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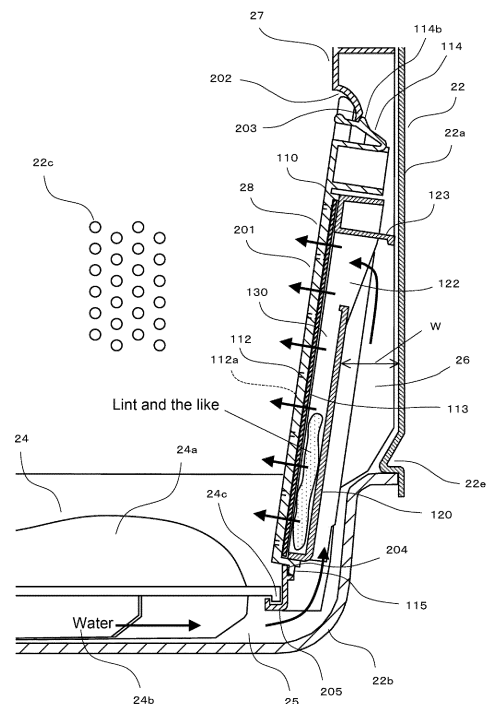
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(54) **WASHING MACHINE**

(57) The present invention provides a washing machine capable of well collecting lint and the like. A full-automatic washing machine includes: a washing and dewatering drum (22) for containing washings; an impeller (24) configured at a bottom of the washing and dewatering drum (22) in a free rotation manner; a circulating water path (26) formed on a side surface part of the washing and dewatering drum (22) and configured to enable water delivered by rotation of the impeller (24) to flow from bottom to top; and a filter unit (28) mounted on the circulating water path (26) and configured to suck from an inflow port (122) the water returning into the washing and dewatering drum (22) from the circulating water path (26) and enable the water to flow through to collect lint and the like contained in the water. The washing and dewatering drum (22) includes a drum body part (22a) and a bottom (22b) mounted on a lower part of the drum body part (22a), and the filter unit (28) is positioned on a lower part of the washing and dewatering drum (22) in a manner of longitudinally spanning between the drum body part (22a) and the bottom (22b).



**FIG. 2**

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**Description****TECHNICAL FIELD**

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

**BACKGROUND**

**[0002]** In the past, one of structures for collecting lint and dust in washings during washing in a full-automatic washing machine may adopt a thread collection structure as follows.

**[0003]** A circulating water path is formed on a side surface part of a washing and dewatering drum, and a filter unit is freely and detachably arranged on the circulating water path. The circulating water path is connected with a side surface of an impeller. Blades are arranged on a back of the impeller, and water pushed out towards an outer circumferential direction by the blades on the back is guided into the circulating water path when the impeller rotates. The water guided into the circulating water path ascends in the circulating water path and flows through the filter unit to return into the washing and dewatering drum. When the water flows through the filter unit, lint and the like included in the water are collected by the filter unit (with reference to patent literature 1).

## Existing Technical Literature

## Patent Literature

**[0004]** Patent Literature 1: Japanese Laid-Open Patent Publication No. 2013-141553

## Problems to be solved in the invention

**[0005]** With respect to the thread collection structure above, the following hidden danger may occur due to an operating mode, load capacity and the like: when a rotating speed of the impeller becomes lower or a water level in the washing and dewatering drum becomes lower, a height for drawing water through rotation of the impeller, i.e., a water level difference, is lowered, quantity of water passing through the filter unit is reduced, and the lint and the like cannot be well collected.

**SUMMARY**

**[0006]** Therefore, lint and the like are expected to be well collected even if a water level difference is lowered under a condition that a thread filter collection structure is adopted.

## Solution for solving the problems

**[0007]** A washing machine in a main embodiment of the present invention includes: a washing and dewatering

drum for containing washings; an impeller configured at a bottom of the washing and dewatering drum in a free rotation manner; a circulating water path formed on a side surface part of the washing and dewatering drum for enabling water delivered by rotation of the impeller to flow from bottom to top; and a filter unit mounted on the circulating water path and configured to suck from an inflow port the water returning into the washing and dewatering drum from the circulating water path and enable the water to flow through to collect lint and the like contained in the water that flows through. Herein, the washing and dewatering drum includes a drum body part and a bottom mounted on a lower part of the drum body part, and the filter unit is positioned on a lower part of the washing and dewatering drum in a manner of longitudinally spanning between the drum body part and the bottom.

**[0008]** Through the above structure, the quantity of circulating water which can be delivered into the filter unit can be increased, so that more lint and the like can be collected. In addition, a water level difference needed for delivering the water into the filter unit can also be lowered. Thus, even if under conditions that a rotating speed of the impeller is low and a water level in the washing and dewatering drum is low, the water can be fully delivered into the filter unit, and the lint and the like can be well collected.

**[0009]** In the washing machine in the present embodiment, the following structures may be adopted that: the filter unit has a box of which sizes in front and rear directions are smaller than sizes in upper, lower, left and right directions; an inflow port is formed in a rear surface, and an outflow port enabling the sucked water to flow out is formed in a front surface; and a filter for enabling the water to pass through and reserving the lint and the like is configured on an inner side of the outflow port.

**[0010]** Through the above structure, the filter unit may form a box which is flat in the front and rear directions, and protrusion of the filter unit protruding towards an inner side of the washing and dewatering drum may be inhibited. Therefore, even if the filter unit is configured on the lower part of the washing and dewatering drum, interference with the impeller may not be worried.

**[0011]** In the washing machine in the present embodiment, the filter unit may adopt a structure as follows: the filter unit is inclined in a manner of inclining to a side surface of the washing and dewatering drum in a state of being mounted on the circulating water path.

**[0012]** Through the above structure, compared with a condition that the filter unit is mounted on the circulating water path in a vertical state, when height positions of the inflow ports are set as the same, the sizes in the upper and lower directions of the filter unit can be increased, and containing capacity of the lint and the like can be enlarged at a correspondingly enlarged part.

**[0013]** In the washing machine in the present embodiment, a structure may be adopted as follows: a turning body for turning a water flow which will flow to upper sides of the inflow ports into a water flow towards the inflow

ports is arranged in the circulating water path.

**[0014]** Through the above structure, the water flowing through the circulating water path may be smoothly guided to the inflow ports.

**[0015]** In the washing machine in the present embodiment, a structure may be adopted as follows: at a position closer to an upstream side than the inflow ports of the circulating water path, at least near the inflow ports, a width of the circulating water path from the side surface of the washing and dewatering drum to a direction of the filter unit is gradually decreased as closer to the inflow ports.

**[0016]** Through the above structure, flow velocity of the water towards the inflow ports can be increased, so that the water and the lint strongly flow into the inflow ports.

**[0017]** Under the condition that the filter unit forms a box-shaped structure, the filter unit may further adopt a structure including a first member for forming the outflow port and a second member for forming the inflow port. In this case, the first member and the second member are connected in a manner of being separated in the front and rear directions, and on the second member, an eave-shaped protrusion body protruding towards the rear is arranged at a position closer to the upper side than the inflow port.

**[0018]** Through the above structure, the water flow in the circulating water path can be changed by the protrusion body and the water is smoothly guided to the inflow port in a state that the filter unit is mounted on the circulating water path. In addition, when the filter unit is removed from the circulating water path and the lint and the like are recovered, the protrusion body serves as a handle, so that the first member and the second member can be easily separated from each other.

#### Effects of the invention

**[0019]** According to the present invention, a washing machine capable of well collecting lint and the like can be provided.

**[0020]** Effects and even significances of the present invention are further clarified through description of embodiments shown below. However, the following embodiments are just an illustration when the present invention is implemented, and the present invention is not limited by any content described in the following embodiments.

#### BRIEF DESCRIPTION OF DRAWINGS

##### [0021]

Fig. 1 is a side sectional view illustrating a structure of a full-automatic washing machine involved in embodiments.

Fig. 2 is an enlarged sectional view illustrating a main part of circumferential parts of a circulating water path mounted with a filter unit involved in embodi-

ments.

Fig. 3 is a diagram illustrating a structure of a filter unit involved in embodiments.

Fig. 4 is a diagram illustrating a structure of a filter unit involved in embodiments.

Fig. 5 is a stereoscopic diagram illustrating a structure of a water path forming member involved in embodiments.

Fig. 6 is an enlarged sectional view illustrating a main part of circumferential parts of a circulating water path mounted with a filter unit involved in change embodiment I.

Fig. 7 is an enlarged sectional view illustrating a main part of circumferential parts of a circulating water path mounted with a filter unit involved in a change embodiment II.

#### List of reference numerals

**[0022]** 22: Washing and dewatering drum; 22a: Drum body part; 22b: Bottom; 24: Impeller; 26: Circulating water path; 26A: Circulating water path; 27: Water path forming member; 27A: Water path forming member; 28: Filter unit; 28A: Filter unit; 28B: Filter unit; 110: Front housing (first member); 112: Outflow port; 113: Filter; 120: Rear housing (second member); 122: Inflow port; 123: Protrusion piece (turning body, protrusion body); 206: Turning plate (turning body).

#### 30 DETAILED DESCRIPTION

**[0023]** A full-automatic washing machine serving as one embodiment of a washing machine in the present invention is described below with reference to drawings.

**[0024]** Fig. 1 is a side sectional view illustrating a structure of a full-automatic washing machine 1.

**[0025]** The full-automatic washing machine 1 includes a housing 10 forming an appearance. The housing 10 includes a square cylindrical machine body part 11 with opened upper and lower surfaces, an upper panel 12 covering the upper surface of the machine body part 11, and a bearer 13 supporting the machine body part 11. A throwing inlet 14 for washings is formed in the upper panel 12. The throwing inlet 14 is covered by an upper cover 15 which can be freely opened and closed.

**[0026]** In the housing 10, an outer drum 20 is elastically suspended and supported by four hanger rods 21 with a vibration-proof apparatus. A washing and dewatering drum 22 is arranged in the outer drum 20.

**[0027]** The washing and dewatering drum 22 is composed of a cylindrical drum body part 22a and a shallow bowl-shaped bottom 22b. The bottom 22b is mounted on a lower part of the drum body part 22a by using fixing methods such as screw fixation. A plurality of dewatering holes 22c are formed in an inner circumferential surface of the washing and dewatering drum 22. In addition, a plurality of water through holes 22d are formed in a bottom surface of the washing and dewatering drum 22. Fur-

ther, a balancing ring 23 is arranged on an upper part of the washing and dewatering drum 22.

**[0028]** An impeller 24 is arranged at a bottom of the outer drum 20. A plurality of blades 24a which radially extend from a center of a surface are formed on the surface of the impeller 24. In addition, a plurality of water drawing blades 24b which radially extend from a center of a back are formed on a back of the impeller 24. The water drawing blades 24b are configured in a pump chamber 25 formed between the back of the impeller 24 and the bottom surface of the washing and dewatering drum 22.

**[0029]** A circulating water path 26 extending towards upper and lower directions along the inner circumferential surface of the washing and dewatering drum 22 is formed by a water path forming member 27 as well as the drum body part 22a and the bottom 22b of the washing and dewatering drum 22. A lower end part of the circulating water path 26 is connected with the pump chamber 25. A filter unit 28 is detachably mounted on the circulating water path 26 to form the water path forming member 27 of the circulating water path 26. The filter unit 28 is positioned on the lower part of the washing and dewatering drum 22 in a manner of longitudinally spanning between the drum body part 22a and the bottom 22b. In addition, the filter unit 28 is inclined in a manner of inclining to the inner circumferential surface side of the washing and dewatering drum 22.

**[0030]** A drive unit 30 for generating a torque for driving the washing and dewatering drum 22 and the impeller 24 is configured at an outer bottom of the outer drum 20. The drive unit 30 includes a drive motor 31 and a transmission mechanism part 32. The transmission mechanism part 32 includes a clutch mechanism. Due to a switching operation performed by the clutch mechanism, the torque of the drive motor 31 is only transmitted to the impeller 24 to only enable the impeller 24 to rotate in a washing process and a rinsing process; while in a dewatering process, the torque of the drive motor 31 is transmitted to the impeller 24 and the washing and dewatering drum 22 to enable the impeller 24 and the washing and dewatering drum 22 to integrally rotate. In addition, the transmission mechanism part 32 has a speed reducing mechanism. In the washing process and the rinsing process, the impeller 24 rotates at a rotating speed obtained by reducing a rotating speed of the drive motor 31 according to a reduction ratio of the speed reducing mechanism.

**[0031]** A water outlet part 20a is formed at the outer bottom of the outer drum 20. A drainage valve 40 is arranged at the water outlet part 20a and connected with a drainage hose 41. When the drainage valve 40 is opened, water stored in the washing and dewatering drum 22 and the outer drum 20 is discharged out of the machine by the drainage hose 41.

**[0032]** A water supply unit 50 used for supplying running water into the washing and dewatering drum 22 is configured on a rear part of the upper panel 12. The water

supply unit 50 has a water supply valve 51. The water supply valve 51 is connected with a water faucet. The running water is guided into the water supply unit 50 from the water faucet when the water supply valve 51 is opened. The guided-in running water flows into the washing and dewatering drum 22 from a water filling nozzle 52 of the water supply unit 50.

**[0033]** The full-automatic washing machine 1 performs washing operations in various operating modes. The washing operations include a washing process, an intermediate dewatering process, a rinsing process and a final dewatering process.

**[0034]** In the washing process and the rinsing process, the impeller 24 rotates to a right direction and a left direction in a state that the water is stored in the washing and dewatering drum 22. A water flow is produced in the washing and dewatering drum 22 due to the rotation of the impeller 24. Washings are cleaned by the produced water flow and detergents contained in the water in the washing process. The washings are rinsed by the produced water flow in the rinsing process.

**[0035]** In the intermediate dewatering process and the final dewatering process, the washing and dewatering drum 22 and the impeller 24 integrally rotate at a high speed. The washings are dewatered by virtue of an action of a centrifugal force generated by the washing and dewatering drum 22.

**[0036]** The full-automatic washing machine 1 in the present embodiment is characterized in a thread collection structure composed of the circulating water path 26 and the filter unit 28. The thread collection structure is described below in detail.

**[0037]** Fig. 2 is an enlarged sectional view illustrating a main part of circumferential parts of the circulating water path 26 mounted with the filter unit 28. Fig. 3 and Fig. 4 are diagrams illustrating a structure of the filter unit 28. Fig. 3(a) is a front stereoscopic diagram illustrating the filter unit 28, and Fig. 3(b) is a rear stereoscopic diagram illustrating the filter unit 28. Fig. 4(a) is a side sectional view illustrating the filter unit 28 in a closed state, and Fig. 4(b) is a side sectional view illustrating the filter unit 28 in an opened state. Fig. 5 is a stereoscopic diagram illustrating a structure of the water path forming member 27.

**[0038]** The filter unit 28 has a box shape of which sizes in front and rear directions are smaller than sizes in upper, lower, left and right directions and which is flat in the front and rear directions. The filter unit 28 includes a front housing 110 opened to the rear and a rear housing 120 opened to the front. The front housing 110 is equivalent to a first member in the present invention, and the rear housing 120 is equivalent to a second member in the present invention.

**[0039]** The front housing 110 and the rear housing 120 are overlapped in the front and rear directions in a manner of embedding the rear housing 120 into an inner side of the front housing 110, thus, a containing part 130 for storing lint and the like is formed inside the filter unit 28. A

shaft part 121 formed on two sides of a lower part of the rear housing 120 is supported on shaft holes 111 formed on two sides of a lower part of the front housing 110 in a free rotation manner. As shown in Fig. 4(b), the front housing 110 and the rear housing 120 are in an opened state when the rear housing 120 is rotated towards the rear by taking the shaft part 121 as a center.

**[0040]** An outflow port 112 is formed in a front surface of the front housing 110. The outflow port 112 is formed by a plurality of outflow holes 112a arranged in a criss-cross manner. A filter 113 formed by mesh pieces is bonded to an inner side of the outflow port 112, and each of the outflow holes 112a is covered by the filter 113.

**[0041]** A engaging claw part 114 is formed at an upper end of the front housing 110. The engaging claw part 114 includes a main body part 114a which can be bent towards a lower side and a claw part 114b protruding towards an upper side from the main body part 114a. A slender mounting rib 115 in the left and right direction which protrudes towards the lower side is formed at the lower end part of the front housing 110.

**[0042]** A rectangular inflow port 122, which is long in a transverse direction, is formed on an upper part at a rear surface of the rear housing 120. An eave-shaped protrusion piece 123 is formed on an upper edge part of the inflow port 122. The protrusion piece 123 has a width which is roughly the same as a transverse width of the inflow port 122 and protrudes more backwards than a side surface of the front housing 110. The protrusion piece 123 is equivalent to a turning body and a protrusion body in the present invention.

**[0043]** A mounting port part 201, which is greatly opened based on a shape corresponding to the filter unit 28, is formed on the water path forming member 27. The mounting port part 201 is slightly inclined and slightly faces the upper side. A circumferential part 202 of the mounting port part 201 is slightly recessed rather than the periphery. An engaging piece 203, which slightly protrudes towards an interior of the mounting port part 201, is formed at an upper part of the circumferential part 202. A rib bearing port 204 corresponding to the mounting rib 115 of the front housing 110 is formed on a lower part of the circumferential part 202.

**[0044]** An arc-shaped groove part 205 is formed at the lower end part of the water path forming member 27. When the water path forming member 27 is mounted in the washing and dewatering drum 22, the groove part 205 forms a part of an annular groove (not shown in figures) formed at the bottom 22b of the washing and dewatering drum 22. As shown in Fig. 2, an annular rib 24c formed on an outer circumferential edge of the impeller 24 is inserted into an annular groove part including the groove part 205.

**[0045]** As shown in Fig. 2, the filter unit 28 is mounted at the mounting port part 201 of the water path forming member 27. A top end part of the front housing 110 is shown in Fig. 3(b), and the upper part and two side parts of the front housing 110 protrude more outwards than

other parts. The protruding part is embedded into the circumferential part 202 of the mounting port part 201, so that the filter unit 28 is fixed in a manner of not moving towards the upper, lower, left, right and rear directions.

5 In addition, the claw part 114b of the engaging claw part 114 is clamped to a back side of the engaging piece 203, and the mounting rib 115 is embedded into the rib bearing port 204, so that the filter unit 28 is fixed in a manner of not moving forwards.

10 **[0046]** Herein, when the filter unit 28 is mounted to the mounting port part 201, the mounting rib 115 at the lower end of the filter unit 28 is embedded into the rib bearing port 204 by a user first. Then, the user bends the engaging claw part 114 downwards in a manner of enabling a claw part 114b to be lower than the engaging piece 203 and also enables the upper part of the filter unit 28 to move backwards. Then, when the filter unit 28 is completely mounted to the mounting port part 201 and the claw part 114b reaches the back side of the engaging piece 203, the user releases bending of the engaging claw part 114, so that the claw part 114b is clamped with the engaging piece 203.

25 **[0047]** A top end of the protrusion piece 123 of the filter unit 28 is close to the inner circumferential surface of the washing and dewatering drum 22 forming a rear surface of the circulating water path 26 in a state that the filter unit 28 is mounted on the water path forming member 27, that is, the circulating water path 26. In addition, on an upstream side closer to the circulating water path 26 than the inflow port 122 of the filter unit 28, a width W of the front and rear directions of the circulating water path 26 defined by the rear surface of the rear housing 120 and the inner circumferential surface of the washing and dewatering drum 22 is in a region which includes a region close to the inflow port 122 and which is closer to the upper side than a folding part 22e of the drum body part 22a of the washing and dewatering drum 22, and is folded in a manner of being gradually narrowed as closer to the inflow port 122.

30 **[0048]** Next, with reference to Fig. 1 and Fig. 2, a collection action on the lint and the like in the filter unit 28 is described.

35 **[0049]** In the washing process or rinsing process, when the impeller 24 rotates, water between the washing and dewatering drum 22 and the outer drum 20 penetrates through the water through holes 22d and are sucked into the pump chamber 25 and pushed towards an outer circumferential direction by virtue of a water drawing action performed by the water drawing blades 24b. The pushed water is guided into the circulating water path 26, ascends in the circulating water path 26 and flows into the containing part 130 of the filter unit 28 through the inflow port 122. At this moment, the lint and the like included in the water flow into the containing part 130.

40 **[0050]** The protrusion piece 123 protrudes on the upper side of the inflow port 122, and a water flow which will flow to the upper side of the inflow port 122 in the circulating water path 26 passes through the protrusion

piece 123 and is turned into a water flow towards the inflow port 122. Thus, the water ascending in the circulating water path 26 is smoothly guided to the inflow port 122. Further, since the width W of the front and rear directions of the circulating water path 26 is folded in a manner of gradually being narrowed near the inflow port 122, flow velocity of the water towards the inflow port 122 is increased. Therefore, the water and the lint can strongly flow into the inflow port 122.

**[0051]** The water flowing into the containing part 130 of the filter unit 28 penetrates through a filter 113 and each of outflow holes 112a of the outflow port 112 to flow into the washing and dewatering drum 22. Then, the lint and the like cannot pass through the filter 113 and are reserved in the containing part 130.

**[0052]** In a period of repeatedly performing the washing operation, the lint and the like may be reserved in the containing part 130 of the filter unit 28. The user removes the filter unit 28 from the circulating water path 26, holds the front housing 110 by one hand and holds the protrusion piece 123 of the rear housing 120 to pull backwards by the other hand. As shown in Fig. 4(b), the front housing 110 and the rear housing 120 are in an opened state, and the user can take out the lint and the like from the filter unit 28 and then discard the lint and the like.

#### Effects of the present embodiment

**[0053]** According to the present embodiment above, since the washing machine is set as a structure that the filter unit 28 is positioned on the lower part of the washing and dewatering drum 22 in a manner of longitudinally spanning between the drum body part 22a and the bottom 22b, the quantity of water delivered to the filter unit 28 can be increased even if a water level difference produced in the pump chamber 25 is the same, and thus, more lint and the like can be collected. In addition, in other words, a water level difference needed for delivering the water to the filter unit 28 can be inhibited to be lower. Therefore, even if a rotating speed of the impeller 24 is low and a water level in the washing and dewatering drum 22 is low, the water can be fully delivered into the filter unit 28, and the lint and the like can be well collected.

**[0054]** In addition, according to the present embodiment, since the filter unit 28 is formed into a box which is flat in front and rear directions, a protrusion amount of the filter unit 28 protruding towards the inner side of the washing and dewatering drum 22 can be inhibited. Therefore, interference with the impeller 24 does not need to be worried even if the filter unit 28 is configured on the lower part of the washing and dewatering drum 22.

**[0055]** Further, according to the present embodiment, the filter unit 28 is mounted on the circulating water path 26 in the manner of inclining to the inner circumferential surface of the washing and dewatering drum 22. Therefore, compared with a condition that the filter unit is mounted in a vertical state, when height positions of the inflow ports 122 are set as the same, sizes in the upper

and lower directions of the filter unit 28 may be increased, and containing capacity of the lint and the like can be enlarged at a correspondingly enlarged part. In addition, as shown in Fig. 2, in the structure of the washing and dewatering drum 22, even if an inner diameter of the bottom 22b is smaller than an inner diameter of the drum body part 22a, since the lower part of the filter unit 28 is positioned at a position, closer to the inner side, of the washing and dewatering drum 22 compared with the upper part, a condition that part of the circulating water path 26 formed by the water path forming member 27 and the bottom 22b is narrowed can also be inhibited.

**[0056]** Further, since the protrusion piece 123 is arranged at an upper position of the inflow port 122 on the filter unit 28, the water flow in the circulating water path 26 can be changed through the protrusion piece 123 in a state that the filter unit 28 is mounted on the circulating water path 26, and the water is smoothly guided to the inflow port 122. In addition, when the filter unit 28 is removed from the circulating water path 26 and the lint and the like are recovered, the front housing 110 and the rear housing 120 can be easily opened by taking the protrusion piece 123 as a handle.

**[0057]** Further, according to the present embodiment, the width W in the front and rear directions of the circulating water path 26 is at least folded near the inflow port 122 in a manner of being gradually narrowed as closer to the inflow port 122. Therefore, the flow velocity of the water towards the inflow port 122 is increased, the water and the lint and the like can be enabled to strongly flow to the inflow port 122, and an effect of collecting the lint and the like can be expected to be improved.

**[0058]** Although embodiments regarding the present invention are described above, the present invention is not limited to the above-mentioned embodiments. In addition, various changes besides the above can also be made to embodiments of the present invention.

#### Change Embodiment I

**[0059]** Fig. 6 is an enlarged sectional view illustrating a main part of circumferential parts of a circulating water path 26A mounted with a filter unit 28A involved in a change embodiment I.

**[0060]** For a water path forming member 27A forming a filter unit 28A and a circulating water path 26A, a structure which is the same as the filter unit 28 and the water path forming member 27 in above embodiments is endowed with the same reference numerals, and description is omitted.

**[0061]** No protrusion piece is arranged above an inflow port 122 on the filter unit 28A. Instead, a turning plate 206 extending to left and right is formed in rear of an upper part of the inflow port 122 on the water path forming member 27A. A left-right width of the turning plate 206 may as well be set to be equal to, or greater than or equal to a left-right width of the inflow port 122. A rear end of the turning plate 206 is close to an inner circumferential

surface of a washing and dewatering drum 22. The turning plate 206 is equivalent to a turning body in the present invention.

**[0062]** A condition that such a structure is adopted is also the same as embodiments above. A water flow in the circulating water path 26A can be changed by the turning plate 206, so that water is smoothly guided to the inflow port 122.

#### Change Embodiment II

**[0063]** In embodiments above, a box-shaped filter unit 28 in which lint and the like can be stored is used. However, as described below, a filter unit 28B with a bag-type thread filter 304 can also be used.

**[0064]** Fig. 7 is an enlarged sectional view illustrating a main part of circumferential parts of a circulating water path 26A mounted with a filter unit 28B involved in a change embodiment II.

**[0065]** In the present change embodiment, like the change embodiment I, a water path forming member 27A is used. The filter unit 28B is mounted on the water path forming member 27A, i.e., a circulating water path 26A.

**[0066]** The filter unit 28B includes a filter box 301. The filter box 301 has an inflow port 302 which is long in upper and lower directions on a rear surface of the filter box 301. An opening part 303 is formed on a front surface of the filter box 301. A thread filter 304 composed of meshed bags is mounted at the opening part 303. An engaging claw part 305 which is the same as an engaging claw part 114 in embodiments above is formed at an upper end part of the filter box 301. The engaging claw part 305 includes a main body part 305a and a claw part 305b, and the claw part 305b is engaged with an engaging piece 203 on the water path forming member 27A. In addition, a mounting rib 306 which is the same as a mounting rib 115 in embodiments above is formed at a lower end part of the filter box 301. The mounting rib 306 is embedded into a rib bearing port 204 on the water path forming member 27A.

**[0067]** In a structure of the present change embodiment, water penetrating through the inflow port 302 to flow into the filter box 301 from the circulating water path 26A further penetrates through the thread filter 304 to flow into the washing and dewatering drum 22. Lint and the like included in the water are reserved in the thread filter 304.

**[0068]** In the structure of the present change embodiment, since the filter unit 28A is inclined in a manner of raising a top end side of the thread filter 304, the thread filter 304 can be prevented from being contacted with an impeller 24.

#### Other Change Embodiments

**[0069]** In the above embodiment, a front housing 110 and a rear housing 120 are connected to a lower end part in a free rotation manner. The front housing 110 and

the rear housing 120 are opened by rotating the rear housing 120 backwards. However, any separation manner of the front housing 110 and the rear housing 120 can be adopted. For example, a manner of completely separating the front housing 110 and the rear housing 120 in front and rear directions can also be adopted.

**[0070]** In addition, in the above embodiment, the front housing 110 opened to the rear and the rear housing 120 opened to the front are combined so as to form a box-shaped filter unit 28. However, a structure of the box-shaped filter unit is not limited to the above structure. For example, a structure that the filter unit is formed by a box opened from a rear surface and a cover body covering the rear surface can also be adopted.

**[0071]** In the above embodiment, a water path forming member 27 extends upwards to a position of a balancing ring 23. Although the water path forming member 27 is not shown in the figures, the water path forming member 27 is combined with the balancing ring 23. However, since a part closer to an upper side than a mounting port part 201 of the water path forming member 27 does not perform functions as a circulating water path 26, these upper parts may not be set.

**[0072]** Although a full-automatic washing machine 1 in the above embodiment does not have a clothes drying function, the present invention is also applicable to a full-automatic washing machine with the clothes drying function.

**[0073]** In addition, various changes can be properly made to embodiments of the present invention within a scope of technical concepts shown in claims.

#### Claims

1. A washing machine, comprising:

- a washing and dewatering drum, for containing washings;
  - an impeller, configured at a bottom of the washing and dewatering drum in a free rotation manner;
  - a circulating water path, formed on a side surface part of the washing and dewatering drum, and for enabling water delivered by rotation of the impeller to flow from bottom to top; and
  - a filter unit, mounted on the circulating water path and configured to suck, from an inflow port, water returning into the washing and dewatering drum from the circulating water path and enable the water to flow through to collect lint and the like contained in the water that flows through, wherein
- the washing and dewatering drum comprises a drum body part and a bottom mounted on a lower part of the drum body part; and
- the filter unit is positioned on a lower part of the washing and dewatering drum in a manner of

longitudinally spanning between the drum body part and the bottom.

- 2. The washing machine according to claim 1, wherein the filter unit has a box of which sizes in front and rear directions are smaller than sizes in upper, lower, left and right directions; the inflow port is formed in a rear surface, and an outflow port enabling the sucked water to flow out is formed in a front surface; and a filter for enabling the water to pass through and reserving the lint and the like is configured on an inner side of the outflow port. 5  
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- 3. The washing machine according to claim 1 or 2, wherein the filter unit is inclined in a manner of inclining to a side surface of the washing and dewatering drum in a state of being mounted on the circulating water path. 15  
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- 4. The washing machine according to any one of claims 1-3, wherein a turning body for turning a water flow which will flow to upper sides of the inflow ports into a water flow towards the inflow ports is arranged in the circulating water path. 25
  
- 5. The washing machine according to any one of claims 1-4, wherein at a position closer to an upstream side than the inflow ports of the circulating water path, at least near the inflow ports, a width of the water path from the side surface of the washing and dewatering drum to a direction of the filter unit is gradually decreased as closer to the inflow ports. 30  
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- 6. The washing machine according to claim 2, wherein the filter unit comprises a first member for forming the outflow port and a second member for forming the inflow port; the first member and the second member are connected in a manner of being separated in front and rear directions, and on the second member, an eave-shaped protrusion body protruding towards the rear is arranged at a position closer to upper side than the inflow port. 40  
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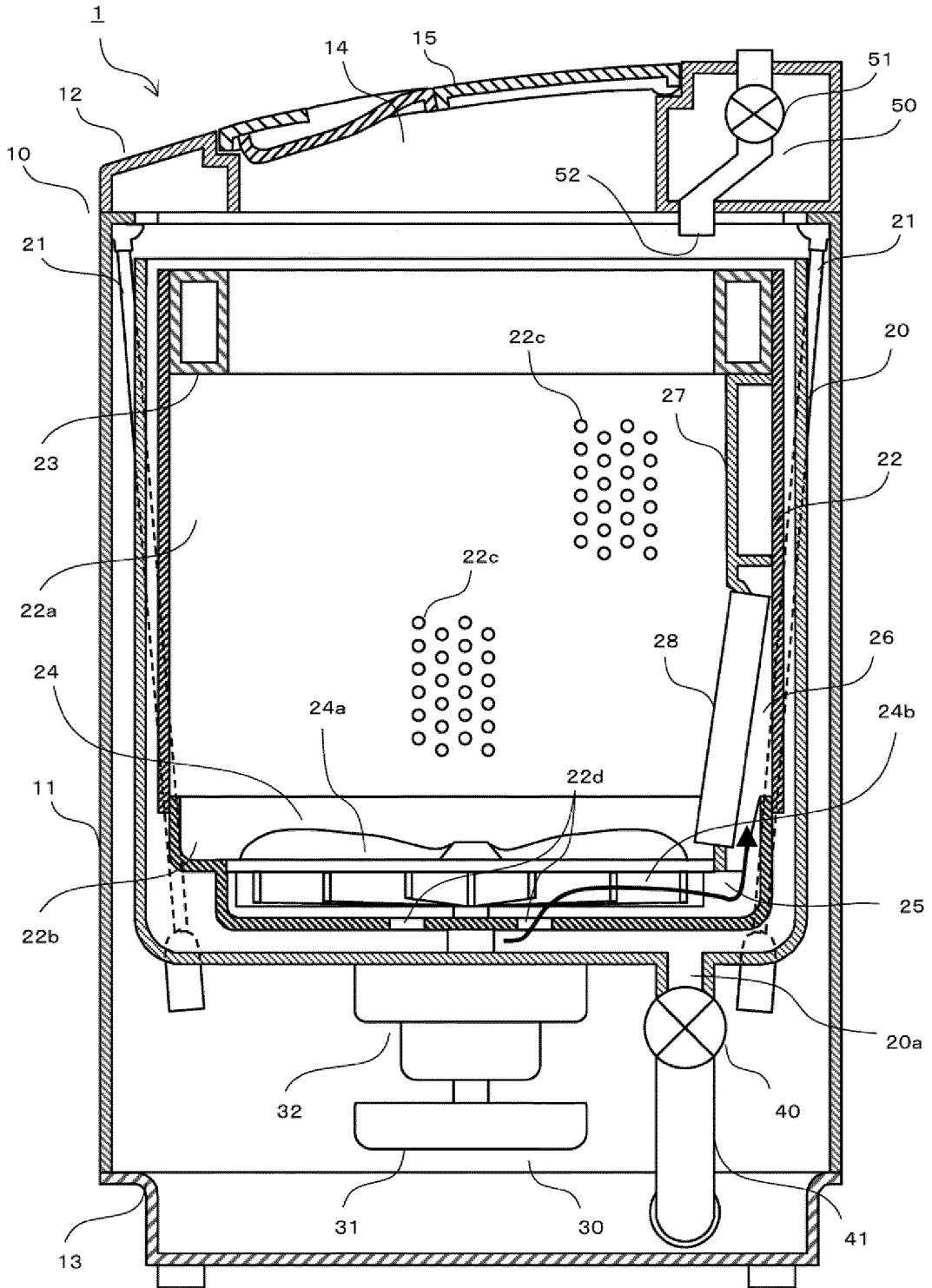


FIG. 1

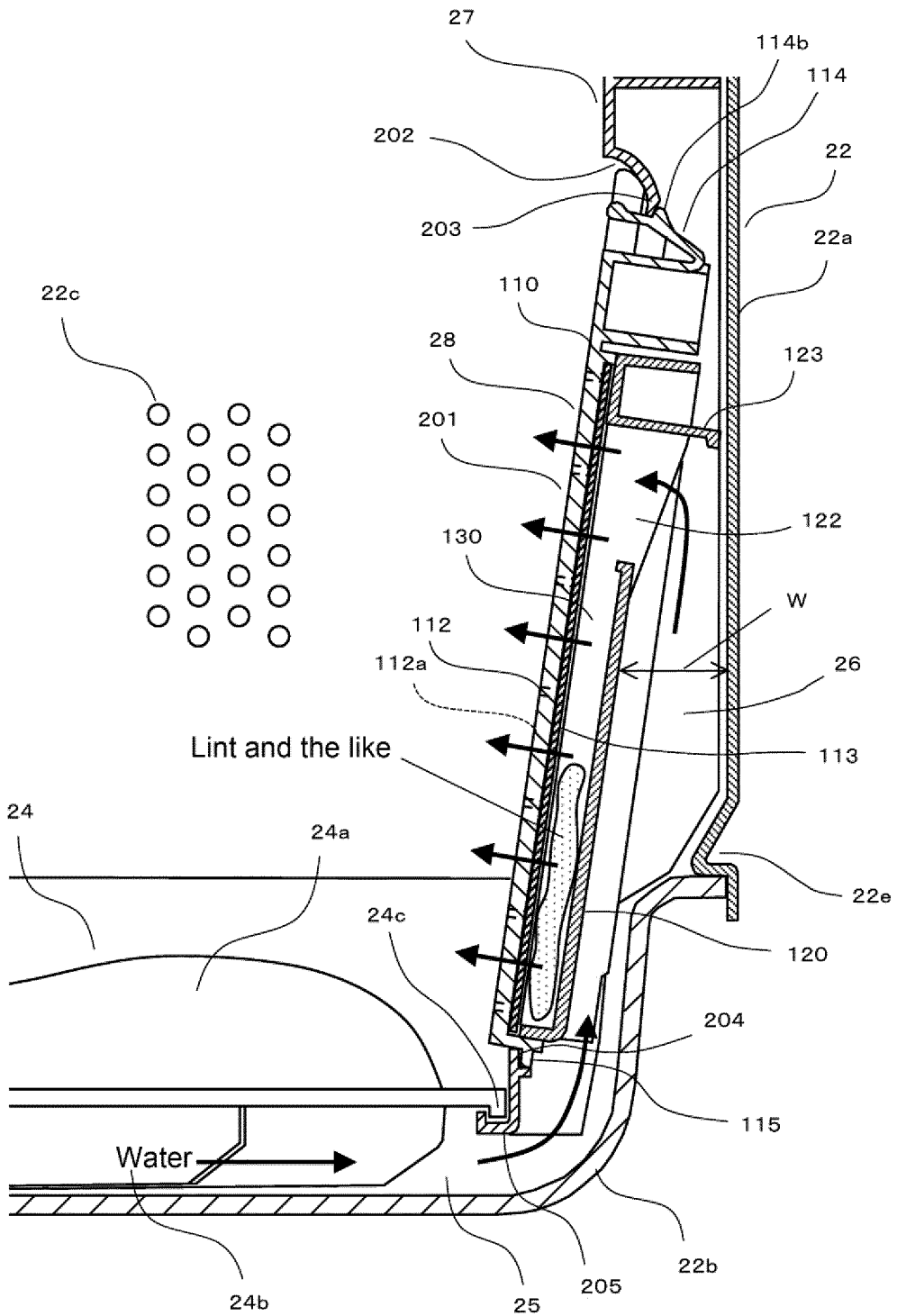


FIG. 2

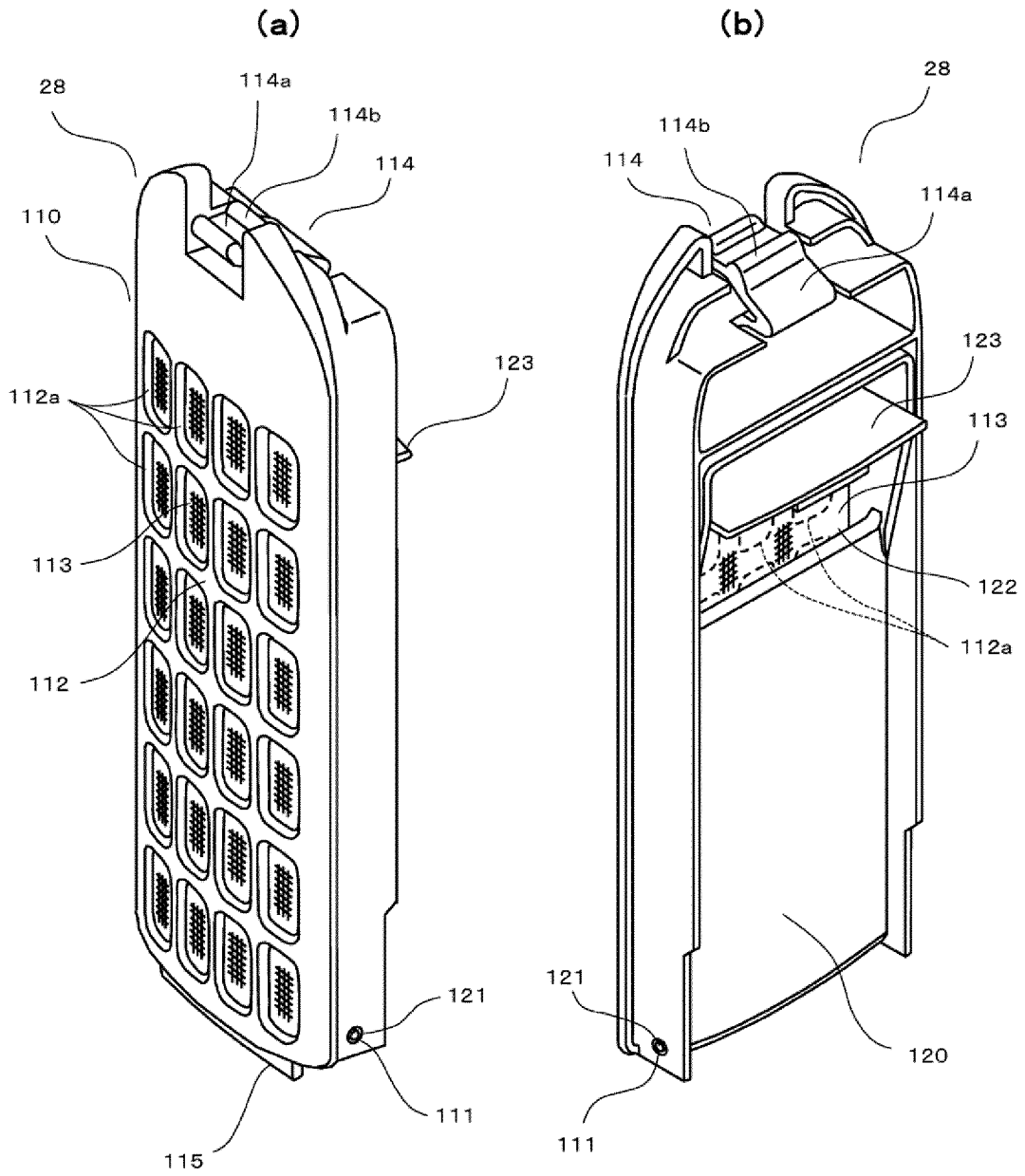


FIG. 3

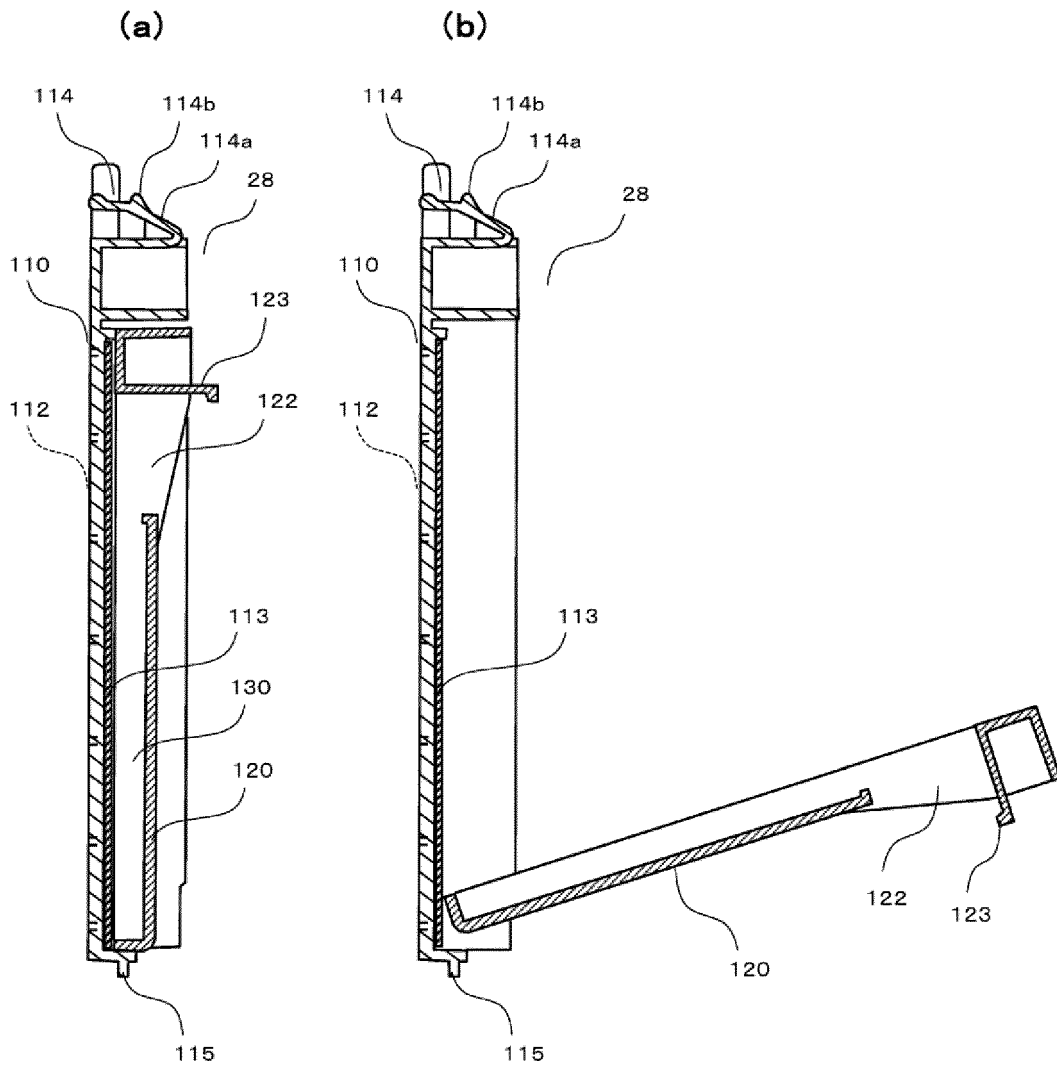
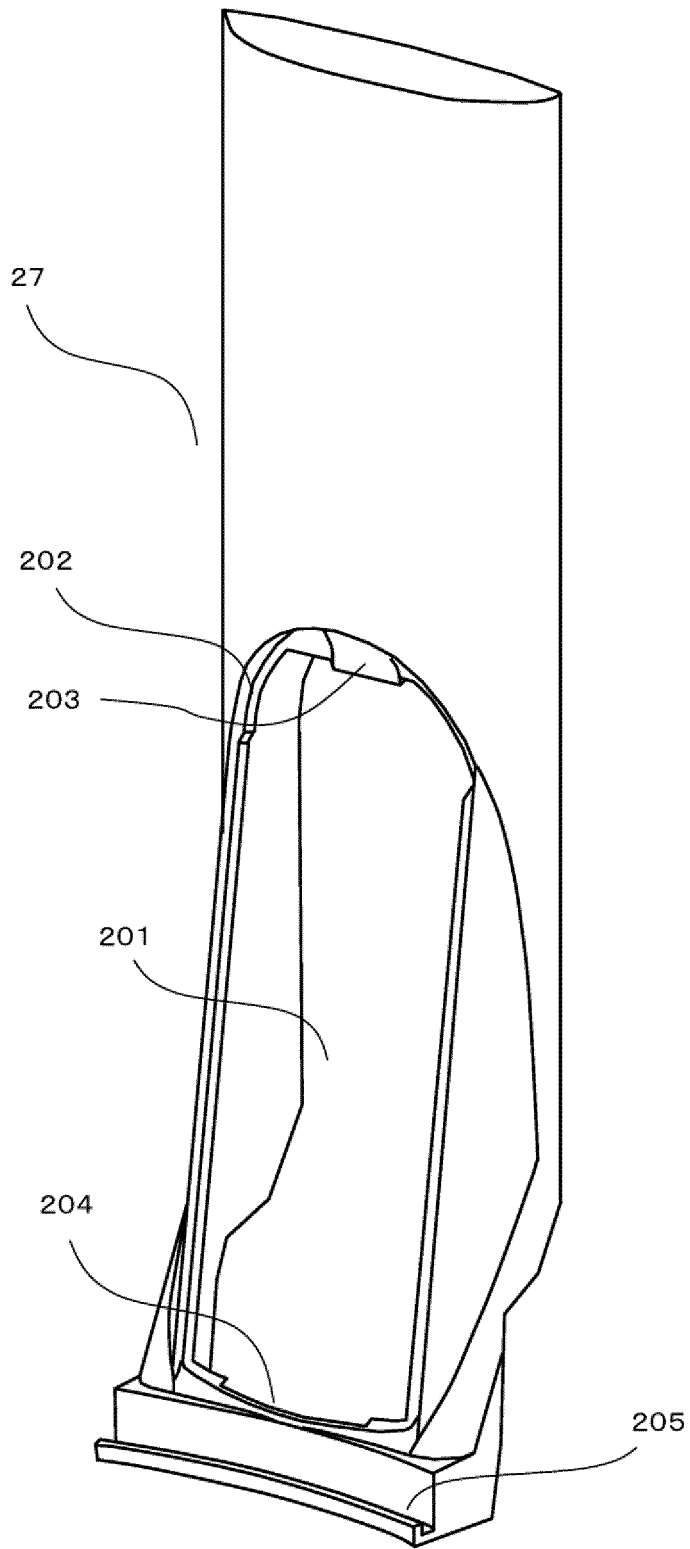


FIG. 4



**FIG. 5**

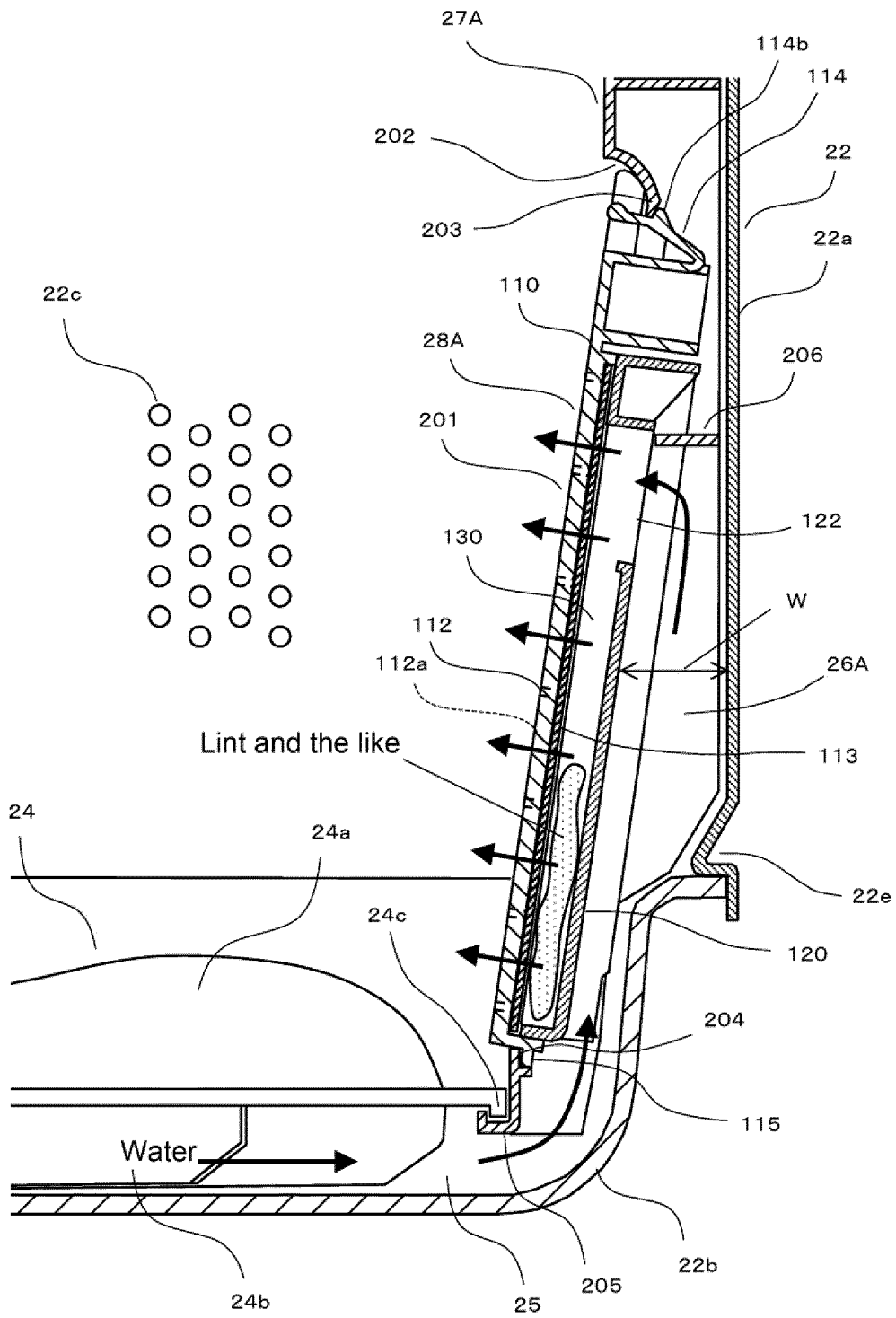


FIG. 6

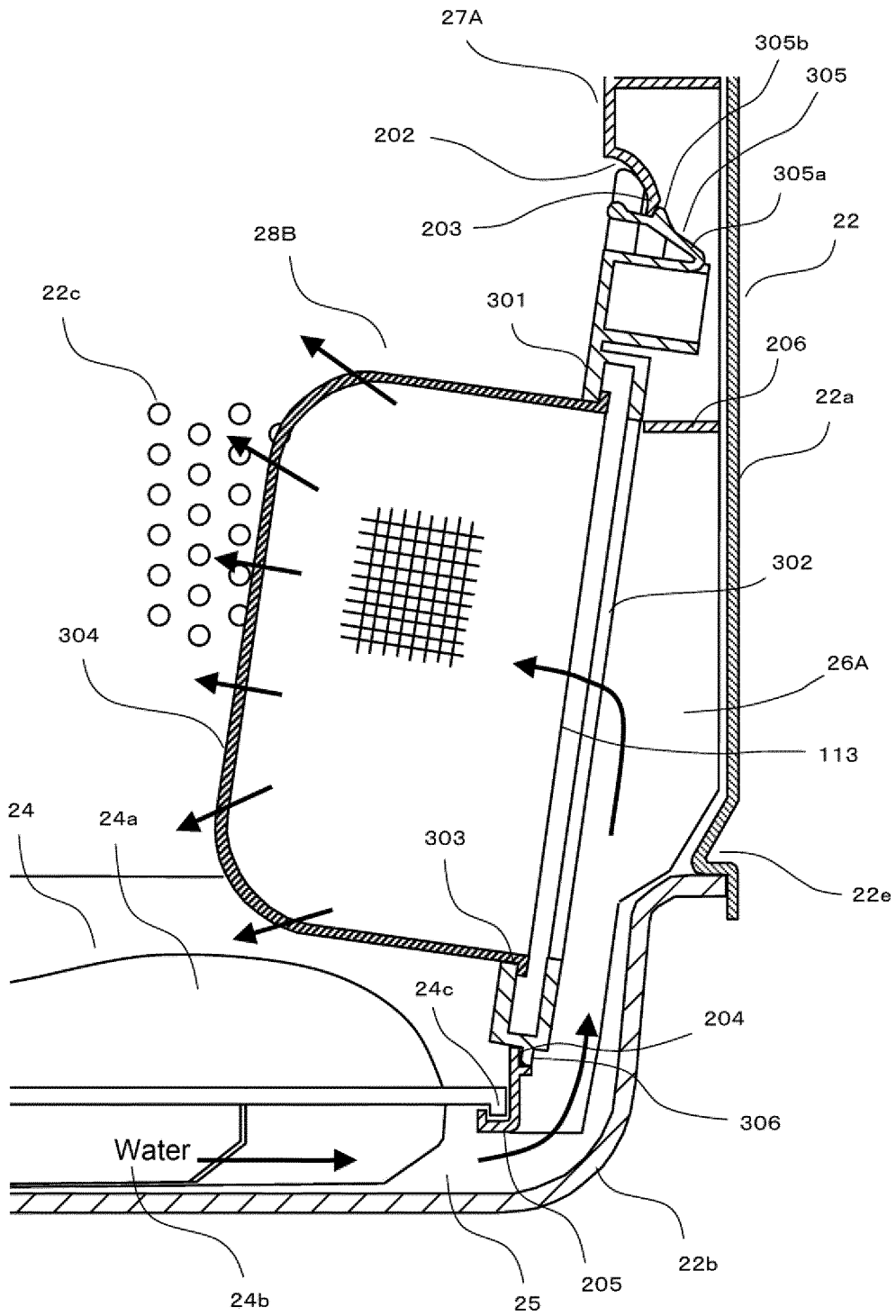


FIG. 7

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/070778

## A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/10 (2006.01) i; 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; WPI; EPODOC: water saving, regenerate, recreate, reuse, reflow, scrap, suede, fur, foreign matter, cotton, wire; HAIER; filter+, filtrat+, +mov+, impeller, water, blade, turb+, +circulat+, stir+, pulsator, vane, cycle, agitator

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 1228488 A (SANYO ELECTRIC CO., LTD.), 15 September 1999 (15.09.1999), description, page 4, lines 25-26, page 5, lines 5-6 and 17-29, page 6, lines 11-19 and page 7, lines 13-15 and 20-21, and figures 1-5	1-6
X	JP 2000014987 A (SANYO ELECTRIC CO), 18 January 2000 (18.01.2000), description, paragraphs [0018]-[0019] and [0030]-[0031], and figures 1-3	1-6

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

\* Special categories of cited documents:

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**  
 Information on patent family members

International application No.

**PCT/CN2016/070778**

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		JP 3439108 B2	25 August 2003
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		JP 3296789 B2	02 July 2002

**REFERENCES CITED IN THE DESCRIPTION**

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- JP 2013141553 A [0004]