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

(11) EP 2 905 371 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.08.2015 Bulletin 2015/33

(51) Int Cl.:
D06F 39/10 *(2006.01)* *D06F 39/12* *(2006.01)*
D06F 58/22 *(2006.01)*

(21) Application number: **15154170.3**

(22) Date of filing: **06.02.2015**

(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

(30) Priority: **11.02.2014 KR 20140015471**

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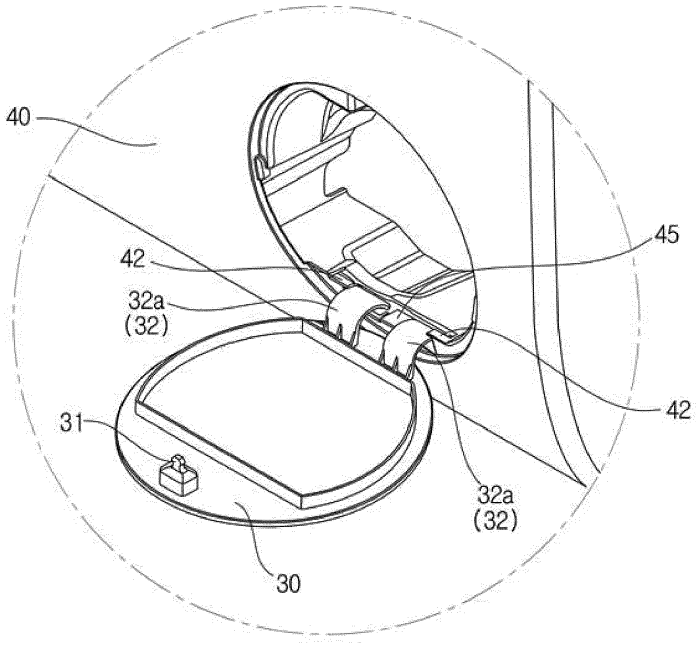
(54) Washing machine

(57) A washing machine (1) is provided that includes a cabinet (10) and a tub (2) disposed in the cabinet (10) and configured to receive washing water. The washing machine (1) includes a pump filter (51) configured to filter foreign substances from the washing water received from the tub (2), a pump filter housing (40) configured to receive the pump filter (51), a housing cover (30) configured to open and close the pump filter housing (40), and at least one coupling portion (32) extending from the housing cover (30) and at least a portion of the at least one coupling portion (32) being coupled to the pump filter housing (40). The washing machine (1) further includes rails (41) disposed on the pump filter housing (40), the rails (41) being configured to receive the at least one coupling portion (32), and the rails (41) being configured to allow movement of the at least one coupling portion (32) as a function of whether the housing cover (30) is in an open state or a closed state.

FIG. 5



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Description

[0001] The present invention relates to a washing machine, and more particularly, to a washing machine having an improved connection between a housing cover and a pump filter housing. The housing cover opens and closes the pump filter housing and the pump filter housing accommodates a pump filter.

[0002] Washing machines are machines that wash clothes using power. A washing machine generally includes a stationary tub in which washing water is stored, a rotatable tub installed in the stationary tub, a driving unit for driving rotation of the rotatable tub. A washing machine also generally includes a water supply unit for supplying washing water to the stationary tub, and a drainage pump for forcibly draining the washing water from the tub.

[0003] In general, the drainage pump has a pump case that includes a washing water introduction chamber that can receive washing water, a drainage pump chamber, and a pumping motor installed on one side of the pump case. A pump filter for filtering foreign substances of washing water is installed in the pump case. The drainage pump also includes an impeller installed in the drainage pump chamber. The impeller is rotated and driven by the pumping motor.

[0004] When the impeller is rotated by the pumping motor, washing water in the tub is introduced into the washing water introduction chamber. The washing water introduced into the washing water introduction chamber passes through the pump filter and into the drainage pump chamber. The washing water that reaches the drainage pump chamber is forcibly discharged out of the drainage pump by the impeller.

[0005] The foreign substances of the washing water are filtered by the pump filter when the washing water passes through the pump filter. Subsequently, a user may detach the pump filter from the pump case to remove the foreign substances from the pump filter and thereafter insert the pump filter back into the pump case.

[0006] However, in this procedure, a housing cover that opens and closes the pump filter housing accommodating the pump filter is not easily opened and closed, which inconveniences the user.

[0007] To address the above-discussed deficiencies, it is a primary object to provide a washing machine with an improved connection between a pump filter housing and a housing cover to improve the opening and closing of the pump filter housing.

[0008] Additional aspects of this disclosure will be set forth in part in the description which follows.

[0009] In accordance with one aspect of the present disclosure, a washing machine includes: a cabinet; a tub that is disposed in the cabinet and accommodates washing water; a pump filter that filters foreign substances included in washing water introduced from the tub; a pump filter housing that accommodates the pump filter; a housing cover that can open and close the pump filter housing; at least one coupling portion which extends from the housing cover and of which at least a portion is coupled to the pump filter housing; and rails disposed on the pump filter housing so that the at least one coupling portion can be inserted into the rails and moved depending on whether the housing cover is opened or closed.

[0010] The at least one coupling portion includes a body portion that extends from the housing cover and a head portion that extends from the body portion.

[0011] The head portion may be inserted into the rails and can be moved depending on whether the housing cover is open or closed.

[0012] The body portion is provided as a curved surface.

[0013] The body portion is provided as a curved surface that protrudes upwards.

[0014] At least one escape prevention jaw is provided at the pump filter housing so as to prevent the at least one coupling portion from escaping from the pump filter housing.

[0015] The at least one escape prevention jaw is provided at a front side of the pump filter housing and surrounds at least a portion of a top surface of the body portion provided at the at least one coupling portion.

[0016] At least one guide portion is provided at a rear side of the pump filter housing and supports the at least one coupling portion.

[0017] The at least one guide portion is provided close to the rails and supports the body portion of the at least one coupling portion.

[0018] The at least one guide portion is provided to correspond to a shape of the body portion of the at least one coupling portion.

[0019] The pump filter housing is injection-molded integrally with the cabinet.

[0020] In accordance with another aspect of the present disclosure, a washing machine includes: a cabinet; a tub that is disposed in the cabinet and accommodates washing water; a pump filter that filters foreign substances included in washing water introduced from the tub; a pump filter housing that accommodates the pump filter; and a housing cover that can be moved to include a first state in which the pump filter housing is closed and a second state in which the pump filter housing is opened, the housing cover including coupling portions coupled to the pump filter housing, wherein the housing cover may be coupled to the pump filter housing so that, in the first state, the coupling portions are disposed at a lower side of the pump filter housing and in the second state, the coupling portions are disposed at an upper side of the pump filter housing.

[0021] Each of the coupling portions include a body portion that extends from the housing cover and a head portion that extends from the body portion and is coupled to the pump filter housing, and the head portion may be coupled to the pump filter housing in the first state and in the second state.

[0022] Each of the coupling portions are coupled to

rails having a form of slits formed on the pump filter housing.

[0023] The head portion is disposed at one point of the rails in the first state and can be moved along the rails and can be disposed at another point of the rails in the second state. The body portion is provided as a curved surface that protrudes upwards.

[0024] At least one guide portion is provided close to the rails at the pump filter housing and supports the body portion.

[0025] The at least one guide portion is provided to have a shape corresponding to that of the body portion.

[0026] At least one escape prevention jaw is provided at the pump filter housing and prevents the coupling portions from escaping from the pump filter housing.

[0027] The coupling portions are provided at both sides of the housing cover.

[0028] Before undertaking the DETAILED DESCRIPTION below, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms "include" and "comprise," as well as derivatives thereof, mean inclusion without limitation; the term "or," is inclusive, meaning and/or; the phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller" means any device, system or part thereof that controls at least one operation, such a device may be implemented in hardware, firmware or software, or some combination of at least two of the same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

[0029] For a more complete understanding of the present disclosure and its advantages, reference is now made to the following description taken in conjunction with the accompanying drawings, in which like reference numerals represent like parts:

FIG. 1 is an oblique front view illustrating an example washing machine that includes a pump filter housing in a closed state according to this disclosure;

FIG. 2 is an oblique front view illustrating the washing machine of FIG. 1 with the pump filter housing in an open state according to this disclosure;

FIG. 3 is a partial cross-sectional side view of the washing machine of FIG. 1 according to this disclosure;

FIG. 4 is an oblique front exploded view illustrating a pump filter and a housing cover disassembled from the pump filter housing of the washing machine of FIG. 1 according to this disclosure;

FIG. 5 is an oblique front view illustrating the pump filter housing of the washing machine of FIG. 1 in an open state according to this disclosure;

FIG. 6 is an oblique rear view illustrating the pump filter housing of the washing machine of FIG. 1 according to this disclosure;

FIG. 7 is a cross-sectional side view illustrating the washing machine of FIG. 1 with the pump filter housing in an open state according to this disclosure;

FIG. 8 is a cross-sectional side view illustrating the washing machine of FIG. 1 according to this disclosure; and

FIG. 9 is an oblique front view illustrating another pump filter housing of a washing machine with the pump filter housing in an open state according to this disclosure.

[0030] FIGURES 1 through 9, discussed below, and the various embodiments used to describe the principles of the present disclosure in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the disclosure. Those skilled in the art will understand that the principles of the present disclosure may be implemented in any suitably arranged washing machine. Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. Although a drum washing machine is described herein as an example, this disclosure contemplates embodiments comprising other types of washing machines.

[0031] FIG. 1 is an oblique front view illustrating an example washing machine that includes a pump filter housing in a closed state according to this disclosure. FIG. 2 is an oblique front view illustrating the washing machine of FIG. 1 with the pump filter housing in an open state according to this disclosure. FIG. 3 is a partial cross-sectional side view of the washing machine of FIG. 1 according to this disclosure.

[0032] As illustrated in FIGS. 1 through 3, a washing machine 1 includes a cabinet 10 that constitutes an exterior. The washing machine 1 also includes a tub 2 that is installed in the cabinet 10 and accommodates washing water. The washing machine 1 further includes a cylindrical rotating tub 3 that is rotatably installed in the tub 2. The rotating tub 3 and has a plurality of dehydration holes 4 formed in a wall surface of the rotating tub 3.

[0033] At least one lifter 5 is installed at an inner circumferential surface of the rotating tub 3. The lifter 5 is configured to lift or drop laundry when the rotating tub 3 is rotated.

[0034] The cabinet 10 includes an upper wall 12 disposed at an upper part of the cabinet 10, a lower wall (not shown) disposed at a lower part of the cabinet 10, a front wall 11 disposed at a front side of the cabinet 10,

a rear wall (not shown) disposed at a rear side of the cabinet 10, and side walls 13 disposed at sides of the cabinet 10.

[0035] An opening is formed in the front side of the cabinet 10 and a door 20 is configured to open and close the opening. Laundry to be washed may be put into and removed from the tub 2 and the rotating tub 3 via the opening.

[0036] An automatic detergent supply unit 14 is installed at an inside of the front cabinet 11. The automatic detergent supply unit 14 is disposed at a lower part of the front of the cabinet 10 so that utilization of an upper space of the cabinet 10 can be increased.

[0037] A display unit 21 that displays a state of the washing machine 1 is provided at an upper part of the front cabinet 11.

[0038] A drainage pump 16 that pumps washing water stored in the tub 2 is installed at a lower part of the tub 2. A connection pipe 15 is disposed between the tub 2 and the drainage pump 16 so that the drainage pump 16 and the tub 2 are connected to each other through the connection pipe 15. Washing water that passes through the drainage pump 16 is discharged out of the washing machine 1 via a drainage hose (not shown).

[0039] The drainage pump 16 includes a pump filter 51. The pump filter 51 is accommodated in a pump filter housing 40 disposed at a lower part of the front cabinet 11. The pump filter housing 40 can be opened and closed by a housing cover 30 that is coupled to the front side of the front cabinet 11.

[0040] A state in which the housing cover 30 of the pump filter housing 40 is closed is referred to as a first state. A state in which the housing cover 30 of the pump filter housing 40 is open is referred to as a second state.

[0041] The housing cover 30 and the pump filter housing 40 are connected by a coupling portion 32 that extends from the housing cover 30. This will be described later.

[0042] A latch 31 is disposed on the housing cover 30. The latch 31 can keep the housing cover fixed to the pump filter housing 40 to keep the pump filter housing 40 in a closed state. In some embodiments, an elastic member (not shown) is provided in the latch 31 so that a user can open and close the pump filter housing 40 by applying pressure to the housing cover 30.

[0043] Also, in some embodiments, the pump filter housing 40 can be injection-molded integrally with the front cabinet 11. However, in alternative embodiments, the pump filter housing 40 can be separately manufactured and coupled to the front cabinet 11.

[0044] A motor (not shown) and a driving shaft (not shown) for transmitting power of the motor (not shown) are connected to a rear side of the rotating tub 3. When a washing operation is performed, the motor (not shown) rotates the rotating tub 3 in a forward direction and a backward direction at a low speed. Thus, the laundry in the rotating tub 3 repeats lifting and dropping motions, and contaminants are removed from the laundry. When the motor (not shown) rotates the rotating tub 3 in one direction at a high speed during a dehydration operation, water is separated from the laundry due to a centrifugal force exerted on the laundry.

[0045] FIG. 4 is an oblique front exploded view illustrating a pump filter and a housing cover disassembled from the pump filter housing of the washing machine of FIG. 1. FIG. 5 is an oblique front view illustrating the pump filter housing of the washing machine of FIG. 1 in an open state according to this disclosure. FIG. 6 is an oblique rear view illustrating the pump filter housing of the washing machine of FIG. 1 according to this disclosure.

[0046] As illustrated in FIGS. 4 through 6, the pump filter housing 40 and the housing cover 30 are coupled to each other using the coupling portion 32 that extends from the housing cover 30. According to an embodiment of the present invention, two coupling portions 32 are provided so that they are provided at both sides of the housing cover 30.

[0047] Each of two coupling portions 32 may include a body portion 32a that extends from the housing cover 30, and a head portion 32b that extends from the body portion 32a. The body portion 32a is provided as a curved surface. More specifically, the body portion 32a is provided as a curved surface that protrudes upwards.

[0048] The coupling portions 32 are coupled to rails 41 disposed on the pump filter housing 40 and can be moved along the rails 41 depending on the whether the pump filter housing 40 is in the first state or the second state. Since the rails 41 are provided in the form of slits on the pump filter housing 40, the user is not required to apply large force to the housing cover 30 when opening and closing the housing cover 30.

[0049] When the pump filter housing 40 is in the second state, only the head portion 32b is coupled to the rails 41. When the pump filter housing is in the first state, as the head portion 32b is moved along the rails 41, the body portion 32a may also be coupled to the rails 41.

[0050] At least one escape prevention jaw 42 is disposed on the pump filter housing 40 and prevents the coupling portions 32 from disconnecting from the pump filter housing 40. The at least one escape prevention jaw 42 is provided at a front side of the pump filter housing 40. The at least one escape prevention jaw 42 is provided to surround at least a portion of a top surface of the body portion 32a disposed on each coupling portion 32. Thus, when the housing cover 30 is opened and closed with respect to the pump filter housing 40, the coupling portions 32 can be prevented from disconnecting from an upper part of the pump filter housing 40 and the housing cover 30 can be prevented from disconnecting from the pump filter housing 40. In some embodiments, since two coupling portions 32 are provided, two escape prevention jaws 42 may also be utilized.

[0051] The rails 41 are disposed close to the escape prevention jaws 42. A barrier wall 45 is formed on the pump filter housing 40 between the coupling portions 32. The respective coupling portions 32 are coupled to both

sides of the barrier wall 45.

[0052] The drainage pump 16 includes a pump case 50 that includes a washing water introduction chamber 52, a drainage pump chamber 53, a circulation chamber 54, and a pump filter 51 inserted into the washing water introduction chamber 52. The drainage pump chamber 53 and the circulation chamber 54 extend from the washing water introduction chamber 52.

[0053] A circulation pump (not shown) is disposed at one side of the circulation chamber 54 of the pump case 50, and a circulation impeller (not shown) is connected to the circulation pump (not shown). The circulation impeller (not shown) is disposed in the circulation chamber 54.

[0054] A circulation port 54a through which washing water is circulated in the tub 2, is formed at a top end of the circulation chamber 54 and extends in an upward direction of the circulation chamber 54. A circulation pipe (not shown) may be connected to the circulation port 54a.

[0055] When the circulation impeller (not shown) is rotated by the circulation pump (not shown), washing water in the washing water introduction chamber 52 is received in an axial direction. Bubbles can be generated in the circulation chamber 54 in addition to the function of circulating washing water of the circulation chamber 54. In this case, air and washing water may be mixed using a pressure difference caused by a pressure drop. The pressure drop occurs when washing water flows and generates bubbles in the circulation chamber 54. The bubbles are introduced by the circulation impeller (not shown) into the tub 2. The bubbles are introduced into the tub 2 via the circulation port 54a and the circulation pipe (not shown).

[0056] The pump filter 51 is mounted on a front side of the washing water introduction chamber 52 to remove foreign substances included in washing water introduced from the tub 2. The pump filter 51 has a hollow cylindrical shape. An inner wall in fluid communication with the circulation chamber 54 and filters foreign substances included in washing water using the pump filter 51 comprises hollow portions or apertures. An inner wall in fluid communication with the drainage pump chamber 53 comprises hollow portions or apertures. Thus, the foreign substances included in washing water are not moved to the circulation chamber 54 but are collected in a direction of the drainage pump chamber 53.

[0057] At least one guide portion 43 is provided at a rear side of the pump filter housing 40 so as to support the coupling portions 32. The at least one guide portion 43 supports the body portion 32a of each coupling portion 32. When the housing cover 30 is moved from the first state to the second state or vice versa, the housing cover 30 supports the body portion 32a. Accordingly, the housing cover 30 can be moved with respect to the pump filter housing 40 in a stable manner.

[0058] The at least one guide portion 43 is provided to have a shape corresponding to that of the body portion 32a. In some embodiments, the at least one guide portion 43 may be provided as a curved surface that protrudes upwards to correspond to the shape of the body portion 32a. In some embodiments where two coupling portions 32 are provided, two guide portions 43 are provided at the rear side of the pump filter housing 40. Further, the head portion 32b of the coupling portion 32 is coupled to the rails 41. The at least one guide portion 43 is provided close to the rails 41 and supports the body portion 32a.

[0059] FIG. 7 is a cross-sectional side view illustrating the washing machine of FIG. 1 with the pump filter housing in an open state. FIG. 8 is a cross-sectional side view illustrating the washing machine of FIG. i.As illustrated in FIGS. 7 and 8, the coupling portions 32 are movable along the rails 41 as the housing cover 30 is moved.

[0060] When the pump filter housing 40 is open and in the second state, only the head portion 32b is coupled to the rails 41 and the head portion 32b is located at upper parts of the rails 41 as illustrated in FIG. 7. The head portion 32b cannot be moved beyond a predetermined distance due to the escape prevention jaws 42. Thus, the housing cover 30 can be prevented from being opened excessively and leaned back beyond the predetermined distance.

[0061] When the pump filter housing 40 is closed and in the first state, the head portion 32b and the body portion 32a are coupled to the rails 41 as illustrated in FIG. 8. When the pump filter housing 40 is in the first state, the head portion 32b is located at lower parts of the rails 41 and the body portion 32a is located in the remaining space of the rails 41.

[0062] An accommodation barrier wall 43 is disposed on the pump filter housing 40 and corresponds to the shape of the housing cover 30 and receives the housing cover 30. The accommodation barrier wall 43 is concave and the concavity extends toward an inside of the pump filter housing 40.

[0063] Further, the latch 31 connects to a latch coupling portion 45. The latch coupling portion 45 is located to correspond to a position of the latch 31 when the pump filter housing 40 is closed and in the first state. In some embodiments, the housing cover 30 is retained by the latch 31 when the housing cover 30 is closed and the pump filter housing 40 is in the first state. However, in alternative embodiments, the housing cover 30 is retained using a hook structure.

[0064] Further, the pump filter housing 40 includes an accommodation space 42 that receives the drainage pump 16.

[0065] FIG. 9 is an oblique front view illustrating another pump filter housing of a washing machine with the pump filter housing in an open state. As illustrated in FIG. 9, only one coupling portion 132 is provided. In this case, the coupling portion 132 is located in the middle of a housing cover 130 and secures stability of movement of the housing cover 130. In this case, only one rail (not shown) is disposed on a pump filter housing 140. Escape prevention jaws 142 are located at both sides of the pump filter housing 140 and surround the coupling portion 132

at both sides of the coupling portion 132 so that the coupling portion 132 can be moved in a stable manner. The escape prevention jaws 142 surround a portion of a body portion 132a of the coupling portion 132.

[0066] As described above, in some embodiments, a coupling structure of a pump filter housing and a housing cover is improved so that the pump filter housing can be easily opened and closed in a manner more convenient for a user.

[0067] In addition, since coupling of the pump filter housing and the housing cover is performed without using separate components, productivity can be improved, and economical production can be performed.

[0068] Although the present invention has been described with exemplary embodiments, various changes and modifications may be suggested to one skilled in the art. It is intended that the present disclosure encompasses such changes and modifications as fall within the scope of the invention as defined by the appended claims.

Claims

1. A washing machine comprising:

a cabinet;
a tub disposed in the cabinet and configured to receive washing water;
a pump filter configured to filter foreign substances from the washing water received from the tub;
a pump filter housing configured to receive the pump filter;
a housing cover configured to open and close the pump filter housing;
at least one coupling portion extending from the housing cover and at least a portion of the at least one coupling portion being coupled to the pump filter housing; and
rails disposed on the pump filter housing, the rails being configured to receive the at least one coupling portion, and the rails being configured to allow movement of the at least one coupling portion as a function of whether the housing cover is in an open state or a closed state.

2. The washing machine of claim 1, wherein the at least one coupling portion comprises:

a body portion extending from the housing cover; and
a head portion extending from the body portion.

3. The washing machine of claim 2, wherein the head portion is inserted into the rails and the head portion is movable as a function of whether the housing cover is in the open state or the closed state.

4. The washing machine of claim 2 or 3, wherein the body portion comprises a curved surface.

5. The washing machine of claim 4, wherein the body portion comprises a curved surface that protrudes upwards.

6. The washing machine of any one of the preceding claims, wherein at least one escape prevention jaw is disposed on the pump filter housing and prevents the at least one coupling portion from disconnecting from the pump filter housing.

7. The washing machine of claim 6, wherein the at least one escape prevention jaws are disposed on a front side of the pump filter housing and surround at least a portion of a top surface of the body portion of the at least one coupling portion.

8. The washing machine of any one of the preceding claims, wherein at least one guide portion is disposed on a rear side of the pump filter housing and supports the at least one coupling portion.

9. The washing machine of claim 8, wherein the at least one guide portion is disposed close to the rails and supports the body portion of the at least one coupling portion.

10. The washing machine of claim 8, wherein the at least one guide portion is configured to correspond to a shape of the body portion of the at least one coupling portion.

11. The washing machine of any one of the preceding claims, wherein the pump filter housing is injection-molded integrally with the cabinet.

12. The washing machine of any of the preceding claims, wherein the at least one coupling portion is disposed at both sides of the housing cover.

13. The washing machine of any one of the preceding claims, wherein the housing cover movable to a first state in which the pump filter housing is closed and movable to a second state in which the pump filter housing is open, and
the housing cover is coupled to the pump filter housing so that when the pump filter housing is in the first state the at least one coupling portion is disposed at a lower side of the pump filter housing, and so that when the pump filter housing is in the second state, the at least one coupling portion is disposed at an upper side of the pump filter housing.

FIG. 1

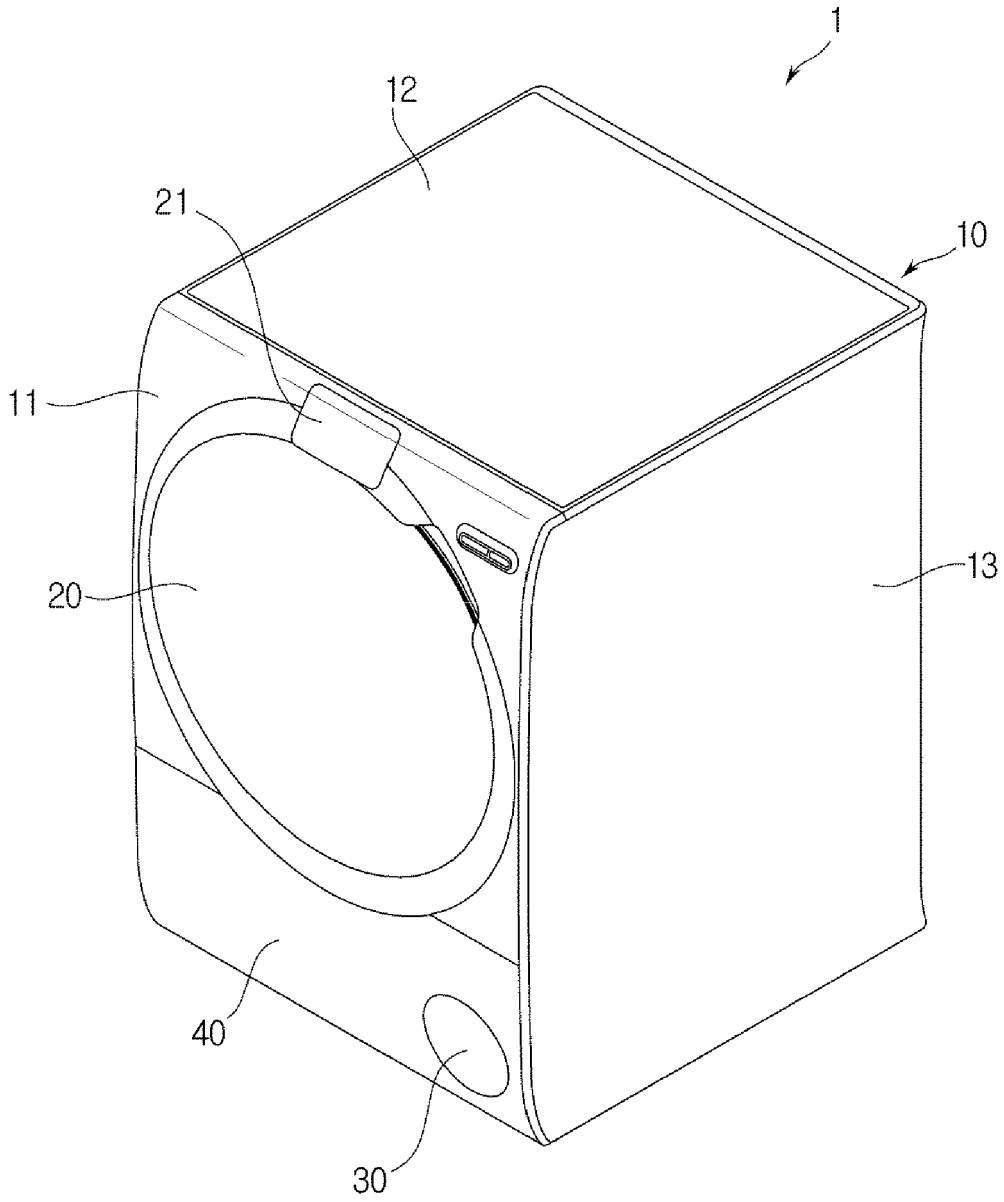


FIG. 2

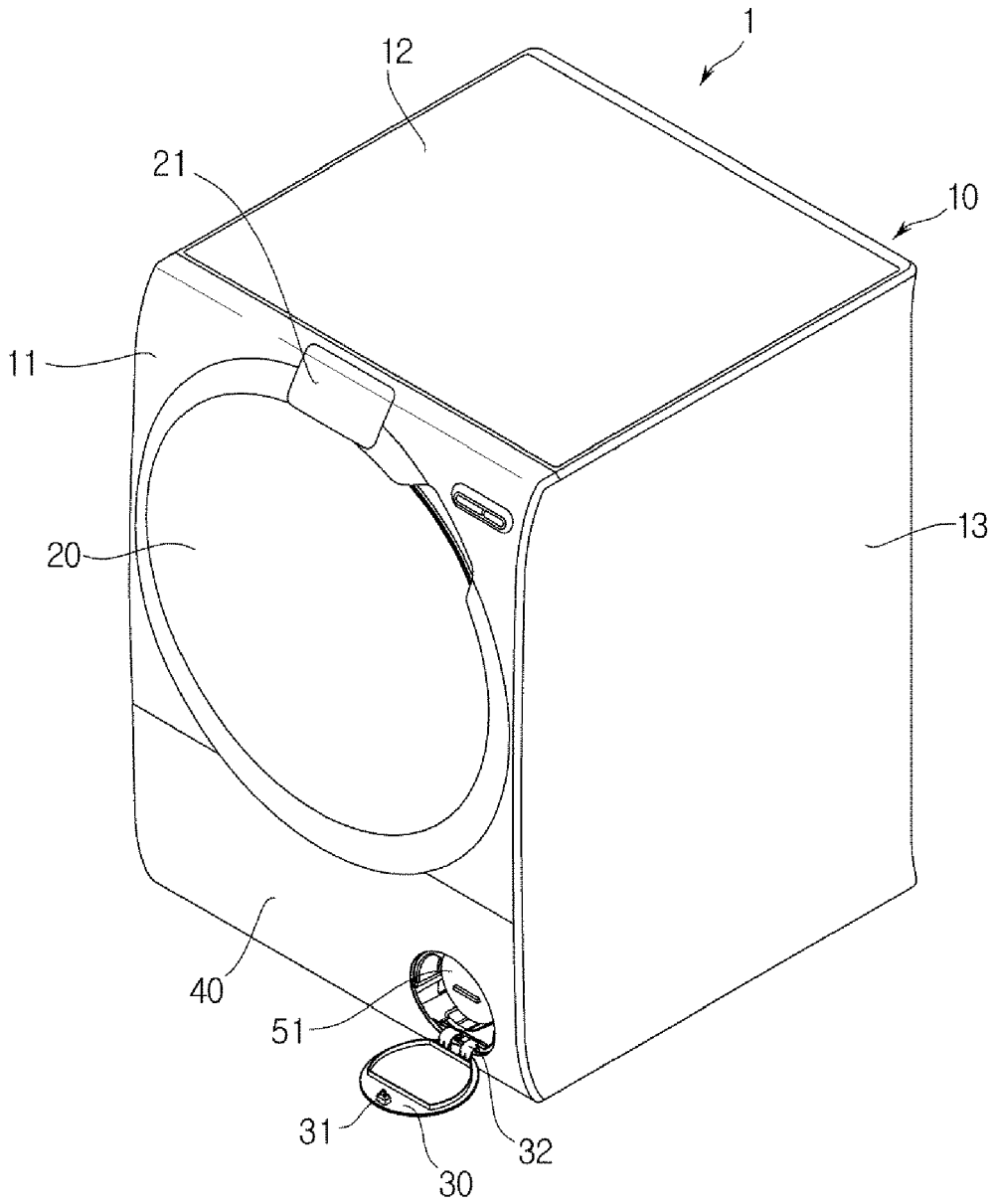


FIG. 3

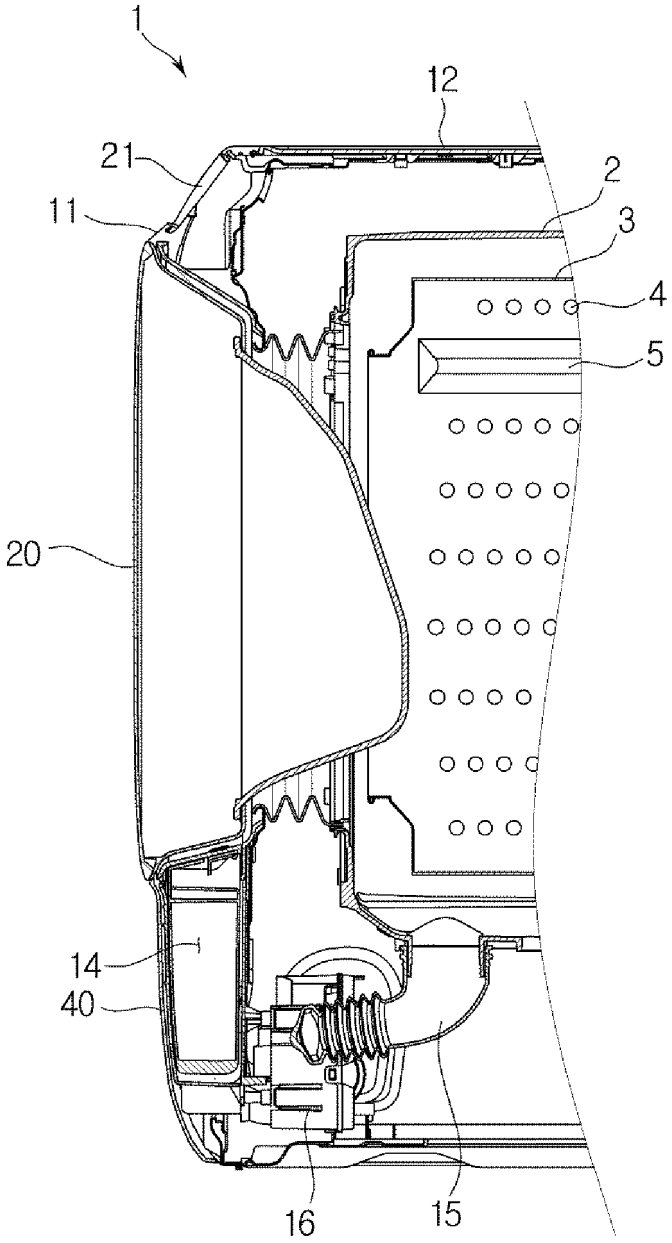


FIG. 4

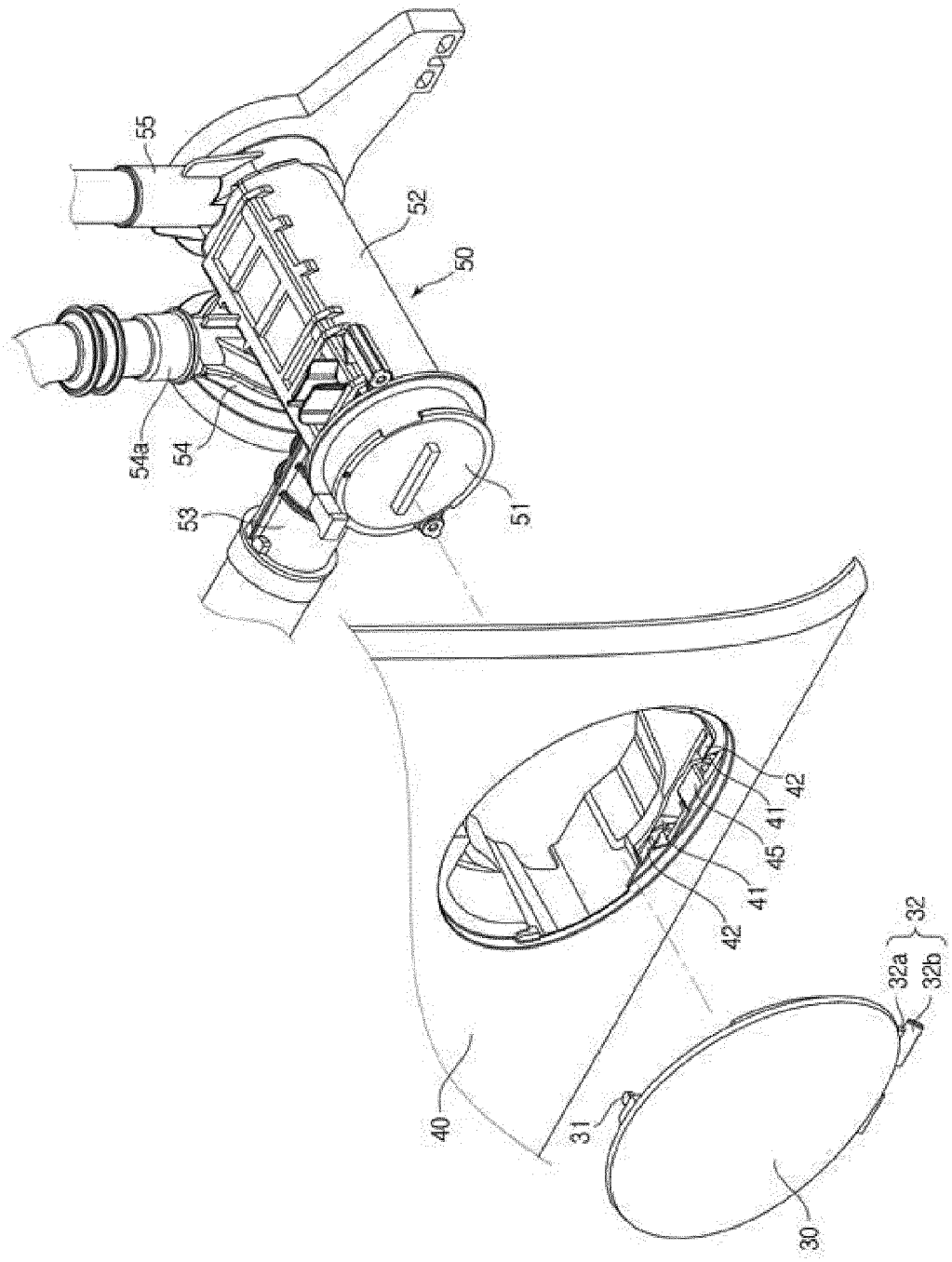


FIG. 5

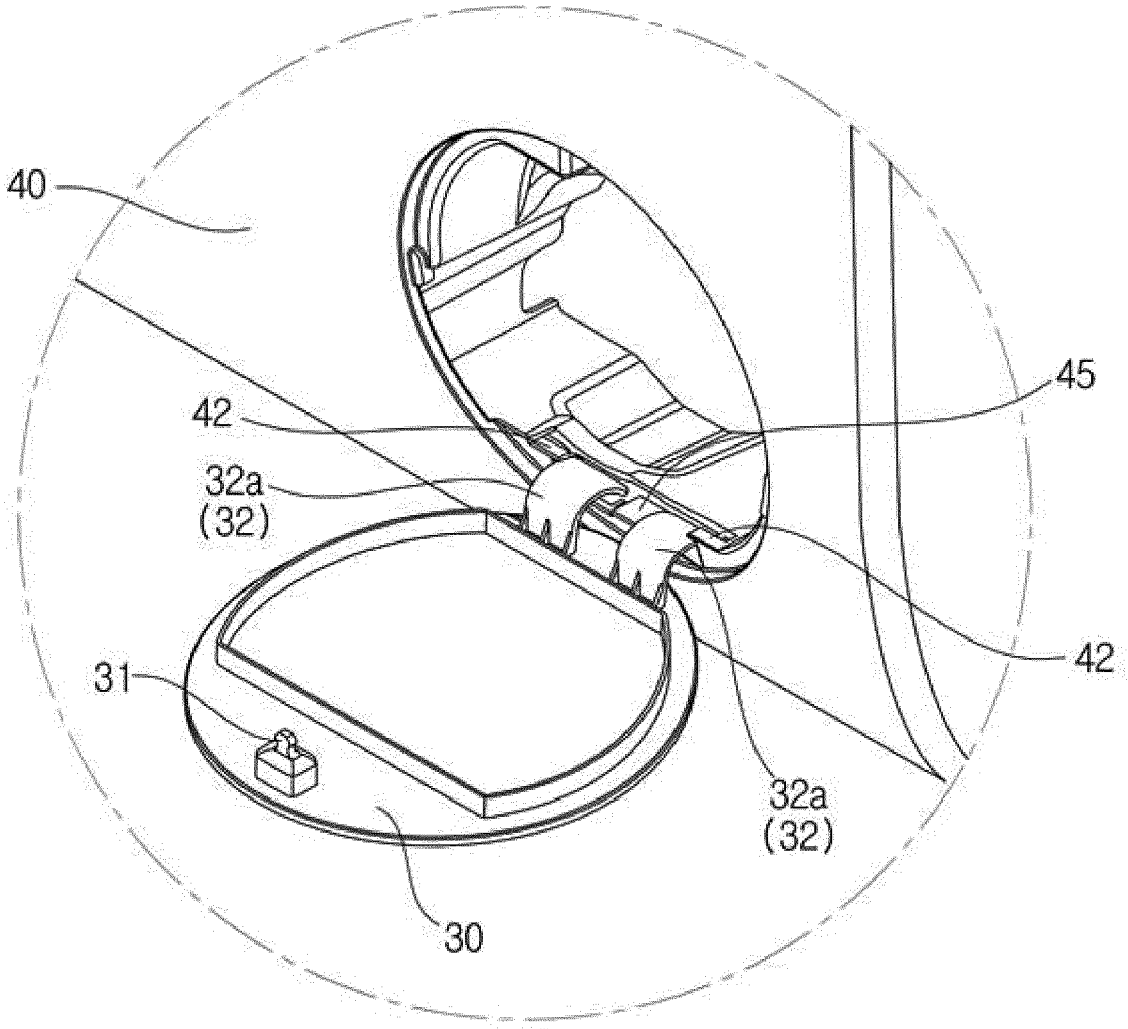


FIG. 6

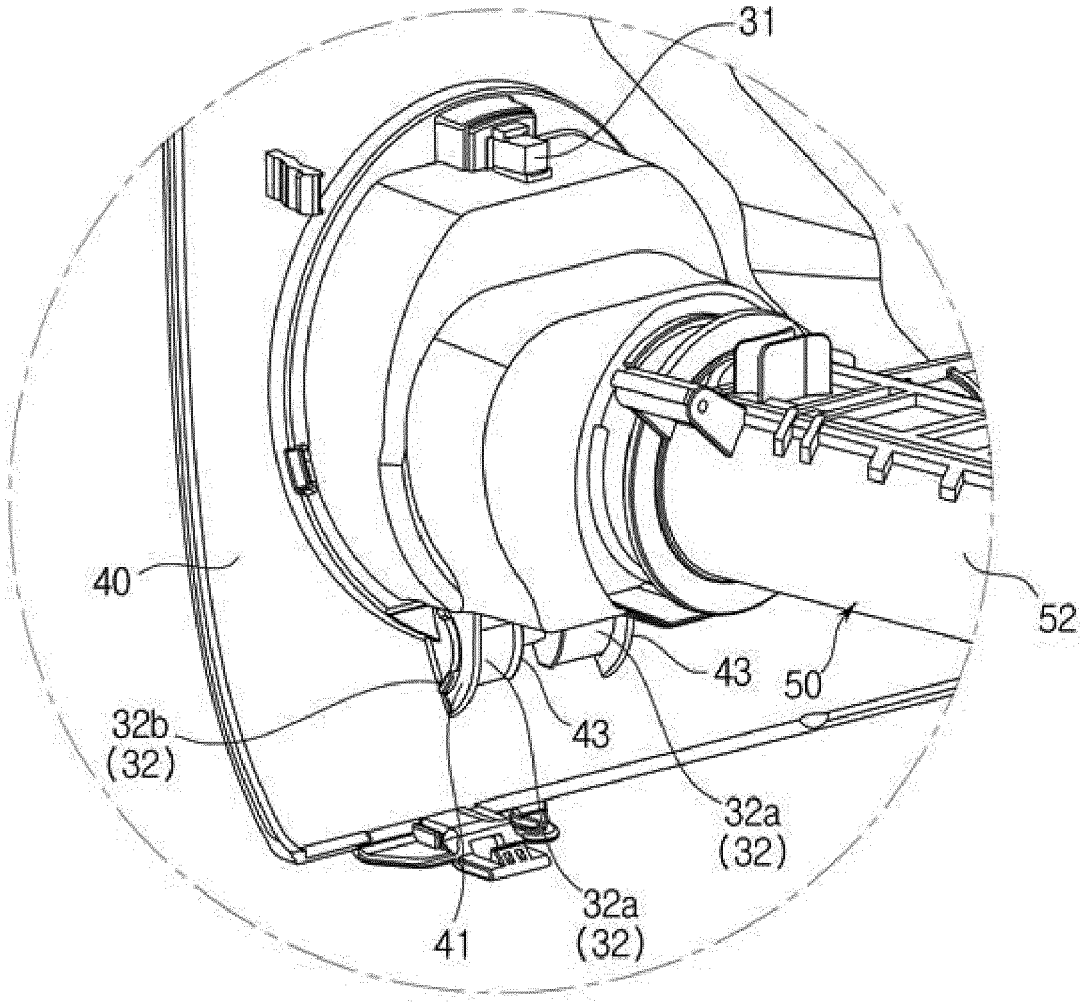


FIG. 7

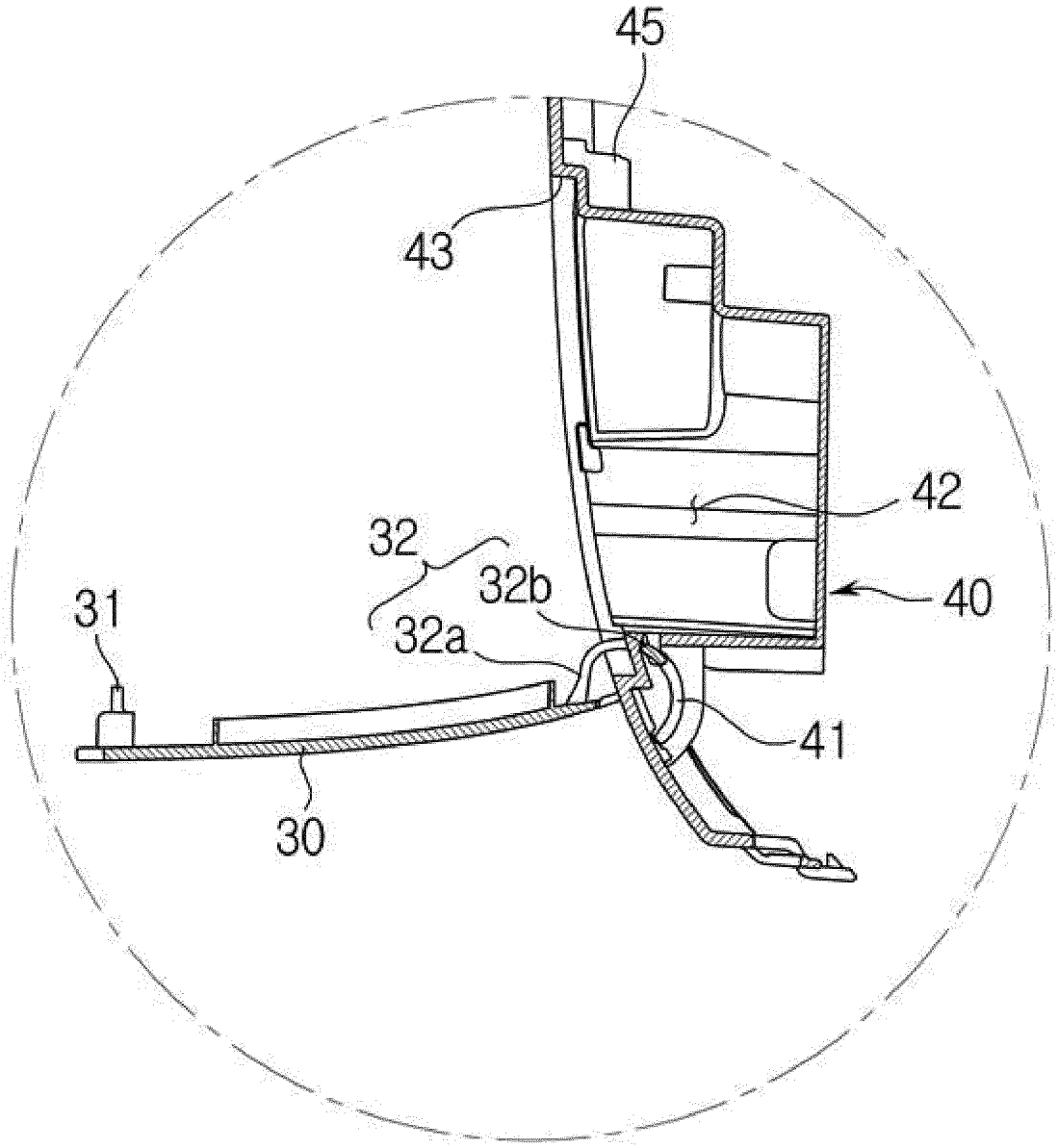


FIG. 8

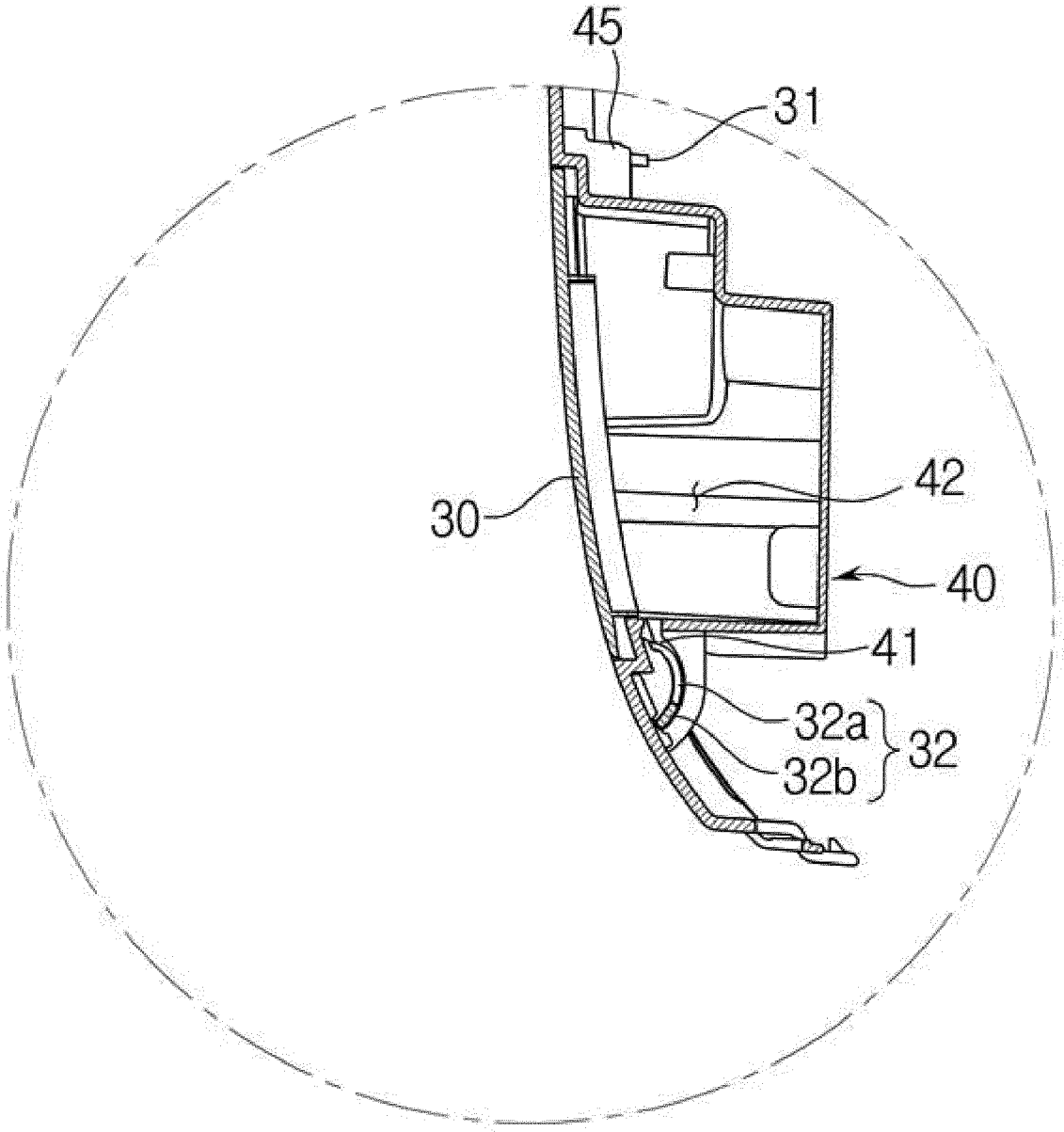
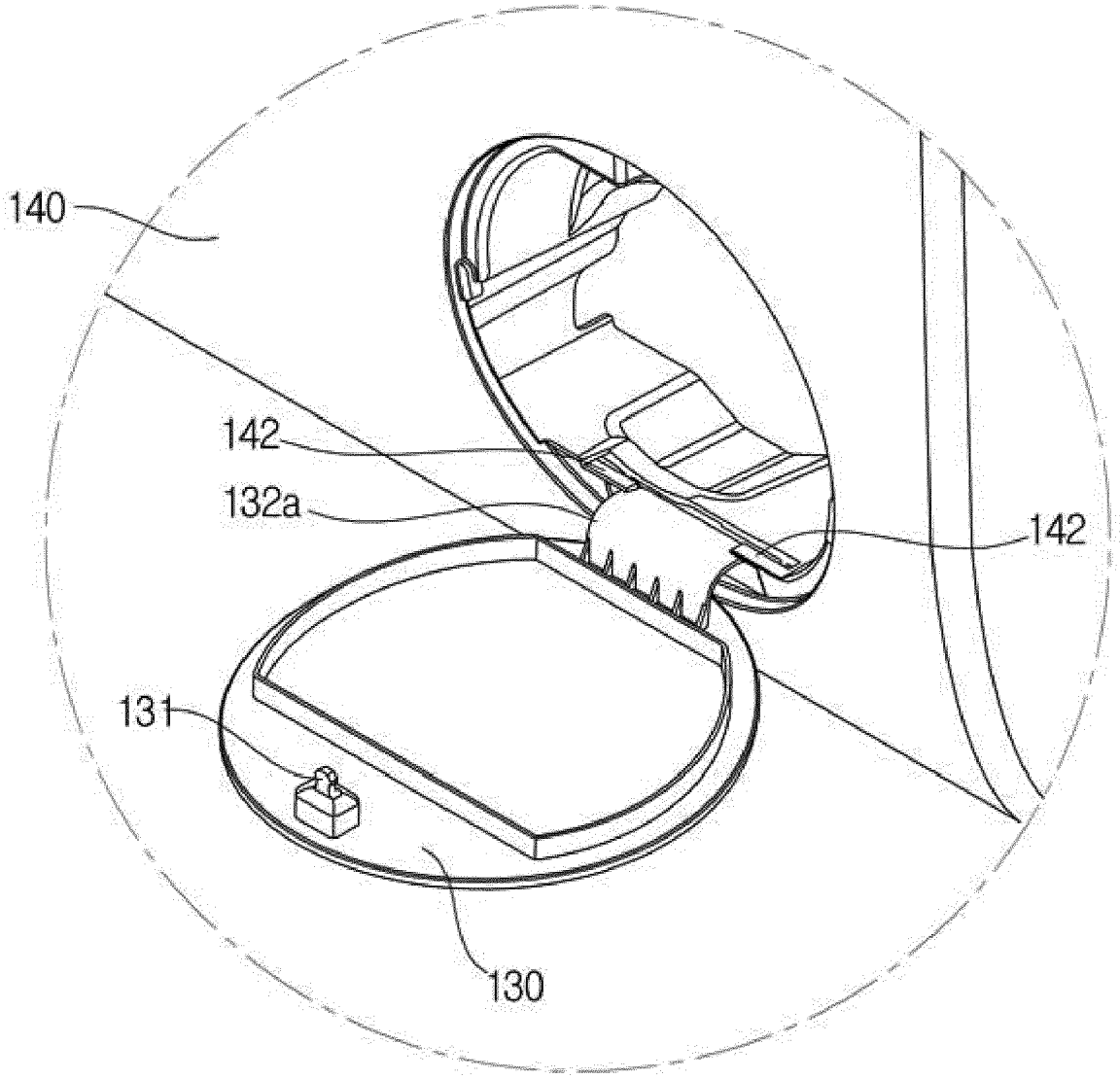


FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 4170

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 1 593 768 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 9 November 2005 (2005-11-09) * paragraphs [0020] - [0022] * * paragraphs [0031] - [0043] * * figures 1-5 *	1-4,8-11	INV. D06F39/10 ADD. D06F39/12 D06F58/22
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 June 2015	Weidner, Maximilian

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