(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 269 871 A1**

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

(43) Date of publication:
17.01.2018 Bulletin 2018/03

(21) Application number: **16764213.1**

(22) Date of filing: **11.03.2016**

(51) Int Cl.:
D06F 39/02 *(2006.01)* ***D06F 39/08*** *(2006.01)*

(86) International application number:
PCT/CN2016/076162

(87) International publication number:
WO 2016/146033 (22.09.2016 Gazette 2016/38)

(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

(30) Priority: **13.03.2015 JP 2015051380**

(71) Applicants:
- **Qingdao Haier Washing Machine Co., Ltd.**
  Laoshan District
  Qingdao,
  Shandong 266101 (CN)
- **Haier Asia Co., Ltd**
  Tokyo 100-0005 (JP)

(72) Inventors:
- **TANAKA, Hiroyuki**
  Tokyo 100-0005 (JP)
- **TAKENAKA, Takuo**
  Tokyo 100-0005 (JP)

(74) Representative: **Zacco Sweden AB**
P.O. Box 5581
114 85 Stockholm (SE)

(54) **WASHING MACHINE**

(57) The present invention provides a washing machine capable of improving rinsing performance of a water-splashing and rinsing process. A full-automatic washing machine includes a washing and dewatering drum (21) for accommodating washings, and a water injection port portion (200) arranged above the washing and dewatering drum (21) and connected with a faucet. Herein, the water injection port portion (200) includes a water flowing path (212) through which water from the faucet flows, a wall portion (214) arranged at a front end of the water flowing path (212) to intercept the flowing water, and a plurality of outflow hole portions (222) arranged on a bottom surface of the water flowing path (212) along the wall portion (214) so that the water flowing through the water flowing path (212) flows into the washing and dewatering drum (21); and the plurality of outflow hole portions (222) allow the water to flow out in such a manner that water from each outflow hole portion (222) does not contact with each other.

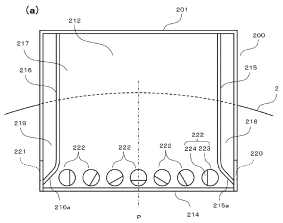


FIG. 6

EP 3 269 871 A1

(Cont. next page)

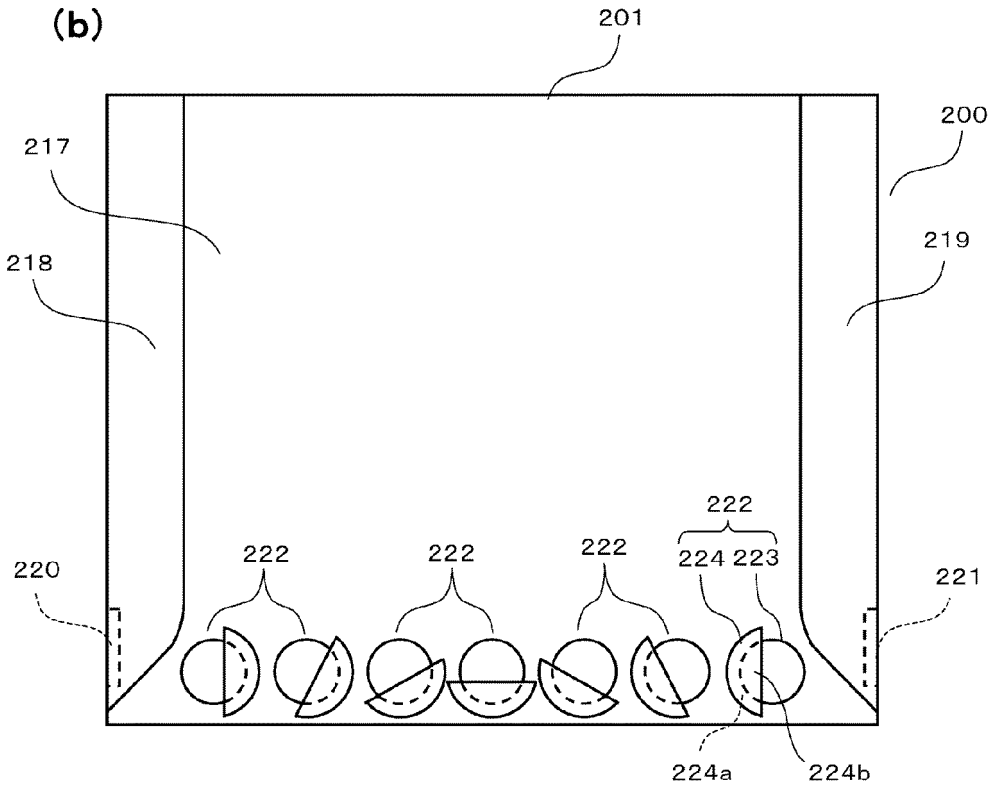


FIG. 6

Description

TECHNICAL FIELD

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

BACKGROUND

[0002] In the past, a washing machine which performs a rinsing process called as a so-called dewatering and rinsing process is known. In the dewatering and rinsing process, a washing and dewatering drum is rotated at a low speed while water is supplied from a top of the washing and dewatering drum, so that washings in the washing and dewatering drum are immersed in the water at first. Then, the washing and dewatering drum is rotated at a high speed to dewater washings, so that detergents contained in the washings are discharged together with the water permeated into the washings. It should be noted that the dewatering and rinsing process is also known as a water-splashing and rinsing process.

[0003] When the dewatering and rinsing process is started, the washings are in a state of being attached to an inner circumferential wall of the washing and dewatering drum due to the previous dewatering process. Therefore, in the washing machine recorded by a patent literature 1, a structure provided with a water outlet direction changing body allowing the water flowing out of a water outlet portion of a water supply pipe to flow to the inner circumferential wall of the washing and dewatering drum is adopted, so that the water is easily sprayed to the washings attached to the inner circumferential wall.

[0004] Since the water outlet direction changing body has an inclination shape closer to the inner circumferential wall of the washing and dewatering drum along with declination and has a circular arc shape substantially concentric with the inner circumferential wall of the washing and dewatering drum, the water supplied to the washing and dewatering drum is slightly expanded in the circular arc shape while dropping toward the inner circumferential wall of the washing and dewatering drum.

Current Technical Literature

Patent Literature

[0005] Patent Literature 1: Japanese Laid-Open Patent Publication No. 07-222893

Problems to be solved in invention

[0006] In the structure of the washing machine of the patent literature 1, the water supplied into the washing and dewatering drum is slightly expanded in the circular arc shape by the water outlet direction changing body, but thereafter is gradually shrunk due to action of surface tension during dropping. Therefore, the water is difficult to come into contact with the washings in a wide range; and the water is difficult to be penetrated into the washings fully.

SUMMARY

[0007] In view of this, a washing machine capable of improving rinsing performance of a water-splashing and rinsing process by fully permeating water into washings is expected.

Solutions for solving problems

[0008] The washing machine of embodiments of the present invention includes a washing and dewatering drum for accommodating washings, and a water injection port portion arranged above the washing and dewatering drum and connected with a faucet, wherein the water injection port portion includes a water flowing path through which water from the faucet flows, a wall portion arranged at a front end of the water flowing path to intercept the flowing water, and a plurality of outflow hole portions arranged on a bottom surface of the water flowing path along the wall portion so that the water flowing through the water flowing path flows into the washing and dewatering drum. The plurality of outflow hole portions enable the water to flow out in such a manner that the water from the outflow hole portions does not contact with each other.

[0009] By adopting the above structure, the water flowing out of the water injection port portion is not shrunk along with dropping to reach the bottom of the washing and dewatering drum in a state of keeping dispersing to a direction perpendicular to a radial direction of the washing and dewatering drum in a wide range. Thus, the water can be fully permeated into the washings by a water supply action in the water-splashing and rinsing process, and the permeated water and detergents are fully discharged by the following dewatering action, so that the rinsing performance of the water-splashing and rinsing process can be improved.

[0010] In the washing machine of the present embodiment, a structure that the outflow hole portions include outflow holes formed in the bottom surface of the water flowing path, and steering bodies for changing directions of water flowing out of the outflow holes can be adopted.

[0011] By adopting the above structure, the orientation of the water flowing out of each outflow hole can be adjusted.

[0012] In the case of adopting the above structure, the water injection port portion can be configured in such a manner that an inner circumferential wall of the washing and dewatering drum is located behind the outflow hole portions. In this case, at least some of the steering bodies allow the water flowing out of the outflow holes to flow rearwards.

[0013] When such a structure is adopted, since the water can flow out of a water supply port portion in a manner

of getting close to an inner circumferential wall side of the washing and dewatering drum, the water can be effectively sprayed to the washings attached to the inner circumferential wall of the washing and dewatering drum in a dewatering process before the water-splashing and rinsing process.

[0014] In the case of adopting the above structure, the orientation of each steering body can be set in such a manner that the water flowing out of the plurality of outflow hole portions forms a circular arc along the inner circumferential wall of the washing and dewatering drum.

[0015] When such a structure is adopted, the water can be effectively sprayed to the washings attached to the inner circumferential wall of the washing and dewatering drum.

[0016] In the washing machine of the present embodiment, a structure that the water flowing out of the plurality of outflow hole portions forms the circular arc along the inner circumferential wall of the washing and dewatering drum can be adopted.

[0017] By adopting the above structure, the water can be effectively sprayed to the washings attached to the inner circumferential wall of the washing and dewatering drum.

[0018] In the washing machine of the present embodiment, a structure that a first water flowing path provided with the outflow hole portions and a second water flowing path separately arranged and different from the first water flowing path can be adopted. In this case, a discharge port is formed in the water injection port portion; and the discharge port enables the water flowing through the second water flowing path to be discharged to a position closer to a side surface than a supply region to which the water from the outflow hole portions is supplied and closer to the inner circumferential wall of the washing and dewatering drum than the supply region.

[0019] By adopting the above structure, since the water is supplied to a portion of the washings closer to the inner circumferential wall of the washing and dewatering drum than the supply region for supplying water by the outflow hole portions, the water is also easy to be fully permeated into the portion, thereby further improving the rinsing performance of the water-splashing and rinsing process.

[0020] In the case of adopting the above structure, a detergent container telescopically accommodated in the water injection port portion is further provided. In this case, the water injection port portion adopts a structure including a first water passage enabling the water from the faucet to flow out into the first water flowing path through the detergent container and a second water passage enabling the water from the faucet to flow out into the second water flowing path without passing through the detergent container.

[0021] When such a structure is adopted, since the water is directly supplied from the second water passage to the second water flowing path without passing through the detergent container, the water strongly flows into and flows through the second water passage. Thus, the water can be discharged from the discharge port strongly, so that the water is splashed far away, and the water can reach a target position close to the inner circumferential wall of the washing and dewatering drum.

[0022] In the case of adopting the above structure, a structure that the bottom surface of the first water flowing path includes a first inclined surface inclining down to an outflow hole portion side and the bottom surface of the second water flowing path includes a second inclined surface inclining down to a discharge port side can be adopted. In this case, an inclination degree of the second inclined surface is set to be greater than an inclination degree of the first inclined surface.

[0023] When such a structure is adopted, since the second inclined surface having the inclination degree greater than the inclination degree of the first inclined surface of the first water flowing path is formed on the bottom surface of the second water flowing path, the water can much strongly flow to the second water flowing path, and the water can be much strongly discharged from the discharge port.

Effects of invention

[0024] The present invention can provide the washing machine capable of improving the rinsing performance of the water-splashing and rinsing process.

[0025] Effects and significance of the present invention are further clarified by description of the following embodiments. However, the following embodiments are just illustrative for implementation of the present invention; and the present invention is not limited by any of the following embodiments.

BRIEF DESCRIPTION OF DRAWINGS

[0026]

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

Fig. 2 is a diagram illustrating a structure of a water supply unit involved in an embodiment;

Fig. 3 is a diagram illustrating a structure of a water supply unit involved in an embodiment;

Fig. 4 is a diagram illustrating a structure of a water supply unit involved in an embodiment;

Fig. 5 is a diagram illustrating a structure of a water supply unit involved in an embodiment;

Fig. 6 is a diagram illustrating a structure of a water supply unit involved in an embodiment;

Fig. 7 is a diagram illustrating a flowing manner of

water from a water injection port portion of a water supply unit involved in an embodiment;

Fig. 8 is a diagram illustrating a structure of a water supply unit involved in a changed embodiment.

DETAILED DESCRIPTION

[0027] Hereinafter, a full-automatic washing machine according to embodiments of the washing machine of the present invention will be described by reference to drawings.

[0028] Fig. 1 is a side sectional view illustrating a structure of the full-automatic washing machine 1.

[0029] The full-automatic washing machine 1 has a housing 10 for forming an appearance. The housing 10 includes: a machine body portion 11 in a square cylinder shape with opened upper surface and lower surface, an upper panel 12 covering an upper surface of the machine body portion 11, and a bearer 13 supporting the machine body portion 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 opened and closed freely.

[0030] In the housing 10, an outer drum 20 is elastically suspended and supported by four suspension rods not shown in figures. A washing and dewatering drum 21 is configured in the outer drum 20. The outer drum 20 and the washing and dewatering drum 21 are slightly inclined forwards. The washing and dewatering drum 21 is rotated by using a rotating shaft R slightly inclined forwards relative to a vertical direction as a center.

[0031] A plurality of dewatering holes 21a are formed in an inner circumferential wall of the washing and dewatering drum 21. In addition, a plurality of water through holes 21b are formed in a bottom surface of the washing and dewatering drum 21. Further, a balance ring 22 is arranged at an upper portion of the washing and dewatering drum 21.

[0032] An impeller 23 is configured at the bottom of the washing and dewatering drum 21. A plurality of blades 23a radially extending from the center of the surface are formed on the surface of the impeller 23. In addition, a plurality of water pumping blades 23b radially extending from the center of the back surface are formed on the back surface of the impeller 23. The water pumping blades 23b are configured in a pump chamber 24 formed between the back surface of the impeller 23 and the bottom surface of the washing and dewatering drum 21.

[0033] A circulation water path 25 extending in up and down direction along an inner circumferential surface of the washing and dewatering drum 21 is formed by an inner circumferential wall of the washing and dewatering drum 21 and a water path forming member 26. A lower end portion of the circulation water path 25 is connected with the pump chamber 24. A filter unit 27 is detachably mounted in the circulation water path 25, i.e., the water path forming member 26 forming the circulation water path 25. The filter unit 27 captures lint and dust from the washings during washing.

[0034] A driving unit 30 for generating a torque for driving the washing and dewatering drum 21 and the impeller 23 is configured at an outer bottom of the outer drum 20. The driving unit 30 includes a driving motor 31 and a transmitting mechanism portion 32. The transmitting mechanism portion 32 has a clutch mechanism. The torque of the driving motor 31 is only transmitted to the impeller 23 so as to only rotate the impeller 23 in a washing process and a rinsing process, and the torque of the driving motor 31 is transmitted to the impeller 23 and the washing and dewatering drum 21 so as to integrally rotate the impeller 23 and the washing and dewatering drum 21 in a dewatering process through a switching operation of the clutch mechanism. In addition, the transmitting mechanism portion 32 has a speed reduction mechanism. In the washing process and the rinsing process, the impeller 23 is rotated at a rotating speed of the driving motor 31 being reduced according to a speed reduction ratio of the speed reduction mechanism.

[0035] A drain port portion 20a is formed at the outer bottom portion of the outer drum 20. A drain valve 40 is arranged on the drain port portion 20a. The drain valve 40 is connected with a drain hose 41. When the drain valve 40 is opened, water stored in the washing and dewatering drum 21 and the outer drum 20 is discharged out of the machine through the drain hose 41.

[0036] A water supply unit 50 for supplying tap water into the washing and dewatering drum 21 is configured at a rear portion of the upper panel 12. A water supply valve 51 is connected with the water supply unit 50. The water supply valve 51 is connected with a faucet. Detergents are thrown into the water supply unit 50 during washing operation. When the water supply valve 51 is opened, the tap water is introduced into the water supply unit 50. The introduced tap water is mixed with detergents in the water supply unit 50, then flows out of the water supply unit 50 and is supplied into the washing and dewatering drum 21. As described later, water is discharged from the water supply unit 50 like a shower head. A detailed structure of the water supply unit 50 is described later.

[0037] The full-automatic washing machine 1 performs the washing operation in various operation modes. The washing operation includes the washing process, an intermediate dewatering process, the rinsing process and a final dewatering process.

[0038] In the washing process and the rinsing process, the impeller 23 is rotated to the right and the left in such a state that the water is stored in the washing and dewatering drum 21. A water flow is generated in the washing and dewatering drum 21 by rotation of the impeller 23. In the washing process, the washings are washed by the generated water flow and detergents contained in the water. In the rinsing process, the washings are rinsed by the generated water flow.

[0039] In the rinsing process, as described above, a

water-splashing and rinsing process is also performed besides the rinsing process performed by storing water in the washing and dewatering drum 21. In the water-splashing and rinsing process, the washing and dewatering drum 21 is rotated at a low speed while a water supply action for supplying water to the washing and dewatering drum 21 is performed at first, so that the water is permeated into the washings in the washing and dewatering drum 21. Next, the washing and dewatering drum 21 is rotated at a high speed to perform a dewatering action for dewatering the washings so that detergents contained in the washings are discharged together with the water permeated into the washings.

[0040] In the intermediate dewatering process and the final dewatering process, the washing and dewatering drum 21 and the impeller 23 are rotated integrally at a high speed. The washings are dewatered by role of a centrifugal force generated by the washing and dewatering drum 21.

[0041] The full-automatic washing machine 1 of the present embodiment is characterized by the structure of the water supply unit 50. The structure of the water supply unit 50 will be described in detail below.

[0042] Fig. 2 to Fig. 6 are diagrams illustrating the structure of the water supply unit 50. Figs. 2(a) and (b) are a front view and a top view of the water supply unit 50 respectively. Figs. 3(a) and (b) are a right side view and a left side view of the water supply unit 50 respectively. Figs. 4(a) and (b) are a sectional view along A-A' and a sectional view along B-B' of Fig. 2(a) respectively. Fig. 5(a) is a top view of the detergent container 100; and Fig. 5(b) is a top view of a water injection port portion 200 in which a cover 203 is omitted. Fig. 6(a) is a top view of the water injection port portion 200 in which the cover 203 and an upper shell 202 are omitted; and Fig. 6(b) is a bottom view of the water injection port portion 200.

[0043] It should be noted that in order to facilitate description, in Fig. 4(b), a right discharge port 220 formed in a right side surface of the water injection port portion 200 is shown by a dotted line. In Fig. 5(b), an intake port portion 204 is shown by a dotted line. In addition, in Fig. 6(a), a portion of an outline of the washing and dewatering drum 21 is drawn to show a positional relationship between the water injection port portion 200 and the washing and dewatering drum 21.

[0044] The water supply unit 50 is composed of a detergent container 100 for accommodating detergents and the water injection port portion 200 for telescopically accommodating the detergent container 100 from the front.

[0045] The detergent container 100 is a square box having opened upper surface and rear surface. A handle 102 is formed on a front surface 101. In addition, a bottom surface 103 of the detergent container 100 is formed into an inclined surface inclining rearwards. Further, the front surface 101 of the detergent container 100 extends to a position below the bottom surface 103 in a manner of shielding a lower portion of the front surface of the water injection port portion 200.

[0046] The water injection port portion 200 is formed by combining a lower shell 201, the upper shell 202 and the cover 203.

[0047] The intake port portion 204 having a connection port 204a is arranged on the upper surface of the water injection port portion 200. The connection port 204a is connected with the water supply valve 51. Thus, the water injection port portion 200 is connected with the faucet by the water supply valve 51.

[0048] A central water passage 205, a right water passage 206 and a left water passage 207 connected with the intake port portion 204 through the upper shell 202 and the cover 203 are formed in the upper portion of the water injection port portion 200. The central water passage 205 is equivalent to a first water passage of the present invention. The right water passage 206 and the left water passage 207 are equivalent to second water passages of the present invention.

[0049] As shown in Fig. 5(b), the central water passage 205 is extended forward from a position just below the intake port portion 204 and is expanded to the left and the right up to a front end of the water injection port portion 200. A central water through port 208 composed of a plurality of water through holes 208a is formed in the front side at the bottom surface of the central water passage 205. The central water through port 208 is located above the front side of the detergent container 100 accommodated in the water injection port portion 200. The right water passage 206 is extended from the position just below the intake port portion 204 to the right up to a right end of the water injection port portion 200. A right water through hole 209 is formed in a right end portion at the bottom surface of the right water passage 206. The left water passage 207 is extended from the position just below the intake port portion 204 to the left up to a left end of the water injection port portion 200. A left water through hole 210 is formed in a left end portion at the bottom surface of the left water passage 207.

[0050] An accommodating portion 211 of the detergent container 100 is formed on an upper side inside the water injection port portion 200; and a water flowing path 212 is formed on a lower side inside the water injection port portion 200. An upper portion of the front surface of the water injection port portion 200 is opened as an inlet/outlet 213 of the detergent container 100; and a lower portion of the water injection port portion 200 is closed by a wall portion 214. The wall portion 214 is extended in a straight line to a left and right direction.

[0051] The water flowing path 212 is divided into a central water flowing path 217, a right water flowing path 218 and a left water flowing path 219 by a right dividing wall 215 formed in a manner of inclining to a right side surface of the water injection port portion 200 and a left dividing wall 216 formed in a manner of inclining to a left side surface of the water injection port portion 200. The central water flowing path 217 occupies the vast majority of the water flowing path 212 and is a wide water path. The right water flowing path 218 and the left water flowing

path 219 are slender water paths. The central water flowing path 217 is equivalent to the first water flowing path of the present invention; and the right water flowing path 218 and the left water flowing path 219 are equivalent to the second water flowing paths of the present invention.

[0052] A right discharge port 220 is formed in the front end portion of the right side surface of the water injection port portion 200; and a left discharge port 221 is formed in the front end portion of the left side surface. The right water flowing path 218 is connected with the right discharge port 220. The left water flowing path 219 is connected with the left discharge port 221. Front end portions 215a and 216a of the right dividing wall 215 and the left dividing wall 216 are respectively bent to the outer side. Directions of the water discharged from the right discharge port 220 and the left discharge port 221 can be adjusted by adjusting bending shapes of the front end portions 215a and 216a of the right dividing wall 215 and the left dividing wall 216. The right discharge port 220 and the left discharge port 221 are equivalent to the discharge ports of the present invention.

[0053] The right water through hole 209 of the right water passage 206 is located above a rear end portion of the right water flowing path 218. In addition, the left water through hole 210 of the left water passage 207 is located above the rear end portion of the left water flowing path 219.

[0054] The bottom surface of the central water flowing path 217 is formed into an inclined surface 217a of which the whole surface is inclined down to the front. In addition, the bottom surfaces of the right water flowing 218 and the left water flowing 219 are also formed into inclined surfaces 218a and 219a of which the whole surfaces are inclined down to the front. The inclination degrees of the inclined surfaces 218a and 219a of the right water flowing path 218 and the left water flowing path 219 are set to be greater than the inclination degree of the inclined surface 217a of the central water flowing path 217. Further, the inclined surfaces 218a and 219a of the right water flowing path 218 and the left water flowing path 219 are set in such a manner that the inclination degrees of the front portions are greater than the inclination degrees of the rear portions. The inclined surface 217a of the central water flowing path 217 is equivalent to the first inclined surface of the present invention; and the inclined surface 218a of the right water flowing path 218 and the inclined surface 219a of the left water flowing path 219 are equivalent to the second inclined surfaces of the present invention. A corner portion between the bottom surface and a rear surface of the water injection port portion 200 has a curved surface shape. The right dividing wall 215 and the left dividing wall 216 are extended to the upper portion of the rear surface through the corner portion.

[0055] A plurality of (seven herein) outflow hole portions 222 are arranged on the bottom surface of the central water flowing path 217 from the left end to the right end in a manner of getting close to and going along the wall portion 214. The outflow hole portions 222 include circular outflow holes 223 formed in the bottom surface of the central water flowing path 217 and steering bodies 224 arranged at outlets of the outflow holes 223. The steering bodies 224 change flowing directions of water flowing out of the outflow holes 223.

[0056] The steering bodies 224 are composed of circular arc-shaped side wall portions 224a and slightly insufficient semi-disc-shaped bottom wall portions 224b. The steering body 224 of the central outflow hole portion 222 is arranged in a manner of facing the just rear. In addition, the steering body 224 of the outflow hole portion 222 at the right end is arranged in a manner of facing the front side surface on the right; and the steering body 224 of the outflow hole portion 222 at the left end is arranged in a manner of facing the front side surface on the left. Further, the steering body 224 of the outflow hole portion 222 located at a right neighborhood of the central outflow hole portion 222 is arranged in a manner of slightly to the right than the just rear; and the steering body 224 of the outflow hole portion 222 located at the right neighborhood is arranged in a manner of slightly to the rear than the front side surface on the right. Further, the steering body 224 of the outflow hole portion 222 located at a left neighborhood of the central outflow hole portion 222 is arranged in a manner of slightly to the left than the just rear; and the steering body 224 of the outflow hole portion 222 located at the left neighborhood is arranged in a manner of slightly to the rear than the front side surface on the left.

[0057] It should be noted that as shown in Fig. 6(a), the inner circumferential wall of the washing and dewatering drum 21 is located behind the plurality of arranged outflow hole portions 222 in a state that the water supply unit 50, i.e., the water injection port portion 200 is configured on the rear portion of the upper panel 12. In addition, the central outflow hole portion 222 is located at a center P of the washing and dewatering drum 21 in the left and right direction.

[0058] Next, the water supply action performed by the water supply unit 50 will be described.

[0059] When the water supply valve 51 is opened, water is introduced into the water supply unit 50 from the faucet. The water from the faucet flows from the intake port portion 204, and reaches the central water through port 208, the right water through hole 209 and the left water through hole 210 through the central water passage 205, the right water passage 206 and the left water passage 207.

[0060] As shown by arrows in Fig. 4 (a), the water reaching the central water through port 208 flows from the central water through port 208 into the detergent container 100, flows rearwards through the bottom surface of the inclined detergent container 100, and flows out from the rear surface of the opened detergent container 100 to the rear portion of the central water flowing path 217. The water flowing to the central water flowing path 217 is guided to the front by the inclined surface 217a of the central water flowing path 217, and is blocked by the wall portion 214, and flows out of the plurality of outflow

hole portions 222 arranged near the wall portion 214. At this time, at the outflow hole portions 222, the water flowing out of the outflow holes 223 and slightly to the front than the just lower portion as shown by arrows S1 is mixed with the water of which the directions are changed by the steering bodies 224 after flowing out of the outflow holes 223 as shown by arrows S2. Finally, the water flowing out of the outflow hole portions 222, as shown by arrows S3, faces a direction synthesized by two directions. Finally, the direction (the arrow S3) of the water flowing out of each outflow hole portion 222 is determined by the orientation of the steering bodies 224. Herein, the "orientation of the steering bodies 224" refers to a direction perpendicular to an end surface of the bottom wall portion 224b, and refers to a direction from the end surface toward the outside of the steering body 224.

[0061] Further, the direction of the water flowing out of each outflow hole portion 222 (the arrows S3) is determined by a blocking amount at which the steering body 224 blocks the outflow hole 223, in other words, determined by an opening amount of the outflow hole 223. Namely, when the blocking amount is large, the volume of water passing through the steering bodies 224 becomes higher, so a vector component of the arrows S2 becomes larger, and the water flowing out becomes more likely to face a horizontal direction; on the contrary, when the blocking amount is small, the volume of water directly flowing out of the outflow holes 223 becomes higher, so a vector component of the arrows S1 becomes larger, and the water flowing out becomes more likely to face a vertical direction.

[0062] On the other hand, as shown by the arrows in Fig. 4(b), the water reaching the right water through hole 209 flows from the right water through hole 209 into the rear portion of the right water flowing path 218, flows forwards by means of the curved surface shape of the corner portion of the right water flowing path 218 and the inclined surface 218a, and is discharged from the right discharge port 220. Similarly, the water flowing from the left water through hole 210 into the left water flowing path 219 is discharged from the left discharge port 221.

[0063] Fig. 7 is a diagram illustrating a flowing manner of the water from the water injection port portion 200 of the water supply unit 50. It should be noted that in Fig. 7(b), the outline of the water injection port portion 200 and the outlines of the outflow hole portions 222 are shown by dotted lines.

[0064] For each outflow hole portion 222, the orientation of the steering body 224 is set as described above. Thus, the water flowing through the central water flowing path 217 flows out of each outflow hole portion 222 to a direction shown by the arrow in Fig. 7(a). Namely, the water flows out of the central outflow hole portion 222 slightly closer to the just rear than the just lower portion. In addition, water flows out from the first outflow hole portion 222 from the center to the right slightly closer to the right inclined rear than the just lower portion, transversely flows out of the second outflow hole portion 222 from the center to the right slightly closer to the right than the just lower portion, and flows out of the outflow hole portion 222 at the right end slightly closer to the right inclined front than the just lower portion. Further, the water flows out of the first outflow hole portion 222 from the center to the left slightly closer to the left inclined rear than the just lower portion, transversely flows out from the second outflow hole portion 222 from the center to the left slightly closer to the left than the just lower portion, and flows out of the outflow hole portion 222 at the left end slightly closer to the left inclined front than the just lower portion. Since the water flowing out of each outflow hole portion 222 does not intersect with each other, a situation that the water is shrunk along with facing down does not appear, as shown in Fig. 7(b), and the water reaches the bottom of the washing and dewatering drum 21 in a state of keeping wide-range dispersing to a direction perpendicular to a radial direction of the washing and dewatering drum 21, i.e., the left and right direction. In addition, as shown in Fig. 7(b), the water flowing out of each outflow hole portion 222 forms such a circular arc-shaped supply region D along the inner circumferential wall of the washing and dewatering drum 21. Since the water flows out of the outflow hole portion 222 in the center and the outflow hole portions 222 on both sides to the rear, the supply region D is formed in a position closer to the rear than the arrangement position of the plurality of outflow hole portions 222, i.e., near the inner circumferential wall of the washing and dewatering drum 21.

[0065] As shown in Fig. 7 (a), the water flowing through the right water flowing path 218 and the left water flowing path 219 is discharged from the right discharge port 220 and the left discharge port 221 to the inclined front. The discharged water as shown in Fig. 7(b) reaches a position closer to the side surface than the supply region D for supplying water by the outflow hole portions 222 and closer to the inner circumferential wall of the washing and dewatering drum 21 than the supply region D.

[0066] In the present embodiment, the initial rinsing process adopts the water-splashing and rinsing process in the two times of rinsing processes performed according to the operation mode. Or, both the two times of rinsing processes adopt the water-splashing and rinsing process.

[0067] In the water-splashing and rinsing process, the water is supplied from the water supply unit 50 and the washing and dewatering tank 21 is rotated at a low speed in the initial water supply action. With the rotation of the washing and dewatering drum 21, the washings pass through a position below the water supply unit 50 successively. As described above, since the water is supplied from the outflow hole portions 222 of the water supply unit 50 along the inner circumferential wall of the washing and dewatering drum 21 in a wide range, when the washings pass through the position below the water supply unit 50, the water can be evenly sprayed to the washings regardless of the position of the washings in

the washing and dewatering drum 21. Further, since the water is supplied from the right discharge port 220 and the left discharge port 221 to the portion of the washings closer to the inner circumferential wall of the washing and dewatering drum 21 than the supply region D, the water can be fully sprayed to the portion.

[0068] Thereafter, when the dewatering action for rotating the washing and dewatering drum 21 at a high speed is performed, detergents can be fully discharged together with the water fully permeated into the washings.

<Effects of embodiment>

[0069] As described above, through the present embodiment, a plurality of outflow hole portions 222 arranged along the wall portion 214 of the front end portion are arranged at the water injection port portion 200 of the water supply unit 50. The outflow hole portions 222 adopt a structure that the water flows out in a manner that the water from each outflow hole portion 222 does not contact with each other. Thus, the water flowing out of the water injection port portion 200 is not shrunk along with dropping, and reaches the bottom of the washing and dewatering drum 21 in a state of keeping wide-range dispersing to the direction perpendicular to the radial direction of the washing and dewatering drum 21. Thus, since the water can be fully permeated into the washings by the water supply action in the water-splashing and rinsing process, detergents can be fully discharged together with the fully permeated water by the following dewatering action, so that the rinsing performance of the water-splashing and rinsing process can be improved.

[0070] In addition, since the water from the water supply unit 50 is widely spread throughout the washings, softeners can be spread throughout the washings without dead corner when the softeners and the water from the water supply unit 50 are fed together during the water-splashing and rinsing process. Thus, the rinsing process in which the softeners is fed may adopt the water-splashing and rinsing process; and the water saving effect of the full-automatic washing machine 1 can be improved.

[0071] Further, through the present embodiment, since the steering body 224 is arranged at each outflow hole portion 222, the orientation of the water flowing out of each outflow hole portion 222 can be adjusted. Particularly, since the water flowing out of each outflow hole portion 222 forms such a circular arc-shaped supply region D along the inner circumferential wall of the washing and dewatering drum 21 by adjusting the orientation of each steering body 224 and the blocking amount at which each steering body 224 blocks each outflow hole 223, the water can be effectively sprayed to the washings attached to the inner circumferential wall of the washing and dewatering drum 21 in the dewatering process before the water-splashing and rinsing process. In addition, the orientations of the steering bodies 224 at the center and both sides are set as an orientation for making the water flow to the rear, and the supply region D is formed to be closer to the inner circumferential wall of the washing and dewatering drum 21 than the arrangement position of the plurality of outflow hole portions 222. Thus the water can be much effectively sprayed to the washings attached to the inner circumferential wall of the washing and dewatering drum 21. In the present embodiment, the washing and dewatering drum 21 is inclined forwards, as shown in Fig. 1; at the rear portion of the full-automatic washing machine 1, the lower portion of the inner circumferential wall of the washing and dewatering drum 21 is located at the further rear. Thus, in the full-automatic washing machine 1 in which the washing and dewatering drum 21 is inclined to the front, since the structure that the supply region D is formed at the rear is particularly important to make the supply region D close to the inner circumferential wall of the washing and dewatering drum 21, the structure is more beneficial for the improvement of the rinsing performance of water-splashing rinsing.

[0072] Further, through the present embodiment, the right water flowing path 218 and the left water flowing path 219 are arranged on the left side and the right side of the water injection port portion 200 so that the water flowing through the water flowing paths 218 and 219 is discharged from the right discharge port 220 and the left discharge port 221, and the discharged water is sprayed to the position closer to the side surface than the supply region D for supplying water by the outflow hole portions 222 and closer to the inner circumferential wall of the washing and dewatering drum 21 than the supply region D. Thus, since the water is supplied to the portion of the washings closer to the inner circumferential wall of the washing and dewatering drum 21 than the supply region D, the water is easily permeated into the portion, thereby further improving the rinsing performance of the water-splashing and rinsing process.

[0073] Further, through the present embodiment, since the water is directly supplied from the right water passage 206 and the left water passage 207 to the right water flowing path 218 and the left water flowing path 219 without passing through the detergent container 100, the water strongly flows in and flows through the right water flowing path 218 and the left water flowing path 219. Thus, since the water can be strongly discharged from the right discharge port 220 and the left discharge port 221, the water can be splashed far and the water can reach the target position near the inner circumferential wall of the washing and dewatering drum 21.

[0074] Further, in the present embodiment, the inclined surfaces 218a and 219a having the inclination degrees greater than that of the inclined surface 217a formed on the bottom surface of the central water flowing path 217 are formed on the bottom surfaces of the right water flowing path 218 and the left water flowing path 219. Thus, since the water much strongly flows through the right water flowing path 218 and the left water flowing path 219, the water can be much strongly discharged from the right discharge port 220 and the left discharge port 221.

[0075] Embodiments of the present invention are de-

scribed above, but the present invention is not limited by the above embodiments and the like. In addition, various changes may be made to embodiments of the present invention.

[0076] For example, in the above embodiment, the wall portion 214 extending to the left and right direction in a straight line is formed at the front end of the water injection port portion 200; and the plurality of outflow hole portions 222 are arranged along the wall portion 214 in a straight line. However, as shown in Fig. 8(a), such a circular arc-shaped wall portion 214A along the inner circumferential wall of the washing and dewatering drum 21 can be formed at the front end of a water injection port portion 200A; and a plurality of outflow hole portions 222A are arranged in a circular arc shape along the wall portion 214A. In this case, the orientations of the steering bodies 224A of the outflow hole portions 222A may be the same, for example, all the steering bodies 224A can be directed to the just rear. It should be noted that in Fig. 8(a), the water injection port portion 200A in which the cover 203 and the upper shell 202 are omitted is drawn.

[0077] In the case of adopting such a structure, since the water flowing out of each outflow hole portion 222A does not intersect with each other either, a situation that the water is shrunk along with dropping does not appear, and the water reaches the bottom of the washing and dewatering drum 21 in the state of keeping wide-range dispersing to the left and right direction. In addition, since the outflow hole portions 222 are arranged in the circular arc shape along the wall portion 214A, the water flowing out of each outflow hole portion 222 forms such a circular arc-shaped supply region along the inner circumferential wall of the washing and dewatering drum 21. Further, since the water from all the outflow hole portions 222 flows to the rear, the supply region is formed at a position closer to the rear than the arrangement position of the plurality of outflow hole portions 222, i.e., closer to the inner circumferential wall of the washing and dewatering drum 21. Thus, the same effects as above embodiments can be achieved.

[0078] Further, in the above embodiment, the water supply unit 50 is composed of the detergent container 100 and the water injection port portion 200. However, as shown in Fig. 8(b), the water supply unit 50 may be composed of the water injection port portion 200B only. In this case, the water injection port portion 200B includes a wall portion 214B extending to the upper shell 202. In addition, a central water through port 208B formed in a central water passage 205B is arranged at a position closer to the rear than the central water through port 208 formed in the central water passage 205 of the water injection port portion 200.

[0079] Further, in the above embodiment, when the supply region D is located at the rear excessively, the water flowing out may be in contact with the balance ring 22. Therefore, the orientations of the steering bodies 224 are set only in the outflow hole portions 222 in the center and both sides in a manner of making the water flow to the rear. However, in the case that the supply region D can be located closer to the rear in such a manner that potential risks such as contact between the water flowing out and the balance ring 22 and the like do not exist, the orientations of the steering bodies 224 can be set in a manner of making the water flow to the rear in all the outflow hole portions 222.

[0080] Further, in the above embodiment, the outflow holes 223 of the outflow hole portions 222 are formed in a circular shape. However, the outflow holes 223 may also be of other shapes, such as quadrangle, triangles and ellipse. The shapes of the turning bodies 224 can be changed in accordance with the shapes of the outflow holes 223.

[0081] Further, in the above embodiment, both the right water flowing path 218 and the left water flowing path 219 are arranged in the water injection port portion 200. However, either the right water flowing path 218 or the left water flowing path 219 can be arranged in the water injection port 200. Further, neither the right water flowing path 218 nor the left water flowing path 219 may be arranged in the water injection port 200.

[0082] Further, in the above embodiment, the detergent container 100 can be divided into a first accommodating portion for accommodating powder detergents and a second accommodating portion for accommodating softeners. Further, the detergent container 100 can also be divided into a first accommodating portion, a second accommodating portion and a third accommodating portion which is for accommodating liquid detergents.

[0083] Further, in the above embodiment, although the outer drum 20 and the washing and dewatering drum 21 are inclined forwards, the outer drum 20 and the washing and dewatering drum 21 may be not inclined.

[0084] Further, although the full-automatic washing machine 1 of above embodiments does not have a clothes drying function, the present invention can also be applied to the full-automatic washing machine having the clothes drying function.

[0085] In addition, various changes can be properly made to embodiments of the present invention within a scope of technical ideas shown in patent claims.

List of reference numerals:

[0086]

21: Washing and dewatering drum;

50: Water supply unit;

100: Detergent container;

200: Water injection port portion;

205: Central water passage (first water passage);

206: Right water passage (second water passage);

207: Left water passage (second water passage);

212: Water flowing path;

214: Wall portion;

217: Central water flowing path (first water flowing path);

217a: Inclined surface (first inclined surface);

218: Right water flowing path (second water flowing path);

218a: Inclined surface (second inclined surface);

219: Left water flowing path (second water flowing path);

219a: Inclined surface (second inclined surface);

220: Right discharge port (discharge port);

221: Left discharge port (discharge port);

222: Outflow hole portion;

223: Outflow hole;

224: Steering body.

Claims

1. A washing machine, comprising:

a washing and dewatering drum, for accommodating washings; and
a water injection port portion, arranged above the washing and dewatering drum and connected with a faucet, wherein
the water injection port portion comprises:

a water flowing path, through which water from the faucet flows;
a wall portion, arranged at a front end of the water flowing path to intercept flowing water; and
a plurality of outflow hole portions, arranged on a bottom surface of the water flowing path along the wall portion so that water flowing through the water flowing path flows into the washing and dewatering drum, wherein

the plurality of outflow hole portions enable water to flow out in such a manner that water from each outflow hole portion does not contact with each other.

2. The washing machine according to claim 1, wherein the outflow hole portions comprise:

outflow holes, formed in the bottom surface of the water flowing path; and
steering bodies, for changing directions of water flowing out of the outflow holes.

3. The washing machine according to claim 1 or 2, wherein
water flowing out of the plurality of outflow hole portions forms a circular arc along an inner circumferential wall of the washing and dewatering drum.

4. The washing machine according to any one of claims 1-3, wherein
the water flowing path comprises a first water flowing path provided with the outflow hole portions, and a second water flowing path separately arranged and different from the first water flowing path; and
a discharge port is formed in the water injection port portion; and the discharge port enables water flowing through the second water flowing path to be discharged to a position closer to a side surface than a supply region to which water from the outflow hole portions is supplied and closer to the inner circumferential wall of the washing and dewatering drum than the supply region.

5. The washing machine according to claim 4,
further comprising a detergent container telescopically accommodated in the water injection port portion;
wherein, the water injection port portion further comprises a first water passage enabling water from the faucet to flow out into the first water flowing path through the detergent container, and a second water passage enabling water from the faucet to flow out into the second water flowing path without passing through the detergent container.

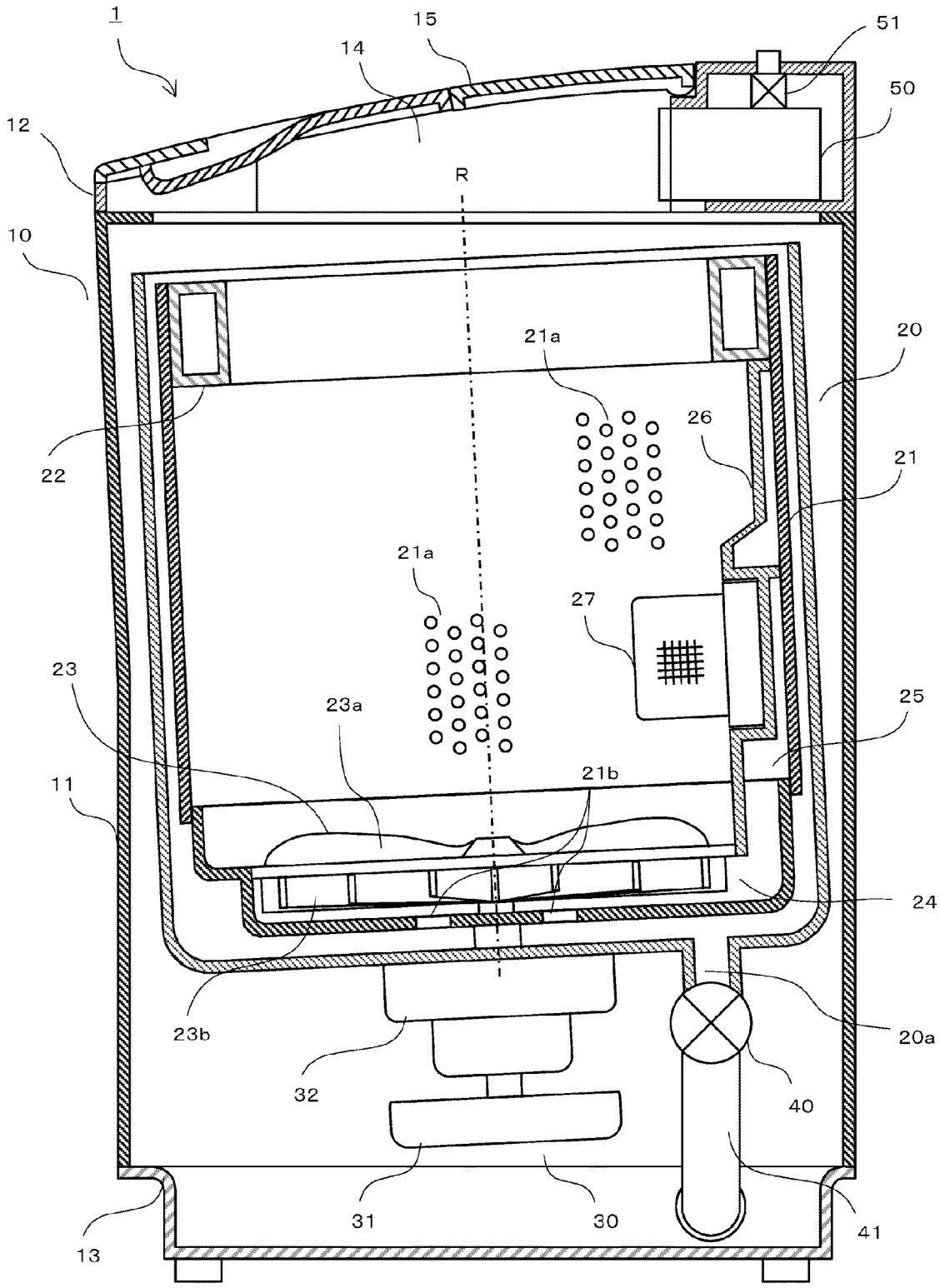

1
15
14
51
50
12
R
10
21a
20
22
26
21
21a
27
23
25
23a
11
21b
24
20a
23b
32
40
31
30
41
13

FIG. 1

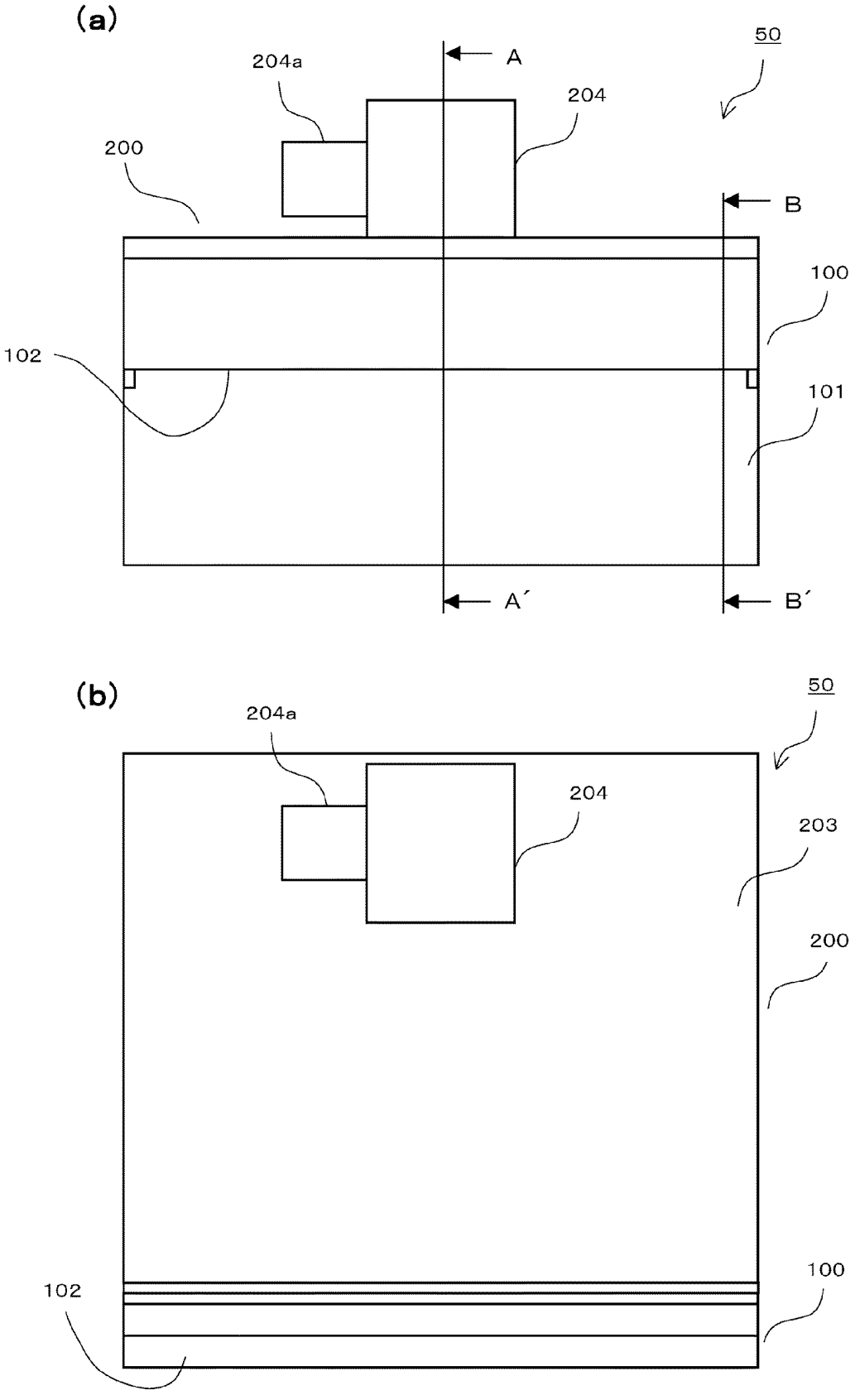


FIG. 2

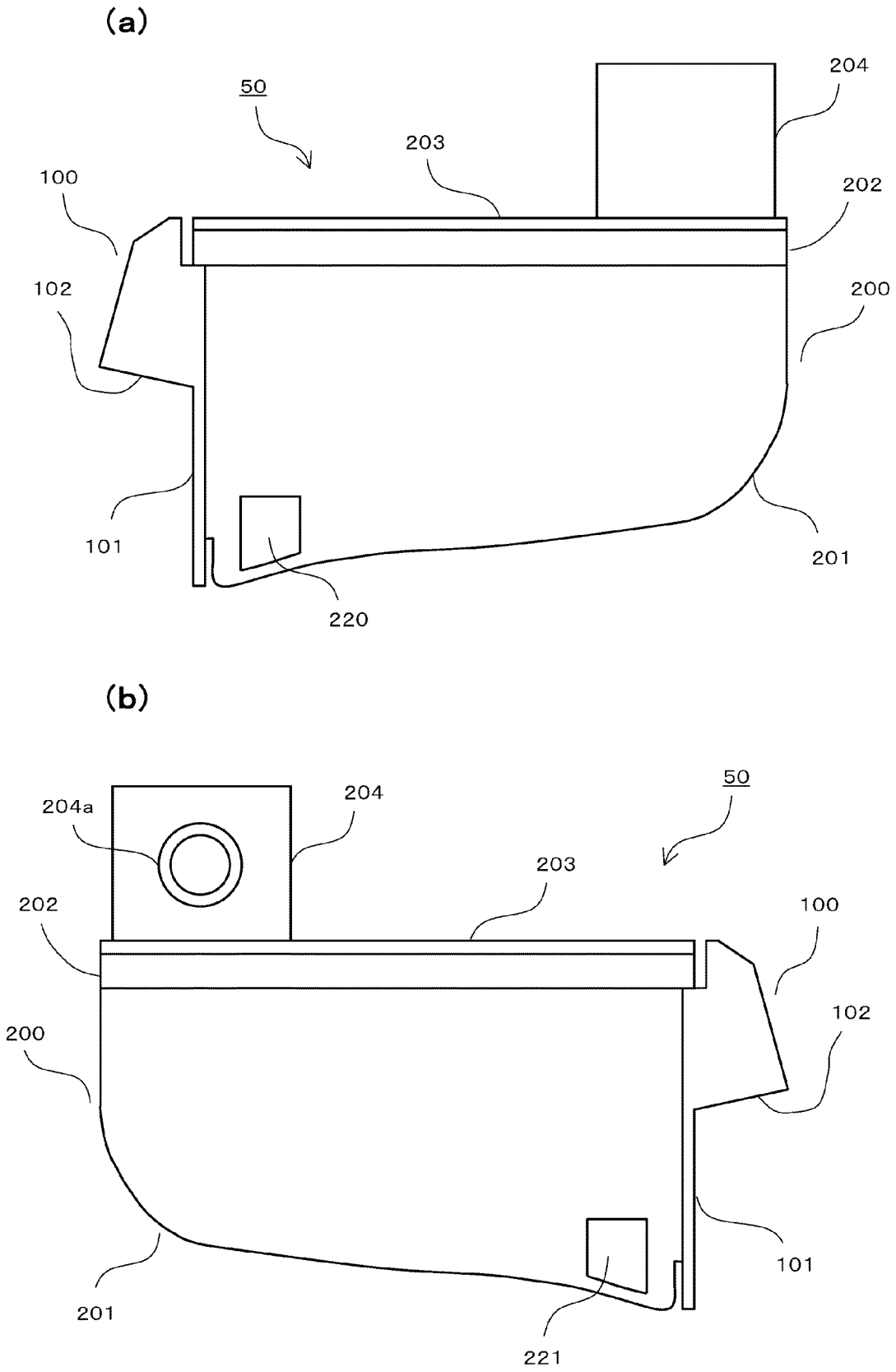

(a)
50
204
203
100
202
102
200
101
201
220
(b)
204a
204
50
203
202
100
200
102
201
101
221

FIG. 3

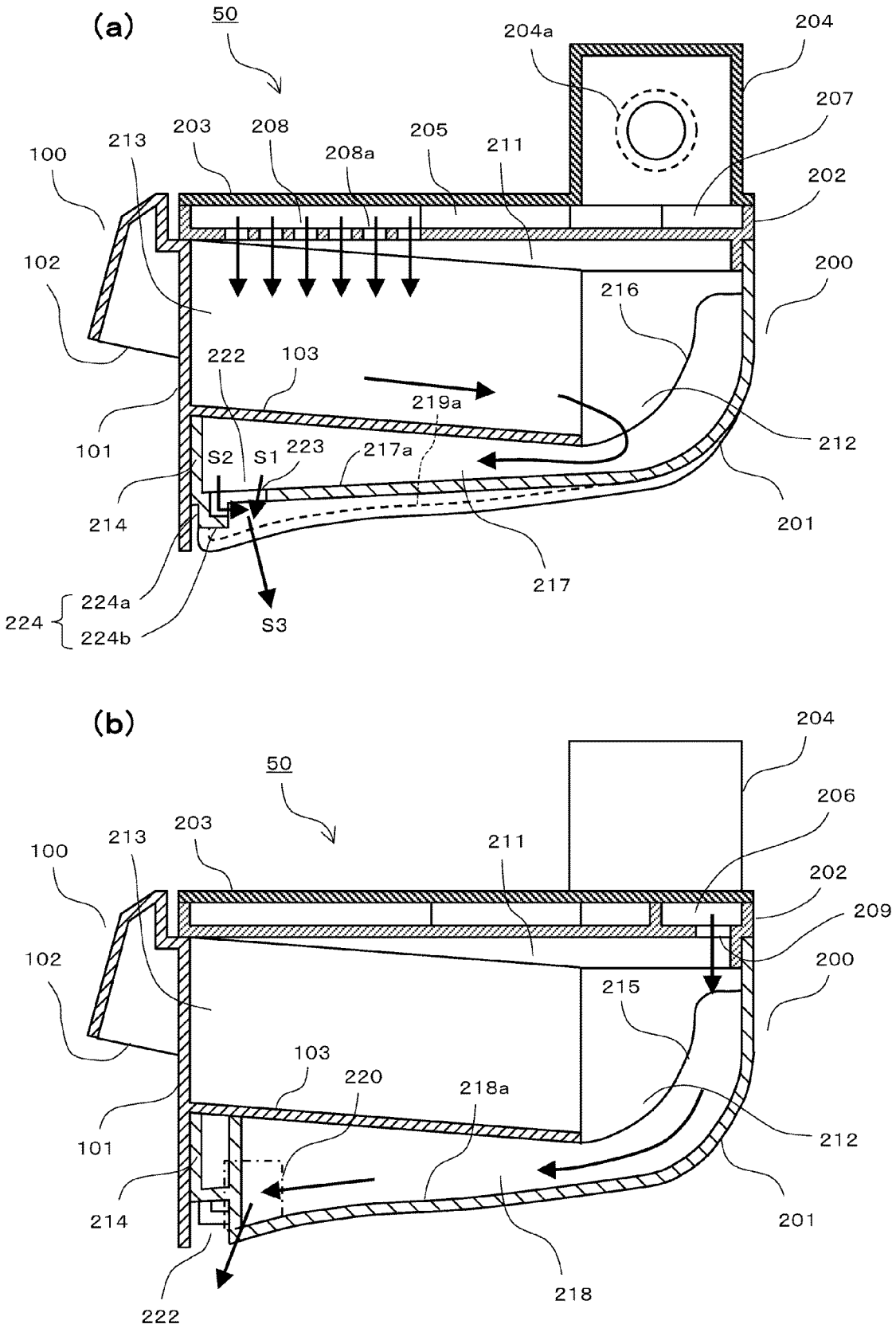

(a)
50
204a
204
207
203
208
205
211
213
208a
100
202
102
200
216
222
103
219a
212
101
S2
S1
223
217a
214
201
217
224
224a
224b
S3
(b)
204
50
206
203
213
211
100
202
209
102
200
215
103
220
218a
212
101
214
201
218
222

FIG. 4

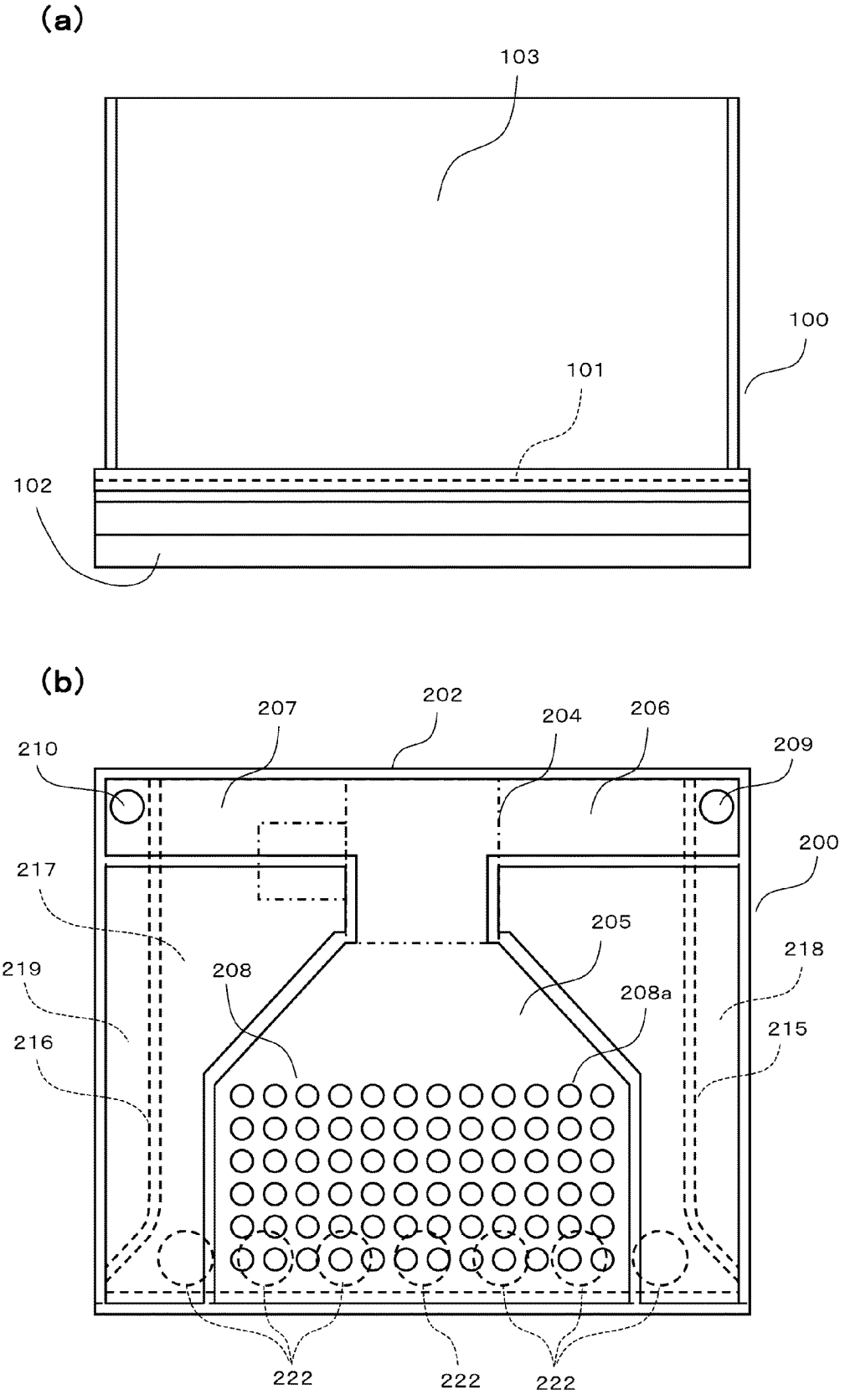

(a)
103
100
101
102
(b)
207
202
204
206
210
209
200
217
205
218
219
208
208a
216
215
222
222
222

FIG. 5

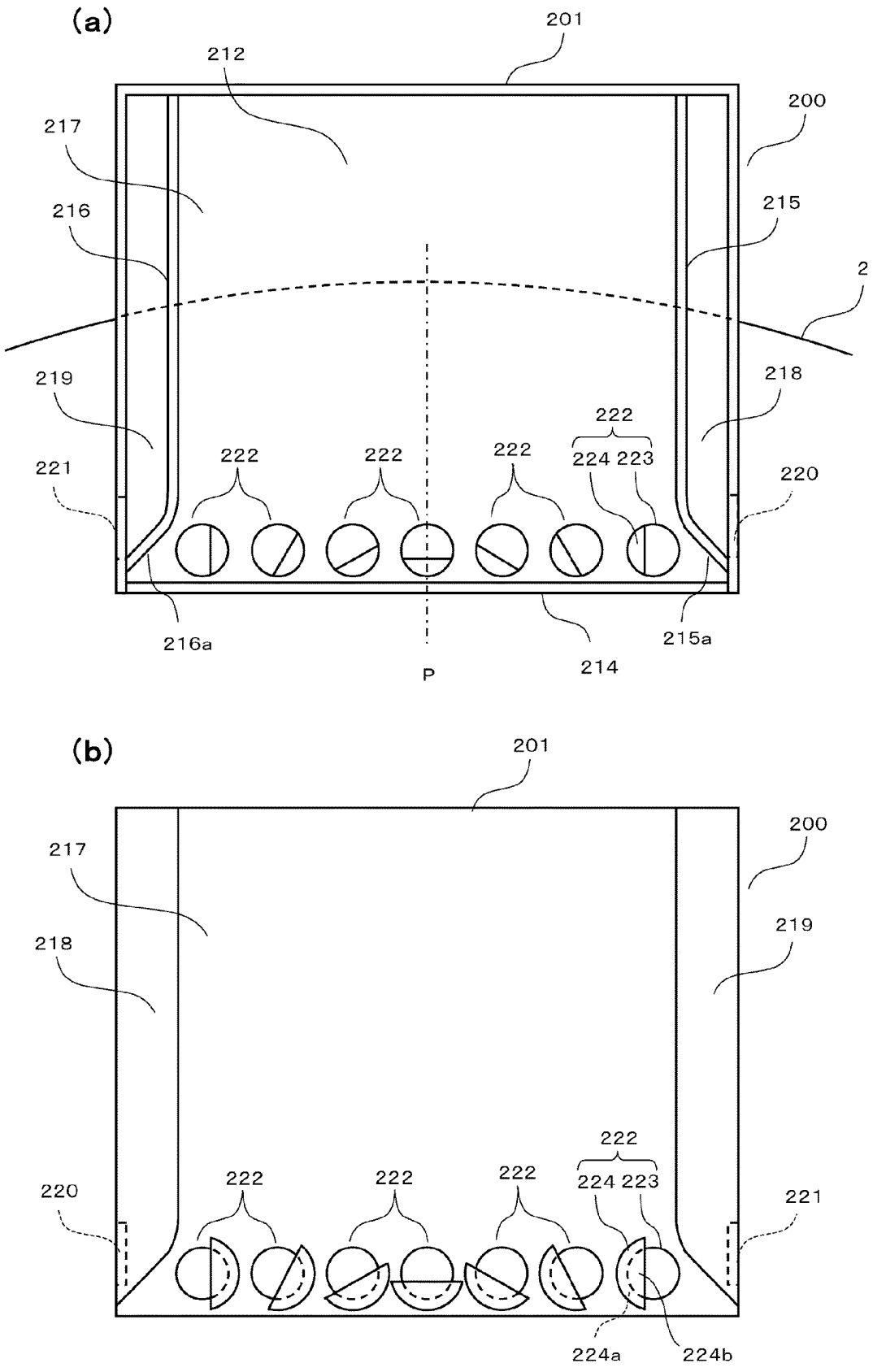
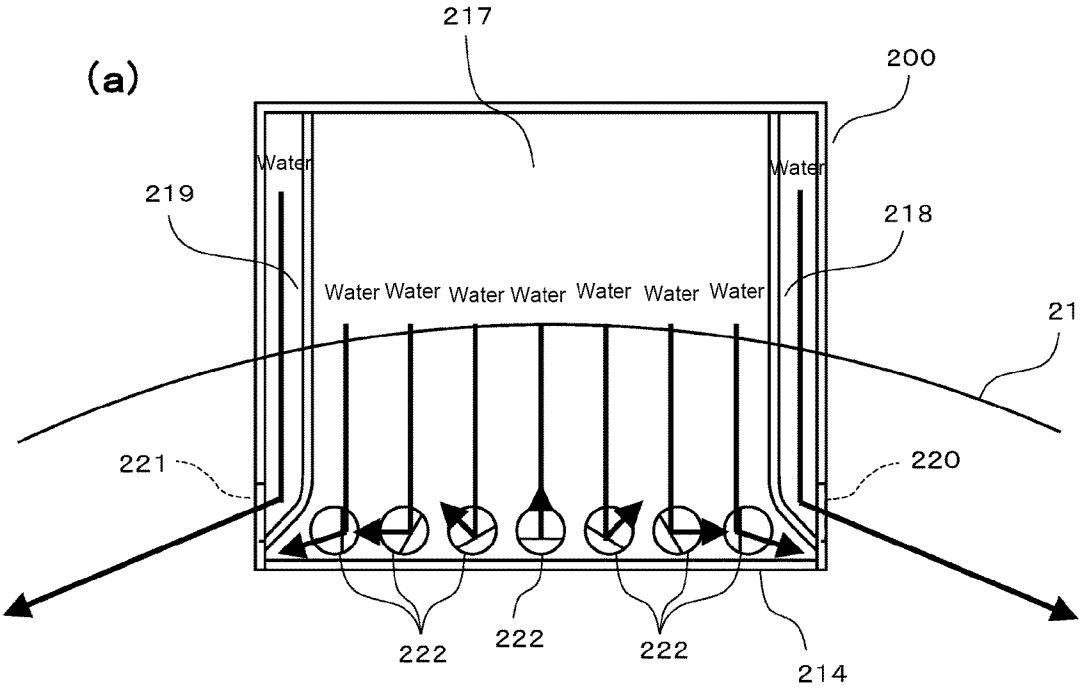

(a)
201
212
200
217
215
216
2
219
218
222
222
222
222
224 223
221
220
216a
215a
214
P
(b)
201
200
217
219
218
222
222
222
222
224 223
220
221
224a
224b

FIG. 6


(a)
217
200
Water
Water
219
218
Water Water Water Water Water Water Water
21
221
220
222
222
222
214

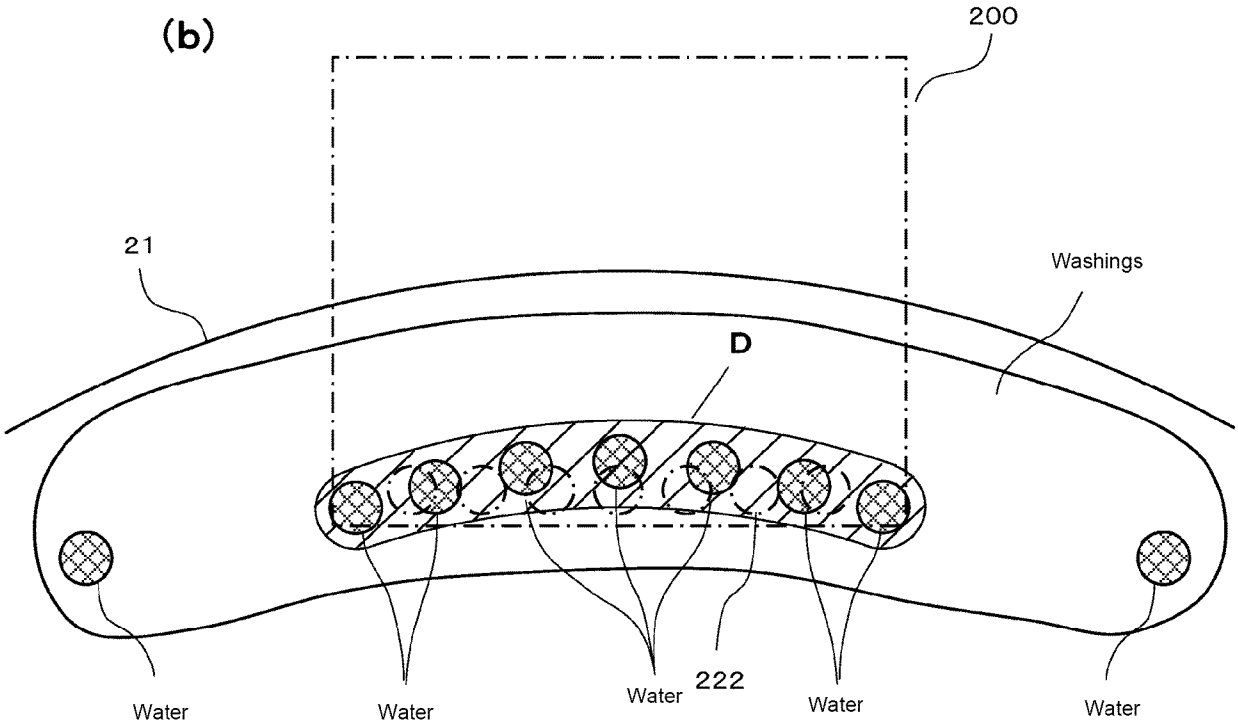

(b)
200
21
Washings
D
Water
Water
Water
222
Water
Water

FIG. 7

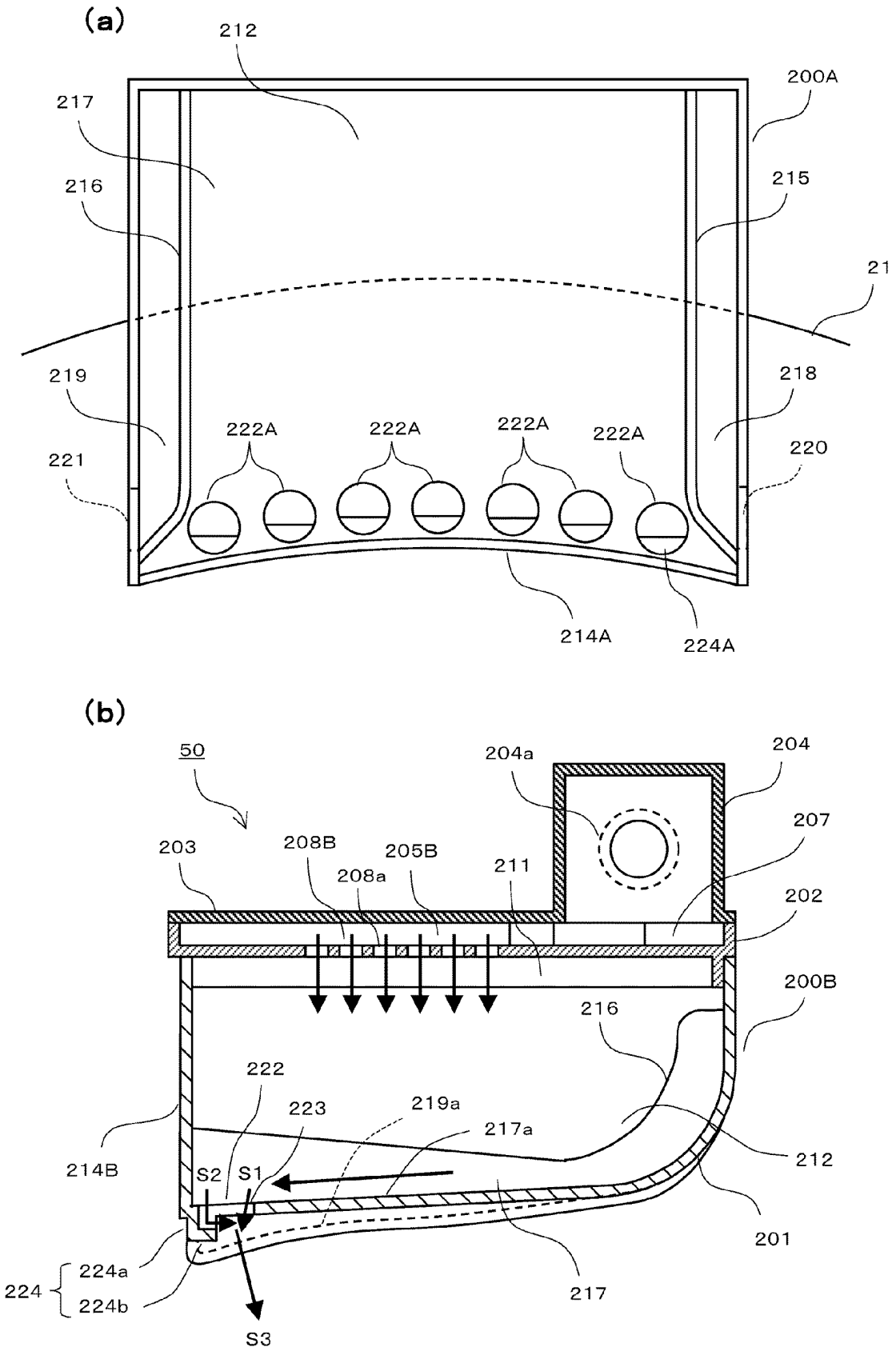

(a)
212
200A
217
216
215
21
219
218
222A
222A
222A
222A
221
220
214A
224A
(b)
50
204a
204
207
203
208B
205B
211
208a
202
200B
216
222
223
219a
217a
214B
S2
S1
212
201
224a
224
224b
217
S3

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/076162

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/02 (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; CNTXT; WPI; EPODOC: water injection, flowing water, watering, water supply, outflow, groove, liquid laundry detergent, softener, rinsing agent, bleaching agent, spray+, spout+, pour+, sprinkl+, splash+, insufflation, eject+, jet+, supply+, provid+, infusion, inject+, serv+, hole+, aperture+, orifice+, finestra+, hollow+, water, two, second, plural+, multi+, many, tub, drum, basket, cylinder, buffer, tumble, roller, barrel, cask, container, detergent, agent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2012125324 A (HITACHI APPLIANCES INC.), 05 July 2012 (05.07.2012), description, paragraphs [0015]-[0072], and figures 1-10	1-4
X	KR 20020080637 A (SAMSUNG ELECTRONICS CO., LTD.), 26 October 2002 (26.10.2002), description, paragraphs [0030]-[0046], and figures 1-5	1-4
X	CN 102251378 A (TOSHIBA CORPORATION et al.), 23 November 2011 (23.11.2011), description, paragraphs [0029]-[0140], and figures 1-8	1-4
A	CN 101892573 A (TOSHIBA CORPORATION et al.), 24 November 2010 (24.11.2010), the whole document	1-5
A	CN 101348993 A (LG ELECTRONICS INC.), 21 January 2009 (21.01.2009), the whole document	1-5

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"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)
"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
"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
"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
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 May 2016 (20.05.2016)	**27 May 2016 (27.05.2016)**
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 **ZHANG, Zhen** Telephone No.: (86-10) **62084588**

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/076162

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2012125324 A	05 July 2012	None	
KR 20020080637 A	26 October 2002	None	
CN 102251378 A	23 November 2011	CN 104264425 A	07 January 2015
		JP 5575542 B2	20 August 2014
		JP 2011240078 A	01 December 2011
		EG 26785 A	10 September 2014
		WO 2011145382 A1	24 November 2011
		VN 32865 A	25 February 2013
		ID 201301969 A	27 June 2013
CN 101892573 A	24 November 2010	TW 201107555 A	01 March 2011
		TW I398562 B	11 June 2013
		CN 101892573 B	21 November 2012
		JP 2010268843 A	02 December 2010
		JP 5489094 B2	14 May 2014
		KR 101134750 B1	13 April 2012
		KR 20100124654 A	29 November 2010
		VN 10012234 B	25 February 2014
		VN 24400 A	25 November 2010
CN 101348993 A	21 January 2009	KR 20090008082 A	21 January 2009
		AU 2008203014 A1	05 February 2009
		AU 2008203014 B2	02 December 2010
		CN 101348993 B	31 August 2011
		KR 101386470 B1	18 April 2014
		US 2009019896 A1	22 January 2009

Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 7222893 A **[0005]**