the upper side Z1, and contains the first transmission shaft 85. The first transmission shaft 85 and the second transmission shaft 86 are coaxially configured in a state without contacting each other.

[0108] The first transmission shaft 85 and the second transmission shaft 86 are coaxially configured with the output shaft 34 at the upper side Z1 of the output shaft 34. The output shaft 34 is connected with the first transmission shaft 85 via the transmission mechanism 32. The output shaft 34 is connected with the second transmission shaft 86 via the transmission mechanism 32.

[0109] The first transmission shaft 85 penetrates the circle center part of the bottom wall 7 of the outer tank 3 and extends towards the upper side Z1. An upper end part of the first transmission shaft 85 is connected with the circle center part of the bottom wall 21 of the washing tank 5. The second transmission shaft 86 extends to the gap 36 of the up-down direction Z between the bottom wall 21 and the bottom wall 7 of the outer tank 3. An upper end part of the second transmission shaft 86 is connected with the circle center part of the water pumping wing 84.

[0110] Torque generated by the motor 30 is respectively transmitted to the first transmission shaft 85 and the second transmission shaft 86 via the output shaft 34 and the transmission mechanism 32. The washing tank 5 adopts the first transmission shaft 85 as the center of rotation and rotates together with the first transmission shaft 85. The water pumping wing 84 adopts the second transmission shaft 86 as the center of rotation, and rotates together with the second transmission shaft 86. Therefore, in the washing machine 1 of the fifth variation example, the plurality of blades 35 of the water pumping wing 84 and the washing tank 5 can separately rotate respectively.

[0111] In the structure, a load of the motor 30 can be reduced by making the water pumping wing 84 rotate only. Therefore, the temperature rise of the motor 30 can be prevented. Certainly, the washing tank 5 also can rotate together with the water pumping wing 84. In this way, since the positions of the washings in the washing tank 5 can be changed, water can be sprinkled onto the washings without dead angle. Under this condition, the rotating direction of the washing tank 5 and the rotating direction of the water pumping wing 84 also can be reversed.

[0112] Next, a six variation example about the present invention will be described.

[0113] Fig. 11 is a diagram illustrating a sixth variation example of the present invention applied in Fig. 5.

[0114] Referring to Fig. 11, in the sixth variation example, the bottom part 41 of the annular wall 8 as a part of the water path 4 includes ribs 87. The ribs 87 are arranged at all the protrusions 49 in a one-by-one manner.

[0115] From the end part of the radial outer side R2 of the bottom part 41, the closer to the radial inner side R1 the ribs 87 are, the more linear extension towards the clockwise side S1 the ribs 87 are. The end parts of the radial outer sides R2 of the ribs 87 are connected with the ribs 49A of the protrusions 49 at the position closer to the anticlockwise side S2 than the connecting parts 56.

[0116] Water fed into the water paths 4 by rotation of the washing tank 5 and rising to the upper end parts 37C of all the pipelines 37 flows into the first space 46 by the second spaces 55 corresponding to the protrusions 10 of the annular wall 8 of the outer tank 3. The flowing of water flowing into the first space 46 is shown by the solid arrow, and faces the clockwise side S1 by means of the ribs 87. In this way, a direction of water discharged from the discharging ports 43 can be adjusted by an extending direction of the ribs 87, so that under a condition that the rotating direction of the washing tank 5 is the clockwise side S1, the direction of water discharged from the discharging ports 43 can be consistent with the rotating direction of the washing tank 5.

[0117] It should be noted that different from the sixth variation example, the closer to the radial inner side R1 the ribs 87 are, the more extending towards the anticlockwise side S2 the ribs 87 are.

[0118] The present invention is not limited to the contents of the above implementation modes, and can be changed within a scope recorded in claims.

[0119] For example, the first variation example to the sixth variation example also can be randomly combined and applied into the present implementation mode.

[0120] In addition, in the above-mentioned implementation mode, although the quantity of the water paths 4 is set to four, the quantity can be randomly changed. Furthermore, all the water paths 4 also can be different in shape.

[0121] The materials of the above components are only examples. For example, the bottom wall 21 of the washing tank 5 is not fully made of resin; and the part connected with the transmission shaft 31 also can be made of metal.

[0122] Although a vertical washing machine 1 for allowing a center of rotation of the washing tank 5 to extend along the up-down direction Z is shown, the washing tank 5 also can be obliquely configured in such a manner that the center of rotation obliquely extends relative to the up-down direction Z.

Claims

1. A washing machine, comprising:

- 5 an outer tank capable of storing water;
a cylindrical washing tank contained in the outer tank, having through holes for allowing water to flow between the washing tank and the outer tank, used for containing the washings and capable of rotating; and
10 a water path for absorbing water stored in the outer tank and discharging the water into the washing tank from an upper side, wherein discharging ports for discharging water into the washing tank from the upper side through the water path are arranged around whole area of a circumferential direction of the washing tank.
- 20 2. The washing machine according to claim 1, wherein the washing machine comprises trimming parts for trimming local parts of the discharging ports, and the trimming parts are separated from the water path.
- 25 3. The washing machine according to Claim 1 or 2, wherein
the washing machine comprises a cover forming the outer tank; and
the cover is also used as at least one part of the water path.
- 30 4. The washing machine according to claim 3, wherein the washing machine comprises a dispersing unit; and the dispersing unit is used for dispersing and discharging water absorbed from the water path to a central side and an outer circumferential side of the washing tank from the discharging ports.
- 35 5. The washing machine according to claim 4, wherein the discharging unit comprises ribs; and the ribs are arranged in the water path and are used for distributing water from the discharging ports to the central side and the outer circumferential side of the washing tank.
- 40 6. The washing machine according to claim 4 or 5, wherein the dispersing unit comprises a changing unit for changing a rotating speed of the washing tank.
- 45 7. The washing machine according to any one of claims 1-6, wherein the washing machine comprises light sources lighted according to an operating state of the washing machine.
- 50
- 55

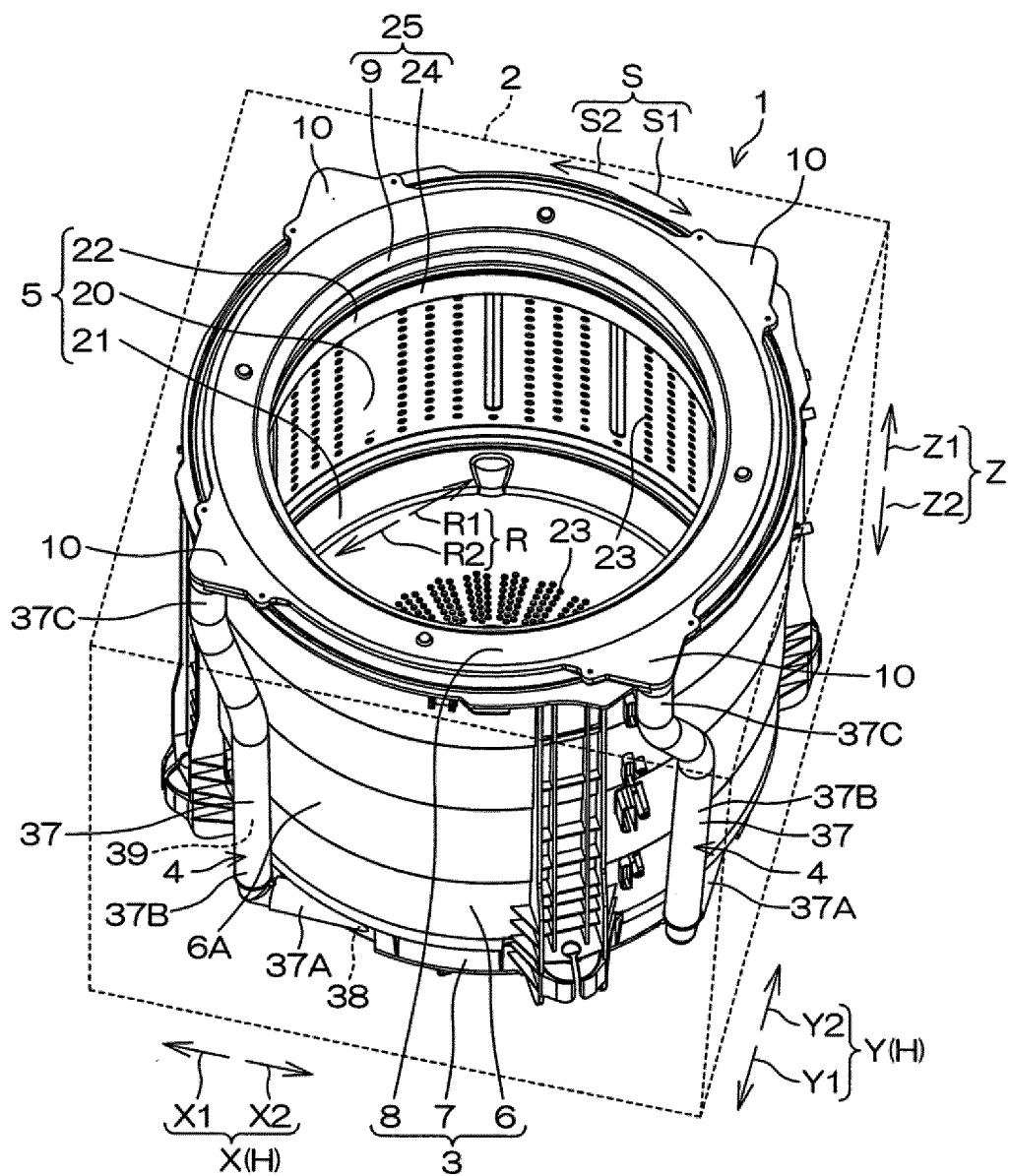


FIG. 1

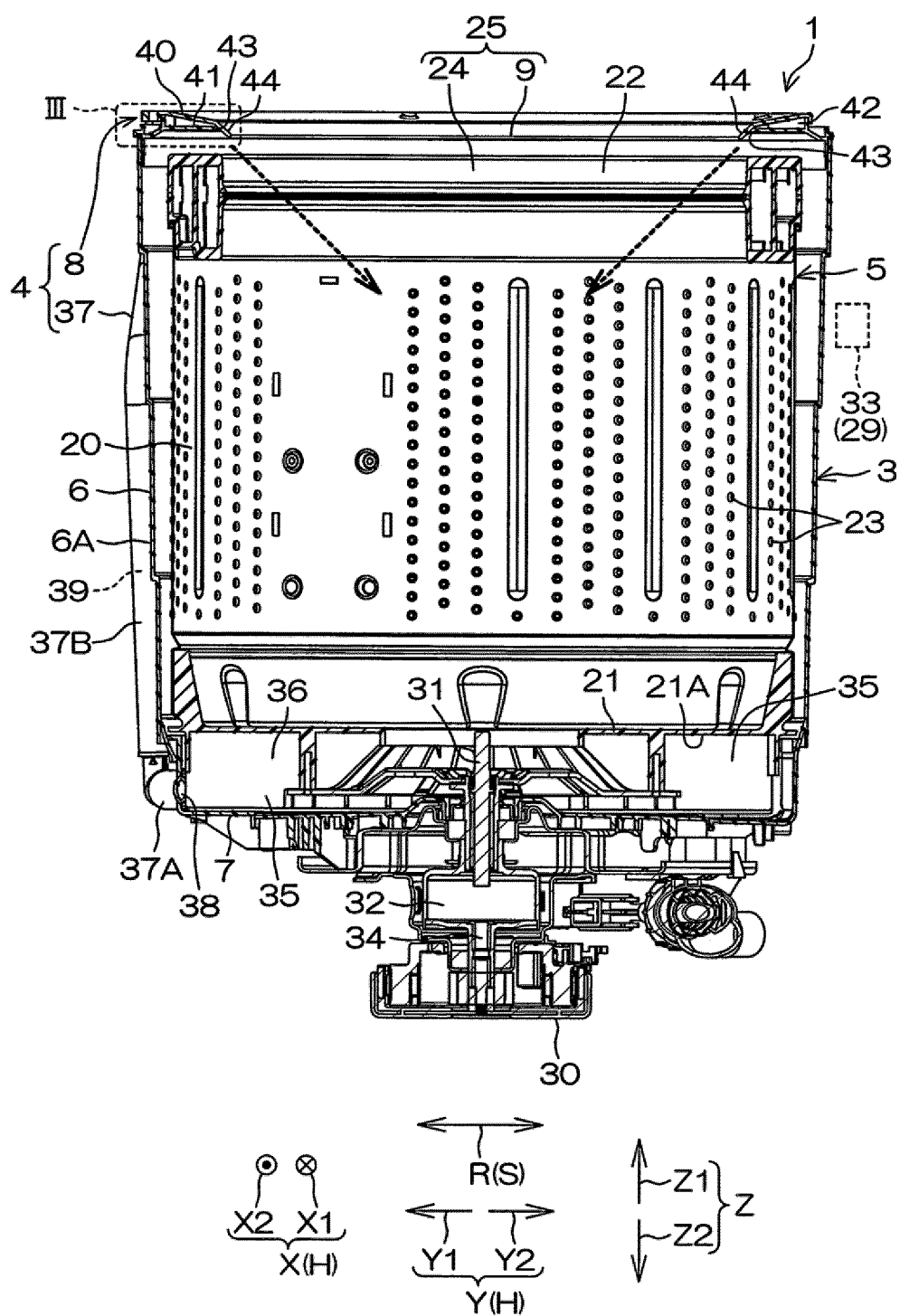


FIG. 2

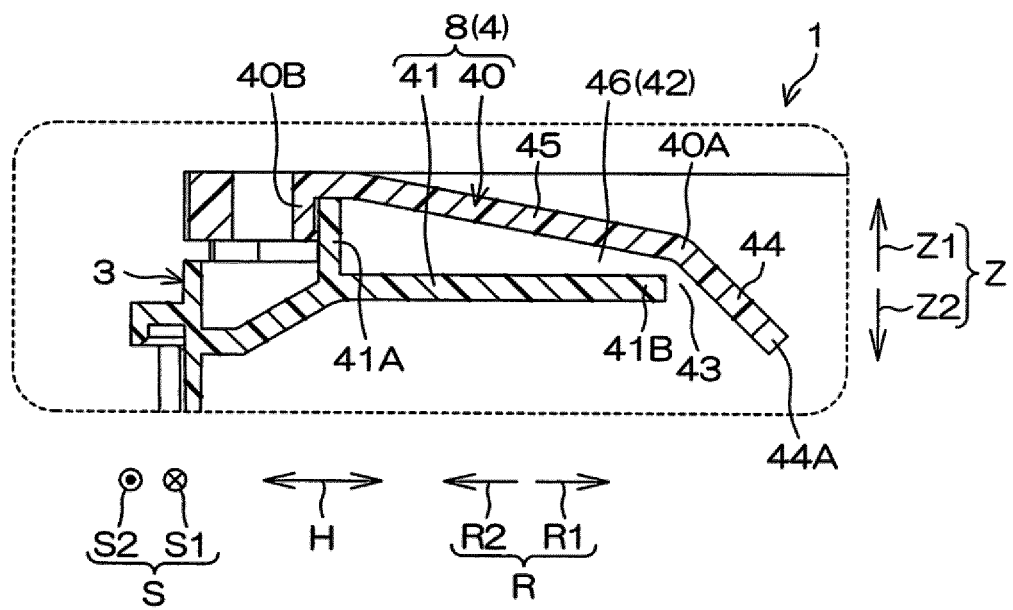


FIG. 3

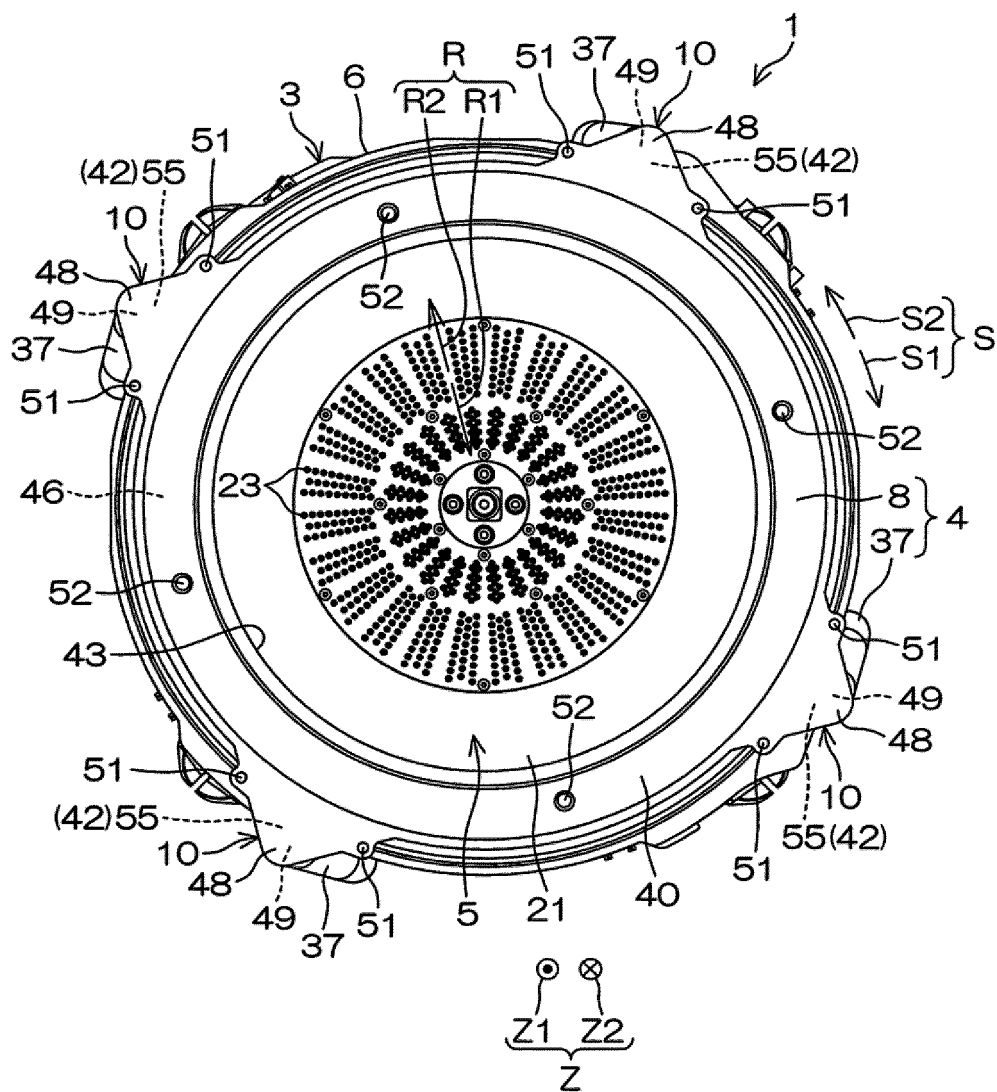


FIG. 4

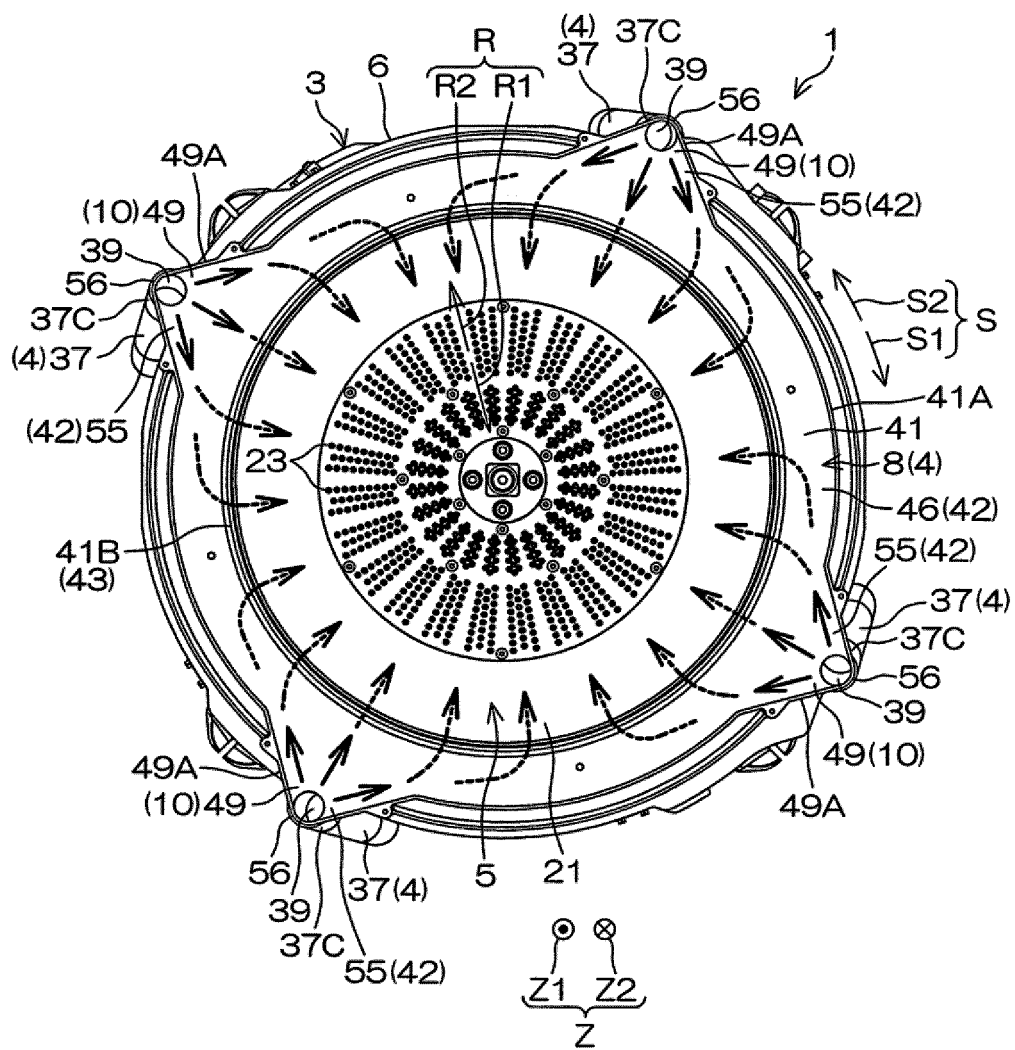


FIG. 5

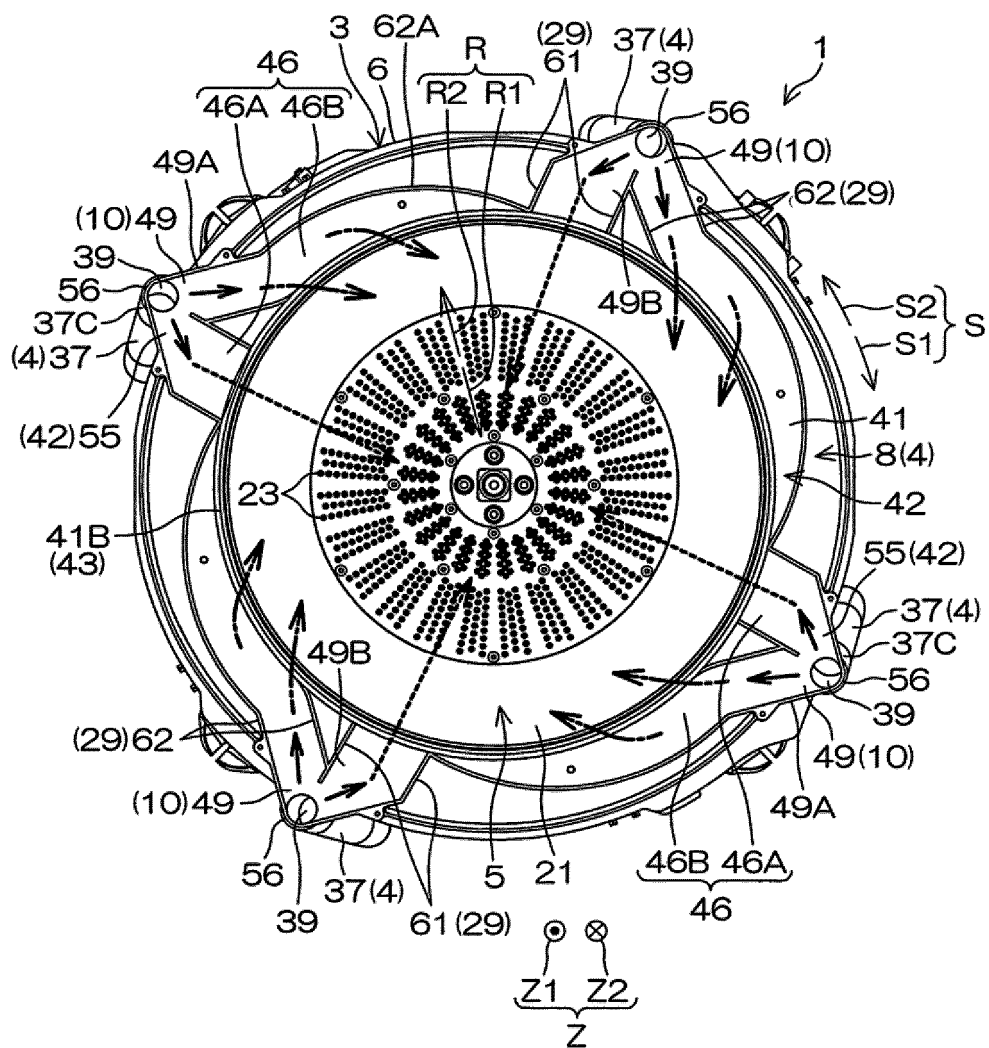


FIG. 6

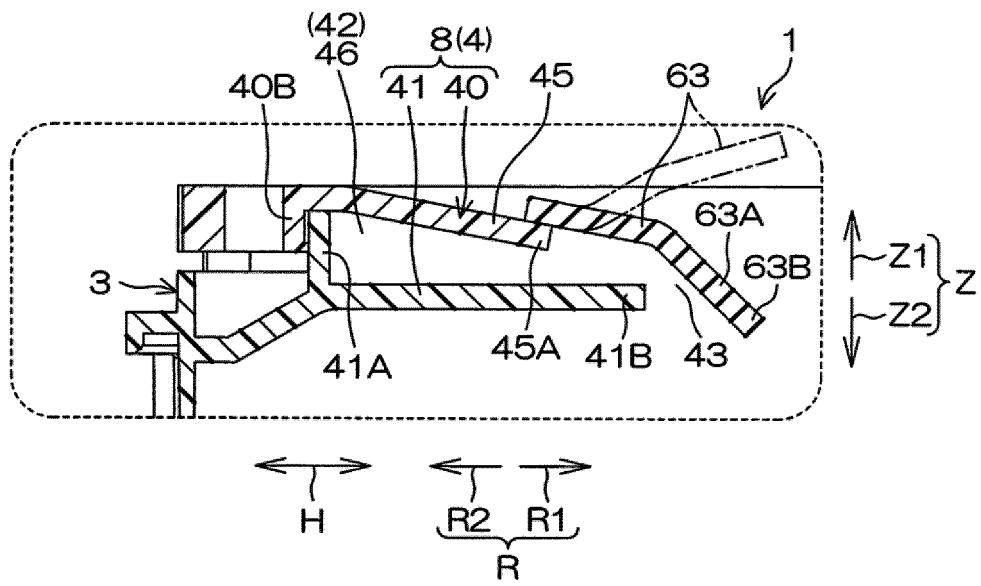


FIG. 7

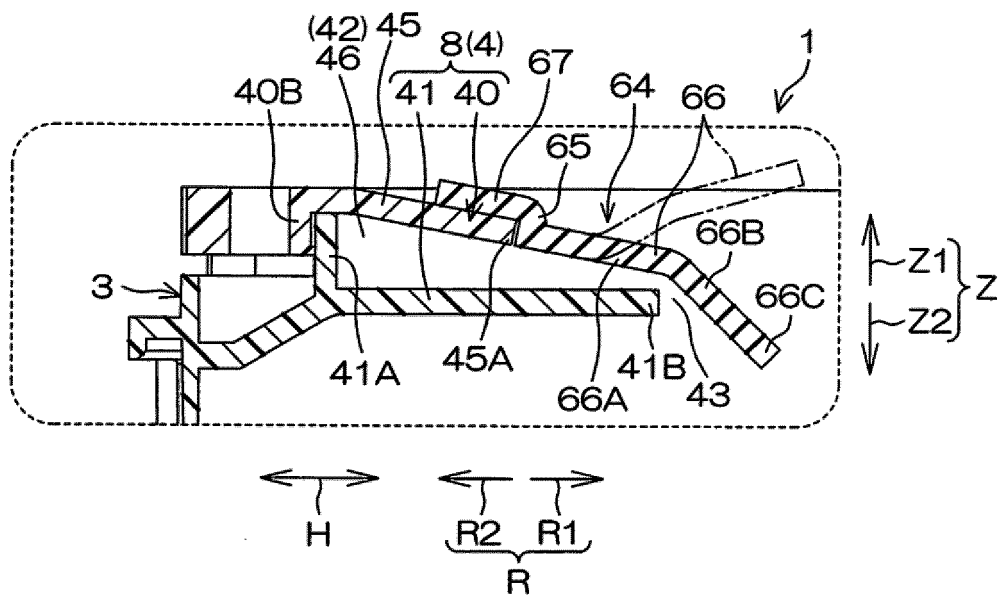


FIG. 8

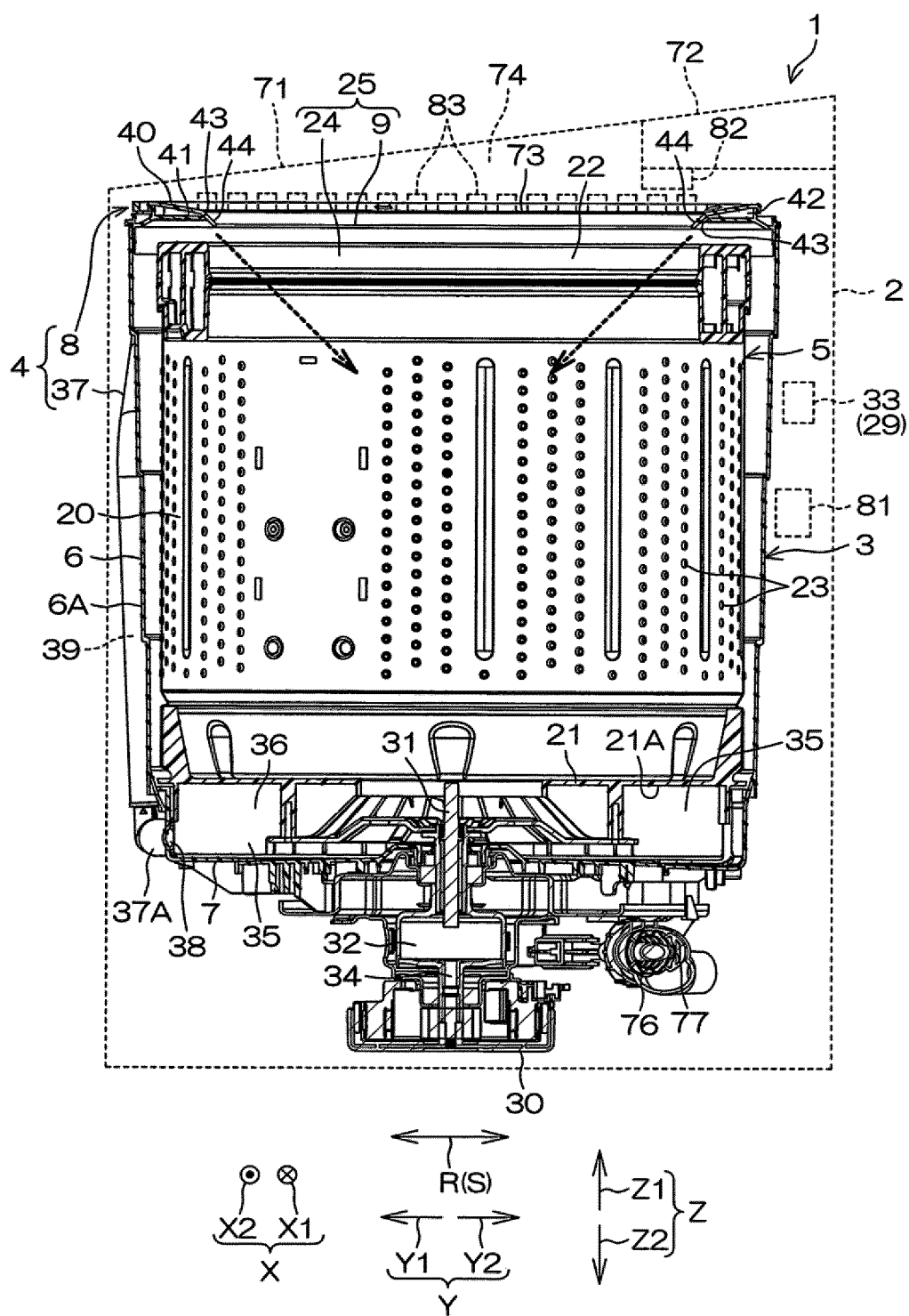


FIG. 9

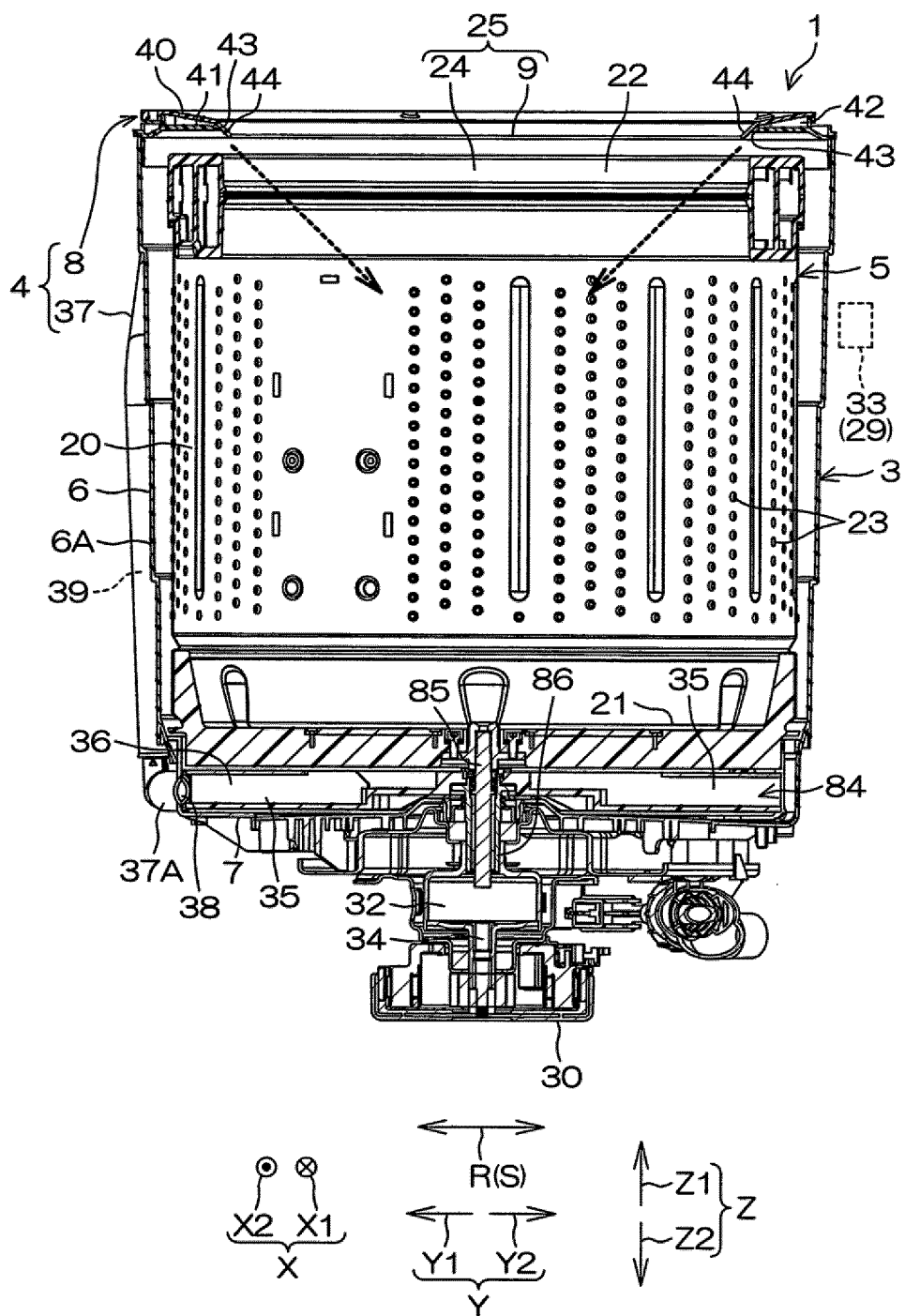


FIG. 10

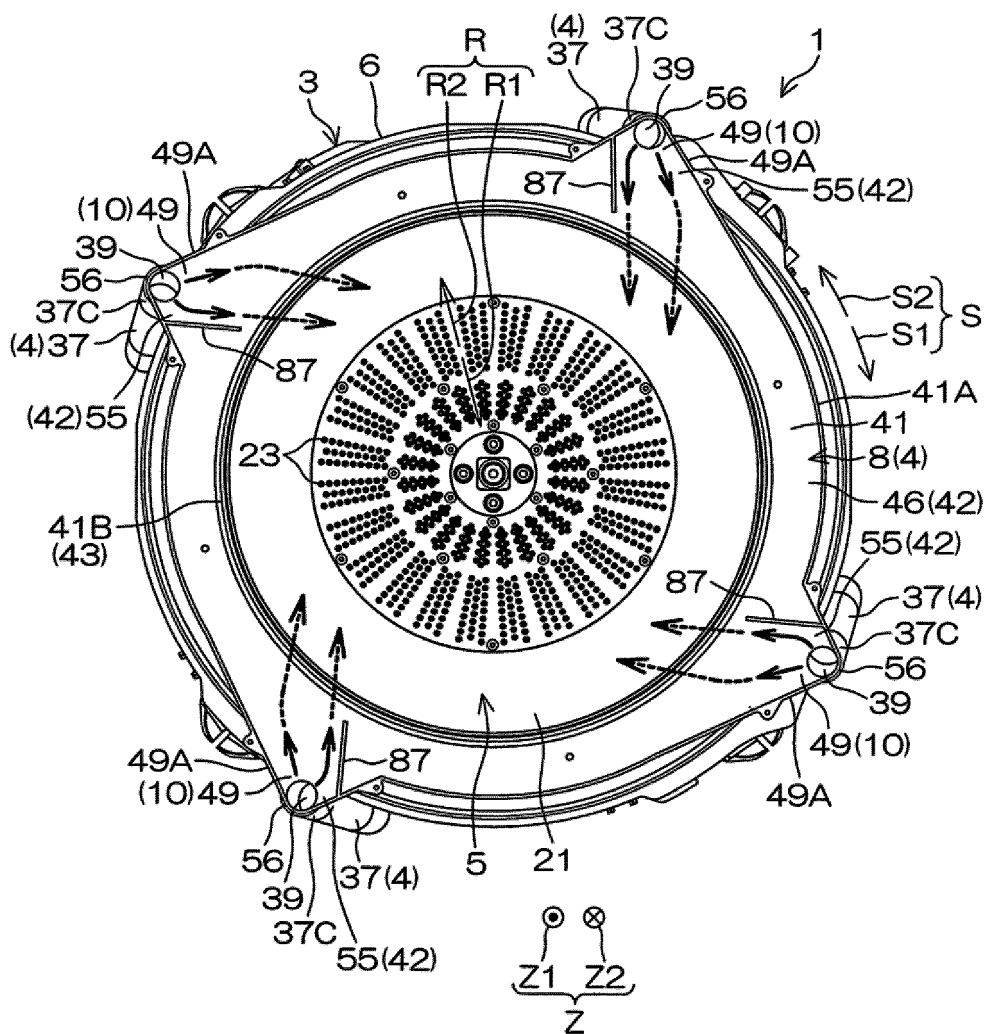


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/095670

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/08 (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

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

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

CNABS; VEN: flow, drain, spray, draw, circulate, around, upper, several, circle, pour???, derive???

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203683954 U (HISENSE RONGSHENG GUANGDONG REFRIGERATOR) 02 July 2014 (02.07.2014) description, paragraphs [0007]-[0017], and figure 1	1-7
A	CN 1093764 A (MATSUSHITA ELECTRIC IND CO., LTD.) 19 October 1994 (19.10.1994) the whole document	1-7
A	JP 2002263396 A (MATSUSHITA ELECTRIC IND CO., LTD.) 17 September 2002 (17.09.2002) the whole document	1-7

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

* Special categories of cited documents:	“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
“A” document defining the general state of the art which is not considered to be of particular relevance	
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“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	“&” document member of the same patent family

Date of the actual completion of the international search 18 February 2016	Date of mailing of the international search report 01 March 2016
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer CHEN, Pengfei Telephone No. (86-10) 62084627

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family membersInternational application No.
PCT/CN2015/095670

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		KR 100233493 B1	01 December 1999
		JP H0629794 A	25 October 1994
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