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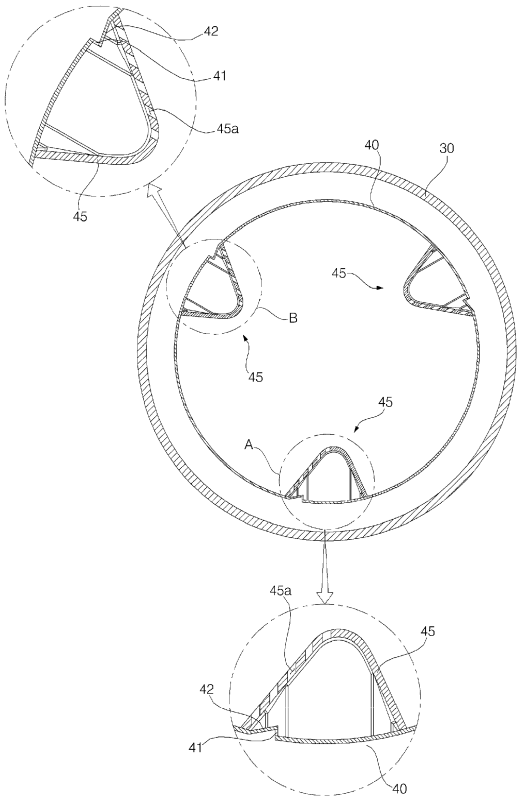
(54) LAUNDRY TREATING APPARATUS

(57) Disclosed herein is a laundry treating apparatus capable of sufficiently wetting laundry in a drum (40) by spraying wash water in a tub (30) on the laundry, without a motor. The laundry treating apparatus includes a tub (30) configured to accommodate wash water, a drum (40) rotatably disposed in the tub (30), and configured to accommodate laundry, and a lifter (45) disposed in the drum (40), to tumble the laundry using rotary power of the drum (40), wherein the drum (40) has a drum hole (41) communicating with an inner space of the lifter (45), and the lifter (45) has a lifter hole (45a) through which the wash water, introduced into the inner space from the tub (30) through the drum hole (41), is sprayed on the laundry at a predetermined position to which the drum (40) rotates.

FIG. 2



EP 3 138 946 A1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority benefit of Korean Patent Application No. 10-2015-0125747, filed on September 4, 2015 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the invention

[0002] The present invention relates to a laundry treating apparatus, and more particularly to a laundry treating apparatus which performs washing by tumbling laundry.

2. Description of the Related Art

[0003] In general, washing machines are classified into a top-loading washing machine, which performs washing using the rotational stream of wash water, and a drum washing machine which performs washing by tumbling laundry.

[0004] That is, the top-loading washing machine has a structure in which an inner vessel, serving as a washing vessel, is disposed so as to rotate about a direction perpendicular to the ground, and a pulsator provided on the bottom of the inner vessel rotates to generate a water stream, so as to perform washing through the friction between laundry and the water stream and by applying impacts to laundry by the pulsator. On the other hand, the drum washing machine has a structure in which an inner vessel, serving as a washing vessel, is disposed so as to rotate about a direction parallel to the ground, so as to perform washing through the friction between laundry and the inner wall surface of the inner vessel and by dropping laundry while the inner vessel rotates.

[0005] The drum washing machine is equipped with a lifter for tumbling (lifting and dropping) laundry when the inner vessel, which is a drum, rotates. The lifter consists of a plurality of lifters installed inside the drum so as to be spaced apart from each other in a circumferential direction which is the direction of rotation of the drum, and the lifters rotate along with the drum.

[0006] Each of the lifters protrudes inward from the drum to a predetermined height, at which the lifter does not lift laundry when the drum rotates at a low speed but lifts laundry when the drum rotates at a high speed. That is, the lifter tumbles the laundry accommodated in the drum using the rotary power of the drum only when the drum rotates at a predetermined speed.

[0007] Meanwhile, the drum is rotatably disposed in a tub, serving as a reservoir. Wash water collects in the bottom of the tub up to the level at which the water may flow into the bottom of the drum, in order to wet the laundry accommodated in the drum.

[0008] However, when a large amount of laundry is in the drum, only a portion of the laundry, namely that portion which is near the bottom of the drum, is wet. Accordingly, in order to sufficiently wet all of the laundry accommodated in the drum, the drum washing machine must be equipped with a motor for lifting the wash water, which collects in the tub, in the upward direction of the drum to spray the water on laundry.

SUMMARY OF THE INVENTION

[0009] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a laundry treating apparatus capable of sufficiently wetting laundry in a drum by spraying wash water in a tub on the laundry.

[0010] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention.

[0011] In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a laundry treating apparatus including a tub configured to accommodate wash water, a drum rotatably disposed in the tub, and configured to accommodate laundry, and a lifter disposed in the drum, to tumble the laundry using rotary power of the drum, wherein the drum has a drum hole communicating with an inner space of the lifter, and the lifter has a lifter hole through which the wash water, introduced into the inner space from the tub through the drum hole, is sprayed on the laundry at a predetermined position to which the drum rotates.

The drum may further comprise a scoop formed at one side of the drum hole so as to guide the wash water in the tub to the drum hole.

The scoop may have a shape that is concave at an outside of the drum and is convex at an inside thereof.

The scoop may guide the wash water to the drum hole when the drum rotates in one direction.

The lifter may comprise a round surface protruding maximally inward from the drum, a first inclined surface disposed at one side of the round surface in one direction of rotation of the drum, and a second inclined surface disposed at the other side of the round surface in the other direction of rotation of the drum; and the lifter hole may be formed in the round surface and the first inclined surface.

The lifter hole may consist of a plurality of lifter holes spaced apart from each other at regular intervals throughout the first inclined surface, and consists of a plurality of lifter holes formed in a portion of the round surface so as to corresponding to the lifter holes formed in the first inclined surface.

Further, the lifter hole may consist of a plurality of lifter holes formed so as to be spaced apart from each other at regular intervals throughout the round surface and the

first inclined surface.

The lifter may comprise a round surface protruding maximally inward from the drum, a first inclined surface disposed at one side of the round surface in one direction of rotation of the drum, and a second inclined surface disposed at the other side of the round surface in the other direction of rotation of the drum; and the lifter hole may be formed only in the first inclined surface.

The lifter hole may consist of a plurality of lifter holes formed so as to be spaced apart from each other at regular intervals throughout the first inclined surface.

The first inclined surface may have an axially asymmetrical shape.

The lifter may comprise a round surface protruding maximally inward from the drum, a first inclined surface disposed at one side of the round surface in one direction of rotation of the drum, and a second inclined surface disposed at the other side of the round surface in the other direction of rotation of the drum; and the lifter hole may be formed only in the round surface.

Also, the lifter may comprise a round surface protruding maximally inward from the drum, a first inclined surface disposed at one side of the round surface in one direction of rotation of the drum, and a second inclined surface disposed at the other side of the round surface in the other direction of rotation of the drum; and the first inclined surface may be formed such that an inner angle between the first inclined surface and an inner surface of the drum is a first angle, and the second inclined surface may be formed such that an inner angle between the second inclined surface and the inner surface of the drum is a second angle larger than the first angle.

The drum may further comprise a first sliding hole communication with the inner space of the lifter; a second sliding hole extending from the first sliding hole and spaced apart from the drum hole in one direction, the second sliding hole having a width perpendicular to an axial direction thereof, the width being smaller than that of the first sliding hole; and a fastening hole spaced apart from the drum hole in a direction opposite to the one direction, and wherein the lifter may further comprise a sliding protrusion coupled by sliding to the second sliding hole from the first sliding hole; and a fastening portion into which a fastening member is inserted and fastened through the fastening hole.

Thee drum may further comprise a first sliding hole communication with the inner space of the lifter; a second sliding hole extending from the first sliding hole and spaced apart from the drum hole in one direction, the second sliding hole having a width perpendicular to an axial direction thereof, the width being smaller than that of the first sliding hole; a third sliding hole; and a fourth sliding hole extending from the third sliding hole and spaced apart from the drum hole in a direction opposite to the one direction, the fourth sliding hole having a width perpendicular to an axial direction thereof, the width being smaller than that of the third sliding hole, and wherein the lifter may further comprise a first sliding protrusion coupled by sliding to the second sliding hole from the first sliding hole; a second sliding protrusion coupled by sliding to the fourth sliding hole from the third sliding hole; and a shield wall for shielding the third sliding hole when the second sliding protrusion is located in the fourth sliding hole.

The drum may further comprise a fastening hole; and the lifter may further comprise a fastening portion into which a fastening member is inserted and fastened through the fastening hole.

[0012] The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating a laundry treating apparatus according to a first embodiment of the present invention;

FIG. 2 is a cross-sectional view of a drum, lifters, and a tub illustrated in FIG. 1;

FIG. 3 is a view of the outside of the drum and the lifters illustrated in FIG. 1;

FIG. 4 is a front perspective view of one of the lifters illustrated in FIG. 1;

FIG. 5 is a cross-sectional view of the lifter illustrated in FIG. 4;

FIG. 6 is a back perspective view of one of the lifters illustrated in FIG. 1;

FIG. 7 is a view illustrating a lifter of a laundry treating apparatus according to a second embodiment of the present invention;

FIG. 8 is a view illustrating a lifter of a laundry treating apparatus according to a third embodiment of the present invention;

FIG. 9 is a front perspective view illustrating a lifter of a laundry treating apparatus according to a fourth embodiment of the present invention;

FIG. 10 is a back perspective view illustrating the lifter of the laundry treating apparatus according to the fourth embodiment of the present invention; and

FIG. 11 is a back view illustrating the lifter of the laundry treating apparatus according to the fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings. The present invention may, however, be embodied in different forms and should not be con-

strued as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present invention to those skilled in the art. Throughout the disclosure, like reference numerals refer to like parts throughout the various figures and embodiments of the present invention.

[0015] Hereinafter, a laundry treating apparatus according to exemplary embodiments of the present invention will be described in more detail with reference to the accompanying drawings.

[0016] The laundry treating apparatus according to exemplary embodiments of the present invention includes all apparatuses for treating laundry. Specifically, the laundry treating apparatus includes washing machines that remove contaminants from laundry using wash water, and washing machines that perform both washing and drying.

[0017] FIG. 1 is a perspective view illustrating a laundry treating apparatus according to a first embodiment of the present invention.

[0018] Referring to FIG. 1, the laundry treating apparatus according to the first embodiment of the present invention may include a cabinet 2 and a control panel 4 installed on the cabinet 2.

[0019] The cabinet 2 may be a case that defines the external appearance of the laundry treating apparatus. The cabinet 2 may have a laundry entry port 3 for the insertion and removal of laundry into and from the cabinet 2. A tub 30 (see FIG. 2) for accommodating wash water may be installed in the cabinet 2.

[0020] A drum 40 for accommodating laundry may be rotatably installed in the tub. A motor (not shown) for rotating the drum 40 may be installed in the cabinet 2.

[0021] The cabinet 2 may be configured by bending a single member many times, or may be configured by coupling a large number of members to each other. The cabinet 2 may include a base fan (not shown), a cabinet body 8, which is installed at the base fan and has a space for accommodating the tub, a cabinet cover 10, which is disposed in front of the cabinet body 8 and has the laundry entry port 3 formed thereon, and a top cover 12 disposed at the upper portion of the cabinet body 8.

[0022] The cabinet body 8 may be configured of a single member or a plurality of members. The cabinet body 8 may include a left cover disposed at the left upper portion of the base fan, a right cover disposed at the right upper portion of the base fan, and a rear cover disposed at the rear upper portion of the base fan. Of course, the cabinet 2 may be configured as a combination of a plurality of members, and may be changed in various forms.

[0023] The cabinet 2 may be equipped with a door 14 for opening and closing the laundry entry port 3. The door 14 may be rotatably or slidably connected to the cabinet 2 so as to open and close the laundry entry port 3. The door 14 may be connected to the cabinet 2 by a hinge mechanism in order to open and close the laundry entry port 3 while rotating about the hinge mechanism.

[0024] The control panel 4 may include an operation unit for operating the laundry treating apparatus. The control panel 4 may include a display unit for displaying information about the laundry treating apparatus. The control panel 4 may include the operation unit and the display unit together. The control panel 4 may be installed on the cabinet 2. The control panel 4 may be disposed on the upper portion of the cabinet cover 10. The control panel 4 may be located on the front upper portion of the cabinet 2, and may define a portion of the external appearance of the laundry treating apparatus.

[0025] The control panel 4 may include a control panel body 20. The control panel body 20 may define the external appearance of the control panel 4. The control panel body 20 may be located above the cabinet cover 10, and may be provided with the operation unit which is operated by a user, and the display unit which displays various types of information about the laundry treating apparatus to the outside.

[0026] The control panel 4 may include a rotary knob 50 which is gripped and operated by the user's hand. The rotary knob 50 may be installed to select various courses of the laundry treating apparatus, and the user may grip and turn the rotary knob 50 in order to select various courses of the laundry treating apparatus. The control panel body 20 may have an opening 22 which is larger than the rotary knob 50. The rotary knob 50 may be disposed such that the front portion thereof is located in front of the opening 22.

[0027] The control panel 4 may include a knob decoration 56 located around the rotary knob 50. The knob decoration 56 may be located between the outer circumference of the rotary knob 50 and the opening 22. The knob decoration 56 may realize a high-quality external appearance around the rotary knob 50, and may have the same color as the outer surface of the control panel body 20.

[0028] The control panel 4 may further include a window 82 which is disposed to surround the outer circumference of the rotary knob 50. The laundry treating apparatus may further include a light source which irradiates the window 82 with light. Light incident on the window 82 may penetrate the window 82, and the user may recognize various types of information about the laundry treating apparatus by checking the shape or location of light radiated to the window 82. A portion of the window 82 may be exposed outward between the knob decoration 56 and the opening 22, and light may be radiated through the exposed portion of the window 82.

[0029] A lifter 45 may be installed in the drum 40. The lifter 45 may consist of a plurality of lifters which are installed so as to be spaced apart from each other at regular intervals along the inner peripheral surface of the drum 40. The lifters 45 may rotate along with the drum 40 when the drum 40 rotates. The lifters 45 may tumble the laundry accommodated in the drum 40 using the rotary power of the drum 40, thereby enabling the laundry to be washed. The lifters 45 may not lift the laundry accommodated in

the drum 40 when the drum 40 rotates at a low speed, but may lift and drop the laundry accommodated in the drum 40 when the drum 40 rotates at a high speed.

[0030] FIG. 2 is a cross-sectional view of the drum, the lifters, and the tub illustrated in FIG. 1. FIG. 3 is a view of the outside of the drum and the lifters illustrated in FIG. 1.

[0031] Referring to FIGS. 2 and 3, the drum 40 may have a drum hole 41, through which the wash water accommodated in the tub 30 is guided to the inner space in each of the lifters 45. The drum hole 41 may consist of three drum holes which are spaced apart from each other at regular intervals in the direction of axial rotation of the drum 40 (hereinafter, referred to as an "axial direction"). The drum holes 41 preferably communicate with the inner spaces of the lifters 45 such that the wash water accommodated in the tub 30 may flow into the inner spaces of the lifters 45 through the drum holes 41. The number of drum holes 41 is not limited to three, but one or more drum holes may be formed at positions corresponding to the inner spaces of the lifters 45.

[0032] The drum 40 may further have a scoop 42 which is formed at one side of each of the drum holes 41. The scoop 42 may have a shape that is concave at the outside of the drum 40 and is convex at the inside thereof. The scoop 42 is preferably formed at one side of the drum hole 41 such that the wash water in the tub 30 may be guided to the drum hole 41 only when the drum 40 rotates in one direction. Here, the one direction in which the drum 40 rotates is a clockwise direction. When the drum 40 rotates clockwise, the scoop 42 is preferably disposed in front of the drum hole 41 in the clockwise direction. That is, only when the drum 40 rotates clockwise, the scoop 42 guides the wash water in the tub 30 to the drum hole 41 so that the wash water may flow into the inner space in each of the lifters 45 through the associated drum hole 41.

[0033] The lifter 45 has a lifter hole 45a through which the wash water introduced into the inner space from the tub 30 through the drum hole 41 is sprayed on laundry at a predetermined position to which the drum 40 rotates. That is, the wash water, which is introduced into the inner space of the lifter 45 through the drum hole 41 at position A, illustrated in FIG. 2, is sprayed on laundry through the lifter hole 45a at position B, illustrated in FIG. 2. In order to spray the wash water, which is introduced into the inner space of the lifter 45, on laundry, the lifter hole 45a is formed in a direction perpendicular to the tangent line of the drum 40. Position A, illustrated in FIG. 2, is the position at which the lifter 45 passes the bottom of the tub 30 and at which wash water collects in the tub 30.

[0034] The lifter 45 may consist of three lifters which are circumferentially arranged at a distance of 120° on the inner peripheral surface of the drum 40. That is, the distance between position A and position B, illustrated in FIG. 2, is a distance of 120°. In the embodiment, the wash water introduced into the inner space of the lifter 45 through the drum hole 41 at position A may be sprayed on laundry through the lifter hole 45a at position B to which the drum 40 rotates at an angle of 120°. Of course, the number of lifters 45 is not limited to three.

[0035] FIG. 4 is a front perspective view of one of the lifters illustrated in FIG. 1. FIG. 5 is a cross-sectional view of the lifter illustrated in FIG. 4.

[0036] Referring to FIGS. 4 and 5, the lifter 45 is axially elongated. The lifter 45 includes a round surface 46 which protrudes maximally inward from the drum 40, a first inclined surface 47 which is disposed at one side of the round surface 46 in one direction of rotation (in the clockwise direction) of the drum 40, a second inclined surface 48 which is disposed at the other side of the round surface 46 in the other direction of rotation of the drum 40, a front surface 49 which extends from the front ends of the round surface 46, the first inclined surface 47, and the second inclined surface 48, and a rear surface (not shown) which extends from the rear ends of the round surface 46, the first inclined surface 47, and the second inclined surface 48.

[0037] The round surface 46 is a curved surface that is convex toward the center of the drum 40. Each of the first and second inclined surfaces 47 and 48 is inclined at a predetermined angle relative to the inner surface of the drum 40, and generally has a flat shape. The inner angle (a) between the first inclined surface 47 and the inner surface of the drum 40 is defined as a first angle, and the inner angle (b) between the second inclined surface 48 and the inner surface of the drum 40 is defined as a second angle. In the embodiment, the first angle is an angle of 48°.

[0038] One end of each of the first and second inclined surfaces 47 and 48 extends from the round surface 46, and the other end thereof may be coupled to the drum 40.

[0039] The lifter hole 45a is formed in the round surface 46 and the first inclined surface 47, but is not formed in the second inclined surface 48. The lifter hole 45a may consist of a plurality of lifter holes which are spaced apart from each other at regular intervals throughout the first inclined surface 47, and may consist of a plurality of lifter holes which are formed in a portion of the round surface 46 so as to corresponding to the lifter holes 45a formed in the first inclined surface 47. The lifter holes 45a formed in the round surface 46 are arranged in one row, and the lifter holes 45a formed in the first inclined surface 47 are arranged in a plurality of rows.

[0040] In the embodiment, the lifter has a hole ratio of 0.8. The hole ratio is a value obtained by dividing a sum of lengths occupied by lifter holes 45a by a remaining length, in a rectilinear length (L) to the tip end of the first inclined surface 47 from the center of a lifter hole 45a closest to the center of the drum 40.

[0041] FIG. 6 is a back perspective view of one of the lifters illustrated in FIG. 1.

[0042] Referring to FIGS. 2 and 6, fastening structures for mounting the lifter 45 to the drum 40 are formed on the back surface of the lifter 45 and the drum 40. The fastening structures includes first and second sliding

holes 43a and 43b and a fastening hole 44 which are formed in the drum 40, and a sliding protrusion 45b and a fastening portion 45c which are formed on each lifter 45.

[0043] The first and second sliding holes 43a and 43b are formed so as to be spaced apart from each of the drum holes 41 in one direction, and the fastening hole 44 is formed so as to be spaced apart from the drum hole 41 in a direction opposite to the direction.

[0044] The first sliding hole 43a is axially elongated, and has a width perpendicular to the axial direction thereof, the width being greater than that of the second sliding hole 43b. The second sliding hole 43b extends from the first sliding hole 43a so as to be axially elongated, and has a width perpendicular to the axial direction thereof, the width being smaller than that of the first sliding hole 43a.

[0045] The sliding protrusion 45b is axially elongated. The sliding protrusion 45b is formed on one side in the lifter 45, and in more detail, is formed on the first inclined surface 47. The fastening portion 45c is formed on the other side in the lifter 45, and in more detail, is formed on the second inclined surface 48.

[0046] After the sliding protrusion 45b is inserted into the first sliding hole 43a formed in the drum 40, the lifter 45 is coupled to the drum 40 by the sliding of the sliding protrusion 45b from the first sliding hole 43a to the second sliding hole 43b. When the sliding protrusion 45b is located in the second sliding hole 43b and the lifter 45 is coupled to the drum 40, the first sliding hole 43a communicates with the inner space of the lifter 45. Accordingly, when the drum 40 rotates in one direction, the wash water in the tub 30 may flow into the inner space of the lifter 45 through the drum hole 41, and may also flow into the inner space of the lifter 45 through the first sliding hole 43a.

[0047] The sliding protrusion 45b preferably has a length and a width corresponding to those of the second sliding hole 43b such that it may be pressed against the second sliding hole 43b and the lifter 45 may be coupled to the drum 40.

[0048] The lifter 45 is coupled to the drum 40 by inserting a screw, serving as a fastening member, into the fastening portion 45c. That is, the screw is inserted and coupled into the fastening portion 45c through the fastening hole 44 in the outside of the drum 40, thereby allowing the other side of the lifter 45 to be coupled to the drum 40.

[0049] As described above, only one side of the lifter 45, which is in one direction of rotation of the drum 40, slides and is coupled to the drum 40 through the sliding protrusion 45b, and the other side thereof is coupled to the drum 40 through the fastening portion 45c. Thus, when the drum 40 rotates in one direction, the wash water in the tub 30 flows into the inner space of the lifter 45 through the drum hole 41 and the first sliding hole 43a, and the wash water introduced into the inner space is not discharged through the other side of the lifter 45. Therefore, the wash water introduced into the lifter 45 may be sprayed on laundry through the lifter hole 45a at a predetermined position to which the drum 40 rotates.

[0050] After one side of the lifter 45 is first coupled to the drum 40 by coupling the sliding protrusion 45b to the second sliding hole 43b, the other side of the lifter 45 is coupled to the drum 40 by inserting the screw into the fastening hole 44 and the fastening portion 45c. Consequently, the process in which the lifter 45 is mounted to the drum 40 may be completed.

[0051] The lifter 45 has an open surface which comes into contact with the inner surface of the drum 40. The lifter 45 has a plurality of partition walls 45d for partitioning the inner space into a plurality of regions. Each of the partition walls 45d may be formed so as to extend from the round surface 46 and the first and second inclined surfaces 47 and 48. The partition wall 45d has a recessed portion 45e formed by depressing a portion of the partition wall 45d toward the inner surface of the drum 40. The recessed portion 45e is disposed at a position corresponding to the drum hole 41 and the scoop 42 formed in the drum 40. The wash water introduced into the inner space of the lifter 45 through the drum hole 41 may axially flow through the recessed portion 45e in the lifter 45. A portion of the partition wall 45d, which extends from the second inclined surface 48, may extend from the fastening portion 45c.

[0052] FIG. 7 is a view illustrating a lifter of a laundry treating apparatus according to a second embodiment of the present invention. In the second embodiment, like reference numerals refer to the same components as those of the first embodiment, and a detailed description thereof will be omitted. Moreover, only differences from the first embodiment will be described.

[0053] Referring to FIG. 7, it can be seen that the lifter, which is designated by reference numeral 145, of the laundry treating apparatus according to the second embodiment of the present invention differs from the lifter 45 of the first embodiment. That is, in the first embodiment, the lifter holes 45a are formed so as to be spaced apart from each other at regular intervals throughout the first inclined surface 47, and the lifter holes 45a are formed in a portion of the round surface 46 so as to correspond to the lifter holes 45a formed in the first inclined surface 47. However, the second embodiment is identical to the first embodiment in that a plurality of lifter holes 45a is formed so as to be spaced apart from each other at regular intervals throughout a first inclined surface 47, but the second embodiment differs from the first embodiment in that a plurality of lifter holes 45a is formed so as to be spaced apart from each other at regular intervals throughout a round surface 46. In the second embodiment, the lifter holes 45a formed in the round surface 46 are arranged in three rows.

[0054] FIG. 8 is a view illustrating a lifter of a laundry treating apparatus according to a third embodiment of the present invention. In the third embodiment, like reference numerals refer to the same components as those of the first embodiment, and a detailed description thereof will be omitted. Moreover, only differences from the first

embodiment will be described.

[0055] Referring to FIG. 8, it can be seen that the lifter, which is designated by reference numeral 245, of the laundry treating apparatus according to the third embodiment of the present invention differs from the lifter 45 of the first embodiment. That is, in the first embodiment, the lifter holes 45a are formed so as to be spaced apart from each other at regular intervals throughout the first inclined surface 47, and the lifter holes 45a are formed in a portion of the round surface 46 so as to correspond to the lifter holes 45a formed in the first inclined surface 47. However, the third embodiment is identical to the first embodiment in that a plurality of lifter holes 45a is formed so as to be spaced apart from each other at regular intervals throughout a first inclined surface 47, but the third embodiment differs from the first embodiment in that no lifter holes are formed in a round surface 46.

[0056] In addition, in the lifter 245 of the third embodiment, the first inclined surface 47 formed with the lifter holes 45a has an axially asymmetrical shape. Accordingly, when the drum 40 rotates in one direction, the lifter 245 may move to a predetermined position in the state in which wash water collects in the inner space of the lifter 245.

[0057] FIG. 9 is a front perspective view illustrating a lifter of a laundry treating apparatus according to a fourth embodiment of the present invention. FIG. 10 is a back perspective view illustrating the lifter of the laundry treating apparatus according to the fourth embodiment of the present invention. FIG. 11 is a back view illustrating the lifter of the laundry treating apparatus according to the fourth embodiment of the present invention. In the fourth embodiment, like reference numerals refer to the same components as those of the first embodiment, and a detailed description thereof will be omitted. Moreover, only differences from the first embodiment will be described.

[0058] Referring to FIGS. 9 to 11, it can be seen that the lifter, which is designated by reference numeral 345, of the laundry treating apparatus according to the fourth embodiment of the present invention differs from the lifter 45 of the first embodiment. That is, in the lifter 45 of the first embodiment, the lifter holes 45a are formed in the round surface 46 and the first inclined surface 47. However, in the lifter 345 of the fourth embodiment, a plurality of lifter holes 45a is formed only in a round surface 46. The lifter holes 45a formed in the lifter 345 of the fourth embodiment are arranged in one row in the round surface 46.

[0059] In addition, in the drum 40 of the first embodiment, the first and second sliding holes 43a and 43b are formed so as to be spaced apart from the drum hole 41 in one direction, and the fastening hole 44 is formed so as to be spaced apart from the drum hole 41 in a direction opposite to the direction. However, the fourth embodiment is identical to the first embodiment in that first and second sliding holes 43a and 43b are formed so as to be spaced apart from the drum hole 41 in one direction in the drum 40, but the fourth embodiment differs from the first embodiment in that third and fourth sliding holes 44a and 44b are formed so as to be spaced apart from the drum hole 41 in a direction opposite to the direction. Here, the third sliding hole 44a has the same structure and function as the first sliding hole 43a, and the fourth sliding hole 44b has the same structure and function as the second sliding hole 43b.

[0060] In the lifter 45 of the first embodiment, the sliding protrusion 45b is formed only on the first inclined surface 47, and the fastening portion 45c is formed on the second inclined surface 48. However, in the fourth embodiment, sliding protrusions 45b and 45f are formed on both first and second inclined surfaces 47 and 48. That is, the sliding protrusions 45b and 45f include a first sliding protrusion 45b which is coupled by sliding to the second sliding hole 43b from the first sliding hole 43a, and a second sliding protrusion 45f which is coupled by sliding to the fourth sliding hole 44b from the third sliding hole 44a.

[0061] When the first sliding protrusion 45b is located in the second sliding hole 43b, the first sliding hole 43a is opened. Thus, when the drum 40 rotates in one direction, the wash water in the tub 30 may be introduced into the inner space of the lifter 345 through the drum hole 41 and the first sliding hole 43a.

[0062] Meanwhile, the second sliding protrusion 45f further has a shield wall 45g formed at one side thereof. The shield wall 45g shields the third sliding hole 44a when the second sliding protrusion 45f is located in the fourth sliding hole 44b. Therefore, when the drum 40 rotates in one direction, it is possible to prevent the wash water accommodated in the inner space of the lifter 345 from flowing out through the third sliding hole 44a.

[0063] In addition, the drum 40 of the fourth embodiment may further have fastening holes 44 which are formed as components corresponding to the fastening hole 44 of the first embodiment. One of the fastening holes 44 may be formed in a portion corresponding to the front portion of the lifter 345, and the remaining one may be formed in a portion corresponding to the rear portion of the lifter 345.

[0064] The lifter 345 may have a fastening portion 45c which is formed as a component corresponding to the fastening portion 45c of the first embodiment. Similar to the first embodiment, the lifter 345 may be coupled to the drum 40 by inserting a screw, serving as a fastening member, into the fastening portion 45c. That is, the screw is inserted and coupled into the fastening portion 45c through the fastening hole 44 in the outside of the drum 40, thereby allowing the lifter 345 to be securely coupled to the drum 40.

[0065] As described above, in the laundry treating apparatus according to the embodiments of the present invention, the wash water in the tub 30 is introduced into the inner space of the lifter 45, 145, 245, or 345 through the drum hole 41, and is then sprayed on laundry through the lifter holes 45a at a predetermined position to which the drum 40 rotates. Therefore, the laundry treating apparatus can eliminate a motor for lifting the wash water

in the tub 30 in the upward direction of the drum 40, whereby it can reduce costs, weight, and noise and save electricity.

[0066] As is apparent from the above description, a laundry treating apparatus according to exemplary embodiments of the present invention has effects of reducing costs, weight, and noise and saving electricity since it can eliminate a motor for lifting the wash water in a tub in the upward direction of a drum.

[0067] The present invention is not limited to the foregoing effects, and other effects thereof will be clearly understood by those skilled in the art from the above description and the following claims.

[0068] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and applications may be devised by those skilled in the art that will fall within the intrinsic aspects of the embodiments. More particularly, various variations and modifications are possible in concrete constituent elements of the embodiments. In addition, it is to be understood that differences relevant to the variations and modifications fall within the spirit and scope of the present disclosure defined in the appended claims.

Claims

1. A laundry treating apparatus comprising:

a tub (30) configured to accommodate wash water;
a drum (40) rotatably disposed in the tub (30), and configured to accommodate laundry; and
a lifter (45; 145; 245; 345) disposed in the drum (40), to tumble the laundry using rotary power of the drum (40),
wherein the drum (40) has a drum hole (41) communicating with an inner space of the lifter (45; 145; 245; 345, and the lifter (45; 145; 245; 345) has a lifter hole (45a) through which the wash water, introduced into the inner space from the tub (30) through the drum hole (41), is sprayed on the laundry at a predetermined position to which the drum (40) rotates.

2. The laundry treating apparatus according to claim 1, wherein the drum (40) further comprises a scoop (42) formed at one side of the drum hole (41) so as to guide the wash water in the tub (30) to the drum hole (41).

3. The laundry treating apparatus according to claim 2, wherein the scoop (42) has a shape that is concave at an outside of the drum (40) and is convex at an inside of the drum (40).

4. The laundry treating apparatus according to claim 2 or 3, wherein the scoop (42) guides the wash water to the drum hole (41) when the drum (40) rotates in one direction.

5. The laundry treating apparatus according to any one of the claims 1 to 4, wherein:

the lifter (45; 145) comprises a round surface (46) protruding maximally inward from the drum (40), a first inclined surface (47) disposed at one side of the round surface (46) in one direction of rotation of the drum (40), and a second inclined surface (48) disposed at the other side of the round surface (46) in the other direction of rotation of the drum (40); and
the lifter hole (45a) is formed in the round surface (46) and the first inclined surface (47).

6. The laundry treating apparatus according to claim 5, wherein the lifter hole (45a) consists of a plurality of lifter holes spaced apart from each other at regular intervals throughout the first inclined surface (47), and consists of a plurality of lifter holes formed in a portion of the round surface (46) so as to corresponding to the lifter holes formed in the first inclined surface (47).

7. The laundry treating apparatus according to claim 5, wherein the lifter hole (45a) consists of a plurality of lifter holes formed so as to be spaced apart from each other at regular intervals throughout the round surface (46) and the first inclined surface (47).

8. The laundry treating apparatus according to any one of the claims 1 to 4, wherein:

the lifter (245) comprises a round surface (46) protruding maximally inward from the drum (40), a first inclined surface disposed at one side of the round surface (46) in one direction of rotation of the drum (40), and a second inclined surface (48) disposed at the other side of the round surface (46) in the other direction of rotation of the drum (40); and
the lifter hole (45a) is formed only in the first inclined surface (47).

9. The laundry treating apparatus according to claim 8, wherein the lifter hole (45a) consists of a plurality of lifter holes formed so as to be spaced apart from each other at regular intervals throughout the first inclined surface (47).

10. The laundry treating apparatus according to claim 8 or 9, wherein the first inclined surface (47) has an axially asymmetrical shape.

11. The laundry treating apparatus according to any one

of the claims 1 to 4, wherein:

the lifter (345) comprises a round surface (46) protruding maximally inward from the drum (40), a first inclined surface (47) disposed at one side of the round surface (46) in one direction of rotation of the drum (40), and a second inclined surface (48) disposed at the other side of the round surface (46) in the other direction of rotation of the drum (40); and
the lifter hole (45a) is formed only in the round surface (46).

12. The laundry treating apparatus according to any one of the claims 1 to 11, wherein:

the lifter comprises a round surface (46) protruding maximally inward from the drum (40), a first inclined surface (47) disposed at one side of the round surface (46) in one direction of rotation of the drum (40), and a second inclined surface (48) disposed at the other side of the round surface (46) in the other direction of rotation of the drum (40); and
the first inclined surface (47) is formed such that an inner angle between the first inclined surface (47) and an inner surface of the drum (40) is a first angle (a), and the second inclined surface (48) is formed such that an inner angle between the second inclined surface (48) and the inner surface of the drum (40) is a second angle (b) larger than the first angle (a).

13. The laundry treating apparatus according to any one of the claims 1 to 10, wherein the drum (40) further comprises:

a first sliding hole (43a) communicating with the inner space of the lifter (45; 145; 245);
a second sliding hole (43b) extending from the first sliding hole (43a) and spaced apart from the drum hole (41) in one direction, the second sliding hole (43b) having a width perpendicular to an axial direction thereof, the width being smaller than that of the first sliding hole (43a); and
a fastening hole (44) spaced apart from the drum hole (41) in a direction opposite to the one direction, and wherein the lifter (45; 145; 245) further comprises:

a sliding protrusion (45b) coupled by sliding to the second sliding hole (43b) from the first sliding hole (43a); and
a fastening portion (45c) into which a fastening member is inserted and fastened through the fastening hole (44).

14. The laundry treating apparatus according to any one of the claims 1 to 4, 11, 12, wherein the drum (40) further comprises:

a first sliding hole (43a) communicating with the inner space of the lifter (345);
a second sliding hole (43b) extending from the first sliding hole (43a) and spaced apart from the drum hole (41) in one direction, the second sliding hole (43b) having a width perpendicular to an axial direction thereof, the width being smaller than that of the first sliding hole (43a);
a third sliding hole (44a); and
a fourth sliding hole (44b) extending from the third sliding hole (44a) and spaced apart from the drum hole (41) in a direction opposite to the one direction, the fourth sliding hole (44b) having a width perpendicular to an axial direction thereof, the width being smaller than that of the third sliding hole (44a), and
wherein the lifter (345)further comprises:

a first sliding protrusion (45b) coupled by sliding to the second sliding hole (43b) from the first sliding hole (43a);
a second sliding protrusion (45f) coupled by sliding to the fourth sliding hole (44b) from the third sliding hole (44a); and
a shield wall (45g) for shielding the third sliding hole (44a) when the second sliding protrusion (45f) is located in the fourth sliding hole (44b).

15. The laundry treating apparatus according to claim 14, wherein:

the drum (40) further comprises a fastening hole (44); and
the lifter (345) further comprises a fastening portion (45c) into which a fastening member is inserted and fastened through the fastening hole (44).

FIG. 1

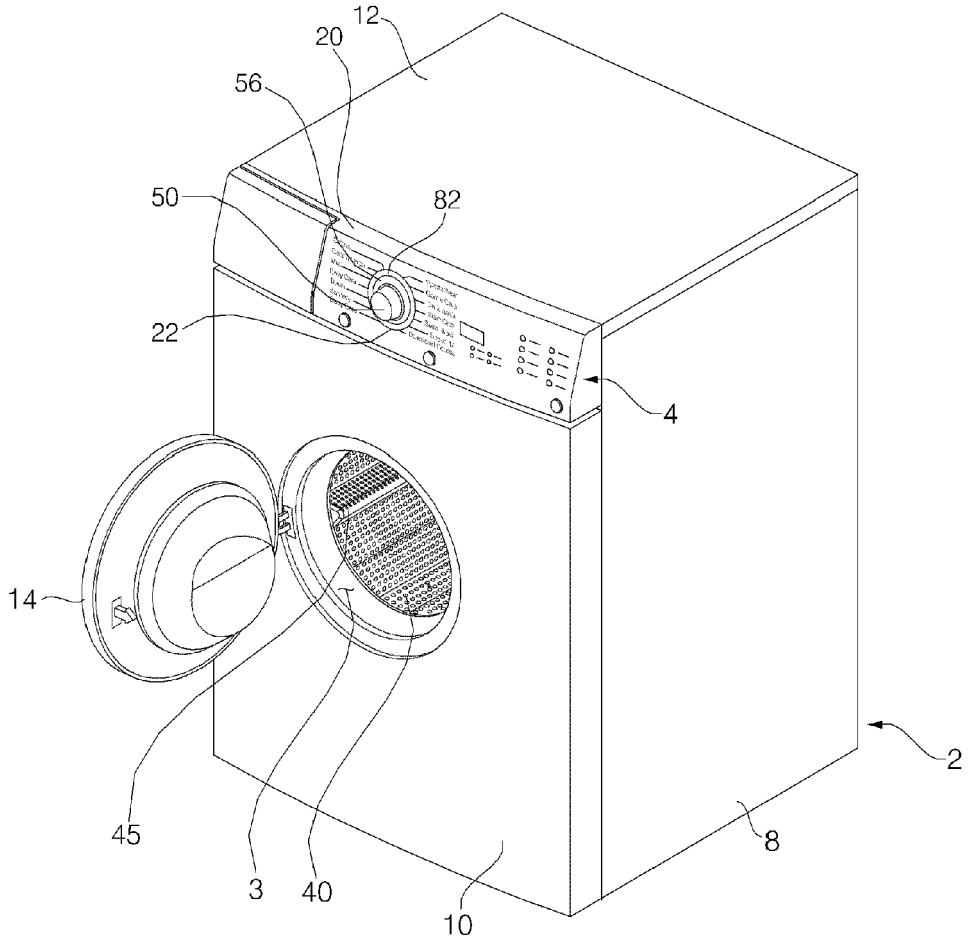


FIG. 2

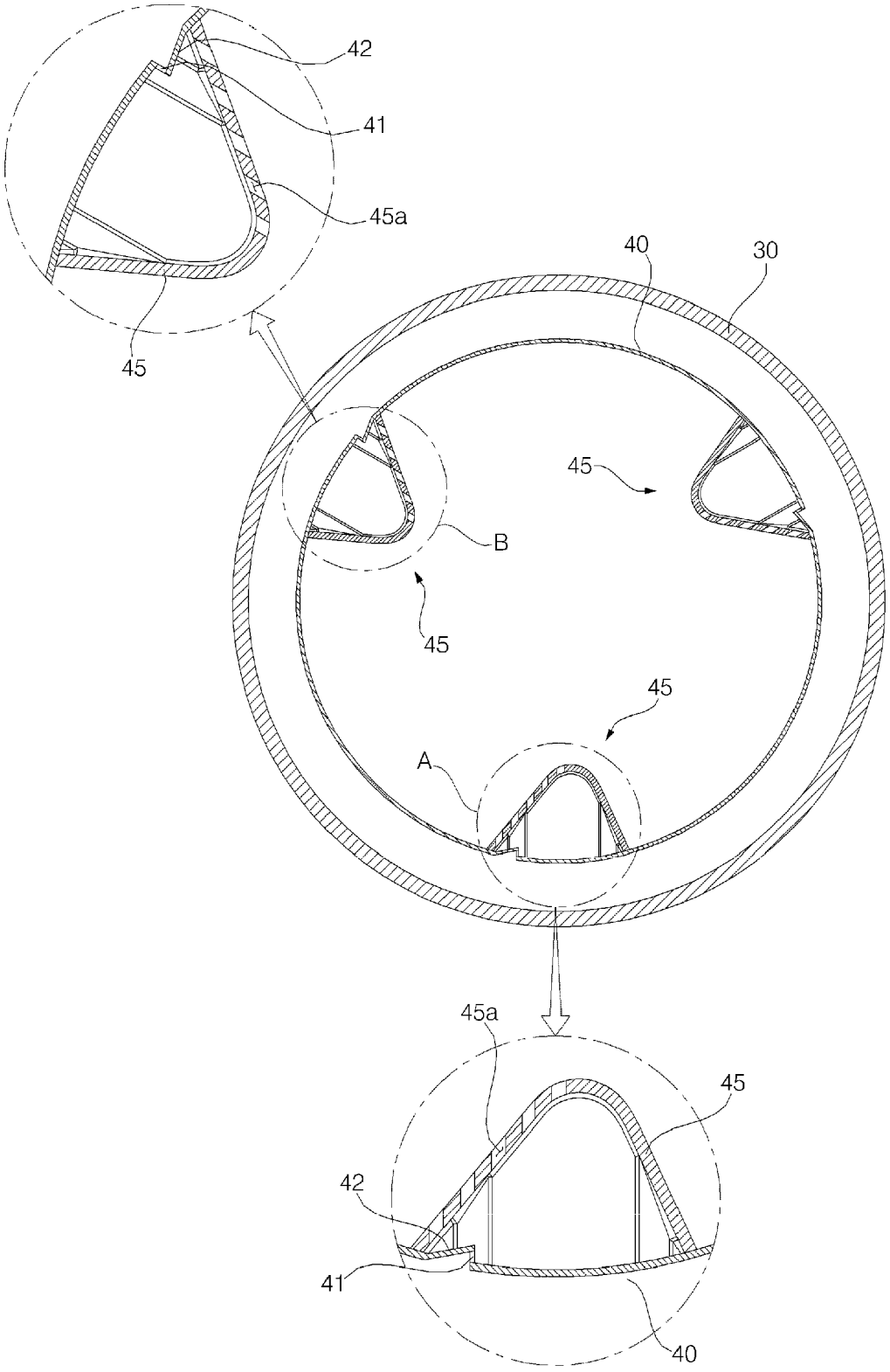


FIG. 3

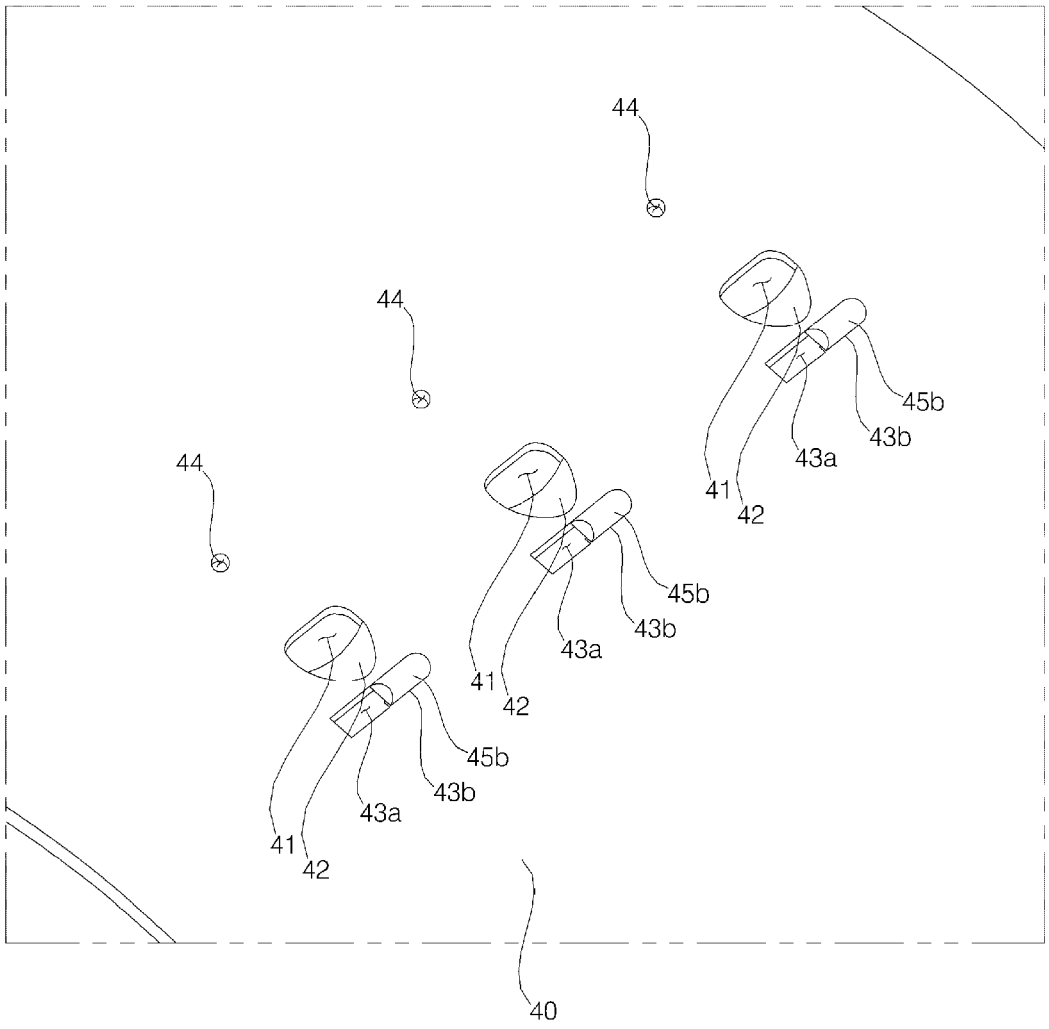


FIG. 4

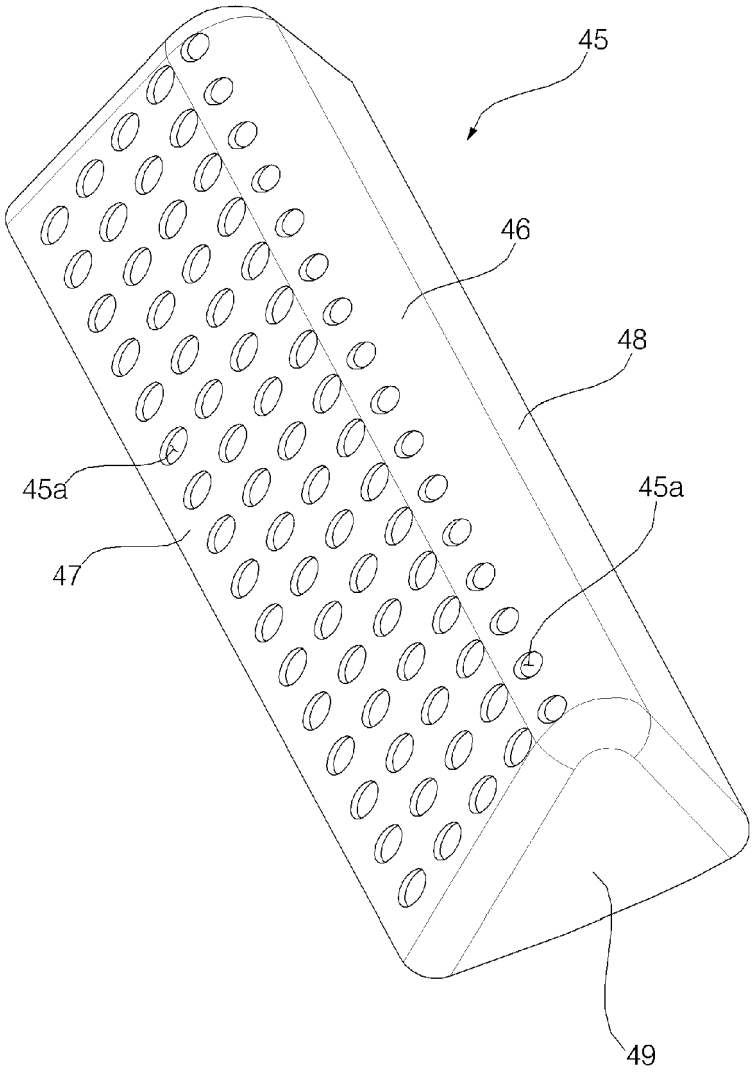


FIG. 5

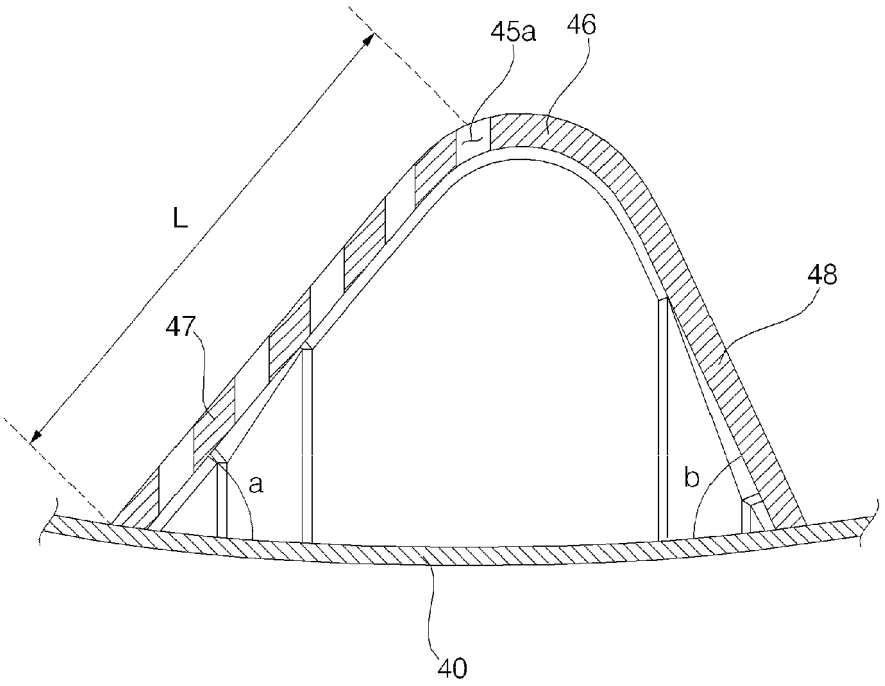


FIG. 6

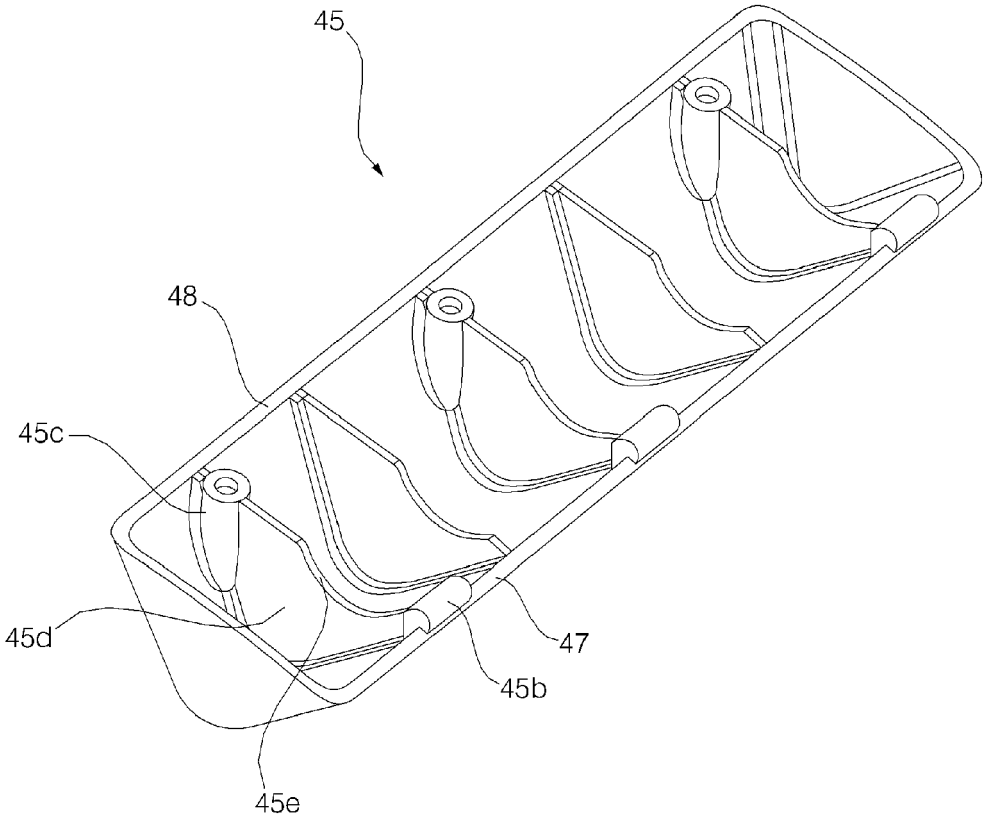


FIG. 7

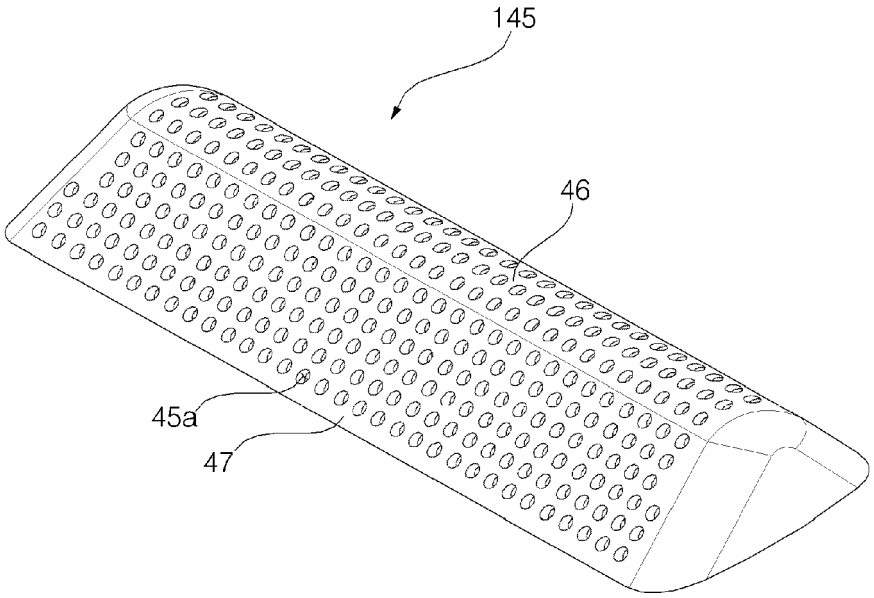


FIG. 8

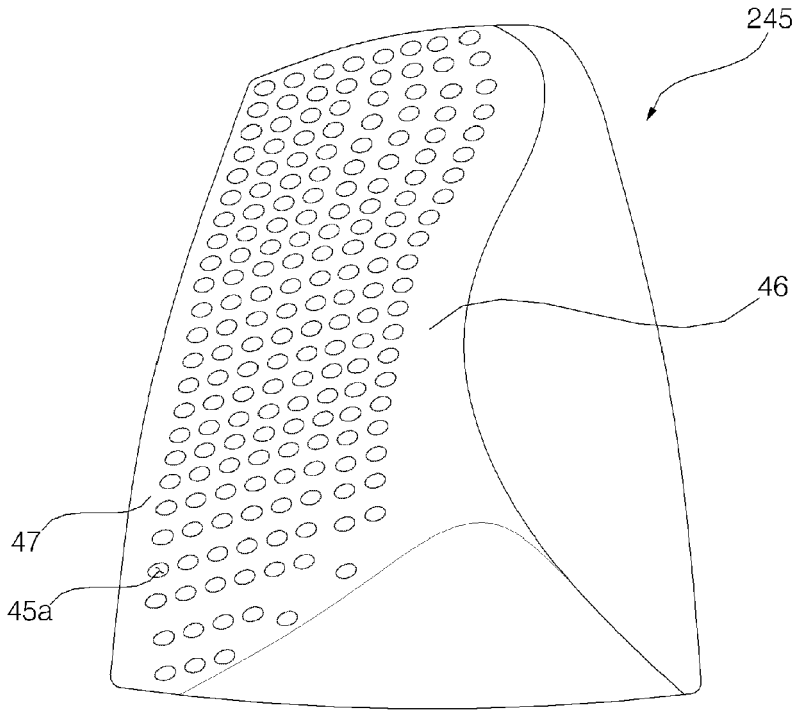


FIG. 9

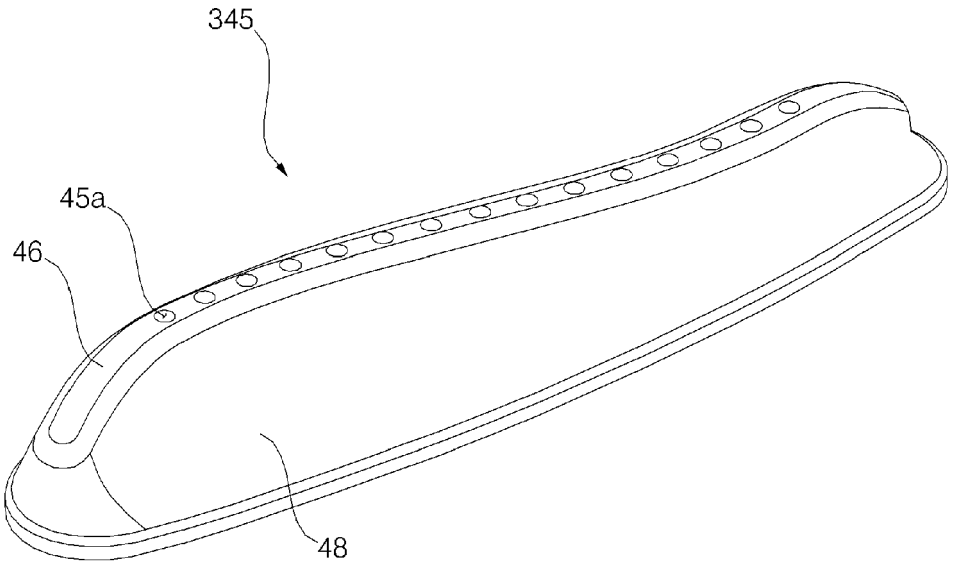


FIG. 10

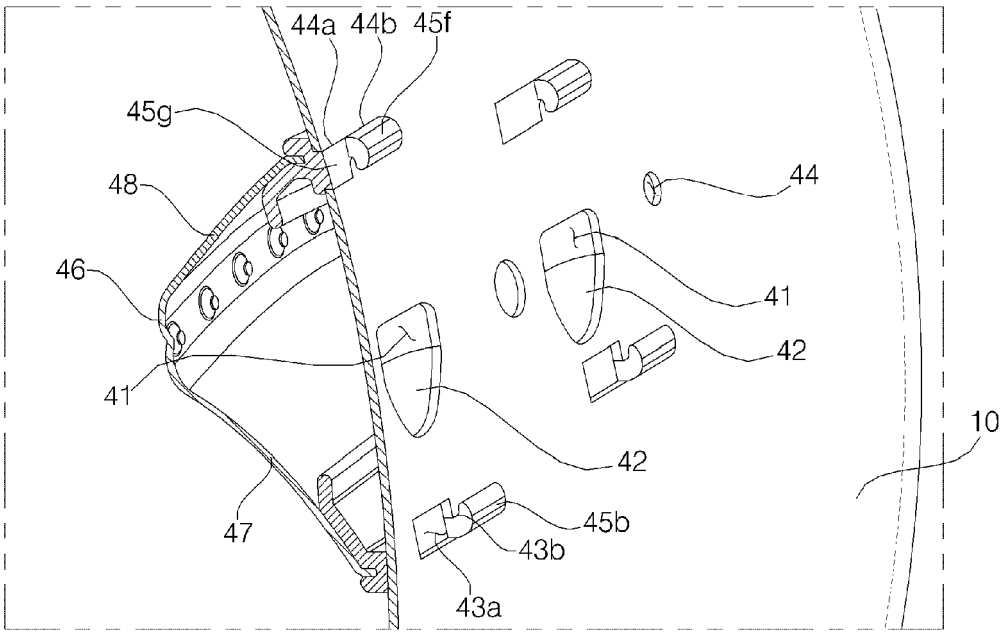
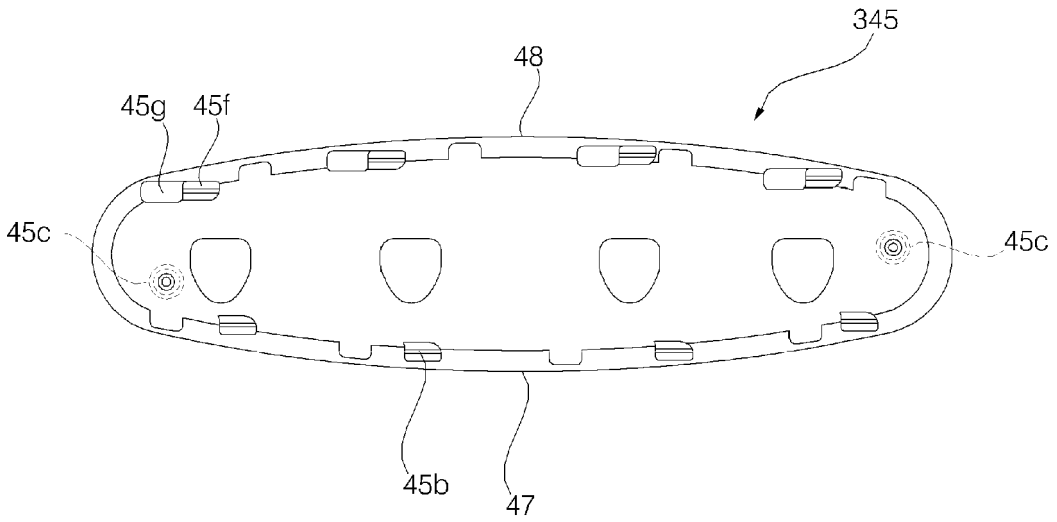


FIG. 11



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Application Number
EP 16 18 6960

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Place of search	Date of completion of the search	Examiner
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