Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2710699 C 2013/01/29

(11)(21) 2 710 699

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2010/07/21

(41) Mise à la disp. pub./Open to Public Insp.: 2011/01/22

(45) Date de délivrance/Issue Date: 2013/01/29

(30) Priorités/Priorities: 2009/07/22 (KR10-2009-0066980);
2009/07/23 (KR10-2009-0067369);
2009/07/23 (KR10-2009-0067365);
2010/01/22 (KR10-2010-0006141)

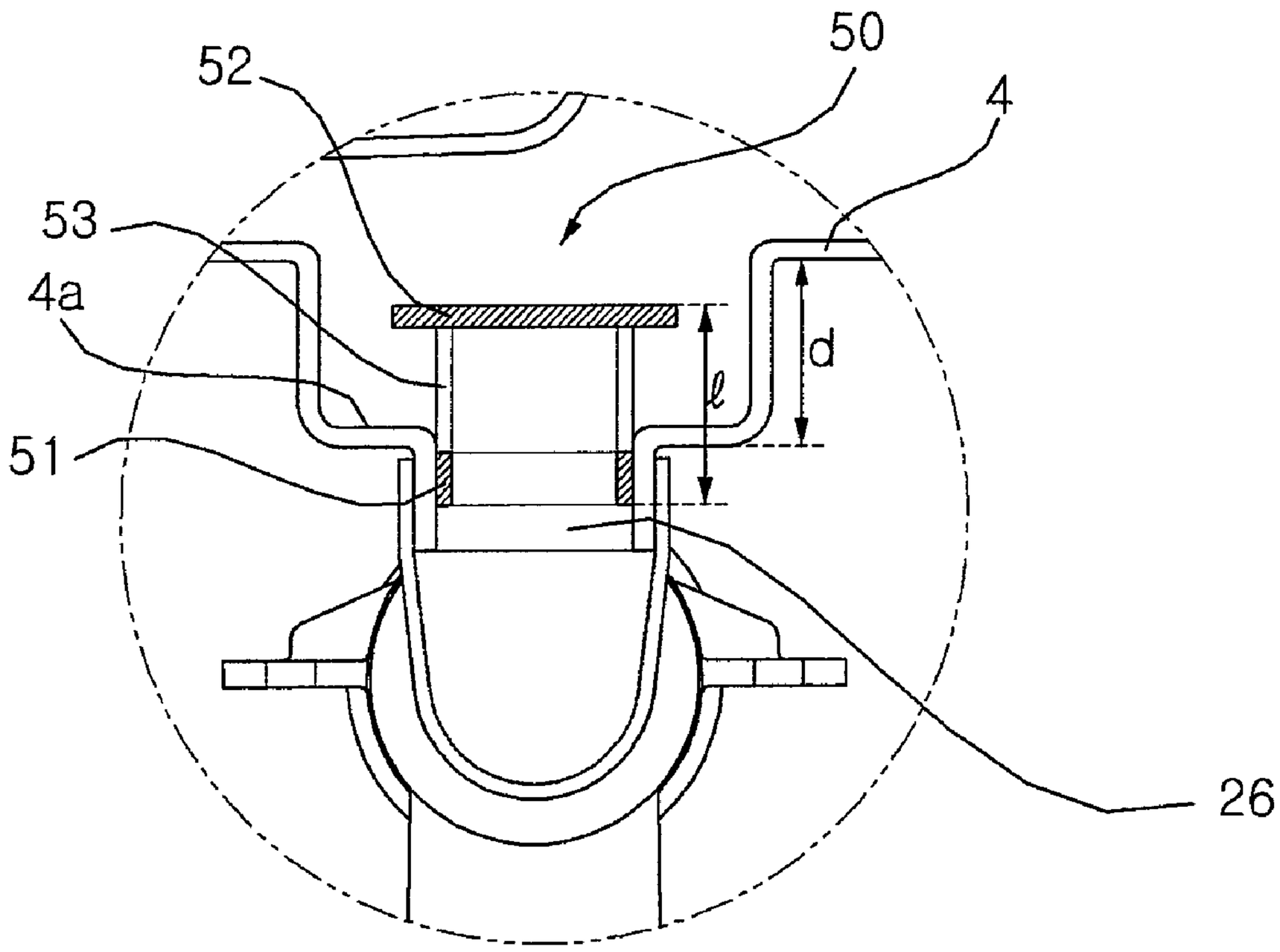
(51) Cl.Int./Int.Cl. *D06F 39/08* (2006.01),
D06F 39/04 (2006.01)

(72) Inventeurs/Inventors:
KIM, YOUNGJONG, KR;
JUNG, KYUNGMUN, KR;
LEE, HYUKSOO, KR

(73) Propriétaire/Owner:
LG ELECTRONICS INC., KR

(74) Agent: SMART & BIGGAR

(54) Titre : MACHINE DE TRAITEMENT DU LINGE
(54) Title: LAUNDRY TREATING MACHINE



(57) Abrégé/Abstract:
The laundry treating machine includes a silencer for covering the upper space over the drain hole, whereby the upper space over the drain hole is always filled with washing water and the generation of a vortex is prevented. Thus, abnormal noise during drainage is prevented, thereby contributing to a quiet operation of the washing machine and improving consumer trust.

ABSTRACT

The laundry treating machine includes a silencer for covering the upper space over the drain hole, whereby the upper space over the drain hole is always filled with washing water and the generation of a vortex is prevented. Thus, abnormal noise during drainage is prevented, thereby contributing to a quiet operation of the washing machine and improving consumer trust.

LAUNDRY TREATING MACHINE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a laundry treating machine, and more particularly, to a laundry treating machine which can reduce noise generated during drainage.

Discussion of the Related Art

Generally, laundry treating machines are classified into washing machines removing dirt or dust from clothes, bedclothes, etc (hereinafter, referred to as 'laundry') by using water and detergent and using mechanical operations, dryers drying wet laundry by using a dry, hot wind generated by a heater and using mechanical operations, and combination washer dryers performing both a washing function and a drying function.

Also, the washing machines may be classified into a top loading type washing machine having a laundry inlet/outlet hole formed in the top surface of a cabinet and through which laundry comes in and out and performing washing using a spinning stream of water generated by the rotation of an inner tub and a drum washing machine having a laundry inlet/outlet hole formed on the front surface of a cabinet and

performing washing by the falling-out of laundry from a high point during the rotation of a drum.

A conventional top loading type washing machine includes a cabinet forming an outer appearance of the washing machine and open at a top surface thereof, a top cover connected to the open top surface of the cabinet, a door rotatable installed on the laundry inlet/outlet hole, a base installed at the bottom of the cabinet, an outer tub installed inside the cabinet and storing water, an inner tub disposed inside the outer tub and performing washing of laundry, a motor unit disposed below the inner tub to rotate the inner tub, a water supply unit for supplying water into the outer tub, and a drain unit for draining the water in the outer tub. Further, the washing machine includes a detergent supply device disposed to communicate with the water supply unit, for supplying detergent along with water.

The drain unit includes a drain hose connected to a drain port formed on the bottom of the outer tub and a drain pump disposed on the drain hose to pump washing water.

However, the conventional top loading type washing machine creates a vortex because of a temporary decrease in the water pressure of the drain port caused by a difference between an amount of drainage and an amount of pumping in an early stage of drainage. If a vortex is generated, air enters through an upper side of the drain port to form an air layer through which no water flows, and abnormal noise is generated in an early stage of drainage due to the air layer. Noise generated during drainage

makes users feel uncomfortable. Moreover, the air layer causes lowering of pumping performance.

Summary of the Invention

In accordance with one aspect of the invention there is provided a laundry treating machine. The laundry treating machine includes an outer tub having a concave groove formed on a bottom surface of the outer tub a drain hole formed in the concave groove of the outer tub for discharging washing water. The laundry treating machine also includes a drain hole cap covering an upper space above the drain hole, the drain hole cap having an entrance part formed at a lateral side of the drain hole cap for causing washing water in the outer tub to flow into the entrance part in a lateral direction when discharging the washing water. A top end of the drain hole cap is disposed below a top end of the concave groove.

The drain hole cap may be spaced apart from a top end of the drain hole by a predetermined distance in the vertical direction for covering the upper space above the drain hole.

The drain hole cap may include an exit part which is formed to be opened so as to be connected with the drain hole for discharging the washing water, a cover part which is disposed separated from the exit part in a vertical direction by a predetermined distance and covering the upper space above the drain hole, and a connection part which connects the exit part and the cover part.

The cover part may be plate shaped and may be larger than a cross-sectional area of the drain hole.

The drain hole cap may be cylinder shaped and a side surface and a bottom surface of the drain hole cap may be opened, and a part of a lower body of the drain hole cap may be inserted into the drain hole.

In accordance with another aspect of the invention there is provided a laundry treating machine. The laundry treating machine includes an outer tub which has a drain hole formed for discharging washing water. The laundry treating machine also includes a plate shaped drain hole cover which is disposed separated from the drain hole in a vertical direction by a predetermined distance and is formed to cover an upper space above the drain hole. The laundry treating machine further includes a heater which is disposed above the drain hole for heating the washing water. The plate shaped drain hole cover is disposed between the heater and the drain hole.

The plate shaped drain hole cover may include a connection part which may be fixed to the outer tub, and a cover part which extends from the connection part and covers the drain hole by being arranged over the drain hole.

The laundry treating machine may include a concave heater mounting groove formed on a bottom surface of the outer tub and configured to mount the heater thereon and the plate shaped drain hole cover may include a cover part disposed in the heater mounting groove above the drain hole and a connection part which may be bent upward and fixed to a portion of the outer tub which is the outside of the heater mounting groove.

The plate shaped drain hole cover may be connected to the heater.

The plate shaped drain hole cover may include a heater connection part which may be mounted on the top of the heater, and a cover part which is extended from the heater connection part and covers the drain hole by being arranged over the drain hole for preventing noise.

In one aspect, the laundry treating machine thus includes a silencer covering the vertical top of the drain hole, whereby the top of the drain hole is always filled with washing water and the generation of a vortex is prevented. Thus, abnormal noise during drainage is prevented, thereby contributing to a quiet operation of the washing machine and improving consumer trust.

Moreover, as the silencer includes a drain hole cap, the laundry washing machine according to the present invention allows washing water to be introduced in a lateral direction while covering the vertical top of the drain hole. Thus, the drainage of the washing water can be properly carried out, and abnormal noise during drainage can be prevented.

Furthermore, the laundry treating machine has the advantage of simple structure and easy installation since the silencer includes a plate shaped drain hole cover.

In another aspect the laundry treating machine includes a heater cover which is disposed in the heater mounting groove so as to cover the top of the heater and covers the vertical top of the drain hole, washing water is drained after being filled between the heater cover and the drain hole, thereby preventing the generation of a vortex and abnormal noise.

In addition, the laundry treating machine includes a heater cover hole which is formed in the heater cover for emitting heat generated from the heater and assisting in drainage and is disposed at a position not overlapping with the drain hole. Therefore, it is advantageous in that both heat emission and drainage are properly carried out.

Additionally, the laundry treating machine includes a heater cover which is disposed for covering the heater mounting groove. Therefore, it is advantageous in that a washing water stream can be properly formed by eliminating a stepped part of the bottom surface of the outer tub.

Brief Description of the Drawings

The above and features of the present invention will become apparent from the following description of preferred embodiments, given in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a top loading type washing machine according to a first exemplary embodiment of the present invention;

FIG. 2 is a longitudinal cross-sectional view of the washing machine shown in

FIG. 1;

FIG. 3 is a perspective view showing an installation structure of a drain hole cap shown in FIG. 1;

FIG. 4 is an enlarged perspective view of the drain hole cap shown in FIG. 3;

FIG. 5 is a cross-sectional view showing part A of FIG. 2;

FIG. 6 is a cross-sectional view comparing the presence and absence of a drain port cap;

FIG. 7 is a perspective view of a drain hole cap according to a second exemplary embodiment of the present invention;

FIG. 8 is a cross-sectional view of a washing machine according to a third exemplary embodiment of the present invention;

FIG. 9 is a perspective view showing part B of FIG. 8;

FIG. 10 is a perspective view of a silencer shown in FIG. 9;

FIG. 11 is a cross-sectional view taken along line V-V of FIG. 9;

FIG. 12 is a plan view of a silencer according to a fourth exemplary embodiment of the present invention;

FIG. 13 is a perspective view of the silencer shown in FIG. 12;

FIG. 14 is a cross-sectional view taken along line I-I of FIG. 12.

FIG. 15 is a longitudinal cross-sectional view of a washing machine according to a fifth exemplary embodiment of the present invention;

FIG. 16 is a view showing part C of FIG. 15; and

FIG. 17 is a plan view showing a heater cover shown in FIG. 16;

Detailed Description of the Preferred Embodiment

Hereinafter, a top loading type washing machine (hereinafter, referred to as 'washing machine') according to an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 1 is a perspective view of a top loading type washing machine according to a first exemplary embodiment of the present invention, and FIG. 2 is a longitudinal cross-sectional view of the washing machine shown in FIG. 1.

Referring to FIGS. 1 and 2, the washing machine according to the first exemplary embodiment of the present invention comprises a case 1 forming an outer appearance of the washing machine and a leg assembly 10 connected to the bottom of the case 1.

The case 1 comprises a cabinet 2 configured to be open at the top and bottom surfaces and constituting the sides of the washing machine, a top cover installed so as to cover the open top surface of the cabinet 2, and a base 5 installed on the open bottom surface of the cabinet 2.

Within the cabinet 2, there are provided an outer tub 4 for holding water, an inner tub 6 disposed inside the outer tub 4 and receiving laundry therein, a driving mechanism such as a motor 8 for driving the inner tub 6, a water supply assembly for supplying water into the outer tub 4, and a drainage assembly 20 for draining the water

in the outer tub 4 after completion of washing or dehydration.

Moreover, the case 1 further comprises a detergent supply unit 30 installed at the top cover 3 and temporarily storing detergent therein. The detergent supply unit 30 is connected to the water supply assembly to supply detergent along with supplied water into the inner tub 6.

The top cover 3 includes a laundry inlet/outlet hole 3a for loading or unloading laundry. A door 50 for opening and closing the laundry inlet/outlet hole 3a is installed at the top cover 3. At least part of the door 40 may be made of glass to make visible the inside thereof. That is, the door 40 comprises a frame part 40a and a glass part 40b fit to the frame part 40a.

Moreover, a display panel 7 is mounted at one side of the top cover 3 to input an operation of the washing machine or display operating conditions of the washing machine.

The outer tub 4 is disposed at an inner upper part of the cabinet 2 so as to be suspended by a plurality of suspensions 15. One ends of the suspensions 15 may be coupled to inner upper parts of the cabinet 2, and the other ends thereof may be coupled to lower parts of the outer tub 4.

A pulsator 9 is installed on the bottom surface of the inner tub 6 to form a spinning stream of water held in the outer tub 4. The pulsator 9 may be integrally formed with the inner tub 6 to thus enable the pulsator 9 to rotate together with the inner tub 6 during rotation of the motor 8, or the pulsator 9 may be formed separately

from the inner tub 6 to thus allow the pulsator 9 to rotate separately during rotation of the motor 8.

A balancer 15 is installed at an upper side of the inner tub 6 to prevent the inner tub 6 from losing balance due to laundry leaning to one side. The balancer 15 may be a liquid balancer having a liquid such as salt water filled therein.

An outer tub cover 14 is installed at an upper side of the outer tub 4 to prevent laundry from falling out and prevent water from being scattered.

The water supply assembly comprises an outer hose 11 for guiding water supplied from an external water tap or the like to the washing machine, a water supply valve 12 connected to the outer hose 11 to control the supply of water, and a water supply hose 13 connecting the water supply valve 12 and the detergent supply unit 30. The water supply valve 12 and the water supply hose 13 form a water supply flow path through which water is supplied.

The detergent supply unit 30 is disposed on the water supply flow path. The detergent supply unit 30 comprises a detergent box housing 31 installed to communicate with the water supply hose 30, a detergent box 32 detachably accommodated in the detergent box housing 31, and a detergent box cover fixed to the detergent box housing 31 and disposed on the top surface of the detergent box 32 to spray water.

The detergent box housing 31 is installed at a detergent box installation part formed at one side of the top cover 3.

The detergent box 32 is coupled to the detergent box housing 31 so that a user can take it out from the detergent box housing 31 in order to put detergent therein. The detergent box 32 may be coupled to the detergent box housing 31 so as to be slidable back and forth. At least part of the rear surface of the detergent box 32 is opened, so that detergent can be introduced during water supply, along with water, into the detergent box housing 31 through the rear surface of the detergent box 32.

The drain assembly 20 comprises a first drain hose 21 connected to the drain port 26 formed on the bottom surface of the outer tub 4, a drain pump housing 24 including a drain pump for pumping water, and a second drain hose 25 connected to the drain pump housing 24 and draining the water pumped by the drain pump out of the cabinet 2. A drain motor for driving the drain pump is interposed within the drain pump housing 24.

The drain assembly 20 may be disposed between the outer tub 4 and the base 5.

FIG. 3 is a perspective view showing an installation structure of a drain hole cap shown in FIG. 1, FIG. 4 is an enlarged perspective view of the drain hole cap shown in FIG. 3, FIG. 5 is a cross-sectional view showing part A of FIG. 2, and FIG. 6 is a cross-sectional view comparing the presence and absence of a drain port cap.

Referring to FIG. 3, a shaft through hole 4b, through which a rotation shaft 8a of the motor 9 passes, is formed at the center of the bottom surface of the outer tub 4.

Also, a concave groove 4a, which is stepped downward, is formed on the

bottom surface of the outer tub 4, and a drain hole 26 which is formed in the bottom surface of the concave groove 4a for draining washing water temporarily stored within the outer tub 4.

The concave groove 4a may have a heater (not shown), etc mounted thereon for heating washing water. A heater installation part 4c for installing the heater (not shown) is formed at one side of the concave groove 4a.

A cross-section of the drain hole 26 may be circular, and protruded downward so as to connect the first drain hose 21 thereto.

The washing machine according to the first exemplary embodiment of the present invention comprises a silencer which is formed for covering a vertical top of the drain hole 26 and for preventing noise generated during drainage.

The silencer comprises a drain hole cap 50 for limiting a space over the drain hole and allowing the top of the drain hole 26 to be always filled with washing water.

The drain hole cap 50 is formed for going through the drain hole 26 in the top of the drain hole 26 and for covering the upper space of the drain hole 26 in the vertical direction.

Referring to FIG. 4, the drain hole cap 50 comprises an exit part 51 which is formed to be opened so as to be connected with the drain hole 26 and to discharge washing water, a cover part 52 which is disposed to be separated from the exit part 51 to a vertical direction with the predetermined distance, and a connection part 53 which connects the exit part 51 and the cover part 52.

The drain hole cap 50 may be inserted into the drain hole 26, or may be fixed by a fixing member as a bolt.

A description of this exemplary embodiment will be given only with respect to the exit part 51 formed in a ring shape and adapted to be press fit into the drain hole 26.

The cover part 52 has a disc shape, and a cross-sectional area of the cover part 52 may be larger than or equal to the cross-sectional area of the drain hole 26. That is, it is preferred that the cover part 52 fully covers the upper space over the drain hole 26.

The connection part 53 may have a bar shape, and may be provided in plural, spaced apart from each other at the predetermined interval.

The drain hole cap 50 is provided with an entrance part 54 formed at a lateral side thereof so that the washing water in the outer tub 4 can be introduced in a lateral direction. The gaps among a plurality of connection parts 53 form the entrance part 54.

A top end of the drain hole cap 50 is lower than a top end of a lateral side of the concave groove 4a. That is, it is preferred that the up-down length (l) of the drain hole cap 50 is shorter than the depth (d) of the concave groove 4a, or the top end of the drain hole cap 50 is not exposed to an upper side of the concave groove 4a.

The cover part 52 of the drain hole cap 50 has to be disposed lower than the top end of the lateral side of the concave groove 4a so that the inside of the drain hole cap 50 is always filled with washing water during drainage.

An operational effect of the thus-constructed washing machine according to the first exemplary embodiment of the present invention will be described below.

When the drain pump is put into operation, the washing water in the outer tub 4 is pumped by the drain pump, and sequentially passes through the drain hole 26, the first drain hose 21, the drain pump 24, and the second drain hose 25, and is discharged out.

Referring to FIG. 6, if there is no drain hole cap 50, the pressure of the top of the drain hole 26 is lowered due to a difference between an amount of actual drainage and an amount of pumping in an early stage of drainage. If the pressure of the top of the drain hole 26 is lowered, a vortex is generated as washing water rotates and an empty space not filled with water is formed in the top of the drain hole 26. As air enters through such an empty space, abnormal noise may be generated due to an air layer.

On the other hand, if there is the drain hole cap 50, the cover part 52 of the drain hole cap 50 limit the upper space apart from the top of the drain hole 26 in the vertical direction. That is, the cover part 52 of the drain hole cap 50 covers the upper space over the drain hole 26.

When drainage begins, the washing water around the drain hole cap 50 gathers towards the drain hole cap 50 along the bottom surface of the outer tub 4.

The washing water gathered towards the drain hole cap 50 flows to the drain hole 26 through the entrance part 54 formed at the lateral side of the drain hole cap 50.

The washing water flown into the drain hole cap 50 through the entrance part 54 of the drain hole cap 50 fills the inside of the drain hole cap 50. Also, the upper space over the drain hole 26 is always filled with the washing water.

Accordingly, the empty space over the drain hole 26 is eliminated, and hence air is not introduced into the drain hole 26.

Even when the amount of drainage is small, as in an early stage of drainage or during intermittent dehydration, the top of the drain hole 26 is always filled with washing water. Therefore, the pressure of the top of the drain hole 26 is not lowered, and introduction of air into the drain hole 26 is prevented. As no air is introduced, this prevents the generation of abnormal noise due to an air layer, thus contributing to a quiet operation of the washing machine. Moreover, when air introduction is prevented, pumping performance can be improved.

FIG. 7 is a perspective view of a drain hole cap according to a second exemplary embodiment of the present invention.

Referring to FIG. 7, the construction and operation of the drain hole cap 100 of the washing machine according to the second exemplary embodiment of the present invention are the same as those in the first exemplary embodiment, except that the drain hole cap 100 comprises an exit part 101 which is to be opened so as to be connected with the drain hole 26 and to discharge washing water, a cover part 102 for covering the upper space over the drain hole 26, and an entrance part 103 for connecting the exit part 101 and the cover part 102 and introducing the washing water

in the outer tub 4, and a plurality of intake holes 104 are formed in the entrance part 103 to introduce the washing water in the outer tub 4 and, therefore, a detailed description thereof will be omitted.

The drain hole cap 100 is shaped of a cylinder and the bottom surface of the drain hole cap 100 is opened, and the plurality of intake holes 104 has a circular shape and are disposed apart from each other at predetermined intervals.

The washing water in the outer tub 4 is introduced into the drain hole cap 100 through the plurality of intake holes 104, and then discharged through the exit part 101 and the drain hole 26. At this time, since the cover part 102 covers the upper space over the drain hole 26 and the washing water is discharged after being filled inside the drain hole cap 100, abnormal noise generated during drainage can be reduced.

FIG. 8 is a cross-sectional view of a washing machine according to a third exemplary embodiment of the present invention, FIG. 9 is a perspective view showing part B of FIG. 8, FIG. 10 is a perspective view of a silencer shown in FIG. 9, and FIG. 11 is a cross-sectional view taken along line V-V of FIG. 9.

Referring to FIGS. 8 to 11, the construction and operation of the silencer of the washing machine according to the third exemplary embodiment of the present invention are the same as those in the first exemplary embodiment, except that the silencer comprises a plate shaped drain hole cover 200 which is disposed over the drain hole 26 so as to be spaced apart from the drain hole 26 with a predetermined distance in a vertical direction and covers the upper space over the drain hole 26 and,

therefore, a detailed description thereof will be omitted.

The washing machine further comprises a heater 160 which is disposed over the drain hole and heats washing water.

A heater mounting groove 161 for mounting the heater 160 thereon is formed on the bottom surface of the outer tub 4. While the heater mounting groove 161 is described as a concave shape, the present invention is not limited thereto and the heater 160 may be fixed to one side of the outer tub 4 without forming the heater mounting groove 161.

The plate shaped drain hole cover 200 according to the third exemplary embodiment of the present invention is disposed between the heater 160 and the drain hole 26.

The plate shaped drain hole cover 200 comprises a connection part 201 which is fixed to the outer tub 4 and a cover part 202 which is extended from the connection part201 and covers the drain hole 26.

A fixing groove (not shown) may be formed on the outer tub 4 to fix the connection part201 thereto. The connection part 201 may be fixed to the fixing groove (not shown) by a member (not shown) such as a bolt.

The connection part201 is provided with fixing holes 201 for fixing the bolt (not shown).

The cover part 202 is disposed not on the same plane as the connection part201, but rather on a different plane from that of the connection part201. That is,

the cover part 202 is disposed in the heater mounting groove 161, and the connection part201 is bent upward from the cover part 202 and disposed on the bottom surface of the outer tub 4.

The cover part 202 may be disposed to cover any part of the upper space over the drain hole 26. The cover part 202 may be disposed to cover a half of the upper space over the drain hole 26 or the entire upper space over the drain hole 26. At this time, the cover part 202 is spaced apart from the top of the drain hole 26 with a predetermined distance in the vertical direction. Therefore, even if the cover part 202 covers the upper space over the drain hole 26, this does not obstruct drainage.

As pointed out above, the cover part 202 of the plate shaped drain hole cover 200 limits the upper space over the drain hole 26. Thus, in the case of drainage of washing water, drainage is carried out as washing water is sufficiently filled between the cover part 202 and the drain hole 26.

Accordingly, the generation of a vortex over the drain hole 26 is prevented and no air is introduced, thus reducing abnormal noise during drainage.

FIG. 12 is a plan view of a silencer according to a fourth exemplary embodiment of the present invention, FIG. 13 is a perspective view of the silencer shown in FIG. 12, and FIG. 14 is a cross-sectional view taken along line I-I of FIG. 12.

Referring to FIGS. 12 to 14, the construction and operation of the silencer of the washing machine according to the fourth exemplary embodiment of the present invention are the same as those in the first exemplary embodiment, except that the

silencer comprises a plate shaped drain hole cover 300 which is formed so as to cover the upper space over the drain hole 26 and the plate shaped drain hole cover 300 is disposed over the heater 160 and, therefore, a detailed description thereof will be omitted.

The plate shaped drain hole cover 300 comprises a heater connection part 301 which is mounted on the heater 160 and a cover part 302 which is extended from the heater connection part 301 and covers the upper space over the top of the drain hole 26.

The heater connection part 301 has a shape corresponding to one side surface of the heater 160 so as to be mounted on the heater 160. This exemplary embodiment will be described with respect to the heater 160 having a circular cross section and the heater connection part 301 having a semi-circular cross section. However, the present invention is not limited thereto but the heater connection part 301 may have various shapes corresponding to the shape of the heater 160.

The heater connection part 301 may only be mounted on the heater 160 or may be fixed by a fixing member. For example, the heater connection part 301 may comprise an engaging protrusion (not shown) for engaging the heater connection part 301 after the heater connection part 301 is mounted on the heater 160. The engaging protrusion may have a ring shape, but the present invention is not limited thereto and may comprise all structures that can be fixed to the heater 160.

The heater connection part 301 may be formed in plural number and mounted

on a plurality of positions of the heater 160. This exemplary embodiment will be described with respect to the case where two heater connection parts 301 are provided at both left and right sides of the cover part 302.

The cover part 302 may be disposed to cover any part of the upper space over the drain hole 26. The cover part 302 may be disposed to cover a half of the upper space over the drain hole 26 or the entire upper space over the drain hole 26. This exemplary embodiment will be described with respect to the case where the cover part 302 fully covers the upper space over the drain hole 26.

The plate shaped drain hole cover 300 is disposed over the heater 160 and is disposed apart from the drain hole 26 by a predetermined distance in a vertical direction. Therefore, even if the cover part 302 of the plate shaped drain hole cover 300 covers the upper space over the drain hole 26, this does not obstruct drainage.

As pointed out above, the cover part 302 of the plate shaped drain hole cover 300 limits the upper space over the drain hole 26. Thus, in the case of drainage of washing water, drainage is carried out as washing water is sufficiently filled between the cover part 302 and the drain hole 26.

Accordingly, the generation of a vortex above the drain hole 26 is prevented and no air is introduced, thus reducing abnormal noise during drainage.

FIG. 15 is a longitudinal cross-sectional view of a washing machine according to a fifth exemplary embodiment of the present invention, FIG. 16 is a view showing part C of FIG. 15, and FIG. 17 is a plan view showing a heater cover shown in FIG. 16.

Referring to FIGS. 15 to 17, the construction and operation of the washing machine according to the fifth exemplary embodiment of the present invention are the same as those in the first exemplary embodiment, except that the washing machine comprises a heater cover 400 which is disposed on the heater mounting groove 161 so as to cover the top of the heater 160 and fully covers the upper space over drain hole 26 and, therefore, a detailed description thereof will be omitted.

The heater mounting groove 161 is formed concave on the bottom surface of the outer tub 4. The heater 160 is disposed at the heater mounting groove 161.

The drain hole 26 is formed at one lower part of the heater mounting groove 161, and the heater 160 is disposed above the drain hole 26.

The heater cover 400 may be shaped of a plate, and may be made of a metal having heat resistance to endure heat generated in the heater 160.

The heater cover 400 covers the heater mounting groove 161, and is placed flat with respect to the bottom surface of the outer tub 4. In the case that the bottom surface of the outer tub 4 and the heater mounting groove 161 are stepped, the depth of water reserved in the outer tub 4 changes depending on position. Thus, an alpha water stream, which causes washing water to rise between the inner tub 6 and the outer tub 4 by rapid rotation of the inner tub 6, may not be properly formed.

In this exemplary embodiment, the heater cover 400 is disposed to cover the top of the heater mounting groove 161 and arranged flat with respect to the bottom surface of the outer tub 4, thereby eliminating a stepped part of the bottom surface of

the outer tub 4.

As the stepped part of the bottom surface of the outer tub 4 is eliminated by means of the heater cover 400, the alpha water stream is properly formed, thus improving washing performance.

The heater cover 400 may be fixed to the bottom surface of the outer tub 4 by a fixing member. The heater cover 400 is provided with a plurality of fixing holes 401, and fixed by a fixing member such as a bolt (not shown).

Referring to FIG. 17, the heater cover 400 is provided with a heater cover hole 402 for emitting heat generated from the heater 160 and draining washing water.

At least two heater cover holes 402 may be formed. This exemplary embodiment will be described with respect to the case where there are two heater cover holes 402.

The two heater cover holes 402 may have different shapes and sizes from each other. This exemplary embodiment will be described with respect to the heater cover holes 402 respectively having a circular shape and a semi-circular shape. The heater cover holes 402 may be larger than or equal to the drain hole 26.

The heater cover holes 402 are formed at a position which does not overlap the drain hole 26 in the vertical direction.

The heater cover holes 402 and the drain hole 26 are not disposed in a line because the heater cover 400 has to fully cover the upper space over the drain hole 26.

The circumferences of the heater cover holes 402 is disposed to be separated

from the circumference of the drain hole 26 to the vertical and horizontal direction with the predetermine distance

The horizontal distance (t) between the circumference of one of the heater cover holes 402 arranged closer to the drain hole 26 and the drain hole 26 preferably exceeds 0.

When drainage begins, the washing water in the outer tub 4 is introduced into the heater mounting groove 161 through the heater cover holes 402 and then introduced into the drain hole 26.

Since the heater cover 400 covers the upper space over the drain hole 26, the washing water is drained after filling the upper space over the drain hole 26.

That is, even in an early stage of drainage or when the amount of drainage flow is small, the washing water fills the drain hole 26, thus preventing the pressure of the top of the drain hole 26 from being lowered. Accordingly, no vortex is generated in the drain hole 26 and no air is introduced, thereby preventing abnormal noise caused by air introduction. This can contribute to a quiet operation of the washing machine, and improve pumping performance because of the prevention of air introduction.

While specific embodiments have been described and illustrated, such embodiments should be considered illustrative only and not as limiting the invention as defined by the accompanying claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A laundry treating machine comprising:

an outer tub having a concave groove formed on a bottom surface of the outer tub;

a drain hole formed in the concave groove of the outer tub for discharging washing water;

a drain hole cap covering an upper space above the drain hole, the drain hole cap having an entrance part formed at a lateral side of the drain hole cap for causing washing water in the outer tub to flow into the entrance part in a lateral direction when discharging the washing water; and

wherein a top end of the drain hole cap is disposed below a top end of the concave groove.

2. The laundry treating machine of claim **1**, wherein the drain hole cap is spaced apart from a top end of the drain hole by a predetermined distance in the vertical direction for covering the upper space above the drain hole.

3. The laundry treating machine of claim **1**, wherein the drain hole cap comprises:

an exit part which is formed to be opened so as to be connected with the drain hole for discharging the washing water;

a cover part which is disposed separated from the exit part in a vertical

direction by a predetermined distance and covering the upper space above the drain hole; and

a connection part which connects the exit part and the cover part.

4. The laundry treating machine of claim **3**, wherein the cover part is plate shaped and is larger than a cross-sectional area of the drain hole.

5. The laundry treating machine of claim **1**, wherein the drain hole cap is cylinder shaped and a side surface and a bottom surface of the drain hole cap are opened, and a part of a lower body of the drain hole cap is inserted into the drain hole.

6. A laundry treating machine comprising:

an outer tub which has a drain hole formed for discharging washing water;

a plate shaped drain hole cover which is disposed separated from the drain hole in a vertical direction by a predetermined distance and is formed to cover an upper space above the drain hole; and

a heater which is disposed above the drain hole for heating the washing water,

wherein the plate shaped drain hole cover is disposed between the heater and the drain hole.

7. The laundry treating machine of claim **6**, wherein the plate shaped drain hole cover comprises:

a connection part which is fixed to the outer tub; and

a cover part which extends from the connection part and covers the drain hole by being arranged over the drain hole.

8. The laundry treating machine of claim **6**, further comprising a concave heater mounting groove formed on a bottom surface of the outer tub and configured to mount the heater thereon, and wherein the plate shaped drain hole cover comprises:

a cover part disposed in the heater mounting groove above the drain hole; and

a connection part which is bent upward and fixed to a portion of the outer tub which is the outside of the heater mounting groove.

9. The laundry treating machine of claim **6**, wherein the plate shaped drain hole cover is connected to the heater.

10. The laundry treating machine of claim **9**, wherein the plate shaped drain hole cover comprises:

a heater connection part which is mounted on the top of the heater; and

a cover part which is extended from the heater connection part and covers the drain hole by being arranged over the drain hole for preventing noise.

FIG. 1

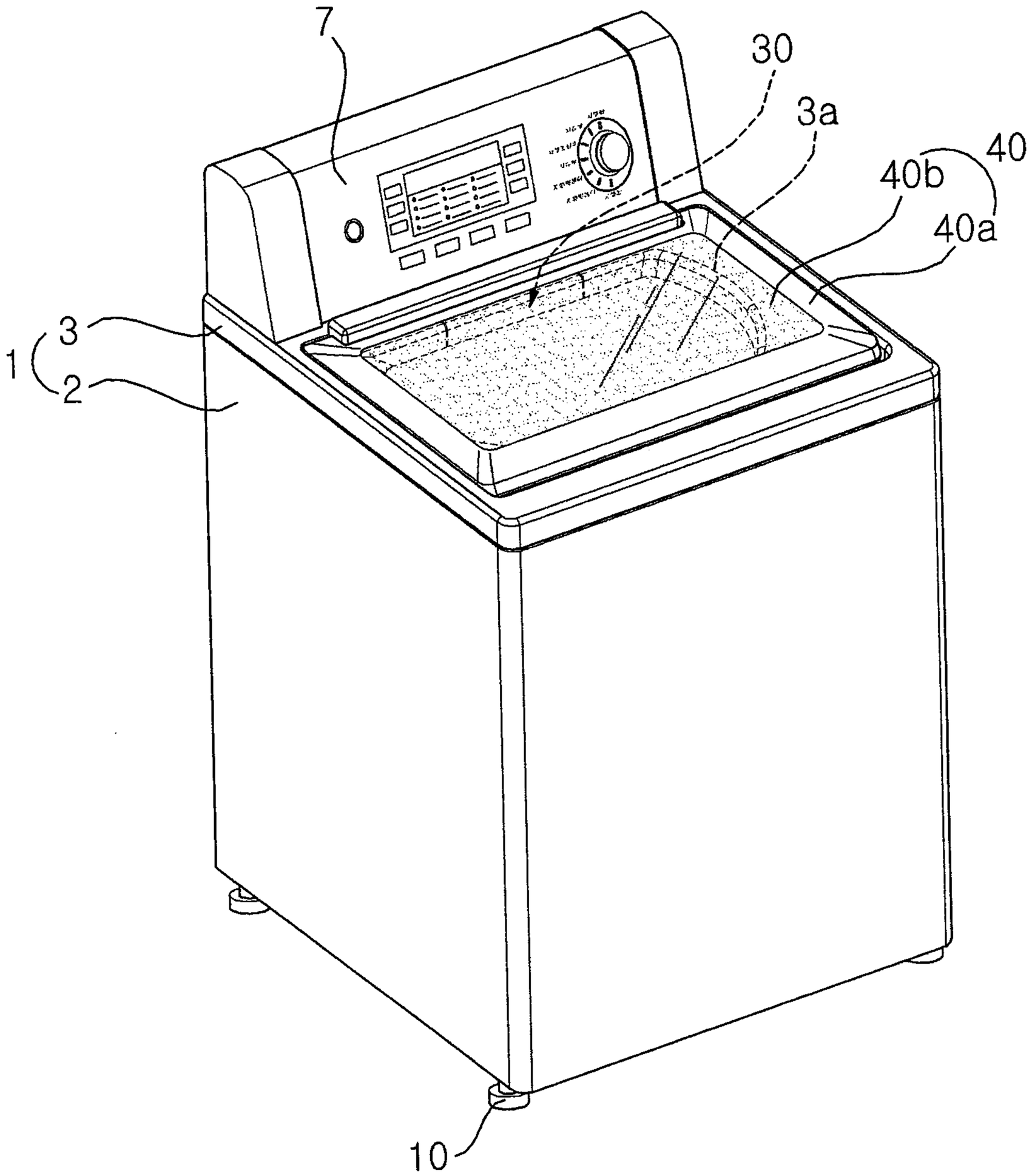


FIG. 2

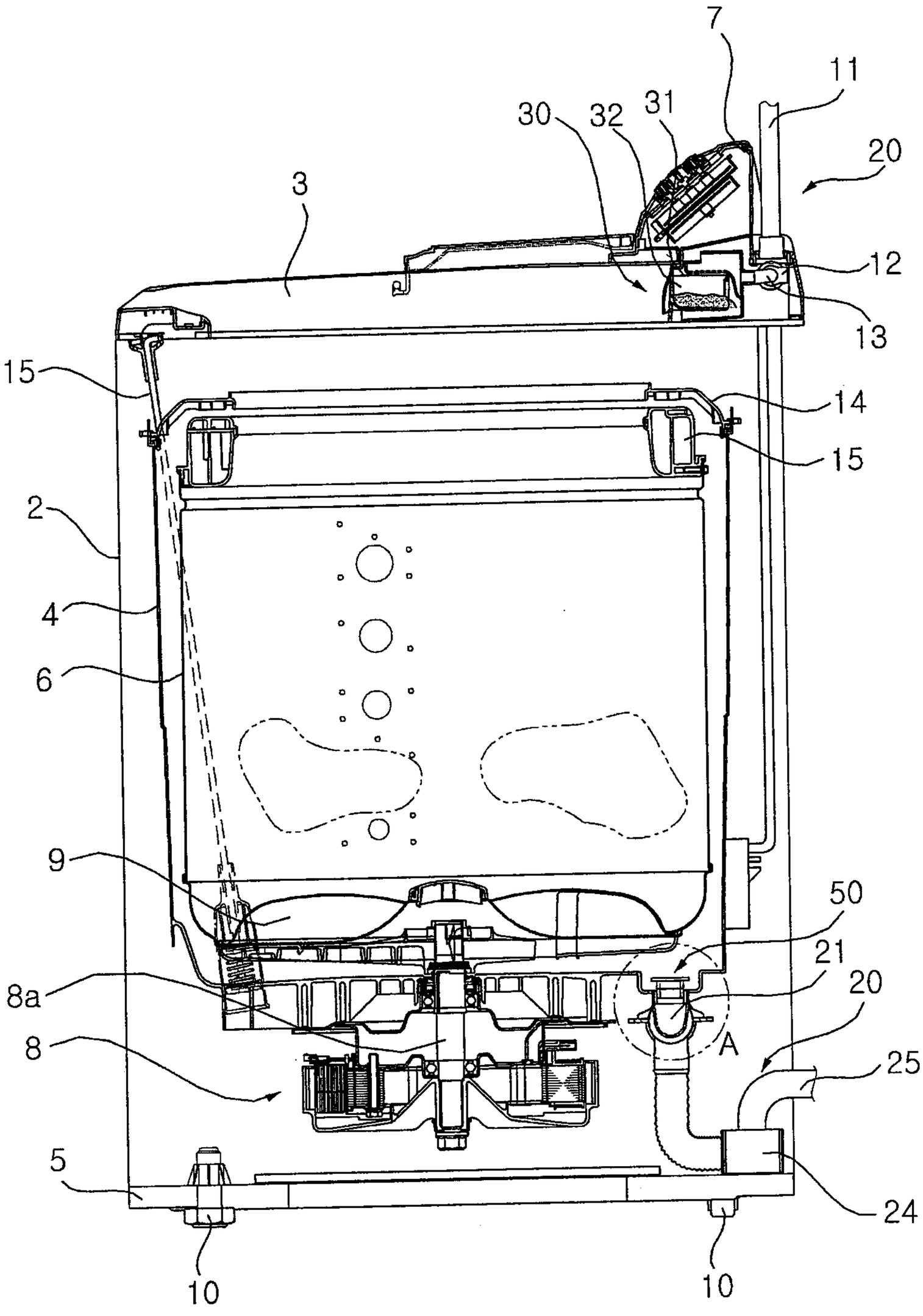


FIG. 3

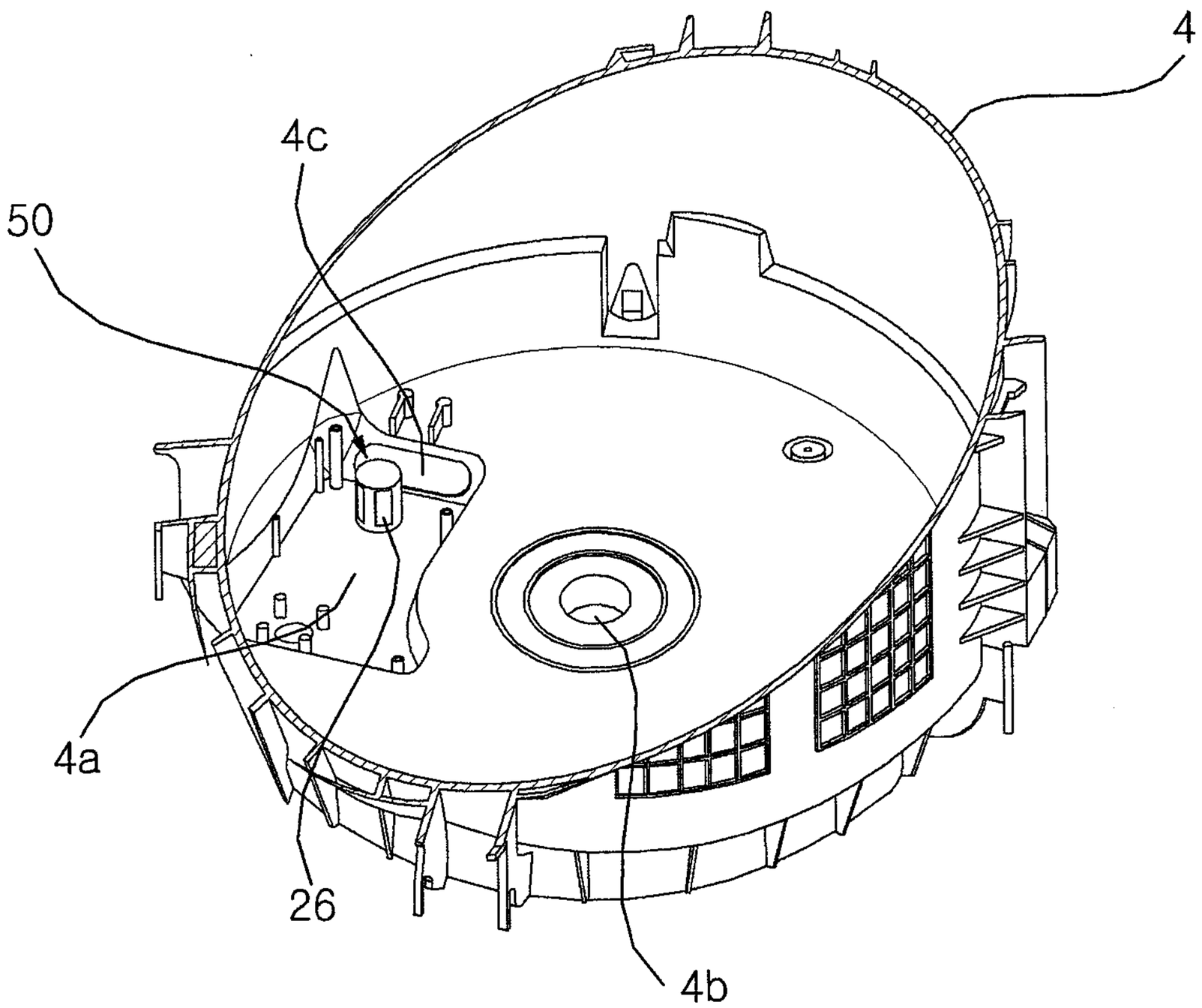


FIG. 4

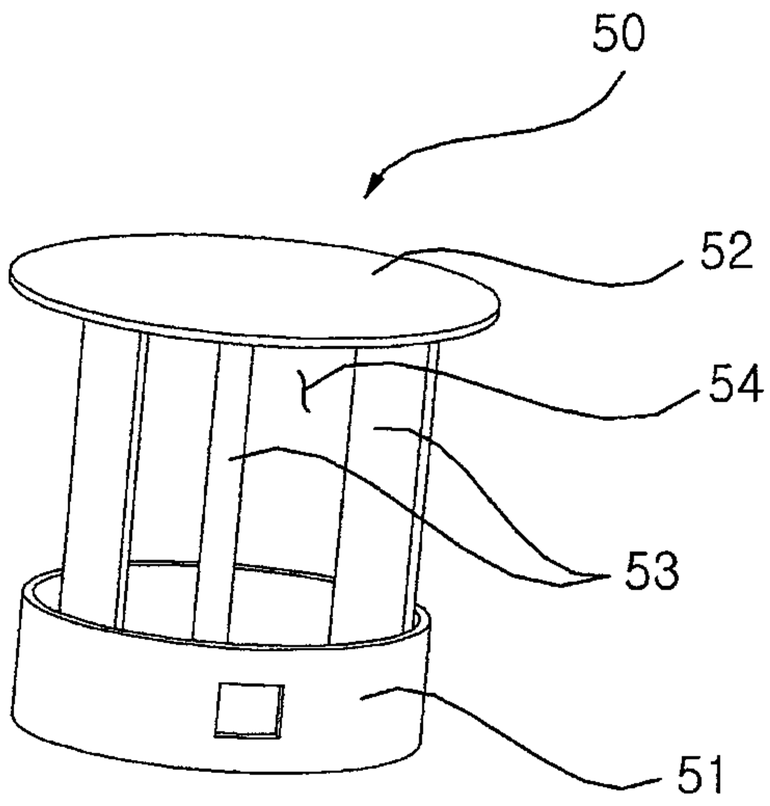


FIG. 5

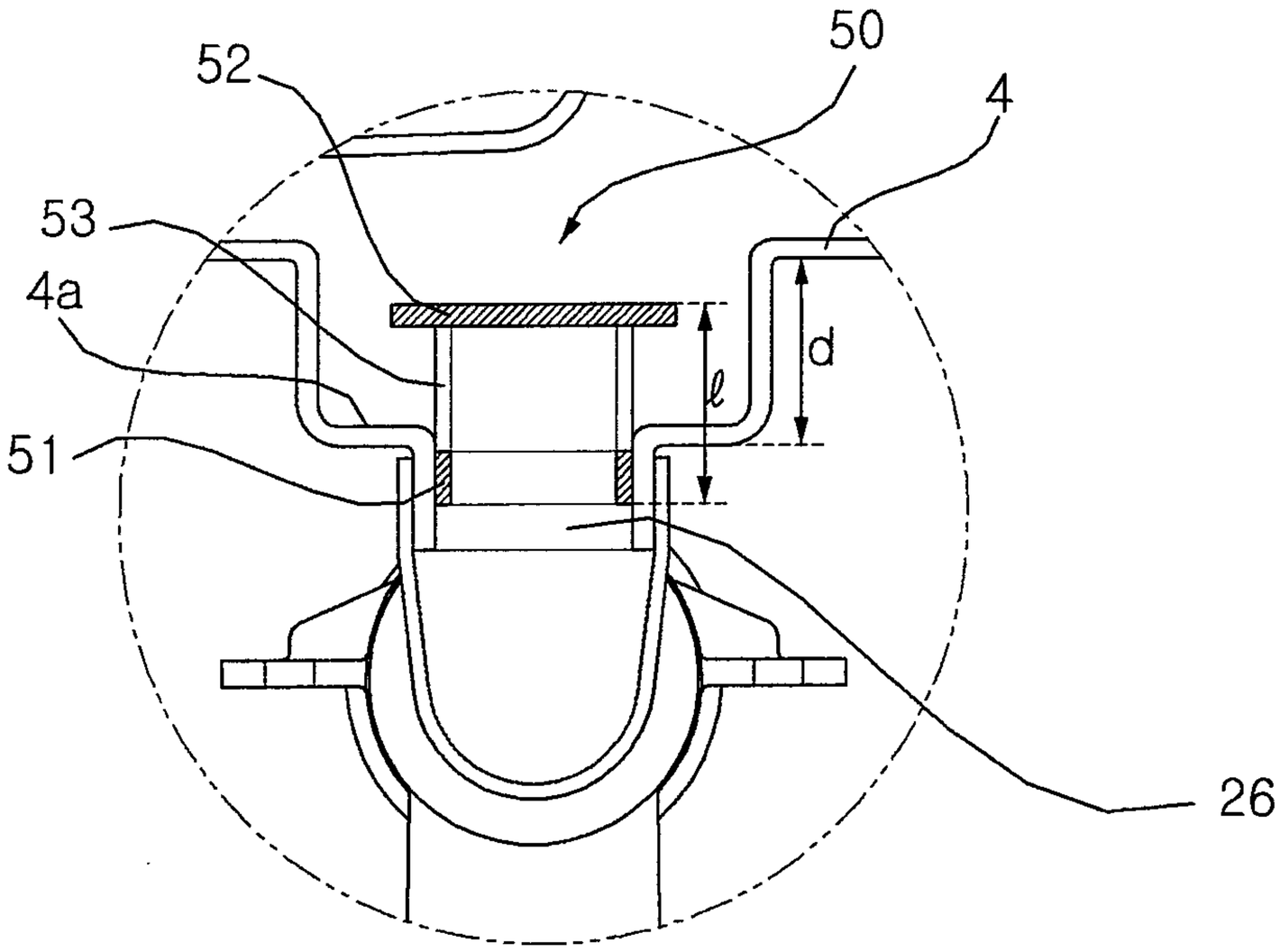
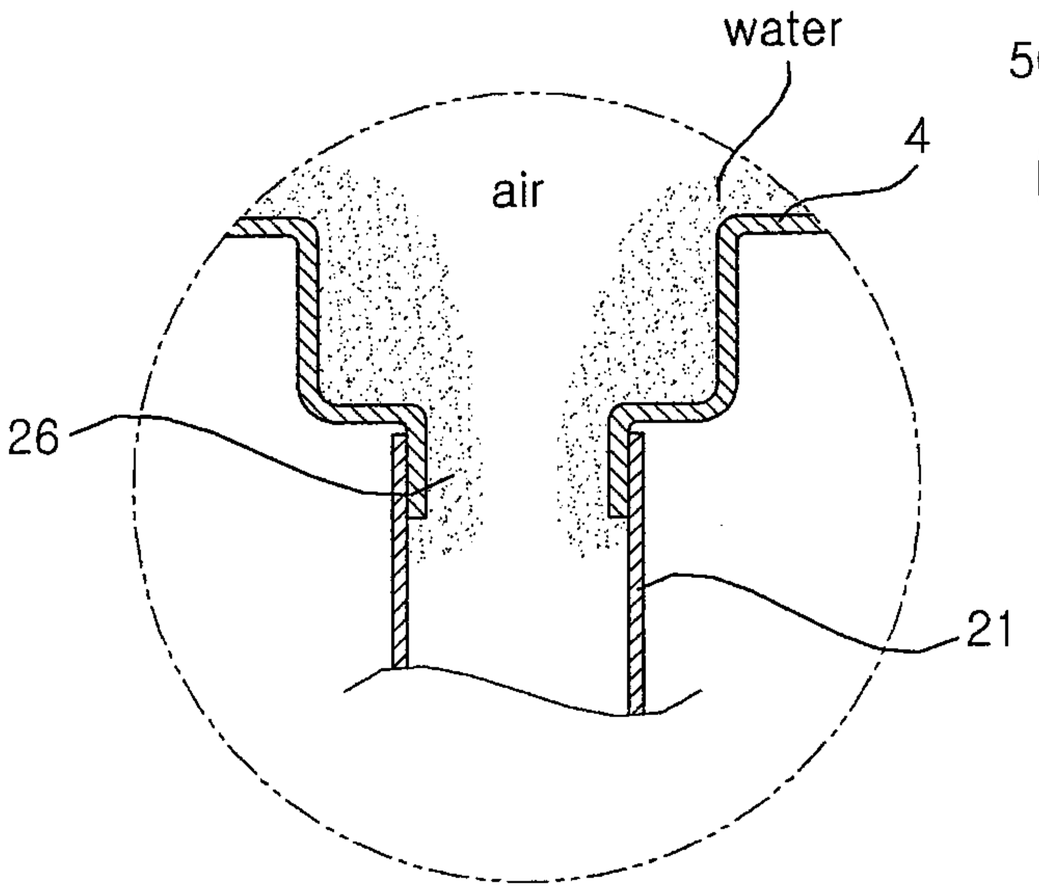
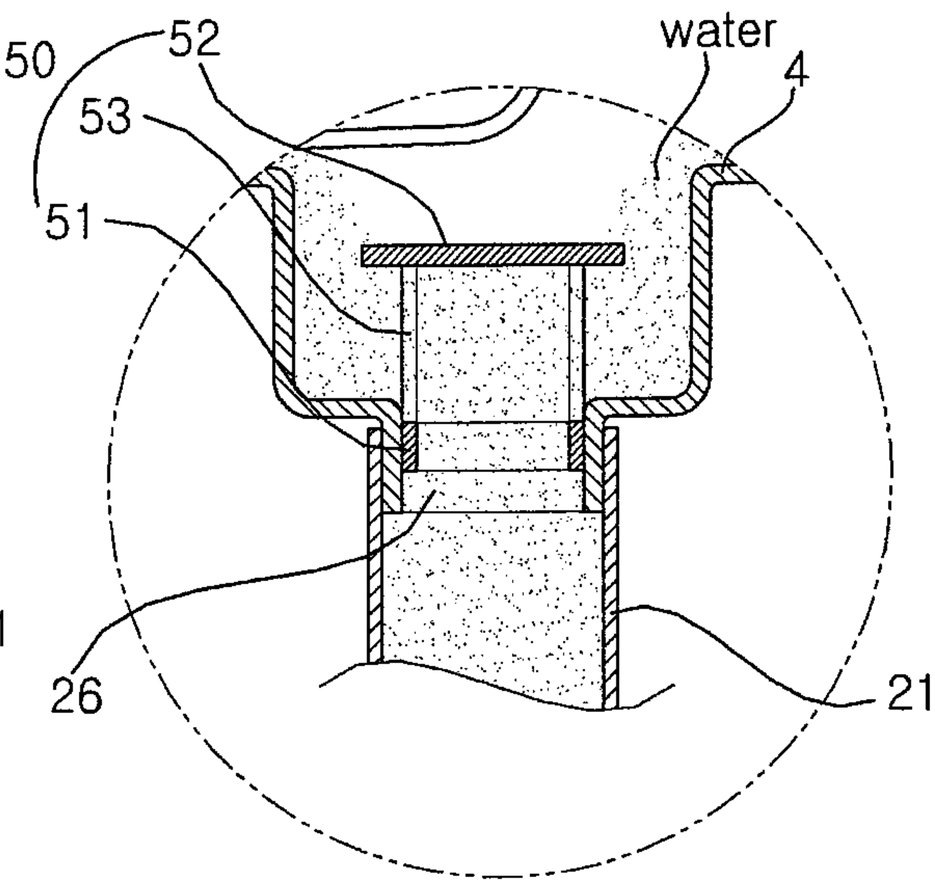


FIG. 6



<No cap>



<Cap>

FIG. 7

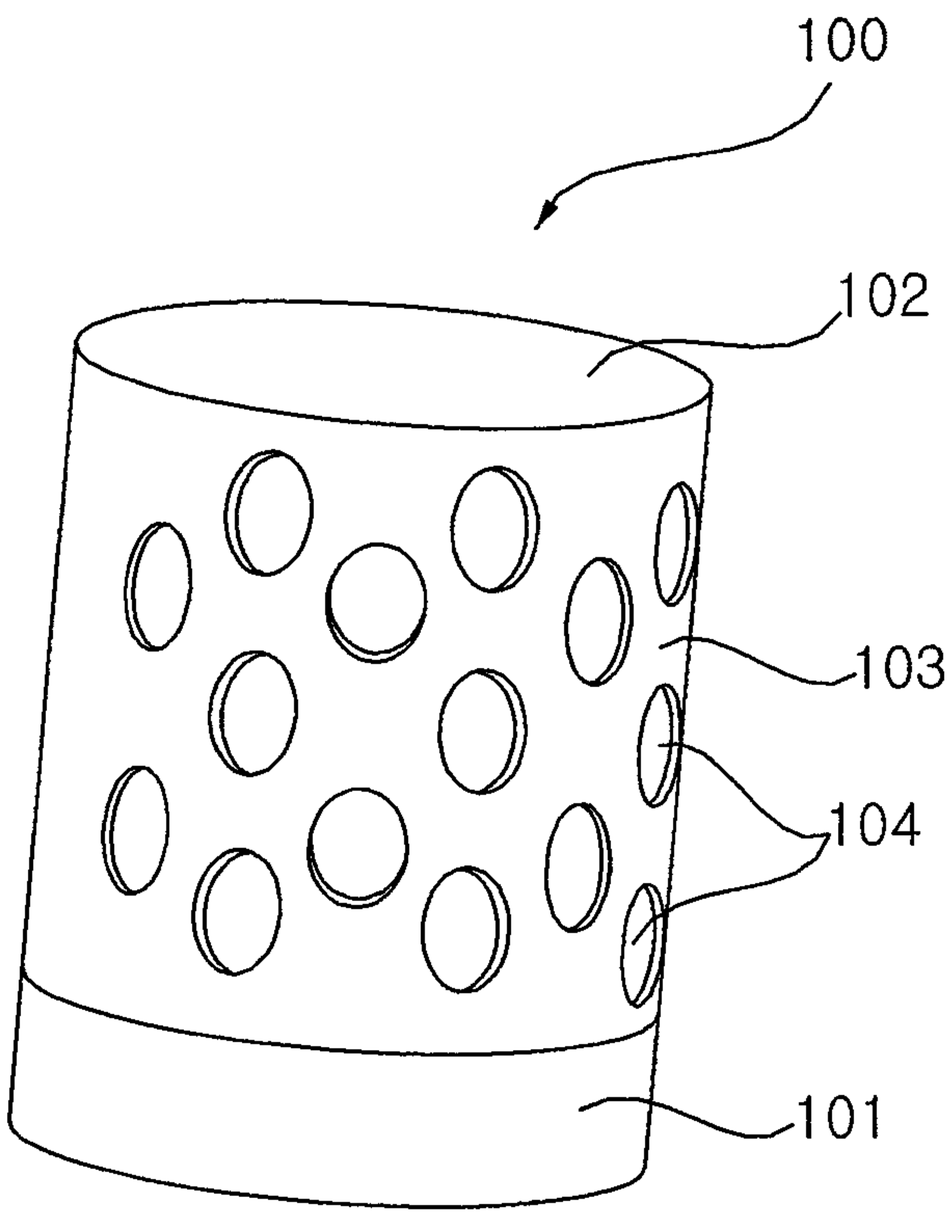


FIG. 8

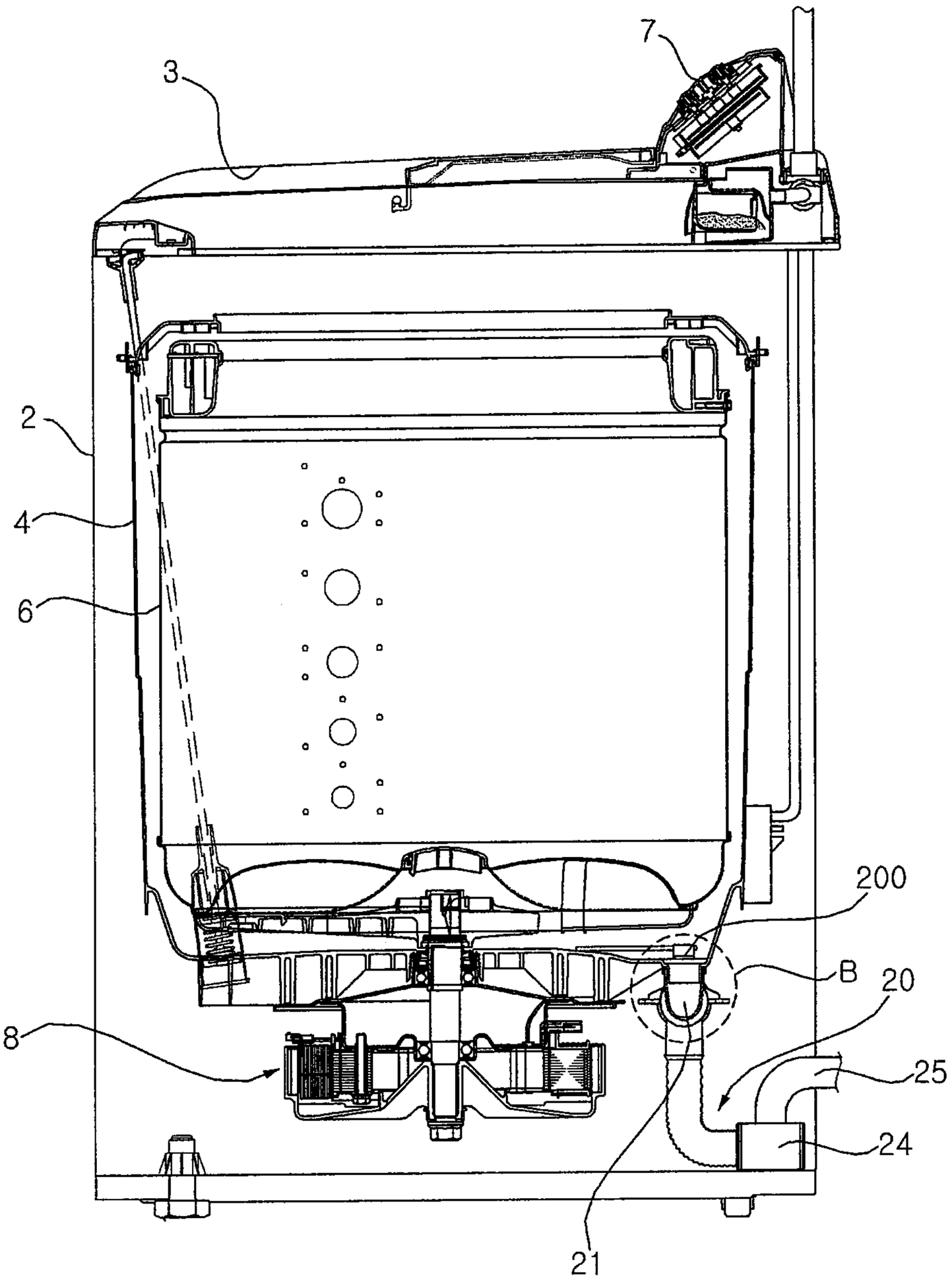


FIG. 9

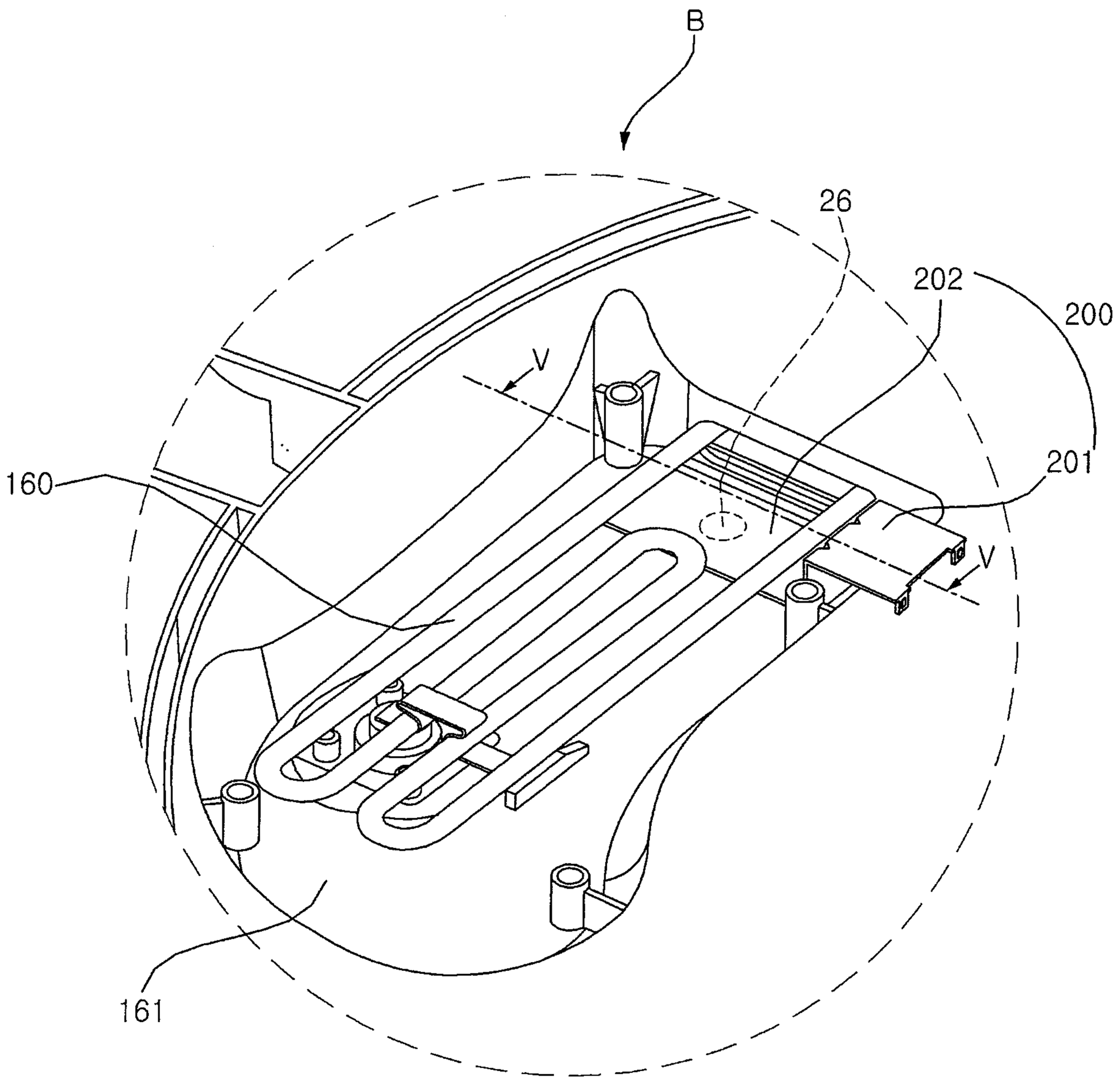


FIG. 10

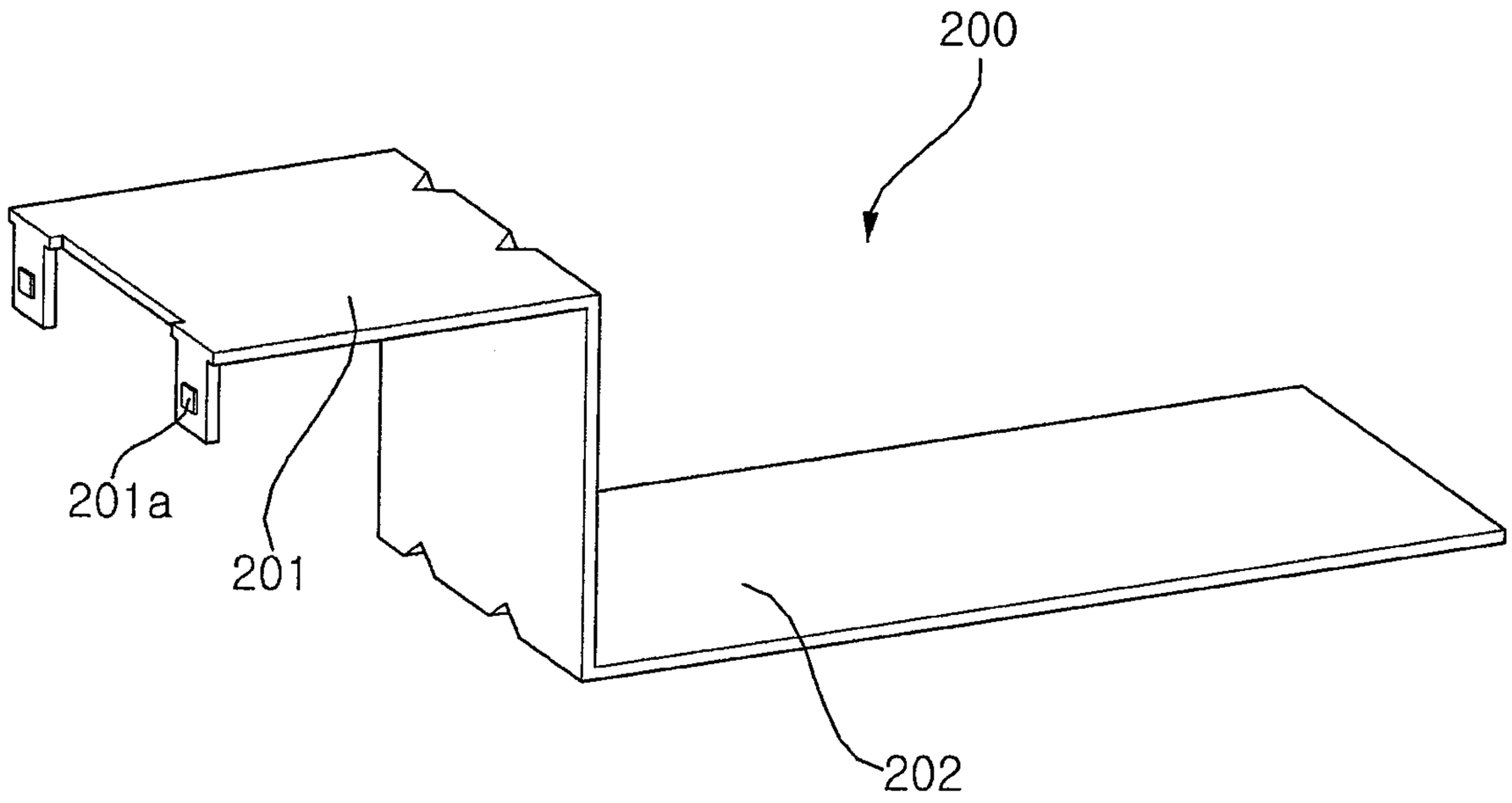


FIG. 11

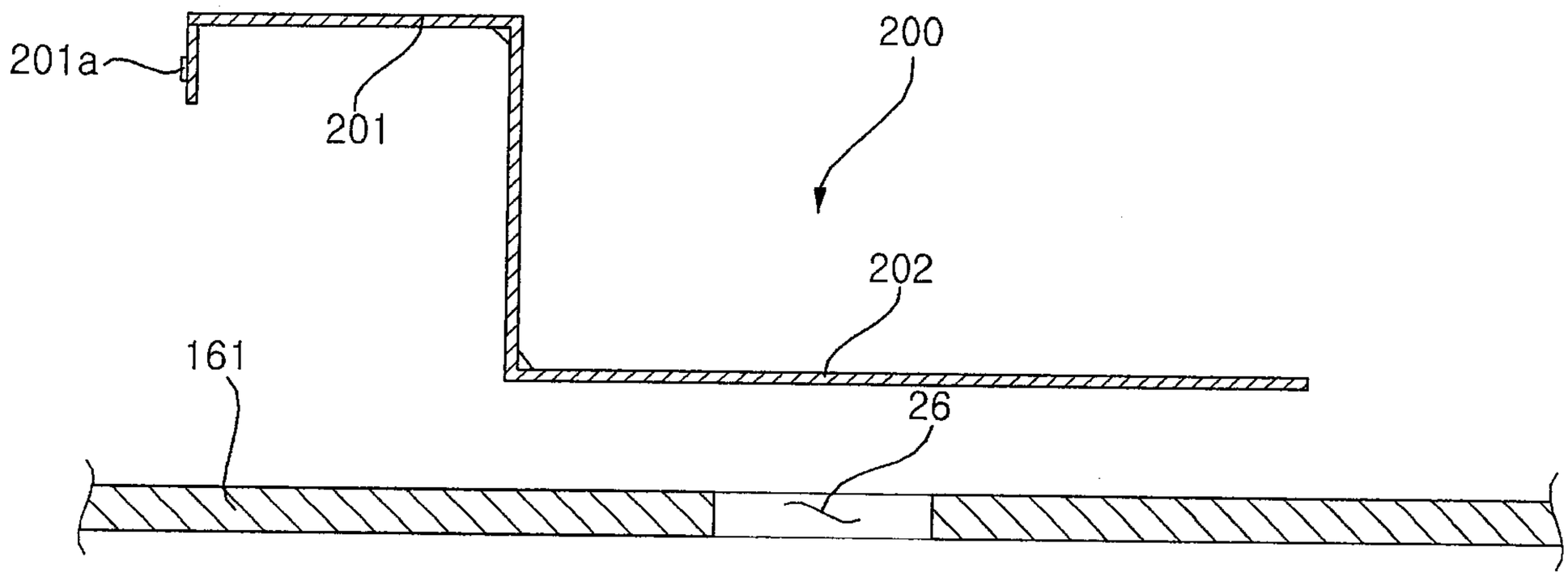


FIG. 12

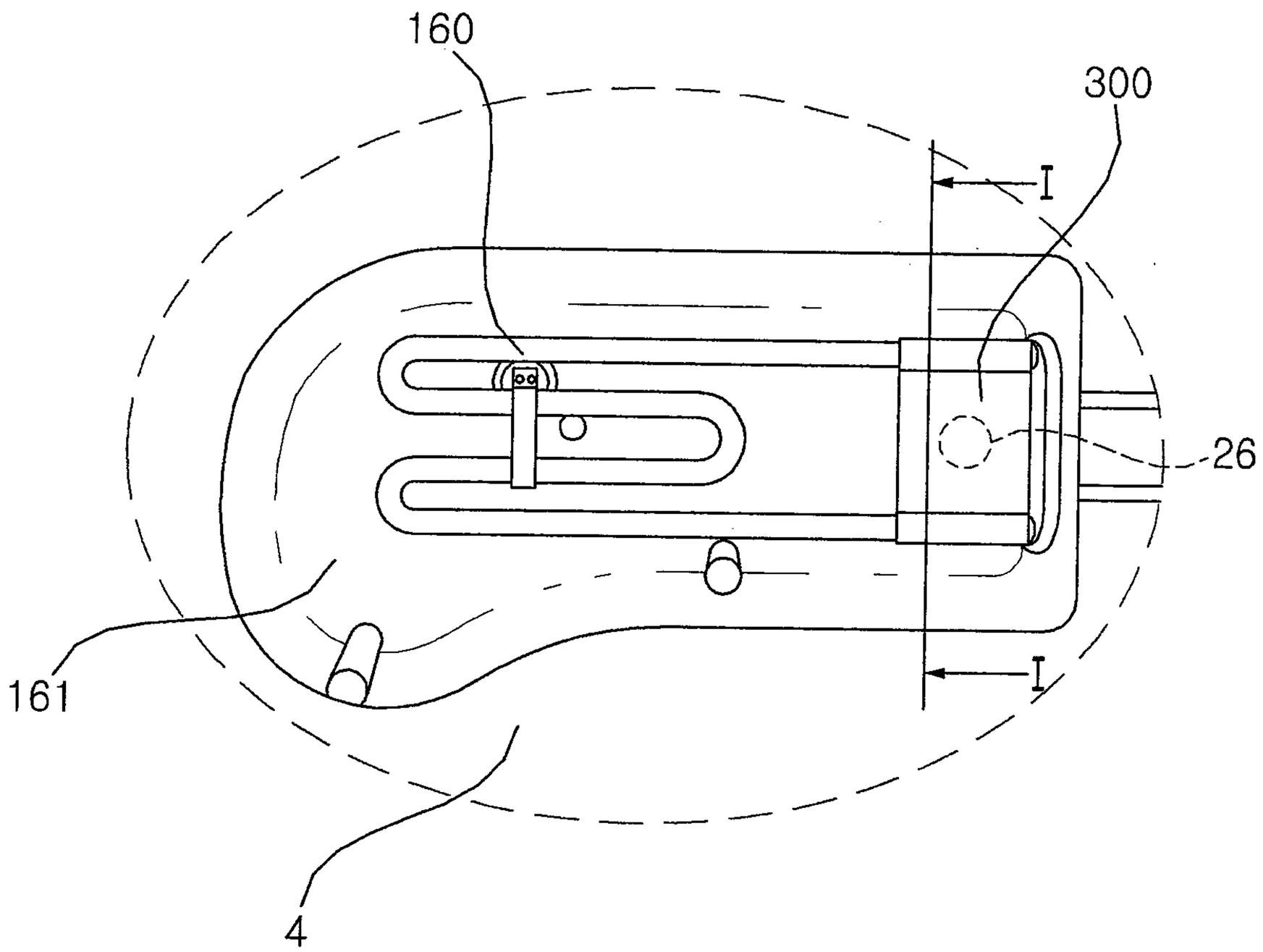


FIG. 13

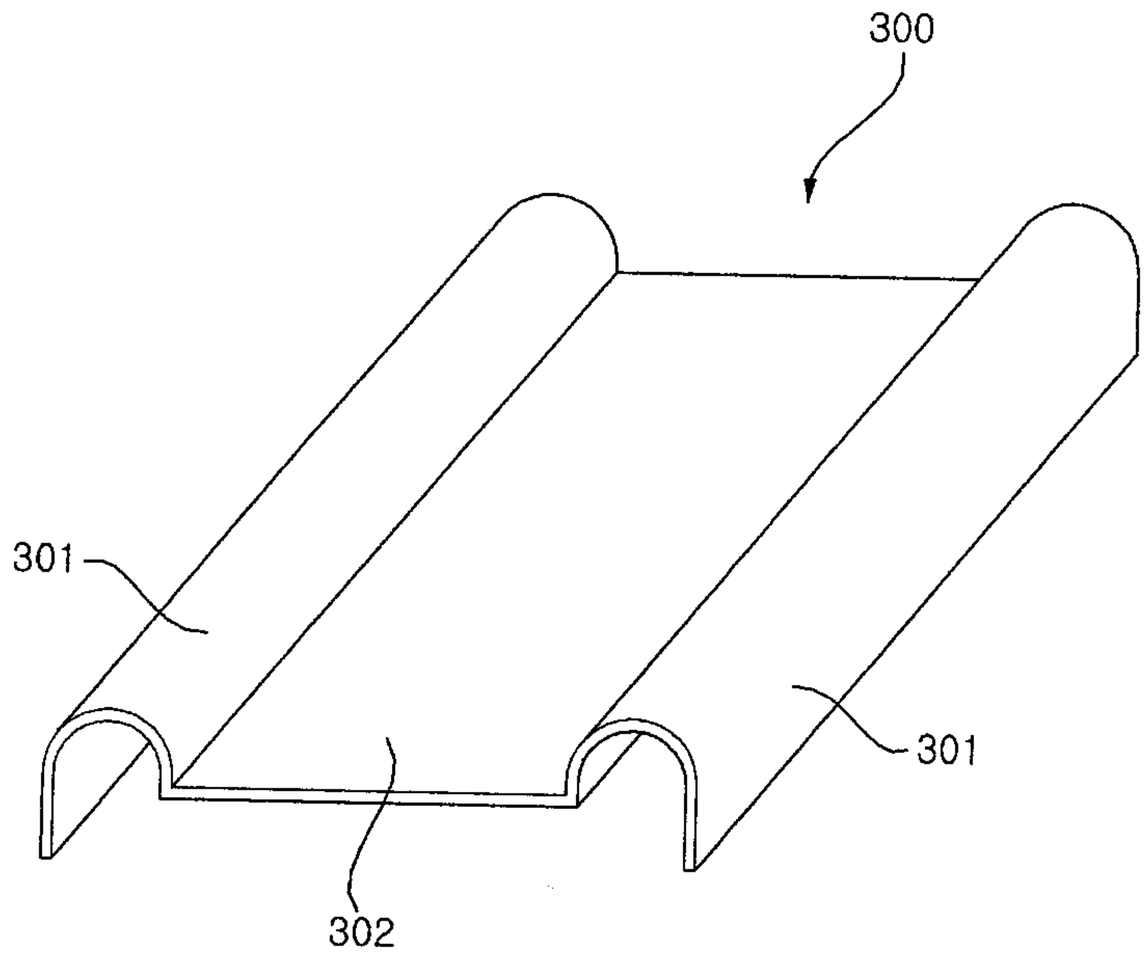


FIG. 14

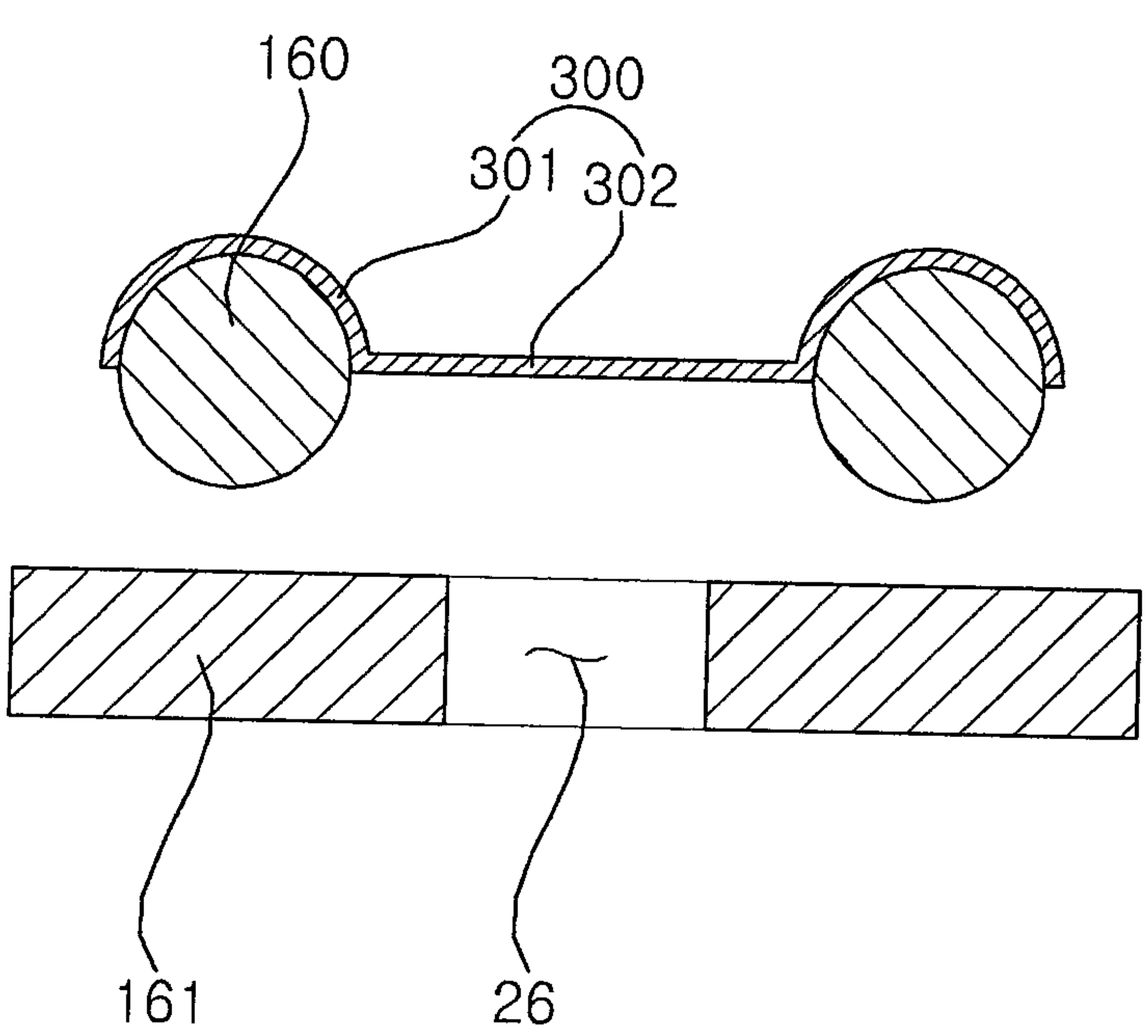


FIG. 15

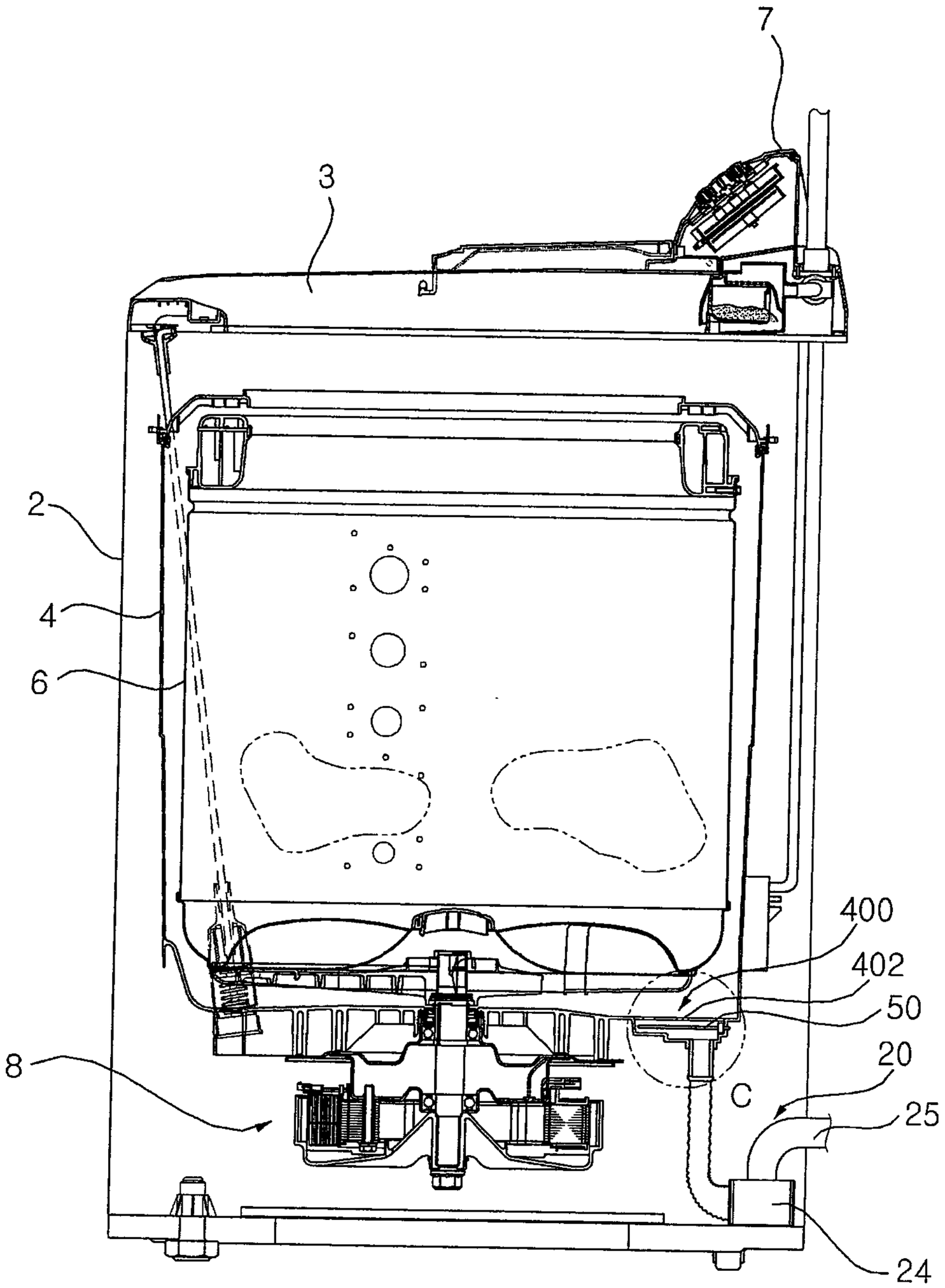


FIG. 16

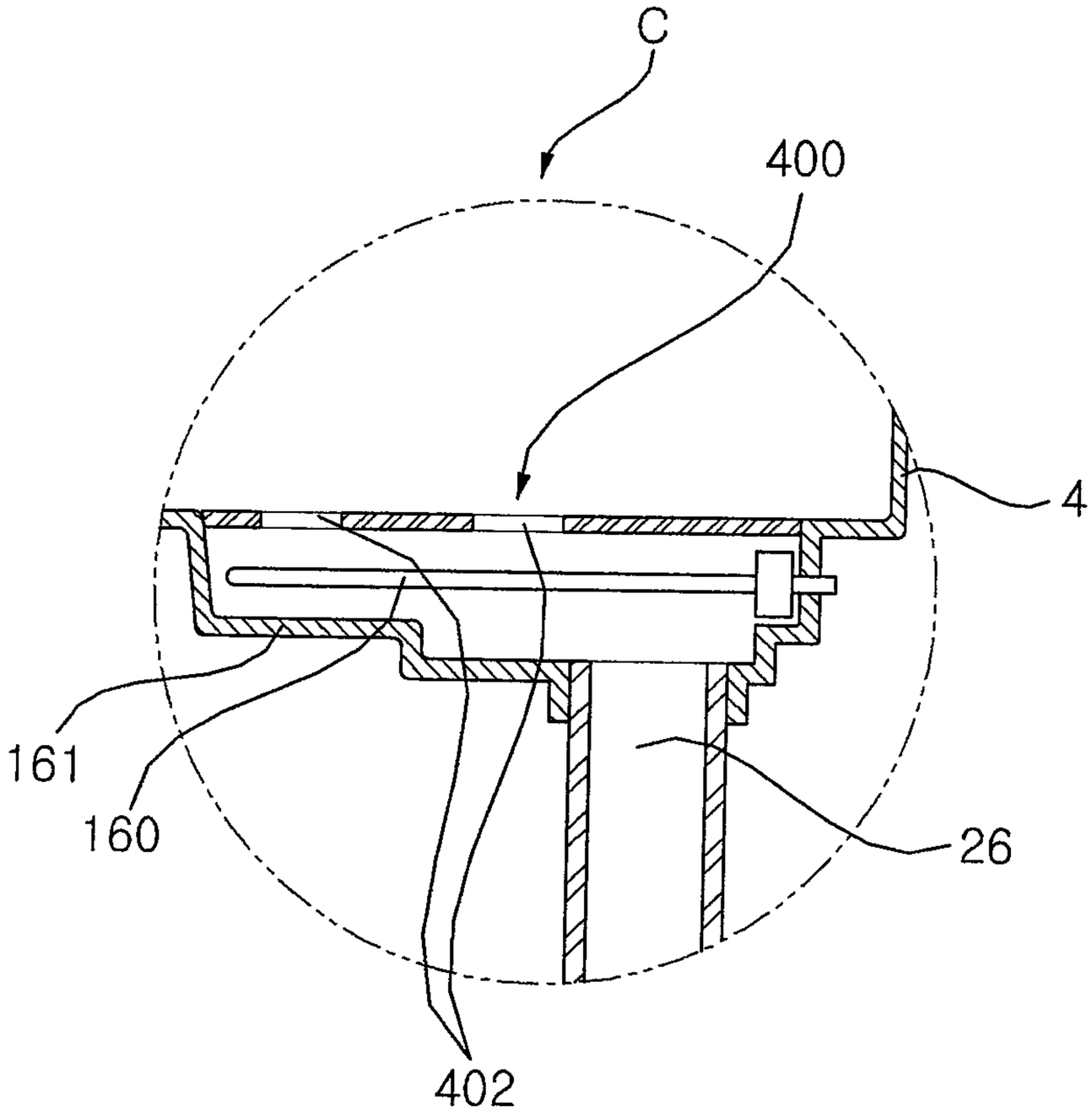
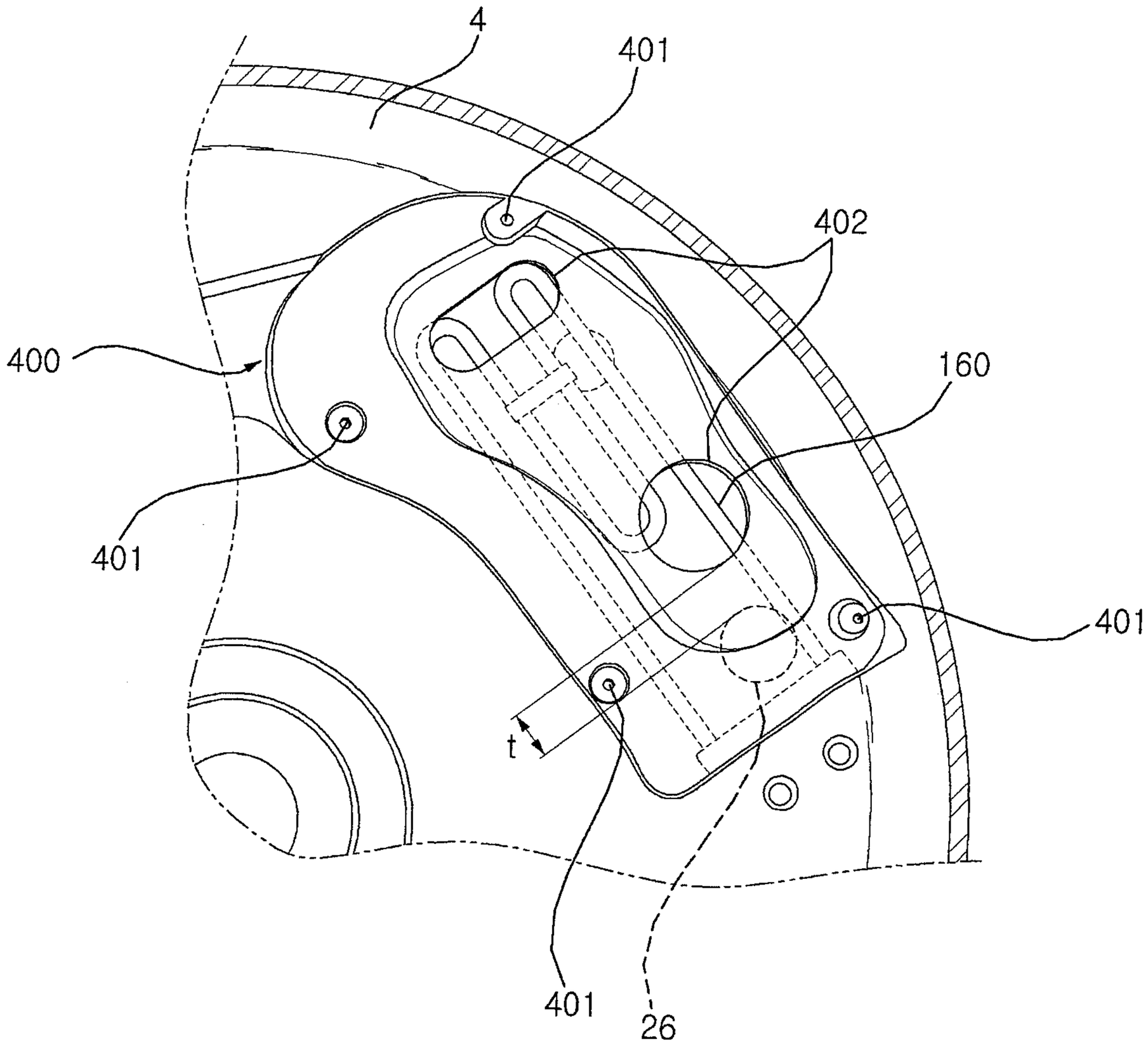
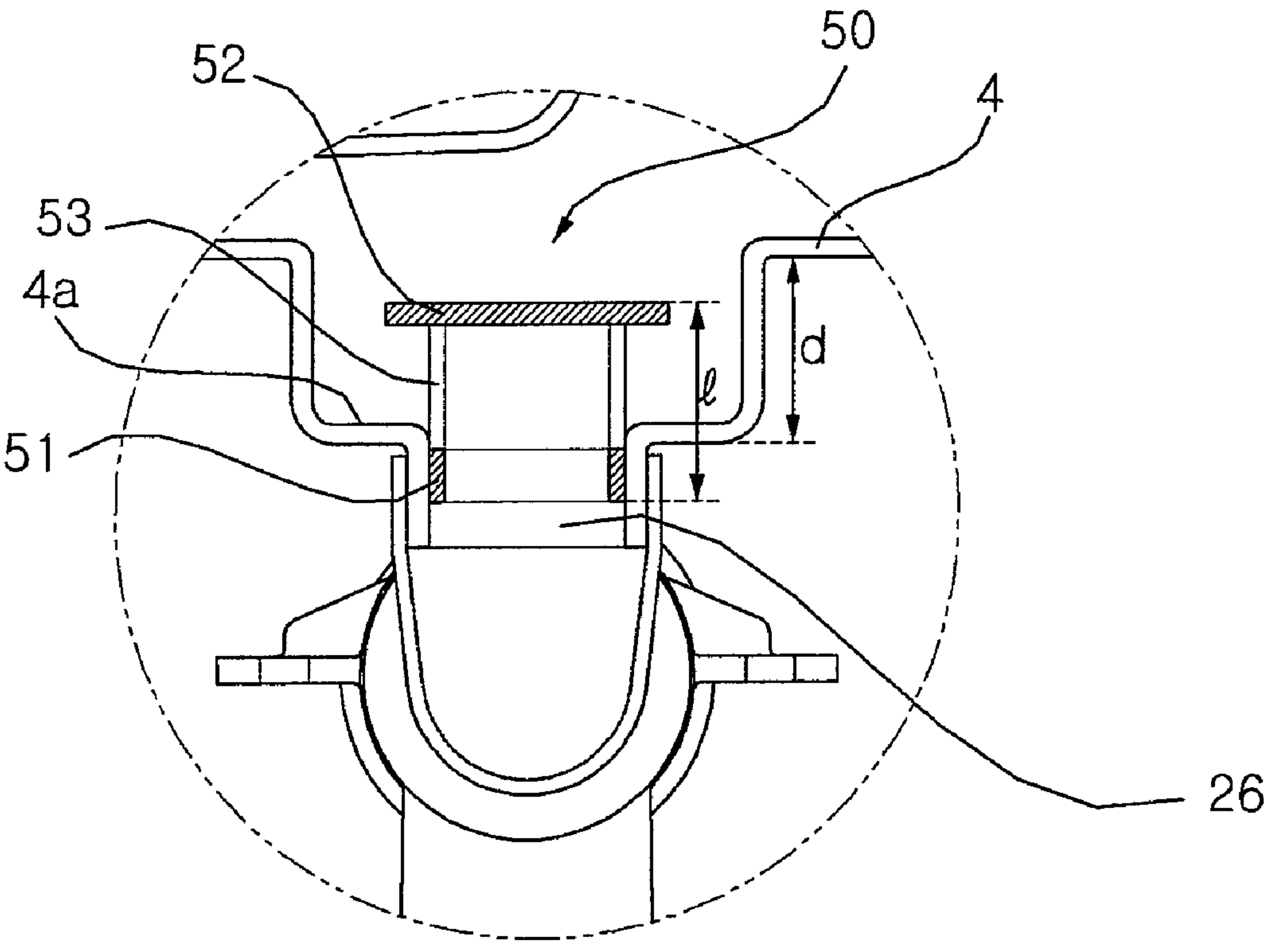


FIG. 17




50
52
4
53
4a
ℓ
d
51
26