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

(11) **EP 3 690 104 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.08.2020 Bulletin 2020/32

(51) Int Cl.:
D06F 37/06 *(2006.01)* *D06F 37/04* *(2006.01)*

(21) Application number: **19215945.7**

(22) Date of filing: **13.12.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **01.02.2019 KR 20190013925**
21.10.2019 KR 20190130784

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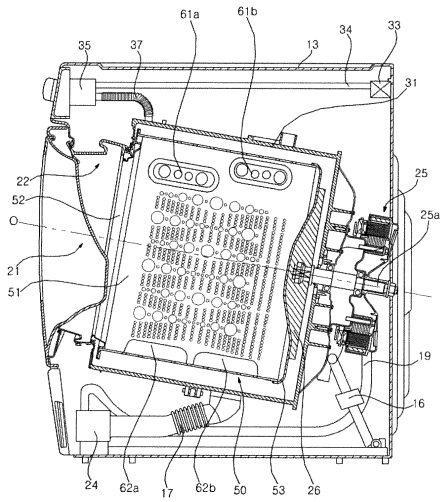
Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) LAUNDRY TREATING APPARATUS

(57) A laundry treating apparatus according to the present disclosure includes a drum (51) having a mounting slot and being configured to receive laundry and rotate about a predetermined rotation axis extending in a front-rear direction, and a lifter (61a, 61b, 62a, 62b, 63a, and 63b) disposed on an inner circumferential surface of the drum and extending in the front-rear direction. The lifter includes a lifter frame (620) installed on the inner circumferential surface of the drum, and a frame cover (640) coupled to the lifter frame and protruding radially inward from the inner circumferential surface of the drum. The lifter frame has a catching protrusion (626) protruding from an inner surface of the lifter frame and having a shape that is symmetrical based on a center in a plan view.

FIG. 1



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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This present application claims the benefit of priority to Korean Patent Application No. 10-2019-0013925, entitled "LAUNDRY TREATING APPARATUS," filed on February 1, 2019 and Korean Patent Application No. 10-2019-0130784, entitled "LAUNDRY TREATING APPARATUS," filed on October 21, 2019, in the Korean Intellectual Property Office.

BACKGROUND

1. Technical Field

[0002] The present disclosure relates to a laundry treating apparatus having a rotary drum in which lifters are provided.

Description of Related Art

[0003] Korean Utility Model Registration No. 20-0358903 discloses a washing machine having a drum in which lifters are provided. A hook protrudes from one surface of the lifter, and a hook throughhole is formed in the drum such that the hook is caught by the hook throughhole.

[0004] The hook includes a neck extending from a lifter main body, and a head expanding from an end of the neck so as to have a larger width than the neck. The lifter is installed such that the head is caught by an outer surface of the drum in a state in which the neck is positioned in the hook throughhole.

[0005] However, in order to injection-mold the lifter having the hook as described above, a mold includes an upper mold configured to form an upper surface of the lifter main body, and a lower mold configured to form a lower surface of the lifter main body. However, there is a disadvantage in that undercutting occurs due to a part of the head vertically overlapping the lifter main body.

SUMMARY OF THE INVENTION

[0006] An aspect of the present disclosure is to provide a laundry treating apparatus in which a lifter provided in a drum includes a lifter frame coupled to the drum, and a lifter cover configured to cover the lifter frame, in which the lifter frame may be easily formed by injection molding.

[0007] Another aspect of the present disclosure is to provide a laundry treating apparatus in which there is no restriction in terms of installation direction during a process of installing a lifter in a drum, and the lifter may thus be more easily installed in the drum.

[0008] Still another aspect of the present disclosure is to provide a laundry treating apparatus capable of ensuring structural rigidity of a lifter installed in a drum and improving an aesthetic appearance of the interior of the drum by minimizing exposure of an unnecessary portion.

[0009] Aspects of the present invention are not limited to those mentioned above, and other aspects not mentioned above may be clearly understood by those skilled in the art from the following description.

[0010] In a laundry treating apparatus according to an embodiment of the present disclosure, a drum into which laundry has been inserted rotates about a predetermined rotation axis extending in a front-rear direction, and a lifter provided in the drum lifts up the laundry in the drum when the drum rotates.

[0011] The lifter includes a lifter frame and a lifter cover. An outer side of the lifter frame is covered by the lifter cover.

[0012] The lifter frame is made of synthetic resin and includes a frame base configured to adjoin an inner surface of the drum and having an opening portion, an insertion protrusion protruding from a bottom surface of the frame base, and a frame sidewall extending upward from the frame base and configured to cover at least a part of the opening portion.

[0013] A mounting slot is formed in the drum, and the insertion protrusion is inserted into the mounting slot. The insertion protrusion includes a vertical portion extending downward from the bottom surface of the frame base, and a catching portion bent toward the inside of the opening portion at a lower end of the vertical portion.

[0014] The lifter frame may have a catching protrusion protruding from an inner surface of the lifter frame and having a shape that is symmetrical based on a center in a plan view.

[0015] A planar shape of the frame cover may be formed to cover a region extending from the region in which any one of the mounting slots in a first group and the mounting slots in a second group is formed by a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

[0016] The frame cover may be made of metal. The frame base may have a seating groove in which a lower end of the frame cover is seated. The seating groove may extend annularly along a circumference of the opening portion, and the catching portion may be disposed in an inner portion surrounded by the seating groove.

[0017] A coupling tab may be formed at the lower end of the frame cover, and a tab binding port through which the coupling tab passes may be formed in the seating groove.

[0018] The seating groove extends in the form of a closed curve along a circumference of the lifter frame, and a horizontal projection plane of the insertion protrusion may be positioned in the closed curve of the seating groove.

[0019] The mounting slot may include an insertion section S1 having a width W1 through which the catching portion passes, and a binding section S2 extending forward or rearward from the insertion section and having a width W2 smaller than a width of the catching portion.

[0020] The lifter frame may include a frame upper plate

disposed at a position spaced apart from the frame base in a radial direction of the drum and connected to the frame base through the frame sidewall, and a fastening boss protruding from a bottom surface of the frame upper plate. The drum may have a fastening hole fastened to the fastening boss by means of a predetermined fastening member.

[0021] The pair of lifters may be spaced apart from each other in the front-rear direction of the drum.

[0022] The frame base may include left and right sides that extend in the front-rear direction and are formed to be parallel to each other. The tab binding port may be formed in at least one of the left side or the right side, and the coupling tab configured to be inserted into the tab binding port may be formed at the lower end of the lifter cover.

[0023] The insertion protrusions may be formed at the left side and the right side, respectively. The catching portion of the insertion protrusion formed at the left side may be bent rightward from the vertical portion, and the catching portion of the insertion protrusion formed at the right side may be bent leftward from the vertical portion.

[0024] According to the laundry treating apparatus of the present disclosure, in which the lifter includes the lifter frame coupled to the drum, and the lifter cover configured to cover the lifter frame, the catching protrusion is formed to be symmetrical in a plan view. Accordingly, the catching protrusion may be installed to come into contact with the catching tab in any direction, even when the front and rear positions of the lifter are changed during the process of installing the lifter in the drum.

[0025] In addition, according to the laundry treating apparatus according to the present disclosure, the operation of assembling the drum and the lifter may be easily performed without considering the directionality of the lifter during the process of installing a plurality of lifters in the drum.

[0026] In addition, according to the laundry treating apparatus according to the present disclosure, the installation position of the lifter may be changed depending on the type of drum, an extra mounting slot for changing the installation position may be covered by the frame cover.

[0027] In addition, according to the laundry treating apparatus according to the present disclosure, the forming position of the insertion protrusion is disposed inward from the forming position of the coupling tab. Accordingly, it is possible to prevent a particular portion from being structurally weakened and the insertion protrusion may be covered by the frame cover.

[0028] In addition, according to the laundry treating apparatus according to the present disclosure, the fastening boss is formed on the upper surface of the lifter frame that has relatively high rigidity. Accordingly, fastening force may be further increased when the fastening boss and the fastening hole are fastened by means of the fastening member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The above and other aspects, features, and advantages of the present disclosure will become apparent from the detailed description of the following aspects in conjunction with the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a laundry treating apparatus according to an exemplary embodiment of the present disclosure;

FIG. 2 is a perspective view of a lifter illustrated in FIG. 1;

FIG. 3 is an exploded perspective view of the lifter illustrated in FIG. 2;

FIG. 4 is a plan projection view of the lifter illustrated in FIG. 2;

FIG. 5 is a view illustrating a raw material (a) cut to manufacture a large-capacity drum, and a raw material (b) cut to manufacture a small-capacity drum;

FIG. 6 is an enlarged view (a) of a part of the drum corresponding to a part A illustrated in FIG. 5 and an enlarged view (b) of a part of the drum corresponding to a part B illustrated in FIG. 5;

FIG. 7 is an enlarged view (a) of a part B of the drum illustrated in (a) of FIG. 5 and an enlarged view (b) of a part C of the drum illustrated in (b) of FIG. 5;

FIG. 8 is a top plan view of a lifter frame, and FIG. 9 is a bottom plan view of the lifter frame;

FIG. 10 is a cross-sectional view taken along a line A-A illustrated in FIG. 2;

FIG. 11 is a front view of the lifter frame, and FIG. 12 is a side view of the lifter frame;

FIG. 13 is a top plan view of a frame cover, FIG. 14 is a front view of the frame cover, and FIG. 15 is a side view of the frame cover;

FIG. 16 is a view illustrating a pair of front and rear lifters illustrated in FIG. 1;

FIG. 17 is a view illustrating the lifters illustrated in FIG. 16 when viewed from a front side;

FIG. 18 is a view (a) illustrating a state in which the drum illustrated in FIG. 1 is deployed and a developed view (b) of the drum having the lifters disposed according to another exemplary embodiment of the present disclosure;

FIG. 19 is a view (a) illustrating a change in height of a first fabric caused by the rear lifter in accordance with a rotation angle of the drum and a view (b) illustrating a change in height of a second fabric caused by the front lifter that constitutes a set together with the rear lifter;

FIG. 20 is a view illustrating an inner circumferential surface of a drum having mounting slots according to a modified example, in which (a) illustrates a small-capacity drum and (b) illustrates a large-capacity drum; and

FIG. 21 is a view illustrating another exemplary embodiment of the lifter.

DETAILED DESCRIPTION

[0030] Advantages and features of the present disclosure and methods for achieving them will become apparent from the descriptions of aspects herein below with reference to the accompanying drawings. However, the present disclosure is not limited to the aspects disclosed herein but may be implemented in various different forms. The aspects are provided to make the description of the present disclosure thorough and to fully convey the scope of the present disclosure to those skilled in the art. It is to be noted that the scope of the present disclosure is defined only by the claims.

[0031] The shapes, sizes, ratios, angles, the number of elements given in the drawings are merely exemplary, and thus, the present disclosure is not limited to the illustrated details. Like reference numerals designate like elements throughout the specification.

[0032] In relation to describing the present disclosure, when the detailed description of the relevant known technology is determined to unnecessarily obscure the gist of the present disclosure, the detailed description may be omitted.

[0033] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

[0034] When an element or layer is referred to as being "on," "engaged to," "connected to," or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0035] The terms "connected" and "coupled" are not restricted to physical or mechanical connections or couplings, and can include electrical connections or couplings, whether direct or indirect. The connection can be such that the objects are permanently connected or releasably connected. The term "communicatively coupled" is defined as connected, either directly or indirectly through intervening components, and the connections are not necessarily limited to physical connections, but are connections that accommodate the transfer of data, fluids, or other matter between the so-described components.

[0036] Although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example embodiments.

[0037] Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0038] The term "or" as used herein is to be interpreted as an inclusive or meaning any one or any combination. Therefore, "A, B or C" means any of the following: "A; B; C; A and B; A and C; B and C; A, B and C". An exception to this definition will occur only when a combination of elements, functions, steps or acts are in some way inherently mutually exclusive.

[0039] Hereinafter, a washing machine will be described as an example of a laundry treating apparatus, but the laundry treating apparatus is not limited to the washing machine. The laundry treating apparatus is an apparatus for treating laundry (or an object to be dried) such as clothes inputted into a drum 51 and may be a dryer or a washing-drying machine.

[0040] Referring to FIG. 1, a laundry treating apparatus according to an exemplary embodiment of the present disclosure may include a casing 13 configured to define an exterior, a water storage tub 31 disposed in the casing 13 and configured to store washing water, a washing tub

50 rotatably installed in the water storage tub 31 and configured to receive inserted laundry, and a motor 25 configured to rotate the washing tub 50. A damper 16 configured to absorb vibration of the water storage tub 31 may be provided in the casing 13.

[0041] A drum 51 may be rotated about a rotation axis O extending in a front-rear direction, and the drum 51 may constitute the washing tub 50. The rotation axis is approximately horizontal. However, the term "horizontal" does not mean "geometrically horizontal" in a strict sense. In a case in which an inclination is closer to a horizontal axis than a vertical axis even though the inclination is formed at a certain angle with respect to the horizontal axis as illustrated in FIG. 1, it will be said that the drum 51 or the washing tub 50 is rotated about the horizontal axis.

[0042] A laundry insertion port is formed in a front surface of the casing 13, and a door 21 configured to open or close the laundry insertion port may be rotatably provided on the casing 13. A tubular gasket 22 is provided such that the laundry insertion port and an inlet of the water storage tub 31 communicate with each other. The gasket 22 is made of a soft material (for example, rubber). A front end of the gasket 22 may be connected to a circumference of the laundry insertion port of the casing 13, and a rear end of the gasket 22 may be connected to a circumference of the inlet of the water storage tub 31.

[0043] A water supply valve 33, a water supply pipe 34, and a water supply hose 37 may be installed in the casing 13. When the water supply valve 33 is opened and the washing water is supplied, the washing water that has passed through the water supply pipe 34 may be mixed with detergent in a dispenser 35 that stores the detergent, and then the washing water may be supplied to the water storage tub 31 through the water supply hose 37.

[0044] An input port of a pump 24 is connected to the water storage tub 31 through the drain hose 17, and a discharge port of the pump 24 is connected to drain pipes 19. The water discharged from the water storage tub 31 through the drain hose 17 is pumped by the pump 24, flows through the drain pipes 19, and then is discharged to the outside of the laundry treating apparatus.

[0045] The washing tub 50 may include the drum 51, a front cover 52 coupled to a front end of the drum 51, and a rear cover 53 coupled to a rear end of the drum 51. The drum 51 may be formed in the form of a tubular (or cylindrical) body made by rolling up a metal plate (for example, made of stainless steel) having a plurality of throughholes 51h (see FIG. 5) and then joining both ends of the metal plate. The water stored in the water storage tub 31 may be introduced into the washing tub 50 through the throughholes 51h. A plurality of embossed portions 51a (see FIG. 5), which are convexly formed by plastic processing, may be formed on an inner circumferential surface of the drum 51, and the throughholes 51h may be formed between the embossed portions 51a.

[0046] An opening portion may be formed in the front cover 52 so that laundry may be inserted into the drum 51. The inlet of the water storage tub 31 communicates with the opening portion. The front cover 52 may be made of the same type of material as the drum 51.

[0047] The rear cover 53 closes an opened rear side of the drum 51, and a spider 26 connected to a driving shaft 25a of the motor 25 may be coupled to a rear surface of the rear cover 53. The spider 26 is configured to transmit rotational force of the driving shaft 25a to the washing tub 50, and the driving shaft 25a of the motor 25 may be coupled to a center of the spider 26.

[0048] A plurality of lifters 61a, 61b, 62a, 62b, 63a, and 63b are provided in the drum 51. When the drum 51 is rotated, the laundry is lifted up by the lifters 61a, 61b, 62a, 62b, 63a, and 63b.

[0049] The multiple lifters 61a, 62a, and 63a include first and second lifters disposed in the front-rear direction of the drum 51. Hereinafter, an example in which the first lifters are front lifters 61a, 62a, and 63a and the second lifters are rear lifters 61b, 62b, and 63b spaced rearward apart from the front lifters will be described. However, the first lifter may be the rear lifter and the second lifter may be the front lifter depending on the embodiment.

[0050] Referring to FIGS. 1 and 18, the plurality of front lifters 61a, 62a, and 63a, together with the plurality of rear lifters 61b, 62b, and 63b, define sets (or pairs), respectively. Three sets of lifters 61 (61a and 61b), 62 (62a and 62b), and 63 (63a and 63b) may be disposed at equal angles about the rotation axis O, but the present disclosure is not necessarily limited thereto. For example, four sets of lifters may be disposed at an interval of 90 degrees or five sets of lifters may be disposed at an interval of 72 degrees about the rotation axis O.

[0051] Hereinafter, an example in which the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b have the same structure will be described, but the present disclosure is not necessarily limited thereto.

[0052] Referring to FIGS. 2 to 4, each of the lifters 61a, 61b, 62a, 62b, 63a, and 63b includes a lifter frame 620 fixed to the drum 51, and a frame cover 640 configured to cover the lifter frame 620. The frame cover 640 protrudes radially inward (toward the inside of the drum 51) from the inner circumferential surface of the drum 51 and comes into contact with the laundry. The frame cover 640 is fixed to the drum 51 by means of the lifter frame 620 instead of being fixed directly to the drum 51.

[0053] The lifter frame 620 may be made of synthetic resin. The lifter frame 620 is preferably formed by injection molding, but the present disclosure is not limited thereto.

[0054] A lifter made of metal is not only excellent in strength, but also luxurious and hygienic. In order to couple the lifter directly to a drum made of metal, it is necessary to weld the lifter to a raw material cut out in a shape of the deployed drum, roll up the raw material in a cylindrical shape, and then weld together the ends of the raw material where they meet each other. However, raw material that was flat becomes curved during the

process of rolling up the raw material, and as a result, there is a concern that stress may be applied to the welded portions between the lifter and the drum and cause the welded portions to separate.

[0055] In order to address this concern, the present disclosure proposes a configuration in which a frame cover 640 made of metal is fixed to the drum 51 by means of a lifter frame 620 made of synthetic resin.

[0056] Meanwhile, referring to FIG. 3 and FIGs. 8 to 12, the whole of an outer surface 620a (see FIG. 8) of the lifter frame 620 has a convex shape, and an inner surface 620b (see FIG. 9) of the lifter frame 620 has a concave shape. Specifically, the lifter frame 620 may include a frame base 621, a frame upper plate 623, and a frame sidewall 622.

[0057] The frame base 621 is fixed to the inner circumferential surface of the drum 51. The frame base 621 may have a ring shape (or a closed shape formed by a single line) opened at a central portion thereof.

[0058] The frame upper plate 623 is spaced apart from the frame base 621 in the direction toward the inside of the drum 51 and connected to the frame base 621 by means of the frame sidewall 622. The frame sidewall 622 may be formed in the form of a tubular (or cylindrical) body, such that a lower end of the frame sidewall 622 is connected to the frame base 621, and an upper end of the frame sidewall 622 is connected to the frame upper plate 623.

[0059] The frame sidewall 622 is shaped such that a contour of a cross section thereof gradually decreases upward from the lower end connected to the frame base 621 (or in the radial direction of the drum 51) (or gradually decreases in a direction away from the inner circumferential surface of the drum 51), and the contour of the cross section is smallest at a portion that meets the frame upper plate 623.

[0060] One or more water flow inlet holes may be formed in the drum 51 so as to allow the washing water stored in the water storage tub 31 to be introduced to the inside of the frame cover 640. Any opening portion formed in a region covered by the frame cover 640 may be a water flow inlet hole. For example, some of the throughholes 51h, which are positioned inside the frame cover 640, may be water flow inlet holes. Furthermore, mounting slots 511a and 511b, fastening holes 513a and 513b, and opening portions 512a and 512b, which will be described below, may be water flow inlet holes.

[0061] One or more water flow throughholes 624 and 624a may be formed in the lifter frame 620. Any opening may be a water flow throughhole 624 as long as the opening is formed in the lifter frame 620 and allows the inside and the outside of the lifter frame 620 to communicate with each other.

[0062] The water flow throughhole 624 may be formed in the frame sidewall 622 and/or the frame upper plate 623. The washing water stored in the concave space of the lifter frame 620 may be discharged through the water flow throughhole 624.

[0063] One or more water flow discharge holes 646h may be formed in the frame cover 640 to discharge the washing water in the lifters 61a, 61b, 62a, 62b, 63a, and 63b into the drum 51. The washing water in the concave space inside the lifter frame 620 may pass through the water flow throughhole 624, and then may be discharged into the drum 51 through the water flow discharge hole 646h.

[0064] An outer surface 640a of the frame cover 640, which is exposed to the inside of the drum 51 and comes into contact with the laundry, has a convex shape, and an inner surface of the frame cover 640 has a concave shape that corresponds to the convex outer surface 620a of the lifter frame 620. The frame cover 640 may be made of metal, preferably stainless steel, but the present disclosure is not limited thereto. The frame cover 640 may be formed by plastically processing (for example, pressing) a metal plate having a predetermined thickness.

[0065] The frame cover 640 may include a cover sidewall 645 extending upward from a lower end adjoining the frame base 621, and a cover upper plate 646 configured to cover an upper side of the cover sidewall 645. The cover upper plate 646 is approximately parallel to the frame upper plate 623. The plurality of water flow discharge holes 646h may be formed in the cover upper plate 646.

[0066] The cover sidewall 645 is shaped such that a contour of a cross section thereof gradually decreases upward from the lower end (or in the radial direction of the drum 51) (or gradually decreases in the direction away from the inner circumferential surface of the drum 51), and the contour of the cross section is smallest at a portion that meets the cover upper plate 646.

[0067] The lifter frame 620 includes spacers 625 that protrude from the frame upper plate 623 and allow the frame cover 640 to be spaced apart from the frame upper plate 623. The spacer 625 protrudes from the frame upper plate 623 to the inner surface of the frame cover 640.

[0068] The inner surface of the frame cover 640 may be spaced apart from the frame upper plate 623 to a degree equal to or greater than a length (or height) of the spacer 625 protruding from the frame upper plate 623. The spacer 625 may be spaced apart from the inner surface of the frame cover 640 at a predetermined distance. In this case, the inner surface of the frame cover 640 is spaced apart from the frame upper plate 623 at a distance equal to a sum of the height of the spacer 625 and the interval between the spacer 625 and the inner surface of the frame cover 640. When the frame cover 640 is pressed by external force, the frame cover 640 comes into contact with the frame upper plate 623, such that the frame cover 640 is prevented from being deformed any further.

[0069] Alternatively, the spacer 625 may be configured to come into contact with the frame cover 640, depending on the embodiment. In this case, the spacer 625 protrudes from the outer surface 620a of the lifter frame 620 and adjoins the inner surface of the frame cover 640.

Because the spacer 625 supports the inner surface of the frame cover 640 in the state in which the frame upper plate 623 is spaced apart from the frame cover 640, the state in which the frame cover 640 is spaced apart from the frame upper plate 623 may be maintained even though the frame cover 640 is pressed toward the lifter frame 620 by external force.

[0070] The spacer 625 may have a cross-shaped rib structure. Specifically, the spacer 625 may include a vertical rib 625a extending on the frame upper plate 623 in a longitudinal direction of the lifter frame 620 (or the front-rear direction), and a horizontal rib 625b extending while crossing the vertical rib 625a. The vertical rib 625a and the horizontal rib 625b may be orthogonal to each other.

[0071] Referring to FIG. 10, the inner surface of the cover upper plate 646 may be spaced apart from the outer surface of the frame upper plate 623. That is, a predetermined separation space (or a gap gl) may be formed between the inner surface of the cover upper plate 646 and the outer surface of the frame upper plate 623, and the separation space g1 may serve as a flow path that guides the washing water to the water flow discharge hole 646h.

[0072] A separation space g2 may also be formed between the frame sidewall 622 and the cover sidewall 645. A seating groove 621r (see FIGS. 8 and 9) to be described below is formed in the frame base 621 and disposed at a position toward the outside of the frame base 621 spaced apart from the frame sidewall 622 at a predetermined distance. Therefore, the lower end of the cover sidewall 645 positioned in the seating groove 621r is spaced apart from the frame sidewall 622. Because the lower end of the frame cover 640 is spaced apart from the frame sidewall 622 by the seating groove 621r and the cover upper plate 646 is spaced apart from the frame upper plate 623 by the spacer 625, two points of the frame cover 640, which are the lower end of the frame cover 640 and the portion of the frame cover 640 supported by the spacer 625, are forcibly spaced apart from the lifter frame 620, and as a result, the state in which the cover sidewall 645 positioned between the two points is spaced apart from the lifter frame 620 is maintained.

[0073] The washing water introduced into each of the lifters 61a, 61b, 62a, 62b, 63a, and 63b is introduced into the separation spaces g1 and g2, and water flows formed in the separation spaces g1 and g2 during the rotation of the washing tub 50 clean the outer surface of the lifter frame 620 and the inner surface of the frame cover 640. Foreign substances produced during the cleaning process may be discharged through the water flow discharge hole 646h formed in the frame cover 640 or through the water flow inlet hole formed in the drum 51. The flow paths are formed between the lifter frame 620 and the frame cover 640 by the separation spaces g1 and g2, and as a result, this configuration may be advantageous in maintaining the lifters 61a, 62a, 63a, 61b, 62b, and 63b in a clean state.

[0074] The frame cover 640 may have domes 641, 642, 643, and 644 formed at the positions corresponding to the spacers 625. That is, the spacers 625 may be disposed below the domes 641, 642, 643, and 644. In the case in which the plurality of spacers 625 are formed in the exemplary embodiment, the plurality of domes 641, 642, 643, and 644 may be formed at the positions corresponding to the plurality of spacers 625, respectively.

[0075] The domes 641, 642, 643, and 644 may be formed on the cover upper plate 646. An inner surface of each of the domes 641, 642, 643, and 644, which faces the spacer 625, may be concavely formed, and an outer surface of each of the domes 641, 642, 643, and 644 may be convexly formed. The concave inner surface of each of the domes 641, 642, 643, and 644 may come into contact with the spacer 625.

[0076] The domes 641, 642, 643, and 644 are convexly formed by pressing the cover upper plate 646, which is made of metal. The plurality of domes 641, 642, 643, and 644 may be disposed in the longitudinal direction of the cover upper plate 646 (or the longitudinal direction of the lifters 61a, 61b, 62a, 62b, 63a, and 63b). The one or more water flow discharge holes 646h may be formed between the adjacent domes 641, 642, 643, and 644.

[0077] The domes 641, 642, 643, and 644 may include two or more domes of which the depth of the concave portion of the inner surfaces thereof is different from each other. In more detail, the domes 641, 642, 643, and 644 may include large domes 641 and 644, each of which have a concave portion of a first depth, and small domes 642 and 643, each of which have a concave portion of a second depth smaller than the first depth. The height of the spacers 625a and 625d corresponding to the large domes 641 and 644 may be greater than the height of the spacers 625b and 625c corresponding to the small domes 642 and 643.

[0078] The domes 641, 642, 643, and 644 may include the two or more domes having different sizes. Each of the domes 641, 642, 643, and 644 may have a circular shape, but the present disclosure is not necessarily limited thereto. Here, the 'size' may be determined based on the shape when the concave portion of the inner surface of each of the domes 641, 642, 643, and 644 are viewed from above, and for example, the 'size' may be defined as a diameter of the concave portion. However, since the difference between the inner diameter and the outer diameter of each of the domes 641, 642, 643, and 644 is merely due to the thickness of the material, the size may be defined based on the outer diameter of each of the domes 641, 642, 643, and 644.

[0079] The size of the spacer 625 may also vary depending on the size of each of the domes 641, 642, 643, and 644. That is, in the case in which there are the large domes 641 and 644 and the small domes 642 and 643 as illustrated in FIG. 13, the spacer 625 corresponding to the large domes 641 and 644 may be larger than the spacer 625 corresponding to the small domes 642 and 643.

[0080] The two small domes 643 and 644 may be po-

sitioned between the pair of large domes 641 and 642, and the water flow discharge holes 646h may be formed between the domes 641, 642, 643, and 644. The plurality of water flow discharge holes 646h may be arranged in a direction crossing the lifters 61a, 61b, 62a, 62b, 63a, and 63b (or a direction orthogonal to the length of each of the lifters 61a, 61b, 62a, 62b, 63a, and 63b).

[0081] The water stored in the water storage tub 31 is introduced into the lifters 61a, 61b, 62a, 62b, 63a, and 63b through the opening portion. The lifter frame 620 is a structure having one or more of the water flow through-holes 624, and the water introduced into the lifters 61a, 61b, 62a, 62b, 63a, and 63b may reach the water flow discharge holes 646h through the water flow through-holes 624.

[0082] The washing water introduced into the lifters 61a, 61b, 62a, 62b, 63a, and 63b is raised by the rotation of the washing tub 50 in the state in which the washing water is in the lifters 61a, 61b, 62a, 62b, 63a, and 63b, and the washing water is discharged (or sprayed) through the water flow discharge holes 646h in this process.

[0083] Referring to FIGS. 2, 3, 10, and 13 to 15, the frame cover 640 may include one or more washing protrusions 603 and 604 having a ring shape or one or more washing rings protruding from the outer surface of the cover sidewall 645. The plurality of washing protrusions 603 and 604 may be disposed in parallel with one another. In the exemplary embodiment, two washing protrusions 603 and 604 are provided, but the present disclosure is not necessarily limited thereto. In the case in which the frame cover 640 is made of metal, the washing protrusions 603 and 604 may be formed by pressing.

[0084] Each of the washing protrusions 603 and 604 has a shape corresponding (or similar) to the contour of the cover sidewall 645, and preferably, the washing protrusion may protrude to a predetermined height from the cover sidewall 645. Since the contour of the cover sidewall 645 decreases upward, among the washing protrusions 603 and 604, the washing protrusion that is positioned at an upper side is smaller than the other washing protrusion.

[0085] A frictional force applied between the laundry and the washing protrusions 603 and 604 generates an effect of rubbing the laundry, thereby improving washing power. In addition, because the washing protrusions 603 and 604 assist in the operation of lifting up the laundry, physical force (for example, force for lifting up or striking the laundry) of a level as in the related art may be applied to the laundry even when the height of each of the lifters 61a, 61b, 62a, 62b, 63a, and 63b is decreased to be smaller than that in the related art.

[0086] The frame cover 640 may be coupled to the lifter frame 620. Referring to FIGS. 2 and 3, one or more coupling tabs 648 may be formed at the lower end of the frame cover 640. As illustrated in FIG. 14, the coupling tabs 648 may be formed at a left side 645L or a right side 645R at the lower end when the frame cover 640 is viewed from the front side. The left side 645L and the right side 645R may be straight sections extending in the front-rear direction.

[0087] Referring to FIGS. 8 and 9, tab binding ports 621h, through which the coupling tabs 648 pass from above, may be formed in the lifter frame 620. The tab binding ports 621h may be formed at positions corresponding to the coupling tabs 648, respectively. A coupling tab 648 passes through the tab binding port 621h, and the passing portion of the coupling tab 648 is bent and caught by a rim of the tab binding port 621h (or a bottom surface of the frame base 621), such that the lifter frame 620 and the frame cover 640 may be coupled to each other.

[0088] Meanwhile, the seating groove 621r, which corresponds to the lower end of the frame cover 640, may be formed in the frame base 621 of the lifter frame 620. The lower end of the frame cover 640 may be inserted and seated in the seating groove 621r. In this case, the tab binding port 621h may be formed in the seating groove 621r.

[0089] Hereinafter, a structure in which the lifter frame 620 and the drum 51 are coupled to each other will be described.

[0090] Referring to FIGS. 8, 9, 11, and 12, one or more insertion protrusions 627 may be formed on each of the front lifters 61a, 62a, and 63a and/or the rear lifters 61b, 62b, and 63b. Further, referring to FIGS. 5 to 7, the drum 51 may have mounting slots 511a1 in a first group G1 and mounting slots 511a2 in a second group G2. Each of the groups G1 and G2 may include the one or more mounting slots 511a1(1) to 511a1(4). Here, the 'group' is a set of mounting slots and may include one or a plurality of mounting slots.

[0091] The mounting slots 511a1 in the first group G1 and the mounting slots 511a2 in the second group G2 may include a number of the mounting slots 511a1(1) to 511a1(4) and 511a2(1) to 511a2(4) that corresponds to the number of the one or more insertion protrusions 627. That is, in the case in which the mounting slots in the first group G1 and the second group G2 are used to install the front lifters 61a, 62a, and 63a, the number of mounting slots 511a1 in the first group G1 and the number of mounting slots 511a2 in the second group G2 may correspond to the number of insertion protrusions 627 provided on each of the front lifters 61a, 62a, and 63a.

[0092] Likewise, depending on the embodiment, in the case in which the mounting slots in the first group G1 and the second group G2 are used to install the rear lifters 61b, 62b, and 63b, the number of mounting slots 511a1 in the first group G1 and the number of mounting slots 511a2 in the second group G2 may correspond to the number of insertion protrusions 627 provided on each of the rear lifters 61b, 62b, and 63b.

[0093] The one or more insertion protrusions 627 formed on each of the front lifters 61a, 62a, and 63a or the rear lifters 61b, 62b, and 63b may be selectively fastened to the mounting slots 511a2 in the first group G1 or the second group G2. The position at which the lifter

is installed may be determined depending on whether the one or more insertion protrusions 627 formed on each of the lifters 61a, 62a, 63a, 61b, 62b, and 63b are inserted into the mounting slots that constitute any one of the first group G1 or the second group G2.

[0094] Hereinafter, the example in which the mounting slots 511a, which constitute the first group G1 and the second group G2, are used to install the front lifters 61a, 62a, and 63a will be described, but the mounting slots may be formed in the same manner in order to install the rear lifters 61b, 62b, and 63b.

[0095] The mounting slots 511a2 in the second group G2 are formed in a region shifted rearward within a range in which the mounting slots 511a2 in the second group G2 overlap the mounting slots 511a1 in the first group G1. For reference, in FIG. 6, a first region M1 indicates a region in which the mounting slots 511a1 in the first group G1 are formed, and a second region M2 indicates a region in which the mounting slots 511a2 in the second group G2 are formed. Hereinafter, as illustrated in FIG. 6, the mounting slots 511a2 in the second group G2 are disposed rearward from the mounting slots 511a1 in the first group G1.

[0096] Referring to FIGS. 5 to 7, the mounting slots 511a2 in the second group G2 are spaced apart from the mounting slots 511a1 in the first group G1 in the rearward direction at a predetermined distance D. Therefore, when the insertion protrusions 627 are installed in the mounting slots 511a1 in the first group G1, each of the front lifters 61a, 62a, and 63a is positioned further forward by a distance D in comparison with a case in which the insertion protrusions 627 are installed in the mounting slots 511a2 in the second group G2. As illustrated in FIG. 5, the metal plate of the large-capacity drum 51 further extends forward by a distance E in comparison with a case in which the drum is the small-capacity drum. In the case of the large-capacity drum (FIG. 5A), the front lifters 61a, 62a, and 63a are installed by using the mounting slots 511a1 in the first group G1, such that the front lifters 61a, 62a, and 63a may be installed relatively further forward in comparison with the case in which the drum is the small-capacity drum (FIG. 5B). Therefore, the laundry positioned in the region corresponding to the distance E may easily come into contact with the front lifters 61a, 62a, and 63a while the drum 51 rotates.

[0097] The mounting slots 511a in the respective groups G1 and G2 may be disposed in rows in the front-rear direction. Particularly, the mounting slots 511a in each of the groups G1 and G2 are disposed in two rows. Further, when the entire configuration is viewed without distinguishing the groups, the mounting slots 511a may be arranged along common reference lines extending in the front-rear direction. Preferably, in the embodiment, the mounting slots are disposed on two straight lines parallel to each other.

[0098] In more detail, the mounting slots 511a1 in the first group G1 may include two or more first mounting slots 511a1(1) and 511a1(2) arranged at a first interval T in a first row P1 extending in the front-rear direction. Furthermore, the mounting slots 511a1 in the first group G1 may further include two or more first mounting slots 511a1(3) and 511a1(4) arranged at the first interval T in a second row P2 parallel to the first row P1.

[0099] The mounting slots 511a2 in the second group G2 may include two or more second mounting slots 511a2(1) and 511a2(2) arranged in the first row P1 at positions shifted, by a second interval D smaller than the first interval T, rearward from the mounting slots 511a1 in the first group G1.

[0100] Furthermore, the mounting slots 511a2 in the second group G2 may further include two or more second mounting slots 511a2(3) and 511a2(4) arranged in the second row P2 at positions shifted, by the interval T, rearward from the mounting slots 511a1 in the first group G1.

[0101] Hereinafter, the mounting slots 511a1 and 511a2, which can be used to install the front lifters 61a, 62a, and 63a, are defined as being in a front lifter installation group, and the mounting slots 511b (see (a) of FIG. 6), which can be used to install the rear lifters 61b, 62b, and 63b, are defined as being in a rear lifter installation group.

[0102] The plurality of front or rear lifters 61a, 62a, 63a, 61b, 62b, and 63b may be disposed in a circumferential direction of the drum 51, such that the plurality of front lifter installation groups may be disposed in the circumferential direction, and likewise, the plurality of rear lifter installation groups may also be disposed in the circumferential direction.

[0103] Hereinafter, the mounting slot belonging to the front lifter installation group is referred to as the front mounting slot 511a, and the mounting slot belonging to the rear lifter installation group is referred to as the rear mounting slot 511b.

[0104] Referring to FIGS. 8 to 12, the insertion protrusion 627 may protrude from the frame base 621. The insertion protrusion 627 may include a vertical portion 627a (see FIG. 11) protruding downward from the bottom surface of the frame base 621, and a catching portion 627b bent in the horizontal direction from the vertical portion 627a. The catching portion 627b may protrude toward the inside of the ring-shaped frame base 621 when viewed from above.

[0105] As illustrated in FIG. 11, the insertion protrusions 627 may be formed at left and right sides of the frame base 621, respectively, when the lifter frame 620 is viewed from the front side. Two or more insertion protrusions 627 may be formed along one side of the frame base 621 (or in the front-rear direction).

[0106] Specifically, the insertion protrusion 627(L) formed at the left side of the frame base 621 may include the catching portion 627b which is bent rightward. On the contrary, the insertion protrusion 627(R) formed at the right side of the frame base 621 may include the catching portion 627b which is bent leftward.

[0107] Referring to FIG. 6, each of the mounting slots 511a and 511b may be shaped to have a length L1 in

the approximately front-rear direction of the drum 51. Each of the mounting slots 511 and 511b may include an insertion section S1 having a predetermined width W1, and a binding section S2 extending rearward or forward from the insertion section S1 and having a smaller width (W2 < W1) than the insertion section S1. In the exemplary embodiment, the binding section S2 extends rearward from a rear end of the insertion section S1, but the present disclosure is not necessarily limited thereto. On the contrary, the binding section S2 may extend forward from a front end of the insertion section S1.

[0108] Furthermore, as illustrated in FIG. 20, to be described below, in the exemplary embodiment, the binding section S2 of the front mounting slot 511a may extend forward from the front end of the insertion section S1, and the binding section S2 of the rear mounting slot 511b may extend rearward from the rear end of the insertion section S1.

[0109] Meanwhile, referring to FIGS. 5 to 7, when installing the lifter frame 620 in the drum 51, the insertion protrusion 627 of the lifter frame 620 passes through the insertion section S1, and the lifter frame 620 is pushed rearward, such that the vertical portion 627a is moved forward along the binding section S2, and thus the catching portion 627b is positioned below the binding section S2. In this case, since the bottom surface of the frame base 621 is in close contact with the inner circumferential surface of the drum 51, and a width W3 (see FIG. 11) of the catching portion 627b is larger than the width W2 of the binding section S2, the catching portion 627b cannot pass through the binding section S2 from the lower side to the upper side.

[0110] Meanwhile, the seating groove 621r may extend in the form of a closed curve along a circumference of the lifter frame 620, and a horizontal projection plane of the insertion protrusion 627 may be positioned in the closed curve of the seating groove 621r.

[0111] That is, the insertion protrusion 627 may be positioned inward from the seating groove 621r. In the case in which the coupling tab 648 and the tab binding port 621h are formed on the seating groove 621r, the forming position of the insertion protrusion 627 and the forming positions of the coupling tab 648 and the tab binding port 621h may not overlap each other.

[0112] As described above, since the forming position of the insertion protrusion 627 is disposed inward from the forming positions of the coupling tab 648 and the tab binding port 621h, it is possible to prevent a particular portion from being structurally weakened, and the insertion protrusion 627 may be covered by the frame cover 640.

[0113] Therefore, it is possible to ensure structural rigidity of the lifters 61a, 61b, 62a, 62b, 63a, and 63b installed in the drum 51, and improve an aesthetic appearance of the interior of the drum 51 by minimizing exposure of an unnecessary portion.

[0114] Meanwhile, referring to FIGS. 8 to 11, the frame sidewall 622 may include a sidewall left portion 622L having a lower end connected to a left side 621a of the frame base 621, and a sidewall right portion 622R having a lower end connected to a right side 621b of the frame base 621. At least one of the sidewall left portion 622L or the sidewall right portion 622R may define an acute angle with respect to the frame base 621. Particularly, at least one of the sidewall left portion 622L or the sidewall right portion 622R may be symmetric with each other when viewed from the front side.

[0115] The frame sidewall 622 may have a mold ejection port 624a formed at a position corresponding to the insertion protrusion 627 when the lifter frame 620 is viewed vertically downward from above. The mold ejection port 624a may be formed in at least one of the sidewall left portion 622L or the sidewall right portion 622R.

[0116] The lifter frame 620 may be formed by injection molding. In this case, the mold may include an upper mold that forms the upper surface of the lifter frame 620, and a lower mold that forms the lower surface of the lifter frame 620.

[0117] The upper surface of the insertion protrusion 627 may be formed by the upper mold. Since the insertion protrusion 627 is positioned at the lower side of the frame sidewall 622, an opening portion, through which a portion of the upper mold defining the upper surface of the insertion protrusion 627 may pass during the process of opening the mold, needs to be formed in a region that overlaps the insertion protrusion 627 in a direction in which the upper mold is opened on the frame sidewall 622 (or a vertically upward direction from the frame base 621) so that a mold portion of the upper mold, which forms the upper surface of the insertion protrusion 627 (particularly, the upper surface of the catching portion 627b), may be moved upward (or so that the upper mold may be withdrawn without undercutting during the process of opening the mold), and the mold ejection port 624a is the opening portion. For reference, PL in FIG. 11 indicates a parting line formed by the upper mold and the lower mold.

[0118] As illustrated in FIG. 8, when the lifter frame 620 is viewed vertically downward from above (hereinafter, referred to as 'a plan view of the lifter frame'), the catching portion 627b of the insertion protrusion 627 is positioned in the mold ejection port 624a (or overlaps the mold ejection port 624a). Further, in the plan view of the lifter frame, an outer periphery of the catching portion 627b is spaced apart from a rim of the mold ejection port 624a, excluding the portion 627a connected to the vertical portion 627a.

[0119] Referring to FIGS. 9 and 10, a catching protrusion 626 may be formed on at least one of the front lifters 61a, 62a, and 63a or the rear lifters 61b, 62b, and 63b. The catching protrusion 626 may protrude downward from the concave inner surface 620b of the lifter frame 620.

[0120] Referring to FIG. 6, the opening portions 512a and 512b, into which the catching protrusions 626 are inserted, may be formed in the drum 51. The pair of opening portions 512a1 and 512a2 for installing the front lifters

61a, 62a, and 63a may be spaced apart from one another by an interval D in the front-rear direction.

[0121] The catching protrusion 626 is selectively inserted into any one of the pair of opening portions 512a1 and 512a2 depending on whether the insertion protrusions 627 are inserted into the mounting slots 511a1 in the first group G1 or the mounting slot 511a2 in the second group G2.

[0122] Catching tabs 514a and 514b, which each come into contact with (or are caught by) the lower end of the catching protrusion 626, may be formed on rims of the opening portions 512a and 512b. The catching tabs 514a and 514b may come into contact with the lateral surfaces of the catching protrusions 626 in the opening portions 512a and 512b, thereby restricting lateral movement of the catching protrusions 626.

[0123] Meanwhile, the positions of the catching tabs 514a and 514b may be determined based on the relative positions of the mounting slots 511a and 511b with respect to the insertion section S1 of the binding section S2. That is, as illustrated in FIG. 6, when the binding section S2 is positioned rearward from the insertion section S1, the catching tabs 514a and 514b are positioned in a first concave portion 626a at the front side of the catching protrusions 626. The catching tabs 514a and 514b may extend rearward from the front end of the opening portion 512 to restrict the movement of the catching protrusions 626 when the catching protrusion 626 is about to move forward (that is, the insertion protrusion 627 is about to move from the binding section S2 to the insertion section SI).

[0124] On the contrary, like the mounting slot 511a illustrated in FIG. 20, when the binding section S2 is positioned forward from the insertion section S1, the catching tabs 514a and 514b are positioned in a second concave portion 626b at the rear side of the catching protrusions 626. The catching tabs 514a and 514b may extend forward from the rear end of the opening portion 512 to restrict the movements of the catching protrusions 626 when the catching protrusion 626 is about to move rearward (that is, the insertion protrusion 627 is about to move from the binding section S2 to the insertion section S1).

[0125] The catching tabs 514a and 514b may be bent at a predetermined angle to the outside of the drum 51 based on the portion connected to the rims of the opening portions 512a and 512b.

[0126] The lateral surfaces of the catching protrusions 626 may come into contact with the catching tabs 514a and 514b even in the state in which the lower ends of the catching protrusions 626 are not inserted into the opening portions 512a and 512b. When the lifter frame 620 is about to move (that is, about to move in a direction opposite to a direction in which the lifter frame 620 is installed) such that the vertical portion 627a moves from the binding section S2 to the insertion section S1, the movement is restricted as the catching tabs 514a and 514b interfere with the lower ends of the catching protrusions 626.

[0127] Referring to FIG. 9, at the lower end of the catching protrusion 626, the first concave portion 626a may be formed at a side facing the catching tabs 514a and 514b. In the state in which the lifter frame 620 has been completely installed, the catching tabs 514a and 514b may be positioned in the first concave portion 626a.

[0128] At the lower end of the catching protrusion 626, the second concave portion 626b may be further formed at a side opposite to the first concave portion 626a. When the lifter frame 620 is installed in a state in which the front and rear sides of the lifter frame 620 are changed, the catching tabs 514a and 514b may be positioned in the second concave portion 626b.

[0129] In this case, the catching protrusion 626 may be formed to be symmetrical based on the center in a plan view of the lifter frame 620. That is, as illustrated in FIG. 9, the catching protrusion 626 may be formed to be symmetrical about the vertical and horizontal axes based on the center thereof.

[0130] In particular, the first concave portion 626a and the second concave portion 626b of the catching protrusion 626 may be formed to be symmetrical in both directions based on the longitudinal direction of the lifter frame 620.

[0131] Therefore, the catching protrusion 626 may be installed to come into contact with the catching tabs 514a and 514b in any direction, even when the front and rear positions of the lifters 61a, 61b, 62a, 62b, 63a, and 63b are changed during the process of installing the lifters 61a, 61b, 62a, 62b, 63a, and 63b in the drum 51.

[0132] Therefore, the installation operator may easily install the lifters 61a, 61b, 62a, 62b, 63a, and 63b in the drum 51 without considering the directions in which the lifters 61a, 61b, 62a, 62b, 63a, and 63b are installed.

[0133] Meanwhile, referring to FIG. 9, fastening bosses 628 may be formed on at least one of the front lifters 61a, 62a, and 63a or the rear lifters 61b, 62b, and 63b. The fastening boss 628 may protrude downward from the inner surface 620b of the lifter frame 620. The fastening boss 628 may extend from the frame upper plate 623. Two or more fastening bosses 628 may be provided to be spaced apart from one another in the front-rear direction.

[0134] Referring to FIGS. 5 and 6, fastening holes 513a and 513b may be formed in the drum 51. The fastening holes 513a and 513b may include a first fastening hole 513al formed at a position corresponding to the fastening boss 528 when the insertion protrusion 627 of the lifter frame 620 is installed in the mounting slot 511a1 in the first group G1, and a first fastening hole 513a2 formed at a position corresponding to the fastening boss 528 when the insertion protrusion 627 of the lifter frame 620 is installed in the mounting slot 511a2 in the second group G2. The pair of first fastening holes 513al(1) and 513a1(2) are provided to correspond to the pair of fastening bosses 528, and the second fastening holes 513a2 including a pair of second fastening holes 513a2(1) and 513a2(2) may be provided.

[0135] Referring to FIG. 7, the fastening boss 628 may be selectively fastened to the first fastening hole 513al or the second fastening hole 513a2 by means of a predetermined fastening member (hereinafter, for exemplary purposes, a screw 98) based on whether the insertion protrusion 627 is inserted into the mounting slot 511a1 in the first group G1 or the mounting slot 511a2 in the second group G2.

[0136] In the state in which the insertion protrusion 627 is inserted into the mounting slot 511a and the lifter frame 620 is temporarily assembled, the screw 98 passes through the fastening hole 513a from the outside of the drum 51 and is then fastened to the fastening boss 628, such that the lifter frame 620 may be completely installed.

[0137] In this case, the fastening boss 628 may protrude from the inner surface of the frame upper plate 623 in the direction toward the inner circumferential surface of the drum 51.

[0138] In the structure of the lifter frame 620, the frame upper plate 623 has relatively higher rigidity than the frame sidewall 622 having the plurality of holes.

[0139] Therefore, in order to more rigidly install the lifters 61a, 61b, 62a, 62b, 63a, and 63b in the drum 51, the fastening boss 628 to be fastened, by means of the fastening member, to the fastening hole 513a of the drum 51 may be formed on the frame upper plate 623.

[0140] As described above, since the fastening boss 628 is formed on the upper surface of the lifter frame 620 that has relatively high rigidity, fastening force may be further increased when the fastening boss 628 is fastened to the fastening hole 513a by means of the fastening member.

[0141] Meanwhile, as described above, as illustrated in FIG. 7A or 7B, the installation position of the lifter frame 620 may vary depending on whether the insertion protrusion 627 is inserted into the mounting slot 511a1 or the mounting slot 511a2. In any case, the mounting slots 511a1 and 511a2, the opening portions 512a1 and 512a2, and the fastening holes 513a1 and 513a2 are hidden by the frame cover 640 in the state in which the lifter is completely installed. That is, the mounting slots 511a1 and 511a2, the opening portions 512a1 and 512a2, and the fastening holes 513a1 and 513a2 are positioned inside the frame cover 640, and thus are not exposed to the inside of the drum 51.

[0142] In other words, in the state in which the at least one insertion protrusion 627 provided on each of the lifters 61a, 62a, 63a, 61b, 62b, and 63b is fastened to the mounting slot (for example, 511a1) in any one group (for example, G1) among the mounting slots 511a in the first group G1 and the second group G2, the mounting slot (for example, 511a2) in the other group (for example, G2) may be hidden inside the drum 51 by the lifter.

[0143] In more detail, in the state in which the at least one insertion protrusion 627 provided on each of the front lifters 61a, 62a, and 63a is inserted into the mounting slot in any one group (for example, G1) of the first group G1 and the second group G2, the front end of each of the front lifters 61a, 62a, and 63a may be positioned forward from the mounting slots 511a1(1) to 511a1(4) and 511a2(1) to 511a2(4) belonging to the first group G1 and the second group G2.

[0144] In addition, the rear end of each of the front lifters 61a, 62a, and 63a may be positioned rearward from any of the mounting slots 511a1(1) to 511a1(4) and 511a2(1) to 511a2(4) belonging to the first group G1 and the second group G2.

[0145] Since all of the mounting slots 511a1(1) to 511a1(4) and 511a2(1) to 51 1a2(4) used to install the front lifters 61a, 62a, and 63a are positioned between the front ends and the rear ends of the front lifters 61a, 62a, and 63a, the mounting slots may be hidden by being covered by the front lifters 61a, 62a, and 63a.

[0146] Manufacturers of laundry treating apparatuses sometimes produce various types of products having drums having different capacities. In this case, a metal plate having the mounting slots 511a and 511b, the opening portions 512a and 512b, the fastening holes 513a and 513b, and the like is cut out based on a predetermined standard, the raw material 51' or 51" (see FIG. 5) cut out in this manner is rolled up, and the ends of the raw material are joined together so as to manufacture the drum 51. In this case, the metal plate is cut to a predetermined length based on the standard of the drum. In order to manufacture two drums having different lengths, it is necessary to differently adjust the interval between the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b in accordance with the length of the drum.

[0147] For example, as illustrated in FIG. 5, the interval between the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b when the length of the drum 51' is long (see (a) of FIG. 5) needs to be greater than the interval between the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b when the length of the drum 51" is short (see (b) of FIG. 5), so that the laundry may be uniformly lifted up by the front and rear lifters 61b, 62b, and 63b even in the case of the large-capacity drum 51.

[0148] Therefore, extra mounting slots 511a are further formed in the drum 51 in order to adjust the installation position of at least one of the front lifters 61a, 62a, and 63a or the rear lifters 61b, 62b, and 63b in the front-rear direction when the length of the drum is changed.

[0149] In the present exemplary embodiment, the extra mounting slots 511a are provided to adjust the installation positions of the front lifters 51a, 52a, and 53a, but the present disclosure is not necessarily limited thereto. Depending on exemplary embodiments, the extra mounting slots 511b may be provided to adjust the installation positions of the rear lifters 61b, 62b, and 63b.

[0150] The extra mounting slots 511a may be formed in the lifter frame 620 such that the extra mounting slots 511a correspond in number to the mounting slots 511a (hereinafter, referred to as 'installation slots') into which the insertion protrusions 627 are inserted, and the extra mounting slots 511a may be formed at points spaced

apart from the respective installation slots at a predetermined distance D in the frontward or rearward direction. The installation position of the lifter frame 620 may be changed by the distance D by separating the insertion protrusion 627 from the mounting slot (for example, 511a1) and then inserting the insertion protrusion 627 into the extra mounting slot (for example, 511a2).

[0151] Meanwhile, in the exemplary embodiment, the extra opening portions 512a are provided to adjust the installation positions of the front lifters 51a, 52a, and 53a, but the present disclosure is not necessarily limited thereto. Depending on the embodiment, the extra opening portions 512b may also be provided to adjust the installation positions of the rear lifters 61b, 62b, and 63b.

[0152] Meanwhile, in the exemplary embodiment, the extra fastening holes 513a are provided to adjust the installation positions of the front lifters 51a, 52a, and 53a, but the present disclosure is not limited thereto. Depending on the embodiment, the extra fastening holes 513b may also be provided to adjust the installation positions of the rear lifters 61b, 62b, and 63b.

[0153] In this regard, a planar shape of the frame cover 640 may be formed to cover a region extending from the region in which any one of the mounting slots 511a in the first group G1 and the second group G2 is formed by a spacing distance D between the mounting slots 511a1(1) to 511a1(4) in the first group and the mounting slots 511a2(1) to 511a2(4) in the second group.

[0154] Therefore, the installation positions of the lifters 61a, 61b, 62a, 62b, 63a, and 63b may be changed depending on the type of drum 51, and the extra mounting slots for changing the installation positions may be covered by the frame cover 640.

[0155] Meanwhile, FIG. 20 illustrates another exemplary embodiment of the present disclosure. In order to install the lifter frame 620 by means of the front mounting slot 511a, the lifter frame 620 needs to be pushed forward after the insertion protrusion 627 is inserted into the insertion section S1. In order to install the lifter frame 620 by means of the rear mounting slot 511b, the lifter frame 620 needs to be pushed rearward after the insertion protrusion 627 is inserted into the insertion section S1.

[0156] On the contrary, in order to separate the lifter frame 620 from the drum 51, the lifter frame 620 is pushed forward or rearward to move the catching portion 627b of the insertion protrusion 627 from the binding section S2 and align the catching portion 627b with the insertion section S1, and the lifter frame 620 is lifted up, such that the catching portion 627b passes through the insertion section S1, and the lifter frame 620 may be separated from the drum 51.

[0157] FIG. 16 is a view illustrating a pair of front and rear lifters illustrated in FIG. 1; FIG. 17 is a view illustrating the lifters illustrated in FIG. 16 when viewed from a front side; FIG. 18 is a view (a) illustrating a state in which the drum illustrated in FIG. 1 is deployed and a developed view (b) of the drum having the lifters disposed according to another exemplary embodiment of the present disclosure; FIG. 19 is a view (a) illustrating a change in height of a first fabric caused by the rear lifter in accordance with a rotation angle of the drum and a view (b) illustrating a change in height of a second fabric caused by the front lifter that constitutes a set together with the rear lifter; Hereinafter, description will be made with reference to FIGS. 16 to 19.

[0158] Each of the front lifters 61a, 62a, and 63a is disposed on the inner circumferential surface of the drum 51 and extending in the front-rear direction. The plurality of front lifters 61a, 62a, and 63a are disposed based on the rotation axis O at equal angles.

[0159] The rear lifters 61b, 62b, and 63b are disposed on the inner circumferential surface of the drum 51 and positioned rearward from the front lifters 61a, 62a, and 63a. Like the front lifters 61a, 62a, and 63a, the rear lifters 61b, 62b, and 63b are disposed based on the rotation axis O at equal angles.

[0160] The rear lifters 61b, 62b, and 63b are disposed to form a predetermined phase angle with the front lifters 61a, 62a, and 63a with respect to the rotation axis O. Here, the 'phase angle' is made by defining, as a rotation angle of the drum 51, a point in time at which the lifters 61a, 62a, 63a, 61b, 62b, and 63c reach a point on the circumference. Assuming that the drum 51 is rotated clockwise CW in the exemplary embodiment, the rear lifters 61b, 62b, and 63b reach the same height prior to the front lifters 61a, 62a, and 63a by a degree corresponding to the phase angle $\Delta\theta$.

[0161] As illustrated in FIGS. 16 and 17, assuming that each of the lifters 61a, 62a, 63a, 61b, 62b, and 63b has a length C1 extending in the front-rear direction and a width C2 defined in the left-right direction (or a direction orthogonal to the longitudinal direction), a circumferential distance (C3 = $\Delta\theta$r, see FIG. 19) corresponding to the phase angle is larger than 0 and equal to or smaller than two times the width C2 in the circumferential direction of each of the front lifters 61a, 62a, and 63a.

[0162] Referring to FIG. 18, a no-lifter region SE, in which there is no front lifter or rear lifter, is formed between any one pair of front/rear lifters (for example, 61a and 61b) and another pair of front/rear lifters (for example, 62a and 62b) on the inner circumferential surface of the drum 51. The no-lifter region SE may extend from the front end to the rear end of the drum 51.

[0163] Specifically, the no-lifter region SE passes between the two adjacent sets of lifters from the front end of the drum 51 and extends to the rear end of the drum 51. Specifically, the no-lifter region SE extends straight from the front end of the drum 51 to the rear end of the drum while passing between the two adjacent front lifters (for example, 61a and 62a) among the plurality of front lifters 61a, 62a, and 63a and between the two rear lifters 61b and 62b that each form the phase angle $\Delta\theta$ with each of the two adjacent front lifters 61a and 62a.

[0164] Since the no-lifter region SE extends straight from the front end to the rear end of the drum 51, the laundry may be uniformly distributed to the front and rear

regions of the drum 51 in the no-lifter region SE.

[0165] Typically, the washing machine detects eccentricity of the drum 51 before performing a spin-drying process, and when the detected eccentricity is within a reference value, the drum is accelerated such that the rotational speed of the drum 51 reaches a predetermined spin-drying speed (or spin-drying RPM). Otherwise, a fabric distribution is performed to change the position of fabrics in the drum 51. The fabric distribution is repeated if the detected eccentricity does not reach the reference value. When the number of times the fabric distribution is repeated reaches a predetermined number of times, it is determined that the fabric distribution has failed, and the spin-drying is stopped.

[0166] In the washing machine according to the present exemplary embodiment, a first fabric positioned at the rear side of the drum 51 (that is, the fabric to be lifted up by the rear lifters 61b, 62b, and 63b) and a second fabric positioned at the front side of the drum 51 (that is, the fabric to be lifted up by the front lifters) flow with a time difference (or a phase difference) by the phase angle $\Delta\theta$ formed by the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b, and as a result, the fabric distribution may be more smoothly performed.

[0167] More specifically, referring to FIG. 19, when the drum 51 is rotated clockwise CW in a state in which the rear lifters 61b, 62b, and 63b are positioned at a lowest point ($\theta = 0$) of the drum 51, the first fabric begins to be lifted up first by the rear lifters 61b, 62b, and 63b, and then the second fabric begins to be lifted up by the front lifters 61a, 62a, and 63a after the time corresponding to the phase angle $\Delta\theta$ has passed.

[0168] Assuming that the fabrics roll ($\theta < \pi / 2$) and that a position P at which the fabric lifted up by the lifters 61a, 62a, 63a, 61b, 62b, and 63b falls is a position Pd, the first fabric lifted up by the rear lifters 61b, 62b, and 63b reaches the position (or height) Pd and falls first, and then the second fabric lifted up by the front lifters 61a, 62a, and 63a reaches the position Pd and falls.

[0169] The first fabric and the second fabric move with a time difference without forming lumps, and thus may be evenly distributed. As a result, it is possible to reduce the number of times the fabric distribution is repeated, reduce the instances of failure to enter the spin-drying stage, and reduce the overall washing time including the spin-drying time.

[0170] In addition, since the fabrics flow with a phase difference when the fabrics roll or tumble, friction or collision between the fabrics caused by the relative movement occurs more frequently, such that contamination may be more effectively removed by the washing operation (that is, washing power is improved).

[0171] Meanwhile, FIG. 20 is a view illustrating a modified example in which the lifters are disposed, in which (a) illustrates a small-capacity drum and (b) illustrates a large-capacity drum. Referring to FIG. 20, one set of front lifters 61a, 62a, and 63a and rear lifters 61b, 62b, and 63b may be disposed in a row in the front-rear direction. That is, the front lifters 61a, 62a, and 63a and the rear lifters 61b, 62b, and 63b, which constitute one set, may be arranged on the same line without being spaced apart from one another in the circumferential direction.

[0172] FIG. 21 is a view illustrating another exemplary embodiment of the lifter. The exemplary embodiment illustrated in FIG. 21 provides a lifter 64 including a lifter frame 620' and a frame cover 640' slightly different in shape from those in the above-mentioned exemplary embodiments, but similar in detailed configuration to those in the above-mentioned exemplary embodiments. Therefore, constituent elements identical to the constituent elements according to the above-described exemplary embodiments will be assigned the same reference numerals, and a specific description thereof will be omitted.

[0173] While the invention has been explained in relation to its embodiments, it is to be understood that various modifications thereof will become apparent to those skilled in the art upon reading the specification. Therefore, it is to be understood that the invention disclosed herein is intended to cover such modifications as fall within the scope of the appended claims.

Claims

1. A laundry treating apparatus comprising:

a drum (51) configured to rotate about a rotation axis (O) extending in a front-rear direction; and
a lifter (61a, 61b, 62a, 62b, 63a, and 63b) disposed on an inner circumferential surface of the drum (51) and configured to revolve about the rotation axis (O) when the drum (51) rotates,
wherein the drum (51) comprises:

an opening portion formed by penetrating and opening a part of the drum (51); and
a catching tab (514a, 514b) extending from one surface of a circumference of the opening portion to an opened portion,
wherein the lifter (61a, 61b, 62a, 62b, 63a, 63b) comprises:

a lifter frame (620) installed on the inner circumferential surface of the drum (51); and
a frame cover (640) coupled to the lifter frame (620) and protruding radially inward from the inner circumferential surface of the drum (51),
wherein the lifter frame (620) comprises:

a frame base (621) coupled to the inner circumferential surface of the drum (51) and having a seating groove (621r) formed along a cir-

cumference of the frame base (621);
a frame upper plate (623) spaced apart from the frame base (621) in a direction toward the inside of the drum (51);
a frame sidewall (622) configured to connect the frame upper plate (623) and the frame base (621); and
a catching protrusion (626) protruding from an inner surface of the lifter frame (620) and configured to come into contact with the catching tab (514a, 514b) when the lifter frame (620) is coupled to the inner circumferential surface of the drum (51), and
wherein the catching protrusion (626) is formed to be symmetrical based on a center in a plan view of the lifter frame (620).

2. The laundry treating apparatus of claim 1, wherein a first concave portion (626a) and a second concave portion (626b) of the catching protrusion (626) are formed to be symmetrical in both directions based on a longitudinal direction of the lifter frame (620);
and preferably
wherein the catching protrusion (626) is disposed at a center in a plan view of the lifter frame (620).

3. The laundry treating apparatus of claim 1 or 2, wherein the frame cover (640) comprises:

a cover upper plate (646) having an inner surface facing the frame upper plate (623); and
a cover sidewall (645) having a lower end inserted into the seating groove (621r) and an upper end connected to the cover upper plate (646);
and preferably
wherein the frame cover (640) is formed to be symmetrical based on a center in a plan view.

4. The laundry treating apparatus of any one of claims 1 to 3, wherein the lifter frame (620) further comprises an insertion protrusion (627) comprising a vertical portion (627a) extending downward from a bottom surface of the frame base (621), and a catching portion (627b) bent from a lower end of the vertical portion (627a) in a direction toward the inside of the frame base (621);
and preferably
wherein a plurality of the insertion protrusions (627) are provided, and the respective insertion protrusions (627) are disposed to be symmetrical based on a center in a plan view of the lifter frame (620).

5. The laundry treating apparatus of claim 4, wherein the drum (51) further comprises:

mounting slots in a first group; and
mounting slots in a second group formed in a region spaced apart from the mounting slots in the first group in a rearward direction within a range in which some of the mounting slots in the first group and some of the mounting slots in the second group overlap one another, and
wherein the insertion protrusion (627) is selectively inserted into any one of the mounting slots in the first group and the mounting slots in the second group, and a pair of the opening portions is formed in the inner circumferential surface of the drum (51) so as to be spaced apart from each other in the front-rear direction to correspond to a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

6. The laundry treating apparatus of claim 5, wherein a planar shape of the frame cover (640) is formed to cover a region extending from the region in which any one of the mounting slots in the first group and the mounting slots in the second group is formed by a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

7. The laundry treating apparatus of any one of claims 4 to 6, wherein a coupling tab (648) protrudes from a lower end of the frame cover (640), and the lifter frame (620) has a tab binding port (621h) formed in the seating groove (621r) such that the coupling tab (648) is inserted into the tab binding port (621h) when the lifter frame (620) is coupled to the frame cover (640);
and preferably
wherein the seating groove (621r) extends in the form of a closed curve along a circumference of the frame base (621), and a horizontal projection plane of the insertion protrusion (627) is positioned in the closed curve of the seating groove (621r).

8. The laundry treating apparatus of any one of claims 1 to 7, wherein the lifter frame (620) further comprises a fastening boss (628) protruding from an inner surface thereof in a direction toward the inner circumferential surface of the drum (51), and a fastening hole (513a, 513b) is formed in the drum (51), such that the fastening boss (628) and the fastening hole (513a, 513b) are fastened to each other by means of a fastening member.

9. The laundry treating apparatus of claim 8, wherein the fastening boss (628) protrudes from an inner surface of the frame upper plate (623) in a direction

toward the inner circumferential surface of the drum (51).

10. The laundry treating apparatus of any one of claims 1 to 9, wherein the lifter frame (620) is made of synthetic resin, and the frame cover (640) is made of metal.

11. The laundry treating apparatus of any one of claims 1 to 10, wherein the lifters (61a, 61b, 62a, 62b, 63a, 63b) comprise:

a plurality of front lifters (61a, 62a, 63a) disposed in a circumferential direction of the drum (51); and
a plurality of rear lifters (61b, 62b, 63b) disposed respectively in the circumferential direction of the drum (51) at rear sides of the respective front lifters (61a, 62a, 63a).

12. A laundry treating apparatus comprising:

a tub (50) configured to receive washing water;
a drum (51) configured to receive laundry and rotate in the tub (50) about a rotation axis (O) extending in a front-rear direction; and
a lifter (61a, 61b, 62a, 62b, 63a, 63b) disposed on an inner circumferential surface of the drum (51) and configured to revolve about the rotation axis (O) when the drum (51) rotates,
wherein the lifter (61a, 61b, 62a, 62b, 63a, 63b) comprises:

a lifter frame (620) installed on the inner circumferential surface of the drum (51); and
a frame cover (640) coupled to the lifter frame (620) and protruding radially inward from the inner circumferential surface of the drum (51), and
wherein the lifter frame (620) has a catching protrusion (626) protruding from an inner surface of the lifter frame (620) and having a shape that is symmetrical based on a center in a plan view.

13. The laundry treating apparatus of claim 12, wherein a first concave portion (626a) and a second concave portion (626b) of the catching protrusion (626) are formed to be symmetrical in both directions based on a longitudinal direction of the lifter frame (620); and preferably
wherein the drum (51) comprises:

mounting slots in a first group; and
mounting slots in a second group formed in a region spaced apart from the mounting slots in the first group in a rearward direction within a range in which some of the mounting slots in the first group and some of the mounting slots in the second group overlap one another, and
wherein a planar shape of the frame cover (640) is formed to cover a region extending from the region in which any one of the mounting slots in the first group and the mounting slots in the second group is formed by a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

14. The laundry treating apparatus of claim 12 or 13, wherein the lifter frame (620) further comprises:

an insertion protrusion (627) comprising a vertical portion (627a) extending downward from a bottom surface of the lifter frame (620), and a catching portion (627b) bent from a lower end of the vertical portion (627a) in a direction toward the inside of the lifter frame (620); and
a seating groove (621r) formed along a circumference of the lifter frame (620) such that a lower end of the frame cover (640) is inserted into the seating groove (621r), and
wherein the seating groove (621r) extends in the form of a closed curve along a circumference of the lifter frame (620), and a horizontal projection plane of the insertion protrusion (627) is positioned in the closed curve of the seating groove (621r).

15. The laundry treating apparatus of any one of claims 12 to 14, wherein the lifter frame (620) further comprises a fastening boss (628) protruding from an upper inner surface thereof in a direction toward the inner circumferential surface of the drum (51), and a fastening hole (513a, 513b) is formed in the drum (51), such that the fastening boss (628) and the fastening hole (513a, 513b) are fastened to each other by means of a fastening member.

Amended claims in accordance with Rule 137(2) EPC.

1. A laundry treating apparatus comprising:

a drum (51) configured to rotate about a rotation axis (O) extending in a front-rear direction; and
a lifter (61a, 61b, 62a, 62b, 63a, and 63b) disposed on an inner circumferential surface of the drum (51) and configured to revolve about the rotation axis (O) when the drum (51) rotates,
wherein the drum (51) comprises:

an opening portion formed by penetrating and opening a part of the drum (51); and
a catching tab (514a, 514b) extending from one surface of a circumference of the open-

ing portion to an opened portion,

wherein the lifter (61a, 61b, 62a, 62b, 63a, 63b) comprises:

a lifter frame (620) installed on the inner circumferential surface of the drum (51); and
a frame cover (640) coupled to the lifter frame (620) and protruding radially inward from the inner circumferential surface of the drum (51),

wherein the lifter frame (620) comprises:

a frame base (621) coupled to the inner circumferential surface of the drum (51) and having a seating groove (621r) formed along a circumference of the frame base (621);
a frame upper plate (623) spaced apart from the frame base (621) in a direction toward the inside of the drum (51); and
a frame sidewall (622) configured to connect the frame upper plate (623) and the frame base (621); **characterized by**
a catching protrusion (626) protruding from an inner surface of the lifter frame (620) and configured to come into contact with the catching tab (514a, 514b) when the lifter frame (620) is coupled to the inner circumferential surface of the drum (51), and
wherein the catching protrusion (626) is formed to be symmetrical based on a center in a plan view of the lifter frame (620).

2. The laundry treating apparatus of claim 1, wherein a first concave portion (626a) and a second concave portion (626b) of the catching protrusion (626) are formed to be symmetrical in both directions based on a longitudinal direction of the lifter frame (620);
and preferably
wherein the catching protrusion (626) is disposed at a center in a plan view of the lifter frame (620).

3. The laundry treating apparatus of claim 1 or 2, wherein the frame cover (640) comprises:

a cover upper plate (646) having an inner surface facing the frame upper plate (623); and
a cover sidewall (645) having a lower end inserted into the seating groove (621r) and an upper end connected to the cover upper plate (646);
and preferably
wherein the frame cover (640) is formed to be symmetrical based on a center in a plan view.

4. The laundry treating apparatus of any one of claims 1 to 3, wherein the lifter frame (620) further comprises an insertion protrusion (627) comprising a vertical portion (627a) extending downward from a bottom surface of the frame base (621), and a catching portion (627b) bent from a lower end of the vertical portion (627a) in a direction toward the inside of the frame base (621);
and preferably
wherein a plurality of the insertion protrusions (627) are provided, and the respective insertion protrusions (627) are disposed to be symmetrical based on a center in a plan view of the lifter frame (620).

5. The laundry treating apparatus of claim 4, wherein the drum (51) further comprises:

mounting slots in a first group; and
mounting slots in a second group formed in a region spaced apart from the mounting slots in the first group in a rearward direction within a range in which some of the mounting slots in the first group and some of the mounting slots in the second group overlap one another, and
wherein the insertion protrusion (627) is selectively inserted into any one of the mounting slots in the first group and the mounting slots in the second group, and a pair of the opening portions is formed in the inner circumferential surface of the drum (51) so as to be spaced apart from each other in the front-rear direction to correspond to a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

6. The laundry treating apparatus of claim 5, wherein a planar shape of the frame cover (640) is formed to cover a region extending from the region in which any one of the mounting slots in the first group and the mounting slots in the second group is formed by a spacing distance between the mounting slots in the first group and the mounting slots in the second group.

7. The laundry treating apparatus of any one of claims 4 to 6, wherein a coupling tab (648) protrudes from a lower end of the frame cover (640), and the lifter frame (620) has a tab binding port (621h) formed in the seating groove (621r) such that the coupling tab (648) is inserted into the tab binding port (621h) when the lifter frame (620) is coupled to the frame cover (640);
and preferably
wherein the seating groove (621r) extends in the form of a closed curve along a circumference of the frame base (621), and a horizontal projection plane of the insertion protrusion (627) is positioned in the closed curve of the seating groove (621r).

8. The laundry treating apparatus of any one of claims

1 to 7, wherein the lifter frame (620) further comprises a fastening boss (628) protruding from an inner surface thereof in a direction toward the inner circumferential surface of the drum (51), and a fastening hole (513a, 513b) is formed in the drum (51), such that the fastening boss (628) and the fastening hole (513a, 513b) are fastened to each other by means of a fastening member.

9. The laundry treating apparatus of claim 8, wherein the fastening boss (628) protrudes from an inner surface of the frame upper plate (623) in a direction toward the inner circumferential surface of the drum (51).

10. The laundry treating apparatus of any one of claims 1 to 9, wherein the lifter frame (620) is made of synthetic resin, and the frame cover (640) is made of metal.

11. The laundry treating apparatus of any one of claims 1 to 10, wherein the lifters (61a, 61b, 62a, 62b, 63a, 63b) comprise:

a plurality of front lifters (61a, 62a, 63a) disposed in a circumferential direction of the drum (51); and
a plurality of rear lifters (61b, 62b, 63b) disposed respectively in the circumferential direction of the drum (51) at rear sides of the respective front lifters (61a, 62a, 63a).

FIG. 1

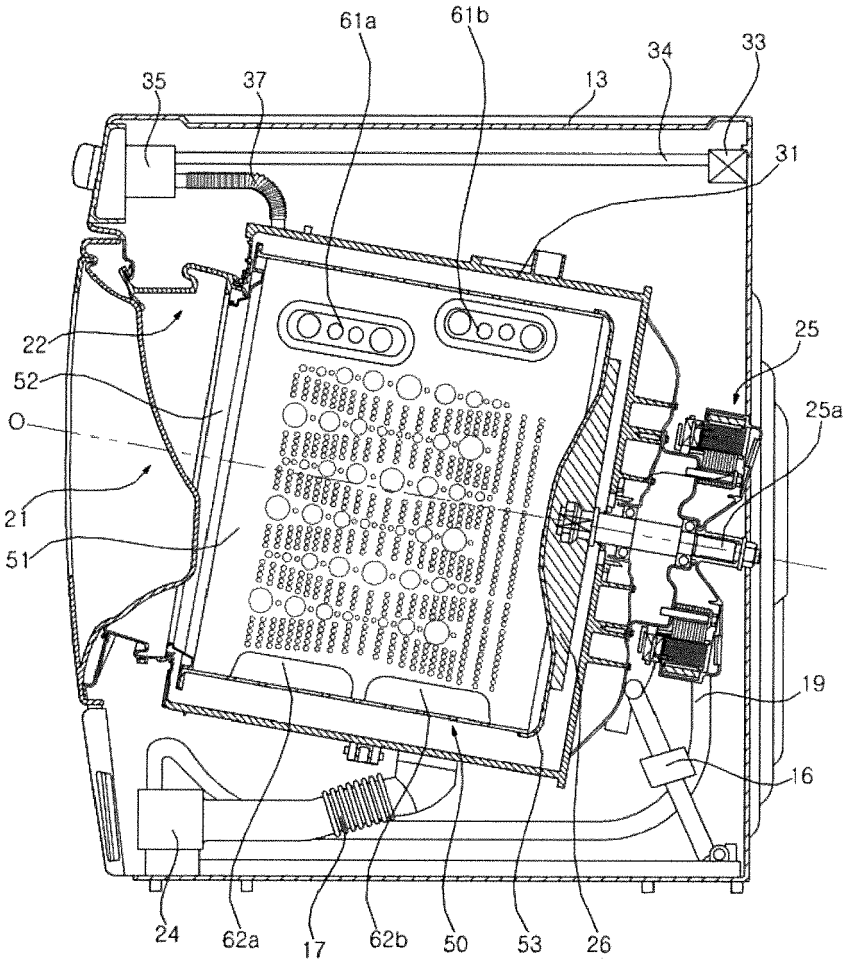

61a
61b
34
33
35
37
13
31
22
25
52
25a
O
21
51
19
16
24
62a
17
62b
50
53
26

FIG. 2

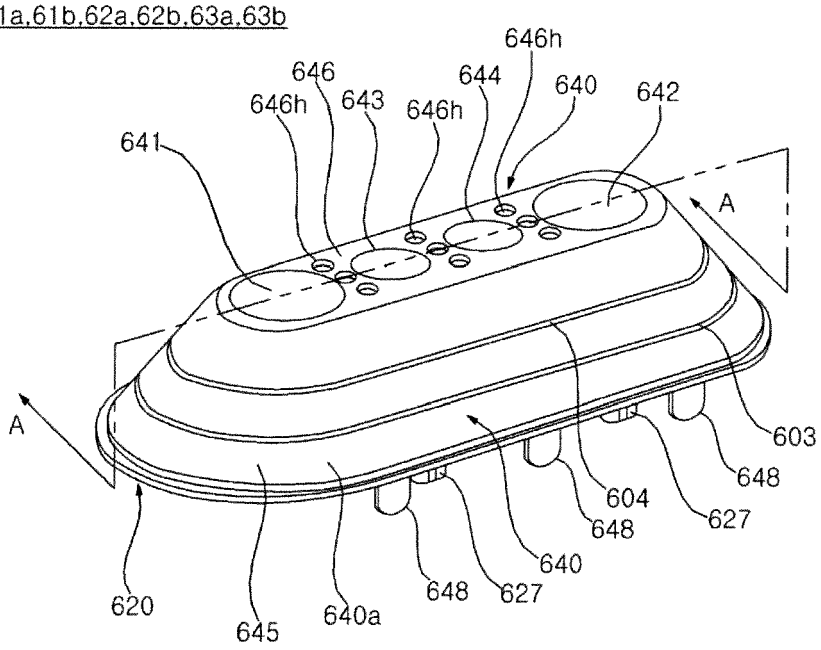
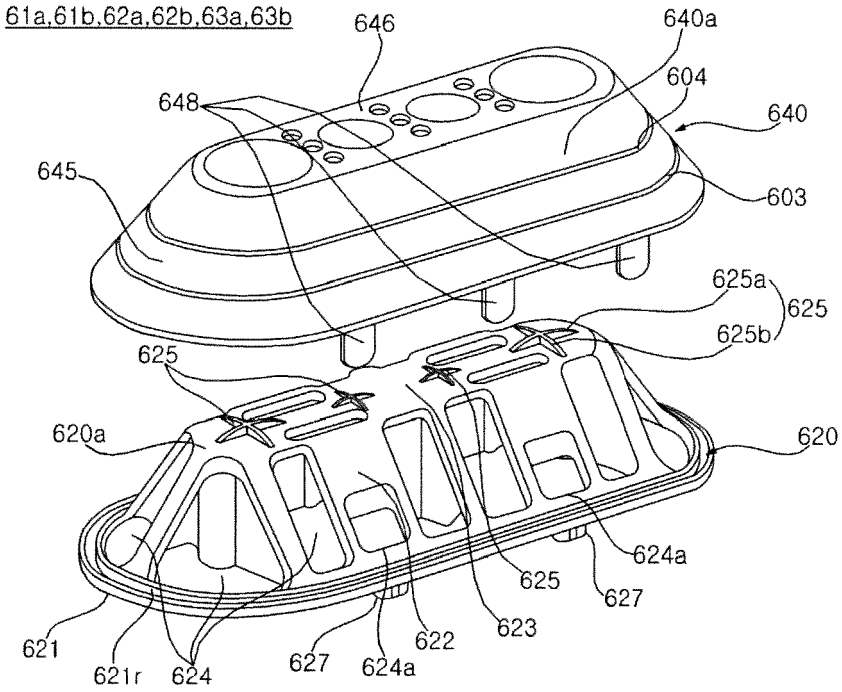

61a,61b,62a,62b,63a,63b
646h
646
644
640
642
646h
643
646h
641
A
A
603
648
604
627
648
640
648
627
620
645
640a

FIG. 3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646
640a
604
648
640
645
603
625a
625
625b
625
620a
620
624a
625
627
623
621
622
621r
624
627
624a

FIG. 4

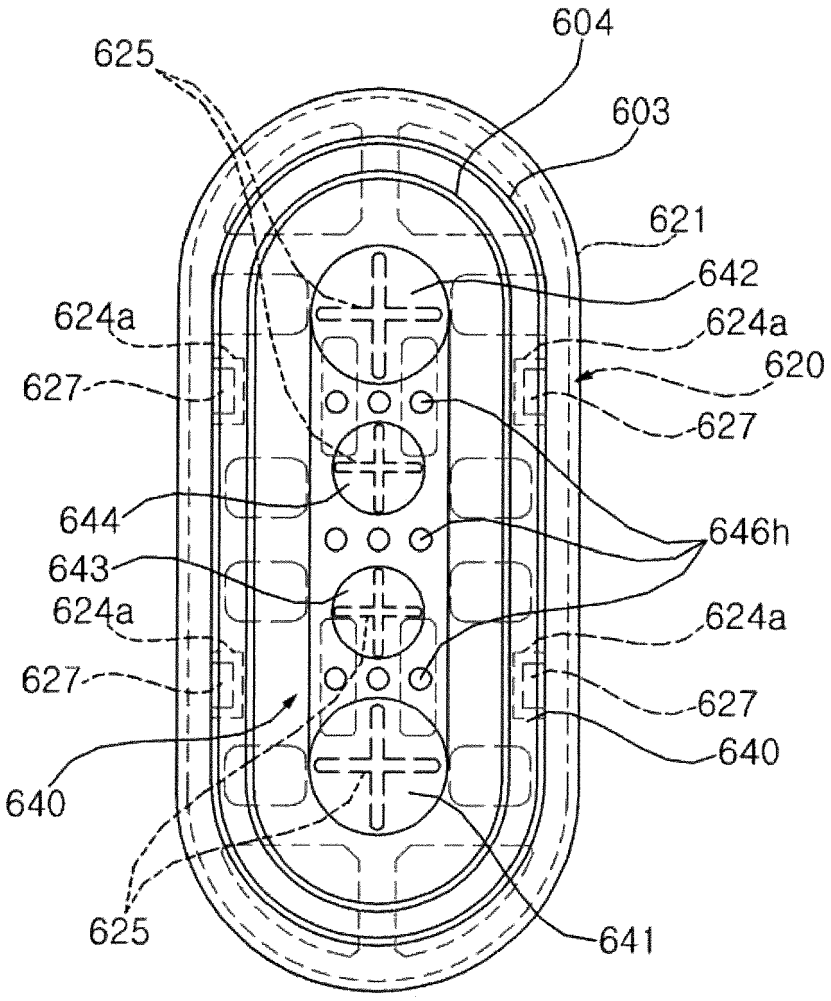

604
625
603
621
642
624a
624a
620
627
627
644
646h
643
624a
624a
627
627
640
640
625
641

FIG. 5

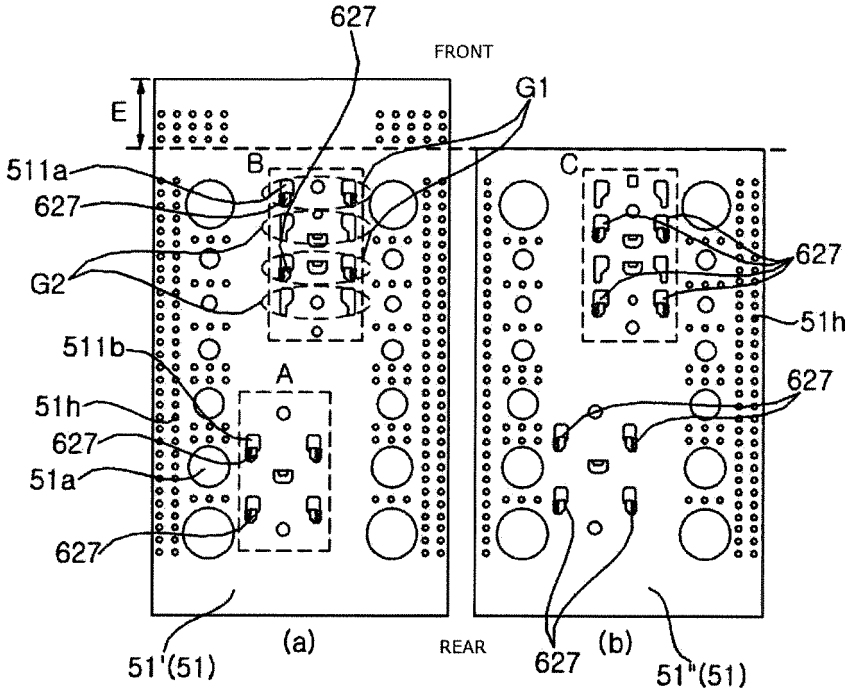

627
FRONT
G1
E
511a
B
C
627
627
G2
51h
511b
A
627
51h
627
51a
627
(a)
REAR
627
(b)
51'(51)
51"(51)

FIG. 6

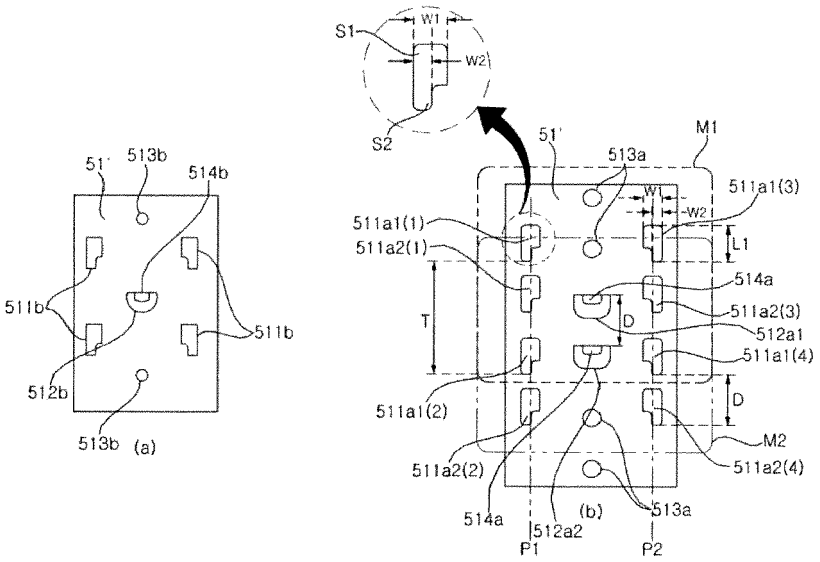

S1
W1
W2
S2
51'
513b
514b
511b
511b
512b
513b
(a)
51'
513a
M1
511a1(3)
W1
W2
511a1(1)
511a2(1)
L1
514a
T
D
511a2(3)
512a1
511a1(4)
D
511a1(2)
M2
511a2(2)
511a2(4)
514a
512a2
(b)
513a
P1
P2

FIG. 7

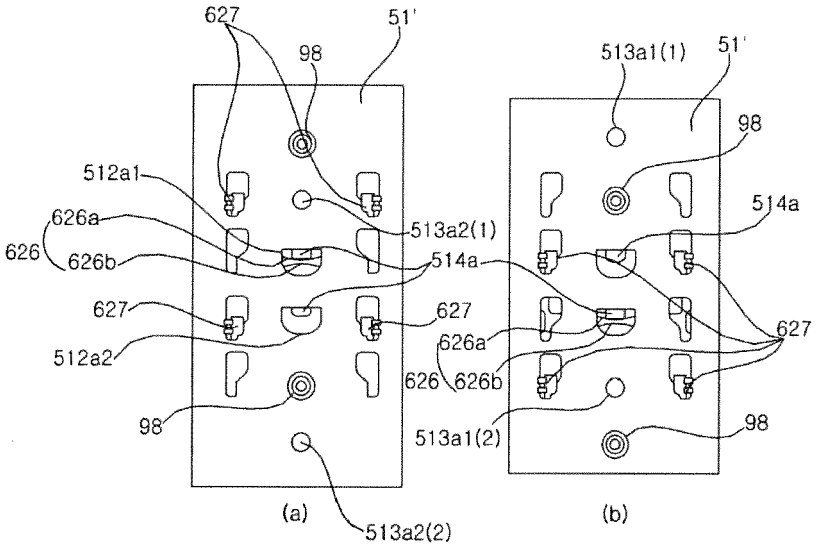

627
51'
98
512a1
626a
626
626b
627
512a2
98
513a2(1)
514a
627
513a2(2)
(a)
513a1(1)
51'
98
514a
627
626a
626
626b
513a1(2)
98
(b)

FIG. 8

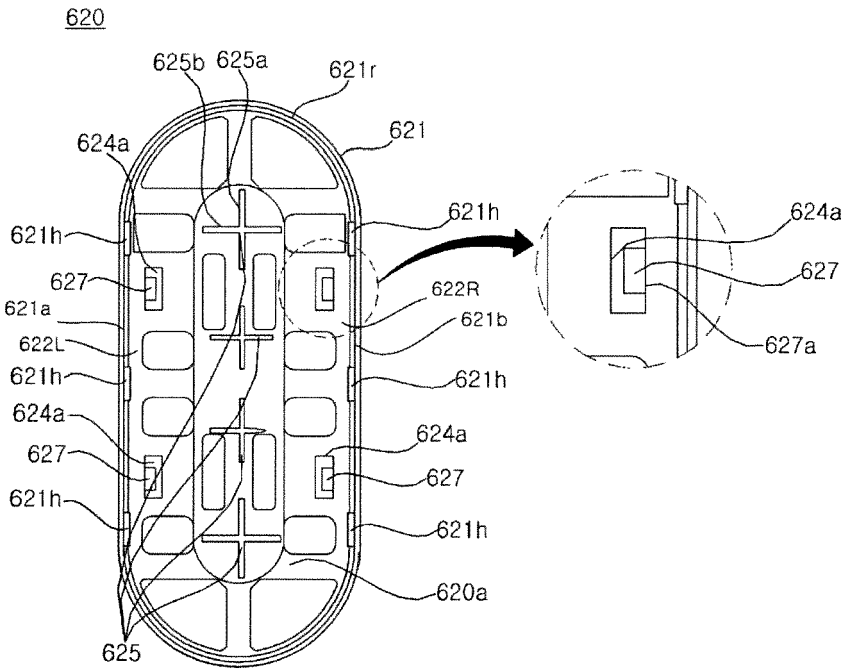

620
625b
625a
621r
621
624a
621h
627
621a
622L
621h
624a
627
621h
625
621h
622R
621b
621h
624a
627
621h
620a
624a
627
627a

FIG. 9

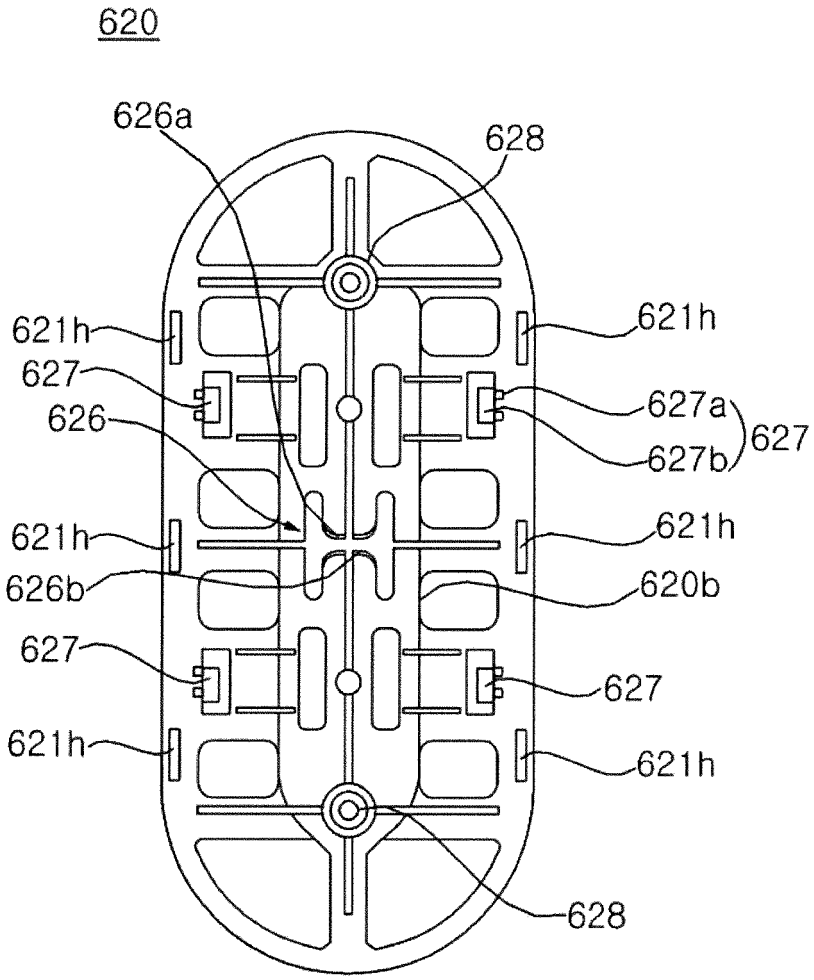

620
626a
628
621h
627
626
627a
627b
627
621h
626b
620b
627
627
621h
621h
628

FIG. 10

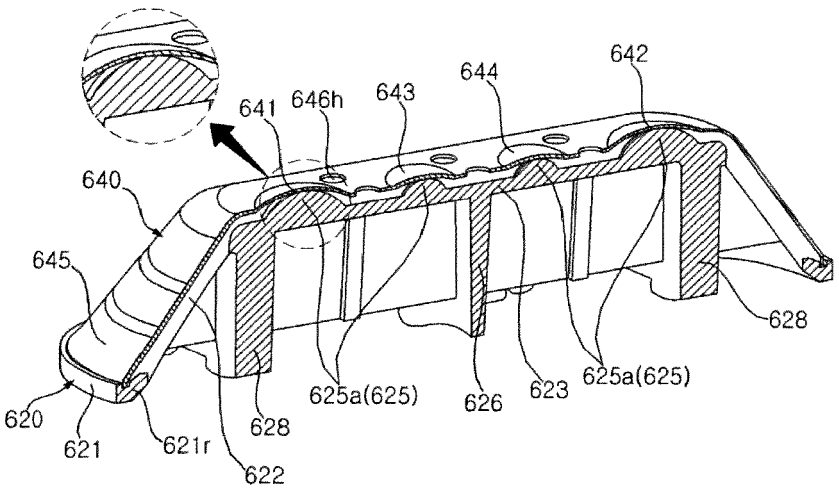

642
644
641
646h
643
640
645
628
620
621
621r
622
628
625a(625)
626
623
625a(625)

FIG. 11

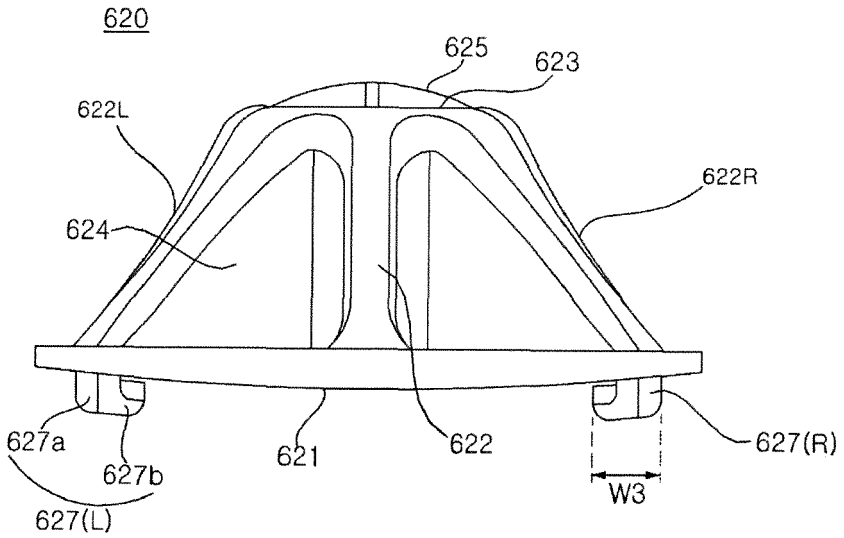

620
625
623
622L
622R
624
627a
627b
627(L)
621
622
627(R)
W3

FIG. 12

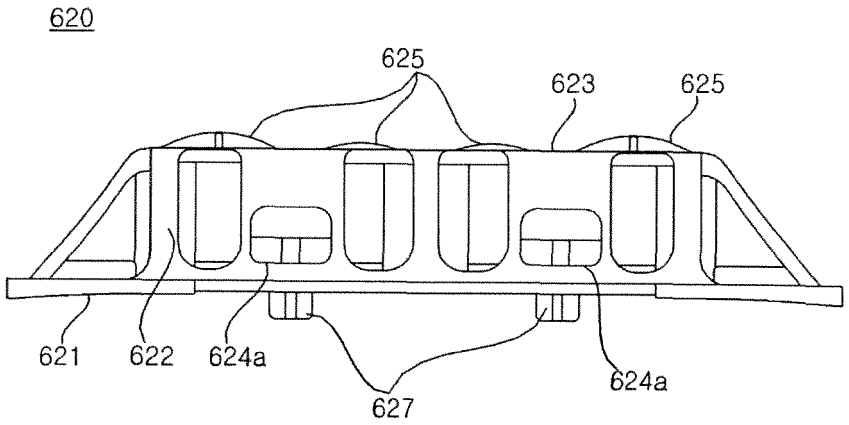

620
625
623
625
621
622
624a
627
624a

FIG. 13

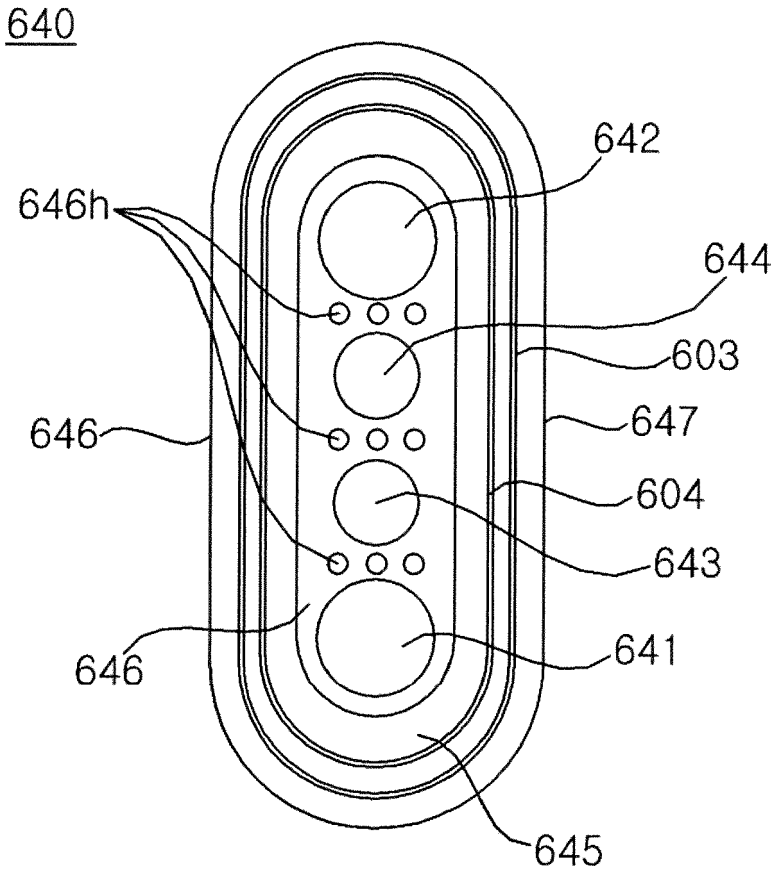

640
642
646h
644
603
646
647
604
643
646
641
645

FIG. 14

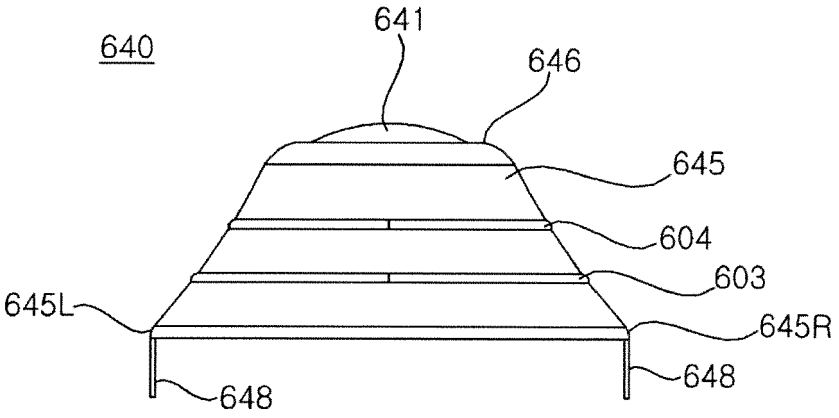

641
640
646
645
604
603
645L
645R
648
648

FIG. 15

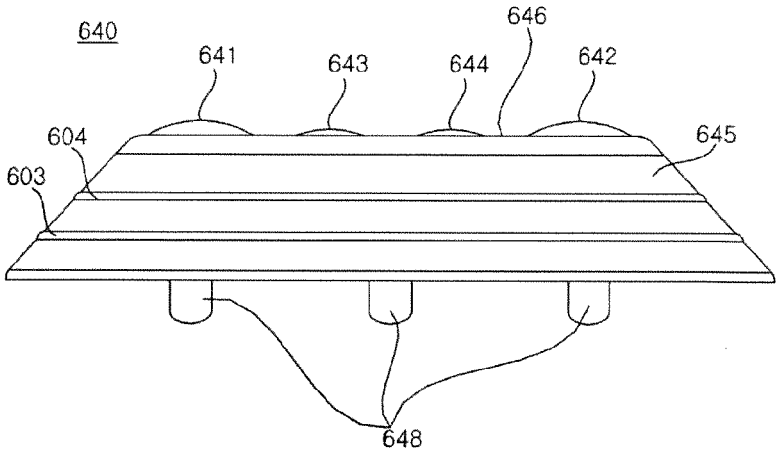

640
641
643
644
646
642
604
645
603
648

FIG. 16

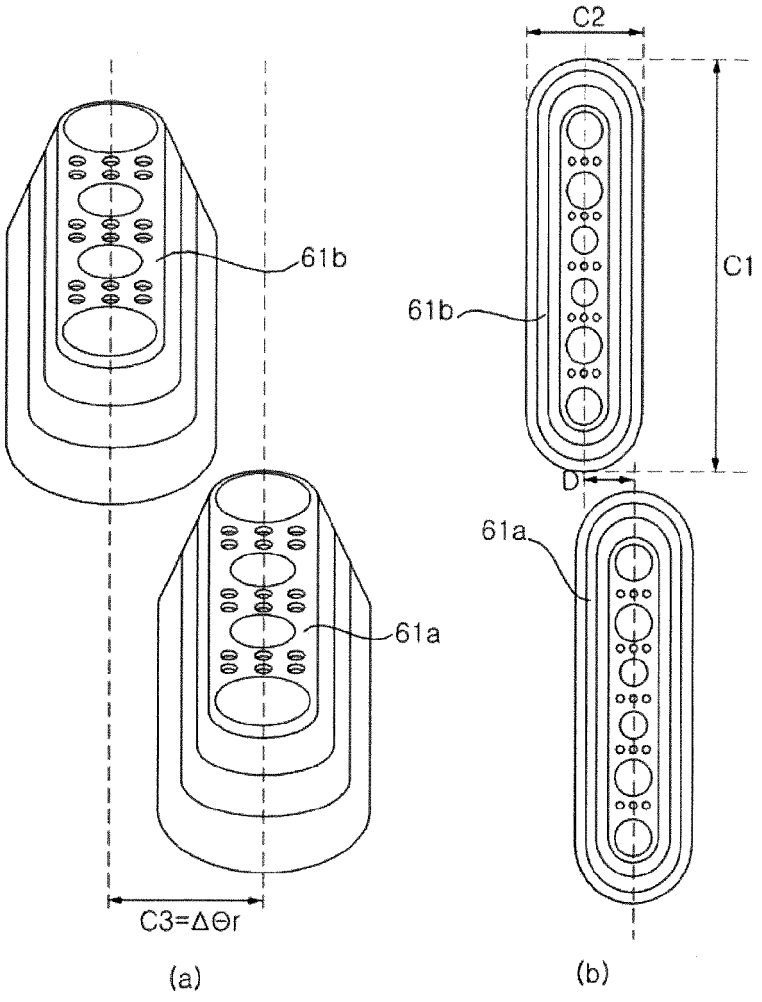

C2
C1
61b
61b
D
61a
61a
C3=ΔΘr
(a)
(b)

FIG. 17

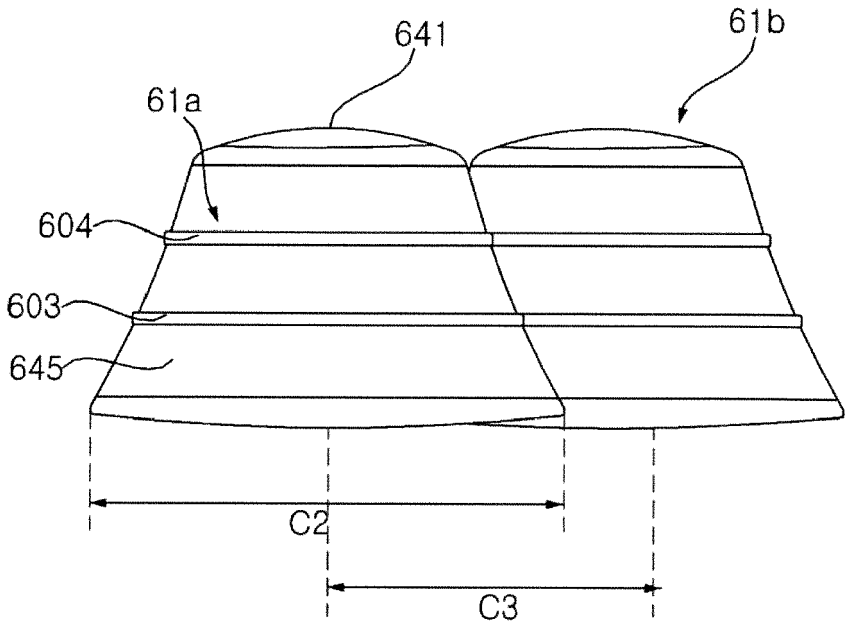

641
61b
61a
604
603
645
C2
C3

FIG. 18

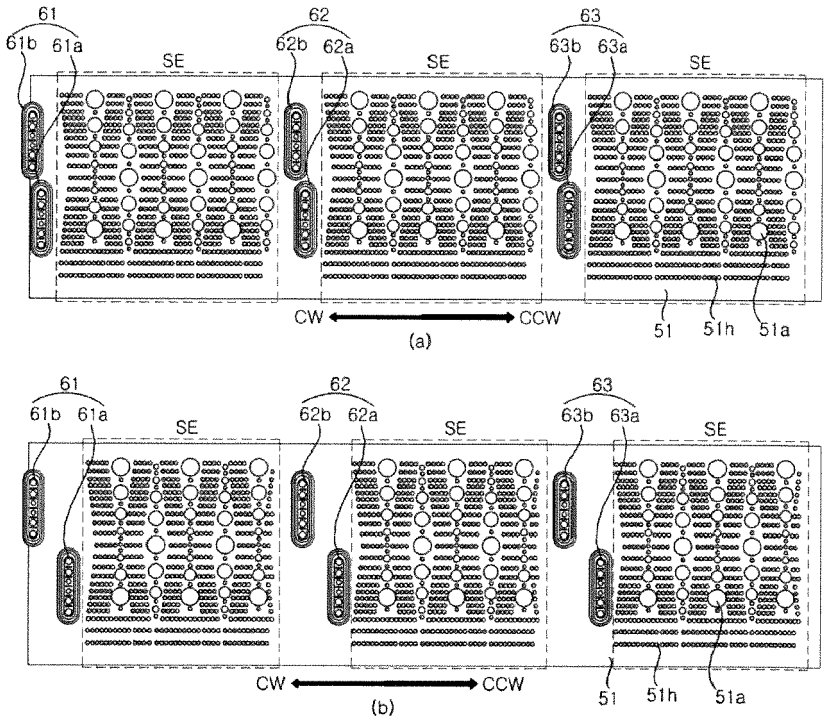

61
61b
61a
SE
62
62b
62a
SE
63
63b
63a
SE
CW
CCW
(a)
51
51h
51a
61
61b
61a
SE
62
62b
62a
SE
63
63b
63a
SE
CW
CCW
(b)
51
51h
51a

FIG. 19

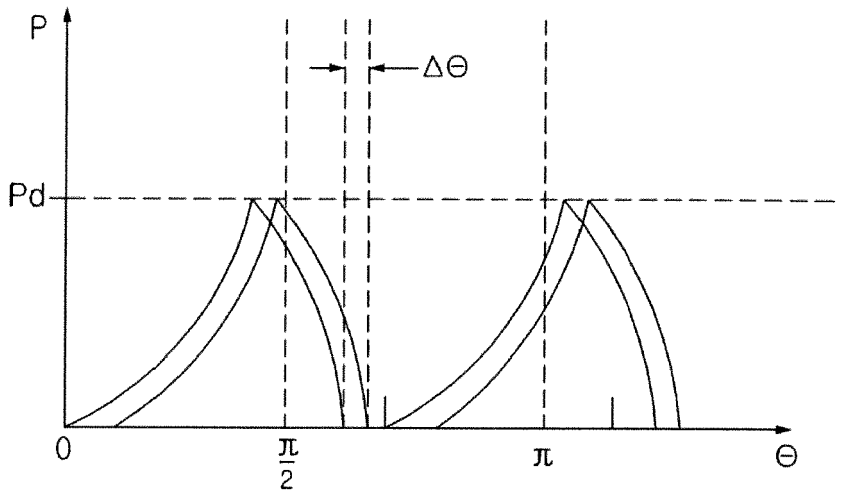

P
ΔΘ
Pd
0
π/2
π
Θ

FIG. 20

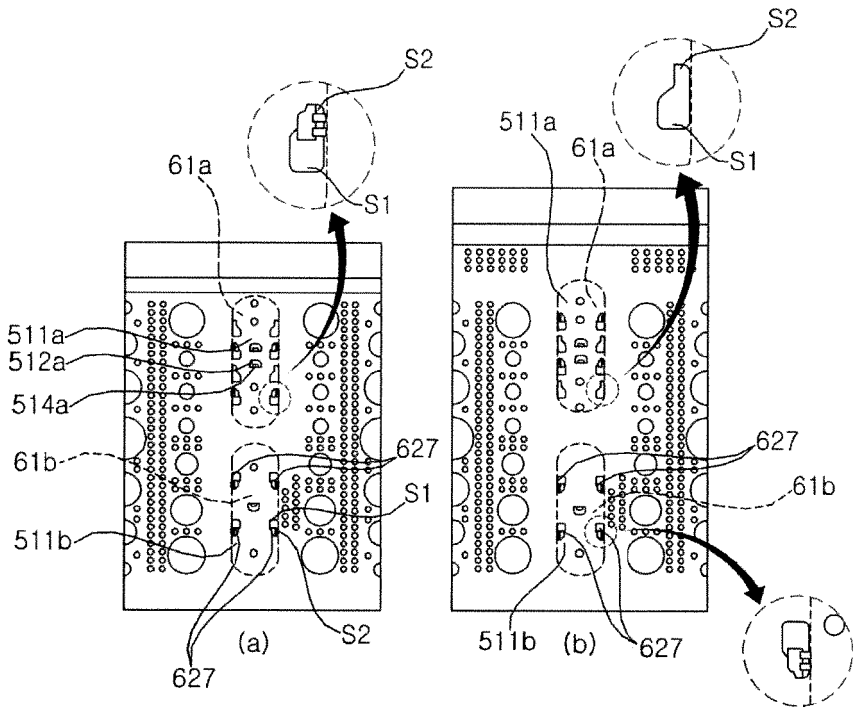
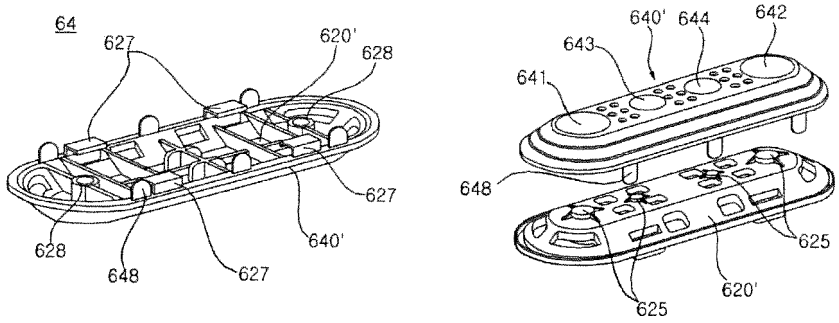

S2
61a
S1
511a
512a
514a
61b
627
S1
511b
S2
627
(a)
S2
511a
61a
S1
627
61b
511b
(b)
627

FIG. 21


64
627
620'
628
627
640'
628
648
627
640'
644
642
643
641
648
625
620'
625

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EUROPEAN SEARCH REPORT

Application Number
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A	* paragraph [0066] - paragraph [0078]; figures 1-7 *	1-11	
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A	* claim 1; figure 2 *	1-11	
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A	EP 2 799 611 A1 (LG ELECTRONICS INC [KR]) 5 November 2014 (2014-11-05) * figure 1 *	11	TECHNICAL FIELDS SEARCHED (IPC) D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 April 2020	Diaz y Diaz-Caneja

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		IT 1246496 B	19-11-1994
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