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(54) **WASHING MACHINE**

(57) The present invention provides a washing machine capable of suppressing a situation that a structure of an upper cover becomes complicated and a situation that operability of the upper cover is decreased, and allowing a user to operate by operation buttons arranged on the upper cover. A full-automatic washing machine includes: an upper panel (12), having a throwing inlet (14) for washings; an operation part (16), arranged around the throwing inlet (14) of the upper panel (12) and including a plurality of operation buttons and a switching element for detecting pressing of the operation buttons; an upper cover (15), covering the throwing inlet (14) and the operation part (16) in a manner of opening and closing freely; and a second power button (240) and a second start button (250), arranged at positions corresponding to a first power button (301) and a first start button (302) included in the plurality of operation buttons on the upper cover (15). When the second power button (240) and the second start button (250) are pressed in such a state that the upper cover (15) is closed, the first power button (301) and the first start button (302) are pressed respectively.

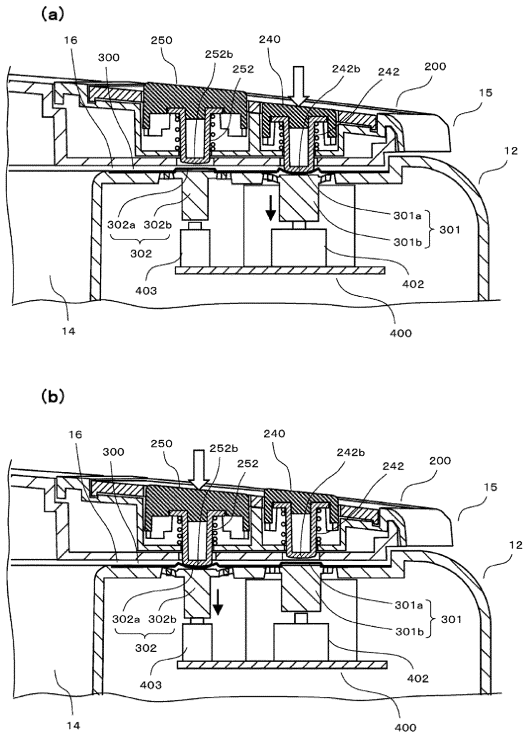

FIG. 7

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Description

TECHNICAL FIELD

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

BACKGROUND

[0002] In the past, an operation part is arranged around a throwing inlet, such as front and side of the throwing inlet, on an upper panel of a full-automatic washing machine. The operation part includes a plurality of operation buttons and a switching element for detecting pressing of these operation buttons (referring to a patent literature 1). On the other hand, the full-automatic washing machine can adopt such a structure that the operation part is arranged on an upper cover covering the throwing inlet.

Current Technical Literature

Patent Literature

[0003] Patent Literature 1: Japanese Laid-Open Patent Publication No. 10-024195

Problems to be solved in invention

[0004] However, in a case that the upper cover is provided with the operation part as described above, since electrical wiring from a substrate on which the switching element and the like are mounted needs to be performed inside the upper cover, a hidden danger that a structure of the upper cover becomes complicated may exist. In particular, the upper cover mostly adopts a folded structure from the viewpoint of operability. In this case, since the electrical wiring needs to penetrate through a hinge part, hidden dangers that the wiring processing becomes difficult and the structure of the upper cover becomes more complicated exist. In addition, since the operation part is arranged, the hidden dangers that the upper cover becomes heavy and an opening-closing operation of the upper cover is difficult also exist.

SUMMARY

[0005] Thus, the purpose of the present invention is to provide a washing machine capable of suppressing a situation that a structure of an upper cover becomes complicated and a situation that operability of the upper cover is decreased, and allowing a user to operate by operation buttons arranged on the upper cover.

Solutions for solving problems

[0006] The washing machine of a main embodiment of the present invention includes: an upper panel, having a throwing inlet for washings; an operation part, arranged around the throwing inlet of the upper panel and including a plurality of operation buttons and a switching element for detecting pressing of these operation buttons; an upper cover, covering the throwing inlet and the operation part in a manner of opening and closing freely; and a second button, arranged at a position corresponding to a first button included in the plurality of operation buttons on the upper cover, wherein when the second button is pressed in such a state that the upper cover is closed, the first button is pressed.

[0007] According to the above structure, the upper cover can be operated in a closed state by the second button arranged on the upper cover. In addition, since the operation part including the switching element is arranged on an upper panel side, it is unnecessary to perform electrical wiring processing inside the upper cover, and increase of weight of the upper cover can also be suppressed. Thus, the situation that the structure of the upper cover becomes complicated and the situation that the operability of the upper cover is decreased can be suppressed.

[0008] In the washing machine of the present embodiment, the first button includes a first power button for turning on/off power, and a first start button for starting/pausing an operation. In this case, the second button includes a second power button for pressing the first power button by pressing of the second power button, and a second start button for pressing the first start button by pressing of the second start button.

[0009] According to the above structure, the second power button and the second start button corresponding to the first power button and the first start button having high operation frequencies are arranged on the upper cover, and the operation buttons corresponding to the operation buttons having low operation frequencies are not arranged on the upper cover, thereby preventing the structure of the upper cover from becoming complicated and preventing the weight of the upper cover from increasing due to arrangement of the plurality of operation buttons.

[0010] In the washing machine of the present embodiment, the second button includes: a button body which is made of resin and is pressed by a finger of a user; and a pressing body which is mounted on a back surface of the button body and is pressed through the button body to move downwards so as to press the first button.

[0011] According to the above structure, since the pressing body of the second button is formed by additionally arranging a member on the button body, an outer diameter of the pressing body can be increased to increase an area of a pressing surface for pressing the first button, thereby reducing a load on the first button.

[0012] It should be noted that the outer diameter of the pressing body is hardly increased when the pressing body is formed by integrating with the button body through resin molding rather than arranging the member additionally. If the pressing body is of a hollow structure, a hole extending to the pressing body is formed in a sur-

face of the button body. If the pressing body is of a solid structure, sink marks are easily generated on the surface of the button body. In either case, the appearance quality of the second button is easily reduced.

[0013] When the above structure is adopted, the pressing body is made of a material softer than the button body.

[0014] When such a structure is adopted, damage to the button body caused by the operation of a user can be suppressed, and the situation that the first button is damaged by the abutted pressing body can be suppressed.

[0015] The washing machine of the present embodiment further includes: a display part, arranged on the operation part for displaying information related to the operation; a display window, arranged at a position of an upper surface of the upper cover corresponding to the display part; and a frame part, surrounding an edge of the display window and extending from the edge to a display part side. In this case, an opening part at a front end of the frame part has a size capable of accommodating the display part; and the display window is designed in such a manner that the size in a front-rear direction of the display window at least is greater than the size of the opening part in the front-rear direction. Further, an inclination degree of a front side wall part of the frame part extending from a front side edge of the display window to the front side edge of the opening part is designed to be smaller than the inclination degree of a rear side wall part of the frame part extending from a rear side edge of the display window to the rear side edge of the opening part.

[0016] According to the above structure, a front-rear spacing between the front side edge of the opening part and the front side edge of the display window can be increased on a front side of the display part. Thus, the situation that a front end part of the display part is invisible because of being shielded by a front edge part of the display window when a user stands on the front side of the washing machine to see the display part can be suppressed. In addition, since the front-rear spacing between a rear side edge of the opening part and the rear side edge of the display window can be reduced, the size of the display window is not too large to exceed a necessary range.

Effects of invention:

[0017] The present invention can provide a washing machine capable of suppressing the situation that the structure of the upper cover becomes complicated and the situation that operability of the upper cover is decreased, and allowing the user to operate by operation buttons arranged on the upper cover.

[0018] The effects and significance of the present invention are further clarified by description of the following embodiments. However, the following embodiments are merely examples during implementation of the present invention. The present invention is not limited by contents recorded in the following embodiments.

BRIEF DESCRIPTION OF DRAWINGS

[0019]

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

Fig. 2 is a top view illustrating a full-automatic washing machine in such a state that an upper cover is closed in an embodiment;

Fig. 3 is a diagram illustrating a structure of an operation part of an embodiment;

Fig. 4 is a diagram illustrating a structure of an operation part of an embodiment;

Fig. 5 is a diagram illustrating a structure of an upper cover operation part of an embodiment;

Fig. 6 is a diagram illustrating a structure of an upper cover operation part of an embodiment;

Fig. 7 is a diagram illustrating a situation when a second power button is pressed in such a state that an upper cover is closed and a diagram illustrating a situation when a second start button is pressed in such a state that the upper cover is closed in an embodiment.

List of reference numerals

[0020] 12: Upper panel; 14: Throwing inlet; 15: Upper cover; 16: Operation part; 240: Second power button; 241: Button body; 242: Pressing body; 242b: Lower surface; 250: Second start button; 251: Button body; 252: Pressing body; 252b: Lower surface; 260: Display window; 260a: Front edge (front side edge); 260b: Rear edge (rear side edge); 261: Frame part; 261a: Front wall part (front side wall part); 261b: Rear wall part (rear side wall part): 262: Opening part; 262a: Front edge (front side edge); 262b: Rear edge (rear side edge); 301: First power button; 302: Second start button; 306: Time information display part (display part).

DETAILED DESCRIPTION

[0021] Hereinafter, a full-automatic washing machine as an embodiment of a washing machine of the present invention is described with reference to drawings.

[0022] Fig. 1 is a side sectional view illustrating a structure of the full-automatic washing machine 1.

[0023] The full-automatic washing machine 1 has a housing 10 for forming an appearance. The housing 10 includes: a machine body part 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 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 opened and closed freely.

[0024] 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 rotates by using a rotating shaft R slightly inclined forwards relative to a vertical direction as a center. The housing 10 has a protrusion part 10a protruding forward in correspondence with an amount that an upper part of the outer drum 20 protrudes forwards.

[0025] 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 the upper part of the washing and dewatering drum 21.

[0026] 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.

[0027] A circulation water path 25 extending to up and down directions along an inner circumferential surface of the washing and dewatering drum 21 is formed by a water path forming component 26 and an inner circumferential wall of the washing and dewatering drum 21. A lower end part of the circulation water path 25 is connected with the pump chamber 24. A detachable filter unit 27 is mounted in the circulation water path 25, i.e., the water path forming component 26 forming the circulation water path 25. The filter unit 27 captures thread and dust from the washings during washing.

[0028] 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 part 32. The transmitting mechanism part 32 has a clutch mechanism. By a switching operation based on the 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. In addition, the transmitting mechanism part 32 has a speed reduction mechanism. In the washing process and the rinsing process, the impeller 23 rotates at a rotating speed of the driving motor 31 being reduced according to a speed reduction ratio of the speed reduction mechanism.

[0029] A drain port part 20a is formed at the outer bottom part of the outer drum 20. A drain valve 40 is arranged on the drain port part 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.

[0030] A water supply unit 50 for supplying tap water into the washing and dewatering drum 21 is configured at the rear part 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 water tap. 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 the 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.

[0031] 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.

[0032] In the washing process and the rinsing process, the impeller 23 rotates 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 the detergents contained in the water. In the rinsing process, the washings are rinsed by the generated water flow.

[0033] In the intermediate dewatering process and the final dewatering process, the washing and dewatering drum 21 and the impeller 23 rotate integrally at a high speed. The washings are dewatered by action of a centrifugal force generated by the washing and dewatering drum 21.

[0034] Fig. 2 is a top view illustrating the full-automatic washing machine 1 in such a state that the upper cover 15 is closed.

[0035] The upper cover 15 is composed of a front cover 101, a rear cover 102, and a hinge part 103 for foldably connecting the front cover 101 with the rear cover 102. The front cover 101 includes a semi-disc-shaped front substrate 104 and a half-ring-shaped front decoration plate 105 fixed to the front substrate 104. A concave part 106 reaching a lower part of the front decoration plate 105 is formed on the front substrate 104. A handle part 107 is formed by the concave part 106 and the front dec-

oration plate 105. The front substrate 104 is made of a transparent material. The rear cover 102 includes a substantially square rear substrate 108 and a half-ring-shaped rear decoration plate 109 fixed to the rear substrate 108. In such a state that the upper cover 15 is closed, the front decoration shape 105 is connected with the rear decoration plate 109 to form a ring.

[0036] A lengthwise operation part 16 is arranged on the right of the throwing inlet 14 on the upper panel 12. In a closed state, the upper cover 15 not only covers the throwing inlet 14 in a manner of opening and closing freely, but also covers the operation part 16 in the manner of opening and closing freely. An upper cover operation part 200 is arranged on the front cover 101 of the upper cover 15. Next, a detailed structure of the upper cover operation part 200 is described.

[0037] Fig. 3 and Fig. 4 are diagrams illustrating the structure of the operation part 16. Fig. 3(a) is a top view illustrating a main part of a right end part of the upper surface of the full-automatic washing machine 1 in such a state that the upper cover 15 is opened. Fig. 3(b) is a top view illustrating an operation panel part 300. Fig. 4(a) is a sectional view along A-A' in Fig. 3(a). Fig. 4(b) is a sectional view along B-B' in Fig. 3(a).

[0038] The operation part 16 is composed of the operation panel part 300 and an operation substrate part 400 configured on the back surface of the operation panel part 300.

[0039] The operation panel part 300 includes a first power button 301, a first start button 302, a mode button 303, a bath water button 304, a dewatering button 305, a time information display part 306, a process information display part 307, a mode information display part 308, a bath water information display part 309 and a dewatering information display part 310.

[0040] The first power button 301 is an operation button for performing turning on/off power of the full-automatic washing machine 1. The first power button 301 is composed of a pressing pad 301a formed on a membrane panel M for covering the upper panel 12 and a pressing button 301b integratedly formed with the upper panel 12 at a position corresponding to the pressing pad 301a.

[0041] The first start button 302 is an operation button for starting/pausing the washing operation. The first start button 302 is composed of a pressing pad 302a formed on the membrane panel M and a pressing button 302b integratedly formed with the upper panel 12 at a position corresponding to the pressing pad 302a.

[0042] Elastic parts 301c and 302c are arranged around each of the pressing buttons 301b and 302b. When a pressing force is applied downward, the pressing buttons 301b and 302b can move downwards through warping of the elastic parts 301c and 302c.

[0043] The mode button 303 is an operation button for selecting an operation mode. The bath water button 304 is an operation button for selecting whether bath water is utilized. The dewatering button 305 is an operation button for selecting completion of dewatering. The mode button 303, the bath water button 304 and the dewatering button 305 are also composed of respective pressing pads 303a, 304a and 305a and respective pressing buttons not shown in figures.

[0044] The time information display part 306 includes: a first display part 311 for displaying a remaining time of the washing operation and a reservation time reserved by a timer; and a second display part 312 for showing the type of time displayed by the first display part 311 with words and identifiers. For example, the remaining time is displayed by turning on a light with a word "remaining"; and the reservation time is displayed by turning on a light with a timer identifier. The first display part 311 is composed of a square transparent time display region 311a formed on the membrane panel M and an opening part 311b formed at a position of the upper panel 12 corresponding to the time display region 311 a. The second display part 312 is composed of words and the like 312a formed on the membrane panel M and light acquisition holes 312b formed at positions of the upper panel 12 corresponding to the words and the like 312a. It should be noted that error information may be displayed by, for example, Latin letters or numerals in the first display part 311. The time information display part 306 is equivalent to the display part of the present invention.

[0045] The process information display part 307 displays a process which is being performed. The process information display part 307 is composed of words 307a for displaying various processes and light acquisition holes not shown in figures. The mode information display part 308 displays the operation mode selected by the mode button 303. The mode information display part 308 is composed of words 308a indicating various operation modes and light acquisition holes not shown in figures. The bath water information display part 309 displays whether the bath water is utilized and a final process of utilization when the bath water is utilized according to selection by the bath water button 304. The bath water information display part 309 is composed of words 309a indicating various final processes and light acquisition holes not shown in figures. The dewatering information display part 310 displays completion status of dewatering selected by the dewatering button 305. The dewatering information display part 310 is composed of words 310a indicating various completion status of dewatering and light acquisition holes not shown in figures.

[0046] The operation substrate part 400 includes: a wiring substrate 401 and a power switching element 402 configured on the wiring substrate 401; a start switching element 403; a mode button 303; various switching elements (not shown in figures) used by the dewatering button 305 and the bath water button 304; a display element 404 for displaying time and other information in the first display part 311 of the time information display part 306; an LED element 405, for lighting up the words and the like 312a of the second display part 312; the mode information display part 308; and LED elements (not shown in figures) for lighting up various words 308a, 309a and

310a of the dewatering information display part 310 and the bath water information display part 309.

[0047] The power switching element 402 is configured just below the first power button 301 to detect pressing of the first power button 301. The start switching element 403 is configured just below the first start button 302 to detect the pressing of the first start button 302. Other switching elements are also configured just below the corresponding operation buttons to detect the pressing of the corresponding operation buttons. In addition, the display element 404 is configured just below the first display part 311. The LED element 405 is configured just below the second display part 312. Other LED elements are also configured just below the corresponding display parts.

[0048] Fig. 5 and Fig. 6 are diagrams illustrating the structure of the upper cover operation part 200. Fig. 5(a) is an enlarged view illustrating the main part of the upper cover 15 of a peripheral part of the upper cover operation part 200. Fig. 5(b) is an enlarged view illustrating the main part of the upper surface of the full-automatic washing machine 1 in such a state that the upper cover 15 for indicating the peripheral part of the upper cover operation part 200 is closed. Fig. 6(a) is a sectional view along C-C' in Fig. 5(a). Fig. 6(b) is a sectional view along D-D' in Fig. 5(a).

[0049] The upper cover operation part 200 has an operation surface 210 formed in a manner of slightly recessed than the circumference on the front decoration plate 105 of the front cover 101. A power button mounting part 220 and a start button mounting part 230 are formed side by side on the front side of the operation surface 210. The power button mounting part 220 and the start button mounting part 230 are formed in a manner of further recessing from the operation surface 210. A second power button 240 is mounted on the power button mounting part 220. A second start button 250 is mounted on the start button mounting part 230. In addition, the power button mounting part 220 and a display window 260 which is squarely opened behind the start button mounting part 230 are formed on the operation surface 210.

[0050] A cover 270 made of a transparent material is mounted on the operation surface 210. The cover 270 is fixed to the operation surface 210 through engagement of engaging claw parts 271 formed at multiple parts of an outer peripheral part of the cover 270 and engaging holes 211 formed at multiple parts of an inner peripheral part of the operation surface 210. In addition, an opening part 272 penetrated by the second power button 240 and an opening part 273 penetrated by the second start button 250 are formed on the cover 270.

[0051] The second power button 240 includes a button body 241 pressed by a finger of a user and a pressing body 242 protruding downward from the button body 241. The button body 241 is made of a resin material and is of a substantially square shape in top view. The pressing body 242 is of a cylindrical shape with an opened upper surface and a closed lower surface, and a flange part 242a is formed at an upper end part of the pressing body 242. The pressing body 242 is fixed to the button body 241 in such a manner that the upper end part of the pressing body 242 is embedded into a protrusion 241a formed on the back surface of the button body 241. The pressing body 242 is made of a material softer than the button body 241, for example, a soft resin material. In addition, a lower surface 242b of the pressing body 242 is formed in a convex curved surface shape, more particularly, a spherical shape. A circular insertion hole 221 penetrated by the pressing body 242 is formed in the bottom of the power button mounting part 220. Moreover, a circular insertion hole 110 penetrated by the pressing body 242 is also formed in the front substrate 104 of the front cover 101.

[0052] A compression spring 281 is arranged between the bottom surface of the power button mounting part 220 and the flange part 242a of the pressing body 242. The compression spring 281 pushes the second power button 240 upwards. Engaging claw parts 241b are formed on the front side and the rear side of the back surface of the button body 241. The clamping claw parts 241b on the front side and the rear side are respectively engaged with engaging holes 222 formed in the front side and the rear side of the power button mounting part 220 in a manner of movable in up and down directions. In such a state that the second power button 240 is not pressed, the engaging claw parts 241b are engaged with upper ends of the engaging holes 222 so as to prevent the second power button 240 from dropping upwards.

[0053] The second start button 250 includes a button body 251 pressed by a finger of a user and a pressing body 252 protruding downwards from the button body 251. The button body 251 is made of a resin material and is of a substantially horizontally-long rectangular shape in top view. The pressing body 252 is of a cylindrical shape with an opened upper surface and a closed lower surface, and a flange part 252a is formed at an upper end part of the pressing body 252. The pressing body 252 is fixed to the button body 251 in such a manner that the upper end part of the pressing body 252 is embedded into a protrusion 251a formed on the back surface of the button body 251. The pressing body 252 is made of a material softer than the button body 251, for example, a soft resin material. In addition, a lower surface 252b of the pressing body 252 is formed in a curved surface shape, more particularly, a spherical shape. A circular insertion hole 231 penetrated by the pressing body 252 is formed in the bottom of the start button mounting part 230. Moreover, a circular insertion hole 111 penetrated by the pressing body 252 is also formed in the front substrate 104 of the front cover 101.

[0054] A compression spring 282 is arranged between the bottom surface of the start button mounting part 230 and the flange part 252a of the pressing body 252. The compression spring 282 pushes the second start button 250 upwards. Engaging claw parts and engaging holes not shown in figures are also arranged between the sec-

ond start button 250 and the start button mounting part 230. In such a state that the second start button 250 is not pressed, the engaging claw parts are engaged with upper ends of the engaging holes so as to prevent the second start button 250 from dropping upwards.

[0055] When the second power button 240 and the second start button 250 are not pressed, the pressing bodies 242 and 252 do not protrude more downwards than the bottom surface of the front substrate 104, i.e., the bottom surface of the upper cover 15. Thus, even if the upper cover 15 is closed in such a state that hard foreign matters and the like are placed on the periphery of the first power button 301 and the first start button 302 of the operation part 16, the pressing bodies 242 and 252 are not strongly pressed in by colliding the foreign matters, thereby preventing the damage to the second power button 240 and the second start button 250.

[0056] In addition, since the insertion holes 221 and 231 of the power button mounting part 220 and the start button mounting part 230 as well as the insertion holes 110 and 111 of the front substrate 104 are formed in a circular shape, which is different from a situation that, for example, cross sections of the pressing bodies 242 and 252 are designed in a cross shape and correspondingly the insertion holes 221 and 231 and the insertion holes 110 and 111 are designed in the cross shape, even if the second power button 240 and the second start button 250 are detached from the upper cover 15, the user can easily press the first power button 301 and the first start button 302 by the circular insertion holes 221 and 231 as well as insertion holes 110 and 111.

[0057] A frame part 261 surrounding the edge of the display window 260 is formed on the back surface of the operation surface 210. The frame part 261 extends from the edge of the display window 260 to a front substrate 104 side, i.e., a time information display part 306 side located below the front substrate 104 in such a state that the upper cover 15 is closed. The front end of the frame part 261 is abutted against the front substrate 104. The opening part 262 of the front end of the frame part 261 is formed in a shape similar to that of the display window 260. As shown in Fig. 5(b), the opening part 262 is located above the time information display part 306 in such a state that the upper cover 15 is closed, and is designed to have a size capable of accommodating the time information display part 306, i.e., a size same as or slightly greater than that of the time information display part 306.

[0058] The display window 260 is designed in such a manner that the sizes in a front-rear direction and a left-right direction are greater than the sizes of the opening part 262 in the front-rear direction and the left-right direction. Furthermore, an inclination degree of a front wall part 261 a of the frame part 261 extending from a front edge 260a of the display window 260 to a front edge 262a of the opening part 262 is designed to be smaller than the inclination degree of a rear wall part 261b of the frame part 261 extending from a rear edge 260b of the display window 260 to a rear edge 262b of the opening part 262. Further, the inclination degree of a left wall part 261c of the frame part 261 extending from a left edge 260c of the display window 260 to a left edge 262c of the opening part 262 is designed to be smaller than the inclination degree of a right wall part 261 d of the frame part 261 extending from a right edge 260d of the display window 260 to a right edge 262d of the opening part 262.

[0059] As described above, the cover 270 and the front substrate 104 are transparent. Thus, as shown in Fig. 5(b), the user can see the time information display part 306 through the opening part 262 and the display window 260 in such a state that the upper cover 15 is closed. Herein, it can be considered that the user stands in the center of the front side of the full-automatic washing machine 1 to see the time information display part 306 in most cases. In the present embodiment, the frame part 261 is formed in such a manner that the inclination degree of the front wall part 261a is smaller than that of the rear wall part 261b, and the inclination degree of the left wall part 261c is smaller than that of the right wall part 261d. Thus, a front-rear spacing between the front edge 262a of the opening part 262 and the front edge 260a of the display window 260 can be increased on the front side of the time information display part 306; and a left-right spacing between the left edge 262c of the opening part 262 and the left edge 260c of the display window 260 can be increased on the left side of the time information display part 306. Thus, a situation that a front end part of the time information display part 306 is invisible because of being shielded by a front edge part of the display window 206 and a situation that a left end part of the time information display part 306 is invisible because of being shielded by a left edge part of the display window 260 when the user stands in the center of the front side of the full-automatic washing machine 1 to see the time information display part 306 can be suppressed. In addition, since the front-rear spacing between the rear edge 262b of the opening part 262 and the rear edge 260b of the display window 260 can be reduced, and the front-rear spacing between the right edge 262d of the opening part 262 and the right edge 260d of the display window 260 can be reduced, the size of the display window 260 is not too large to exceed a necessary size.

[0060] A first dewatering hole 263 is formed in the front end of the front wall part 261a of the frame part 261. A second dewatering hole 112 communicated with the first dewatering hole 263 is formed in the front substrate 104. Water generated by moisture condensation and the like in a chamber enclosed by the cover 270, the frame part 261 and the front substrate 104 flows out of the upper cover 15 through the first dewatering hole 263 and the second dewatering hole 112. Since the first dewatering hole 263 is formed in the front end of the front wall part 261a of the frame part 261, the first dewatering hole 263 is hardly to be seen from the viewpoint of the user standing in front of the full-automatic washing machine 1.

[0061] Fig. 7(a) is a diagram illustrating a situation when the second power button 240 is pressed in such a

state that the upper cover 15 is closed. Fig. 7(b) is a diagram illustrating a situation when the second start button 250 is pressed in such a state that the upper cover 15 is closed.

[0062] As shown in Fig. 7(a) and Fig. 7(b), when the upper cover 15 is closed, the first power button 301 is located just below the second power button 240; and the first start button 302 is located just below the second start button 250.

[0063] As shown in Fig. 7(a), when the second power button 240 is pressed, the pressing body 242 protrudes downwards from the bottom surface of the upper cover 15; and the lower surface 242b of the pressing body 242 is abutted against the pressing pad 301a of the first power button 301, thereby pressing the pressing button 301b of the first power button 301. The power switching element 402 is pressed by the declined pressing button 301b. Thus, the power is turned on when the full-automatic washing machine 1 is not turned on; and the power is turned off when the full-automatic washing machine 1 is turned on.

[0064] On the other hand, as shown in Fig. 7(b), when the second start button 250 is pressed, the pressing body 252 protrudes downwards from the bottom surface of the upper cover 15; and the lower surface 252b of the pressing body 252 is abutted against the pressing pad 302a of the first start button 302, thereby pressing the pressing button 302b of the first start button 302. The start switching element 403 is pressed by the declined pressing button 302b. Thus, the washing operation is started when the washing operation is not performed; and the washing operation is interrupted when the washing operation is being performed.

[0065] Since the power is turned off before the washing operation is performed in most cases, the first power button 301 is operated every time the washing operation is performed in most cases. In addition, the first start button 302 is operated every time the washing operation is performed. Thus, operation frequencies of the first power button 301 and the first start button 302 are higher than those of the mode button 303, the bath water button 304 and the dewatering button 305.

[0066] In the present embodiment, an on/off operation of the power and a start/pause operation can be performed in such a stat that the upper cover 15 is closed by the second power button 240 and the second start button 250 arranged on the upper cover 15. Furthermore, since the operation part 16 including the power switching element 402 and the start switching element 403 is arranged on the upper panel 12 side, it is unnecessary to perform electrical wiring processing inside the upper cover 15, and the increase of the weight of the upper cover 15 can be suppressed. Thus, a situation that the structure of the upper cover 15 becomes complicated and a situation that operability of the upper cover 15 is decreased can be suppressed.

[0067] In addition, in the above embodiment, the second power button 240 and the second start button 250 corresponding to the first power button 301 and the first start button 302 having high operation frequencies are arranged on the upper cover 15, and the operation buttons corresponding to the operation buttons having low operation frequencies are not arranged on the upper cover 15, thereby preventing the structure of the upper cover 15 from becoming complicated and preventing the weight of the upper cover 15 from increasing due to arrangement of the plurality of operation buttons.

[0068] Further, in the present embodiment, since the pressing bodies 242 and 252 of the second power button 240 and the second start button 250 are formed by components additionally arranged on the button bodies 241 and 251, outer diameters of the pressing bodies 242 and 252 can be increased so as to increase areas of the lower surfaces 242b and 252b and reduce loads applied to the first power button 301 and the second power button 302.

[0069] It should be noted that the outer diameters of the pressing bodies 242 and 252 are hardly increased when the pressing bodies 242 and 252 are formed by integrating with the button bodies 241 and 251 through resin molding rather than arranging the components additionally. If the pressing bodies 242 and 252 are of hollow structures, holes extending to the pressing bodies 242 and 252 are formed in surfaces of the button bodies 241 and 251. If the pressing bodies 242 and 252 are of solid structures, sink marks are easily generated on the surfaces of the button bodies 241 and 251. In either case, the appearance quality of the second power button 240 and the second start button 250 is easily reduced.

[0070] Further, in the present embodiment, since the pressing bodies 242 and 252 are made of the materials softer than the button bodies 241 and 251 on the second power button 240 and the second start button 250, damage to the button bodies 241 and 251 caused by the operation of the user can be suppressed, and the situation that the first power button 301 and the first start button 302 are damaged by the abutted pressing bodies 242 and 252 can be suppressed.

[0071] Further, in the present embodiment, the lower surfaces 242b and 252b of the pressing bodies 242 and 252 are formed in a convex curved surface shape on the second power button 240 and the second start button 250, thereby suppressing damage to the first power button 301 and the first start button 302 caused by the abutted pressing bodies 242 and 252.

[0072] Although embodiments of the present invention are described above, the present invention is not limited to the above embodiments and the like. In addition, various variations besides the above can also be made to embodiments of the present invention.

[0073] For example, in the above embodiments, the second power button 240 and the second start button 250 are arranged in the upper cover operation part 200. However, only one of the operation buttons of the second power button 240 and the second start button 250 can be arranged on the upper cover operation part 200. In addition, at least one of the second power button 240

and the second start button 250, and the operation buttons of the operation part 16 other than the first power button 301 and the first start button 302, for example, the operation button for the operation mode button 303, can also be arranged on the upper cover operation part 200, wherein the mode button 303 is an operation button having the operation frequency only inferior to those of the first power button 301 and the first start button 302.

[0074] In addition, in the above embodiments, the operation part 16 is arranged on the right of the throwing inlet 14 of the upper panel 12. However, the operation part 16 can also be arranged on the front or left of the throwing inlet 14 of the upper panel 12.

[0075] Further, in the above embodiments, the pressing bodies 242 and 252 of the second power button 240 and the second start button 250 are made of the materials softer than the button bodies 241 and 251. However, the pressing bodies 242 and 252 can also be made of the same materials as the button bodies 241 and 251.

[0076] Further, in the above embodiments, although the lower surfaces 242b and 252b of the pressing bodies 242 and 252 are formed in the convex curved surface shape, the lower surfaces 242b and 252b of the pressing bodies 242 and 252 may not be formed in the convex curved surface shape. For example, the lower surfaces 242b and 252b of the pressing bodies 242 and 252 may be of a flat shape. However, in this case, in order to suppress the damage to the first power button 301 and the first start button 302, inclined surfaces of edge parts of the lower surfaces 242b and 252b are preferably processed into R surfaces or C surfaces.

[0077] Further, in the above embodiments, the frame part 261 is formed in such a manner that the inclination degree of the front wall part 261a is smaller than that of the rear wall part 261b, and the inclination degree of the left wall part 261c is smaller than that of the right wall part 261d. However, the left wall part 261c can also be formed to have the same inclination degree as that of the right wall part 261d as long as at least the front wall part 261a is formed to have the inclination degree smaller than that of the rear wall part 261b.

[0078] Further, in the above embodiments, the display window 260 is arranged in the upper cover operation part 200. However, the display window 260 may not be arranged in the upper cover operation part 200.

[0079] Further, in the above embodiments, 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 not be inclined.

[0080] Further, although the full-automatic washing machine 1 of the above embodiments does not have a clothes drying function, the present invention is also applicable to a full-automatic washing machine with the clothes drying function.

[0081] In addition, various changes can be appropriately made to embodiments of the present invention within a scope of technical ideas shown in claims.

Claims

1. A washing machine, comprising:

   an upper panel, having a throwing inlet for washings;
   an operation part, arranged around the throwing inlet of the upper panel and comprising a plurality of operation buttons and a switching element for detecting pressing of the operation buttons;
   an upper cover, covering the throwing inlet and the operation part in a manner of opening and closing freely; and
   a second button, arranged at a position corresponding to a first button in the plurality of operation buttons on the upper cover, wherein when the second button is pressed in such a state that the upper cover is closed, the first button is pressed.

2. The washing machine according to claim 1, wherein the first button comprises a first power button for turning on/off power, and a first start button for starting/pausing an operation; and
   the second button comprises a second power button for pressing the first power button by pressing of the second power button, and a second start button for pressing the first start button by pressing of the second start button.

3. The washing machine according to claim 1 or 2, wherein
   the second button comprises:

   a button body, made of resin and pressed by a finger of a user; and
   a pressing body, mounted on a back surface of the button body and pressed through the button body to move downwards to press the first button.

4. The washing machine according to claim 3, wherein the pressing body is made of a material softer than the button body.

5. The washing machine according to any one of claims 1-4, further comprising:

   a display part, arranged on the operation part for displaying information related to an operation; a display window, arranged at a position of an upper surface of the upper cover corresponding to the display part; and
   a frame part, surrounding an edge of the display window and extending from the edge to a display part side, wherein
   an opening part at a front end of the frame part has a size capable of accommodating the dis-

play part; and the display window is designed in such a manner that a size in a front-rear direction of the display window at least is greater than a size of the opening part in the front-rear direction; and

an inclination degree of a front side wall part of the frame part extending from a front side edge of the display window to a front side edge of the opening part is designed to be smaller than an inclination degree of a rear side wall part of the frame part extending from a rear side edge of the display window to a rear side edge of the opening part.

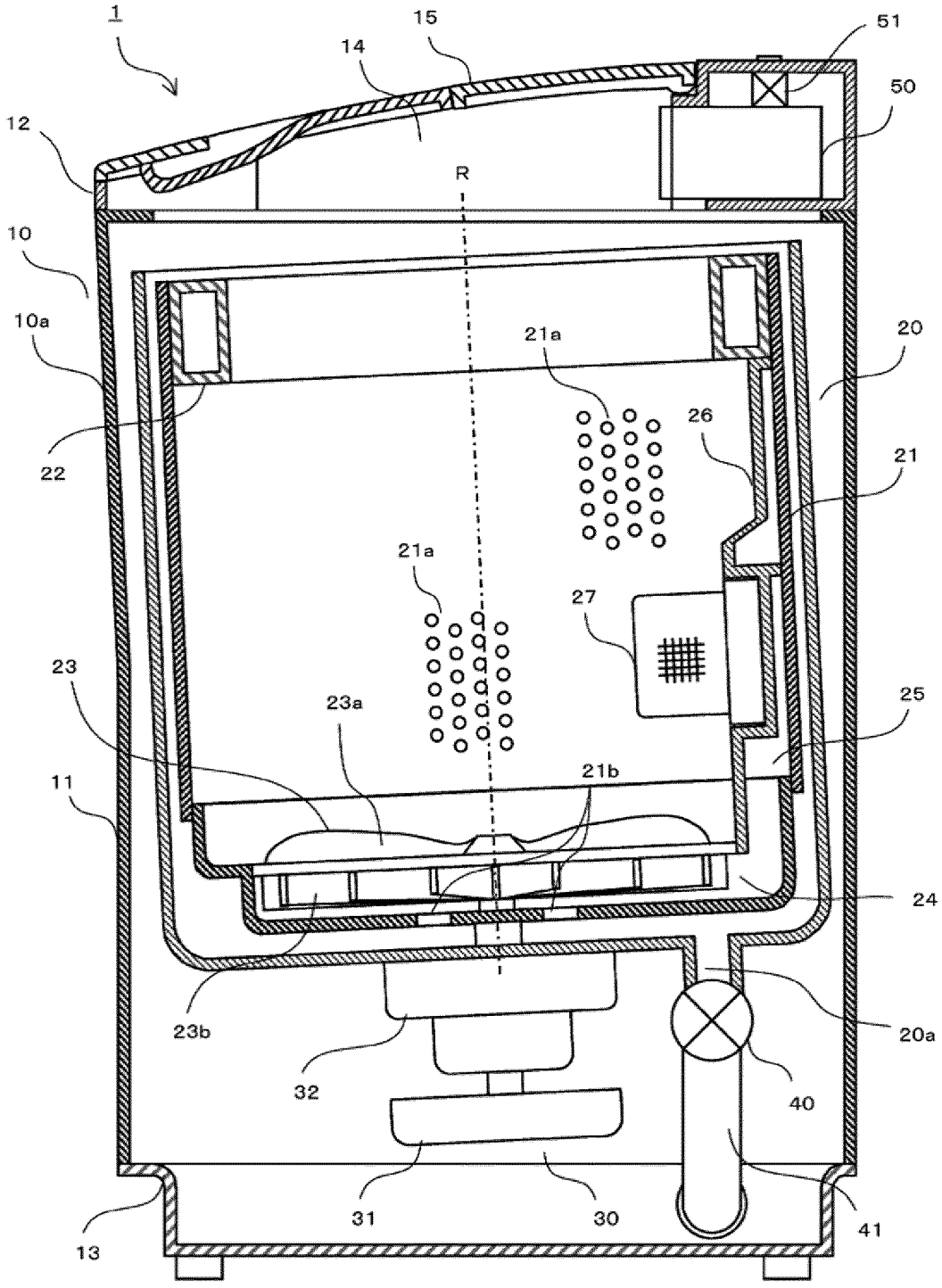

1
15
14
51
50
12
R
10
10a
21a
20
22
26
21
21a
27
23
23a
25
21b
11
24
23b
20a
32
40
31
30
41
13

FIG. 1

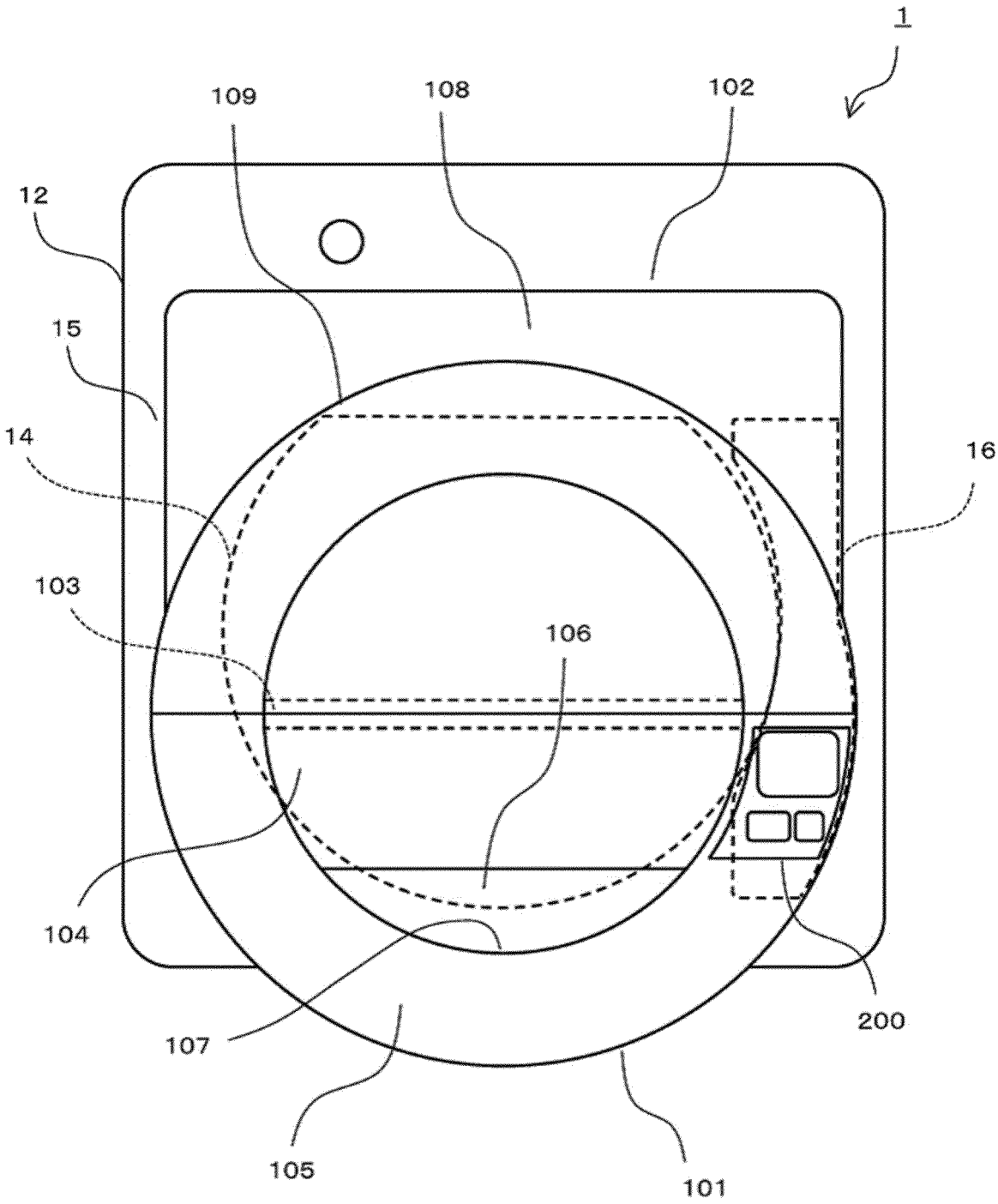


FIG. 2

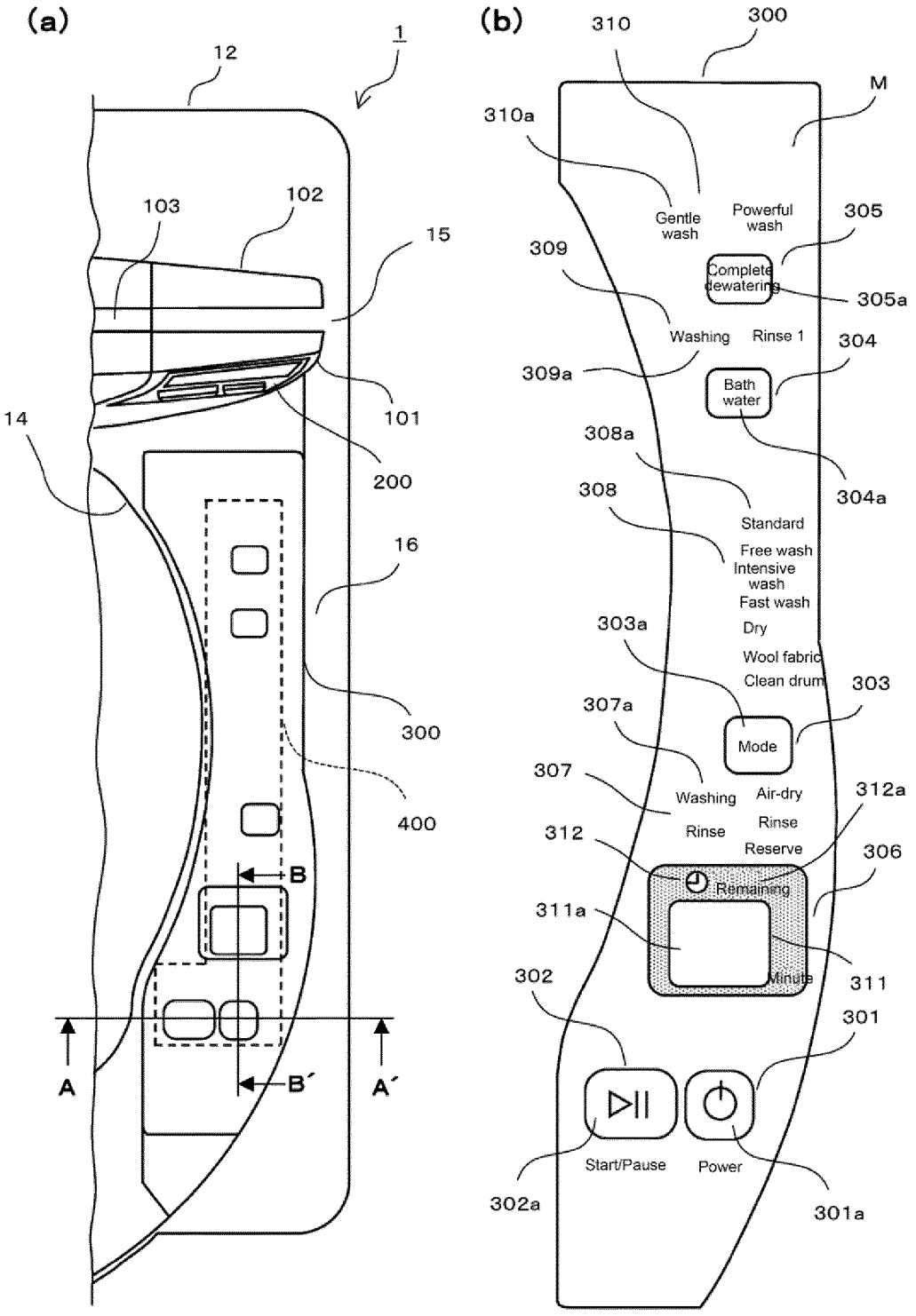
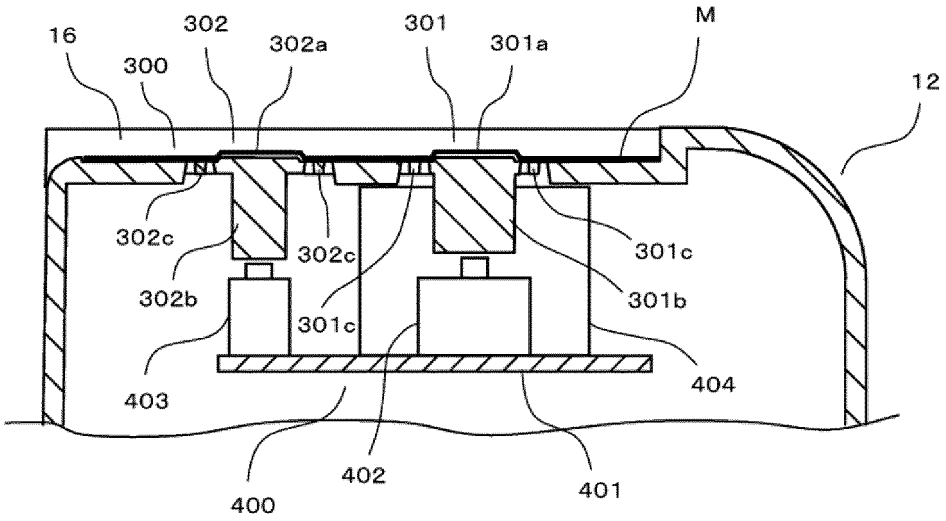

(a)
1
12
103
102
15
101
14
200
16
300
400
B
A
B´
A´
(b)
310
300
M
310a
Gentle wash
Powerful wash
305
309
Complete dewatering
305a
Washing
Rinse 1
304
309a
Bath water
308a
304a
308
Standard
Free wash
Intensive wash
Fast wash
Dry
303a
Wool fabric
Clean drum
303
307a
Mode
307
Washing
Air-dry
Rinse
Rinse
Reserve
312a
312
306
Remaining
311a
Minute
311
302
301
Start/Pause
Power
302a
301a

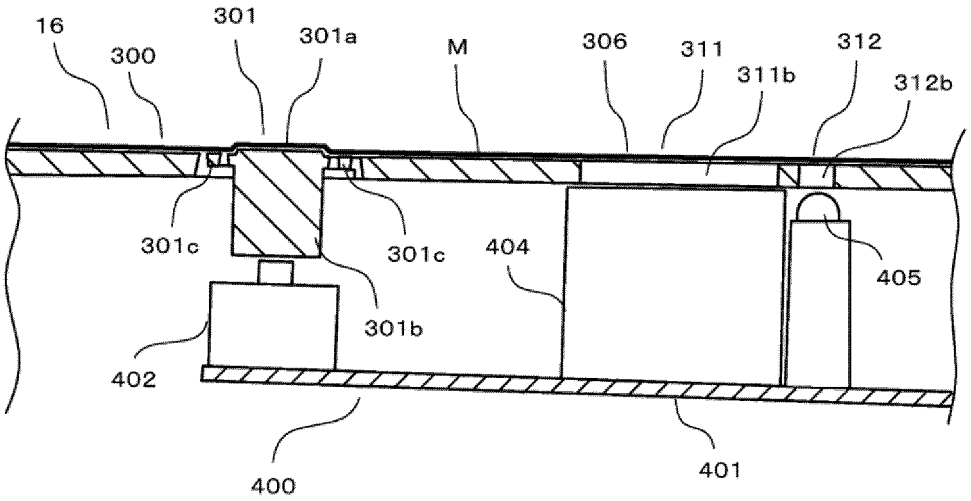
FIG. 3

(a)



Sectional view along A-A'

(b)



Sectional view along B-B'

FIG. 4

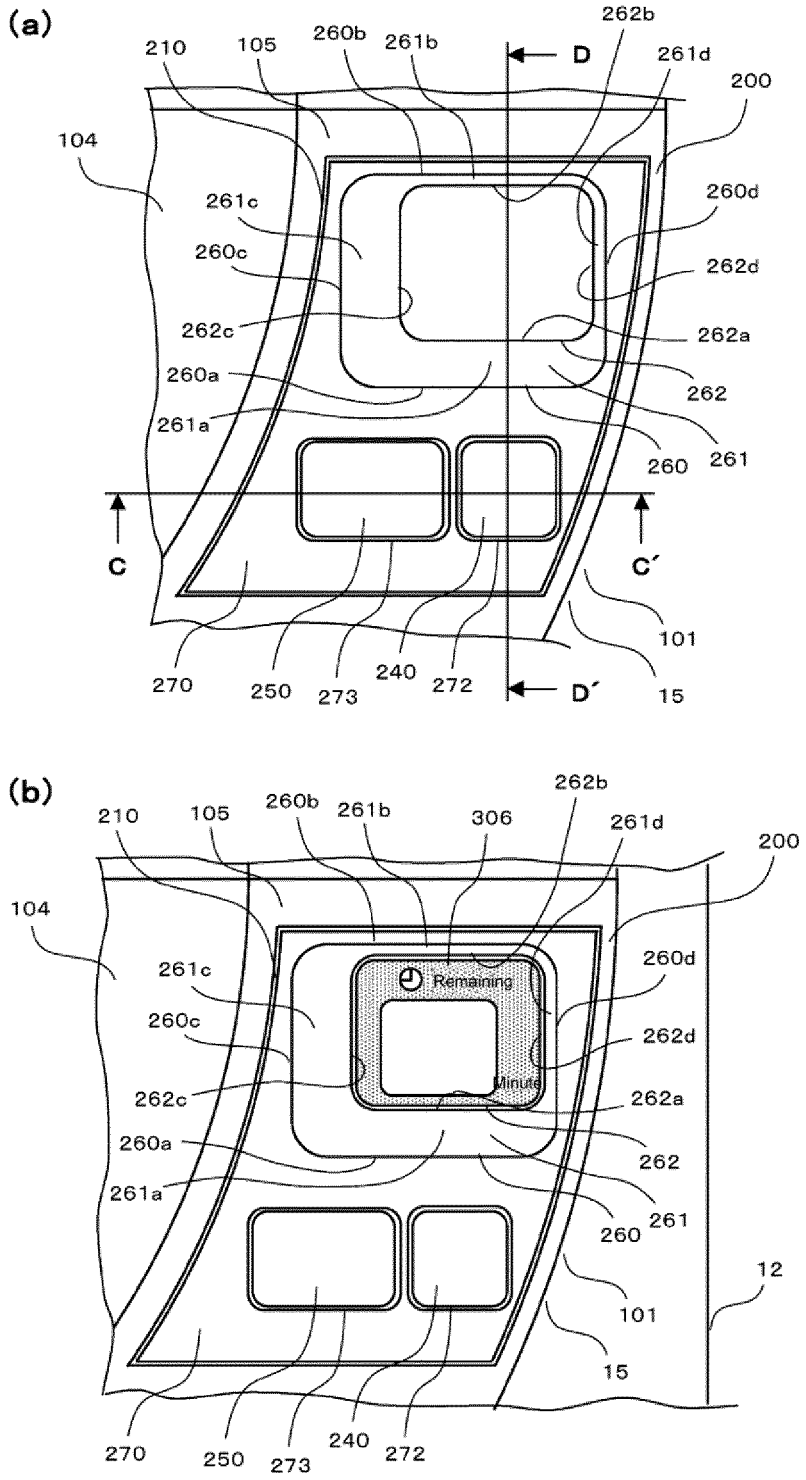
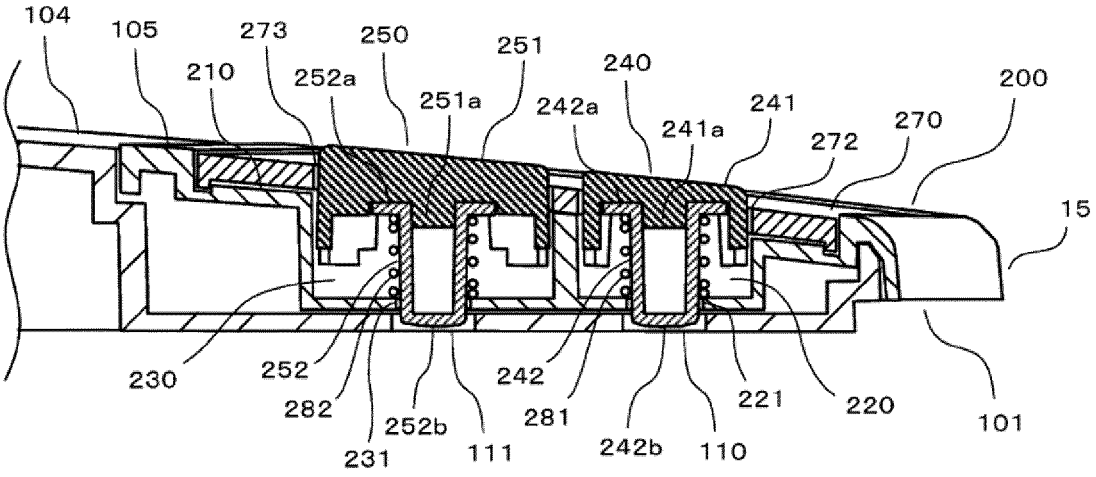

(a)
210
105
260b
261b
D
262b
261d
200
104
261c
260d
260c
262d
262c
262a
260a
262
261a
260
261
C
C´
101
270
250
273
240
272
D´
15
(b)
210
105
260b
261b
306
262b
261d
200
104
261c
Remaining
260d
260c
262d
Minute
262c
262a
260a
262
261a
261
260
12
101
15
270
250
273
240
272

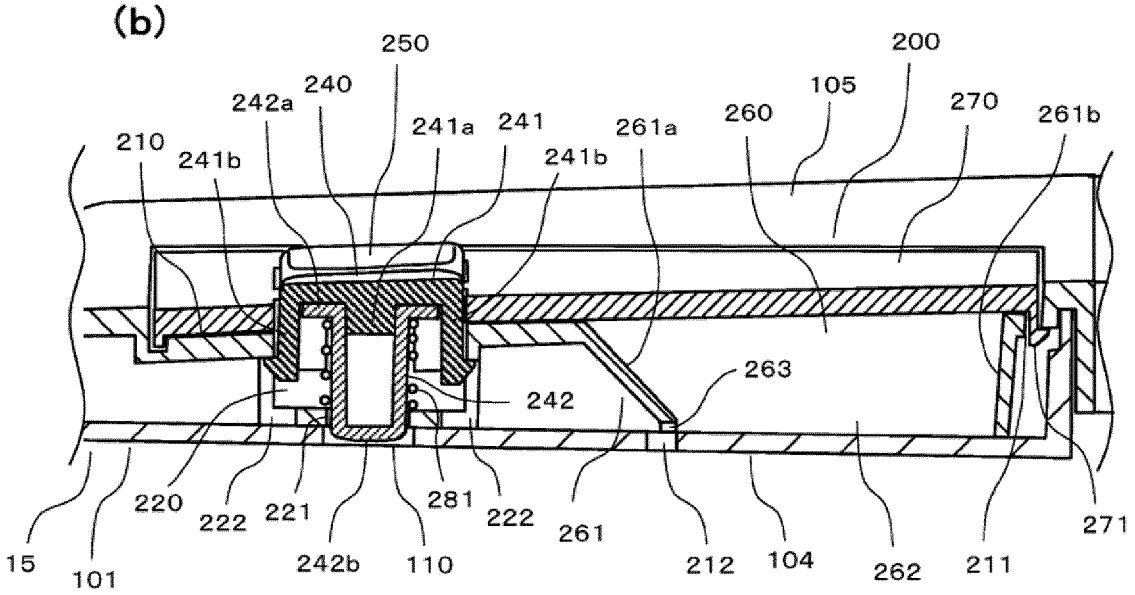
FIG. 5

(a)



Sectional view along C-C'

(b)



Sectional view along D-D'

FIG. 6

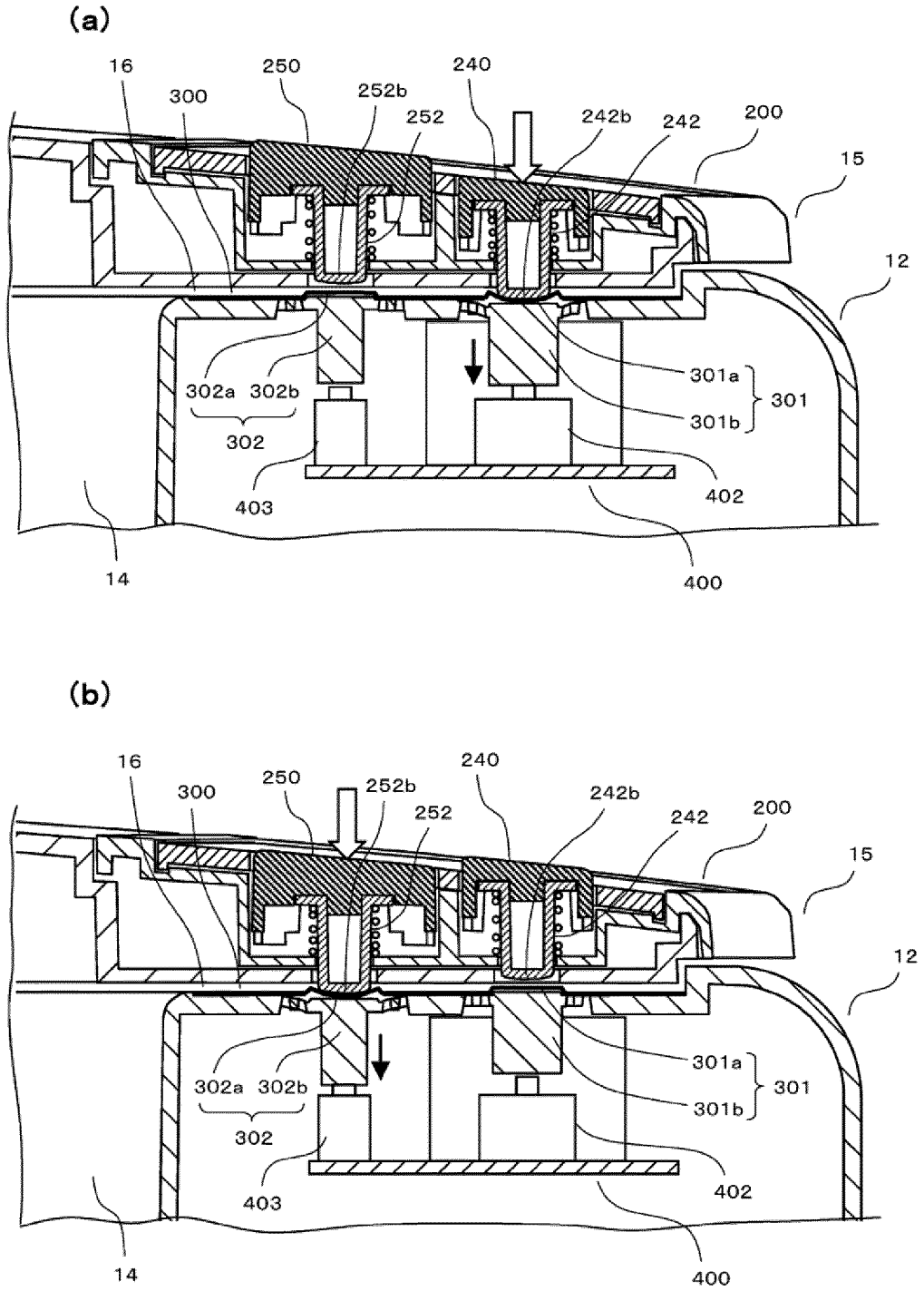

(a)
16
300
250
252b
252
240
242b
242
200
15
12
302a
302b
302
301a
301b
301
403
402
14
400
(b)
16
300
250
252b
252
240
242b
242
200
15
12
302a
302b
302
301a
301b
301
403
402
14
400

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/076163

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/00 (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; JPABS; WPI; EPODOC: key?, button?, knob?, cover, door, display+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP H04116974 U (TOSHIBA KK), 20 October 1992 (20.10.1992), description, paragraphs [0013]-[0014], and figures 1-4	1-4
X	JP 4186357 B2 (MATSUSHITA DENKI SANGYO KK), 26 November 2008 (26.11.2008), description, paragraphs [0017]-[0023], and figures 1-3	1-4
A	CN 203729117 U (NINGBO HUIYI ELECTRICAL APPLIANCES MANUFACTURING CO., LTD.), 23 July 2014 (23.07.2014), the whole document	1-5
A	GB 2279969 A (TOSHIBA KK et al.), 18 January 1995 (18.01.1995), the whole document	1-5
A	JP H1153972 A (CANON KK), 26 February 1999 (26.02.1999), the whole document	1-5

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

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 June 2016 (07.06.2016)	**15 June 2016 (15.06.2016)**
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 **LIU, Jing** Telephone No.: (86-10) **62084545**

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/076163

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP H04116974 U	20 October 1992	JP 2542644 Y2	30 July 1997
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CN 203729117 U	23 July 2014	None	
GB 2279969 A	18 January 1995	TW 257807 B	21 September 1995
		CN 1104690 A	05 July 1995
		GB 2279969 B	15 January 1997
		KR 171916 B1	01 May 1999
		CN 1061400 C	31 January 2001
		JP H0775697 A	20 March 1995
JP H1153972 A	26 February 1999	None	

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 10024195 A **[0003]**