

(19)



(11)

EP 2 586 900 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

01.05.2013 Bulletin 2013/18

(51) Int Cl.:

D06F 37/06 (2006.01)

D06F 37/14 (2006.01)

(21) Application number: **12186199.1**

(22) Date of filing: **27.09.2012**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

(30) Priority: **29.09.2011 KR 20110099069**

(71) Applicant: **Samsung Electronics Co., Ltd.**

Suwon-si, Gyeonggi-do 443-742 (KR)

(72) Inventors:

- **Choi, Min Jea**
Gyeonggi-do (KR)

- **Park, Hee Beom**
Gyeonggi-do (KR)

- **Kim, Sung Hwan**
Daejeon (KR)

- **Yoo, Sang Oh**
Seoul (KR)

- **Lee, Hyung Woo**
Gyeonggi-do (KR)

- **Ryu, Doo Young**
Gyeonggi-do (KR)

(74) Representative: **Grünecker, Kinkeldey,**

Stockmair & Schwanhäusser

Leopoldstrasse 4

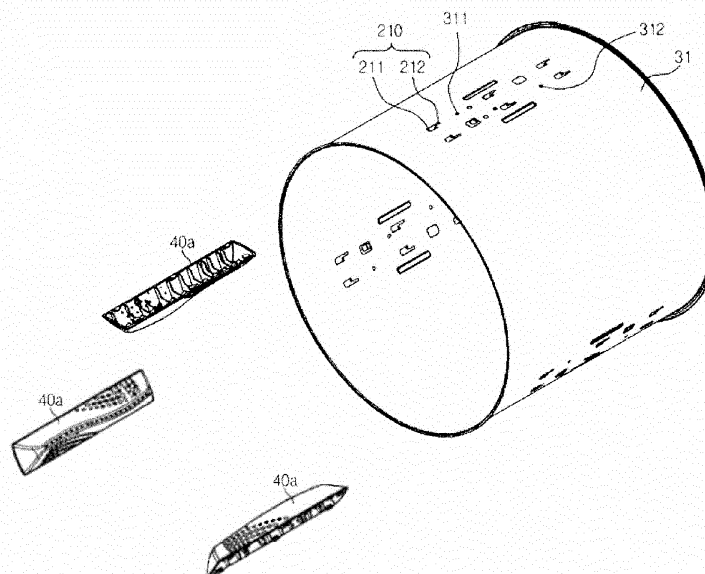
80802 München (DE)

(54) **Lifter and washing machine having the same**

(57) A washing machine (1) including a cabinet (10), a tub (20) arranged within the cabinet (10), a drum (30) arranged within the tub (20) to accommodate laundry and rotated by a motor (71), and a plurality of lifters (40a) provided on the inner circumferential surface of the drum (30) to move the laundry within the drum (30), each of said lifters (40a) includes a plurality of hooks (200) pro-

vided along a frame (105a) formed at the lower end of each of the plurality of lifters (40a) so as to allow each of the plurality of lifters (40a) to be hung to the drum (30), and at least one protrusion (301, 302, 400) protruding from the lower end of each of the plurality of lifters (40a) so as to allow each of the plurality of lifters (40a) to be fixed to the inner circumferential surface of the drum (30).

FIG.2b



EP 2 586 900 A1

Description

BACKGROUND

1. Field

[0001] Embodiments of the present inventive concept relate to a washing machine having lifters to lift and drop laundry in a drum.

2. Description of the Related Art

[0002] A washing machine is an apparatus which washes laundry using electric power, and generally includes a tub to store wash water, a drum rotatably installed within the tub, and a motor to rotate the drum.

[0003] When the drum is rotated by the motor under the condition that laundry and wash water are placed within the drum, contaminants are removed from the laundry through friction of the laundry with the drum and the wash water.

[0004] A plurality of lifters lifting and dropping the laundry during rotation of the drum to cause friction of the laundry with the wash water is provided on the inner circumferential surface of the drum.

[0005] The conventional lifters are mounted on the inner circumferential surface of the drum using fastening members, such as screws, etc. If the fastening members are separately used, fastening time of the lifters to the drum may be lengthened and the overall price of the washing machine may be raised due to costs of the fastening members.

SUMMARY

[0006] Therefore, it is an aspect of the present inventive concept to provide a lifter which is simply mounted on a drum, and a washing machine having the same.

[0007] It is another aspect of the present inventive concept to provide a lifter, the shape of which is changed to increase washing and drying efficiency of laundry, and a washing machine having the same.

[0008] Additional aspects of the inventive concept will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the inventive concept.

[0009] In accordance with one aspect of the present inventive concept, a washing machine includes a cabinet, a tub arranged within the cabinet to contain water therein, a drum arranged within the tub to accommodate laundry and rotated by rotary force transmitted from a driving source, and a plurality of lifters provided on the inner circumferential surface of the drum to move the laundry within the drum, wherein each of the plurality of lifters includes a plurality of hooks provided along a frame formed at the lower end of each of the plurality of lifters so as to allow each of the plurality of lifters to be hung to the drum, and at least one protrusion protruding from the

lower end of each of the plurality of lifters so as to allow each of the plurality of lifters to be fixed to the inner circumferential surface of the drum.

[0010] The at least one protrusion may include at least one fixing protrusion to prevent each of the plurality of lifters mounted on the drum from moving.

[0011] The drum may include at least one fixing hole through which the at least one fixing protrusion passes so as to allow the at least one fixing protrusion to prevent the plurality of lifters from moving.

[0012] The at least one fixing protrusion may include a first fixing protrusion and a second fixing protrusion, and the first fixing protrusion and the second fixing protrusion may be separated from each other so as to prevent the plurality of lifters from moving.

[0013] The first fixing protrusion and the second fixing protrusion may be arranged in opposite directions with respect to the center of the frame.

[0014] The at least one protrusion may include at least one adhering protrusion adhering the plurality of hooks closely to the inner circumferential surface of the drum to increase fastening force between each of the plurality of lifters and the drum.

[0015] The at least one protrusion may protrude farther than the frame of the lower end of each of the plurality of lifters.

[0016] Each of the plurality of hooks may include a support part protruding from the frame of each of the plurality of lifters and a hanging part bent from the support part and extended to the inside of the frame.

[0017] The drum may include a plurality of hanging holes to which the hanging parts of the plurality of hooks are hung so as to mount each of the plurality of lifters on the drum.

[0018] Each of the plurality of hanging holes may include a through hole through which each of the plurality of hooks passes so as to protrude from the inside of the drum toward the outside and a guide hole allowing each of the plurality of hooks having passed through the through hole to be slid therealong and thus the hanging part to be hung to each of the hanging holes.

[0019] The guide hole may have a smaller width than the through hole.

[0020] The plurality of hanging holes may be formed in the same number as the number of the plurality of hooks.

[0021] In accordance with another aspect of the present inventive concept, a washing machine includes a drum accommodating laundry and rotated by rotary force transmitted from a driving source, and a plurality of lifters provided on the inner circumferential surface of the drum, wherein each of the plurality of lifters includes a plurality of hooks provided at the lower end of each of the plurality of lifters so as to mount each of the plurality of lifters on the drum, and at least one protrusion protruding from the lower end of each of the plurality of lifters so as to allow each of the plurality of lifters to be fixed to the inner circumferential surface of the drum.

[0022] The at least one protrusion may protrude to press the inner circumferential surface of the drum outwardly.

[0023] The drum may include at least one fixing hole provided at a position corresponding to the at least one protrusion, and the at least one protrusion may protrude to pass through the at least one fixing hole.

[0024] In accordance with a further aspect of the present inventive concept, a lifter includes a body contacting laundry to lift the laundry, a plurality of hooks provided at a designated interval along a frame formed at the lower end of the body so as to mount the body on a drum, and at least one protrusion protruding from the lower end of the body.

[0025] The at least one protrusion may include a fixing protrusion preventing the body from moving.

[0026] The at least one protrusion may include an adhering protrusion to increase mounting force of the plurality of hooks on the drum.

[0027] Each of the plurality of hooks may include a support part protruding downwardly from the lower end of the body and a hanging part bent from the support part and extended to the inside of the frame of the lower end of the body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] These and/or other aspects of the inventive concept will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a cross-sectional view illustrating the configuration of a washing machine in accordance with an embodiment of the present inventive concept;

FIG. 2A is a perspective view illustrating a drum on which lifters in accordance with an embodiment of the present inventive concept are mounted;

FIG. 2B is an exploded perspective view illustrating the configuration of the lifters and the drum of FIG. 2A;

FIGS. 3A and 3B are perspective views illustrating the lifter of FIG. 2A;

FIG. 4 is a view illustrating the lower surface of the lifter of FIG. 2A;

FIG. 5 is a view illustrating mounting of the lifter of FIG. 2A on the drum;

FIG. 6 is a cross-sectional view taken along the line I-I of FIG. 5;

FIG. 7 is a cross-sectional view taken along the line II-II of FIG. 5;

FIG. 8 is a view illustrating a drum in accordance with another embodiment of the present inventive concept;

FIG. 9 is a view illustrating a first lifter of FIG. 8;

FIG. 10 is a view illustrating a second lifter of FIG. 8; and

FIG. 11 is a development view of the drum on which the first and second lifters in accordance with an embodiment of the present inventive concept are mounted.

DETAILED DESCRIPTION

[0029] Reference will now be made in detail to embodiments of the present inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0030] FIG. 1 is a cross-sectional view illustrating the configuration of a washing machine in accordance with an embodiment of the present inventive concept.

[0031] As shown in FIG. 1, a washing machine 1 includes a cabinet 10 forming the external appearance of the washing machine 1, a tub 20 arranged within the cabinet 10, a drum 30 rotatably arranged within the tub 20, and a motor 71 to drive the drum 30.

[0032] An inlet 11 through which laundry is put into the drum 30 is formed through the front surface part of the cabinet 10. The inlet 11 is opened and closed by a door 12 installed on the front surface part of the cabinet 10.

[0033] The tub 20 is supported by dampers 78. The dampers 78 connect the inner lower surface of the cabinet 10 to the outer surface of the tub 20.

[0034] Water supply pipes 50 to supply wash water to the tub 20 are installed above the tub 20. One end of each water supply pipe 50 is connected to an external water supply source (not shown), and the other end of each water supply pipe 50 is connected to a detergent supply device 52.

[0035] The detergent supply device 52 is connected to the tub 20 through a connection pipe 54. Water supplied through the water supply pipe 50 passes through the detergent supply device 52, and then water together with detergent is supplied to the inside of the tub 20.

[0036] A drainage pump 80 and a drainage pipe 84 to discharge water in the tub 20 to the outside of the cabinet 10 are installed under the tub 20.

[0037] The drum 30 includes a cylindrical part 31, a front plate 32 arranged at the front portion of the cylindrical part 31, and a rear plate 33 arranged at the rear portion of the cylindrical part 31. An opening 32a through which laundry is put into and taken out of the drum 30 is formed through the front plate 32, and a drive shaft 72 to transmit power of the motor 71 is connected to the rear plate 33.

[0038] A plurality of through holes 34 to circulate wash water is provided on the circumferential surface of the drum 30, and the inner space of the drum 30 and the inner surface of the tub 20 communicate with each other by the through holes 34.

[0039] The drive shaft 72 is arranged between the drum 30 and the motor 71. One end of the drive shaft 72 is connected to the rear plate 33 of the drum 30, and the other end of the drive shaft 72 extends to the outside of the rear wall of the tub 20. When the motor 71 drives the drive shaft 72, the drum 30 connected to the drive shaft 72 is rotated around the drive shaft 72.

[0040] A bearing housing 73 is installed on the rear wall of the tub 20 so as to rotatably support the drive shaft 72. The bearing housing 73 may be formed of an aluminum alloy, and be inserted into the rear wall of the tub 20 when the tub 20 is formed through injection molding. A plurality of bearings 74 is installed between the bearing housing 73 and the drive shaft 72 so as to effectively rotate the drive shaft 72.

[0041] The motor 71 rotates the drum 30 in the forward and reverse directions at a low velocity in a washing cycle, and thereby, the laundry within the drum 30 repeats rising and falling motions so that contaminants are removed from the laundry.

[0042] When the motor 71 rotates the drum 30 in one direction at a high velocity in a spin-drying cycle, water is separated from the laundry by centrifugal force applied to the laundry.

[0043] When the laundry is not uniformly distributed in the drum 30 and leans to a specific portion of the inside of the drum 30 during rotation of the drum 30 in the spin-drying process, unbalanced load is generated in the drum 30, and rotation of the drum 30 becomes unstable and causes vibration and noise. Therefore, the washing machine 1 includes balancers (not shown) to stabilize rotation of the drum 30. A pair of balancers (not shown) is formed on the front plate 32 and the rear plate 33 of the drum 30.

[0044] A plurality of lifters 40a is installed on the inner circumferential surface of the drum 30 so as to raise and drop laundry when the drum 30 is rotated.

[0045] FIG. 2A is a perspective view illustrating the drum on which the lifters in accordance with an embodiment of the present inventive concept are mounted.

[0046] As shown in FIG. 2A, the plural lifters 40a are arranged at a designated interval along the inner circumferential surface of the cylindrical part 31 of the drum 30.

[0047] Although this embodiment illustrates three lifters 40a as being arranged, the number of the lifters 40a may be increased or decreased.

[0048] Conventionally, lifters are mounted on the inner circumferential surface of a cylindrical part of a drum using fastening members, such as screws. On the other hand, in accordance with this embodiment, the lifters 40a are mounted on the drum 30 using only structures of the cylindrical part 31 of the drum 30 and the lifters 40a without fastening members, such as screws.

[0049] Here, the structures of the lifters 40a and the cylindrical part 31 will be described with reference to the accompanying drawings.

[0050] FIG. 2B is an exploded perspective view illustrating the configuration of the lifters and the drum of FIG. 2A, FIGS. 3A and 3B are perspective views illustrating the lifter of FIG. 2A, and FIG. 4 is a view illustrating the lower surface of the lifter of FIG. 2A.

[0051] As shown in FIGS. 2B, 3A, 3B and 4, the lifter 40a includes a body forming the external appearance of the lifter 40a, and a frame 105a forming the lower end of the body and contacting the inner circumferential surface of the cylindrical part 31 of the drum 30 when the lifter 40a is mounted on the drum 30. The lower end of the lifter 40a is opened and forms an opening 103a at the inside of the frame 105a.

[0052] The body includes two contact surfaces 101 a and 102a rotated together with the drum 30 and performing a function of holding and lifting laundry, and a side surface 104a connected to the sides of the two contact surfaces 101 a and 102a.

[0053] The contact surfaces 101 a and 102a protrude from the frame 105a in the longitudinal direction of the lifter 40a. The two contact surfaces 101 a and 102a extend from the frame 105a in a tilted state toward the central portion of the lifter 40a so that the ends of the contact surfaces 101 a and 102a are close to each other as the contact surfaces 101 a and 102a are distant from the frame 105a. In the case of a specific shape of the lifter 40a, the ends of the two contact surfaces 101 a and 102a may directly contact and thus form the lifter 40a having a shape with the sharp end.

[0054] Both ends of the side surface 104a are connected to the frame 105a, and the side surface 104a starts from one side surface of the body, connects the ends of the two contact surfaces 101 a and 102a and extends to the other side surface of the body to form the body of the lifter 40a. In accordance with this embodiment, the lifter 40a has a shape with the stubby end.

[0055] A plurality of through holes 107a to pass wash water is formed on the two contact surfaces 101 a and 102a.

[0056] A plurality of ribs 106a is formed on the inner surface of the lifter 40a formed by the two contact surfaces 101a and 102a and the side surface 104a in the widthwise direction of the lifter 40a. The ribs 106a allow the lifter 40a to have a sufficient strength even if the inside of the lifter 40a is vacant. Further, the ribs 106a serve to allow protrusions to protrude from the lower end of the lifter 40a.

[0057] A plurality of hooks 200 is arranged along the frame 105a of the lower end of the lifter 40a. In accordance with this embodiment, six hooks 200 are provided such that three hooks 200 at one side are arranged to be opposite three hooks 200 at the other side at a designated interval. The hooks 200 may be provided in number less than or more than six.

[0058] The hook 200 includes a support part 202 pro-

truding from the frame 105a in the opposite direction to the body, and a hanging part 201 bent from the support part 202 toward the inside of the frame 105a.

[0059] The hanging parts 201 of the opposite hooks 200 are bent in opposite directions so that the lifter 40a may be connected to the cylindrical part 31 of the drum 30. Although this embodiment illustrates the hanging parts 201 as being bent in the inward direction of the frame 105a, the hanging parts 201 may be bent in the outward direction of the frame 105a or be bent in the lengthwise direction of the frame 105a as long as the lifter 40a may be mounted on the drum 30 by the hanging parts 201.

[0060] Two fixing protrusions 301 and 302 protrude adjacent to the frame 105a of the lower end of the lifter 40a.

[0061] The fixing protrusions 301 and 302 perform a function of preventing rotation and movement of the lifter 40a after the lifter 40a has been mounted on the cylindrical part 31 of the drum 30. Therefore, the fixing protrusions 301 and 302 are formed opposite to each other in opposite directions with respect to the center of the frame 105a of the lifter 40a.

[0062] Differently from this embodiment, the fixing protrusions 301 and 302 may be formed in number more than or less than two. However, in order to achieve the original function of the fixing protrusions 301 and 302, the fixing protrusions 301 and 302 may be formed in even number.

[0063] In addition to the fixing protrusions 301 and 302, an adhering protrusion 400 protrudes from the lower end of the lifter 40a. The adhering protrusion 400 has the same shape as the fixing protrusions 301 and 302, but has a function of adhering the hooks 202 closely to the cylindrical part 31 of the drum 30 differently from the fixing protrusions 301 and 302. Further, the adhering protrusion 400 differs from the fixing protrusions 301 and 303 in that a hole into which the adhering protrusion 400 is inserted is not formed on the cylindrical part 31 of the drum 30, which will be described later.

[0064] Holes through which the hooks 200 and the fixing protrusions 301 and 302 of the lifter 40a pass are formed on the cylindrical part 31 of the drum 30. Due to the function of the adhering protrusion 400, a hole through which the adhering protrusion 400 passes is not formed on the cylindrical part 31 of the drum 30. This will be described later with reference to FIG. 6.

[0065] In accordance with this embodiment, since a total of three lifters 40a are mounted on the drum 30, a total of three sets of holes corresponding to the hooks 200 and the fixing protrusions 301 and 302 of the lifters 40a are formed on the drum 30.

[0066] Hanging holes 210 through which the hooks 200 pass to mount the lifters 40a on the drum 30 are provided in the same number as the number of the hooks 200. The hanging hole 210 includes a through hole 211 and a guide hole 212.

[0067] The through hole 211 is formed in a size sufficient to pass the hanging part 201 of the hook 200. Since

the hanging part 201 is not hung to the through hole 211 due to the size thereof, the guide hole 212 having a narrow width and connected to the through hole 211 is formed.

[0068] When the support part 202 of the hook 200 slides along the guide hole 212, the hanging part 201 is hung to the cylindrical part 31 of the drum 30 and thus the lifter 40a is mounted on the cylindrical part 31. Therefore, the guide hole 212 may have a width sufficient to slide and move the support part 202 along the guide hole 212.

[0069] Fixing holes 311 and 312 through which the fixing protrusions 301 and 302 may pass are formed at positions where the fixing protrusions 301 and 302 are located after the hooks 200 have slid along the guide holes 212. When the fixing protrusions 301 and 302 are inserted into and pass through the fixing holes 311 and 312, the fixing protrusions 301 and 302 are fixed and simultaneously, the hooks 200 are precisely fixed to the guide holes 212.

[0070] Further, the fixing holes 311 and 312 are opposite each other with respect to the center of the frame 105a, and thus have a function of preventing the lifter 40a from being rotated under the condition that the lifter 40a is mounted on the cylindrical part 31.

[0071] The fixing holes 311 and 312 are provided in the same number as the number of the fixing protrusions 301 and 302.

[0072] FIG. 5 is a view illustrating mounting of the lifter of FIG. 2A on the drum, FIG. 6 is a cross-sectional view taken along the line I-I of FIG. 5, and FIG. 7 is a cross-sectional view taken along the line II-II of FIG. 5.

[0073] As shown in FIGS. 5 to 7, in order to mount the lifter 40a on the inner circumferential surface of the drum 30, the hanging parts 201 of the hooks 200 pass through the through holes 211 and protrude from the outer circumferential surface of the cylindrical part 31. When the lifter 40a is slid, the hooks 200 move along the guide holes 212 and the hanging parts 201 are hung to the cylindrical part 31 of the drum 30.

[0074] When the hanging parts 201 move to positions hung to the cylindrical part 31, the fixing protrusions 301 and 302 are inserted into and pass through the fixing holes 311 and 312 and are thus fixed. Thereby, the hooks 200 are fixed so as not to move from the guide holes 212 to the through holes 211.

[0075] As described above, a hole corresponding to the adhering protrusion 400 is not formed. As shown in FIG. 5, even when mounting of the lifter 40a has been completed, the adhering protrusion 400 only contacts the inner circumferential surface of the cylindrical part 31.

[0076] The adhering protrusion 400 and the fixing protrusions 301 and 302 have similar shapes and protrude in similar manners. That is, when the fixing protrusions 301 and 302 have a length sufficient to protrude from the fixing holes 311 and 312, the adhering protrusion 400 has a similar length.

[0077] When mounting of the lifter 40a has been com-

pleted, the fixing protrusions 301 and 302 are inserted into the fixing holes 311 and 312 to protrude from the fixing holes 311 and 312, but the adhering protrusion 400 presses the inner circumferential surface of the cylindrical part 31 outwardly because there is no hole corresponding to the adhering protrusion 400. The cylindrical part 31 pressed by the adhering protrusion 400 expands outwardly and portions around the guide holes 212 where the hooks 200 are located protrude outwardly. Thereby, the hanging parts 201 of the hooks 200 are more closely adhered to the cylindrical part 31 at the portions around the guide holes 212. When the hanging parts 201 of the hooks 200 are more closely adhered to the cylindrical part 31, connecting force between the hooks 200 and the cylindrical part 31 is further strengthened and the lifter 40 is more firmly fixed to the drum 30. Although only one adhering protrusion 400 is shown as an example, a plurality of adhering protrusions may be provided and protrude from the lower end of the lifter 40a to press the inner circumferential surface of the cylindrical part 31.

[0078] As described above, in accordance with this embodiment, the lifters 40 may be firmly mounted on the drum 30 without separate fastening members.

[0079] Thereby, the price of the washing machine is lowered due to omission of the fastening members, and thus price competitiveness of the washing machine may be raised. Further, the lifters 40a may be simply mounted on the drum 30, and thus time and man-power taken to mount the lifters 40a on the drum 30 may be reduced.

[0080] Although this embodiment of the present inventive concept illustrates the drum washing machine, a clothes dryer has the same drum structure as the drum washing machine and thus the above lifter structure may be applied to the clothes dryer.

[0081] FIG. 8 is a view illustrating a drum in accordance with another embodiment of the present inventive concept.

[0082] As shown in FIG. 8, a total of three lifters 41 b and 42b are mounted on the inner circumferential surface of the cylindrical part 31 of the drum 30. The three lifters 41 b and 42b include two first lifters 41 b and a second lifter 42b.

[0083] Fastening holes 500 are provided on the rear surfaces of the respective lifters 41 b and 42b, and the lifters 41 b and 42b are connected to the cylindrical part 31 of the drum 30 by fastening members (not shown), such as screws. However, the lifters 41 b and 42b may be connected to the cylindrical part 31 using the hooks 200 (with reference to FIG. 3A), the fixing protrusions 301 and 302 (with reference to FIG. 3A) and the adhering protrusion 400 (with reference to FIG. 3A) without fastening members, as described earlier.

[0084] The respective lifters 41 b and 42b are arranged along the central portion of the cylindrical part 31 but are arranged at different positions with respect to the central portion of the cylindrical part 31. This will be described later with reference to FIG. 11.

[0085] Hereinafter, shapes of the first lifters 41 b and

the second lifter 42b will be described.

[0086] FIG. 9 is a view illustrating the first lifter of FIG. 8.

[0087] As shown in FIG. 9, the first lifter 41 b includes a body forming the external appearance of the first lifter 41 b, and a frame 115b forming the lower end of the body and contacting the inner circumferential surface of the cylindrical part 31 of the drum 30 when the lifter 40a is mounted on the drum 30.

[0088] The body includes a contact surface 112b rotated together with the drum 30 and performing a function of holding and lifting laundry, a rear surface 111 b formed opposite the contact surface 112b, and a side surface 114a covering the sides of the body.

[0089] The contact surface 112b and the rear surface 111 b of the first lifter 41 b protrude from the frame 115b in the lengthwise direction of the first lifter 41 b. The contact surface 112b and the rear surface 111 b of the first lifter 41 b are extended in a tilted state toward the central portion of the lifter 41 b, and the ends of the contact surface 112b and the rear surface 111 b directly contact to form the lifter 41 a having a shape with the sharp end.

[0090] The contact surface 112b of the first lifter 41 b is formed as a surface curved from one side to the other side thereof in the lengthwise direction. That is, the shape of the contact surface 112b is formed in a curved surface lowered only in one direction, such as a quarter circle.

[0091] FIG. 10 is a view illustrating the second lifter of FIG. 8.

[0092] As shown in FIG. 10, the second lifter 42b includes a body and a frame 125b in the same manner as the first lifter 41 b.

[0093] The body includes a contact surface 122b rotated together with the drum 30 and performing a function of holding and lifting laundry, a rear surface 121 b formed opposite the contact surface 122b, and a side surface 124a covering the sides of the body.

[0094] The contact surface 122b and the rear surface 121 b of the second lifter 42b protrude from the frame 125b in the lengthwise direction of the second lifter 42b.

The contact surface 122b and the rear surface 121 b of the second lifter 42b are extended in a tilted state toward the central portion of the lifter 42b, and the ends of the contact surface 122b and the rear surface 121 b directly contact to form the lifter 42a having a shape with the sharp end.

[0095] The contact surface 122b of the second lifter 42b is formed as a curved surface with a protruding central portion and both side portions tilted from the central portion, differently from the first lifter 41 b. That is, the shape of the contact surface 122b is formed in a curved surface lowered in two directions, such as a semicircle.

[0096] FIG. 11 is a development view of the drum on which the first and second lifters in accordance with an embodiment of the present inventive concept are mounted.

[0097] Here, 'F' indicates the front portion of the cylindrical part 31 and 'R' indicates the rear portion of the cylindrical part 31, and the arrow at the upper end of the

cylindrical part 31 represents a rotating direction of the drum 30.

[0098] The arrows located adjacent to the respective lifters 41 b and 42b represent moving directions of laundry. Here, the sizes of the arrows represent moving degrees of the laundry.

[0099] As shown in FIG. 11, three lifters 41 b and 42b are installed on the cylindrical part 31 of the drum 30. A sensor 34 to sense humidity of the laundry is mounted on the front portion of the cylindrical part 31.

[0100] As described above, the lifters 41 b and 42b are not arranged at the central portion of the cylindrical part 31 in a line, but are respectively arranged at the front portion, the rear portion and the central portion of the cylindrical part 31.

[0101] The first lifters 41 b are installed adjacent to the front and rear portions of the cylindrical part 31, and the second lifter 42b is installed at the central portion of the cylindrical part 31.

[0102] The second lifter 42b prevents laundry from being tangled and allows the laundry to be effectively moved in several directions due to the shape of the contact surface 122b thereof. With reference to the arrows representing the moving degrees of the laundry on the second lifter 42b, the laundry is not moved in a designated direction but is uniformly moved in the forward direction D21, the backward direction D23 and the rotating direction D22 of the drum 30. When the laundry is uniformly moved in these directions, washing efficiency of the laundry may be increased.

[0103] Although this embodiment of the present inventive concept illustrates the drum washing machine, a clothes dryer has the same drum structure as the drum washing machine and thus the above lifter structure may be applied to the clothes dryer. When the second lifter 42b is mounted on the clothes dryer, laundry is effectively moved, and thus drying efficiency of the laundry may be increased and drying time of the laundry may be shortened.

[0104] The first lifter 41 b may exert its function in a washing machine performing a drying function or a clothes dryer. The clothes dryer has the same drum structure as the drum washing machine.

[0105] The first lifters 41 b arranged on the front portion and the rear portion of the cylindrical part 31 allow laundry to be effectively moved in the forward direction due to the shape of the contact surfaces 112b thereof. With reference to the arrows representing the moving degrees of the laundry on the first lifters 41 b, it is known that the laundry is farther moved in the forward directions D11 and D31 and the rotating directions D12 and D32. On the other hand, the laundry is scarcely moved in the backward directions D13 and D33.

[0106] The sensor 34 which is provided at the front portion of the cylindrical part 31 more precisely senses humidity of the laundry when the laundry is effectively moved in the forward direction. Therefore, the sensor 34 precisely detects humidity of the laundry, and may thus

prevent the washing machine or the clothes dryer from being operated even when drying of the laundry has been completed.

[0107] As is apparent from the above description, a lifter in accordance with an embodiment of the present inventive concept includes hooks, fixing protrusions and an adhering protrusion formed thereon, and may thus be simply and firmly mounted on a drum without separate fastening members, thereby reducing time and manpower taken to assemble the lifter with the drum and lowering product price.

[0108] Further, the lifter has a curved shape, and may thus allow laundry to be effectively moved without being caught to the lifter, thereby increasing washing and drying efficiency of the laundry.

[0109] Although a few embodiments of the present inventive concept have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the inventive concept, the scope of which is defined in the claims and their equivalents.

Claims

1. A washing machine comprising:

a cabinet;
a tub arranged within the cabinet to contain water therein;
a drum arranged within the tub to accommodate laundry and rotated by rotary force transmitted from a driving source; and
a plurality of lifters provided on the inner circumferential surface of the drum to move the laundry within the drum,
wherein each of the plurality of lifters includes:

a plurality of hooks provided along a frame formed at the lower end of each of the plurality of lifters so as to allow each of the plurality of lifters to be hung to the drum; and
at least one protrusion protruding from the lower end of each of the plurality of lifters so as to allow each of the plurality of lifters to be fixed to the inner circumferential surface of the drum.

2. The washing machine according to claim 1, wherein the at least one protrusion includes at least one fixing protrusion to prevent each of the plurality of lifters mounted on the drum from moving.

3. The washing machine according to claim 2, wherein the drum includes at least one fixing hole through which the at least one fixing protrusion passes so as to allow the at least one fixing protrusion to prevent

the plurality of lifters from moving.

4. The washing machine according to claim 2, wherein:

the at least one fixing protrusion includes a first
fixing protrusion and a second fixing protrusion;
and
the first fixing protrusion and the second fixing
protrusion are separated from each other so as
to prevent the plurality of lifters from moving.

5. The washing machine according to claim 4, wherein
the first fixing protrusion and the second fixing pro-
trusion are arranged in opposite directions with re-
spect to the center of the frame.

6. The washing machine according to claim 1, wherein
the at least one protrusion includes at least one ad-
hering protrusion adhering the plurality of hooks
closely to the inner circumferential surface of the
drum to increase fastening force between each of
the plurality of lifters and the drum.

7. The washing machine according to claim 1, wherein
the at least one protrusion protrudes farther than the
frame of the lower end of each of the plurality of lifters.

8. The washing machine according to claim 1, wherein
each of the plurality of hooks includes a support part
protruding from the frame of each of the plurality of
lifters, and a hanging part bent from the support part
and extended to the inside of the frame.

9. The washing machine according to claim 8, wherein
the drum includes a plurality of hanging holes to
which the hanging parts of the plurality of hooks are
hung so as to mount each of the plurality of lifters on
the drum.

10. The washing machine according to claim 9, wherein
each of the plurality of hanging holes includes a
through hole through which each of the plurality of
hooks passes so as to protrude from the inside of
the drum toward the outside, and a guide hole allow-
ing each of the plurality of hooks having passed
through the through hole to be slid therealong and
thus the hanging part to be hung to each of the hang-
ing holes.

11. The washing machine according to claim 10, wherein
the guide hole has a smaller width than the through
hole.

12. The washing machine according to claim 9, wherein
the plurality of hanging holes is formed in the same
number as the number of the plurality of hooks.

13. The washing machine according to claim 1, wherein

the at least one protrusion protrudes to press the
inner circumferential surface of the drum outwardly.

14. The washing machine according to claim 1, wherein:

the drum includes at least one fixing hole pro-
vided at a position corresponding to the at least
one protrusion; and
the at least one protrusion protrudes to pass
through the at least one fixing hole.

FIG.1

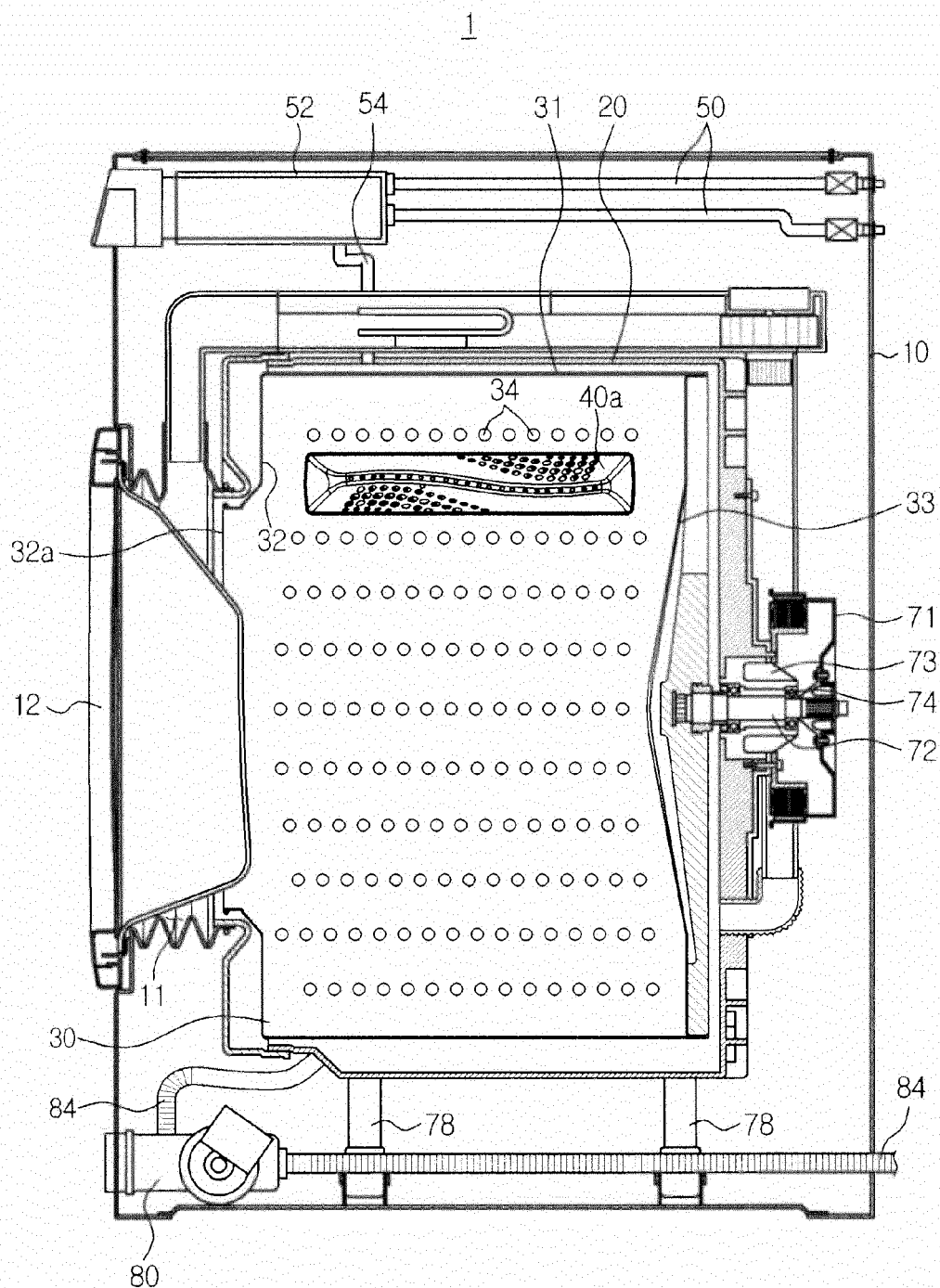


FIG.2a

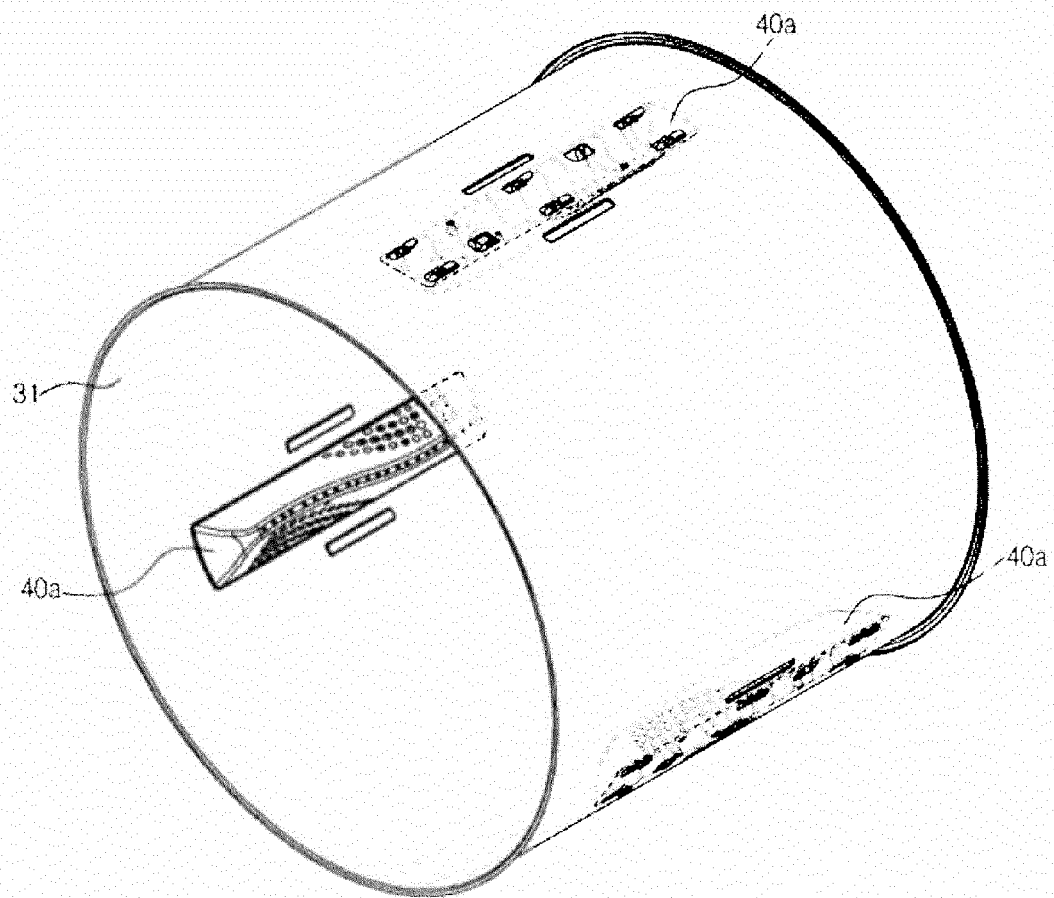


FIG.2b

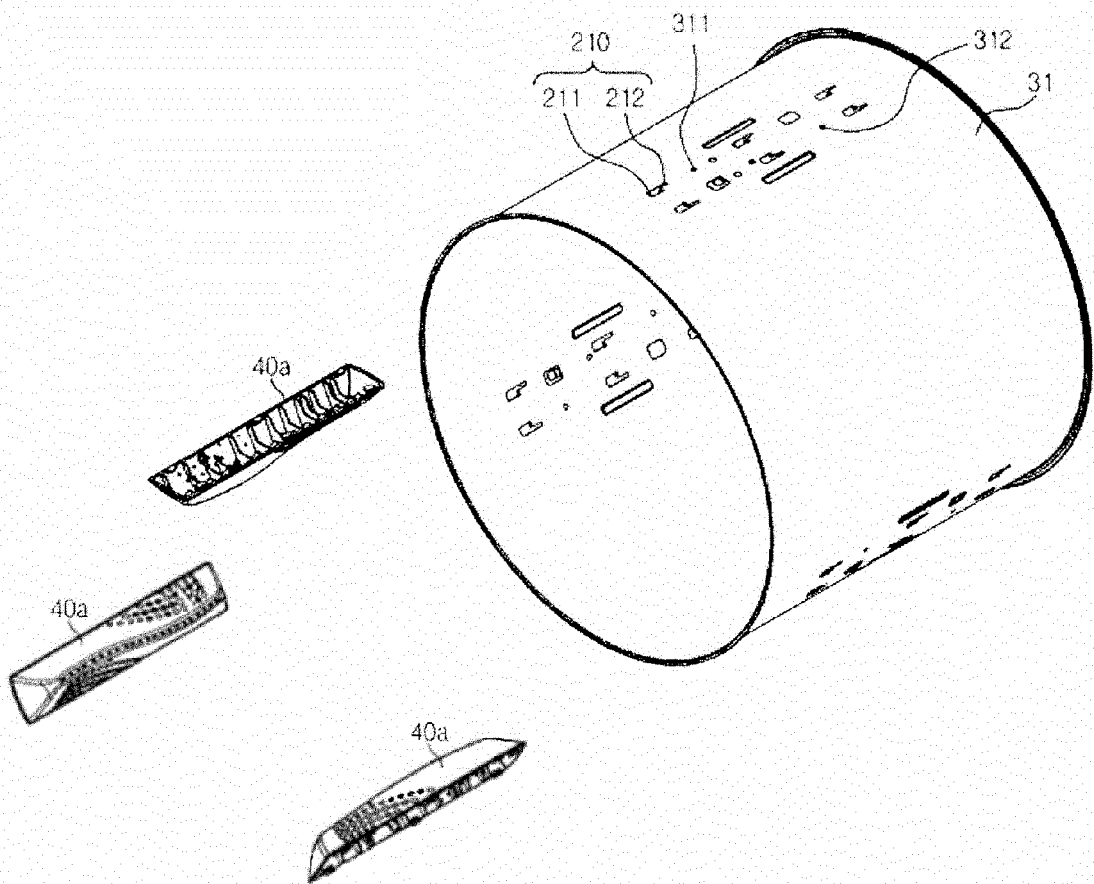


FIG.3a

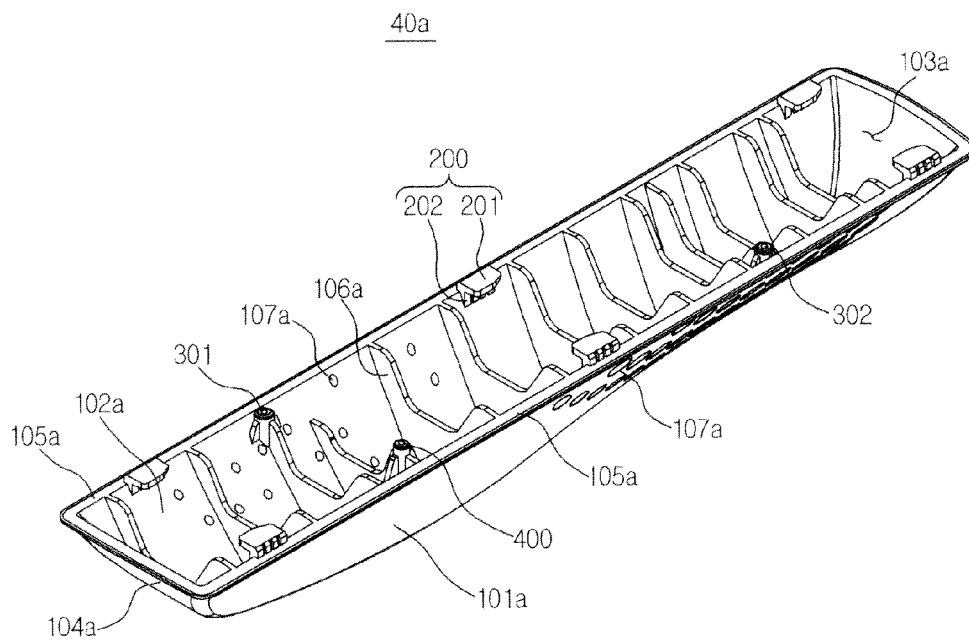


FIG.3b

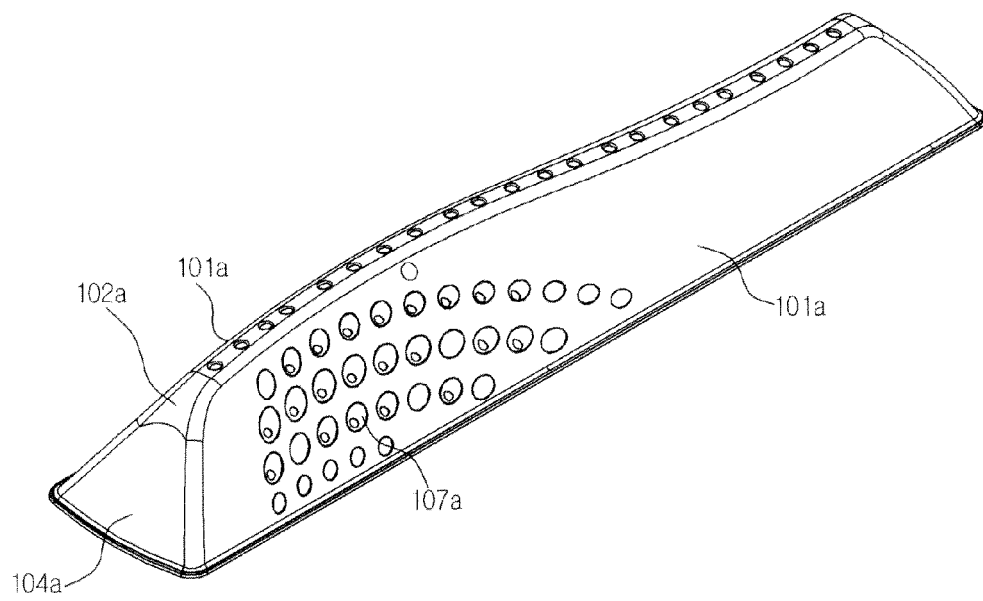


FIG.4

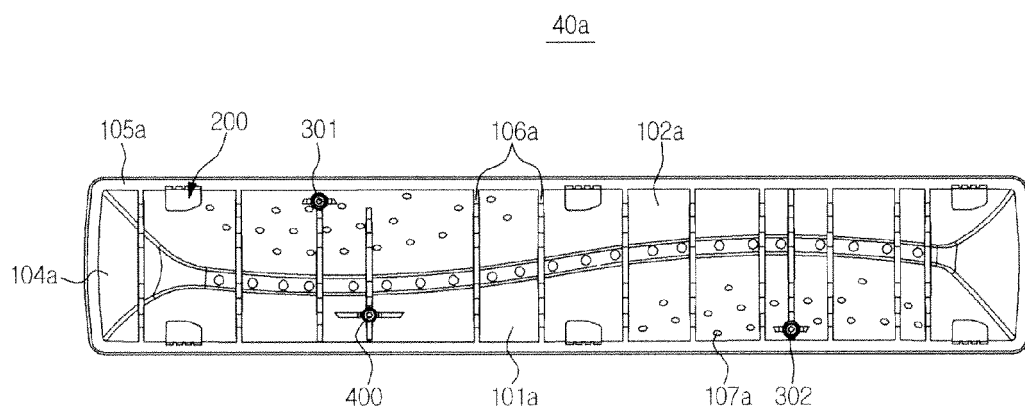


FIG.5

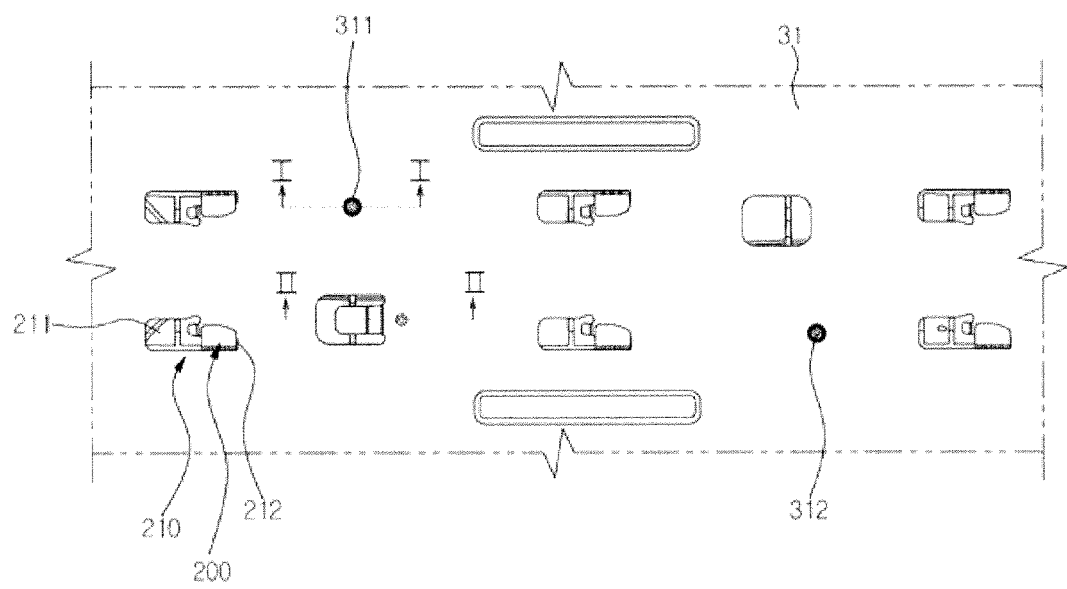


FIG.6

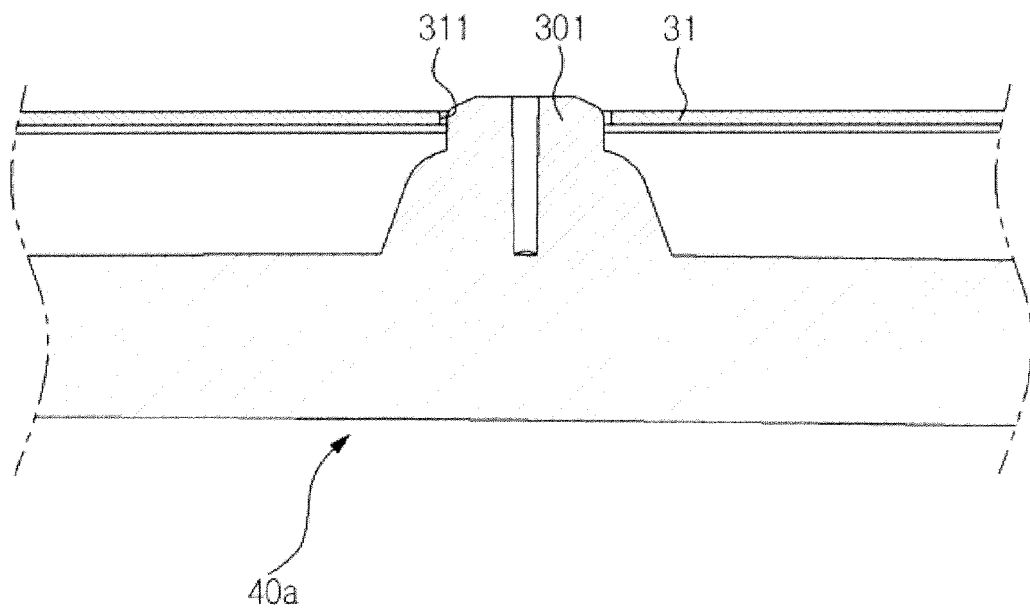


FIG.7

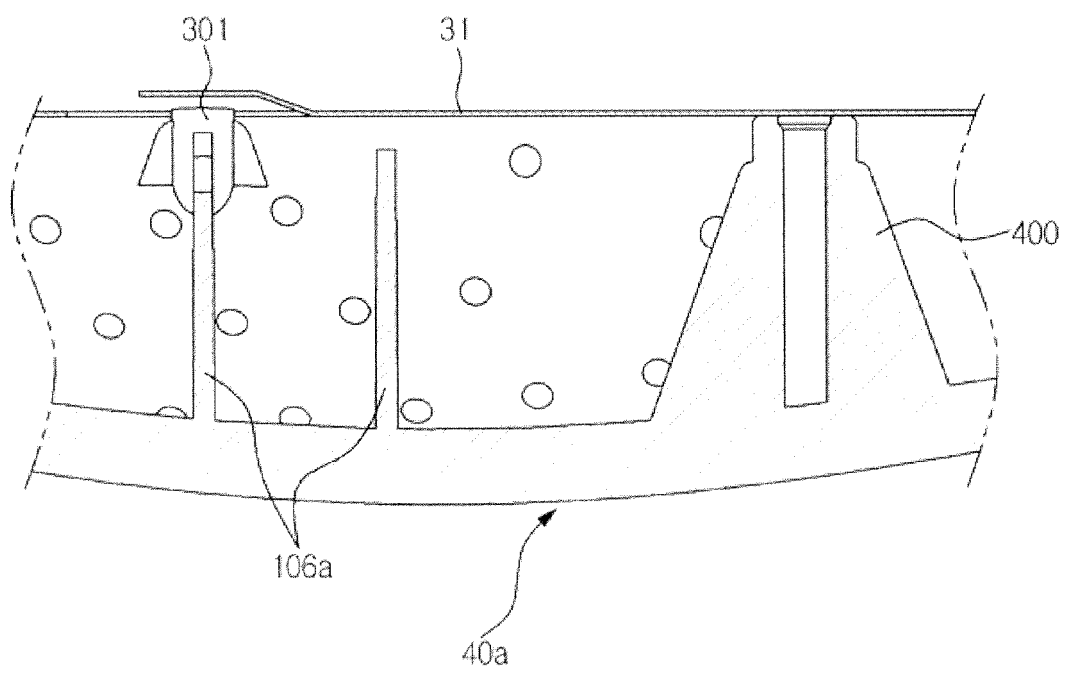


FIG.8

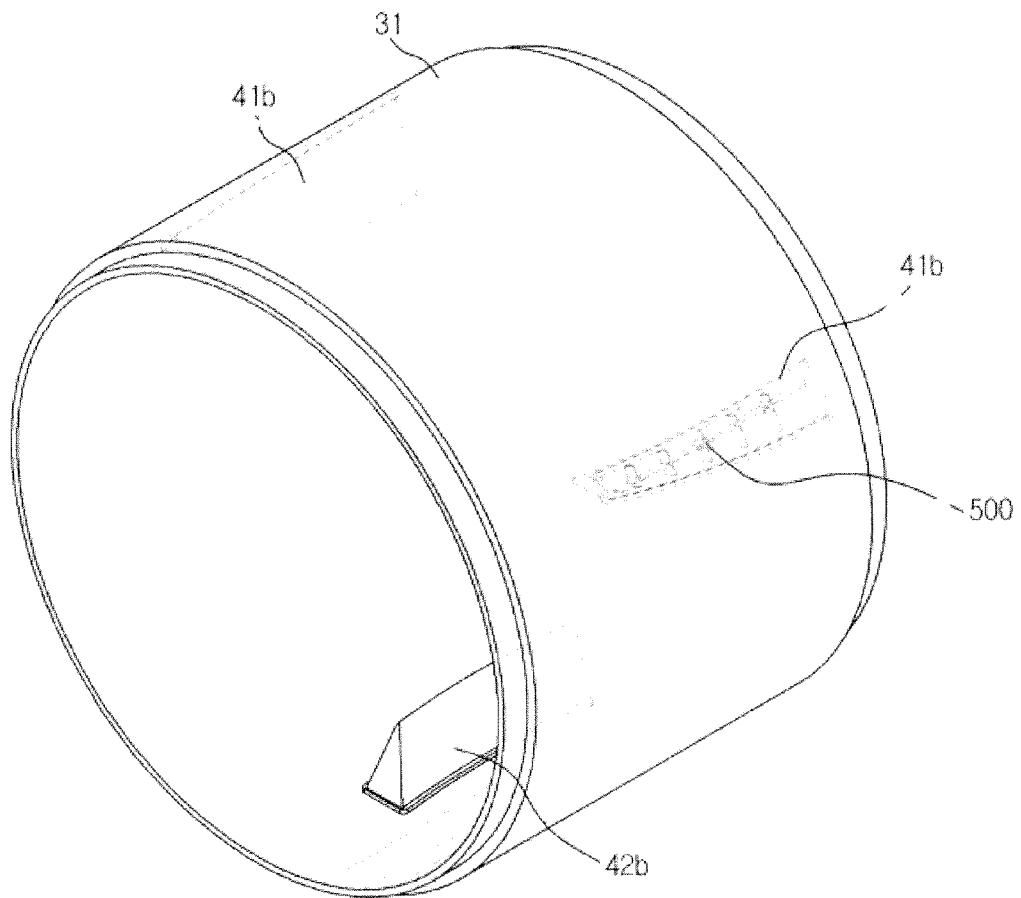


FIG.9

41b

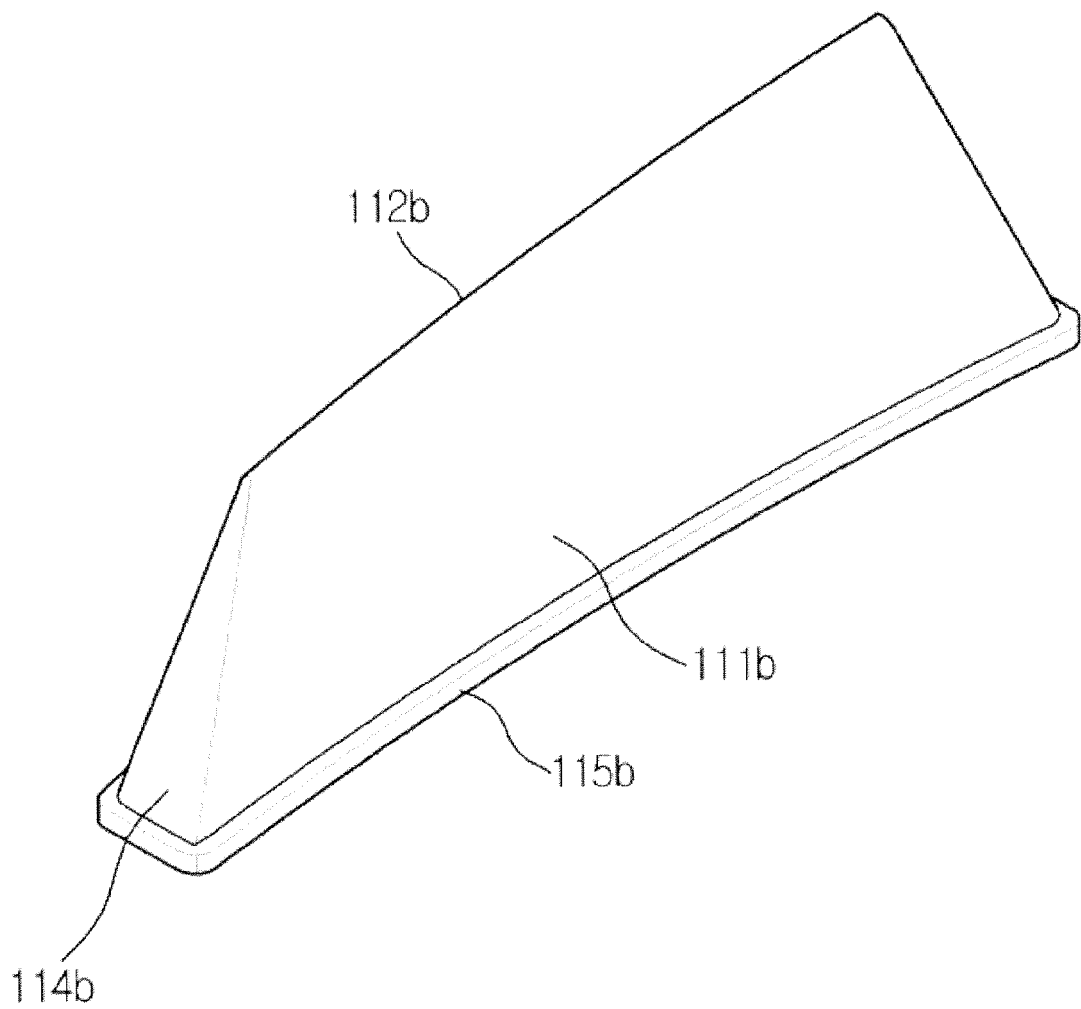


FIG.10

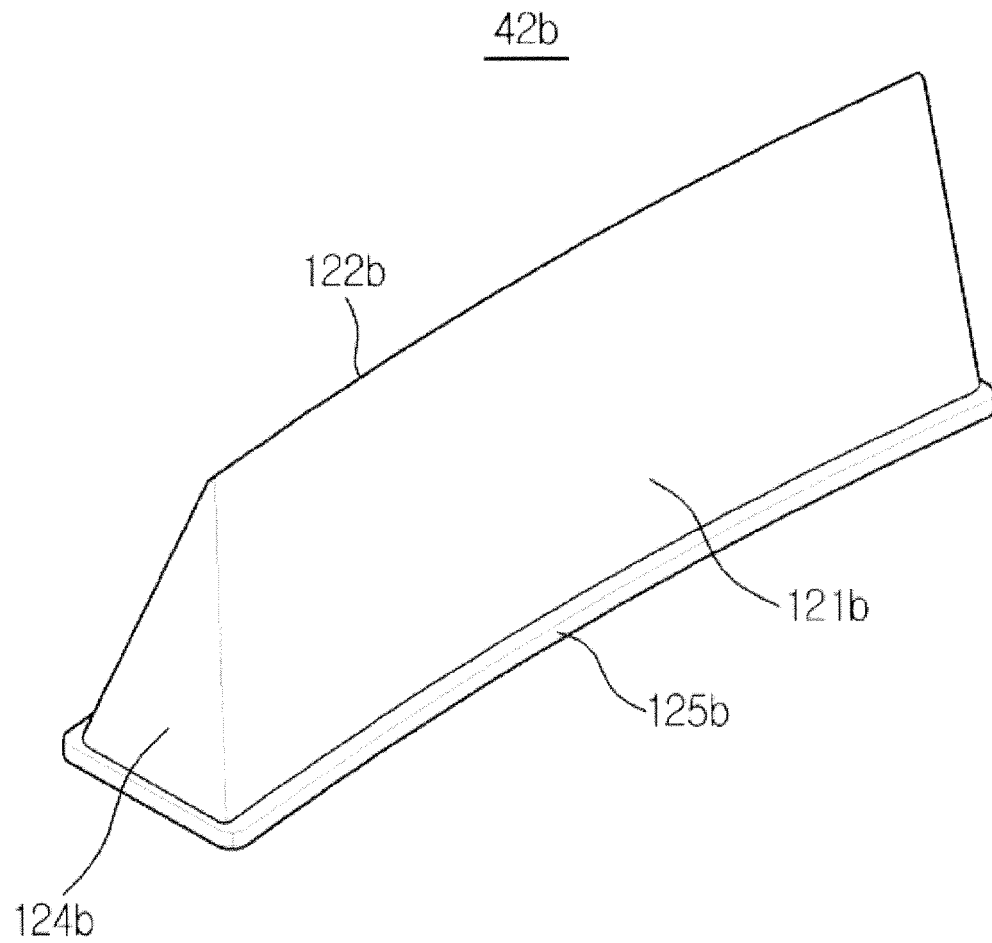
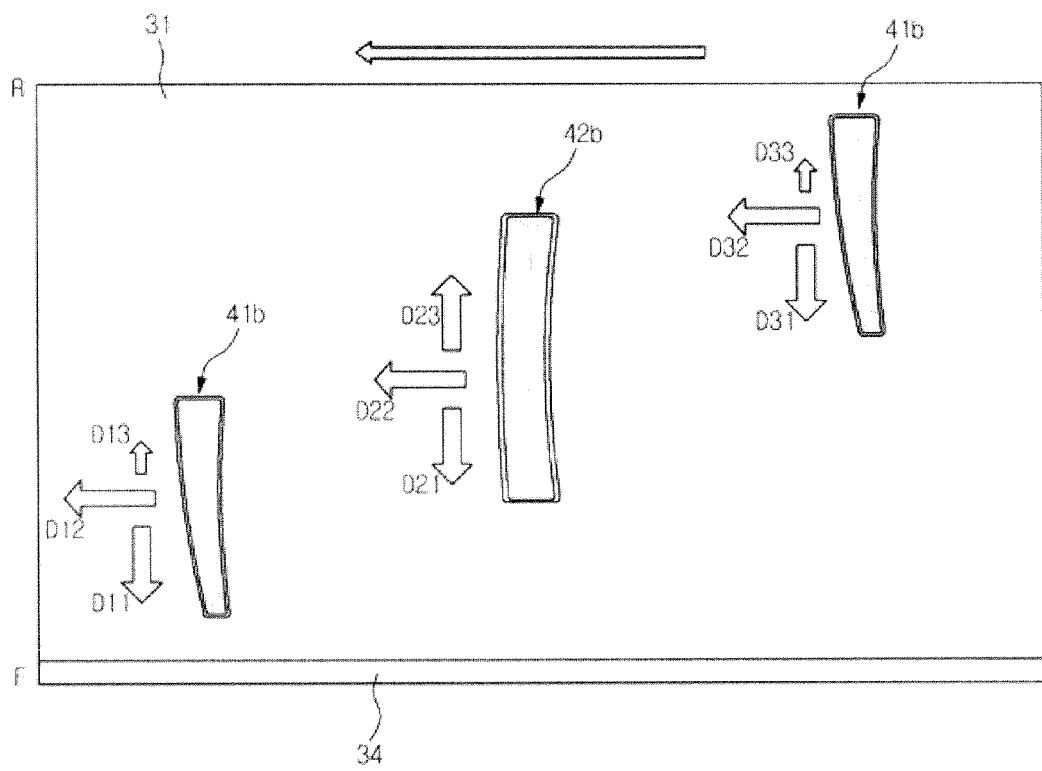


FIG.11





EUROPEAN SEARCH REPORT

Application Number
EP 12 18 6199

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 40 41 324 A1 (BOSCH SIEMENS HAUSGERAETE [DE]) 27 June 1991 (1991-06-27)	1-3,7-9	INV. D06F37/06 D06F37/14
Y	* column 1, line 1 - column 3, line 62;	4-6,	
A	claims; figures *	10-12,14 13	
Y	----- WO 2005/121436 A1 (LG ELECTRONICS INC [KR]; KIM CHANG-WOOK [KR]) 22 December 2005 (2005-12-22)	4-6,14	
A	* paragraphs [0055] - [0059]; claims; figures *	1-3,7-13	
Y	----- DE 33 17 201 A1 (LICENTIA GMBH [DE]) 15 November 1984 (1984-11-15)	10-12	
A	* page 3, line 1 - column 7, line 3; claims; figures *	1-9,13, 14	TECHNICAL FIELDS SEARCHED (IPC) D06F
A	----- WO 2009/095303 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; ARABACI FERUDUN [TR]; TUERE GUELTE) 6 August 2009 (2009-08-06) * the whole document *	1-14	

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 March 2013	Examiner Clivio, Eugenio
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 18 6199

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

22-03-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4041324 A1	27-06-1991	DE 4041324 A1	27-06-1991
		ES 2027145 A6	16-05-1992
		FR 2656344 A1	28-06-1991
		IT 1246496 B	19-11-1994
-----	-----	-----	-----
WO 2005121436 A1	22-12-2005	DE 112005000279 T5	19-04-2007
		KR 20050115726 A	08-12-2005
		US 2007068034 A1	29-03-2007
		WO 2005121436 A1	22-12-2005
-----	-----	-----	-----
DE 3317201 A1	15-11-1984	NONE	
-----	-----	-----	-----
WO 2009095303 A1	06-08-2009	TR 200800580 A2	21-08-2009
		WO 2009095303 A1	06-08-2009
-----	-----	-----	-----