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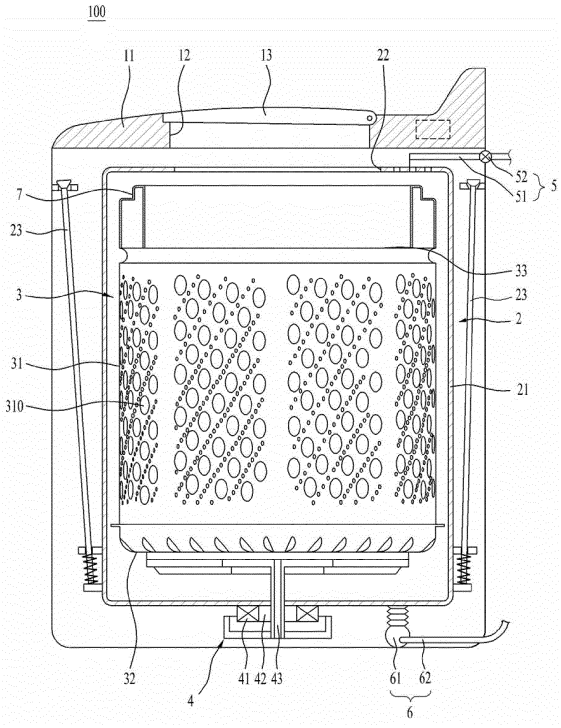
(54) LAUNDRY TREATMENT APPARATUS INCLUDING A BALANCER

(57) Disclosed is a laundry treatment apparatus including a balancer. This apparatus for treating laundry comprises a drum (3) having a drum entrance (33) formed in a top side to put the laundry therethrough and a drum body (31) defining a space where laundry is washed, and a balancer (7) provided to the drum (3) to resolve unbalancing of the drum (3), the balancer (7) comprising a recess part (711) configured to reduce a top side of a space for storing liquid in the balancer (7). Accordingly, the center of gravity of the balancer can be lowered and a laundry receiving space can be increased.

FIG. 2



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Description

BACKGROUND OF THE DISCLOSURE

Field of the Disclosure

[0001] The present disclosure relates to a laundry treatment apparatus, and more particularly, to a balancer and laundry treatment apparatus including the same.

Discussion of the Related Art

[0002] Generally, there are laundry treatment devices of various types such as a washer for mainly washing laundry, a washer for mainly drying laundry, a refresher for mainly refreshing laundry and the like.

[0003] Regarding a laundry treatment device, washing refers to a process of removing contaminants from clothes using mechanical action by injecting water and detergent, and drying refers to a process of removing moisture contained in wet laundry.

[0004] Washers mainly aimed at washing clothes may also be equipped in various forms. For example, a small laundry treatment device is provided to an original laundry treatment device as an integral part to handle or treat a small amount of washing objects.

[0005] A drum may rotate without maintaining dynamic equilibrium (or dynamic balance) depending on a location of the laundry stored inside. Dynamic balance means 'a centrifugal force generated from rotation of a rotating body or a moment made by the centrifugal force is zeroed all on the axis of rotation.' In case of a rigid body, if the mass distribution is constant around the axis of rotation, the dynamic balance may be regarded as maintained.

[0006] In a laundry treatment device, dynamic balance can be understood as a case that the mass distribution of laundry is within an allowable range centering around a rotation axis of a drum (i.e., a case that the drum vibrates and rotates within the allowable range) in case that the drum rotates while the laundry is stored.

[0007] On the other hand, a dynamic balance broken state (i.e., unbalance) of a laundry treatment device is a state that mass distribution is not even centering around a rotation axis of a drum on rotation of the drum, which occurs when laundry fails to be evenly distributed within the drum. A drum rotating in an unbalanced state vibrates, and the vibration of the drum is transferred to a tub or cabinet to cause a problem of inducing noise.

[0008] A laundry treatment device may include a balancer to resolve the unbalance between operations. Various types of balancers may be configured.

[0009] Various types of balancers are disclosed in Korean Publication of Unexamined Patent Applications, No. 10-2020-0036587 (2020.04.07) and Korean Publication of Unexamined Patent Applications, No. 10-2015-0001636 (2015.01.06), which fail to disclose the structure of reducing influence caused by a balancer in an unbalanced state.

SUMMARY OF THE DISCLOSURE

[0010] Accordingly, embodiments of the present disclosure are directed to a balancer and laundry treatment apparatus including the same that substantially obviate one or more problems due to limitations and disadvantages of the related art.

[0011] One technical task of the present disclosure is to provide a balancer and laundry treatment apparatus including the same, by which the unbalance occurring in high-speed rotation of a drum can be effectively attenuated.

[0012] Another technical task of the present disclosure is to provide a balancer and laundry treatment apparatus including the same, by which an extent of unbalance occurring due to a balancer can be minimized as well as a laundry receiving space is secured to the maximum.

[0013] Further technical task of the present disclosure is to provide a balancer and laundry treatment apparatus including the same, by which unbalance can be resolved precisely using a plurality of circulation flow paths.

[0014] Technical tasks obtainable from the present disclosure are non-limited by the above-mentioned technical tasks. And, other unmentioned technical tasks can be clearly understood from the following description by those having ordinary skill in the technical field to which the present disclosure pertains.

[0015] Additional advantages, objects, and features of the disclosure will be set forth in the disclosure herein as well as the accompanying drawings. Such aspects may also be appreciated by those skilled in the art based on the disclosure herein.

[0016] As one example to resolve the aforementioned tasks, provided is a laundry treatment apparatus including a balancer in a shape recessed from a top side of a balancer housing toward an inside of the balancer housing.

[0017] Particularly, provided is a laundry treatment apparatus including a balancer configured to have a concave shape at a water concentrated portion on high-speed rotation of a drum.

[0018] In addition, it is intended to provide a laundry treatment apparatus including a balancer having a 1- or 2-ring structure in some cases.

[0019] To achieve these objects and other advantages and in accordance with the purpose of the disclosure, as embodied and broadly described herein, an apparatus for treating laundry according to one embodiment of the present disclosure may include a drawer cabinet, a drawer body configured withdrawable forward from the drawer cabinet, a tub configured in the drawer body to provide a space for storing water, a drum having a drum body configured rotatable in the tub to store the laundry and a drum entrance for putting the laundry, and a balancer connected to a top side of the drum to damp vibration generated from rotation of the drum, the balancer including a balancer housing coupled to a top side of the drum body and having a balancer perforated hole communi-

cating with the drum entrance to put the laundry therethrough and a circulation flow path configured in a ring shape within the balancer housing to provide a moving route of liquid, wherein the balancer housing may include a recess part configured in a concave shape by being recessed toward the circulation flow path from a top side of a side having the liquid inclined thereto on rotation of the drum.

[0020] The balancer housing may include an outer surface located on a most outer side of the balancer housing, an inner surface provided to a most inner side of the balancer housing to from a balancer perforated hole therein, and a bottom surface connecting the outer surface and the inner surface together, wherein the outer surface, the inner surface and the bottom surface may be formed as an integral part and wherein the recess part may be provided to the outer surface.

[0021] The outer surface may include a drum connecting part connected to the drum body and extended in a height direction of the drum and a projected part formed with the drum connecting part as an integral part, extended in the height direction of the drum, projected to a most outer side of the outer surface, and connected to the recess part.

[0022] The recess part may be formed with the projected part and the drum connecting part as the integral part.

[0023] A partition is provided between the outer surface and the inner surface to divide an inner space of the circulation flow path.

[0024] The apparatus may include a first chamber divided by the partition and formed closer to the outer surface than the inner surface and a second chamber divided by the partition and formed closer to the inner surface than the outer surface, wherein the recess part may be configured in the first chamber.

[0025] The circulation flow path may include a first circulation flow path configured in a ring shape within the first chamber to store the liquid and a second circulation flow path configured in a ring shape within the second chamber to store the liquid, wherein the first circulation flow path and the second circulation flow path may be configured to enable the liquid stored in the first circulation flow path and the liquid stored in the second circulation flow path to flow independently from each other based on rotation of the drum.

[0026] The recess part may include a first recess extension part extended from the outer surface in a direction of the inner surface and a second recess extension part extended from the first recess extension part in a height direction of the drum body.

[0027] The drawer cabinet may be connected to a laundry treatment unit performing at least one job selected from the group consisting of washing, drying and refreshing of the laundry.

[0028] In another aspect of the present disclosure, as embodied and broadly described herein, an apparatus for treating laundry according to one embodiment of the present disclosure may include a cabinet, a tub received in the cabinet and providing a space for storing water, a drum having a drum body configured rotatable in the tub to store the laundry and a drum entrance for putting the laundry, and a balancer located on a top side of the drum body to damp vibration generated from rotation of the drum, the balancer including a balancer housing coupled to a top side of the drum body and having a balancer perforated hole communicating with the drum entrance to put the laundry therethrough and a circulation flow path configured in a ring shape within the balancer housing to provide a moving route of liquid, wherein the balancer housing may include a recess part configured in a concave shape by being recessed toward the circulation flow path from a top side of a side having the liquid inclined thereto on rotation of the drum.

[0029] The balancer housing may include an outer surface located on a most outer side of the balancer housing, an inner surface provided to a most inner side of the balancer housing to from a balancer perforated hole therein, and a bottom surface connecting the outer surface and the inner surface together, wherein the outer surface, the inner surface and the bottom surface may be formed as an integral part.

[0030] The outer surface may include a drum connecting part connected to the drum body and extended in a height direction of the drum and a projected part formed with the drum connecting part as an integral part, extended in the height direction of the drum, projected to a most outer side of the outer surface, and connected to the recess part.

[0031] The recess part may be formed with the projected part as the integral part.

[0032] A partition is provided between the outer surface and the inner surface to divide an inner space of the circulation flow path.

[0033] The apparatus may include a first chamber divided by the partition and formed closer to the outer surface than the inner surface and a second chamber divided by the partition and formed closer to the inner surface than the outer surface, wherein the recess part may be configured in the first chamber.

[0034] The circulation flow path may include a first circulation flow path configured in a ring shape within the first chamber to store the liquid and a second circulation flow path configured in a ring shape within the second chamber to store the liquid, wherein the first circulation flow path and the second circulation flow path may be configured to enable the liquid stored in the first circulation flow path and the liquid stored in the second circulation flow path to flow independently from each other based on rotation of the drum.

[0035] The recess part may include a first recess extension part extended from the outer surface in a direction of the inner surface and a second recess extension part extended from the first recess extension part in a height direction of the drum body.

[0036] Accordingly, the present disclosure provides

the following effects and/or advantages.

[0037] First of all, a balancer and laundry treatment apparatus including the same according to the present disclosure may effectively attenuate unbalance occurring on high-speed rotation of a drum.

[0038] A balancer and laundry treatment apparatus including the same according to the present disclosure may minimize an extend of unbalance occurring due to the balancer as well as secure a laundry receiving space to the maximum.

[0039] A balancer and laundry treatment apparatus including the same according to the present disclosure may resolve unbalance precisely using a plurality of circulation flow paths.

[0040] A balancer and laundry treatment apparatus including the same according to the present disclosure may enable liquid flowing in a balancer housing to work stably by maintaining low center of gravity on high-speed rotation of a drum.

[0041] A balancer and laundry treatment apparatus including the same according to the present disclosure may improve efficiency by securing a laundry receiving space.

[0042] Effects obtainable from the present disclosure may be non-limited by the above-mentioned effects. And, other unmentioned effects can be clearly understood from the following description by those having ordinary skill in the technical field to which the present disclosure pertains.

[0043] It is to be understood that both the foregoing general description and the following detailed description of the present disclosure are exemplary and explanatory and are intended to provide further explanation of the disclosure as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the disclosure and together with the description serve to explain the principle of the disclosure. The above and other aspects, features, and advantages of the present disclosure will become more apparent upon consideration of the following description of preferred embodiments, taken in conjunction with the accompanying drawing figures.

FIG. 1 is a perspective diagram showing a laundry treatment apparatus according to one embodiment of the present disclosure.

FIG. 2 is a cross-sectional diagram showing a laundry treatment apparatus according to one embodiment of the present disclosure.

FIG. 3 is a perspective diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure.

FIG. 4 is an exploded perspective diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure.

FIG. 5 is a cross-sectional diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure.

FIG. 6 is a perspective diagram showing a balancer according to one embodiment of the present disclosure.

FIG. 7 is a cross-sectional diagram showing an inner structure of a balancer of the related art and an inner structure of a balancer according to one embodiment of the present disclosure.

FIG. 8 is a schematic diagram showing various embodiments of a balancer according to the present disclosure.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0045] Reference will now be made in detail to the preferred embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. A detailed description below is provided to assist in a comprehensive understanding of the methods, devices, and/or systems described in this specification. However, this is just an example, by which the idea of the present disclosure is non-limited.

[0046] In explaining embodiments of the present disclosure, if it is deemed that a specific description of the prior art related to the present disclosure may unnecessarily blur the gist of the present disclosure, the detailed description shall be omitted. Furthermore, the terms described below are those defined in consideration of their functions in the present disclosure, which may depend on the intentions or practices of the user, operator, etc. The definition will therefore have to be based on the full text of the present specification. The terms used in the detailed description are simply to describe embodiments of the present disclosure and should never be limited. Unless clearly used differently, singular forms of expression contain multiple forms of meaning. In this description, an expression such as "include" or "provide" is intended to refer to some characteristics, numbers, steps, operations, elements, or combinations thereof, and should not be interpreted to exclude the existence or possibility of one or more other characteristics, numbers, steps, operations, elements, or combinations thereof.

[0047] As shown in the drawings, a laundry treatment apparatus 100 according to one embodiment of the present disclosure may include a cabinet 1, a tub 2 and a drum 3. The cabinet 1 may be configured in any shapes capable of receiving the tub 2 therein, and FIG. 1 shows one example of a case that the cabinet 1 forms an exterior of the laundry treatment apparatus 100.

[0048] A cabinet entrance 12 for supplying laundry to the drum 3 or withdrawing laundry stored in the drum 3 externally may be formed in the cabinet 1. A cabinet body 11 providing a receiving space for receiving the components described in the following therein and a door 13 for opening/closing the cabinet entrance 12 may be pro-

vided to the cabinet 1. A control panel 14 for a user to control the laundry treatment apparatus 100 may be provided to an outside of the cabinet 1.

[0049] According to one embodiment, as shown in FIG. 1, the cabinet entrance 12 is formed in a top side of the cabinet 1 and the door 13 is provided to the top side to open/close the cabinet entrance 12. Alternatively, the cabinet entrance 12 and the door 13 may be provided to any places other than the top side of the cabinet 1.

[0050] The tub 2 is a means for storing water required for washing of laundry. A tub entrance 22 communicating with the cabinet entrance 12 may be provided to the tub 2. For example, as one side of the tub 2 is open, the tub entrance 22 may be formed, and at least one portion of the tub entrance 22 is located to confront the cabinet entrance 12 so as to communicate with the cabinet entrance 12.

[0051] FIG. 1 shows a laundry treatment apparatus 100 of a top-loading type according to one embodiment of the present disclosure.

[0052] The tub 2 may include a tub body 21 forming an exterior of the tub 2. As one side of the tub body 21 is open, the tub entrance 22 communicating with the cabinet entrance 12 may be provided. So to speak, as a top side of the tub 2 is open, the tub entrance 22 is formed. The tub entrance 22 is located below the cabinet entrance 12 to communicate with the cabinet entrance 12.

[0053] The tub 2 is fixed to an inside of the cabinet 1 via a tub support part 23. The tub support part 23 may be configured with a structure capable of damping the vibration generated from the tub 2. The tub 2 is supplied with water through a water supply part 5. The water supply part 5 may include a water supply pipe 51 connecting a water supply source and the tub 2 together and a water supply valve opening/closing the water supply pipe 51.

[0054] The laundry treatment apparatus 100 according to one embodiment of the present disclosure may include a detergent supply device configured to store a detergent and supply the detergent to the tub 2. The water supply part 5 supplies water to the detergent supply device, whereby the water via the detergent supply device may be supplied to the tub 2 together with the detergent.

[0055] The water stored in the tub 2 is discharged from the cabinet 1 through a drain part 6. The drain part 6 may include a drain pipe 62 guiding the water in the tub 2 to an outside of the cabinet 1 and a drain pump 61 provided to the drain pipe 62.

[0056] The laundry treatment apparatus 100 according to one embodiment of the present disclosure may include a water spray device spraying water into the tub 2 through the tub entrance 22. The water supply part 5 may be connected to the water spray device, thereby supplying water into the tub directly via the water spray device.

[0057] The drum 3 may be rotatably provided within the tub 2. To be rotatable within the tub 2, the drum 3 may be configured to have a circular cross-section. For example, as shown in FIG. 1, the drum 3 may be configured in a cylindrical shape.

[0058] Particularly, the drum 3 may include a drum body 31 providing a space for storing laundry therein, an extension side 32 configured to connect the drum body 31 and support laundry by being formed as an integral part with the drum body 31, and a drum entrance 33 formed in one side of the drum body 31 to put laundry.

[0059] The drum 3 may be provided with the drum entrance 33 located below the tub entrance 22 to communicate with the entrance. As one side of the drum 3 is open, as described below, an open side may be formed. The open side may correspond to the drum entrance 33.

[0060] A multitude of communicating holes 310, through which an inside and outside of the drum body 31, i.e., an inside of the drum 3 and an inside of the tub 2 partitioned by the drum 3 communicate with each other, may formed in an outer circumference of the drum body 31. Hence, the water supplied to the tub 2 may be supplied into the drum 3, in which laundry is stored, through the communicating holes 310 of the drum 3.

[0061] The drum 3 may be rotated by a drive part 4. The drive part 4 may include a stator 41 fixed to an outside of the tub 2 to form a rotating magnetic field if supplied with current, a rotor 42 rotated by the rotating magnetic field, and a rotating shaft 43 configured to penetrate the tub 2 to connect the rotor 42 to the drum 3 and the like.

[0062] As shown in FIG. 1, the rotating shaft 43 may be configured vertical to a floor surface of the tub 2. In this case, the cabinet entrance 12 may be provided to the top side of the cabinet 1, the tub entrance 22 may be provided to the top side of the tub 2, and the drum entrance 33 may be provided to the top side of the drum 3.

[0063] In some implementations, if the drum 3 rotates while laundry is concentrated on a predetermined area in the drum 3, a dynamic balance broken state (i.e., unbalance) occurs in the drum 3. If the drum 3 in the unbalanced state rotates, the drum 3 rotates while vibrating by the centrifugal force working on the laundry. Such vibration of the drum 3 is transferred to the tub 2 or the cabinet 1 to cause a problem of inducing noise.

[0064] To prevent such a problem, the present disclosure may further include a balancer 7 controlling the unbalance of the drum 3 by generating a force of cancelling or damping a centrifugal force working on laundry.

[0065] In some implementations, referring to FIG. 1, the tub 2 may include a space for storing water therein and the drum 3 may be rotatably provided within the tub 2. The drum 3 may include an open side (i.e., drum entrance) for putting or withdrawing laundry and an extension side (i.e., floor surface) 32 located on the opposite side of the open side.

[0066] According to one embodiment of the present disclosure, FIG. 2 shows that the top side of the drum 3 corresponds to the drum entrance 33 and that the bottom side corresponds to the extension side 33. As described above, the drum entrance 33 may correspond to a side through which the laundry put through the cabinet entrance 12 of the cabinet 1 and the tub entrance 22 of the tub 2 passes.

[0067] Meanwhile, the water supply part 5 may be configured to supply water into the tub 2 in a manner of being connected to such a means as the detergent supply device, the water spray device and the like. In some implementations, one embodiment of the present disclosure may include a control unit (not shown) controlling a water supply amount by controlling the water supply part 5 in a washing course and the like.

[0068] The control unit may be configured to control a water supply amount supplied to the tub 2 in a washing course, a rinsing course and the like, the water supply amount may be controlled via a manipulating part (i.e., control panel) 14 provided to the cabinet 1 so as to be manipulated by a user or determined via an amount of laundry, a load of the drive part4 and the like.

[0069] The control unit may be configured to control the water supply part 5 depending on one of a plurality of preset water supply amounts based on a command or the like selected by a user in a washing course and the like.

[0070] FIG. 3 is a perspective diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure. FIG. 4 is an exploded perspective diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure. FIG. 5 is a cross-sectional diagram showing a laundry treatment apparatus according to another embodiment of the present disclosure.

[0071] Referring to FIG. 3 and FIG. 4, a laundry treatment apparatus 100' may include a cabinet 1 having an entrance 12 provided to a front side and a drawer 10 provided to one side of the cabinet 1.

[0072] In particular, the cabinet 1 is a part that provides a space for treating laundry. In the drawing, a washer or dryer having a cabinet entrance 12 provided to a front side is shown, by which the present disclosure is non-limited.

[0073] Laundry treatments in the cabinet 1 are non-limited to washing or drying and may be performed in various ways such as refreshing of injecting stream while heating laundry and the like. Namely, a laundry treatment unit (described later) coupled to the laundry treatment apparatus 100' may include a laundry treatment apparatus capable of performing at least one of washing, drying and refreshing. For example, the laundry treatment unit may be configured in various forms such as a washer, a dryer, a washer/dryer, a laundry treatment device including an iron and a laundry rack, etc.

[0074] In some implementations, the laundry treatment apparatus 100' according to one embodiment of the present disclosure may be configured in a manner that a drawer 10 is provided to the cabinet 1. The drawer 10 may be provided to any side of the cabinet 1. Yet, it is preferable that the drawer 10 is provided to a top or bottom side of the cabinet 1 for the efficiency of an installation space. In the drawing, the drawer 10 is provided to the bottom side of the cabinet 1 with reference to an installation plane, by which the present disclosure is non-limited.

[0075] The drawer 10 may include a drawer body 20 and a drawer cabinet 101 providing a space for receiving the drawer body 20 therein. The drawer cabinet 101 may be a part connected to the aforementioned cabinet 1. The drawer cabinet 101 may be formed with the cabinet 1 as an integral part and provided as a part distinguished with a separate member such as a partition (not shown). Alternatively, the cabinet 1 and the drawer cabinet 101 may be manufactured separately and then provided as a coupled part.

[0076] The drawer 10 may be configured to include the drawer body 20 withdrawable from the drawer cabinet 101, a tub 3 provided within the drawer body 20 to provide a space for storing water therein, and a drum 4 rotatably provided within the tub 3.

[0077] The drawer 10 may be configured to include a drawer body 20, a drawer cover 202 forming a top side of the drawer body 20, and a drawer panel 201 fixed to the drawer body 20.

[0078] The drawer panel 20 may be provided to the front sides of the drawer 10 and the cabinet 1. The drawer panel 201 may be configured to be similar to the front side of the cabinet or projected in a front direction by the same length. Yet, the shape of the drawer panel 201 may be changed depending on the manufacturing problems, functional additions and the like.

[0079] The drawer cover 202 may be provided to seal a space between the tub 30 received in the drawer body 20 and the drawer body 20. In some cases, the drawer cover 202 may include a first drawer cover 2021 provided to a top side of a tub cover 302 and a second drawer cover 2022 provided above the first drawer cover 201 to be coupled to the first drawer cover 2021. A drawer entrance 203 providing a space for putting laundry may be formed in the drawer cover 202.

[0080] In other words, the drawer body 20 may be configured in a hexahedral shape having an open side provided to a top side, and the drawer cover 202 may be configured to form a top side of the drawer 10 by being fixed to a top end of the drawer body 20.

[0081] The drawer panel 201 may be configured as a means (e.g., handle) for facilitating the drawer body 20 to be withdrawn from or inserted in the cabinet 1.

[0082] The drawer body 20 may be easily withdrawn or inserted via a rail part 110 connected to the drawer cabinet 101 and the drawer body 20.

[0083] A control panel controlling an operation of the laundry treatment apparatus 100' may be provided to a top side of the drawer panel 201. The control panel is a means for receiving, from a user, control commands required for an operation of a means (e.g., water supply valve, pump) for supplying water to the tub 30 or draining water, a means (e.g., drive part) for rotating the drum 40, etc. Namely, the control panel may include an input unit for a user to input a control command to the laundry treatment apparatus and a display unit for confirming the control command inputted via the input unit or informing a

user of an execution process of a control command inputted by the user.

[0084] The drawer cover 202 may be provided with an entrance configured to perforate the drawer cover 202 to communicate with an inside of the drawer body 20 and a drawer entrance 203 configured to perforate the drawer cover 202 so as to have a water supply pipe 602 (described later) inserted therein.

[0085] The drawer 10 may have a length of a width direction (i.e., Y-axis direction) greater than a length of a height direction (i.e., Z-axis direction) (i.e., a width-directional length of the drawer may be set greater than a height-directional length of the drawer). This is to enable the laundry treatment apparatus 100' to be located above or below another treatment device capable of laundry washing or drying and to facilitate a user's access to the control panel or the drawer entrance 203.

[0086] The tub 30 may include a tub body 301 located within the drawer body 20 to provide a space for storing water therein and a tub cover 302 coupled to the tub body 301 so as to form a top side of the tub 30.

[0087] The tub body 301 may be configured in a cylindrical shape having an open top side. If a width of the drawer body 20 is formed greater than a height of the drawer body 20, a width of the tub body 301 is preferably set greater than a height of the tub body 301.

[0088] The tub body 301 may be flexibly fixed to an inside of the drawer 20 via a support part 303. The tub support part 303 may include a first bracket projected from the drawer body 20 toward a circumference of the tub body 301, a second bracket projected from the circumference of the tub body 301 toward a lateral side of the drawer body and located at a position lower than the first bracket, and a support bar having one end (i.e., top end) connected to the first bracket and the other end (i.e., bottom end) connected to the second bracket. A plurality of the tub support parts 303 of the above structure may be configured in a manner of being spaced apart from each other at the same angle with reference to a vertical line that passes a center of the tub body 301.

[0089] A tub entrance 304 enabling an inner space of the tub body 301 to communicate with an outside and a water supply outlet may be provided to the tub cover 302. The tub entrance 304 may be located below the drawer outlet 203 and configured to be open/closed by a tub door 305 rotatably coupled to the tub cover 302. As the tub door 305 is located below the drawer entrance 203, when the drawer 10 is withdrawn from the drawer cabinet 101, the tub door 305 may be rotated in a direction of opening the tub entrance 304. One end of a water supply pipe 602 is fixed to the water supply outlet.

[0090] The drum 40 may include a drum body 401 rotatably provided within the tub 30 to provide a space for storing laundry therein and an extension side 402 formed with the drum body 401 as an integral part and configured to connect the drum body 401 to support laundry. The drum body 401 may be configured in a cylindrical shape having an open top side or a cylindrical shape having a drum entrance 403 formed in a top side. A plurality of communicating holes 401a may be formed in at least one of a circumferential surface and a floor surface of the drum body 401 to enable an inside of the drum body 401 to communicate with an inside of the tub 30.

[0091] The drum body 401 is rotated by a drive part 50. The drive part 50 may include a stator 501 fixed to a bottom side of the tub body 301 and located outside the tub 30, a rotor 502 rotated by a rotating magnetic field provided by the stator 501, and a rotating shaft 503 penetrating the bottom side of the tub body 301 to connect the drum body 401 and the rotor 502. As shown in the drawing, the rotating shaft 503 may be configured to be vertical to the tub entrance 304 (or the floor surface of the tub body).

[0092] A balancer 7 may be provided to a top end of the drum body 401. The balancer 7 is a means for damping vibration generated from the drum body when the drum body 401 rotates. The balancer 7 may include a balancer housing 71 fixed to the top end of the drum body 401, a circulation flow path 74 provided inside the balancer housing 71 in a ring shape to correspond to the balancer housing 71, and a liquid movable along an inside of the circulation flow path 74.

[0093] The above-configured laundry treatment apparatus 100' is supplied with water through the water supply part 601. The water supply part 601 may include a water supply pipe 602 connecting the water supply outlet to a water supply source located outside the drawer cabinet 101 and a water supply valve 603 controlling the water supply pipe 602 to be open or closed in response to a control signal of a control unit.

[0094] Meanwhile, the water stored in the tub 30 is discharged from the drawer cabinet 101 through a drain part 604. The drain part 604 may include a first drain pipe 605 connecting the bottom side of the tub body 301 to a drain pump 606 described later and a second drain pipe 607 guiding the water discharged from the drain pump 606 to an outside of the drawer cabinet 101. A drain cabinet perforated hole penetrated by the second drain pipe 607 may be provided to a rear side of the drawer cabinet 101.

[0095] The drain pump 606 may be fixed to the drawer body 20 or the drawer cabinet 101 to connect the first drain pipe 605 and the second drain pipe 607 together. FIG. 5 shows one example of a case that the drain pump 606 is fixed to the drawer body 20.

[0096] The drain pump 606 may include a housing fixed to an inside of the drawer body 22, a motor rotating an impeller provided within the housing, and a discharge pipe connected to the second drain pipe 607 to discharge water in the housing to the second drain pipe 607.

[0097] FIG. 6 is a perspective diagram showing a balancer according to one embodiment of the present disclosure.

[0098] In the following, a balancer applied to the laundry treatment apparatuses shown in FIGs. 1 to 5 will be described in detail. Namely, the balancer 7 described in the present disclosure is applicable to the top-loading

type laundry treatment apparatus shown in FIG. 1 and FIG. 2 or one of the two laundry treatment apparatuses combined together shown in FIGs. 3 to 5. Yet, for the clarity and convenience of the description, the following description will be made with reference to the configuration shown in FIGs. 3 to 5.

[0099] The balancer 7 may be provided to a top side of the drum, and more particularly, to a top side of the drum body 401, i.e., a portion in which the drum entrance 403 is formed. The balancer 7 may work to damp the vibration generated from rotation of the drum 40.

[0100] The balancer 7 may include a balancer housing 71 and a balancer cover 72.

[0101] The balancer housing 71 may be configured to form the top side of the drum body 401 by being fixed to the drum body 401. The balancer housing 71 is configured in a ring shape to have a balancer perforated hole 73 formed by perforating the balancer housing 71.

[0102] In addition, the balancer 7 includes a circulation flow path 74 provided inside in a ring shape to provide a moving path of liquid and the liquid stored in the circulation flow path 74.

[0103] In this case, types of the liquid are non-limited. It is enough for the liquid to flow by being received in the balancer housing to resolve the unbalance due to the rotation of the drum 40.

[0104] Since the balancer perforated hole 73 is located below the tub entrance 304, laundry put through the tub entrance 304 moves into the drum body 401 through the balancer perforated hole 73. Thus, as the balancer perforated hole 73 communicates with the drum entrance, the laundry having passed through the balancer perforated hole 73 enters the drum body 401 through the drum entrance.

[0105] A top end of the balancer housing 71 and a bottom end of the balancer cover 72 may be coupled together by thermal bonding. Namely, the balancer housing 71 and the balancer cover 72 are provided as an integral part via thermal bonding, whereby an exterior of the balancer 7 may be determined. Although FIG. 6 sows that the balancer housing 71 and the balancer cover 72 are disassembled for the clarity of the present disclosure, the balancer housing 71 and the balancer cover 72 are preferably formed as an integral part.

[0106] A bottom end of the balancer housing 71 may be inserted into the drum body 401, and a top side of the balancer housing 71 may be exposed from the drum body 401.

[0107] In order to prevent liquid from moving along a circulation flow path while the drum body 401 is rotating at high speed, a multitude of slip prevention walls 75 may be provided to the circulation flow path 74.

[0108] As shown in the drawing, the slip prevention wall 75 may be provided to the balancer housing 71. One end may be fixed to an outer surface 712 (i.e., a surface confronting a circumferential surface of the tub body) of the circulation flow path 74, and a free end may include a board projected toward an inner surface 713 (i.e., a surface facing a center of the drum body) of the circulation flow path 74.

[0109] The free end of the slip prevention wall 75 should be configured not to contact with an inner circumferential surface of the circulation flow path 74. Namely, when the drum body 401 rotates at low speed or eccentrically, the liquid needs to move along the circulation flow path.

[0110] Preferably, the slip prevention wall 75 includes a multitude of boards spaced apart from each other at the same angle with reference to the center of the balancer perforated hole 73.

[0111] In addition, if a width of the circulation flow path 74 (i.e., a length of the circulation flow path side by side with a diameter direction of the drum body) is increased to raise a volume of the circulation flow path 74, it causes a disadvantage that a volume of the drum body decreases (i.e., a disadvantage that an amount of laundry that can be treated by the drum body). Hence, the width of the circulation flow path 74 is preferably set smaller than a height of the circulation flow path (i.e., a length of the circulation flow path side by side with a height direction of the drum body).

[0112] FIG. 7 is a cross-sectional diagram showing an inner structure of a balancer of the related art and an inner structure of a balancer according to one embodiment of the present disclosure. Particularly, FIG. 7 (a) is a cross-sectional diagram showing a balancer of the related art, and FIG. 7 (b) is a cross-sectional diagram showing a balancer according to one embodiment of the present disclosure.

[0113] Prior to the description of FIG. 7, the balancer 7 will be described schematically. By increasing heights of the balancer housing 71 and the balancer cover 72 (i.e., the height of the balancer) and the volume of the circulation flow path 74, the unbalanced state of the laundry treatment apparatus 100' can be resolved effectively. Yet, if a height of a gravity center G of the balancer 7 is raised, it may cause a problem that vibration of the top end of the drum body 401 and vibration of the top end of the tub 30 increase.

[0114] In particular, if the height of the gravity center G of the balancer 7 is raised, a distance between the bottom end of the tub support part 303 and the gravity center G is increased (i.e., a distance between a support point formed by the tub support part and the gravity center of the whole drum is increased). This means that a distance (i.e., a length of a moment arm) orthogonal to a force (i.e., a force generated when liquid moves along the circulation flow path) working on the gravity center G on a bottom end of the tub support part 303 is increased and the length of the moment arm means that the top end vibration of the tub 30 may increase.

[0115] Therefore, it is important to minimize the height of the gravity of the balancer as well as to increase the volume of the circulation flow path. In addition, if the height of the balancer 7 is long, it is advantageous in securing a laundry received space to the maximum. Yet,

the gravity center is raised, an extent of unbalance may increase. Hence, it is important to minimize the height of the gravity center as well as to secure the height of the balancer 7.

[0116] In particular, if the weight unbalance generated from rotation of the drum 40 exceeds a reference value, liquid received in the balancer 7 flows along the circulation flow path 74. In doing so, the liquid is inclined to a radial outside of the balancer 7. The reason why the liquid is inclined to the radial outside of the balancer 7 is that a centrifugal force works on the liquid.

[0117] Each of FIG. 7 (a) and FIG. 7 (b) shows a form that liquid is inclined to a radial outside of the balancer housing 71, i.e., a state of a water surface on high-speed rotation of the drum.

[0118] Referring to FIG. 7 (b), the balancer 7 according to one embodiment of the present disclosure includes a recess part 711. The recess part 711 may be configured in a concave shape recessed toward the circulation flow path 74 from a top side of the liquid inclined side on rotating the drum 40.

[0119] The recess part 711 is configured in a shape of being recessed toward an inside of the circulation path 74 from a top side of the balancer housing 71. Therefore, compared to the balancer of the related art, the balancer 7 according to one embodiment of the present disclosure has a decreased height (with reference to a height direction of the balancer) of the liquid inclined portion on rotation of the drum 40.

[0120] A center of gravity is an action point of a resultant force of gravity working on each portion of an object. Hence, if the height of the liquid inclined portion is decreased, as shown in FIG. 7, the center of gravity is lowered overall.

[0121] In particular, compared to a gravity center G of the related art balancer, a gravity center G' of the balancer 7 having the recess part 711 may be lowered by a prescribed length d with reference to a height direction of the balancer 7. Hence, an effect caused to the unbalance occurrence by the balancer may be minimized as well as a receiving space of the drum 40 is secured to the maximum.

[0122] The balancer 7 is a part provided to reduce noise and vibration when an unbalance extent is equal to or greater than a reference value on rotation of the drum 40. Yet, it is not preferable that the unbalance increases due to the balancer 7. If the height of the balancer 7 is determined as excessively low, a space for receiving laundry therein is reduced to bring the degradation of laundry treatment performance of washing (or drying).

[0123] The balancer 7 includes the recess part 711, thereby minimizing the effect caused to the unbalance occurrence and securing a space for receiving laundry therein to the maximum. The recess part 711 will be described in the following again.

[0124] The balancer housing 71 includes an outer surface 712 provided to a most radial outside of the balancer housing 71, an inner surface 713 provided to a most inner side of the balancer housing 71 to form a balancer perforated hole 73 therein, and a bottom surface 714 connecting the outer surface 712 and the inner surface 713 to each other.

[0125] The outer surface 712, the inner surface 713 and the bottom surface 714 are formed as an integral part. The bottom surface 714 may be inserted in an inside of the drum body 401 so as to be connected to the drum 40 or connected to the drum body 401 on the top side of the drum body 401.

[0126] The outer surface 712 may include a drum connecting part 712a connected to the drum body 401 and extended in a height direction of the drum 40, a projected part 712b formed with the drum connecting part 712a as an integral part, extended in the height direction of the drum and projected toward a most outer side of the outer surface 712, and a recess part 711 connected to the projected part 712b. In this case, the drum connecting part 712a, the projected part 712b and the recess part 711 may be formed as an integral part. In addition, the drum connecting part 712a may include a surface connected to the drum body 401. A length of the drum connecting part 712a is non-limited.

[0127] The balancer 7 and the drum 40 may be connected via a balancer coupling part 405 provided to the drum. As shown in FIG. 7 (a), the balancer coupling part 405 may be configured in a manner of being fastened to the drum connecting part 712a and the bottom surface 714, or the drum connecting part 712a may be fitted into the drum 40. In this case, a bead part 404 may become the balancer coupling part 405.

[0128] If the projected part 712b is further projected toward a radial outside of the balancer housing 71, it becomes more advantageous. Yet, if it becomes excessively larger than a space formed by the drum body 401, space efficiency may be lowered. Hence, it is preferable that the projected part 712b is projected to have a length equal to or more or less than a length of the space formed by the drum body 401.

[0129] In particular, the recess part 711 may include a first recess extension part 711a extended from the outer surface 712 in a direction of the inner surface 713 and a second recess extension part 711b extended from the first recess extension part 711a in a height direction of the balancer (or drum).

[0130] Liquid flowing in the circulation flow path 74 may be inclined up to the extension length of the first recess extension part 711a on high-speed rotation of the drum 40. Namely, with reference to the height direction of the balancer housing 71 on the high-speed rotation of the drum 40, the liquid may be located on an outside of a virtual extension line of the second recess extension part 711b.

[0131] The second recess extension part 711b may include a portion thermally bonded to the balancer cover 72.

[0132] FIG. 8 is a schematic diagram showing various embodiments of a balancer according to the present dis-

closure. FIG. 8 (a) is a schematic diagram showing a balancer having two circulation flow paths, and FIG. 8 (b) is a schematic diagram showing a balancer having a single circulation flow path.

[0133] Referring to FIG. 8 (a), a partition 76 may be provided within the balancer housing 71. The partition 76 is located between the outer surface 712 and the inner surface 713 of the balancer housing 71 and extended in the height direction of the balancer housing 71. By the partition, the circulation flow path 74 may be divided into the first circulation flow path 741 and the second circulation flow path 742.

[0134] Particularly, the balancer housing 71 may include a first chamber C1 comparted by the partition 76 and formed closer to the outer surface 712 than the inner surface 713 and a second chamber C2 comparted by the partition 76 and formed closer to the inner surface 713 than the outer surface 712. In this case, the recess part 711 may be provided to the first chamber C1. Liquid stored in the first circulation flow path 741 and liquid received in the second circulation path 742 may be rotated independently from each other.

[0135] The case of having two circulation flow paths 741 and 742 may resolve the unbalance state more effectively than the case of having the single circulation flow path 74. Yet, since a radial length of the balancer 7 is determined depending on a radial length of the drum body 401, it may result in decreasing a size of the balancer perforated hole 73 through which laundry is put. On the contrary, in case that the single circulation flow path 74 is provided, the size of the balancer perforated hole 73 through which the laundry is put can be increased sufficiently.

[0136] In addition, since the center of gravity may be lowered due to the recess part 711, it may be able to provide a laundry treatment apparatus with large laundry storage capacity despite having the same gravity center of the related art in a manner of decreasing a length of the bead part 404 (with reference to the height direction of the balancer) by a length d of the lowered gravity center G' and increasing a length of the balancer housing 71 by the reduced portion of the bead part 404.

[0137] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. An apparatus for treating laundry, comprising:

a drum (3) having a drum entrance (33) formed in a top side to put the laundry therethrough and a drum body (31) defining a space where laundry is washed; and

a balancer (7) provided to the drum (3) to resolve unbalancing of the drum (3), the balancer (7) comprising a recess part (711) configured to reduce a top side of a space for storing liquid in the balancer (7).

2. The apparatus of claim 1, the balancer (7), comprising:

a balancer housing (71) coupled to a top side of the drum body (31) and having a balancer perforated hole (73) communicating with the drum entrance (33) to put the laundry therethrough; and

a circulation flow path (74) configured in a ring shape within the balancer housing (71) to provide a moving route of the liquid.

3. The apparatus of claim 2, wherein the recess part (711) is configured in a concave shape in a manner of being recessed toward an inside of the circulation flow path (74) from an outside of the balancer housing (71) above a position of the liquid moving on the circulation flow path (74) by a centrifugal force.

4. The apparatus of claim 2 or 3, the balancer housing (71), comprising:

an outer surface (712) located on a most outer side of the balancer housing (71);

an inner surface (713) provided to a most inner side of the balancer housing (71) to from a balancer perforated hole (73) therein; and

a bottom surface (714) connecting the outer surface (712) and the inner surface (713) together.

5. The apparatus of claim 4, wherein the outer surface (712), the inner surface (713) and the bottom surface (714) are formed as an integral part and wherein the recess part (711) is provided to the outer surface (712).

6. The apparatus of claim 4 or 5, the outer surface (712) comprising:

a drum connecting part (712a) connected to the drum body (31) and extended in a height direction of the drum (3); and

a projected part (712b) formed with the drum connecting part (712a) as an integral part, extended in the height direction of the drum (3), projected to a most outer side of the outer surface (712), and connected to the recess part (711).

7. The apparatus of claim 6, wherein the recess part (711) is formed with the projected part (712b) and

the drum connecting part (712a) as the integral part.

8. The apparatus of any one of claims 4 to 7, wherein a partition (76) is further provided between the outer surface (712) and the inner surface (713) to divide an inner space of the circulation flow path (74).

9. The apparatus of claim 8, comprising:

a first chamber (C1) divided by the partition (76) and formed closer to the outer surface (712) than the inner surface (713); and
a second chamber (C2) divided by the partition (76) and formed closer to the inner surface (713) than the outer surface (712),
wherein the recess part (711) is formed in the first chamber (C1).

10. The apparatus of claim 9, the circulation flow path (74), comprising:

a first circulation flow path (741) configured in a ring shape within the first chamber (C1) to store the liquid; and
a second circulation flow path (742) configured in a ring shape within the second chamber (C2) to store the liquid,
wherein the first circulation flow path (741) and the second circulation flow path (742) are configured to enable the liquid stored in the first circulation flow path (741) and the liquid stored in the second circulation flow path (742) to flow independently from each other based on rotation of the drum (3).

11. The apparatus of any one of claims 4 to 10, the recess part (711), comprising:

a first recess extension part (711a) extended from the outer surface (712) in a direction of the inner surface (713); and
a second recess extension part (711b) extended from the first recess extension part (711a) in a height direction of the drum body (31).

12. The apparatus of one of claims 1 to 11, comprising:

a cabinet (1); and
a tub (2) received in the cabinet (1) and providing a space for storing water,
wherein the drum body (31) is configured to be rotatable in the tub to store the laundry; and
wherein the balancer (7) is connected to a top side of the drum (3).

13. The apparatus of one of claims 1 to 11, comprising:

a drawer cabinet (101);
a drawer body (20) configured to be withdrawable forward from the drawer cabinet (101); and
a tub (3) configured in the drawer body (20) to provide a space for storing water,
wherein the drum body (31) is configured to be rotatable in the tub (3) to store the laundry; and
wherein the balancer (7) is connected to a top side of the drum (3).

14. The apparatus of claim 13, wherein the drawer cabinet (101) is connected to a laundry treatment unit performing at least one job selected from a group consisting of washing, drying and refreshing of the laundry.

FIG. 1

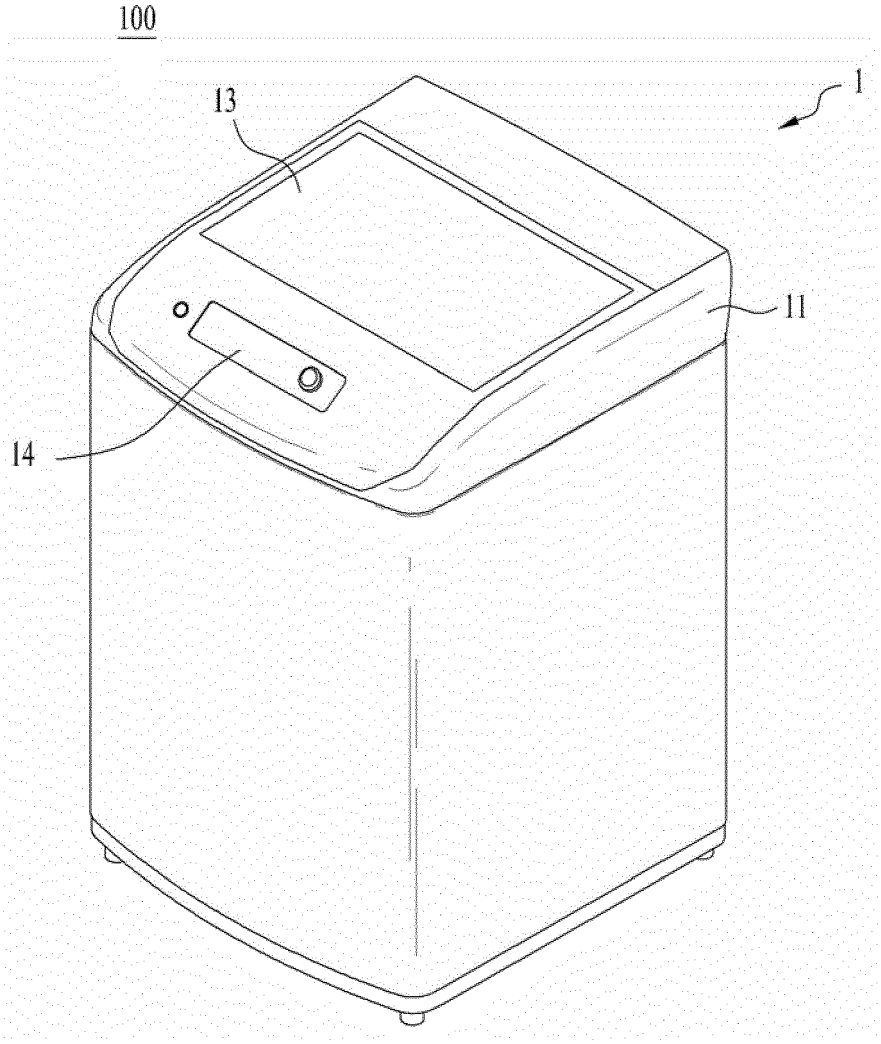


FIG. 2

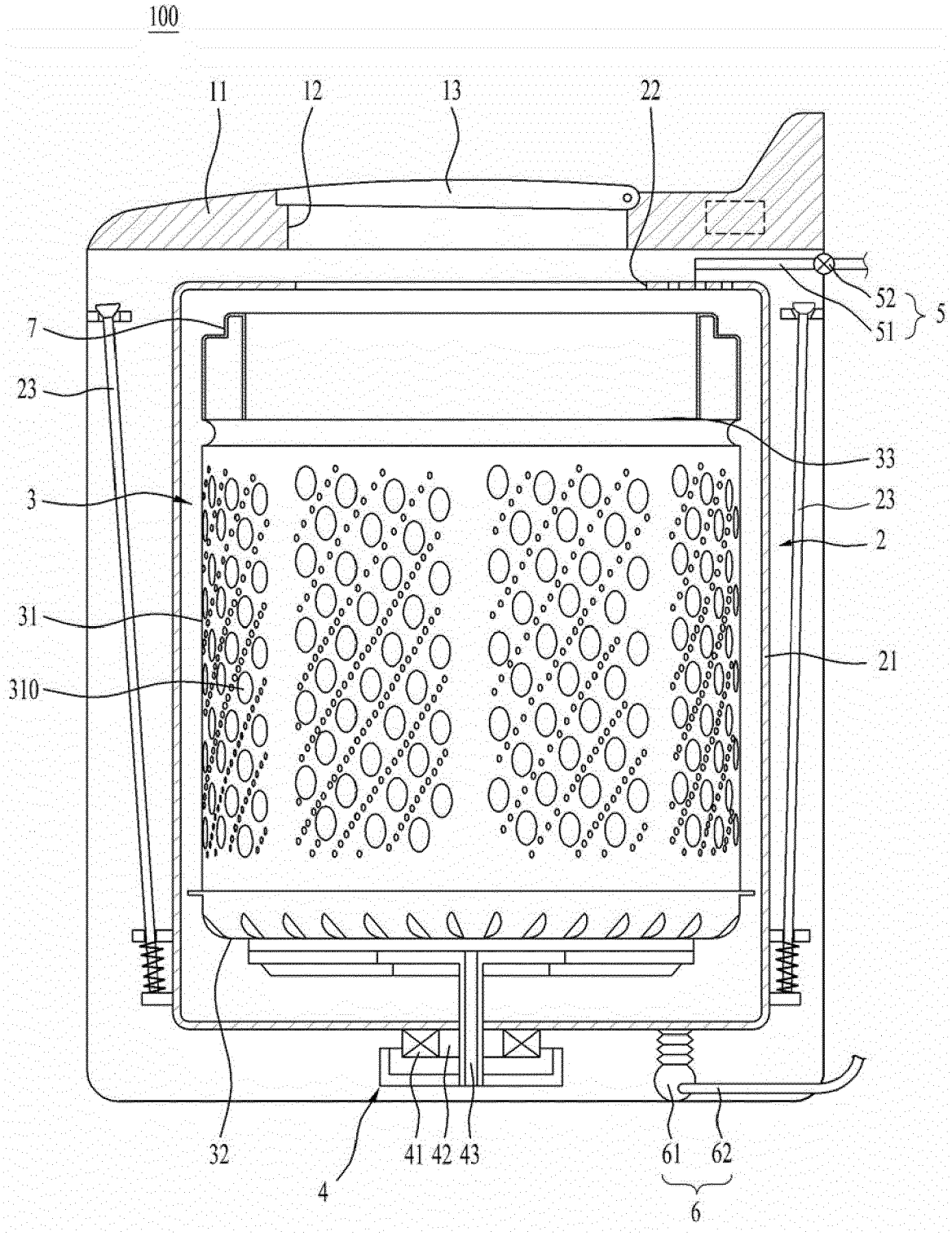


FIG. 3

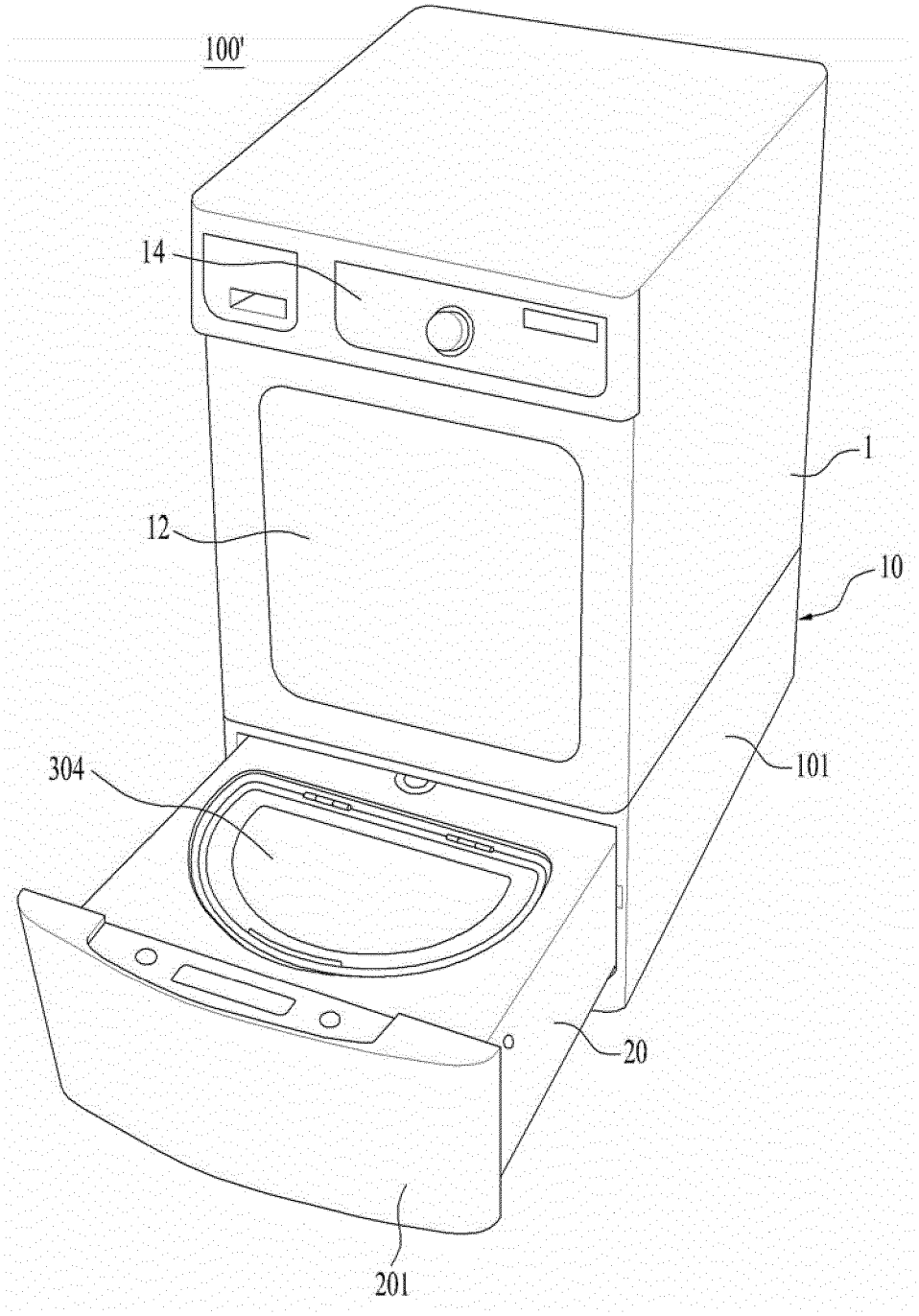


FIG. 4

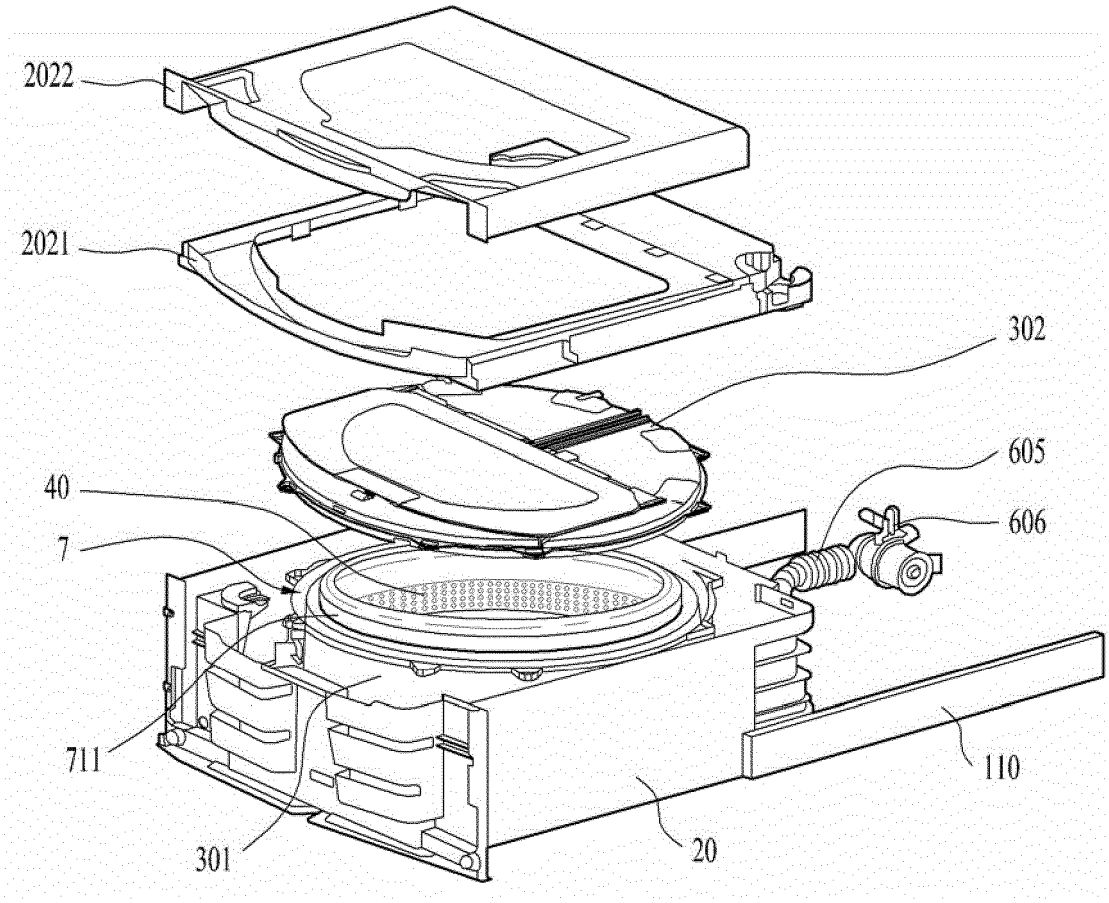


FIG. 5

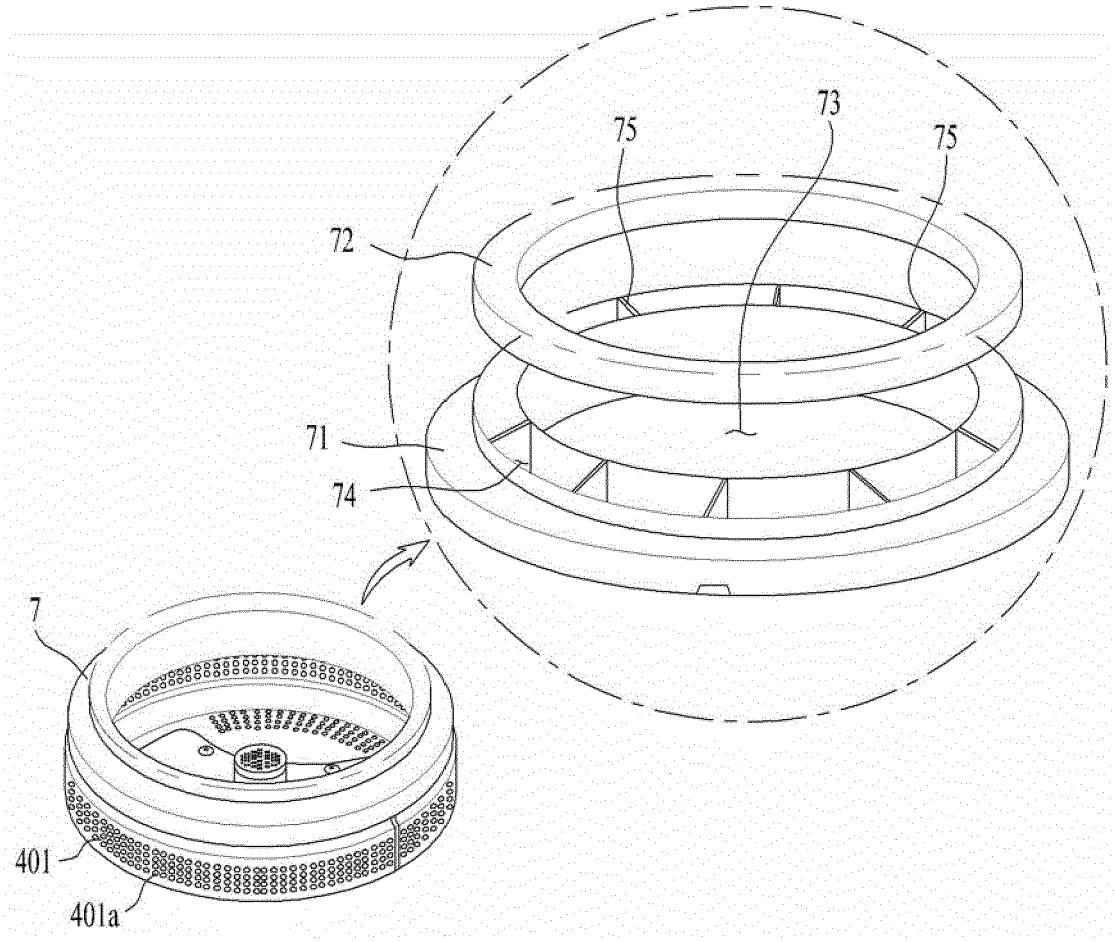


FIG. 6

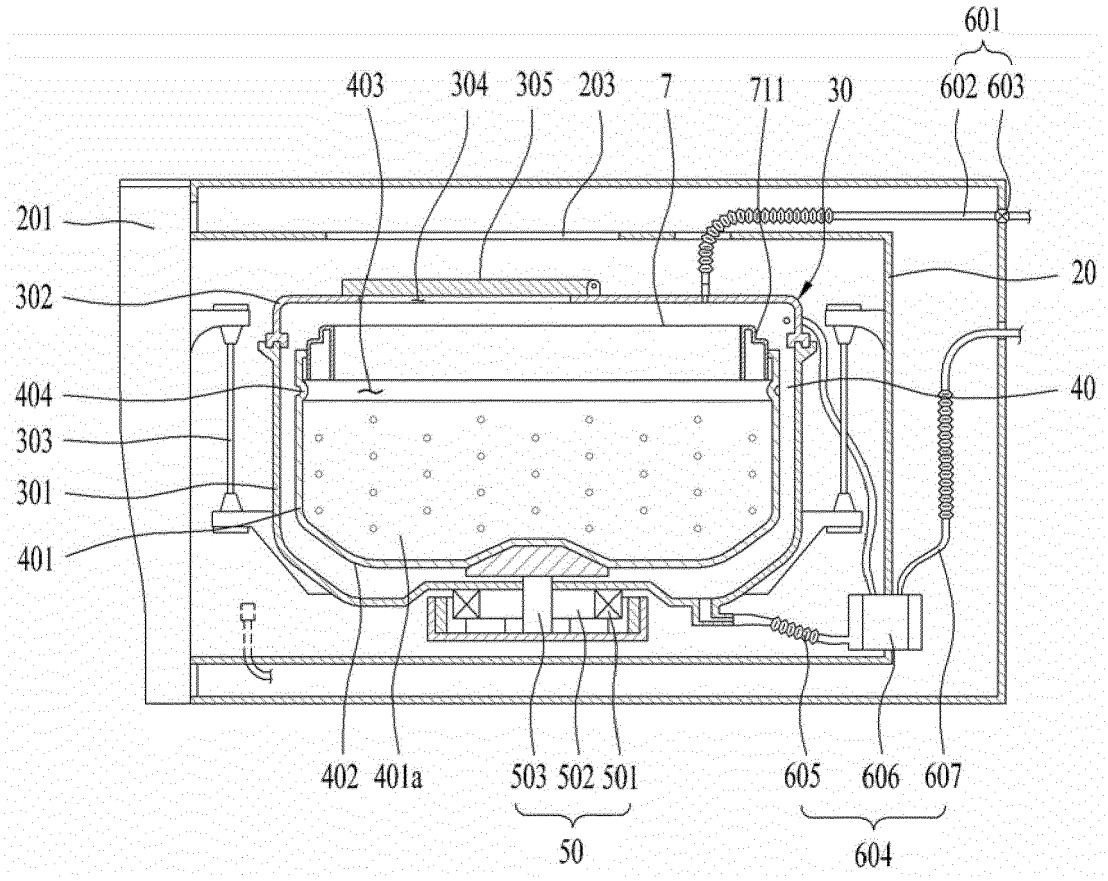

601
403
304
305
203
7
711
30
602
603
201
20
302
404
40
303
301
401
402
401a
503
502
501
605
606
607
50
604

FIG. 7

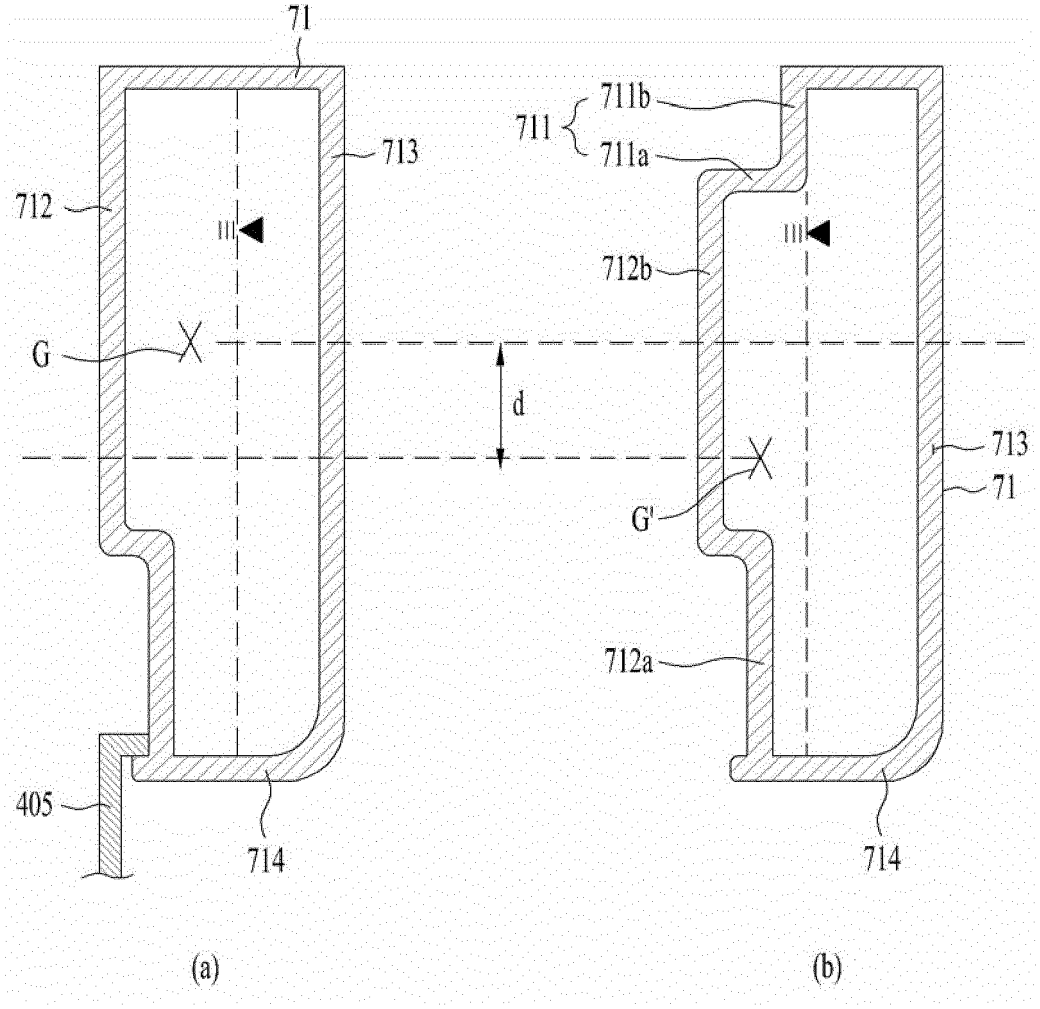
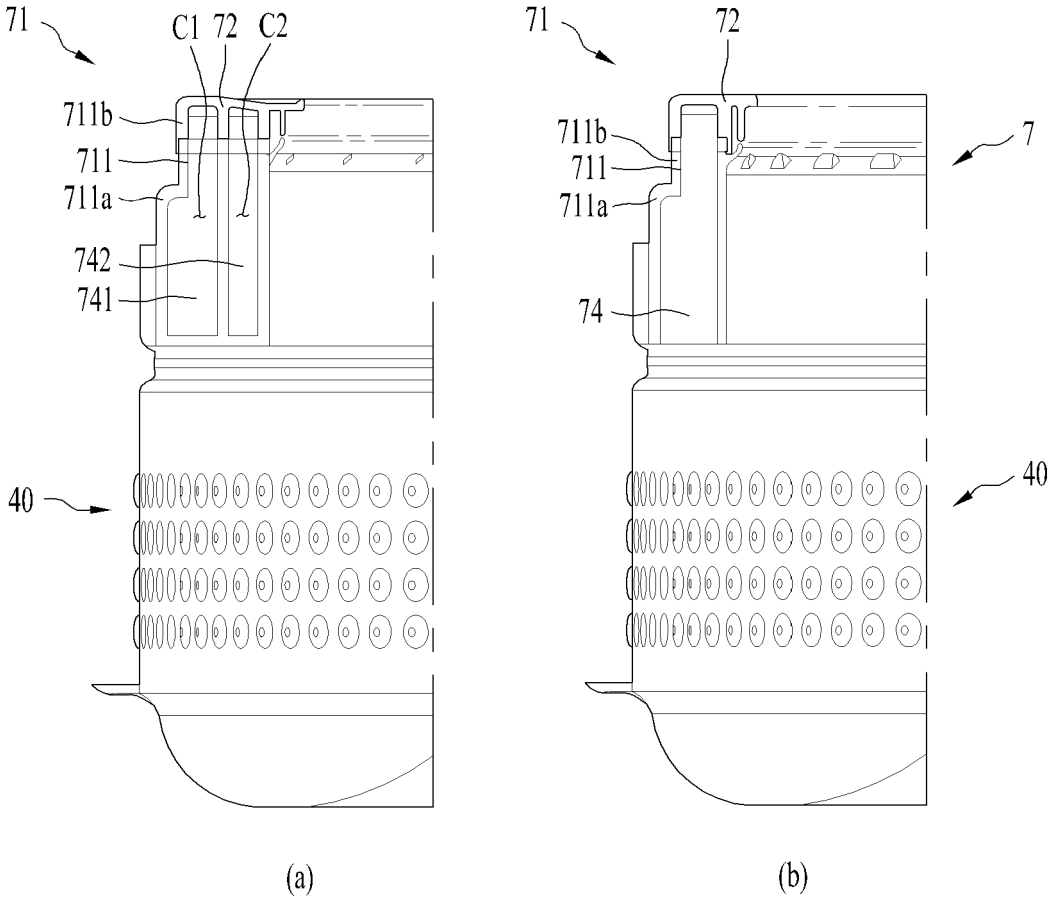

71
711b
711
711a
713
712
III
III
712b
G
d
713
71
G'
712a
405
714
714
(a)
(b)

FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 0980

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X	US 2018/119327 A1 (KIM KEUNJOO [KR] ET AL) 3 May 2018 (2018-05-03) * paragraphs [0140] - [0175] * * figures 1-5 *	1-5, 11-14	
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Place of search	Date of completion of the search	Examiner
Munich	20 January 2022	Weidner, Maximilian

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

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