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(54) **DEVICE AND WASHING MACHINE**

(57) The present disclosure provides a device and a washing machine having the device. The device is configured to draw water accumulated in a washing tank and splash the water onto laundry in the washing tank, and can lower difficulty in arranging a structure for splashing all the water onto the laundry. The device (1) includes: a main body (12) mounted on an inner circumferential face (5E) of the washing tank (5); an intake port (13) provided at a lower end portion (12C) of the main body (12); a waterway (15); and an exhaust port (14) provided on a surface (12B) of an upper end portion (12D) of the main body (12). Water introduced by the intake port (13) into the washing tank (5) is guided through the waterway (15) so as to be exhausted from the exhaust port (14) and splashed onto laundry (S) in the washing tank (5). The exhaust port (14) is relatively long in a circumferential direction Y of the inner circumferential face (5E), a top-to-bottom width of the exhaust port (14) in the middle is narrower than that at both ends in the circumferential direction Y, and a groove (21) on the surface (12B) of the main body (12) is adjacently arranged on two outer sides of the exhaust port (14) in the circumferential direction Y.

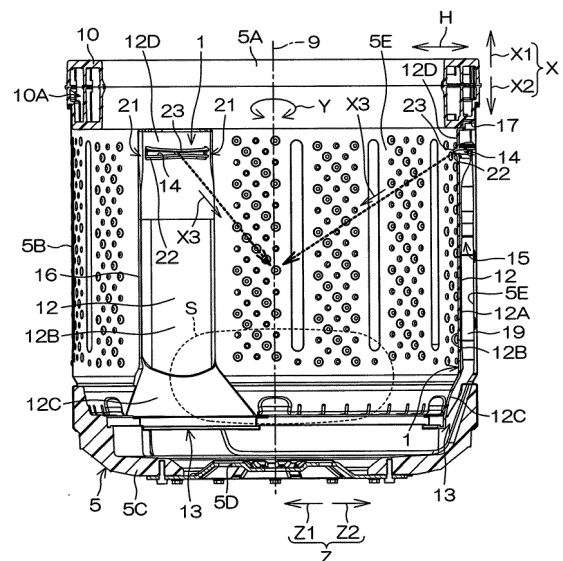


FIG. 2

Description

Summary

TECHNICAL FIELD

Problems to be Solved by the Disclosure

[0001] The present disclosure relates to a device for use in a washing machine, and a washing machine having the device.

Background

[0002] The washing machine disclosed in following patent documents 1-3 has a device, which is configured to draw water accumulated in a washing tank for accommodating laundry and then discharge the water to splash onto the laundry inside the washing tank from top.

[0003] In patent document 1, a cover member as the device is mounted on an inner circumferential face of the washing tank. A circulation waterway is defined between the cover member and the inner circumferential face of the washing tank. Water drawn in the circulation waterway is exhausted from an exhaust port which is formed on the upper end portion of the cover member, so as to be splashed onto the laundry inside the washing tank.

[0004] In patent document 2, a guiding wall part as the device is mounted on the inner circumferential face of the washing tank. A circulation waterway is defined between the guiding wall part and the inner circumferential face of the washing tank. Water drawn in the circulation waterway is exhausted from an exhaust port which is formed in an upper end portion of the guiding wall part, so as to be splashed onto the laundry inside the washing tank.

[0005] In patent document 3, a waterway constituting member as the device is mounted on the inner circumferential face of the washing tank. A circulation waterway is formed in the waterway constituting member. Water drawn in the circulation waterway is exhausted from an exhaust port which is formed in an upper end portion of the waterway constituting member, so as to be splashed onto the laundry inside the washing tank.

Related art document

Patent document

[0006]

Patent document 1: Japanese Patent Laid-Open No. 2004-113277

Patent document 2: Japanese Patent Laid-Open No. Heisei 10-33883

Patent document 3: Japanese Patent Laid-Open No. Heisei 8-336696

[0007] A state of water when being exhausted from the exhaust port of the device of patent documents 1-3 is largely effected by volume and level of water accumulated in the washing tank and the height of the exhaust port. For example, when the water volume is less, or the water level is lower than the exhaust port and a height difference between the water level and the exhaust port is large, water potential is weak when water being exhausted from the exhaust port, and a water exhaust range is narrower. Thus, it is difficult to splash all the water exhausted from the exhaust port onto laundry inside the washing tank.

[0008] In patent document 1, since the exhaust port is bordered into a straight line such that it becomes flat in a direction tangential to an inner circumferential face of the washing tank, the water exhausted from the exhaust port would not diffuse in the circumferential direction of the inner circumferential face of the washing tank, but only be splashed onto the laundry on a side closer to a curvature center of the inner circumferential face of the washing tank.

[0009] In patent document 2, a portion of a guiding wall part surrounding the exhaust port is formed in a substantially arc shape bulged toward a curvature center of the inner circumferential face of the washing tank. Similarly, in patent document 3, a portion of a waterway constituting member surrounding the exhaust port is also formed in a substantially arc shape bulged toward a curvature center of the inner circumferential face of the washing tank. Consequently, since the exhaust port is bordered into a substantially arc shape bulged toward the curvature center of the inner circumferential face of the washing tank, the water exhausted from the exhaust port will not only diffuse toward the curvature center but also toward the circumferential direction of the inner circumferential face of the washing tank into a fan shape, and is completely splashed onto the laundry.

[0010] However, in the case of patent documents 2 and 3, it is difficult to form a portion of the guiding wall part and the waterway constituting member surrounding the exhaust port to be bulged toward the curvature center of the inner circumferential face of the washing tank.

[0011] The present disclosure has been made in consideration of these circumstances, and therefore an object of the present disclosure to provide a device and a washing machine having the same, where the device is configured to draw water accumulated in a washing tank and splash the water onto laundry in the washing tank, and can lower difficulty in arranging a structure for splashing all the water onto the laundry.

[0012] Furthermore, an object of the present disclosure to provide a device capable of splashing all the water onto laundry, and a washing machine having the device.

Technical Solutions for Solving the Problems

[0013] The device of the present disclosure is used in a vertical washing machine, the vertical washing machine having a cylindrical washing tank with a bottom and is formed with an access port for laundry at an upper end and is provided with a bottom wall at a lower end; the device includes: a main body, having a back face which is opposite to an inner circumferential face of the washing tank and a surface which is located on an opposite side of the back face and faces a central axis side of the washing tank; wherein the main body is mounted on the inner circumferential face of the washing tank in a posture along the up-down direction; an intake port, which is provided at a lower end portion of the main body for introducing water in the washing tank from a bottom wall side; a waterway, which is provided in the main body for guiding the water introduced by the intake port upwardly; and an exhaust port, which is provided on a surface of an upper end portion of the main body for exhausting the water guided by the waterway and splashing the water onto laundry in the washing tank, where the exhaust port is relatively long in a circumferential direction of the inner circumferential face of the washing tank, a top-to-bottom width of the exhaust port in the middle of the circumferential direction is narrower than that at both ends in the circumferential direction, and a groove on the surface of the main body is adjacently arranged on two outer sides of the exhaust port in the circumferential direction.

[0014] Furthermore, the present disclosure is characterized in that the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and are arranged in the circumferential direction, and each of the devices includes a guiding member, which is arranged on the surface of the main body in such a way that an upper end of the exhaust port is bordered, and guides the water exhausted from the exhaust port in an obliquely downward direction relative to the horizontal direction.

[0015] Furthermore, the present disclosure is characterized in that the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and arranged in the circumferential direction, and each of the devices includes a blocking member, which blocks an end portion on a same side in the circumferential direction in the exhaust port.

[0016] In addition, the present disclosure relates to a washing machine, characterized by including the above device.

Effects of the Disclosure

[0017] According to the present disclosure, the device for use in a vertical washing machine having a cylindrical washing tank with a bottom which is formed with a laundry access port at an upper end and is provided with a bottom wall at a lower end includes: a main body mounted on

the inner circumferential face of the washing tank in a posture along the up-down direction. The device in the main body can introduce water in the washing tank from the intake port at a lower end portion, guide the water upward through the waterway, exhaust the water from the exhaust port of the surface of the upper end portion of the main body and splash the water onto laundry inside the washing tank from top.

[0018] The exhaust port is relatively long in a circumferential direction of the inner circumferential face of the washing tank. It is difficult for the exhaust port which is relatively long in the circumferential direction to spread the water risen from the waterway to the exhaust port to the two ends in the circumferential direction. However, the top-to-bottom width of the exhaust port in the middle of the circumferential direction is narrower than that at both ends in the circumferential direction. In other words, the width of the exhaust port is increased from the central portion to the two ends in the circumferential direction. Therefore, even if the potential of water from the waterway toward the exhaust port is weak, since the water risen to the exhaust port spreads over the whole region from the central portion to the two ends in the exhaust port, the exhaust port can also exhaust the water widely from the whole region in the circumferential direction.

[0019] Further, a groove on the surface of the main body is adjacently arranged on two outer sides of the exhaust port in the circumferential direction. That is to say, there is only a need to arrange grooves on the two outer sides of the exhaust port on the surface of the main body, since the exhaust port is bordered into a substantially arc shape bulged toward the central axis side of the washing tank, the water exhausted from the exhaust port would not only diffuse toward the central axis side but also toward the circumferential direction of the inner circumferential face of the washing tank into a fan shape, and is completely splashed onto the laundry. Therefore, difficulty in arranging an exhaust port which is used as the structure for plashing all the water onto the laundry and bordered into a substantially arc shape can be reduced.

[0020] Furthermore, according to the present disclosure, in the case that the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and arranged in the circumferential direction, in each of the devices, a guiding member, which is arranged on the surface of the main body in such a way that the upper end of the exhaust port is bordered, guides the water exhausted from the exhaust port in an obliquely downward direction relative to the horizontal direction. Therefore, compared with the case that the water is exhausted from each exhaust port in the horizontal direction or in an obliquely upward direction relative to the horizontal direction and collides, even if the water exhausted from each of the exhaust ports of the plurality of devices collides with each other in the washing tank, a collision position of the water in the washing tank can be moved from the access port

toward a lower bottom wall side. Therefore, water can be prevented from being scattered outside the access port after collision, and all the water can be splashed onto the laundry on the bottom wall side.

[0021] Furthermore, according to the present disclosure, in the case that the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and arranged in the circumferential direction, in each of the devices, an end portion on a same side in the circumferential direction in the exhaust port is blocked by a blocking member. Consequently, by making the water exhausted from each of the exhaust ports of the plurality of devices not collide with each other to the greatest extent, water can be prevented from being scattered outside the access port after collision, and all the water can be especially splashed onto the laundry.

[0022] Furthermore, according to the present disclosure, in the washing machine including the above device, difficulty in arranging a structure for splashing all the water onto the laundry in the device can be lowered.

Description of Drawings

[0023]

Fig. 1 is a schematic front view in section showing part showing an internal structure in a washing machine 2 having a device 1 involved in an embodiment of the present disclosure.

Fig. 2 is a longitudinal sectional front view showing a washing tank 5 in the washing machine 2.

Fig. 3 is a stereogram showing the device 1 as viewed from the front.

Fig. 4 is a rear view showing the device 1.

Fig. 5 is a front view showing the device 1.

Fig. 6 is a sectional view taken along line VI-VI of Fig. 5.

Fig. 7 is a sectional view taken along line VII-VII of Fig. 5.

Fig. 8 is a front view showing a main part of the device 1 involved in a variant embodiment.

Fig. 9 is a schematic top view showing an interior of the washing tank 5 mounted with the device 1 involved in multiple variant embodiments.

Detailed description of the Embodiments

[0024] Embodiments of the present disclosure will be specifically described below with reference to the accom-

panying drawings.

[0025] Fig. 1 is a schematic front view in section showing part showing an internal structure in a washing machine 2 having a device 1 involved in an embodiment of the present disclosure.

[0026] First of all, overview of the washing machine before 2 is described by taking an up-down direction X in Fig. 1 as a benchmark. In the up-down direction X, an upward direction is referred as an upward direction X1, and a downward direction is referred as a downward direction X2. Furthermore, the washing machine 2 further includes a laundry dryer having a function of drying laundry S.

[0027] The washing machine 2 includes a housing 3, a water tank 4, a washing tank 5 and a motor 6.

[0028] The housing 3 is formed in a box shape. The housing 3 abuts against a floor 7 from the top via legs 3A provided at a lower end thereof, so as to be disposed on the floor 7.

[0029] The water tank 4 is formed in a cylindrical shape with a bottom. The water tank 4 has: a circumferential wall 4A in a substantially cylindrical shape and having an opening part 4B at an upper end, and a bottom wall 4C in a circular plate shape for blocking a hollow portion of the circumferential wall 4B from the downward direction X2. The opening part 4A is opened and closed by a lid 8 connected to the circumferential wall 4B. Water such as tap water, bath water and a liquid dissolved with detergents and the like are accumulated in the water tank 4.

[0030] The washing tank 5 is formed in a cylindrical shape with a bottom and is slightly smaller than the water tank 4. The washing tank 5 has a circumferential wall 5B in a substantially cylindrical shape and having an access port 5A at an upper end, and a bottom wall 5C in a circular plate shape for blocking a hollow portion of the circumferential wall 5C from the downward direction X2. Therefore, in the washing tank 5, the access port 5A is formed at the upper end, and the bottom wall 5C is provided at the lower end. The washing tank 5 is coaxially housed within the water tank 4. The washing tank 5 housed within the water tank 4 can rotate with a central axis 9 as an axis, which the central axis 9 extends in the up-down direction X and is orthogonal to a horizontal direction H. Consequently, the washing machine 2 is a vertical washing machine with a vertically arranged washing tank 5.

[0031] The access port 5A is in communication with the opening part 4A from the downward direction X2, and the opening part 4A and the access port 5A are both opened and closed by the lid 8. A user of the washing machine 2 can feed/take laundry into/out of the washing tank 5 via the opened access port 5A. A through hole 5D is formed in the bottom wall 5C, and water in the water tank 4 can circulate between the water tank 4 and the washing tank 5 through the through hole 5D.

[0032] An annular balancer 10 is mounted at an upper end portion of an inner circumferential face 5E of the circumferential wall 5B. The balancer 10 is a component for reducing vibration of the washing tank 5 during rotat-

ing, and a liquid for helping to reduce vibration is housed in a cavity 10A inside the balancer 10.

[0033] The motor 6 is disposed at the downward direction X2 of the bottom wall 4C of the water tank 4 in the housing 3. An output shaft 6A of the motor 6 extends toward the upward direction X1, and sequentially passes through a circle center of the bottom wall 4C and a circle center of the bottom wall 5C of the washing tank 5. The output shaft 6A has a flange portion 6B protruding in shape of a collar between the bottom wall 4C and the bottom wall 5C, and is fixed to the bottom wall 5C and therefore is joined to the washing tank 5. The washing tank 5 rotates when driven by the motor 6.

[0034] A rotary wing 11 is mounted on an upper end portion of the output shaft 6A, which the upper end portion protrudes toward the upward direction X1 further than the bottom wall 5C. The rotary wing 11 is a so-called impeller. The rotary wing 11 is formed in a disk shape, and the upper end portion of the output shaft 6A is mounted at a circle center thereof. An upper surface of the rotary wing 39 is provided with a plurality of stirring vanes 11A radially arranged, and a lower surface of the rotary wing 11 is provided with a plurality of pumping vanes 11B radially arranged. The rotary wing 11 rotates when driven by the motor 6, and laundry S in the washing tank 5 is stirred by the stirring vanes 11A.

[0035] The inner circumferential face 5E of the washing tank 5 is mounted with the device 1. Hereinafter, a circumferential direction of the inner circumferential face 5E is referred as a circumferential direction Y, and a radial direction of the inner circumferential face 5E is referred as a radial direction Z. In the radial direction Z, a side toward the central axis 9 side is referred as a radial inner side Z1, a side away from the central axis 9 is referred as a radial outer side Z2. The up-down direction X and the circumferential direction Y are orthogonal to each other when viewed from either of the radial inner side Z1 and the radial outer side Z2.

[0036] Number of device 1 used in the washing machine 2 may be arbitrarily set, i.e. may be either one or more than one. In this embodiment, the device 1 is mounted on the inner circumferential face 5E in a state that a plurality of devices with same size and shape are gathered together and arranged in the circumferential direction Y. Spacing of adjacent devices 1 in the circumferential direction Y may be fixed between arbitrary devices 1, but may also vary depending on the devices 1.

[0037] The device 1 includes a main body 12 made of resin. The main body 12 is in shape of a relatively long lid in the up-down direction X and is erected between the balancer 10 and the bottom wall 5C of the washing tank 5 and is mounted on the inner circumferential face 5E of the washing tank 5 from the radial inner side Z1 in a posture along the up-down direction. Therefore, the main body 12 has a back face 12A which is opposite to the inner circumferential face 5E of the washing tank 5, and a surface 12B which is located on an opposite side of the back face 12A and faces a central axis 9 side.

[0038] An intake port 13 is provided on the end portion 12C of the main body lower 12, and an exhaust port 14 is provided on the surface 12B of the upper end portion 12D of the main body upper 12. A waterway 15 extending in the up-down direction X is provided on the back face 12A of the main body 12. The waterway 15 is blocked by the inner circumferential face 5E of the washing tank 5 from the radial outer side Z2, is in communication with the intake port 13 at a lower end, and is in communication with the exhaust port 14 at an upper end.

[0039] When the rotary wing 11 rotates, water in the washing tank 5 is pressed into the intake port 13 of each device 1 by the pumping vanes 11B of the rotary wing 11, and is introduced into the intake port 13 from a side wall 5C side of the washing tank 5. The water introduced by the intake port 13 is guided through the waterway 15 to the exhaust port 14 at the upward direction X1, and then is exhausted from the exhaust port 14, as shown in arrows with bold dashed lines, and is splashed onto laundry S in the washing tank 5 from the upward direction X1. Consequently, the water in the washing tank 5 circulates via the waterway 15 of the device 1 and is repeatedly used for washing, and therefore washing can be performed with a small amount of water.

[0040] Next, the device 1 is described in detail.

[0041] Fig. 2 is a longitudinal sectional front view showing a washing tank 5 in the washing machine 2.

[0042] Two devices 1 are illustrated in Fig. 2. Among the two devices 1, one device 1 is illustrated in a front view as viewed from the radial inner side Z1, and the other device 1 is illustrated in a longitudinal sectional view. As shown in one device 1, the exhaust port 14 in each of the devices 1 is a slit which is relatively long in the circumferential direction Y of the inner circumferential face 5E of the washing tank 5. The following description will be made with reference to the gesture of the device 1 when being mounted on the inner circumferential face 5E of the washing tank 5; in this case, directions are determined mainly by using the up-down direction X, the circumferential direction Y and the radial direction Z.

[0043] Fig. 3 is a stereogram showing the device 1 as viewed from the front.

[0044] Referring to Fig. 3, in the main body 12 of the device 1, a portion closer to the upward direction X1 than the lower end portion 12C extends in the circumferential direction Y with a substantially same width toward the upward direction X1, and the lower end portion 12C is slowly widened in the circumferential direction Y as toward the downward direction X2.

[0045] In Fig. 3, the surface 12B of the main body 12 is exhibited to the maximum and illustrated. In the main body 12 of Fig. 3, a face located behind the surface 12B is the back face 12A. The radial inner side Z1 is a near side of the main body 12 toward the surface 12B from the back face 12A, and the radial outer side Z2 is a far side of the main body 12 toward the back face 12A from the surface 12B.

[0046] The surface 12B may be a flat face, a curved

face, and may also be a face combined by the flat face and the curved face. As viewed from the radial inner side Z1, an outer peripheral portion of the surface 12B except substantially whole region of the lower end portion, constitutes a flange 16 bent from the surface 12B and extending toward the radial outer side Z2.

[0047] Fig. 4 is a rear view showing the device 1.

[0048] As shown in Fig. 4, as viewed from a back face side of the device 1, i.e. the radial outer side Z2, an overall shape of the flange 16 is formed in a substantially inverted U shape. In the flange 16, an upper flange 16A located at an upper end of the main body 12 flatly extends in the circumferential direction Y.

[0049] In the upper flange 16A, a central portion in circumferential direction Y constitutes a first engaging portion 17 in a block shape protruding toward the upward direction X1. In the main body 12, a pair of second engaging portions 18 in a block shape protruding from a lower end thereof toward the downward direction X2 are formed at an interval in the circumferential direction Y. As described above, in a state that the main body 12 is erected between the balancer 10 and the bottom wall 5C of the washing tank 5, the first engaging portion 17 is engaged with the balancer 10 from the downward direction X2, and the second engaging portion 18 is engaged with the bottom wall 5C from the upward direction X1, so that the main body 12 are located on the balancer 10 and the bottom wall 5C, respectively.

[0050] On the back face 12A of the main body 12, a pair of ribs 19 extending in the up-down direction X are integrally provided in a region on an inner side of the substantially U-shaped flange 16. Upper end portions 19A of the pair of ribs 19 are bent in a direction in which they approach each other, and are joined and extend in the circumferential direction Y as a whole. Therefore, an overall shape of the pair of ribs 19 is slightly smaller than an overall shape of the flange 16, and is formed in a substantially inverted U shape. A space sandwiched by the pair of ribs 19 is the waterway 15. Strictly speaking, the waterway 15 is a space relatively long in the up-down direction defined by the pair of ribs 19, the back face 12A of the main body 12, and the region of the inner circumferential face 5E of the washing tank 5 opposed to the back face 12A of the main body 12.

[0051] Lower end portions 19B of the pair of ribs 19 extend obliquely in such a way that an interval therebetween in the circumferential direction Y slowly expands as toward the downward direction X2. The intake port 13 is a region sandwiched by lower end portions 19B of the pair of ribs 19, and is opened toward the downward direction X2. The exhaust port 14 is located at an upper end of the waterway 15, adjacent to upper end portions 19A of the pair of ribs 19 from downward direction X2, and penetrates through the main body 12 in the radial direction Z.

[0052] Each of the pair of ribs 19 does not have to extend linearly in the up-down direction X, but can be bent in the middle. Depending on shapes of the ribs 19,

a width of the waterway 15 in the circumferential direction Y may also change in the middle in the up-down direction X.

[0053] At the back face 12A, a tubular sleeve 20 protruding toward the radial outer side Z2 is integrally provided at a position away from the waterway 15. Number of sleeves 20 can be arbitrarily set, in this embodiment, every two of the sleeves 20 as a unit are arranged along a up-down direction in a substantially central portion of each of the pair of ribs 19 in the up-down direction X. A plug (not shown in figures) provided on the inner circumferential face 5E of the washing tank 5 is inserted into each of the sleeves 20, so that the device 1 is positioned in the washing tank 5.

[0054] Fig. 5 is a front view showing the device 1. Fig. 6 is a sectional view taken along line VI-VI of Fig. 5. Fig. 7 is a sectional view taken along line VII-VII of Fig. 5.

[0055] Referring to Fig. 5, for a top-to-bottom width W of the exhaust port 14, when a width of the central portion 14A in the circumferential direction Y is referred as width W1, and a width of two ends 14B in the circumferential direction is referred as width W2, and the width W1 is narrower than the width W2, the width W is formed to be gradually narrower from the two ends 14B toward the central portion 14A. That is to say, the top-to-bottom width W of the exhaust port 14 in the central portion 14A is narrower than that at the two ends 14B.

[0056] In the exhaust port 14 which is just relatively long in the circumferential direction Y, water risen from the waterway 15 to the exhaust port 14 is difficult to spread over the two ends 14B in the circumferential direction Y. However, in the device 1 of this embodiment, since the top-to-bottom width W of the exhaust port 14 in the central portion 14A is narrower than that at the two ends 14B, the exhaust port 14 is widened from the central portion 14A toward the two ends 14B. Therefore, even if potential of water from the waterway 15 toward the exhaust port 14 is weak, water at the exhaust port 14 can be widely exhausted from a whole region in the circumferential direction Y since the water risen to the exhaust port 14 spreads over a whole region from the central portion 14A to the two ends 14B in the exhaust port 14.

[0057] With reference to Fig. 6, grooves 21 on the surface 12B of the upper end portion 12D of the main body 12 are arranged adjacently one by one on two outer sides of exhaust port 14 in the circumferential direction Y. In the upper end portion 12D of the main body 12, each groove 21 is formed to be recessed toward a side of the back face 12A of the main body 12 and extends in the up-down direction X (also see Fig. 3). Consequently, in the main body 12, the surface 12B of the upper end portion 12D is pressed toward an inner side in the circumferential direction Y, and the exhaust port 14 is bordered into a substantially arc shape bulged toward the radial inner side Z1. Therefore, the exhaust port 14 faces the radial inner side Z1, and is opened at two ends 14B in a manner of facing the circumferential direction Y.

[0058] In this case, water exhausted from the exhaust

port 14, as shown in dashed lines in Fig. 6, diffuses in a fan-shaped exhaust range P expanded from the exhaust port 14 toward the radial inner side Z1 in a plan view.

[0059] In this embodiment, there is only a need to arrange the grooves 21 on two outer sides of the exhaust port 14 on the surface 12B of the main body 12, the exhaust port 14 can be bordered into a substantially arc shape bulged toward a central axis 9 side of the washing tank 5, i.e. toward the radial inner side Z1. Consequently, even if there is a small amount of flow of water exhausted from the exhaust port 14, still not only widely expands toward the radial inner side Z1 but also toward the circumferential direction Y to the fan-shaped exhaust range P, and is completely splashed onto laundry S. Therefore, in the washing machine 2, difficulty in arranging an exhaust port 14 which is used as a structure for plashing all the water onto the laundry S and bordered into a substantially arc shape.

[0060] As for a sequence of arranging the grooves 21 on the main body 12, when the main body 12 is molded by injection molding or the like, male parts corresponding to the grooves 21 can be arranged in a mold in advance, so that the grooves 21 and the main body 12 are integrally formed. In addition, the grooves 21 can be arranged in the molded main body 12 by means of a subsequent cutting process or the like.

[0061] Referring to Fig. 7, the rib 22 and a guiding member 23 are arranged around the exhaust port 14 in the surface 12B of the main body 12. The rib 22 extends along the exhaust port 14 in the circumferential direction Y in such a way that a lower end of the exhaust port 14 is bordered, and protrudes toward the radial inner side Z1 to the horizontal direction H. The rib 22 may also slightly obliquely protrude toward the upward direction X1 with respect to the horizontal direction H. The guiding member 23 extends on the surface 12B of the main body 12 along the exhaust port 14 in the circumferential direction Y in such a way that an upper end of the exhaust port 14 is bordered, and protrudes toward the radial inner side Z1 and obliquely toward the downward direction X2 with respect to the horizontal direction H. A direction along which the guiding member 23 protrudes obliquely toward the downward direction X2 is referred as the obliquely downward direction X3.

[0062] The rib 22 and the guiding member 23 extend in parallel in the circumferential direction Y, and would not be connected at two end portions in the circumferential direction Y, and therefore the two ends 14B of the exhaust port 14 remain in a state of facing the circumferential direction Y (see Figs. 5 and 6). An interval between the rib 22 and the guiding member 23 in the up-down direction X is the width W of the exhaust port 14.

[0063] Water exhausted from the exhaust port 14 is guided by the ribs 22, so as not to be sprinkled along the surface 12B of the main body 12, and flow toward the radial inner side Z1. The guiding member 23 protrudes toward the radial inner side Z1 further than the rib 22. Therefore, the water exhausted from the exhaust port 14

and flowing toward the radial inner side Z1 is guided by the guiding member 23 toward the obliquely downward direction X3 with respect to the horizontal direction H.

[0064] Therefore, compared with a case that water is exhausted from each exhaust port 14 in the horizontal direction H or in an obliquely upward direction relative to the horizontal direction H and collides, even if the water exhausted from each of the exhaust ports 14 of the plurality of devices 1 collides with each other in the washing tank 5, a collision position of the water in the washing tank 5 can be moved from the access port 5A toward a lower bottom wall 5C side (see arrows with bold dashed lines of Fig. 2). Therefore, water can be prevented from being scattered outside the access port 5A after collision, and all the water can be splashed onto the laundry S on the bottom wall 5C side.

[0065] Fig. 8 is a front view showing a main part of the device 1 involved in a variant embodiment.

[0066] The devices 1 involved in the variant embodiment are as described above, provided that a plurality of devices are gathered together. Each of the devices 1 is fully painted black as shown in Fig. 8, and includes a blocking member 24 for blocking an end portion on a same side in the circumferential direction Y in the exhaust port 14. The blocking member 24 is in a shape of a block erected between the rib 22 and the guiding member 23, and may be integrally formed with the main body 12 and may also be installed on the main body 12 latter. When each device 1 is observed from the radial inner side Z1, in any of the devices 1, the blocking member 24 is only provided at one end portion (the left end portion in Fig. 8) in the circumferential direction Y in the exhaust port 14 and blocks this one end portion. Consequently, in any of the devices 1, only one of the two ends 14B of the exhaust port 14 faces the circumferential direction Y, and the other end of the two ends 14B which is provided with the blocking member 24 does not face the circumferential direction Y.

[0067] Fig. 9 is a schematic top view showing an interior of the washing tank 5 mounted with the device 1 involved in multiple variant embodiments.

[0068] As shown in Fig. 9, when the device 1 involved in the variant embodiment is used, in each of the devices 1, by comparing the exhaust range P of water exhausted from the exhaust port 14 in a plan view with the exhaust range when there is no blocking member 24, only region Q with dashed shadow lines is narrowed. That is to say, the water exhausted from the exhaust port 14 is hindered by the blocking member 24, and an exhaust direction is restricted such that the water will not diffuse to the region Q. Consequently, by making the water exhausted from each of the exhaust ports 14 of the plurality of devices 1 not collide with each other to the greatest extent, water can be prevented from being scattered outside the access port 5A after collision, and all the water can be especially splashed onto the laundry S.

[0069] The present disclosure is not restricted to the embodiments as described above, and various modifi-

cations can be made within the scope of the stated technical solution.

[0070] For example, the main body 12 of the device 1 is in a lid shape, and the waterway 15 is a space defined by the back face 12A of the main body 12, the pair of ribs 19 in the back face 12A, and the inner circumferential face 5E of the washing tank 5. Alternatively, it may be also provided that the main body 12 is a hollow body, and the waterway 15 is built into the main body 12 by making the hollow portion become the waterway 15.

Description of Reference Signs

[0071]

1 Device;
2 Washing machine;
5 Washing tank;
5A Access port;
5C Bottom wall;
5E Inner circumferential face;
9 Central axis;
12 Main body;
12A Back face;
12B Surface;
12C Lower end portion;
12D Upper end portion;
13 Intake port;
14 Exhaust port;
14A Central portion;
14B Two ends;
15 Waterway;
21 Groove;
23 Guiding member;
24 Blocking member;
H Horizontal direction;
S Laundry;
W Width;
X1 Upward direction;
X3 Obliquely downward direction;
Y Circumferential direction.

Claims

1. A device for use in a vertical washing machine, the vertical washing machine having a cylindrical washing tank with a bottom and is formed with an access port for laundry at an upper end and is provided with a bottom wall at a lower end; the device comprises:

a main body, having a back face which is opposite to an inner circumferential face of the washing tank and a surface which is located on an opposite side of the back face and faces a central axis side of the washing tank; wherein the main body is mounted on the inner circumferential face of the washing tank in a posture along

the up-down direction;

an intake port, which is provided at a lower end portion of the main body for introducing water in the washing tank from a bottom wall side;

a waterway, which is provided in the main body for guiding the water introduced by the intake port upwardly; and

an exhaust port, which is provided on a surface of an upper end portion of the main body for exhausting the water guided by the waterway and splashing the water onto laundry in the washing tank,

wherein the exhaust port is relatively long in a circumferential direction of the inner circumferential face of the washing tank, a top-to-bottom width of the exhaust port in the middle of the circumferential direction is narrower than that at both ends in the circumferential direction, and a groove on the surface of the main body is adjacently arranged on two outer sides of the exhaust port in the circumferential direction.

2. The device according to claim 1, wherein the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and are arranged in the circumferential direction, and each of the devices comprises a guiding member, which is arranged on the surface of the main body in such a way that an upper end of the exhaust port is bordered, and guides the water exhausted from the exhaust port in an obliquely downward direction relative to the horizontal direction.

3. The device according to claim 1 or 2, wherein the device is mounted on the inner circumferential face of the washing tank in a state that a plurality of devices are gathered together and arranged in the circumferential direction, and each of the devices comprises a blocking member, which blocks an end portion on a same side in the circumferential direction in the exhaust port.

4. A washing machine, comprising a device of any of claims 1-3.

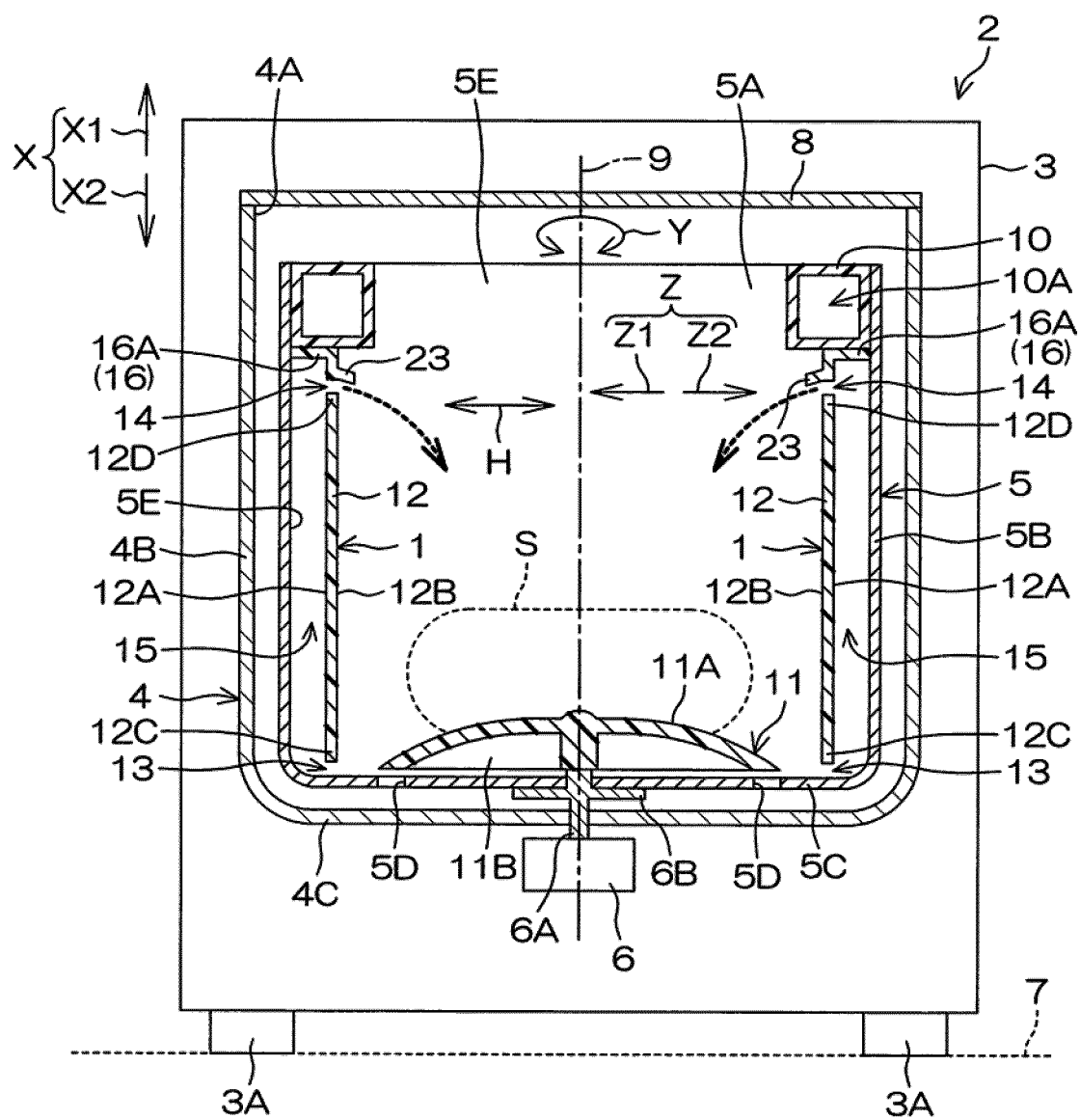


FIG.1

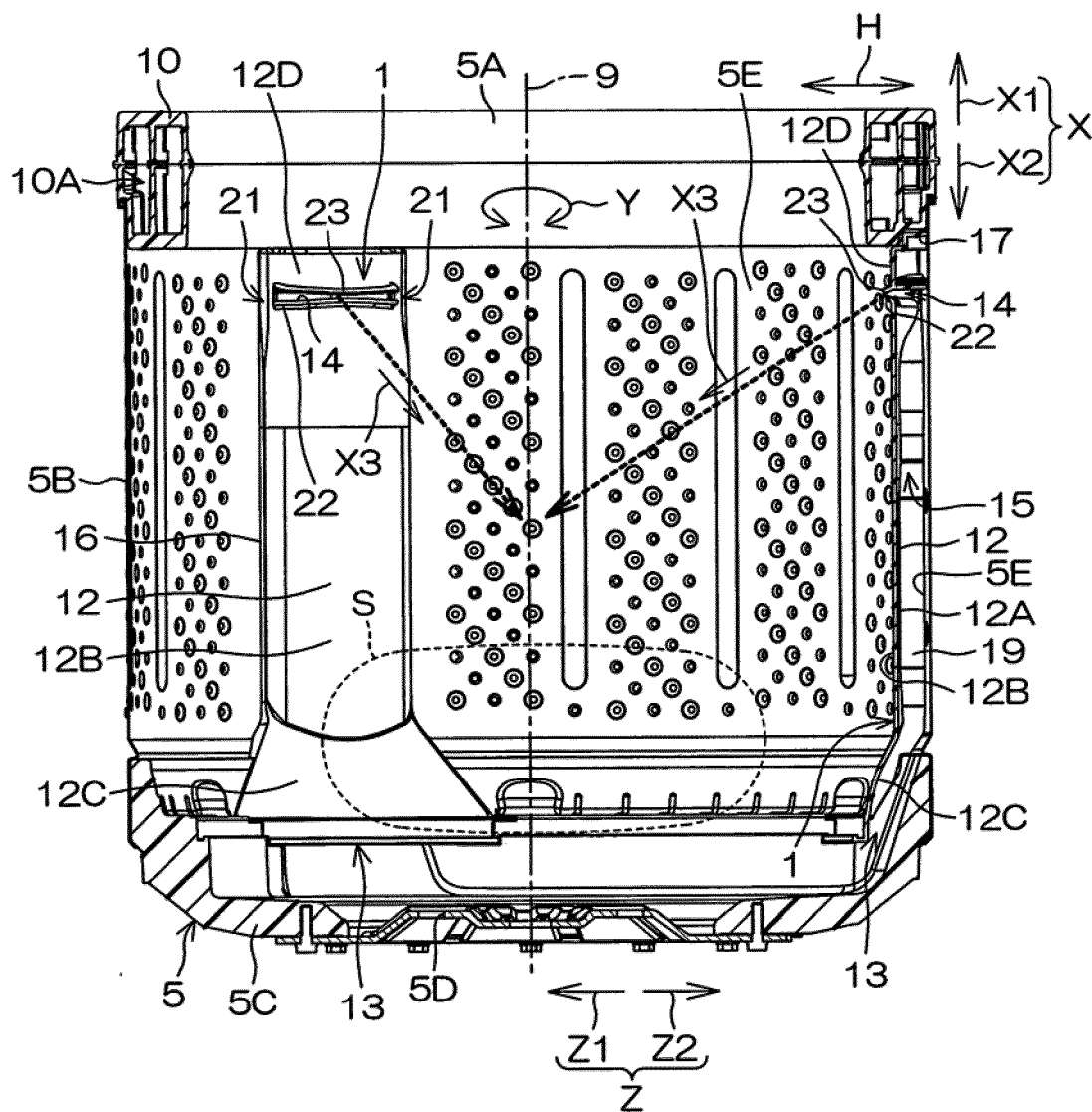


FIG. 2

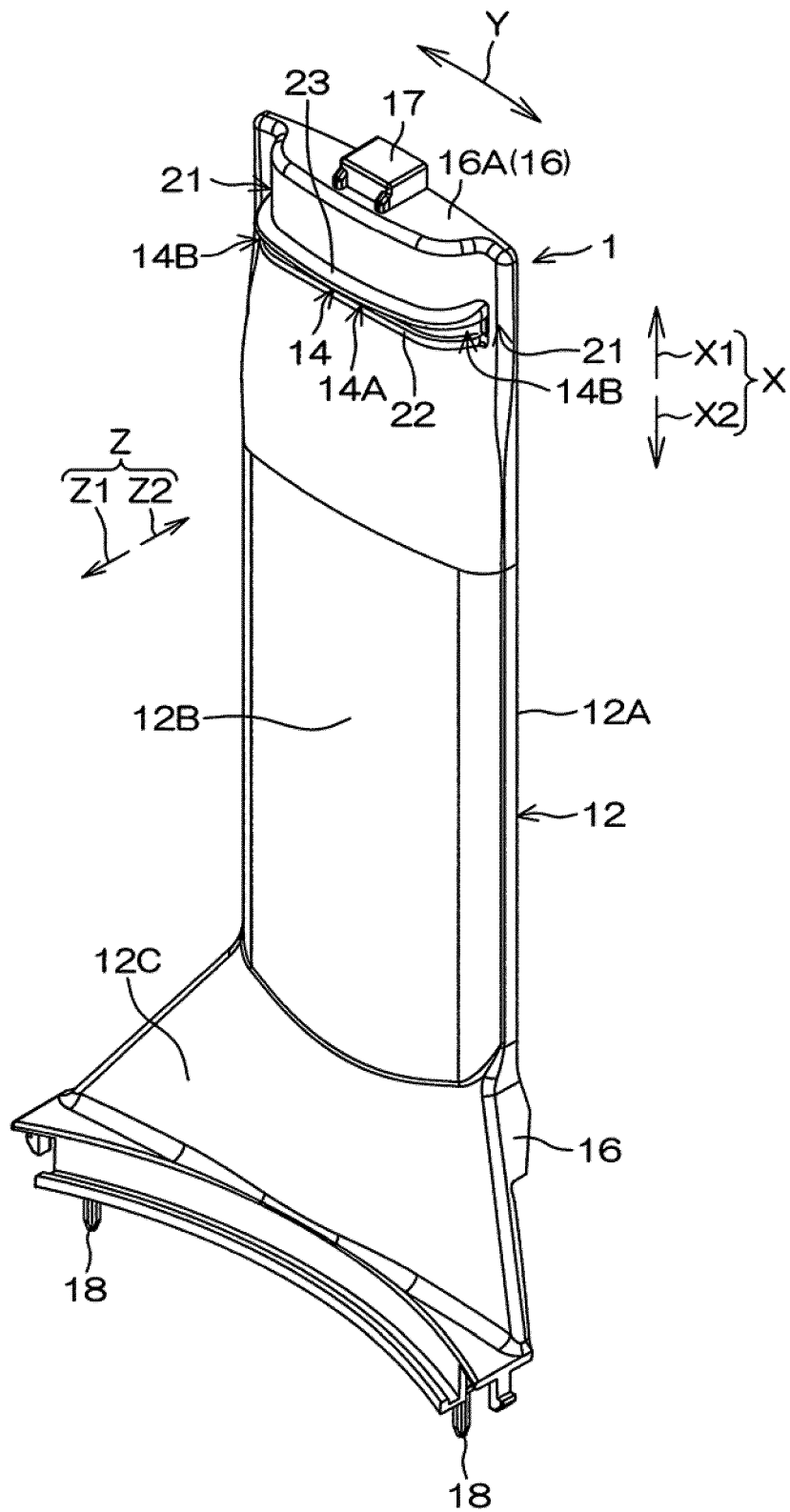


FIG. 3

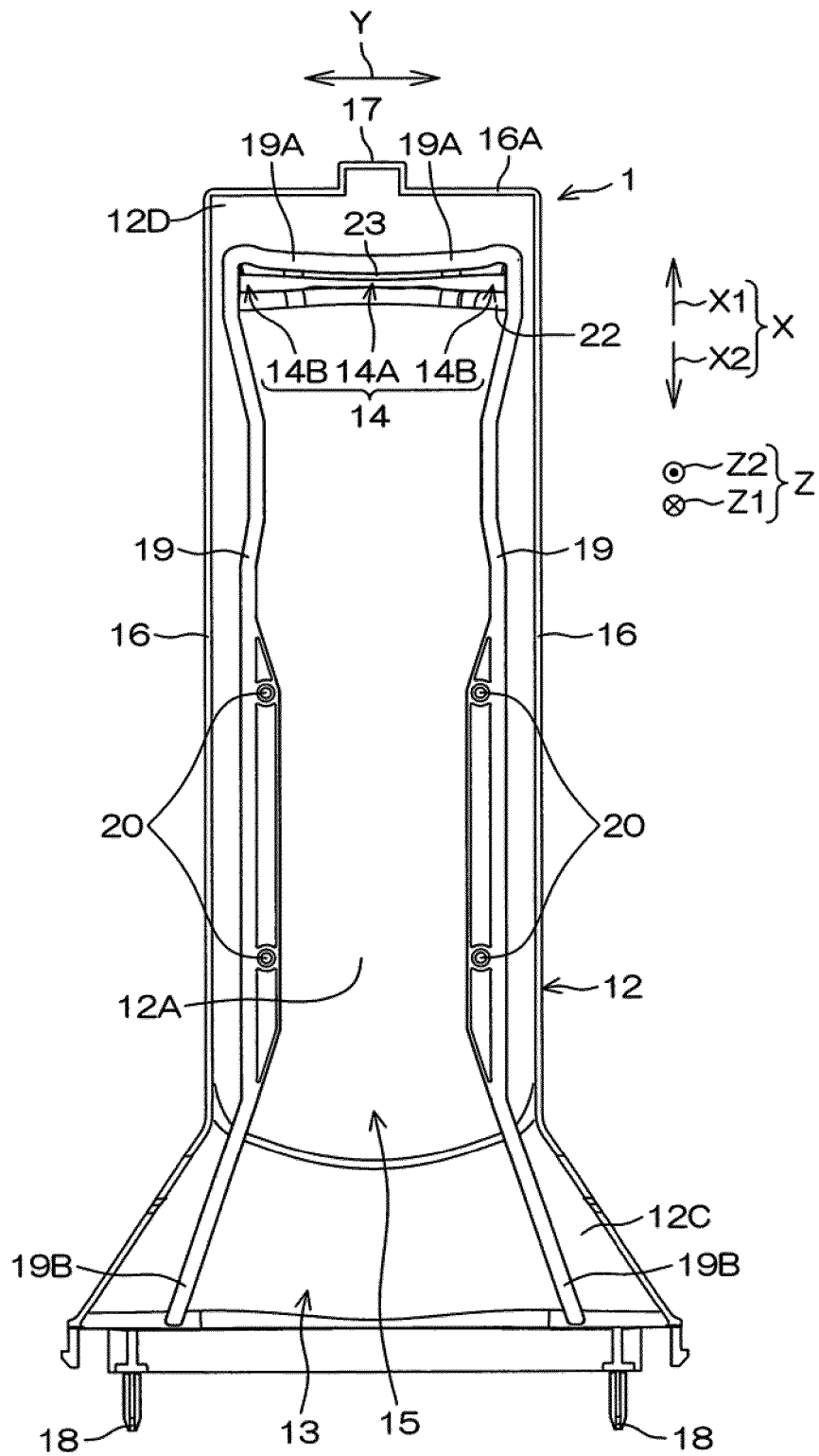


FIG. 4

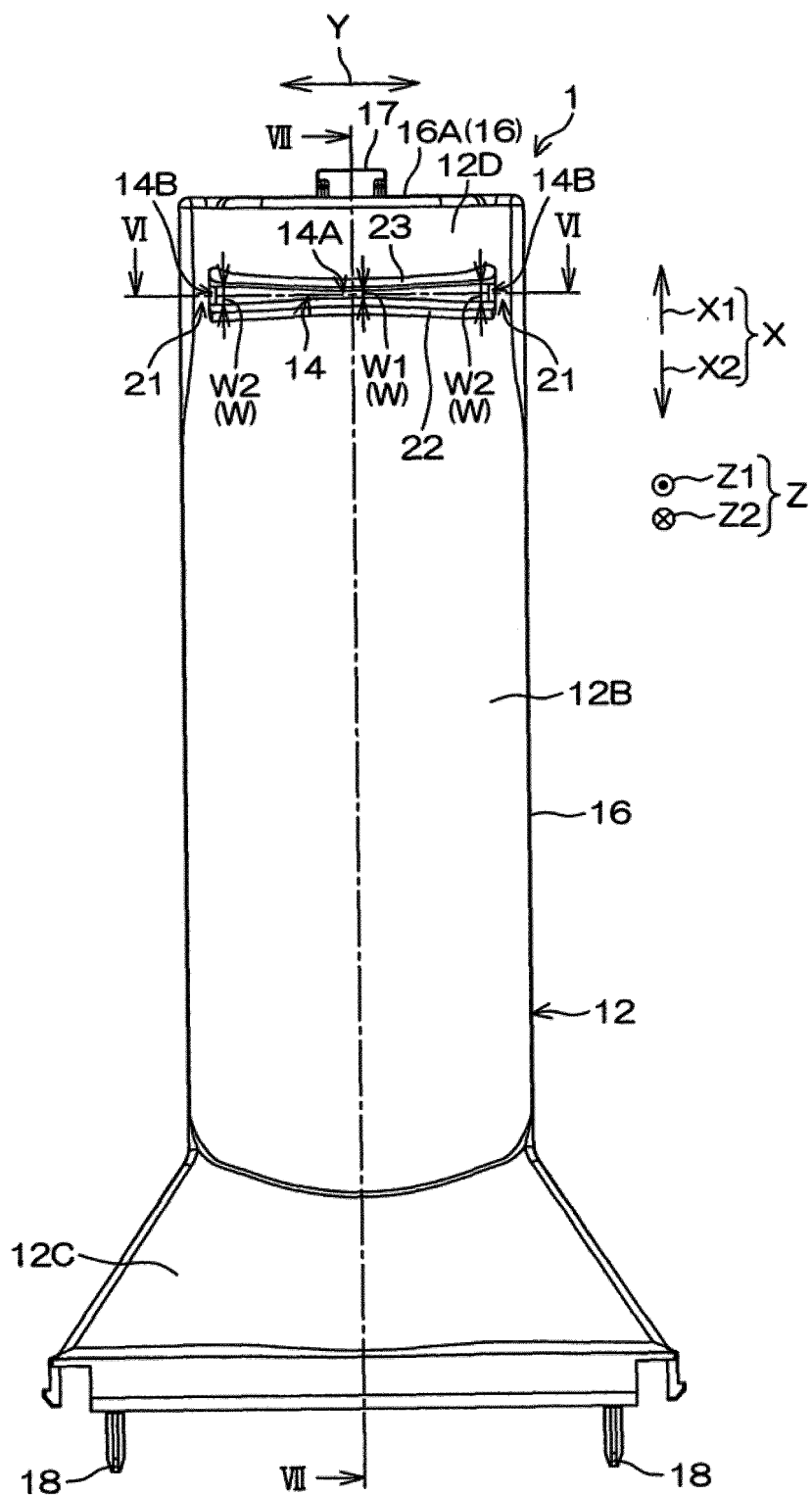


FIG. 5

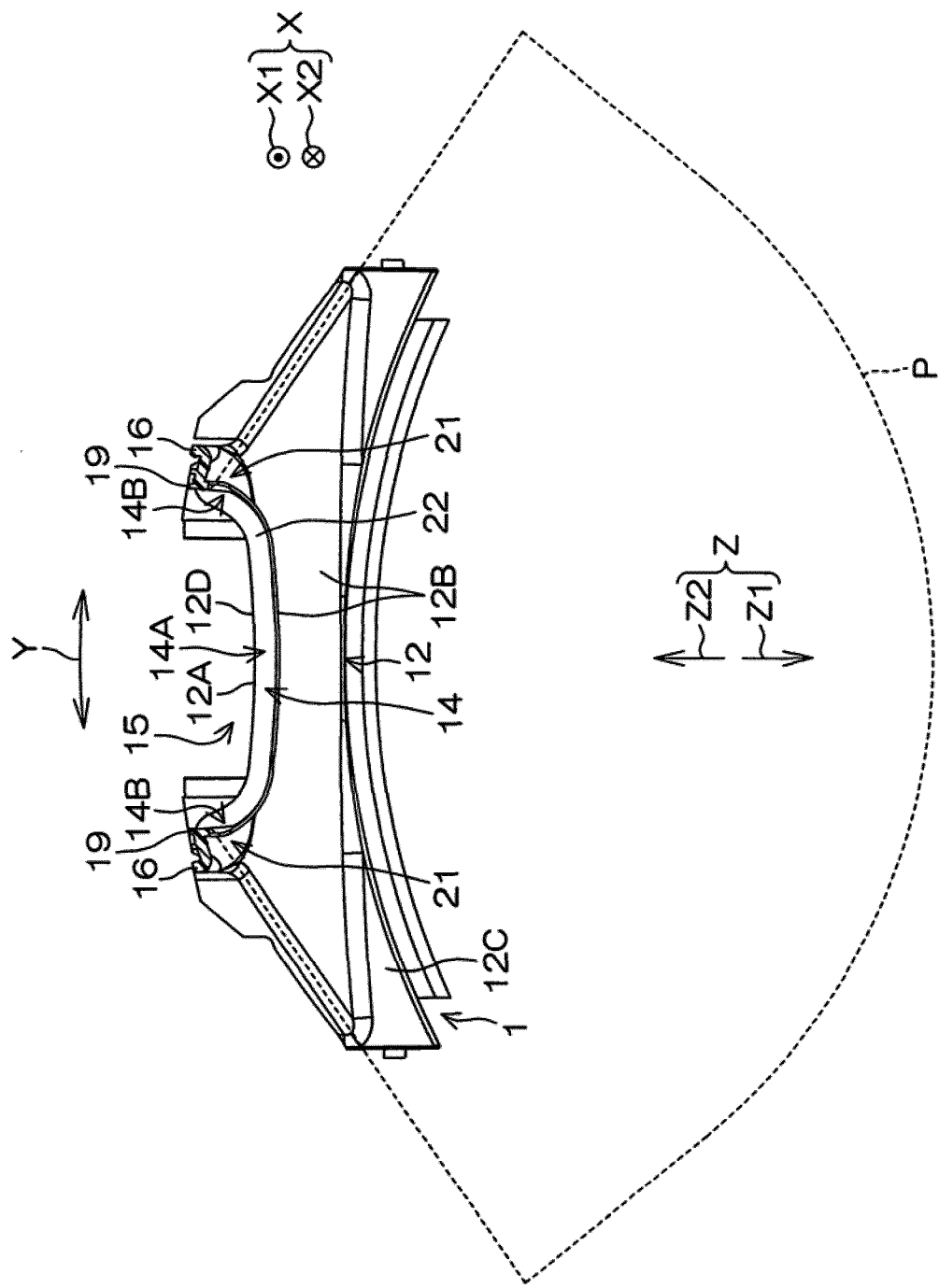


FIG. 6

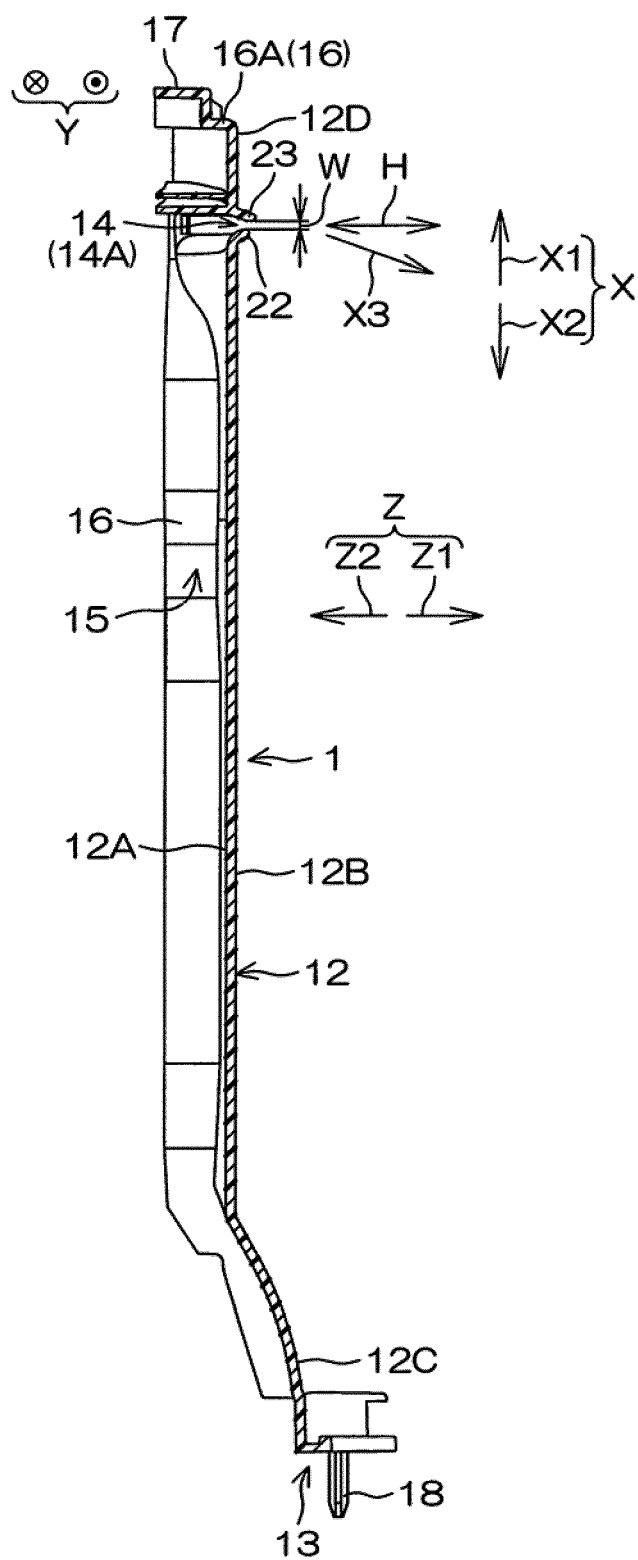


FIG. 7

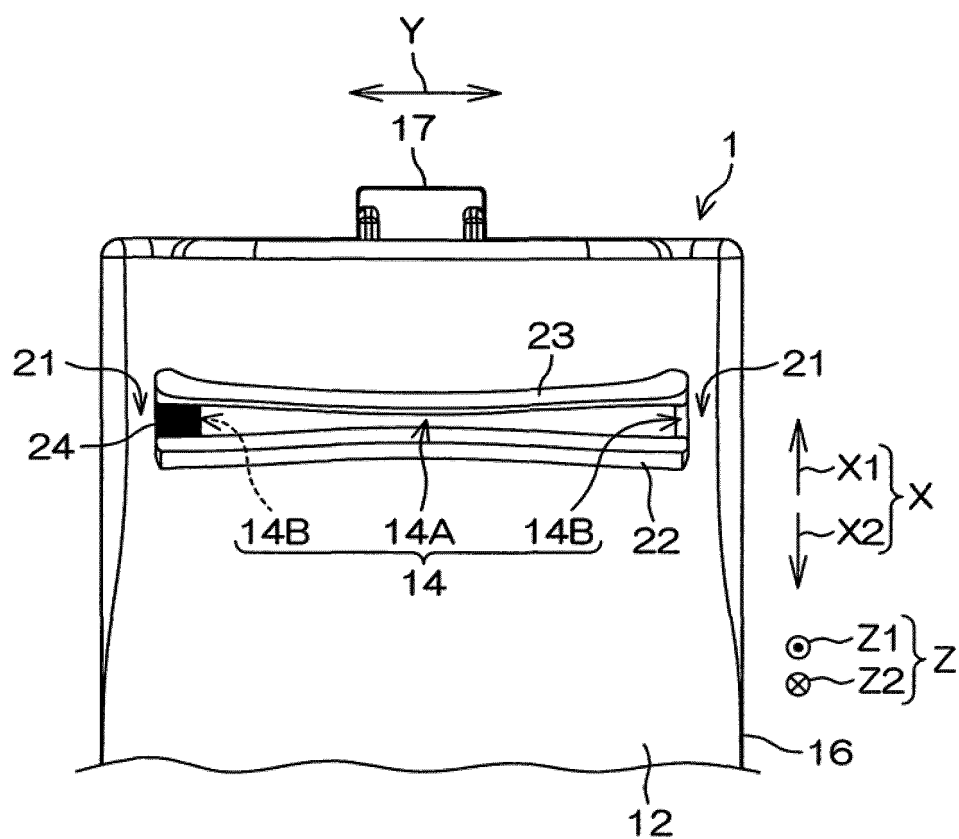


FIG. 8

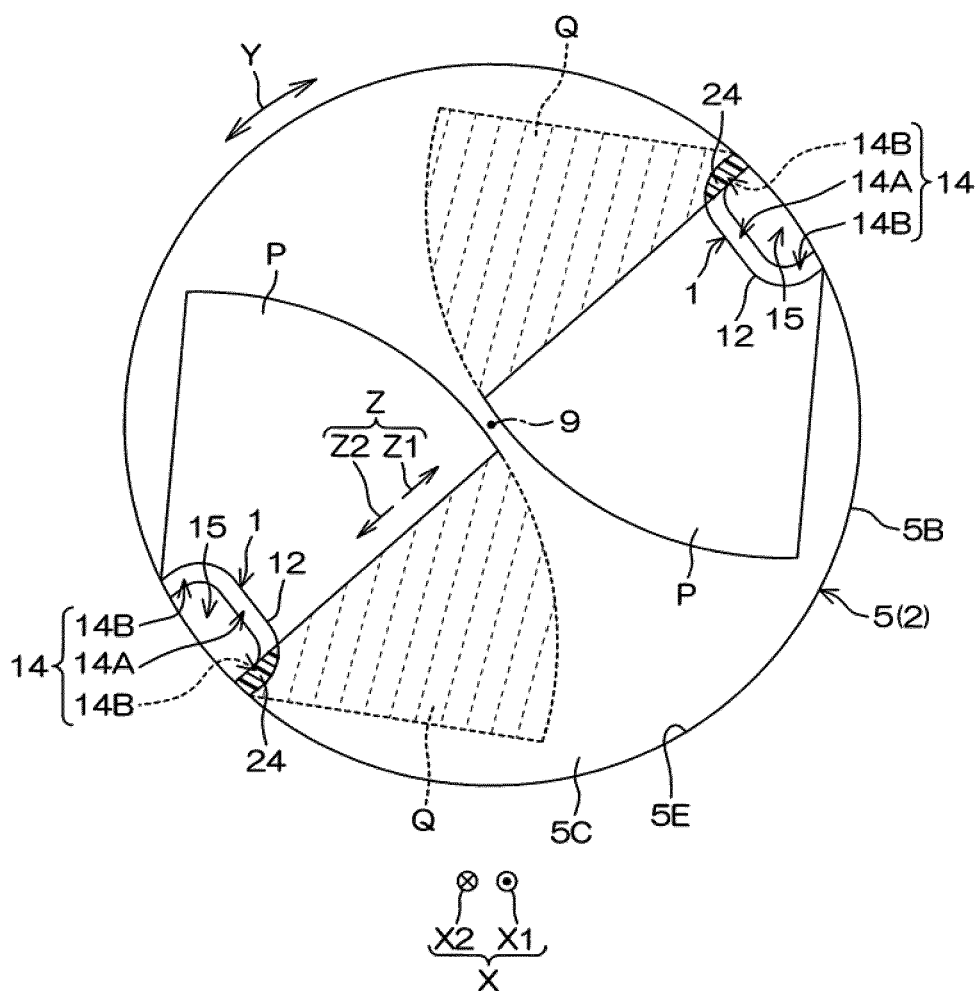


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/095748

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; DWPI; SIPOABS: circulate, column, vertical axis, upright, vertical, pulsator, impeller, inlet, outlet, drain???, groove, long??, narrow

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 102212956 A (HEFEI ROYALSTAR WASHING EQUIPMENT MANUFACTURING CO., LTD.), 12 October 2011 (12.10.2011), description, pages 2-3, and figures 1-3	3-4
A	CN 101353852 A (TOSHIBA CORPORATION et al.), 28 January 2009 (28.01.2009), the whole document	3-4
A	CN 101177908 A (NANJING LG PANDA APPLIANCES CO., LTD.), 14 May 2008 (14.05.2008), the whole document	3-4

☐ 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
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"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 26 March 2015 (26.03.2015)	Date of mailing of the international search report 03 April 2015 (03.04.2015)
Name and mailing address of the ISA/CN: 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 members

International application No.

PCT/CN2014/095748

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102212956 A	12 October 2011	CN 102212956 B	15 August 2012
CN 101353852 A	28 January 2009	CN 101353852 B	25 August 2010
		TW 200914674 A	01 April 2009
		TW1 351457 B	01 November 2011
		JP 2009028146 A	12 February 2009
CN 101177908 A	14 May 2008	KR 101360205 B1	12 February 2014
		DE 102008012633 A1	16 October 2008
		CN 101177908 B	01 June 2011
		DE 102008012633 B4	05 January 2012
		US 2008216518 A1	11 September 2008
		KR 20080081745 A	10 September 2008
		US 8037721 B2	18 October 2011

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004113277 A [0006]
- JP HEISEI1033883 B [0006]
- JP HEISEI8336696 B [0006]