



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.03.2015 Bulletin 2015/12

(51) Int Cl.:
D06F 39/14 (2006.01)

(21) Application number: **14172326.2**

(22) Date of filing: **13.06.2014**

(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

(72) Inventors:
• **Kando, Takeshi**
Osaka 540-6207 (JP)
• **Sakamoto, Junya**
Osaka 540-6207 (JP)

(30) Priority: **27.08.2013 JP 2013175303**

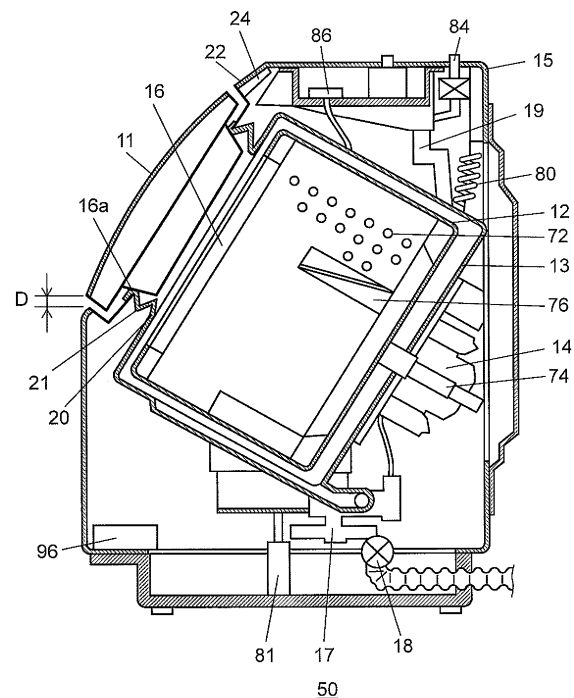
(74) Representative: **Schwabe - Sandmair - Marx**
Patentanwälte
Stuntzstraße 16
81677 München (DE)

(71) Applicant: **Panasonic Corporation**
Kadoma-shi
Osaka 571-8501 (JP)

(54) **Front-loading-type washing machine**

(57) There is provided a front-loading-type washing machine (50) including a rotary drum (12) that is formed in a bottomed cylindrical shape and accommodates laundry, a water tub (13) that rotatably includes the rotary drum, and a motor (14) that rotatably drives the rotary drum. In addition, the front-loading-type washing machine includes a housing that elastically supports the water tub so as to be swingable, a laundry loading port (16) that is formed in the housing, a door body (11) that opens and closes the laundry loading port, and a loading port frame (28) that is formed in the housing near an outer periphery of the door body in a closed state of the door body. Furthermore, the door body is configured to have an opening and closing shaft (26) on a further inner side than the outer periphery of the door body, and the door body has a convex portion (30) protruding further outward than the outer periphery of the door body, on the outer periphery of the door body near the opening and closing shaft. In addition, the loading port frame has a concave portion (29) formed so as not to interfere with the convex portion.

FIG. 1



Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a front-loading-type washing machine including a door body which is openable and closeable in order to load and unload laundry such as clothes.

BACKGROUND ART

[0002] In a case of a front-loading-type washing machine in the related art, those which are configured as illustrated in Figs. 5 and 6 have been proposed (for example, refer to Japanese Patent Unexamined Publication No. 2013-103055).

[0003] Fig. 5 is a cross-sectional view when viewed from a side of front-loading-type washing machine 100 in the related art. Fig. 6 is a perspective view illustrating a state where door body 105 is open in front-loading-type washing machine 100.

[0004] Rotary drum 110 for accommodating laundry such as clothes is formed in a bottomed cylindrical shape, and is rotatably arranged inside water tub 109. Rotary shaft 108 is disposed in a rotational center of a bottom surface of rotary drum 110. An axial direction of rotary drum 110 is arranged so as to be tilted downward from a front surface side to a rear surface side.

[0005] Laundry loading port 103 is disposed on an upward tilted surface of a front surface side (left side in Fig. 5) of housing 101. Laundry loading port 103 is covered by door body 105 so as to be openable and closeable. A user can load the laundry into or unload the laundry from rotary drum 110 through laundry loading port 103 by opening door body 105.

[0006] Door body 105 is connected to housing 101 so as to be pivotally movable by hinge 107 pivotally supporting door body 105. Door body 105 is operated by the user holding handle portion 106, thereby pivotally moving between a closed position for closing laundry loading port 103 and an opened position for opening laundry loading port 103. Hinge 107 is configured to be located inward from an outer periphery of door body 105. Loading port frame 102 is formed in housing 101 near a periphery of door body 105.

[0007] Portion 104 of loading port frame 102 which opposes an outside surface of door body 105 is formed in a bowl shape or in a tilted shape so that the outer periphery of door body 105 near hinge 107 does not interfere with portion 104 when the door body 105 is opened. For example, gap d of approximately 25 mm maximum is disposed between door body 105 and loading port frame 102. In addition, in order to improve the design, gap d is evenly disposed around overall door body 105 so that the vicinity of door body 105 is configured to have a concentric circle.

[0008] However, in the above-described configuration in the related art, large gap d is consequently present between the outer periphery of door body 105 and loading port frame 102. Therefore, when the user opens and closes door body 105, there is a problem in that the user pinches his or her finger in door body 105 by mistake or in that the design becomes accidentally damaged.

SUMMARY OF THE INVENTION

[0009] The present invention is made in view of the above-described circumstances, and aims to provide a front-loading-type washing machine having excellent design which does not cause a user to pinch his or her finger in a door body by mistake, when the user opens and closes the door body.

[0010] A front-loading-type washing machine of the present invention includes a rotary drum that is formed in a bottomed cylindrical shape and accommodates laundry, a water tub that rotatably includes the rotary drum, a motor that rotatably drives the rotary drum, and a housing that elastically supports the water tub so as to be swingable. In addition, the front-loading-type washing machine includes a laundry loading port that is formed in the housing, a door body that opens and closes the laundry loading port, and a loading port frame that is formed in the housing near an outer periphery of the door body in a closed state of the door body. Furthermore, the door body is configured to have an opening and closing shaft on a further inner side than the outer periphery of the door body, and the door body has a convex portion protruding further outward than the outer periphery of the door body, on the outer periphery of the door body near the opening and closing shaft. In addition, the loading port frame has a concave portion formed so as not to interfere with the convex portion.

[0011] According to this configuration, when the door body is opened and closed, it is possible to avoid interference between the door body and the loading port frame by using the concave portion disposed in the loading port frame. Therefore, it is no longer necessary to dispose a large gap between the outer periphery of the door body and the loading port frame by forming the loading port frame in a bowl shape, for example. Accordingly, it is possible to provide a front-loading-type washing machine having excellent design.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a cross-sectional view when viewed from a side of a front-loading-type washing machine according to an embodiment of the present invention; Fig. 2 is a perspective view illustrating a state where a door body of a front-loading-type washing machine according to an embodiment of the present invention is opened;

Fig. 3 is a partial front view illustrating a state where a door body of a front-loading-type washing machine according to an embodiment of the present invention is closed;

Fig. 4 illustrates a configuration near an opening and closing shaft in a state where a door body of a front-loading-type washing machine according to an embodiment of the present invention is opened, and illustrates a cross-sectional configuration when viewed from above at a position of line 4-4 in Fig. 3; Fig. 5 is a cross-sectional view when viewed from a side of a front-loading-type washing machine in the related art; and

Fig. 6 is a perspective view illustrating a state where a door body is opened in a front-loading-type washing machine in the related art.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Hereinafter, an embodiment of the present invention will be described with reference to the accompanying drawings. However, the present invention is not limited to the present embodiment.

[0014] Fig. 1 is a cross-sectional view when viewed from a side of front-loading-type washing machine 50 according to an embodiment of the present invention, Fig. 2 is a perspective view illustrating a state where door body 11 of front-loading-type washing machine 50 is opened, and Fig. 3 is a partial front view illustrating a state where door body 11 of front-loading-type washing machine 50 is closed. In addition, Fig. 4 illustrates a configuration near opening and closing shaft 26 in a state where door body 11 of front-loading-type washing machine 50 is opened, and illustrates a cross-sectional configuration when viewed from above at a position of line 4-4 in Fig. 3.

[0015] In Figs. 1 and 2, rotary drum 12 which accommodates laundry is formed in a bottomed cylindrical shape. Rotary drum 12 has multiple water passage holes 72 on an entire surface of a cylindrical portion, and is rotatably arranged inside water tub 13. Tilted rotary shaft 74 (rotation center shaft) is disposed in a rotation center of rotary drum 12. An axial direction of rotary drum 12 is arranged so as to be tilted downward from a front surface side to a rear surface side. Motor 14 attached to a rear surface of water tub 13 is connected to rotary shaft 74. Motor 14 rotatably drives rotary drum 12 in a forward direction and in a rearward direction.

[0016] A plurality of projection plates 76 for agitating the laundry is disposed on an inner wall surface of rotary drum 12. Laundry loading port 16 is disposed on an upward tilted surface on the front surface side in housing 15. Laundry loading port 16 is covered by door body 11 so as to be openable and closeable. A user can load the laundry into or unload the laundry from rotary drum 12 through laundry loading port 16 by opening door body 11.

[0017] Since laundry loading port 16 is disposed on the upward tilted surface in this way, the user can load

and unload the laundry without largely bending over at his or her waist.

[0018] Water tub 13 is elastically supported so as to be swingable with respect to housing 15, being suspended by spring 80 and supported by damper 81. One end of drain channel 17 is connected to a lower portion of water tub 13. The other end of drain channel 17 is connected to drain valve 18, and washing water inside water tub 13 is drained in a timely manner.

[0019] Water supply valve 84 supplies water into water tub 13 through water supply pipe 19. Water level detection unit 86 detects a water level inside water tub 13. Control device 96 is arranged in a lower portion of the front surface inside housing 15. Cylindrical opening portion 20 is formed on an opening side of a front surface portion of water tub 13. Cylindrical and flexible seal member 21 is fitted to a portion between cylindrical opening portion 20 and opening end 16a of laundry loading port 16 in housing 15. Seal member 21 closes a gap between housing 15 and swinging water tub 13. In addition, seal member 21 seals a gap between door body 11 and laundry loading port 16, when door body 11 is closed.

[0020] In addition, operation panel 22 is disposed in an upper portion on the front surface of housing 15. The user inputs an operation course mode or various functions through input unit 23 on operation panel 22. In this manner, control circuit unit 24 arranged inside operation panel 22 displays operation conditions on display unit 25 on operation panel 22 based on input information, and notifies the user of operation conditions.

[0021] In the present embodiment, rotary drum 12 has tilted rotary shaft 74 in the rotation center thereof. In addition, the axial direction of rotary drum 12 (rotary shaft 74) is tilted downward from the front surface side to the rear surface side. However, an embodiment of the present invention is not limited to this configuration. For example, the axial direction of rotary drum 12 may be a horizontal direction by disposing rotary shaft 74 set to be in the horizontal direction in the rotation center of rotary drum 12. In addition, front-loading-type washing machine 50 may be configured to have a drying function in addition to a washing function.

[0022] As illustrated in Figs. 2 to 4, door body 11 is formed in a substantially circular shape when viewed from the front surface. Door body 11 is connected to housing 15 so as to be pivotally movable by opening and closing shaft 26 which is configured to be located further inward than the outer periphery of door body 11 and has a hinge structure.

[0023] Handle portion 27 having a locking mechanism is disposed on a side substantially opposite to opening and closing shaft 26 with respect to the center of the circular shape of door body 11. Door body 11 is operated by the user holding handle portion 27. In this manner, door body 11 can be pivotally moved between a closed position for closing laundry loading port 16 and an opened position for opening laundry loading port 16.

[0024] Opening end 16a is formed in laundry loading

port 16 of housing 15. In addition, loading port frame 28 accommodating door body 11 on a surface having substantially the same height as that of door body 11 is configured to be located on the front surface of housing 15. Loading port frame 28 may be molded integrally with housing 15, or may be configured to be incorporated in housing 15 as a separate member.

[0025] In the present embodiment, a separate member serving as a housing decorative plate is attached to loading port frame 28 concentrically with the outer periphery of door body 11. Here, door body 11 and loading port frame 28 are configured to be located on surfaces having substantially the same height. In addition, gap D is configured to be located between the outer periphery of door body 11 and loading port frame 28. Gap D has such a width that an adult's finger is unlikely to enter, and is configured to have the dimensions (for example, 3 mm to 10 mm) which are smaller than the dimensions in the related art (refer to Fig. 3). Accordingly, excellent design is achieved.

[0026] As described above, opening and closing shaft 26 is configured to be located further inward than the outer periphery of door body 11. This configuration may cause a possibility that the outer periphery (left side in Fig. 3) of door body 11 near opening and closing shaft 26 interferes with loading port frame 28 when door body 11 is opened. As a countermeasure, concave portion 29 having a predetermined length is formed in loading port frame 28, in an arcuate shape which is concentric with the outer periphery of door body 11. This can prevent the interference between door body 11 and loading port frame 28 (refer to Fig. 4).

[0027] As illustrated in Figs. 3 and 4, convex portion 30 which protrudes outward from the outer periphery of door body 11 and corresponds to a shape of concave portion 29 of loading port frame 28, is disposed on the outer periphery (left side in Fig. 3) of door body 11 near opening and closing shaft 26. Concave portion 29 and convex portion 30 are configured so as not to interfere with each other (so as not to come into physical contact with each other). That is, a shape of concave portion 29 in a depth direction is configured to be a shape taken along a locus of a pivotal movement of convex portion 30. Door body decorative plate 31 having a color tone equal to that of loading port frame 28 serving as the housing decorative plate is attached to the front surface side of convex portion 30. This allows door body decorative plate 31 and loading port frame 28 to have matching texture.

[0028] In this manner, it is possible to configure the outer periphery of door body 11 near opening and closing shaft 26 so as not to interfere with loading port frame 28. In addition, the vertical end surfaces of door body 11 and door body decorative plate 31 when viewed from the front surface are concentric with loading port frame 28 serving as the housing decorative plate, and are formed on the surface having the same height as that of loading port frame 28. In this manner, a sense of unity is achieved in

design, and thus, it is possible to realize front-loading-type washing machine 50 having excellent design.

[0029] As a method of matching the color tone or the texture between convex portion 30 of door body 11 and loading port frame 28, in addition to the method of attaching door body decorative plate 31 to convex portion 30 as described above, a forming method may be used in which the same material of loading port frame 28 is used in convex portion 30 or overall door body 11. Methods are not limited to the above-described method.

[0030] As described above, when door body 11 is opened and closed, concave portion 29 disposed in loading port frame 28 enables front-loading type washing machine 50 of the present embodiment to avoid the interference between door body 11 and loading port frame 28. In this manner, it is no longer necessary to dispose the large gap in loading port frame 28 in order to prevent the interference with door body 11. Accordingly, it is possible to improve the design characteristic.

[0031] In addition, as illustrated in Fig. 4, the shape of concave portion 29 of loading port frame 28 in the depth direction is formed to be the shape taken along the locus of the pivotal movement of convex portion 30 of door body 11. In this manner, even when door body 11 is opened and closed, it is possible to prevent the gap from being broadened between door body 11 and loading port frame 28. Therefore, since a small gap which does not allow a finger to enter can be maintained, it is possible to prevent the finger from being pinched therein.

[0032] As described above, front-loading-type washing machine 50 of the present embodiment includes rotary drum 12 that is formed in the bottomed cylindrical shape and accommodates the laundry, water tub 13 that rotatably includes rotary drum 12, motor 14 that rotatably drives rotary drum 12, and housing 15 that elastically supports water tub 13 so as to be swingable. In addition, front-loading-type washing machine 50 includes laundry loading port 16 that is formed in the housing 15, door body 11 that opens and closes laundry loading port 16, and loading port frame 28 that is formed in housing 15 near the outer periphery of door body 11 in the closed state of door body 11. Furthermore, door body 11 is configured to have opening and closing shaft 26 on the further inner side than the outer periphery of door body 11, and door body 11 has convex portion 30 protruding further outward than the outer periphery of door body 11, on the outer periphery of door body 11 near opening and closing shaft 26. Loading port frame 28 has concave portion 29 formed so as not to interfere with convex portion 30.

[0033] According to this configuration, when door body 11 is opened and closed, concave portion 29 disposed in loading port frame 28 can avoid the interference between door body 11 and loading port frame 28. Therefore, it is no longer necessary to dispose the large gap between the outer periphery of door body 11 and loading port frame 28 by forming loading port frame 28 in the bowl shape, for example. Accordingly, it is possible to provide

front-loading-type washing machine 50 having excellent design.

[0034] In addition, convex portion 30 and the loading port frame 28 are configured by using the same material. In this manner, door body 11 and loading port frame 28 are able to have a sense of unity in design, and thus, it is possible to provide the member having excellent design.

[0035] In addition, the shape of concave portion 29 of loading port frame 28 in the depth direction may be configured to be the shape taken along the locus of the pivotal movement of convex portion 30 of door body 11.

[0036] In this manner, even when door body 11 is opened and closed, it is possible to prevent the gap from being broadened between door body 11 and loading port frame 28. Therefore, since the small gap which does not allow a finger to enter can be maintained, it is possible to prevent the finger from being pinched therein.

[0037] As described above, according to an embodiment of the present invention, a special advantageous effect can be achieved in that it is possible to provide the front-loading-type washing machine having excellent design which does not cause the user to pinch his or her finger in the door body by mistake, when the user opens and closes the door body. Accordingly, an embodiment of the present invention is useful as the front-loading-type washing machine including the door body which is openable and closeable in order to load and unload the laundry.

Claims

1. A front-loading-type washing machine comprising:

a rotary drum that is formed in a bottomed cylindrical shape and accommodates laundry;
 a water tub that rotatably includes the rotary drum;
 a motor that rotatably drives the rotary drum;
 a housing that elastically supports the water tub so as to be swingable;
 a laundry loading port that is formed in the housing;
 a door body that opens and closes the laundry loading port; and
 a loading port frame that is formed in the housing near an outer periphery of the door body in a closed state of the door body,
 wherein the door body is configured to have an opening and closing shaft on a further inner side than the outer periphery of the door body,
 wherein the door body has a convex portion protruding further outward than the outer periphery of the door body, on the outer periphery of the door body near the opening and closing shaft, and
 wherein the loading port frame has a concave

portion formed so as not to interfere with the convex portion.

2. The front-loading-type washing machine of claim 1, wherein the convex portion and the loading port frame are configured by using a same member.
3. The front-loading-type washing machine of claim 1 or 2, wherein a shape of the concave portion of the loading port frame in a depth direction is configured to be a shape taken along a locus of a pivotal movement of the convex portion of the door body.

FIG. 1

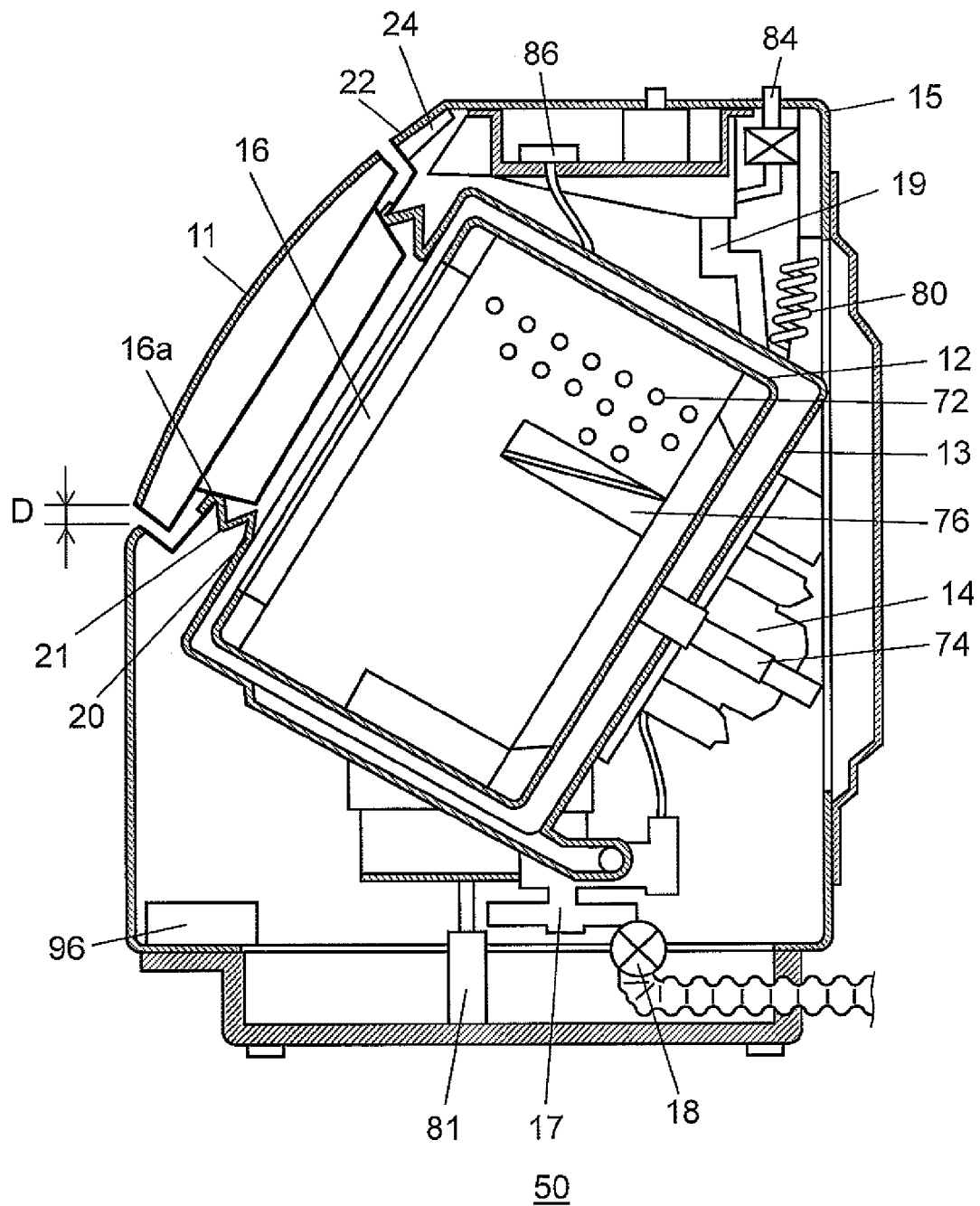


FIG. 2

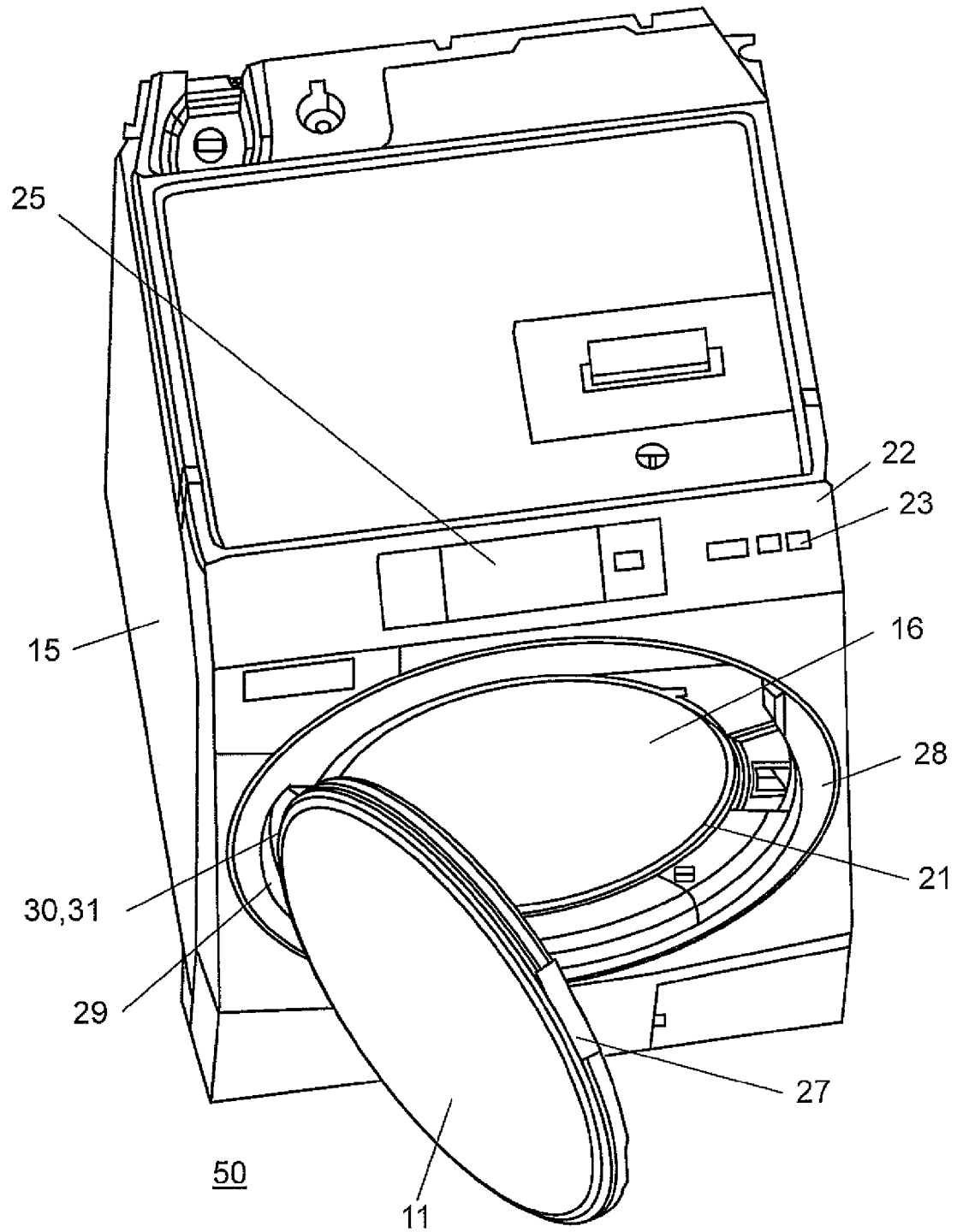


FIG. 3

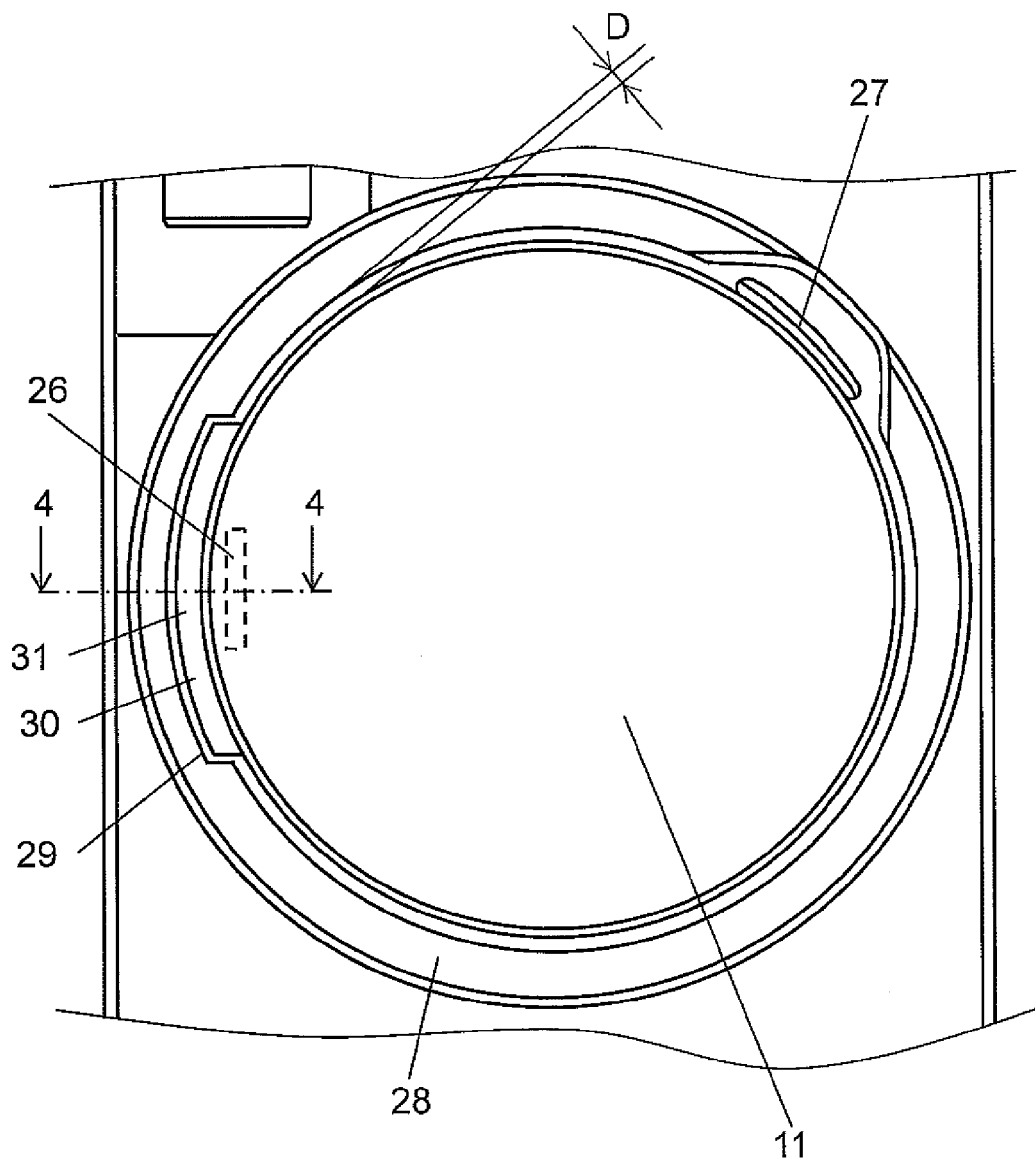


FIG. 4

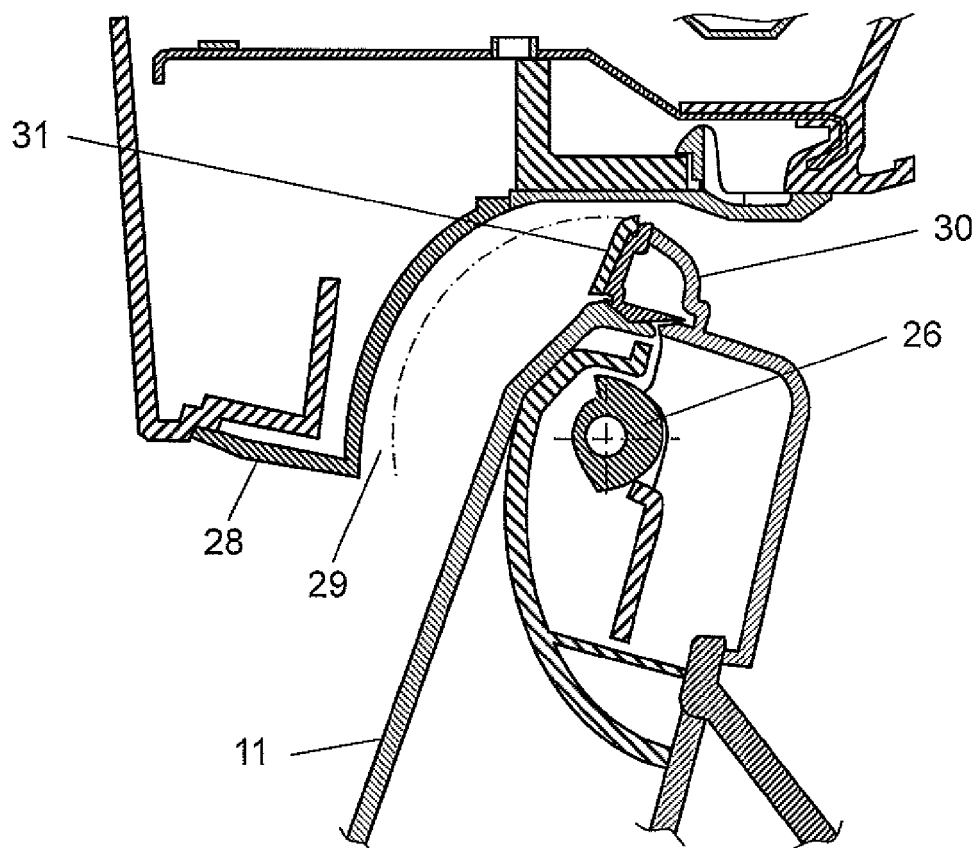


FIG. 5

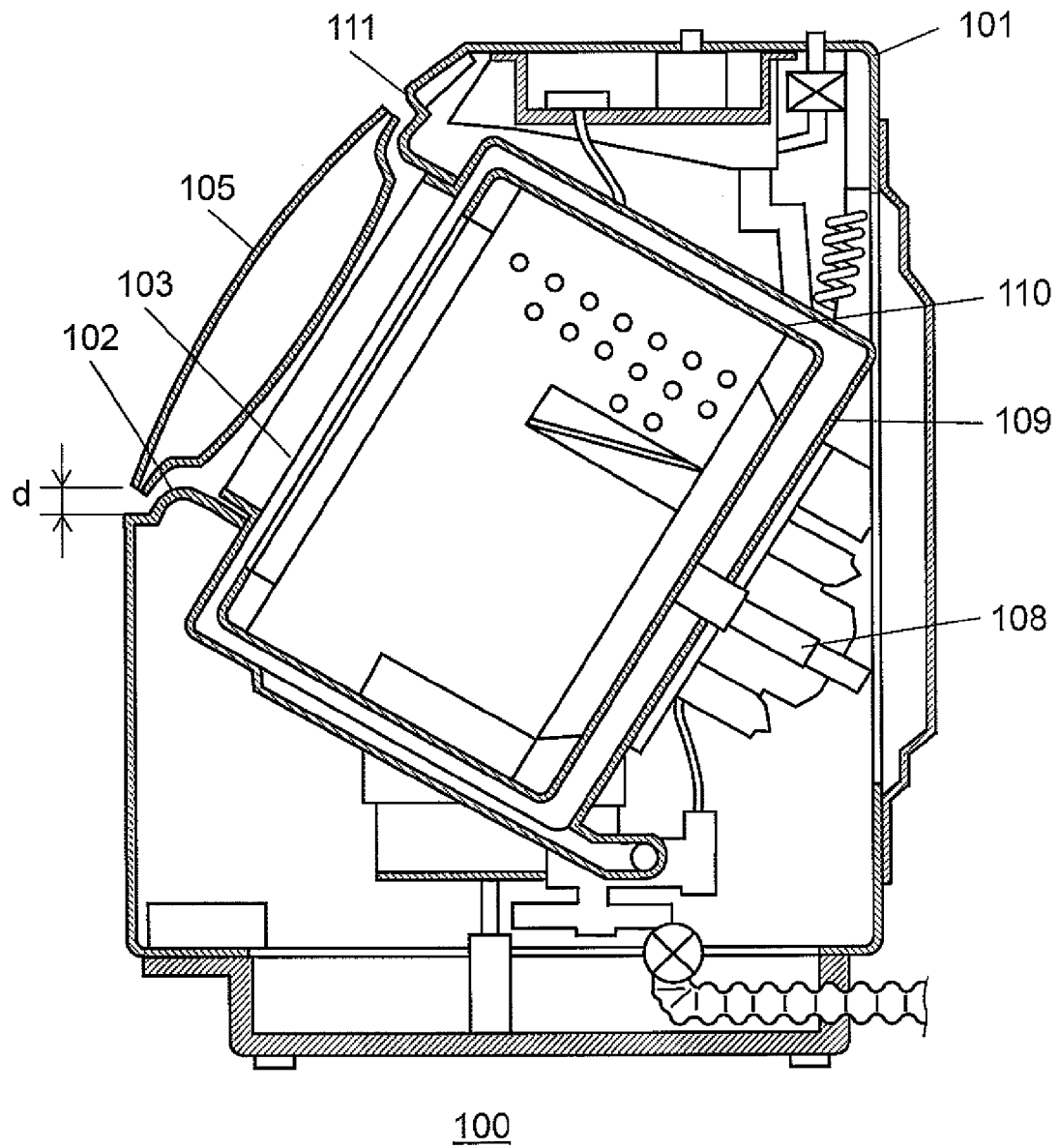
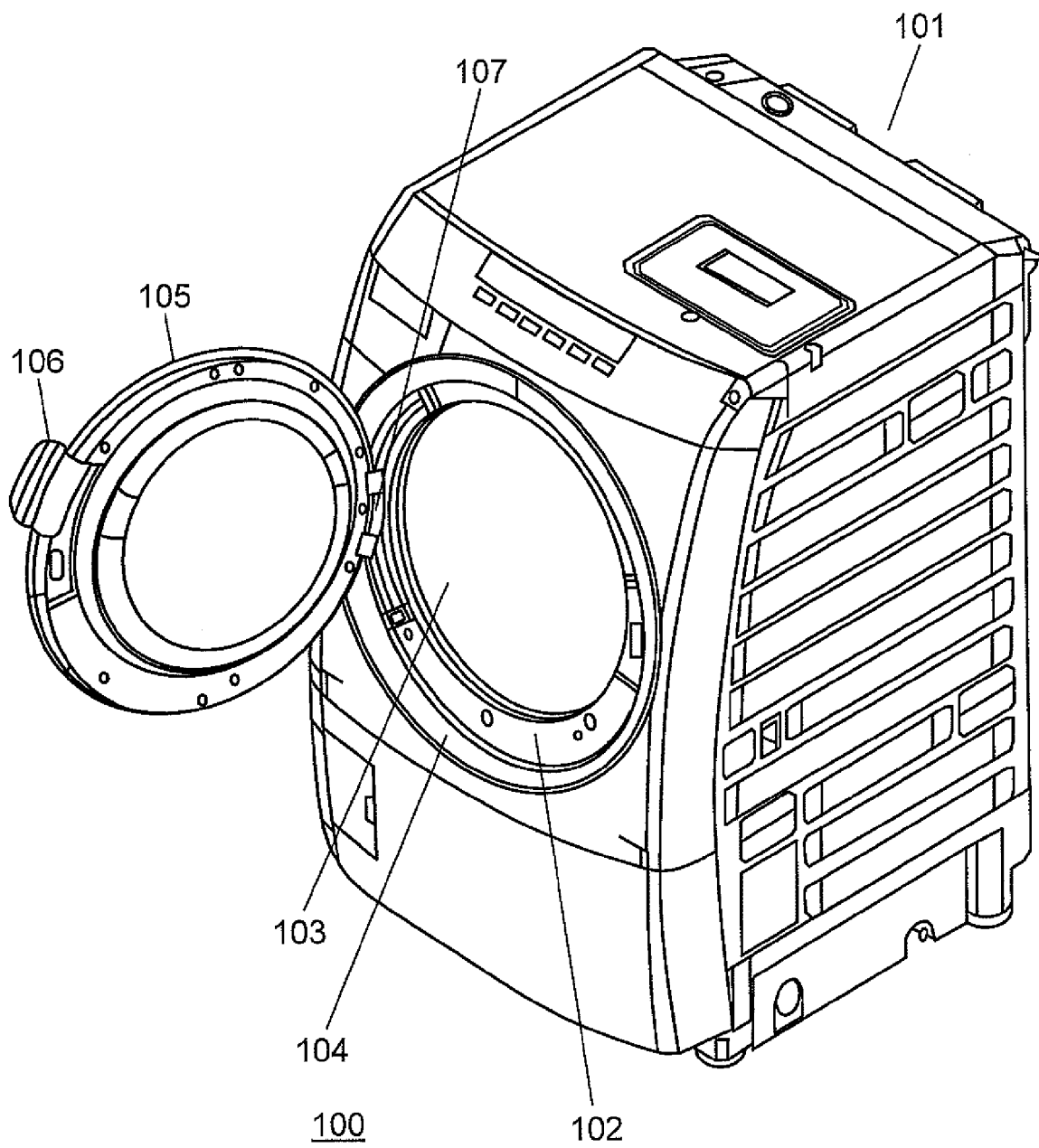


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 14 17 2326

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 2 402 499 A1 (PANASONIC CORP [JP]) 4 January 2012 (2012-01-04) * paragraph [0015] - paragraph [0047]; figures 1-5 *	1	INV. D06F39/14
X	EP 2 568 072 A1 (PANASONIC CORP [JP]) 13 March 2013 (2013-03-13) * paragraph [0007] - paragraph [0046]; figures 1-5 *	1	
A		2,3	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 February 2015	Examiner Diaz y Diaz-Caneja
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 17 2326

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-02-2015

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2402499 A1	04-01-2012	CN 102312363 A	11-01-2012
		CN 202148428 U	22-02-2012
		EP 2402499 A1	04-01-2012
		JP 5583499 B2	03-09-2014
		JP 2012011092 A	19-01-2012
		TW 201207190 A	16-02-2012

EP 2568072 A1	13-03-2013	CN 102869825 A	09-01-2013
		EP 2568072 A1	13-03-2013
		JP 2012170691 A	10-09-2012
		WO 2012114752 A1	30-08-2012

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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 2013103055 A [0002]