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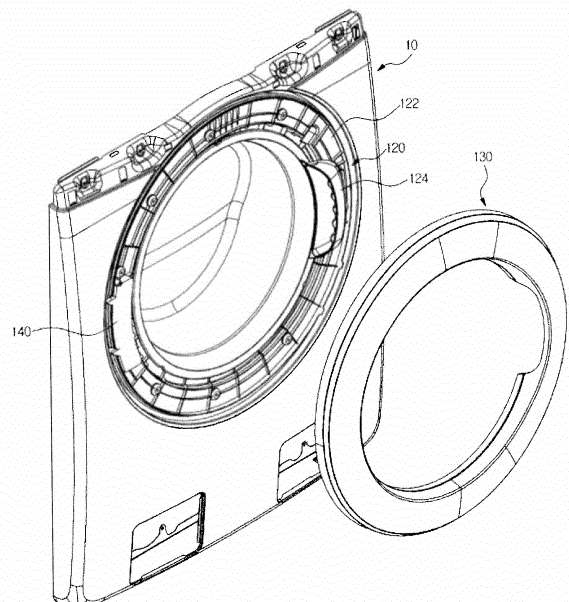
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(54) **Washing machine**

(57) Provided is a washing machine having an improved structure in which a door may be firmly supported not to sag even though the door is repeatedly opened/closed for a long term while a user uses the washing machine. The washing machine includes: a main body (10); an opening (16) formed in a front side of the main body (10); a door (100) that opens/closes the opening (16); and a hinge member (200) that allows the door (100) to be rotatably coupled to the front side of the main body (10). The hinge member (200) includes: a hinge body (202) coupled to the front side of the main body; at least one hinge arm (204) that extends from the hinge body (202); and at least one stopper (240) that protrudes from an outer side of the hinge arm. The door (100) includes: at least one accommodation groove (128) in which at least a portion of the hinge arm (204) is accommodated; and a cover plate (140) that covers the accommodation groove (128) to support the hinge arm (204) and has at least one protrusion (146) that protrudes from an inner side of the cover plate (140) toward the hinge arm (204). When the door (100) opens the opening (16), the stopper (240) and the protrusion (146) are in contact with each other so that rotation of the door (100) can be limited.

FIG. 2



Description

BACKGROUND

1. Field

[0001] Embodiments relate to a combination structure of a door that opens/closes a laundry port of a washing machine.

2. Description of the Related Art

[0002] A drum washing machine as a machine that washes clothes using power, generally includes a tub in which washing water is stored, a drum that is rotatably installed in the tub, and a driving motor for rotating the drum. When the drum is rotated in a state in which laundry and detergent water are put into the drum, laundry is in friction with the drum and detergent water so that dirt on laundry may be removed.

[0003] An opening through which laundry is put into or taken out, is formed in a front side of the drum washing machine, and a door that opens/closes the opening is rotatably coupled to the front side of the drum washing machine using a hinge member.

[0004] When a user opens/closes the door repeatedly for a long term during the usage of the drum washing machine, the hinge member may be damaged due to the weight of the door or shock applied when the door is opened/closed. Damage of the hinge member causes sagging of the door, which gives much inconvenience to the user in using the drum washing machine.

SUMMARY

[0005] In an aspect of one or more embodiments, there is provided a washing machine having an improved structure in which a door may be firmly supported not to sag even though the door is repeatedly opened/closed for a long term while a user uses the washing machine.

[0006] In accordance with an aspect of one or more embodiments, there is provided a washing machine including: a main body; an opening formed in a front side of the main body; a door that opens/closes the opening; and a hinge member that allows the door to be rotatably coupled to the front side of the main body, wherein the hinge member includes: a hinge body coupled to the front side of the main body; at least one hinge arm that extends from the hinge body; and at least one stopper that protrudes from an outer side of the at least one hinge arm, wherein the door includes: a transparent member through which a user sees an inner side of a drum a holder member to which the transparent member is coupled and which has at least one accommodation groove in which at least a portion of the at least one hinge arm is accommodated; and a cover plate that covers the at least one accommodation groove to support the at least one hinge arm and has at least one protrusion that pro-

trudes from an inner side of the cover plate toward the at least one hinge arm, and wherein when the door opens the opening, the at least one stopper and the at least one protrusion are in contact with each other so that rotation of the door is limited.

[0007] A first contact side may be provided at one end of the at least one protrusion, a second contact side may be provided at one end of the at least one stopper and may contact the first contact side, and an angle between a direction that is perpendicular to the first contact side and the second contact side and a direction in which the cover plate covers the at least one accommodation groove may be greater than 0° and less than 90°.

[0008] The cover plate may include at least one protrusion formation hole for forming the at least one protrusion.

[0009] The hinge member may be manufactured using injection molding, and a material for the hinge member may be engineering plastic including glass fiber.

[0010] The at least one hinge arm may include a first arm that extends from the hinge body, a second arm that slantingly extends from one end of the first arm, and a hinge shaft that extends from the second arm in a vertical direction, and a distance from a rotational center of the hinge shaft to one end of the at least one stopper may be longer than a distance from the rotational center of the hinge shaft to one end of the at least one protrusion.

[0011] In accordance with an aspect of one or more embodiments, there is provided a washing machine including: a main body; a drum that is rotatably installed in the main body; a laundry port which is formed at a front side of the main body and through which laundry is put into the drum; a hinge plate including a hinge body coupled to the front side of the main body toward an outer side of the laundry port and at least one hinge arm that extends from the hinge body; a door that is rotatably coupled to the at least one hinge arm so as to open/close the laundry port and includes an accommodation part accommodating at least a portion of the at least one hinge arm; and a stopper that protrudes from an outer side of the at least one hinge arm and is in contact with at least a portion of the accommodation part so as to limit rotation of the door when the door opens the laundry port.

[0012] The accommodation part may include a rotation limitation protrusion that protrudes from an inner side of the accommodation part toward the at least one hinge arm, and the rotation limitation protrusion may be in contact with the stopper and may limit rotation of the door.

[0013] The rotation limitation protrusion may pressurize the stopper in a direction toward the drum.

[0014] The door may include: a transparent member through which a user sees an inner side of the drum; a holder member to which the transparent member is coupled and which has an accommodation groove in which at least a portion of the at least one hinge arm is accommodated, the accommodating groove being formed in one side of the holder member; and a cover plate that covers the accommodation groove and constitutes the

accommodation part together with the accommodation groove.

[0015] The hinge arm may include a first arm that extends from the hinge body, a second arm that slantingly extends from one end of the first arm, and a hinge shaft that extends from the second arm in a vertical direction and is a rotational center of the door, and the accommodation groove may include a first accommodation groove in which the second arm is accommodated and a second accommodation groove which crosses the first accommodation groove and in which the hinge shaft is accommodated.

[0016] The stopper may protrude from an outer side of the second arm, and the cover plate may include a rotation limitation protrusion that protrudes from an inner side of the cover plate toward the hinge arm, is in contact with the stopper and limits rotation of the door.

[0017] An angle between a virtual, first straight line that connects a rotational center of the hinge shaft and one end of the stopper and a virtual, second straight line that connects the rotational center of the hinge shaft and one end of the second arm connected to the first arm, may be equal to or greater than 90° and equal to or less than 180°.

[0018] An angle between a direction in which the stopper pressurizes the rotation limitation protrusion and a direction in which the cover plate is coupled to the holder member, may be greater than 0° and less than 90°.

[0019] The stopper and the second arm may be disposed at both sides of a virtual, third straight line based on the virtual, third straight line that is parallel to a rotational center of the drum and passes the rotational center of the hinge shaft in a state in which the door closes the laundry port.

[0020] A first contact side may be provided at one end of the rotation limitation protrusion, a second contact side may be provided at one end of the stopper, may contact the first contact side, and may pressurize the first contact side, and an angle between a direction that is parallel to the first contact side and the second contact side and a direction in which the cover plate is coupled to the holder member, may be greater than 0° and less than 90°.

[0021] A distance from a rotational center of the at least one hinge arm to one end of the protrusion may be shorter than a distance from the rotational center of the hinge arm to one end of the stopper.

[0022] A material for the hinge plate may be engineering plastic.

[0023] The hinge plate may include glass fiber (GF) having a content of 60% or more.

[0024] In accordance with an aspect of one or more embodiments, there is provided a washing machine including a main body having an opening; a door that opens/closes the opening; and a hinge member rotatably coupling the door to the main body, wherein the hinge member includes a hinge body coupled to the main body; a hinge arm that extends from the hinge body; and a stopper that protrudes from an outer side of the hinge

arm, wherein the door includes a transparent member through which a user sees an inner side of a drum; a holder member to which the transparent member is coupled and which has an accommodation groove in which at least a portion of the hinge arm is accommodated; and a cover plate that covers the accommodation groove to support the hinge arm and has a protrusion that protrudes from an inner side of the accommodation groove toward the hinge arm, and wherein when the door opens the opening, the stopper and the protrusion are in contact with each other so that rotation of the door is limited.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] These and/or other aspects will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view illustrating the exterior of a washing machine according to an embodiment;

FIG. 2 is an exploded view illustrating some elements of a door in a state in which the door closes a laundry port;

FIG. 3 is an exploded perspective view illustrating a door of the washing machine, according to an embodiment;

FIG. 4 is an exploded perspective view illustrating a combination relationship between the door and a hinge member of the washing machine, according to an embodiment;

FIG. 5 is an exploded view illustrating a cover plate in a state in which the door and the hinge member are coupled to each other;

FIG. 6 is an exploded perspective view illustrating the combination relationship between the door and the hinge member;

FIG. 7 is a view illustrating FIG. 3 at a different angle;

FIG. 8 is a partial cross-sectional view illustrating the combination relationship between the door and the hinge member in a state in which the door closes the laundry port;

FIG. 9 is an enlarged view of a portion A of FIG. 8;

FIG. 10 is a partial cross-sectional view illustrating the combination relationship between the door and the hinge member in a state in which the door fully opens the laundry port; and

FIG. 11 is an enlarged view of a portion B of FIG. 10.

DETAILED DESCRIPTION

[0026] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0027] FIG. 1 is a perspective view illustrating the exterior of a washing machine according to an embodiment.

[0028] As illustrated in FIG. 1, the washing machine according to the present invention includes a main body 10 that constitutes the exterior, a tub (not shown) which is disposed in the main body 10 and in which washing water is stored, and a drum 12 that is rotatably disposed in the tub (not shown) so as to wash laundry. A control panel assembly 14 is disposed at a front upper part of the main body 10 so that a user may control an operation of the washing machine. A laundry port 16 through which laundry may be put into the drum 12 is disposed at a front side of the main body 10, and a door 100 is installed at the front side of the main body 10 so as to open/close the laundry port 16.

[0029] The door 100 is rotatably coupled to a hinge member 200 installed at the front side of the main body 10.

[0030] FIG. 2 is an exploded view illustrating some elements of the door 100 in a state in which the door 100 closes the laundry port 16, FIG. 3 is an exploded perspective view illustrating the door 100 of the washing machine, according to an embodiment, FIG. 4 is an exploded perspective view illustrating a combination relationship between the door 100 and the hinge member 200 of the washing machine, according to an embodiment, FIG. 5 is an exploded view illustrating a cover plate 140 in a state in which the door 100 and the hinge member 200 are coupled to each other, FIG. 6 is an exploded perspective view illustrating the combination relationship between the door 100 and the hinge member 200, and FIG. 7 is a view illustrating FIG. 3 at a different angle.

[0031] As illustrated in FIGS. 2 through 7, the door 100 includes a transparent member 110 through which the user may check an inner side of the drum 12, a holder member 120 to which the transparent member 110 is coupled and which has an accommodation groove 128, which is formed in one side of the holder member 120 and in which at least a portion of the hinge member 200 is accommodated and coupled, a cover member 130 that covers the entire surface of the holder member 120, and the cover plate 140 that is disposed between the holder member 120 and the cover member 130 and has an accommodation part (see 125 of FIG. 9) that covers the accommodation groove 128 and accommodates at least a portion of the hinge member 200 together with the accommodation groove 128.

[0032] The transparent member 110 is formed of transparent glass or plastic so that the user may know a washing operation. The transparent member 110 includes a cylindrical transparent body 112, of which the front is opened, a flange 114 that is formed along an outer cir-

cumferential surface of the transparent body 112 so that the transparent member 110 may be coupled to the holder member 120, and a guide 116 that is inclined at the rear of the transparent body 112 and guides washing water used in the washing operation toward the drum 12.

[0033] The holder member 120 includes a disc-shaped holder body 122, of which a center is hollow, a handle 124 that is formed at a front side of the holder body 122 along a circumferential direction of the holder body 122, and a hinge coupling part 126 that is formed at a front side of the holder body 122 along the circumferential direction of the holder body 122 in an opposite position to the handle 124.

[0034] The hinge coupling part 126 includes at least one accommodation groove 128 in which at least a portion of the hinge member 200 is accommodated and coupled, and a coupling rib 129 that protrudes from the front side of the holder body 122 to a predetermined length so that the cover plate 140 may be coupled to the coupling rib 129.

[0035] The accommodation groove 128 includes a first accommodation groove 128a that accommodates a second arm 220 of the hinge member 200 in a state in which the door 100 closes the laundry port 16, and a second accommodation groove 128b in which a hinge shaft 230 of the hinge member 200 is accommodated. The first accommodation groove 128a is formed when a portion of the holder body 122 is cut from its outer side to its inner side to a predetermined length, and the second accommodation groove 128b crosses and communicates with the first accommodation groove 128a. The first accommodation groove 128a is disposed in a direction that is approximately horizontal with the ground, and the second accommodation groove 128b is disposed in a direction that is approximately perpendicular to the first accommodation groove 128a.

[0036] The coupling rib 129 is formed long along the circumferential direction of the holder body 122 and protrudes from the front side of the holder body 122 to a predetermined length so that the cover plate 140 may be coupled to the coupling rib 129. Also, the coupling rib 129 protrudes from the front side of the holder body 122 to a predetermined length so that rigidity of the hinge coupling part 126 on which a load of the door 100 is concentrated, when the door 100 is rotated, may be reinforced. Thus, the door 100 may be stably rotated without sagging or being damaged.

[0037] The cover member 130 constitutes the exterior of the door 100 and is coupled to the holder member 120 so as to cover the entire surface of the holder member 120.

[0038] The transparent member 110, the holder member 120, and the cover member 130 may be injection-molded using a plastic material that is light and has a predetermined strength.

[0039] The cover plate 140 is disposed in a shape corresponding to the coupling rib 129 and is coupled to the hinge coupling part 126 in a direction parallel to an axial

direction of the drum 12. The cover plate 140 includes a plurality of bending parts 142, of which outer ends are bent so as to cover the hinge coupling part 126, a third accommodation groove 144 in which the second arm 220 and a portion of the hinge shaft 230 are accommodated in positions corresponding to the first accommodation groove 128a and the second accommodation groove 128b so that the cover plate 140 may not be interfered with the second arm 220 and the hinge shaft 230 of the hinge member 200 in a state in which the door 100 closes the laundry port 16, and at least one rotation limitation protrusion 146 that protrudes from an inner side of the third accommodation groove 144 toward the hinge coupling part 126 to a predetermined length.

[0040] The third accommodation groove 144 constitutes an accommodation part (see 125 of FIG. 9) that accommodates at least a portion of the hinge member 200 together with the first accommodation groove 128a and the second accommodation groove 128b, in detail, accommodates the second arm 220 together with the first accommodation groove 128a so that the cover plate 140 may not be interfered with the second arm 220, and accommodates and supports the hinge shaft 230 together with the second accommodation groove 128b so that the door 100 may be rotated on the hinge shaft 230.

[0041] As will be described later, the rotation limitation protrusion 146 is in contact with a stopper 240 formed at the second arm 220 of the hinge member 200 and limits rotation of the door 100, and a first contact side (see 146a of FIG. 9) that contacts an end 242 of the stopper 240 is provided at one end 146b of the rotation limitation protrusion 146. A direction in which the first contact side 146a is to be formed has the relationship for forming a predetermined angle with a direction in which the cover plate 140 covers the hinge coupling part 126. A detailed description thereof will be provided later.

[0042] The rotation limitation protrusion 146 may be formed by a protrusion formation hole 148. In order to form the rotation limitation protrusion 146, first, a portion of the third accommodation groove 144 may be cut, the cut portion may be bent toward an inner side of the third accommodation groove 144, thereby forming the rotation limitation protrusion 146.

[0043] The hinge member 200 includes a hinge body 202 that is coupled to the front side of the main body 10 toward an outer side of the laundry port 16, and at least one hinge arm 204 that extends from the hinge body 202.

[0044] The hinge body 202 is provided as a plate that is formed long along approximately a circumferential direction of the door 100. The hinge body 202 includes a plurality of fixing holes 202a through which the hinge body 202 may be fixed to the front side of the main body 10.

[0045] At least two hinge arms 204 may be disposed above and below the hinge body 202. The hinge arms 204 include a first arm 210 that extends from the front side of the hinge body 202 to a predetermined length, the second arm 220 that slantingly extends from one end of the first arm 210, and the hinge shaft 230 that extends

from the second arm 220 in a vertical direction and is a rotational center (see C1 of FIG. 9) of the door 100. A strength reinforcement rib 232 may be further disposed between the first arm 210 and the hinge body 202 so as to reinforce the strength of the hinge member 200.

[0046] The stopper 240 is disposed at one end 220a of the second arm 220. The stopper 240 extends from an outer circumferential surface of one end 220a of the second arm 220 to a predetermined length. In order to limit rotation of the door 100 in contact with the rotation limitation protrusion 146, a distance (see D1 of FIG. 9) from the rotational center C1 of the door 100, i.e., the rotational center C1 of the hinge shaft 230 to one end 242 of the stopper 240 is longer than a distance (see D2 of FIG. 9) from the rotational center C1 of the hinge shaft 230 to one end 146b of the rotation limitation protrusion 146.

[0047] As will be described later, the stopper 240 is in contact with the rotation limitation protrusion 146 formed at an inner side of the third accommodation groove 144 and limits rotation of the door 100, and a second contact side (see 240a of FIG. 9) is provided at one end (see 242 of FIG. 9) of the stopper 240 and is in contact with the first contact side 146a of the rotation limitation protrusion 146. A direction in which the second contact side 240a is to be formed is parallel to a direction in which the first contact side 146a is formed. The direction in which the second contact side 240a is to be formed, has the relationship for forming a predetermined angle with the direction in which the cover plate 140 covers the hinge coupling part 126, and a detailed description thereof will be provided later.

[0048] The hinge member 200 is a component that rotatably supports the door 100. In order to secure stability and reliability of the washing machine, the hinge member 200 should not be easily deformed or damaged by shock that occurs when the washing machine is distributed, by shock that occurs while the door 100 is repeatedly rotated when the washing machine is used, or by force that is continuously applied due to the weight of the door 100. Also, the hinge member 200 should not be easily deformed or damaged by an environment in which the washing machine is installed, i.e., variations in temperature and humidity.

[0049] Thus, the hinge member 200 need to be formed of material having predetermined rigidity and may be formed of an engineering plastic material by using injection molding in consideration of physical and chemical characteristics and productivity. When the engineering plastic material is used to form the hinge member 200, the material is light and may satisfy physical and chemical characteristics required for the hinge member 200, and the hinge member 200 may be manufactured using injection molding. Thus, it is advantageous to design a shape of the hinge member 200, color of the hinge member 200 may be easily adjusted and changed, and no additional post-processing costs are required.

[0050] The hinge member 200 of the door 100 installed

at the washing machine is always exposed to moisture. As described above, when a material for the hinge member 200 is engineering plastic, rigidity may decline due to absorption of moisture. Thus, in order to prevent a rigidity decline, glass fiber (GF) may be included in engineering plastic. In this case, the content of the glass fiber (GF) may be 60% or more.

[0051] The hinge member 200 is formed of the engineering plastic material including the GF in this manner so that the hinge member 200 may not be deformed or damaged due to an operation condition or installation environment of the washing machine. Thus, sagging or deviation of the door 100 is prevented so that stability and reliability of a product may be improved, and the hinge member 200 is manufactured using injection molding so that costs may be reduced and productivity may be improved.

[0052] Hereinafter, a structure in which the hinge member 200 is not damaged by shock applied when the door 100 is repeatedly opened/closed for a long term, will be described in more detail.

[0053] FIG. 8 is a partial cross-sectional view illustrating the combination relationship between the door 100 and the hinge member 200 in a state in which the door 100 closes the laundry port 16, FIG. 9 is an enlarged view of a portion A of FIG. 8, FIG. 10 is a partial cross-sectional view illustrating the combination relationship between the door 100 and the hinge member 200 in a state in which the door 100 fully opens the laundry port 16, and FIG. 11 is an enlarged view of a portion B of FIG. 10.

[0054] As illustrated in FIGS. 8 and 9, the stopper 240 and the second arm 220 may be disposed at both sides of a virtual, third straight line L3 based on the virtual, third straight line L3 that is parallel to the rotational center (see C2 of FIG. 1) of the drum 12 and passes the rotational center C1 of the hinge shaft 230 in a state in which the door 100 closes the laundry port 16. An angle α between a virtual, first straight line L1 that connects the rotational center C1 of the hinge shaft 230 and one end 242 of the stopper 240 and a virtual, second straight line L2 that connects the rotational center C1 of the hinge shaft 230 and one end 220b of the second arm 220 connected to the first arm 210 may be equal to or greater than 90° and equal to or less than 180° .

[0055] As illustrated in FIGS. 10 and 11, when the door 100 opens the laundry port 16 at a predetermined angle or more, the rotation limitation protrusion 146 and the stopper 240 contact each other, thereby limiting rotation of the door 100. In this case, the first contact side 146a of the rotation limitation protrusion 146 and the second contact side 240a of the stopper 240 contact each other, and an angle β between a direction in which the first contact side 146a and the second contact side 240a contact each other, i.e., a direction W1 that is parallel to the first contact side 146a and the second contact side 240a and a direction W2 in which the cover plate 140 is coupled to the holder member 130, may be greater than 0° and less than 90° . In this case, since the direction W1 that is par-

allel to the first contact side 146a and the second contact side 240a is perpendicular to a direction of force F1 in which the stopper 240 pressurizes the rotation limitation protrusion 146, an angle γ between the direction of force F1 in which the stopper 240 pressurizes the rotation limitation protrusion 146 and the direction W2 in which the cover plate 140 is coupled to the holder member 130, may be greater than 0° and less than 90° . A direction of shock applied to the cover plate 140 by the rotation limitation protrusion 146 is the same as the direction of force F1 in which the stopper 240 pressurizes the rotation limitation protrusion 146, and a partial component force F in the direction of force F1 in which the stopper 240 pressurizes the rotation limitation protrusion 146 is parallel to the direction W2 in which the cover plate 140 is coupled to the holder member 130. Thus, a phenomenon that the cover plate 140 may be deformed or deviated from the holder member 130 due to a contact pressure between the rotation limitation protrusion 146 and the stopper 240 while rotation of the door 100 is limited, may be prevented in advance.

[0056] According to a principal of action and reaction, force F2 in which the rotation limitation protrusion 146 pressurizes the stopper 240 is generated with the same amount of force F1 in which the stopper 240 pressurizes the rotation limitation protrusion 146, in an opposite direction to the direction of force F1, and is exerted on the second arm 220. As described above, since the hinge member 200 is formed of the engineering plastic material having sufficient rigidity and is formed using injection molding, the phenomenon that the hinge member 200 may be deviated from the front side of the main body 10 or deformed by force F2 in which the rotation limitation protrusion 146 pressurizes the stopper 240, does not occur.

[0057] As described above, according to embodiments, the hinge member that rotatably supports the door has a structure in which the hinge member is not damaged by the weight of the door and shock applied when the door is repeatedly opened/closed for a long term, so that durability and reliability of a product can be improved.

[0058] In addition, manufacturing costs for the hinge member are reduced so that productivity of the product can be improved.

[0059] Although a few embodiments have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

Claims

1. A washing machine comprising:

- a main body;
- a drum that is rotatably installed in the main

- body;
 a laundry port which is formed at a front side of the main body and through which laundry is put into the drum;
 a hinge plate comprising a hinge body coupled to the front side of the main body toward an outer side of the laundry port and at least one hinge arm that extends from the hinge body;
 a door that is rotatably coupled to the at least one hinge arm so as to open/close the laundry port and comprises an accommodation part accommodating at least a portion of the at least one hinge arm; and
 a stopper that protrudes from an outer side of the at least one hinge arm and is in contact with at least a portion of the accommodation part so as to limit rotation of the door when the door opens the laundry port.
2. The washing machine according to claim 1, wherein:
- the accommodation part comprises a rotation limitation protrusion that protrudes from an inner side of the accommodation part toward the at least one hinge arm, and
 the rotation limitation protrusion is in contact with the stopper and limits rotation of the door.
3. The washing machine according to claim 2, wherein the rotation limitation protrusion pressurizes the stopper in a direction toward the drum.
4. The washing machine according to claim 1, wherein the door comprises:
- a transparent member through which a user sees an inner side of the drum;
 a holder member to which the transparent member is coupled and which has an accommodation groove in which at least a portion of the at least one hinge arm is accommodated, the accommodating groove being formed in one side of the holder member; and
 a cover plate that covers the accommodation groove and constitutes the accommodation part together with the accommodation groove.
5. The washing machine according to claim 4, wherein:
- the at least one hinge arm comprises a first arm that extends from the hinge body, a second arm that slantingly extends from one end of the first arm, and a hinge shaft that extends from the second arm in a vertical direction and is a rotational center of the door, and
 the accommodation groove comprises a first accommodation groove in which the second arm is accommodated and a second accommoda-
- tion groove which crosses the first accommodation groove and in which the hinge shaft is accommodated.
6. The washing machine according to claim 5, wherein:
- the stopper protrudes from an outer side of the second arm, and
 the cover plate comprises a rotation limitation protrusion that protrudes from an inner side of the cover plate toward the hinge arm, is in contact with the stopper and limits rotation of the door.
7. The washing machine according to claim 6, wherein an angle between a virtual, first straight line that connects a rotational center of the hinge shaft and one end of the stopper and a virtual, second straight line that connects the rotational center of the hinge shaft and one end of the second arm connected to the first arm, is equal to or greater than 90° and equal to or less than 180°.
8. The washing machine according to claim 6, wherein an angle between a direction in which the stopper pressurizes the rotation limitation protrusion and a direction in which the cover plate is coupled to the holder member, is greater than 0° and less than 90°.
9. The washing machine according to claim 6, wherein the stopper and the second arm are disposed at both sides of a virtual, third straight line based on the virtual, third straight line that is parallel to a rotational center of the drum and passes the rotational center of the hinge shaft in a state in which the door closes the laundry port.
10. The washing machine according to claim 6, wherein:
- a first contact side is provided at one end of the rotation limitation protrusion, a second contact side is provided at one end of the stopper, contacts the first contact side, and pressurizes the first contact side, and
 an angle between a direction that is parallel to the first contact side and the second contact side and a direction in which the cover plate is coupled to the holder member, is greater than 0° and less than 90°.
11. The washing machine according to claim 2, wherein a distance from a rotational center of the at least one hinge arm to one end of the protrusion is shorter than a distance from the rotational center of the hinge arm to one end of the stopper.
12. The washing machine according to claim 1, wherein a material for the hinge plate is engineering plastic.

13. The washing machine according to claim 12, wherein the hinge plate comprises glass fiber (GF) having a content of 60% or more.

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FIG. 1

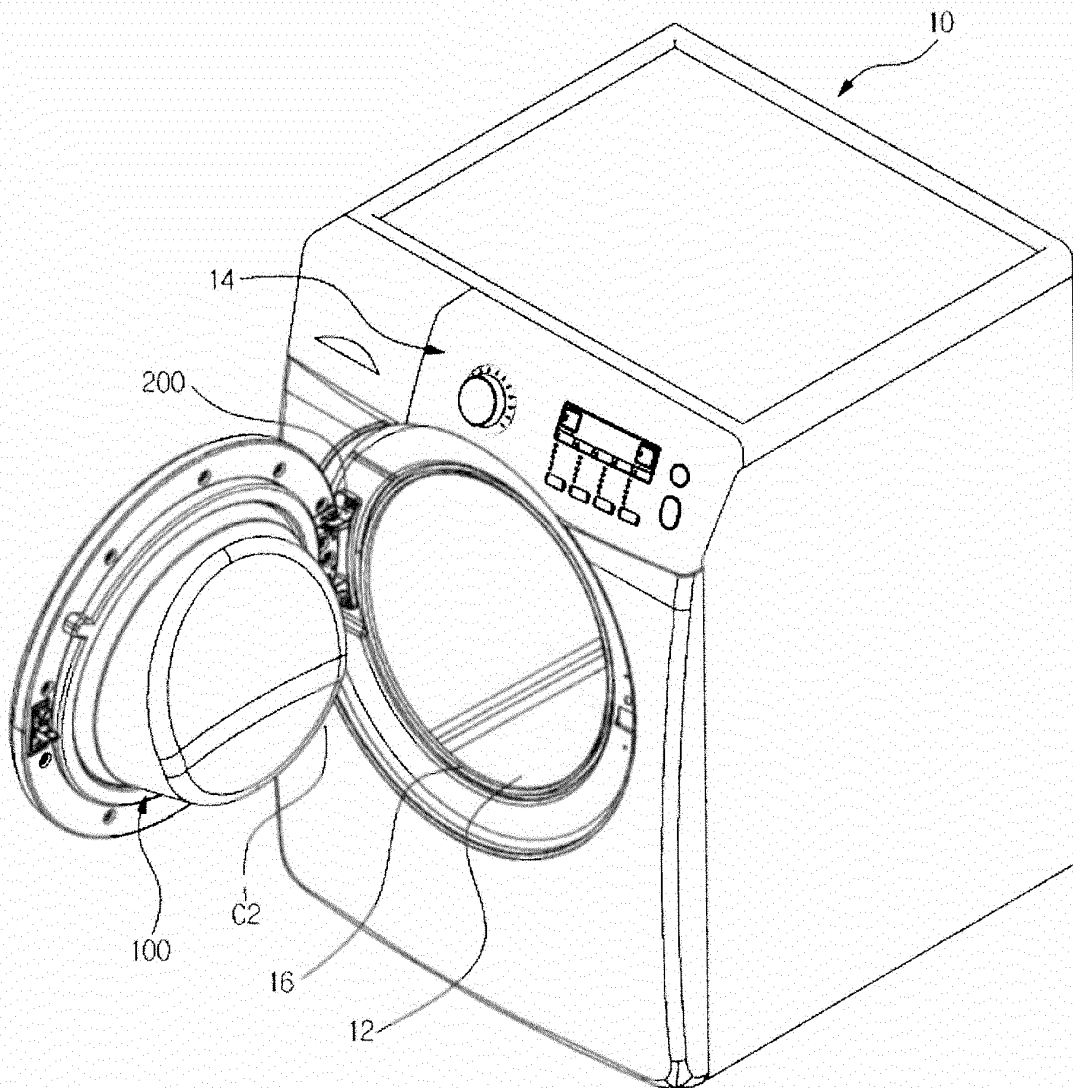


FIG. 2

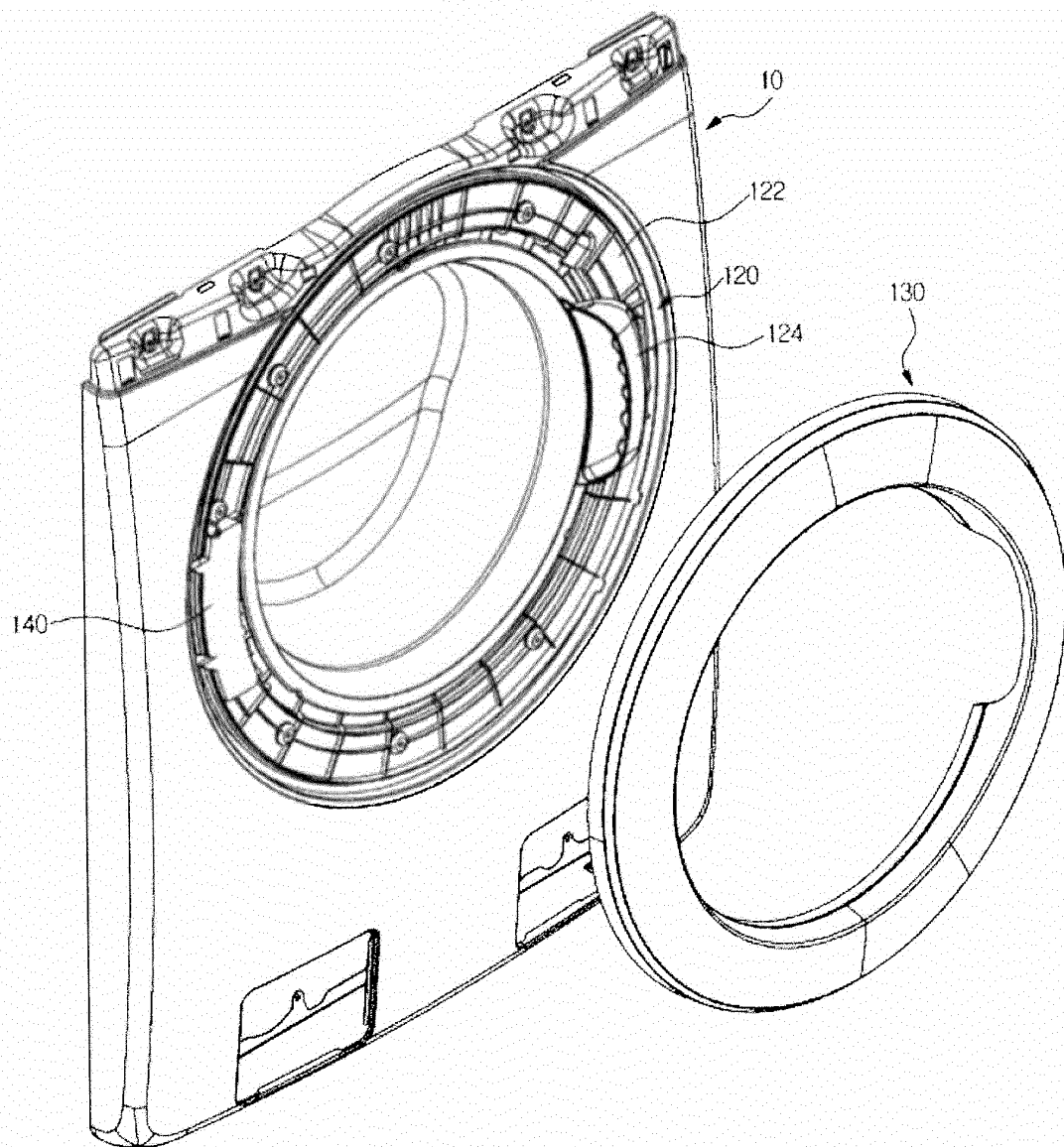


FIG. 3

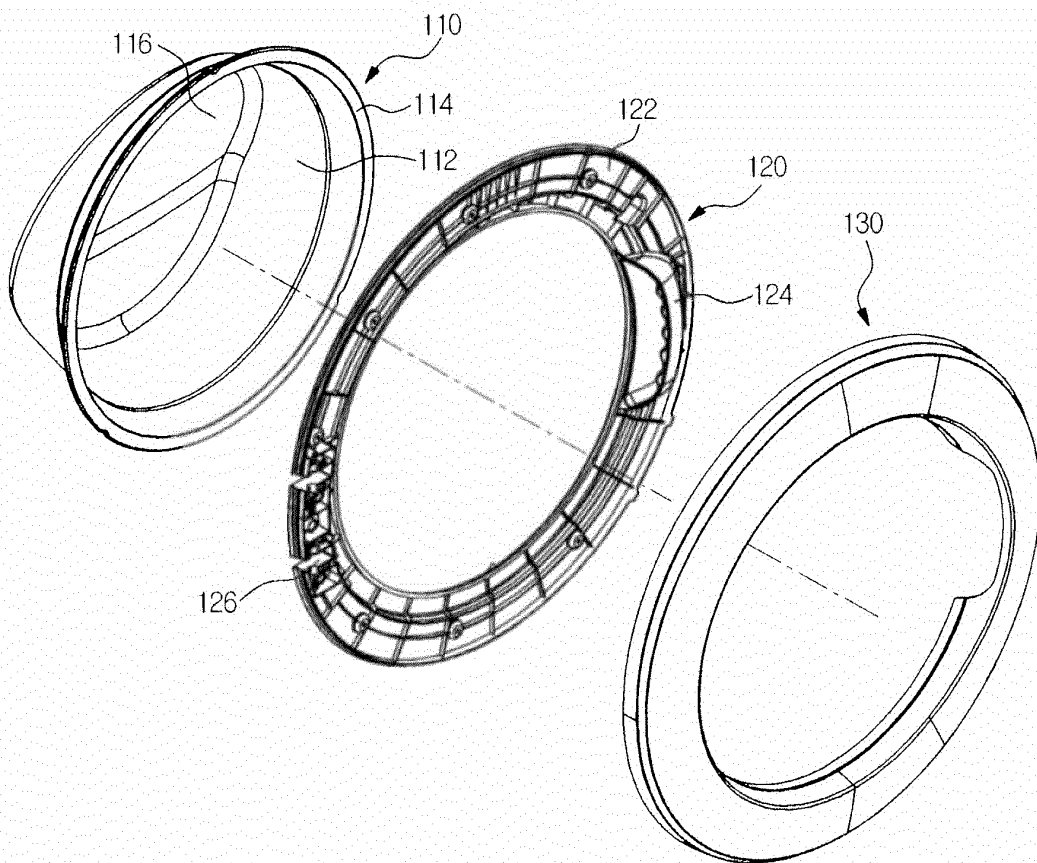


FIG. 4

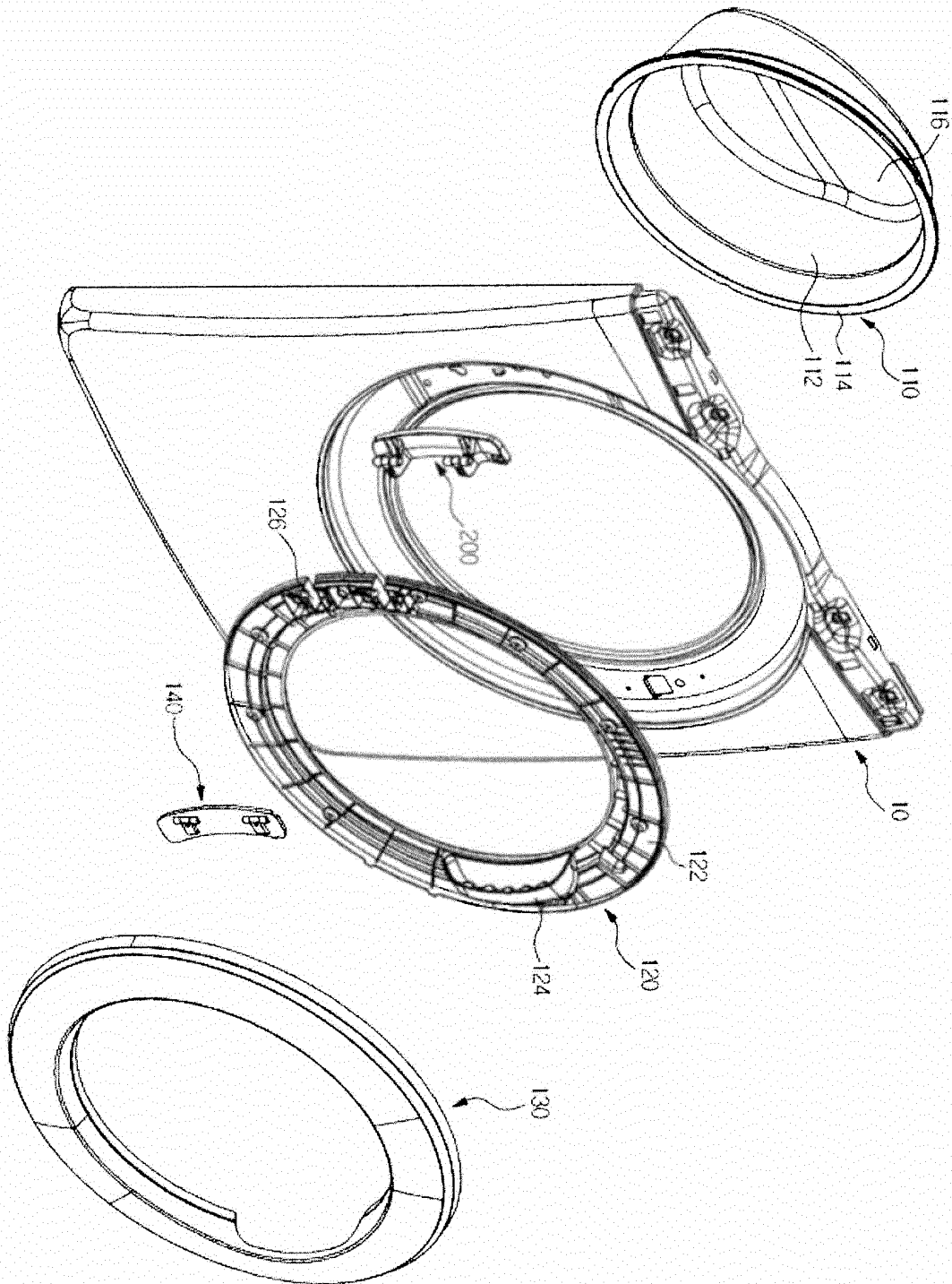


FIG. 5

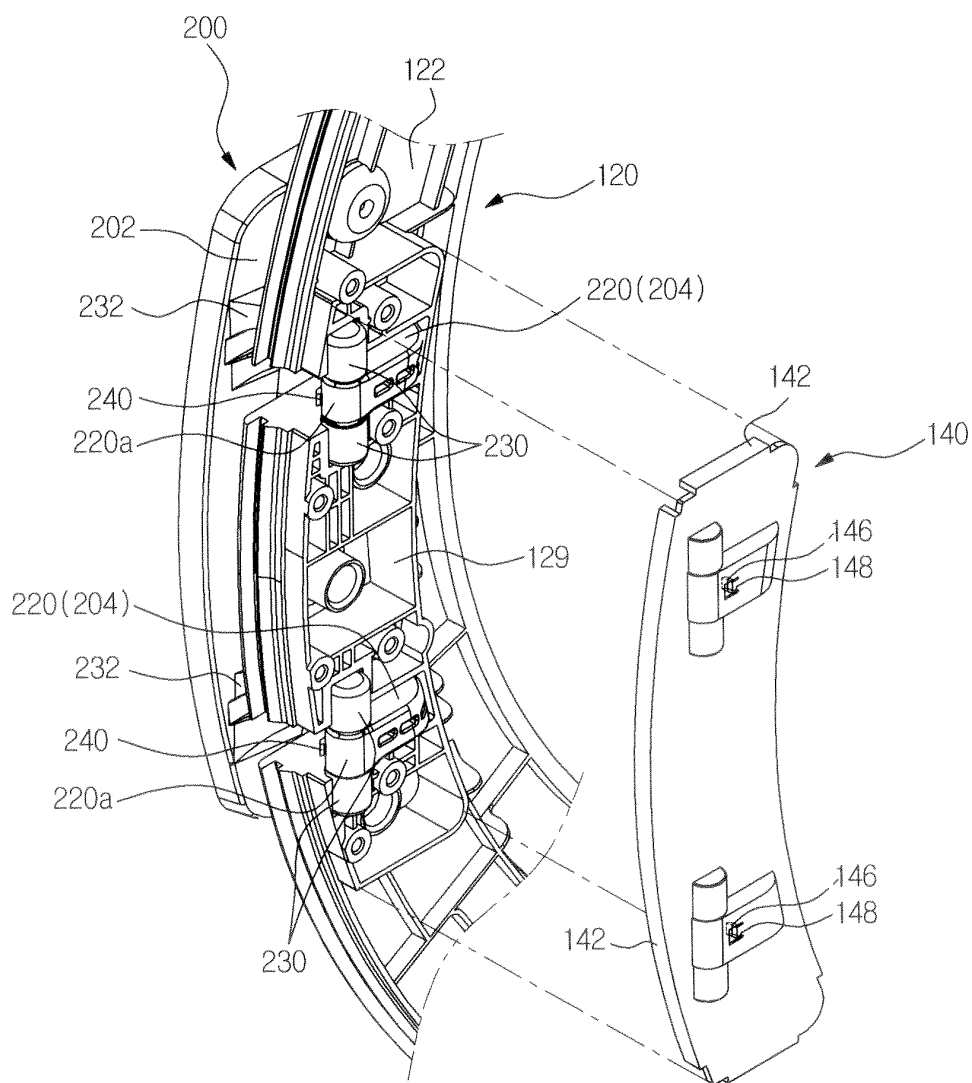


FIG. 6

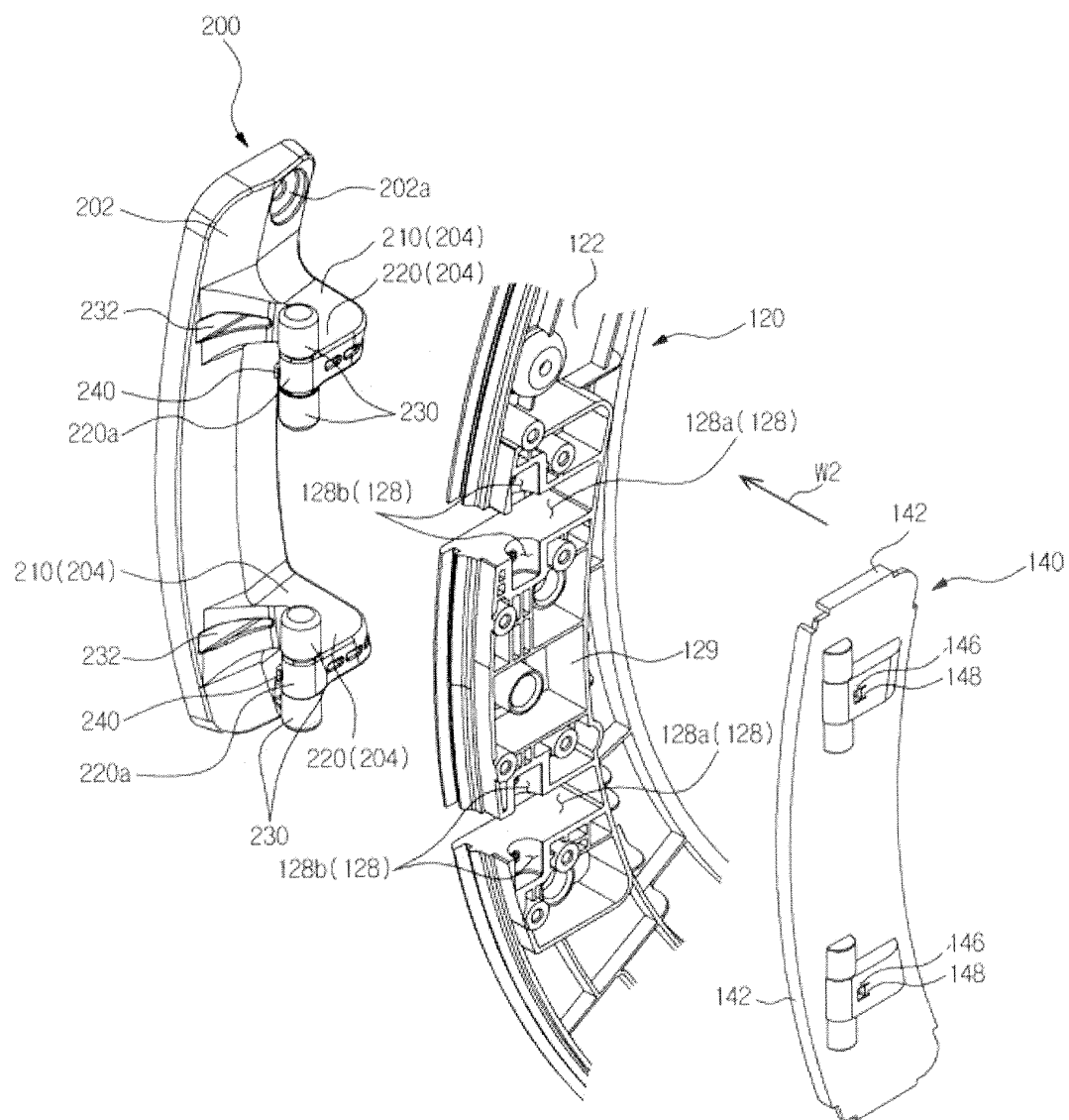


FIG. 7

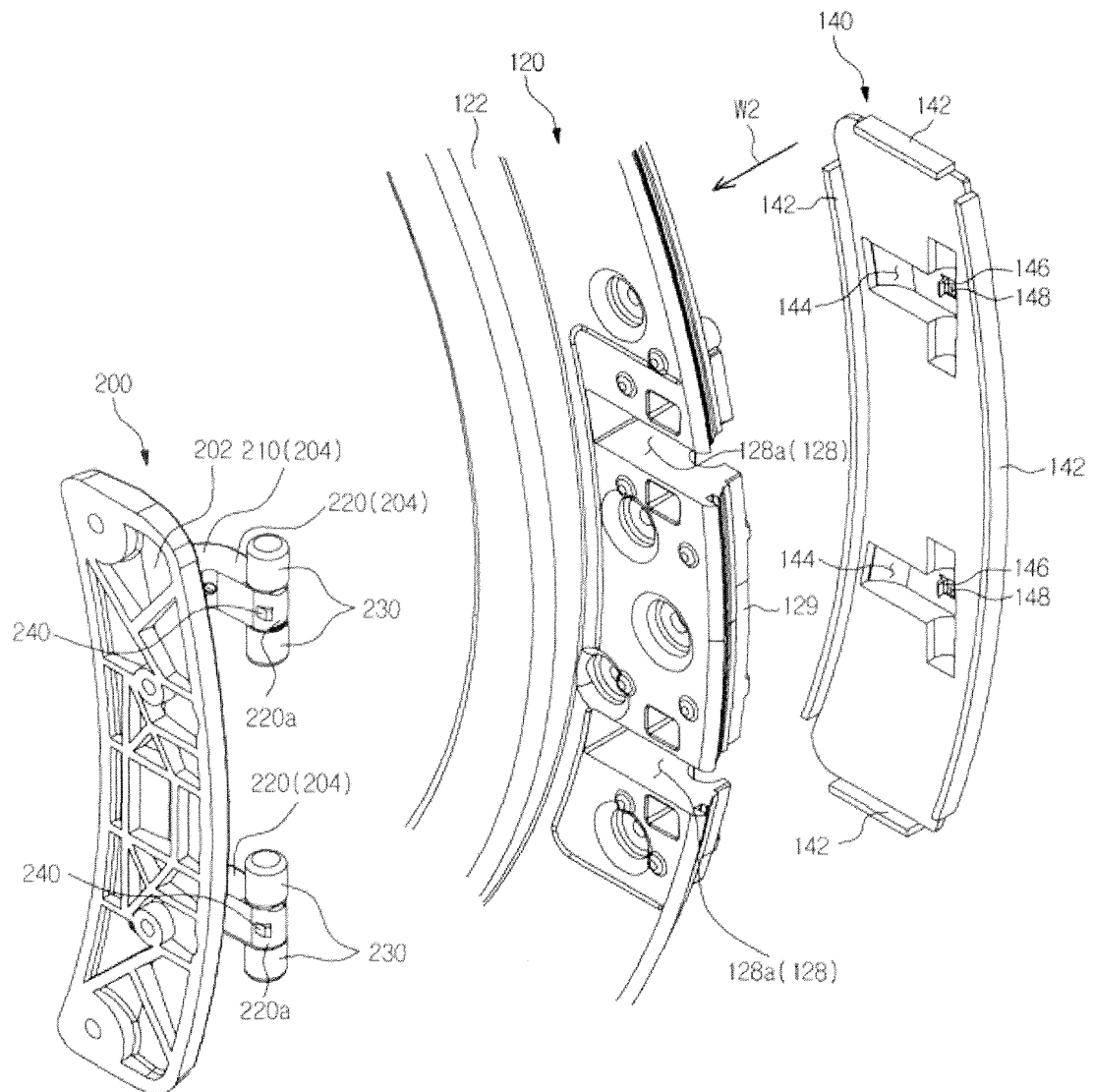


FIG. 8

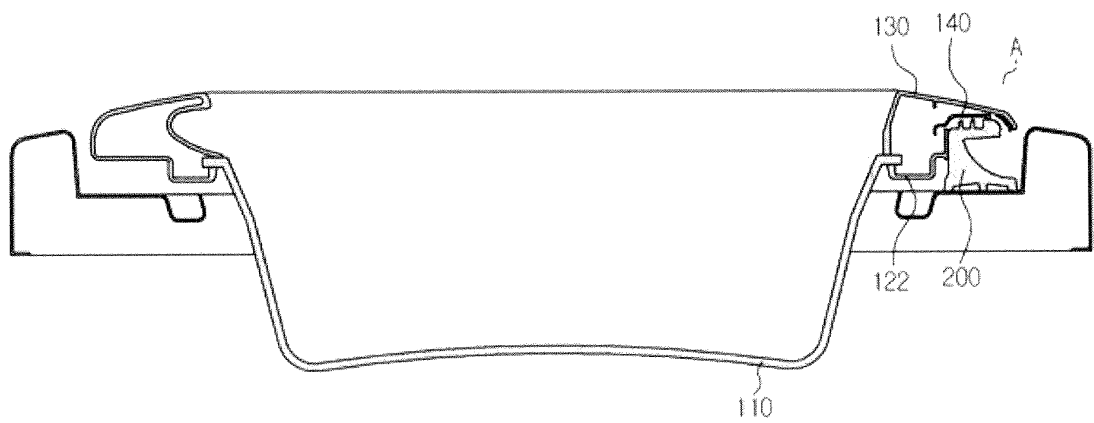


FIG. 9

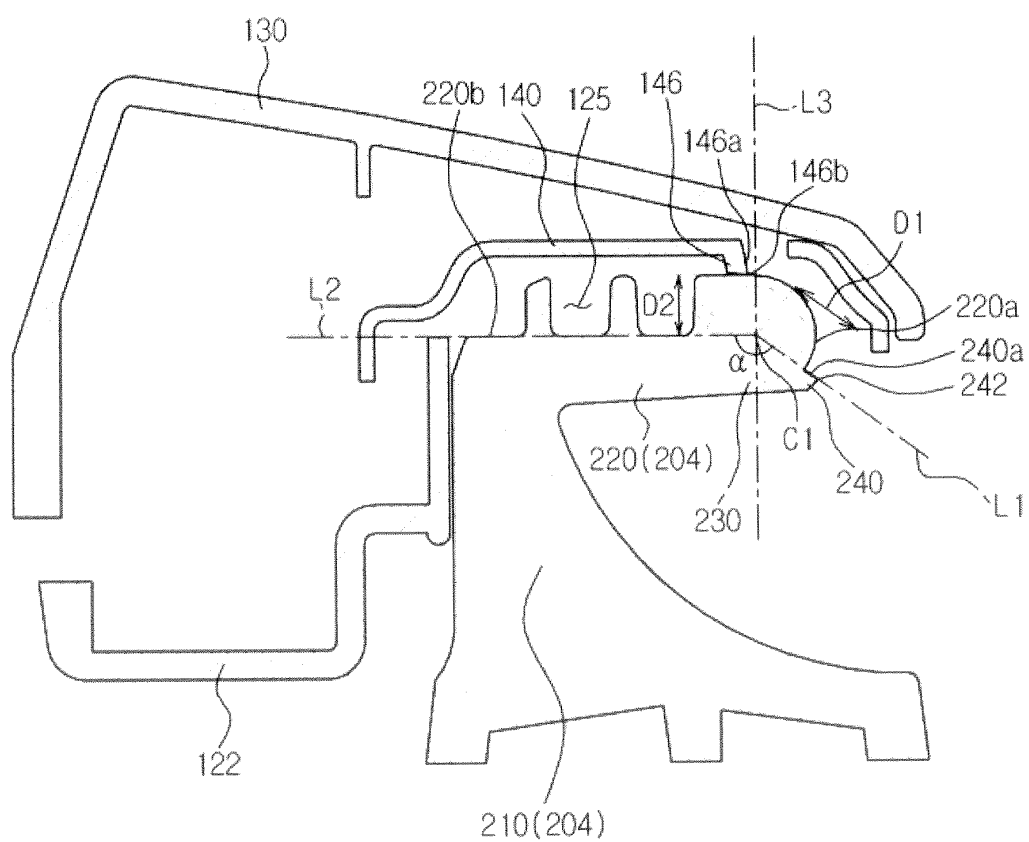


FIG. 10

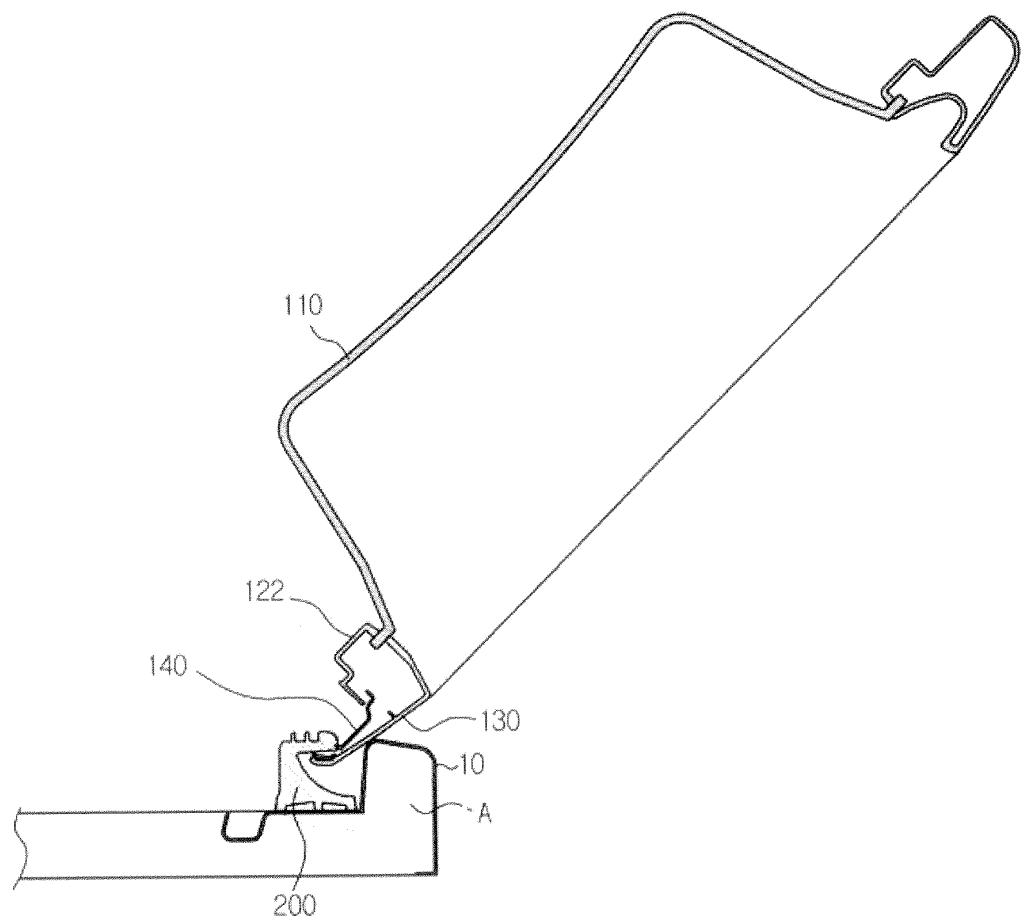


FIG. 11

