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

(11) EP 2 740 835 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.06.2014 Bulletin 2014/24

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

(21) Application number: **13192925.9**

(22) Date of filing: **14.11.2013**

(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: **07.12.2012 KR 20120141936**

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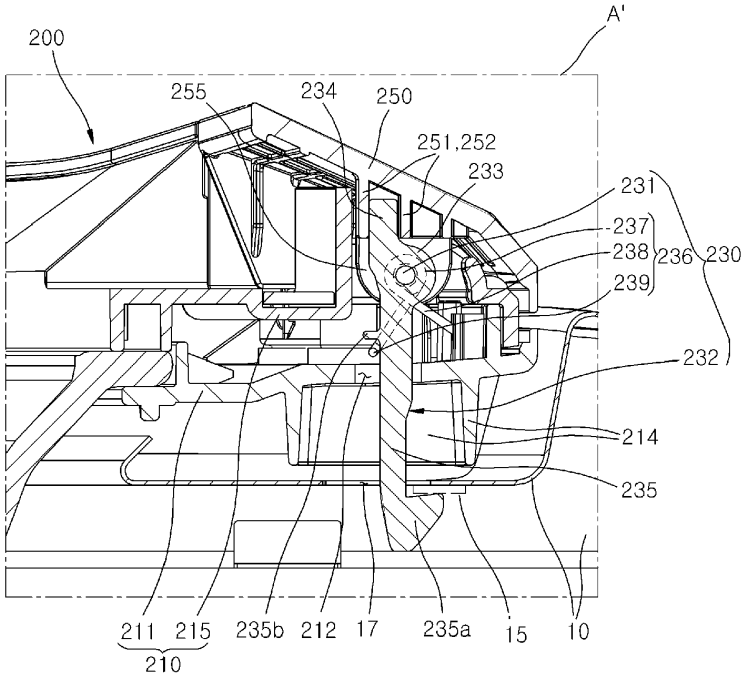
(54) Door apparatus for drum type washing machine

(57) Disclosed herein is a door apparatus (200) for a drum type washing machine, including a door body (210) configured to cover an opening (13) in a cabinet (10) of the drum type washing machine; a locking apparatus (230) including a rotating shaft (231) mounted in the door body (210) and a hook (232) which protrudes towards the cabinet (10) and selectively contacts a receiving surface (15) on or in the cabinet (10); and a door handle (250) including a hook mount (251) configured to receive one end of the hook (232) and separate another end (235a) of the hook (232) from the receiving surface (15) when the door handle (250) rotates around the rotating shaft (231).

FIG. 4



EP 2 740 835 A1

Description

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C 119(a) to Korean Application No. 10-2012-0141936, filed on December 7, 2012 in the Korean Intellectual Property Office, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Exemplary embodiments of the present invention relate to a door apparatus for a drum type washing machine, and more particularly, to a door apparatus for a drum type washing machine mounted on a front portion of a cabinet and configured to open and close a laundry inlet.

[0003] A drum type washing machine is an apparatus which washes laundry using water while rotating a drum by a driving force from a motor in which detergent, washing water, and laundry are added to the drum.

[0004] In general, the drum type washing machine includes a housing forming an external appearance, a cylindrical tub in the housing and having the washing water added therein, a rotatable cylindrical drum in the tub to wash the laundry, a driving motor, a rotating shaft on a back portion of the tub to rotate the drum, and a door on a front portion of the housing.

[0005] An upper front portion of the housing is provided with a detergent box that stores detergent and that includes a washing water supply pipe in the back thereof, which receives water from an outside source and supplies the received water to the detergent box.

[0006] The washing water passing through the detergent box enters the tub through a feed pipe which connects the detergent box to an upper portion of the tub. The water subsequently enters the drum in the tub and contacts the laundry.

[0007] An inner circumference of the drum is provided with a plurality of lifters which protrude or extend inwardly and are spaced from each other. When the drum rotates, the drum performs the washing by applying a physical force to the laundry as the laundry and the washing water are lifted upward by each lifter and then fall downward.

[0008] The front of the tub and the drum have openings, and thus when the door is opened, the laundry may be put in the drum or taken out from the drum through the openings. When the door is closed, the tub and the drum are sealed from the outside, and the laundry may be washed by the supply of the washing water and the rotation of the drum.

[0009] The used washing water from the washing process is discharged outside the tub through a drainage pump and a drain pipe.

[0010] An example of related art may include KR Patent No. 10-0255707 (registered on February 16, 2000: Drum Type Washing Machine).

[0011] For implementing slimness of the door for the drum type washing machine, a length of a locking apparatus for fixing the door to the cabinet, in particular, a hook member mounted as a component of the locking apparatus, may be shortened or miniaturized.

[0012] In this case, the length of the portion of the hook protruding or extending outside the door is kept as it is, but the length of the portion of the hook inserted into the door frame is reduced or shortened, and if necessary, a plurality of rotating members for interworking a door handle with the hook member are provided.

[0013] Therefore, since the door handle needs to be pulled back by a larger force or at a rotating angle, the door opening and closing force (operation sense) is reduced or the interlocking between the door handle and the hook member and between the rotating members is not stable, and abnormalities may occur in the locking performance of the door.

SUMMARY

[0014] Embodiments of the present invention relate to a door apparatus for a drum type washing machine, including a door body configured to cover an opening in a cabinet of the drum type washing machine; a locking apparatus including a rotating shaft in the door body and a hook that extends towards the cabinet, selectively configured to contact, clasp, grasp, or hook or catch to a receiving surface in the cabinet; and a door handle including a hook mount configured to receive one end of the hook and separate another end of the hook from the receiving surface when the door body rotates around the rotating shaft.

[0015] The door body may include a rear frame configured to abut to or the opening of the cabinet, including a through hole through which the hook penetrates; and a front frame coupled to a front portion of the rear frame, including a shaft support that supports opposed ends of the rotating shaft.

[0016] The through hole may have a slit, square, rectangular, round, oval and/or elliptical shape and correspond to a rotating width of the hook (e.g., on the rear frame).

[0017] A circumference of the through hole in the rear frame may include a protruding cover that protrudes or extends towards the cabinet side.

[0018] The shaft support may include a first support configured to support one end of the rotating shaft; and a second support spaced apart or separate from the first support, having the hook therebetween and/or configured to support another (e.g., opposite) end of the rotating shaft.

[0019] The rear frame may include an auxiliary support that protrudes or extends towards the shaft support, configured to support the rotating shaft together with the shaft support.

[0020] The hook may include a shaft connection con-

nected or coupled to the rotating shaft; a handle connection extending from the shaft connection (or a one portion thereof) towards the door handle and configured to fit in the hook mount; and a lock extending from the shaft connection (e.g., another portion of the shaft connection) toward the cabinet, and including a hook that selectively contacts the receiving surface.

[0021] When the door handle is pulled back (e.g., in a first direction), the handle connection connected to the door handle may rotate in the first direction around the rotating shaft, and the lock may be spaced apart or separate from the receiving surface and configured to rotate in the same direction (e.g., clockwise or counter-clockwise) or in a second direction (e.g., left or right) opposite to the first direction.

[0022] The lock or locking apparatus may further include an elastic member which elastically presses the hook toward the receiving surface, and the elastic member may include one or more windings (which may be formed by winding a wire) having a ring, coil or spiral shape, configured to fit around a circumference of the rotating shaft; one or more fasteners at an end of the winding(s) and configured to be fixed or fastened to the door body; and a hook pressure part configured to abut to or contact the hook and elastically press the hook towards the fastener.

[0023] The hook mount may include one or more protrusions or cross-braces defining a space configured to receive one end of the hook; one or more external reinforcing ribs connected to an outer surface of the protrusion(s) or cross-brace(s); and one or more internal reinforcing ribs in or on an inner surface of the protrusion(s) or cross-brace(s).

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The above and other aspects, features and other advantages will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0025] FIG. 1 is a perspective view illustrating a drum type washing machine including an exemplary door apparatus in accordance with one or more embodiments of the present invention;

[0026] FIG. 2 is a diagram illustrating the drum type washing machine in which the exemplary door in accordance with embodiment(s) of the present invention is closed;

[0027] FIG. 3 is a cross-sectional view illustrating the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention taken along the line A-A of FIG. 2;

[0028] FIG. 4 is an enlarged cross-sectional view of the portion A' in FIG. 3;

[0029] FIG. 5 is a cross-sectional view illustrating the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention taken along the line B-B of FIG. 2;

[0030] FIG. 6 is an enlarged cross-sectional view of the part B' in FIG. 5;

[0031] FIG. 7 is an exploded perspective view of main parts illustrating the part C in FIG. 2 in the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention from the front;

[0032] FIG. 8 is an exploded perspective view of main parts illustrating the portion C in FIG. 2 in the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention from the back;

[0033] FIG. 9 is an assembly view for describing an assembling structure of the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention; and

[0034] FIG. 10 is a perspective view of main parts illustrating the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention from the back.

DETAILED DESCRIPTION

[0035] Hereinafter, various embodiments of a door apparatus for a drum type washing machine in accordance with the present invention will be described with reference to the accompanying drawings. During the process, a thickness of lines, a size of components, or the like, illustrated in the drawings may be exaggeratedly illustrated for clearness and convenience of explanation.

[0036] Further, the following terminologies are defined in consideration of the functions in the present invention and may be construed in different ways by intention or practice of users and operators. Therefore, the definitions of terms used in the present description should be construed based on the contents throughout the specification.

[0037] FIG. 1 is a perspective view illustrating a drum type washing machine including an exemplary door apparatus in accordance with one or more embodiments of the present invention, and FIG. 2 is a diagram illustrating the drum type washing machine in which the exemplary door apparatus in accordance with embodiment(s) of the present invention is closed.

[0038] FIG. 3 is a cross-sectional view illustrating the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention taken along the line A-A of FIG. 2, and FIG. 4 is an enlarged cross-sectional view of the portion A' of FIG. 3.

[0039] FIG. 5 is a cross-sectional view illustrating the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention taken along the line B-B of FIG. 2, and FIG. 6 is an enlarged cross-sectional view of the part B' of FIG. 5.

[0040] FIG. 7 is an exploded perspective view illustrating main parts of the part C in FIG. 2 in the exemplary door apparatus for a drum type washing machine in ac-

cordance with embodiment(s) of the present invention from the front, and FIG. 8 is an exploded perspective view illustrating main parts of the part C in FIG. 2 in the illustrating door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention from the back.

[0041] FIG. 9 is an assembly view for describing an assembling structure of the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention, and FIG. 10 is a perspective view illustrating main parts of the exemplary door apparatus for a drum type washing machine in accordance with embodiment(s) of the present invention from the back.

[0042] Referring FIGS. 1 to 3 and 5, a door apparatus (or door) 200 for a drum type washing machine in accordance with embodiment(s) of the present invention includes a door body 210, a locking apparatus (or lock) 230, and a door handle 250.

[0043] The door body 210 covers an opening 13 in a cabinet 10. Laundry is added through the opening 13 illustrated in FIG. 1. As illustrated in FIGS. 1-2, the door 200 is configured to open and close the opening 13 by rotating on one or more hinges or joints adjacent to the opening 13.

[0044] The locking apparatus 230 includes a hook 232, which may selectively hook to, catch on or grasp a receiving surface 15 (see FIG. 4) in or on the cabinet 10, and a rotating shaft 231 which rotatably supports the hook 232 and is mounted in the door body 210.

[0045] The door handle 250 includes a hook mount 251 configured to receive and secure one end of the hook 232. The hook mount 251 is at a front (upper portion of FIG. 3 and left of FIG. 5) of the locking apparatus 230, and is secured by the rotating shaft 231.

[0046] When a user pulls the door handle 250 back, the door handle 250 rotates around the rotating shaft 231, and the hook end 235a (FIG. 4) of the hook 232 detaches from the receiving surface 15 while rotating together with the other end of the hook 232 connected to the door handle 250.

[0047] Referring to FIGS. 4, 6, 7, and 8, the door body 210 in accordance with embodiment(s) of the present invention includes a rear frame 211 and a front frame 215.

[0048] The rear frame 211 forms a rear portion of the door body 210 which contacts a circumference of the opening 13 of the cabinet 10. A position in the rear frame 211 corresponding to the locking apparatus 230 includes a through hole 212 through which the hook 232 penetrates.

[0049] A circumference of the through hole 212 of the rear frame 211 includes a cover 214 that extends or protrudes towards the cabinet 10.

[0050] The through hole 212 may have a slit shape corresponding to a rotating width of the hooked end 235a of the hook 232. The through hole 212 may alternatively have a square or rectangular shape (with or without rounded corners), or a round, oval or elliptical shape. As the hook 232 is biased to one side of the through hole 212, a portion of the through hole 212 is open at all times.

[0051] The cover 214 is at or around the circumference of the through hole 212 and is configured to prevent foreign material from flowing along the rear surface of the rear frame 211, sticking to the rear surface of the rear frame 211, or the like from entering the through hole 212.

[0052] A laundry washing operation is performed when the opening 13 is closed by rotating the door body 210 until it contacts the cabinet 10 as illustrated in FIG. 2 and the hook 232 latches onto the cabinet 10 as illustrated in FIG. 4.

[0053] When the cover 214 has a depth and/or width that may offset a gap between the rear frame 211 and the cabinet 10, it is possible to prevent foreign material, such as water, from entering the through hole 212 or a hole 17 (see FIGS. 4, 7, and 8) abutting to, overlapping or in communication with the through hole 212 or the receiving surface 15 during the washing operation.

[0054] The front frame 215 includes a shaft support 216 which supports opposed ends of the rotating shaft 231. The front frame 215 is coupled with a front portion of the rear frame 211.

[0055] Referring to FIGS. 6, 7, and 8, the shaft support 216 includes a first support 217 and a second support 218 which support opposite ends of the rotating shaft 231. The first support 217 and the second support 218 are spaced apart from each other, and the hook is placed therebetween.

[0056] The first support 217 and the second support 218 may be convex, may extend or protrude forward, and may have a box shape of which the inside may be hollow and the rear side or surface may be open. The first support 217 and the second support 218 may be on the same shaft as the rotating shaft 231.

[0057] One end of the rotating shaft 231 fits in the first support 217, and the opposite end of the rotating shaft 231 is supported in a vertical direction and fits in the second support 218.

[0058] Hereinafter, for convenience of explanation, the lower portion of the shaft support 216 is referred to as the first support 217 and the upper portion of the shaft support 216 is referred to as the second support 218.

[0059] Referring to FIGS. 6, 7, and 9, the hook 232 is between the first support 217 and the second support 218, and the rotating shaft 231 may sequentially penetrate through an upper portion of the first support 217, the hook 232, and a lower portion of the second support 218.

[0060] The rear frame 211 includes an auxiliary support 213 supporting the upper end of the rotating shaft 231. The auxiliary support 213 extends or protrudes toward an inside of the second support 218, together with the second support 218.

[0061] The auxiliary support part 213 abuts to or contacts the upper end of the rotating shaft 231 and is configured to stably support the upper end of the rotating shaft 231 at a plurality of places, together with the second

support part 218. Further, the auxiliary support part 213 includes a hanging surface abutting to or contacting the other end of the rotating shaft 231 to confine the upward movement of the rotating shaft 231.

[0062] Referring to FIGS. 6 to 9, the locking apparatus 230 in accordance with embodiment(s) of the present invention includes the rotating shaft 231, the hook 232, and an elastic member 236.

[0063] The rotating shaft 231 forms the rotating shaft of the door handle 250 and the rotating shaft of the hook 232. The rotating shaft 231 abuts to or contacts the first support part 217, the second support part 218, and the auxiliary support part 231 in a vertical direction at a plurality of places or locations, and is supported in a vertical direction.

[0064] The hook 232 is rotatably mounted on the rotating shaft 231 and extends from the door body 210 into the cabinet 10 when the door 210 closes. The hook 232 locks the locking apparatus 230 to the cabinet 10 when the end 235a of the hook 232 is on the receiving surface 15 of the cabinet 10.

[0065] The elastic member (or spring or coil) 236 elastically press the hook 232 to the receiving surface 15 to maintain the end 235a of the hook 232 on the receiving surface 15 as illustrated in FIGS. 4, 6, and 10 when the door handle 250 is not pulled back.

[0066] Referring to FIGS. 8 to 9, the hook 232 in accordance with embodiment(s) of the present invention includes a shaft connection 233, a handle connection 235, a lock 235, and a spring mount 235b.

[0067] The shaft connection 233 is coupled or connected to the rotating shaft 231, and the rotating shaft 231 penetrates through the shaft connection 233. The shaft connection 233 may have a cylindrical shape, be integral with other part(s) of the hook 232, and have a cylindrical hole in a center thereof configured to receive the rotating shaft 231.

[0068] The handle connection 234 extends from one side (e.g., a front portion) of the shaft connection 233 towards the door handle 250 (e.g., a front of the washing machine), and is inserted into the hook receiver 251 and fixed in place when the elastic member is on the hook mount 251.

[0069] The lock 235 includes a hook part 235a which contacts the receiving surface 15 and extends from the back portion of the shaft connection 233 towards the cabinet 10 (e.g., the back portion of the washing machine).

[0070] Referring to FIG. 2, when the door handle 250 is pulled back to the front right (a first direction), and the door 210 is open, the handle connection 234 and the door handle 250 rotate together to the right (the first direction) around the rotating shaft 231. In this case, the lock 235 is away from the receiving surface 15 as it rotates to the left (a second, or opposite, direction).

[0071] The spring mount 235b is at one side (e.g., the left side in FIGS. 3 and 4) of the lock 235 which abuts to or contacts a hook pressure part or strut 239 of the elastic member 236 and confines the movement of the hook pressure part 239.

[0072] The elastic member 236 is assembled with the hook 232 so that the hook pressure part 239 may contact the spring mount 235b. As a result, the assembled locking apparatus 230 may easily and reliably (constantly) perform its function(s).

[0073] Further, during the rotation of the hook 232, the hook pressure part 239 contacts the hook 232 without being lifted from the hook 232, and an elastic force from the elastic member 236 may be stably applied to the hook 232.

[0074] Referring to FIGS. 4, 9, and 10, the elastic member 236 in accordance with embodiment(s) of the present invention may comprise a torsion spring that includes a winding 237, a fastener or clasp 238, and the hook pressure part or strut 239.

[0075] The winding 237 may be formed by winding a wire in a ring or coil shape. The winding 237 fits around the circumference of the rotating shaft 231.

[0076] The fastener(s) or clasp(s) 238 protrude or extend from an end of the winding 237, which is fixed or mounted to the rear frame 211 of the door body 210.

[0077] In accordance with embodiment(s) of the present invention, the winding 237 is at opposed sides of the hook 232, and the hook pressure part 239 connects a pair of windings 237. The ends of each of the windings 237 include the fasteners 238.

[0078] The hook pressure part 239 is at a position corresponding to the hook 232 to abut to or contact the lock 235 or the spring mount 235b of the hook 232.

[0079] Referring to FIGS. 4 and 10, the hook pressure part 239 extends in a direction opposite to a direction that the fastener 238 extends, to have a shape crossing to the fastener 238.

[0080] The end of each fastener 238 is above the receiving surface 15 of the cabinet 10 and adjacent to the rotating shaft 231. The end of the hook pressure part 239 abuts to or contacts the hook 232 at an opposite side to the fastener(s) 238 relative to the rotating shaft 231, to elastically press the hook 232 towards the fastener(s) 238 (e.g., to force the hook part 235a towards the receiving surface 15).

[0081] Even though the door handle 250 separates the hook 232 from the receiving surface 15 when the door handle 250 is pulled back, when the pressure force pulling the door handle 250 back is released, the hook rapidly rotates to its original (latched, or door closed) position by the elastic member 236 and contacts the receiving surface 15.

[0082] Referring to FIG. 9, the door handle 250 in accordance with embodiment(s) of the present invention includes a hook mount 251, a hinge connection 255, and an auxiliary connection 256.

[0083] The hook mount 251 includes a groove or opening into which the handle connection 234 of the hook 232 fits. The hook mount 251 protrudes or extends towards the hook 232 or cabinet 10 from a back portion or surface of the door handle 250.

[0084] The hinge connection 255 is protrudes or extends towards the hook 232 or cabinet 10 and supports the rotating shaft 231. In one embodiment, a pair of hinge connections 255 each supports a middle portion of the rotating shaft 231 (e.g., at opposite sides of the hook 232) and the elastic member 236 (that is, the upper portion and the lower portion of the hook 232 and the elastic member 236). In accordance with embodiment(s) of the present invention, the rotating shaft 231 penetrates through a round or cylindrical opening in the hinge connection(s) 255.

[0085] The auxiliary connection 256 protrudes or extends towards the rotating shaft 231 at a position separate from the hinge connection part 255. The auxiliary connection 256 connects to the end of the rotating shaft 231 and rotatably supports the rotating shaft 231. In accordance with embodiment(s) of the present invention, the rotating shaft 231 penetrates through a round or cylindrical opening in the auxiliary connection part 256.

[0086] A portion of the auxiliary connection 256 may be inserted into the first support 217 by penetrating through a front portion or surface of the first support 217. The portion inserted into the first support 217 receives a lower end of the rotating shaft 231 in the first support part 217.

[0087] The door handle 250 may be stably connected to the middle portion and the end of the rotating shaft 231 at a plurality of places, including the hinge connection 255 and the auxiliary connection 256.

[0088] Referring to FIG. 9, the hook mount 251 in accordance with embodiment(s) of the present invention includes a protrusion or cross-brace 252, one or more external reinforcing ribs 253, and one or more internal reinforcing ribs 254.

[0089] The protrusion or cross-brace 252 extends towards the hook 232, and the inside of the protrusion or cross-brace 252 includes a space into which the handle connection 234 of the hook 232 fits.

[0090] The space in the protrusion 252 has substantially the same width (e.g., in the rotating direction of the hook) as the handle connection 234 of the hook 232, so that the hook mount 251 can connect to the handle connection 234 without a gap therebetween.

[0091] Therefore, when the door handle 250 rotates, the rotating force of the door handle 250 is directly transferred to the handle connection 234, and the rotation of the handle connection 234 is stably performed by interlocking with the rotation of the door handle 250.

[0092] The external reinforcing rib(s) 253 are outside the protrusion 252 and may have a lattice shape. The external reinforcing rib(s) 253 are connected to an outer surface portion of the protrusion 252.

[0093] The internal reinforcing rib(s) 254 protrude inwardly from an inner surface of the protrusion 252 or in the space defined by the protrusion or cross-brace(s) 252. The internal reinforcing rib(s) 254 extend in a direction orthogonal (e.g., in the front and back directions) to the protrusion 252.

[0094] When the door handle 250 is operated or rotated, the rotating force of the door handle 250 is transferred to the hook 232 by the protrusion 252. The protrusion(s) 252 may apply a shear force to the hook 232.

[0095] The external reinforcing rib(s) 253 reinforce the strength of the protrusion 252 at an outer side of the protrusion 252, and the internal reinforcing rib(s) 254 reinforce the strength of the protrusion(s) 252 at an inner side of the protrusion 252.

[0096] The strength of the protrusion(s) 252 are reinforced by the external reinforcing rib(s) 253 and the internal reinforcing rib(s) 254 to implement locking and unlocking operations, while stably transferring the rotating force of the door handle 250 to the hook 232.

[0097] As set forth above, in accordance with embodiments of the present invention, the hook mount confines and/or fits the end of the hook member therein and is at a position at which the end of the hook member is placed or inserted into the door handle, thereby implementing a structure in which the door handle and the hook member, which may be mounted at a right angle to each other, may abut to or contact each other.

[0098] Therefore, in accordance with embodiments of the present invention, the length of the portion of the hook member in the door may be secured using the overall space in the door between the door handle and the rear frame of the door.

[0099] Also, in accordance with embodiments of the present invention, the slimness of the door may be implemented without reducing or miniaturizing the length of the hook member, thereby securing the strength of the hook member. Any reduction in the strength of the hook member, and the risk of damage to the hook member, may be reduced or minimized despite the miniaturization of the hook member.

[0100] Further, in accordance with embodiment(s) of the present invention, the hook member in the locking apparatus of the door may conveniently rotate with a smaller force by pulling the door handle back, thereby stably implementing the locking of the door.

[0101] Although embodiments of the present invention have been described in detail, they are only examples. It will be appreciated by those skilled in the art that various modifications and equivalent other embodiments are possible from the present invention. Therefore, the technical protection scope of the present invention should be defined by the appended claims.

Claims

1. A door apparatus for a drum type washing machine, comprising:

   a door body configured to cover an opening in a cabinet of the drum type washing machine;
   a locking apparatus including a rotating shaft in the door body and a hook that protrudes or ex-

tends toward the cabinet, selectively configured to contact a receiving surface on or in the cabinet; and
a door handle having a hook mount configured to receive one end of the hook and separate another end of the hook from the receiving surface when the door body rotates around the rotating shaft.

2. The door apparatus of claim 1, wherein the door body includes:

a rear frame configured to abut to or contact an opening in the cabinet and having a through hole through which the hook penetrates; and
a front frame coupled to a front portion of the rear frame and having a shaft support that supports opposed ends of the rotating shaft.

3. The door apparatus of claim 1 or 2, wherein the through hole has a slit, square, rectangular, round, oval and/or elliptical shape.

4. The door apparatus of claims 1 to 3, wherein the shape of the through hole corresponds to a rotating width of the hook.

5. The door apparatus of claims 1 to 4, further comprising a cover on or around a circumference of the through hole on the rear frame.

6. The door apparatus of claims 1 to 5, wherein the cover protrudes or extends towards the cabinet.

7. The door apparatus of claims 1 to 6, wherein the shaft support includes:

a first support configured to support one end of the rotating shaft; and
a second support separate from the first support, configured to support another end of the rotating shaft.

8. The door apparatus of claims 1 to 7, wherein the hook is between the first support and the second support.

9. The door apparatus of claims 1 to 8, wherein the rear frame includes an auxiliary support that protrudes or extends towards the shaft support and supports the rotating shaft together with the shaft support.

10. The door apparatus of claims 1 to 9, wherein the hook includes:

a shaft connection connected or coupled to the rotating shaft;
a handle connection protruding or extending from the shaft connection towards the door handle, configured to fit in the hook mount; and
a lock extending from the shaft connection toward the cabinet, and having a hook part which is configured to contact the receiving surface.

11. The door apparatus of claims 1 to 10, wherein the door handle and the handle connection connected to the door handle rotate in a same direction around the rotating shaft.

12. The door apparatus of claims 1 to 11, wherein the lock is separated from the receiving surface and rotates in the same direction or an opposite direction to the door handle and the handle connection.

13. The door apparatus of claims 1 to 12, wherein the locking apparatus further includes an elastic member that elastically presses the hook to the receiving surface.

14. The door apparatus of claims 1 to 13, wherein the elastic member includes:

one or more windings configured to fit around a circumference of the rotating shaft;
a fastener at an end of one or more of the windings and fixed to the door body; and
a hook pressure part configured to abut to or contact the hook and elastically press the hook towards the fastener.

15. The door apparatus of claims 1 to 14, wherein the hook mount includes:

one or more protrusions or cross-braces defining a space configured to receive one end of the hook;
one or more external reinforcing ribs connected to an outer surface part of least one of the one or more protrusions; and
one or more internal reinforcing rib in or on an inner surface of at least one of the one or more protrusions.

FIG. 1

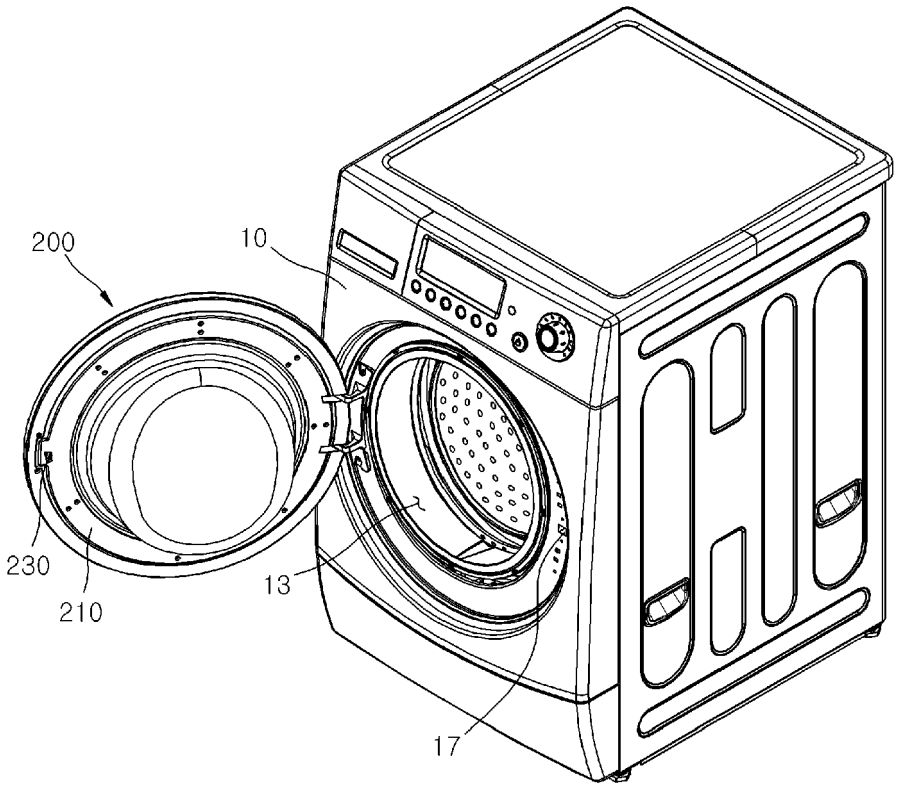


FIG. 2

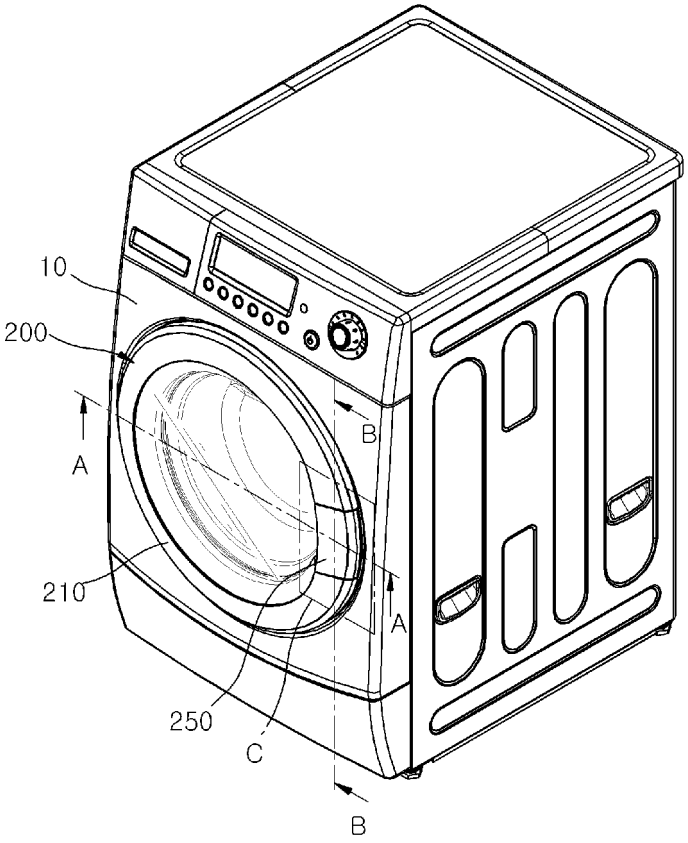
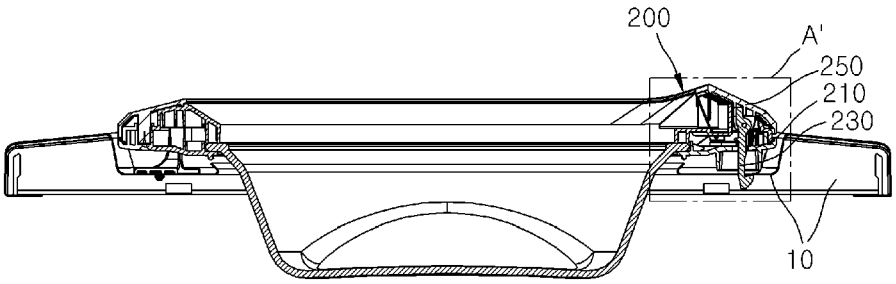


FIG. 3



SECTION A-A

FIG. 4

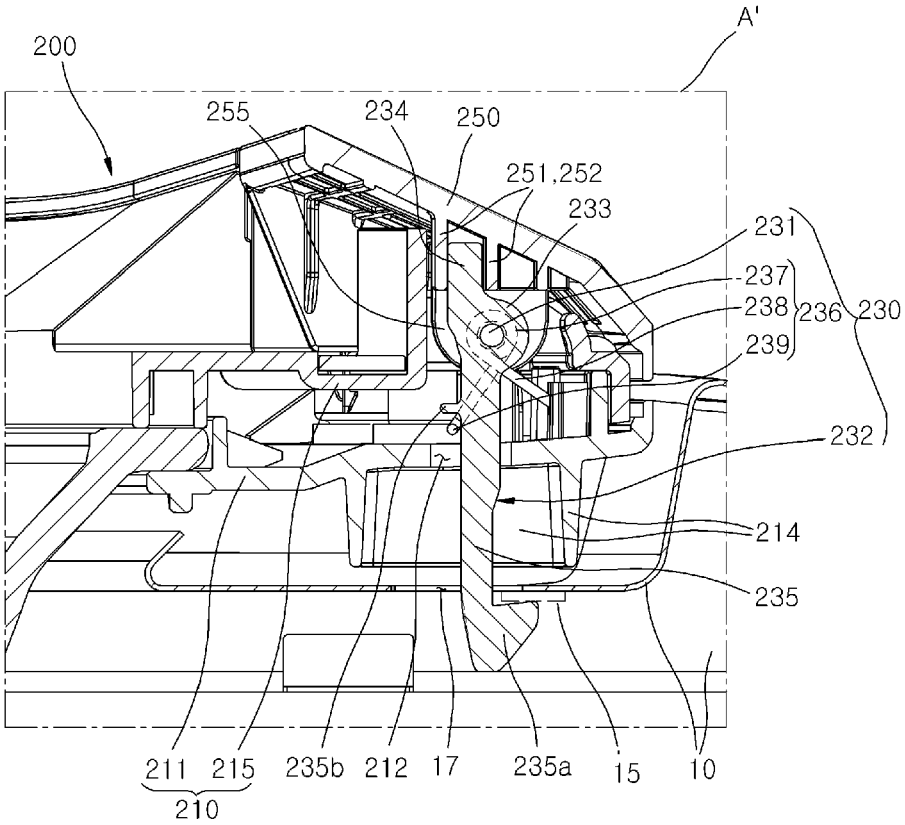
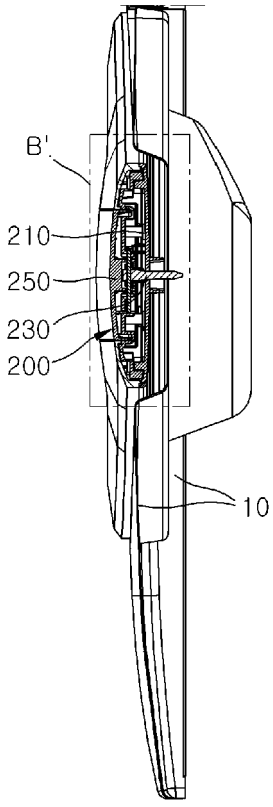


FIG. 5



SECTION B-B

FIG. 6

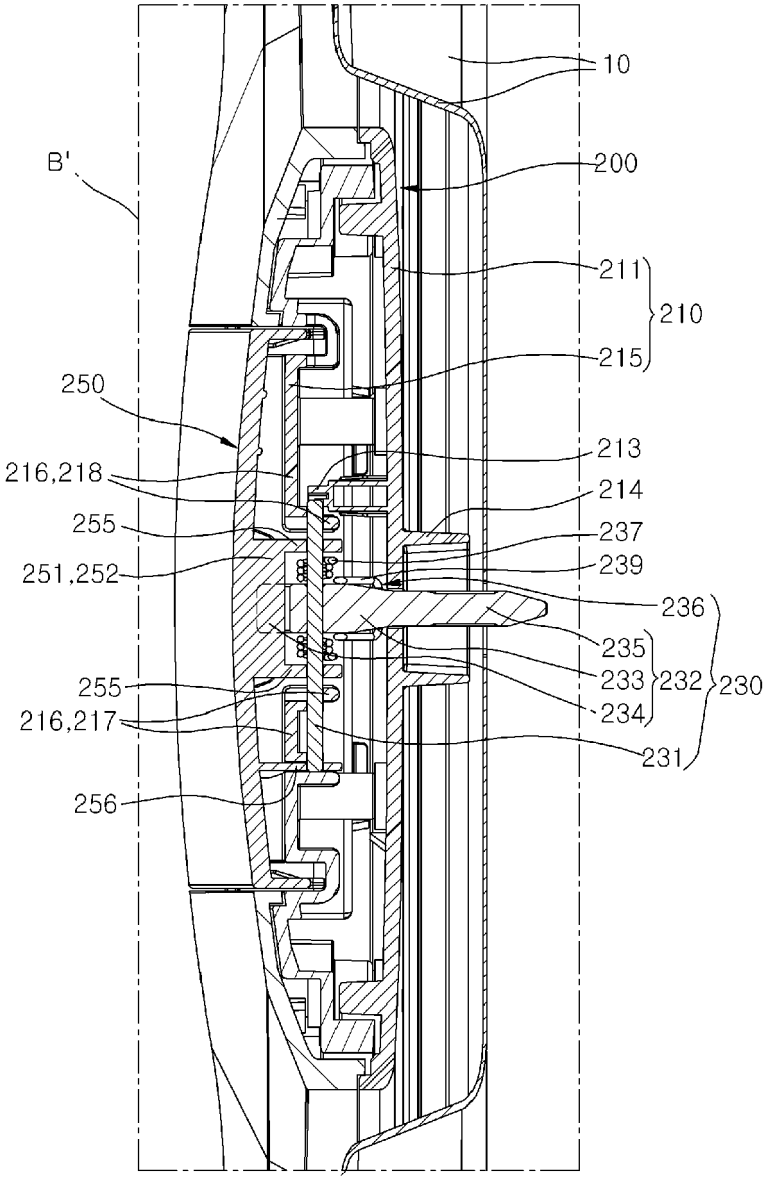

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FIG. 7

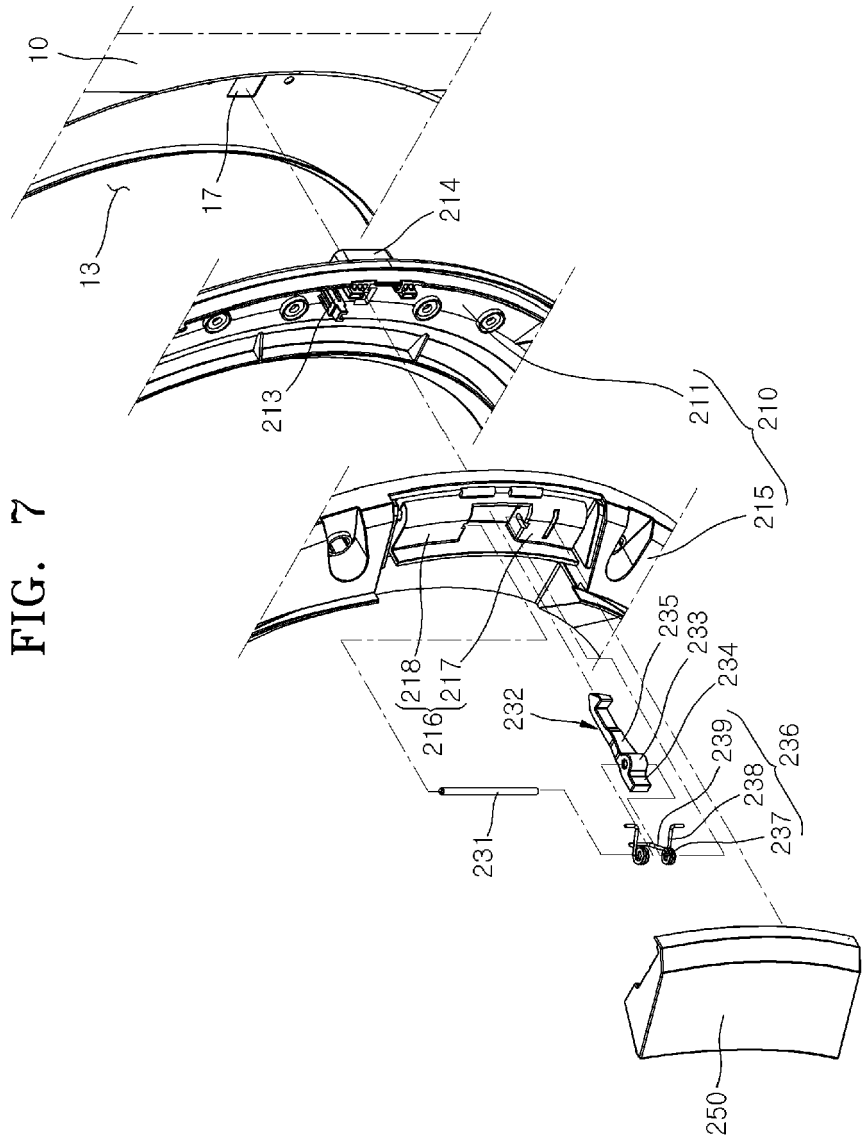
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FIG. 8

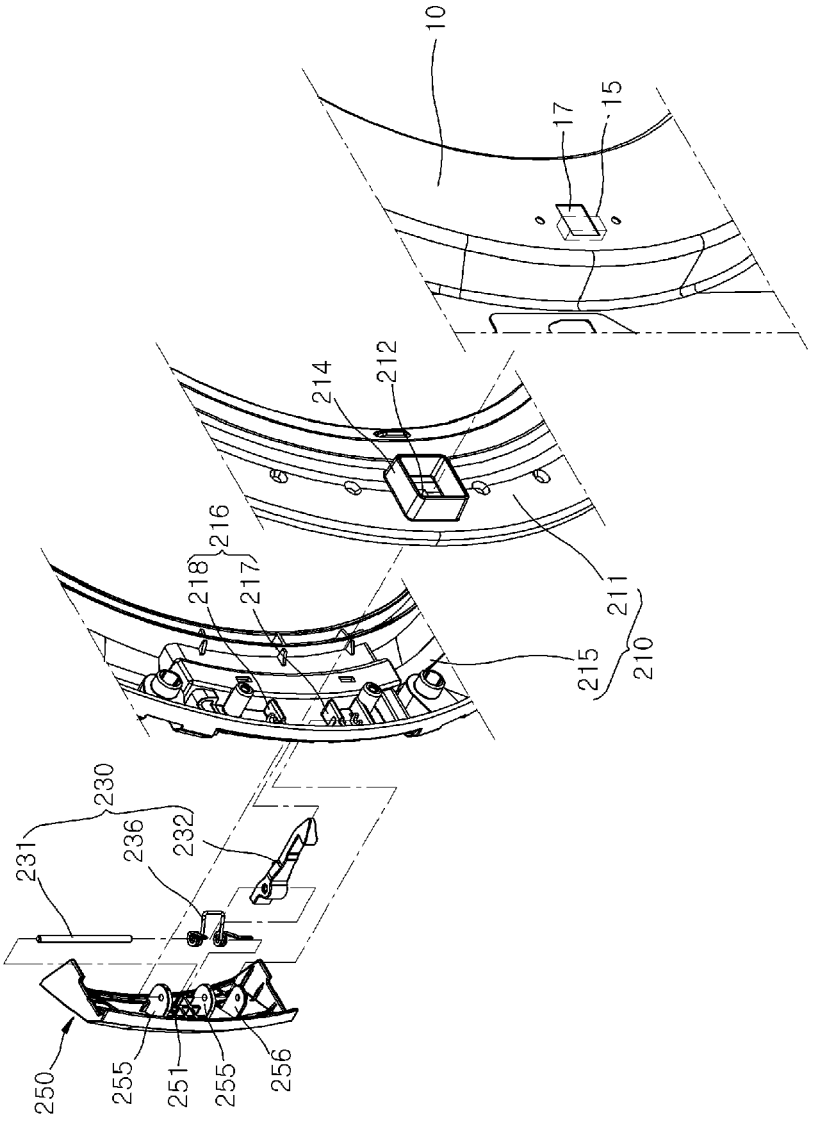
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FIG. 9

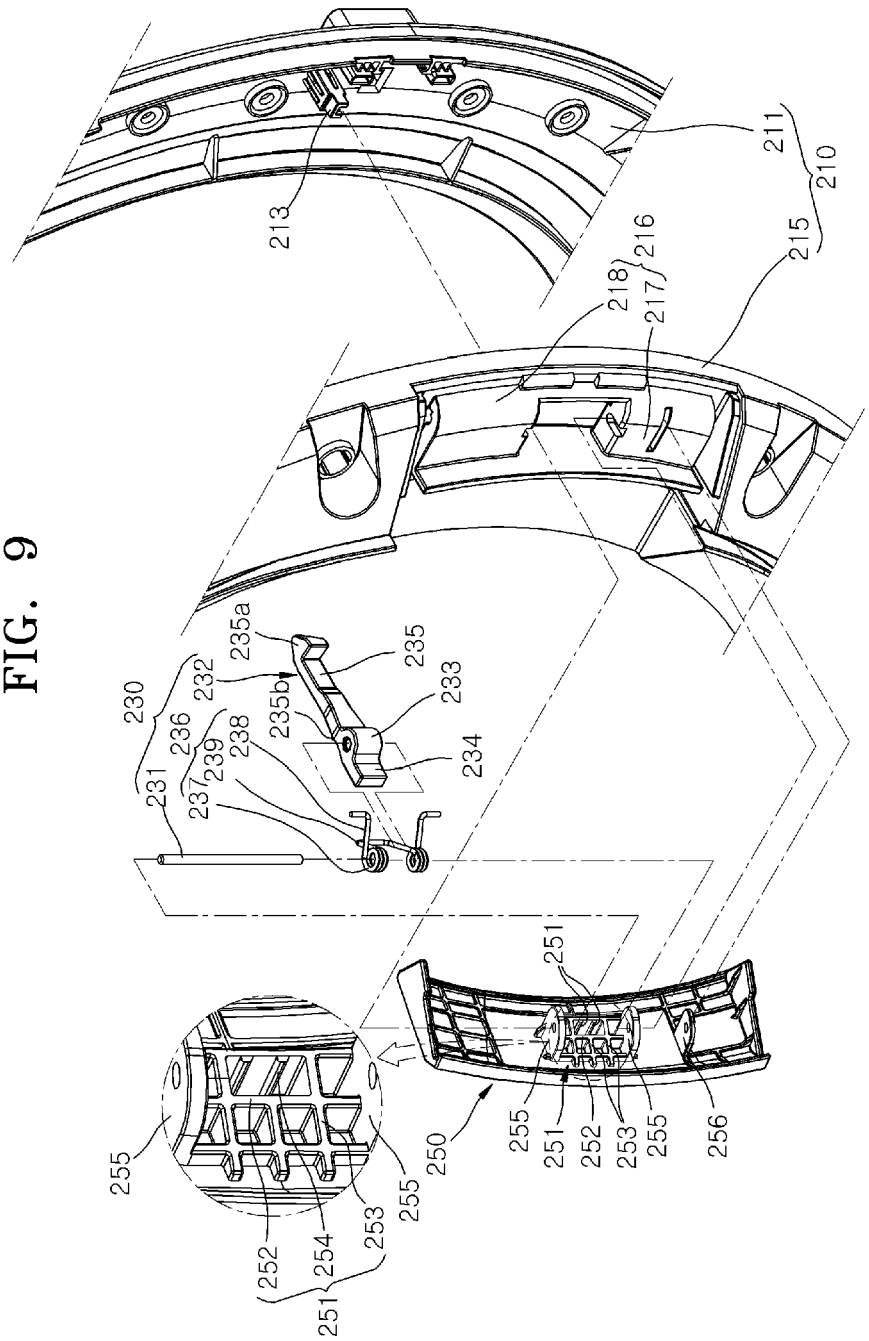
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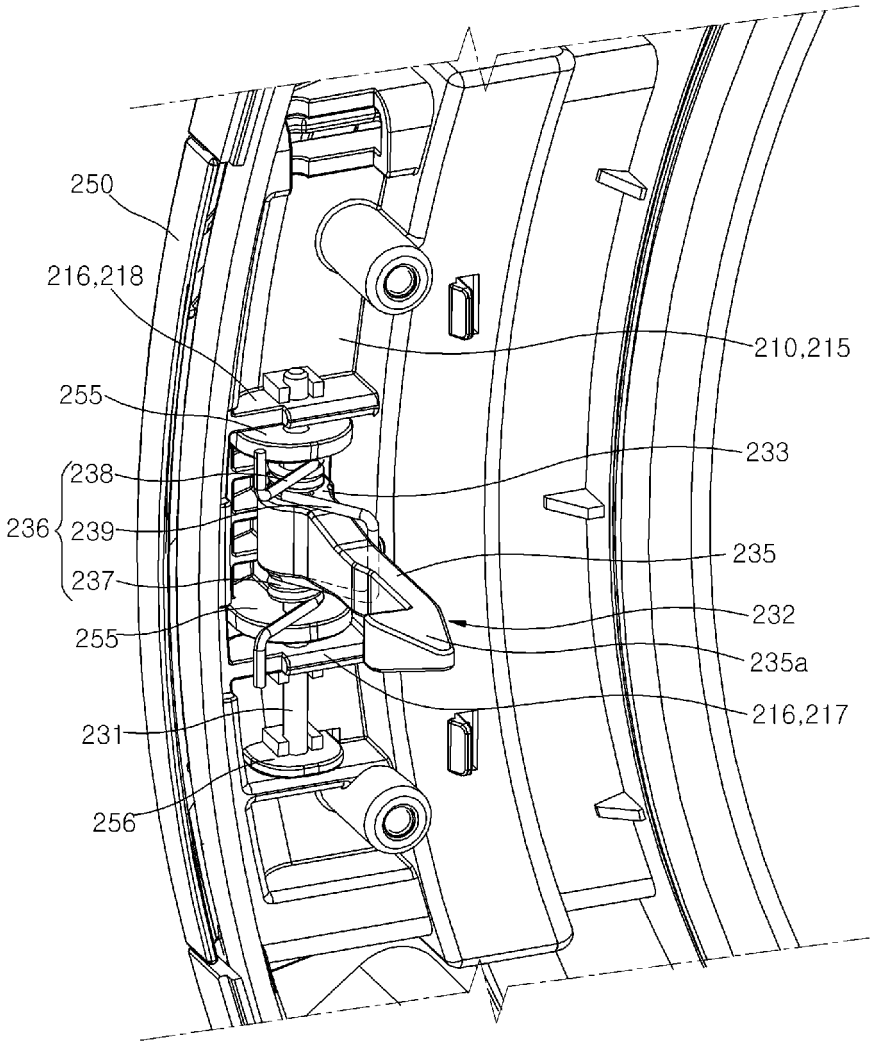
FIG. 10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EUROPEAN SEARCH REPORT

Application Number
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Munich	19 March 2014	Prosig, Christina

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