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

(11) EP 2 891 447 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.07.2015 Bulletin 2015/28

(51) Int Cl.:
A47L 15/50 *(2006.01)*

(21) Application number: **15150114.5**

(22) Date of filing: **05.01.2015**

(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: **06.01.2014 KR 20140001522**

(71) Applicant: **Samsung Electronics Co., Ltd**
Gyeonggi-do 443-742 (KR)

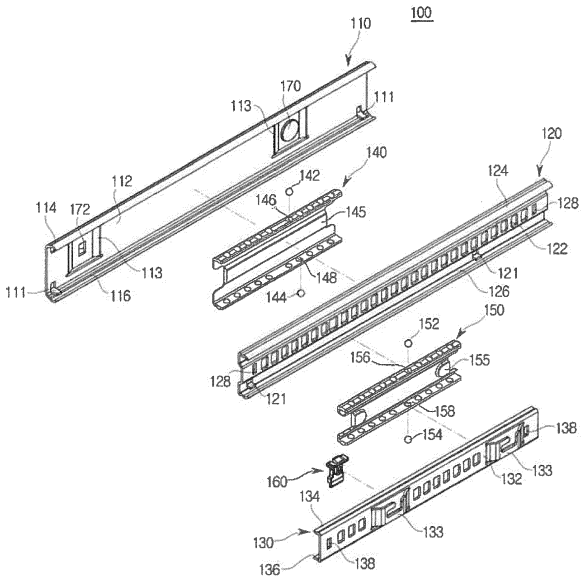
(72) Inventors:
- **Jeong, Heon Ho**
  Gyeonggi-do (KR)
- **Kim, Sung Jin**
  Gyeonggi-do (KR)
- **Joo, Jae Man**
  Gyeonggi-do (KR)

(74) Representative: **Walaski, Jan Filip et al**
Venner Shipley LLP
200 Aldersgate
London EC1A 4HD (GB)

(54) Dishwasher

(57) The present disclosure provides a dishwasher (1) having an improved basket pull-out structure. The dishwasher includes: a tub (20); a basket (40, 45) arranged inside the tub (20) for loading dishes; and a draw-out unit (100) arranged on either side of the basket (40, 45) for guiding the basket to be drawn out forward from the tub, wherein the draw-out unit (100) includes first (110), second (120), and third (130) rails, a plurality of first balls (142, 144) placed between the first (110) and second (120) rails, and a plurality of second balls (152, 154) placed between the second (120) and third (130) rails, and wherein the plurality of first balls (142, 144) and the plurality of second balls (152, 154) are arranged in vertical direction. According to the present disclosure, a slim draw-out unit may be provided by aligning ball bearings in vertical direction, thereby increasing the space utility of the dishwasher.

FIG. 4



EP 2 891 447 A1

Description

[0001] The present disclosure relates to dishwashers, and more particularly to a dishwasher with an improved pull-out structure of baskets.

[0002] In general, a dishwasher is a device for cleaning dishes by spraying high-pressure water at the dishes and typically runs washing, rinse, and dry cycles. The dishwasher removes dirt from the dishes by spraying water without throwing in detergent during a preliminary washing cycle, and cleans dishes by spraying water and simultaneously throwing in detergent in the main washing cycle. The dishwasher rinses the detergent from dishes by spraying water in the rinse cycle, and dries them in the dry cycle.

[0003] In the tub of the dishwasher in which dish washing is conducted, baskets for loading washable items (or dishes) are contained. In order for the user to conveniently load or remove the washable items, the baskets are installed to be drawn out forward from the tub. Draw-out units are installed on either side of the basket to guide the movement of the basket.

[0004] The draw-out unit commonly includes multiple rails, and the basket may be moved while being rolled along the rail with e.g., a roller. However, moving with the roller causes serious friction and big noise. Furthermore, due to vulnerability to shaking, the roller may derail, thus weakening the durability.

[0005] Accordingly, a draw-out unit that guides the basket with ball bearings instead of the roller has recently been introduced. However, such a draw-out unit also has a problem that the supporting structure of the ball bearing is weak in durability.

[0006] Moreover, the use of the multiple rails increases the volume of the draw-out unit, thereby inevitably reducing the space that holds washable items.

[0007] The present disclosure provides a dishwasher having a draw-out unit that uses ball bearings with good durability.

[0008] The present disclosure also provides a dishwasher that increases space efficiency with a small volume draw-out unit.

[0009] In accordance with an aspect of the present disclosure, a dishwasher is provided.

[0010] The dishwasher includes: a tub; a basket arranged inside the tub for loading dishes; and a draw-out unit arranged on either side of the basket for guiding the basket to be drawn out forward from the tub, wherein the draw-out unit includes first, second, and third rails, a plurality of first balls placed between the first and second rails, and a plurality of second balls placed between the second and third rails, and wherein the plurality of first balls and the plurality of second balls are arranged in vertical direction.

[0011] The first, second, and third rails may each be arranged to form a cross section including a coupling unit that extends in the vertical direction and upper and lower ends that bend toward one side.

[0012] The upper and lower ends of each of the first, second, and third rails may bend toward one side of the coupling unit in an identical form.

[0013] The coupling unit of the first rail may be formed to extend longer than the coupling unit of the second rail in the vertical direction, and the coupling unit of the second rail may be formed to extend longer than the coupling unit of the third rail in the vertical direction.

[0014] The first and second rails may be arranged such that the upper end of the second rail is placed below the upper end of the first rail and the lower end of the second rail is placed above the lower end of the first rail, and the second and third rails may be arranged such that the upper end of the third rail is placed below the upper end of the second rail and the lower end of the third rail is placed above the lower end of the second rail.

[0015] The plurality of first balls may include at least one first upper ball placed between the upper end of the first rail and the upper end of the second rail, and at least one first lower ball placed between the lower end of the first rail and the lower end of the second rail, and the plurality of second balls may include at least one second upper ball placed between the upper end of the second rail and the upper end of the third rail, and at least one second lower ball placed between the lower end of the second rail and the lower end of the third rail.

[0016] The dishwasher may further include a first retainer for holding the at least one first upper ball and the at least one first lower ball; and a second retainer for holding the at least one second upper ball and the at least one second lower ball.

[0017] The upper and lower ends of the second rail may be arranged toward the same direction as that of the upper and lower ends of the first rail, and the upper and lower ends of the third rail may be arranged toward the opposite direction of that of the upper and lower ends of the first rail.

[0018] The draw-out unit may include a first retainer placed between the first and second rails, and a second retainer placed between the second and third rails.

[0019] The first retainer may include a plurality of first ball installation units that hold the plurality of first balls, and the second retainer may include a plurality of second ball installation units that hold the plurality of second balls.

[0020] The first retainer may be installed to be able to move along the first rail, and the first rail may include a first fastening rib for preventing the first retainer from deviating from the first rail, and the second retainer may be installed to be able to move along the second rail, and the second rail may include a second fastening rib for preventing the second retainer from deviating from the second rail.

[0021] The first rail may be attached onto the inner side of the tub, the third rail may be coupled with the basket, and the second rail may be placed between the first and third rails.

[0022] The basket may include a coupling unit on each side, and the coupling unit may be coupled with the third

rail to movably support the basket.

[0023] The coupling unit may include a coupling projection that protrudes toward the third rail, and the third rail may include a coupling groove into which the coupling projection is fit.

[0024] The dishwasher may further include: a coupling member detachably coupled with the third rail so as to fasten the coupling projection fit into the coupling groove.

[0025] In accordance with another aspect of the present disclosure, a dishwasher is provided. The dishwasher includes: a tub; a basket arranged inside the tub for loading dishes; and a first rail fixed onto an inner wall of the tub; a second rail installed to be able to move along the first rail; a third rail installed to be able to move along the second rail and coupled with the basket; a first ball bearing placed between the first and second rails and arranged to be able to move along the first rail; and a second ball bearing placed between the second and third rails and arranged to be able to move along the second rail.

[0026] The first ball bearing may include at least one first ball and a first retainer for holding the at least one first ball, and the second ball bearing may include at least one second ball and a second retainer for holding the at least one second ball.

[0027] The at least one first ball and the at least one second ball may be arranged in vertical direction.

[0028] In accordance with another aspect of the present disclosure, a dishwasher is provided. The dishwasher includes: a tub; a basket arranged in the tub for loading dishes; and a draw-out unit installed between the tub and the basket, including a plurality of rails for guiding movement of the basket, wherein the plurality of rails include a first rail attached to the tub, a second rail arranged to have one side be adjacent to the first rail, and a third rail having one side be adjacent to the second rail and the other side coupled with the basket, and wherein the first rail is formed to extend longer than the second rail in the vertical direction, and the second rail is formed to extend longer than the third rail in the vertical direction.

[0029] The plurality of rails may each be formed to have a cross section that includes a coupling unit that extends in the vertical direction and upper and lower ends that bend from the coupling unit in the same direction.

[0030] The first and second rails may be arranged to have their upper and lower ends toward the basket, and the third rail may be arranged to have its upper and lower ends toward the opposite direction compared to the first and second rails.

[0031] The draw-out unit may include a first ball bearing placed between the first and second rails, and a second ball bearing placed between the second and third rails.

[0032] The first ball bearing may include a first upper ball placed between the upper end of the first rail and the upper end of the second rail, and a first lower ball placed between the lower end of the first rail and the lower end of the second rail, and the second ball bearing may include a second upper ball placed between the upper end of the second rail and the upper end of the third rail, and a second lower ball placed between the lower end of the second rail and the lower end of the third rail.

[0033] Other aspects, advantages, and salient features of the disclosure will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses exemplary embodiments of the disclosure.

[0034] The above and other features and advantages of the present disclosure will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

FIG. 1 illustrates a dishwasher, according to an embodiment of the present disclosure;

FIG. 2 illustrates a dishwasher with baskets drawn out, according to an embodiment of the present disclosure;

FIG. 3 is an exploded view of a dishwasher into a tub, a basket, and a draw-out unit, according to an embodiment of the present disclosure;

FIG. 4 is an exploded view of a draw-out unit of a dishwasher, according to an embodiment of the present disclosure;

FIG. 5 is a cross-sectional view of a draw-out unit of a dishwasher, according to an embodiment of the present disclosure; and

FIG. 6 illustrates combination of a draw-out unit and basket of a dishwasher, according to an embodiment of the present disclosure.

[0035] Throughout the drawings, like reference numerals will be understood to refer to like parts, components, and structures.

[0036] The present disclosure will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the disclosure are shown. The disclosure may, however, be embodied in many different forms and should not be construed as being 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 concept of the disclosure to those skilled in the art. Like reference numerals in the drawings denote like elements, and thus their description will be omitted.

[0037] In the description of the present disclosure, if it is determined that a detailed description of commonly-used technologies or structures related to embodiments of the present disclosure may unnecessarily obscure the subject matter of the invention, the detailed description will be omitted.

[0038] FIG. 1 illustrates a dishwasher 1, according to an embodiment of the present disclosure, and FIG. 2 illustrates the dishwasher 1 with baskets drawn out, according to an embodiment of the present disclosure.

[0039] The dishwasher 1 may include a case 10 that forms the exterior, and a tub 20 formed inside the case

10. The front side of the case 10 may be opened to load dishes in the tub 20 or withdraw them from the tub 20. A door 30 may be movably combined with the case 10 to open/close the tub 20.

[0040] The case 10 may have a form of a box, as shown in FIG. 1. However, the form of the case 10 is not limited to what is shown in FIG. 1, and may be in the form of a column or a multi-sided pillar, or in the form of a polyhedral box other than the cubical box. In addition, the dishwasher 1 may be implemented in other various forms that may be applied as the exterior of the dishwasher 1.

[0041] The door 30 may be moved in a certain direction to open or close the tub 20. There may be hinges (not shown) on an edge of the door 30 to rotate the door 30 in a certain direction.

[0042] The door 30 is installed in front of the tub 20, and the user may open the door 30 and load washable items inside the tub 20. A handle (not shown) may be attached onto the door 30 to help the user easily open or close the door 30. A detergent container 31 may be arranged on the inner side of the door 30 for containing detergent.

[0043] The tub 20 may have a form that corresponds to the shape of the case 10. The tub 20 may thus be in the form of a box, but is not limited thereto. The tub 20 may be in the form of a column or a multi-sided pillar, or in the form of a polyhedral box other than the cubical box. However, the tub 20 may not be necessarily formed to correspond to the shape of the case 10.

[0044] Inside of the tub 20, there may be baskets 40, 45 for loading dishes and a spraying unit 50 for spraying water. The spraying unit 50 may spray water at the dishes loaded in the baskets 40, 45 to clean the dishes by using at least one nozzle (not shown).

[0045] The baskets 40, 45 may be wire racks formed of wires so that water does not pool but drains. The baskets 40, 45 may include an upper basket 40 arranged on the upper part of the tub 20 and a lower basket 45 arranged on the lower part of the tub 20. For convenience of explanation, the upper basket 40 will now be just called basket.

[0046] As shown in FIG. 2, the basket 40 may be drawn out forward from the tub 20. For this, the dishwasher 1 may include a draw-out unit 100 that guides the basket 40 to be drawn out forward from the tub 20. The user may load dishes in the basket 40 drawn out with the draw-out unit 100 and push the basket 40 back to the inside of the tub 20 to clean the dishes. After dish washing is finished, the user may draw out the basket 40 forward from the tub 20 and take out the cleaned dishes.

[0047] FIG. 3 is an exploded view of the dishwasher 1 into the tub 20, the basket 40, and the draw-out unit 100, according to an embodiment of the present disclosure. For convenience of explanation, only one basket 40 is shown and the top and bottom faces of the tub 20 are omitted in FIG. 3.

[0048] To have the basket 40 supported by the tub 20, the draw-out unit 100 may be installed between the tub 20 and the basket 40. As shown in FIG. 3, a pair of draw-out units 100 are attached on the inner sides of the tub 20 and coupled with both sides of the basket 40.

[0049] The basket 40 may include a pair of coupling units 60 on the sides of the basket 40 to correspond to the pair of draw-out units 100. The coupling unit 60 may be coupled with the draw-out unit 100 for movably supporting the basket 40. Specifically, one side of the draw-out unit 100 is attached onto the inner side of the tub 20 and the other side is coupled with the basket 40.

[0050] To draw out the basket 40 as much distance as desired, the draw-out unit 100 may include multiple rails. Hereinafter, for convenience of explanation, one draw-out unit 100 and one coupling unit 60 are described because the pair of draw-out units 100 and the pair of coupling units 60 are identically configured, respectively.

[0051] FIG. 4 is an exploded view of the draw-out unit 100 of the dishwasher 1, according to an embodiment of the present disclosure, and FIG. 5 is a cross-sectional view of the draw-out unit of 100 a dishwasher 1, according to an embodiment of the present disclosure.

[0052] The draw-out unit 100 may include a first rail 110, a second rail 120, and a third rail 130 for enabling double withdrawal. The first rail 110 may be fixed onto the inner side of the tub 20, and the third rail 130 may be coupled with the basket 40. The second rail 120 is placed between the first rail 110 and the third rail 130 for expanding the movable distance of the basket 40.

[0053] The draw-out unit 100 may further include ball bearings 140, 150 placed between rails 110, 120, 130 for making the rails 110, 120, 130 smoothly slide in/out. The ball bearings 140, 150 may include a first ball bearing 140 placed between the first and second rails 110 and 120, and a second ball bearing 150 between the second and third rails 120 and 130.

[0054] The first ball bearing 140 may include at least one first ball 142, 144, and a first retainer 145 for holding the at least one first ball 142, 144. The second ball bearing 150 may include at least one second ball 152, 154, and a second retainer 155 for holding the at least one second ball 152, 154.

[0055] The first retainer 145 may include first ball installation units 146, 148 for holding the first balls 142, 144. The first ball installation units 146, 148 may be placed at a certain distance so that the first balls 142, 144 may be taken at the certain distance. The first ball installation units 146, 148 may include a first upper ball installation unit 146 placed on the upper part of the first retainer 145 and a first lower ball installation unit 148 on the lower part of the first retainer 145.

[0056] The first balls 142, 144 may include the first upper ball 142 taken in the first upper ball installation unit 146 and the first lower ball 144 taken in the first lower ball installation unit 148. There may be a plurality of first upper and lower balls 142 and 144 taken in the first upper and lower installment units 146, 148, respectively.

[0057] The first retainer 145 may be formed to be able to move along the first rail 110. As shown in FIG. 4, the

first retainer 145 may have the form of a short rail. To prevent the first retainer 145 from deviating from the first rail 110, the first rail 110 may include a first fastening rib 111.

[0058] The second retainer 155 may include a second upper ball installation unit 156 and a second lower ball installation unit 158, and the second balls 152, 154 may include the second upper ball 152 and the second lower ball 154. The second retainer 155 may be formed to be able to move along the second rail 120, and the second rail 120 may include a second fastening rib 121 to prevent the second retainer 155 from deviating from the second rail 120.

[0059] The first and second fastening ribs 111 and 121 are arranged on the first and second rails 110 and 120, respectively, and the position of them may be adjusted to move the basket 40 as much distance as desired.

[0060] Referring to FIG. 5, a cross-sectional view of the rails 110, 120, 130 are shown, in which connection units 112, 122, 132 extended in the vertical direction, and upper ends 114, 124, 134 and lower ends 116, 126, 136 that bend toward one side may be included. The upper ends 114, 124, 134 and lower ends 116, 126, 136 of the rails 110, 120, 130 may bend toward one side of the connection units 112, 122, 132 in the identical form.

[0061] Specifically, all of the first rail 110, second rail 120, and third rail 130 may be identically formed to include connection units 112, 122, 132, and upper and lower ends 114, 124, 134 and 116, 126, 136 which bend toward one side.

[0062] Hereinafter, the connection unit, upper end, and lower end of the first rail 110 are referred to as first connection unit 112, first upper end 114, and first lower end 116, respectively; the connection unit, upper end, and lower end of the second rail 120 are referred to as second connection unit 122, second upper end 124, and second lower end 126, respectively; and the connection unit, upper end, and lower end of the third rail 130 are referred to as second connection unit 132, second upper end 134, and second lower end 136, respectively.

[0063] The first connection unit 112 may be formed to extend in the vertical direction longer than the second connection unit 122 does, and the second connection unit 122 may be formed to extend in the vertical direction longer than the third connection unit 132 does. That is, the first rail 110, the second rail 120, the third rail 130 decreasingly extend in the vertical direction.

[0064] Accordingly, at least a part of the second rail 120 may be secured in a space formed by the first upper and lower ends 114 and 116 which bend toward one side of the first connection unit 112. Furthermore, at least a part of the third rail 130 may be secured in a space formed by the second upper and lower ends 124 and 126 which bend toward one side of the second connection unit 122.

[0065] In other words, the first and second rails 110 and 120 may be arranged such that the second upper end 124 is placed below the first upper end 114 and the second lower end 126 is placed above the first lower end 116. Furthermore, the second and third rails 120 and 130 may be arranged such that the third upper end 134 is placed below the second upper end 124 and the third lower end 136 is placed above the second lower end 126.

[0066] As shown in FIGS. 3 and 4, the second upper and lower ends 124 and 126 may be arranged to be in the same direction as that of the first upper and lower ends 114 and 116, and the third upper and lower ends 134 and 136 may be arranged to be in the opposite direction of that of the first upper and lower ends 114 and 116.

[0067] For the tub 20 and basket 40, the first and second rails 110 and 120 may have the upper ends 114, 124 and lower ends 116, 126 arranged toward the basket 40, and the third rail 130 may be arranged toward the opposite direction of the first and second rails 110 and 120, the inner side of the tub 20.

[0068] As to coupling of the draw-out unit 100, the first ball bearing 140 may be fit into the first rail 110 such that the first upper ball 142 comes in contact with the bottom part of the first upper end 114 and the first lower ball 144 comes in contact with the top part of the first lower end 116. The first ball bearing 140 moves along the first rail 110 while the first ball 142, 144 is rotating, without being deviated from the first rail due to the first fastening rib 111.

[0069] The first ball bearing 140 may be fit into the second rail 120 such that the first upper ball 142 comes in contact with the top part of the second upper end 124 and the first lower ball 144 comes in contact with the bottom part of the second lower end 126. That is, the first upper ball 142 is placed between the bottom part of the first upper end 114 and the top part of the second upper end 124, and the first lower ball 144 is placed between the top part of the first lower end 116 and the bottom part of the second lower end 126.

[0070] The second connection unit 122 may be arranged to be adjacent to the first connection unit 112, and the first upper and lower ends 114, 116 and the second upper and lower ends 124, 126 may be placed in parallel in the same direction. Furthermore, the second rail 120 may include second fastening projections 128 at either end, which protrude toward the first ball bearing 140. The second fastening projections 128 may protect at least one end of the second rail 120 from being deviated from the first ball bearing 140.

[0071] The second ball bearing 150 may be fit into the second rail 120 on the opposite side of the side on which the first ball bearing 140 is coupled with, and the third rail 130 may be fit into the second ball bearing 150. That is, the second upper ball 152 is placed between the bottom part of the second upper end 124 and the top part of the third upper end 134, and the second lower ball 154 is placed between the top part of the second lower end 126 and the bottom part of the third lower end 136.

[0072] The third connection unit 132 may be arranged to be symmetrical to the second connection unit 122, and the second upper and lower ends 124, 126 and the third upper and lower ends 134, 136 may be placed in parallel

in opposite directions. Furthermore, the third rail 132 may include third fastening projections 138 that protrude toward the second ball bearing 150, and the third fastening projections 138 may protect at least one end of the third rail 130 from being deviated from the second ball bearing 150.

[0073] As discussed above, since the first rail 110, second rail 120, and the third rail 130 may be formed to differ in length in the vertical direction, the third rail 130 may be secured in the second rail 120, which may be secured in the first rail 110. Due to this, the first ball bearing 140 placed between the first rail 110 and the second rail 120 may be formed to extend longer than the second ball bearing 150 placed between the second rail 120 and the third rail 130 in the vertical direction.

[0074] Accordingly, the first balls 142, 144 and second balls 152, 154 may be aligned in the vertical direction, respectively. As shown in FIG. 5, the first upper ball 142 may be placed above the second upper ball 152, and the first lower ball 144 may be placed below the second lower ball 154. In other words, because of the difference in length in the vertical direction between the first and second ball bearings 140 and 150, all of the first balls 142, 144 and second balls 152, 154 may be placed in the vertical direction. This structure of the draw-out unit 100 may reduce the entire volume of the draw-out unit 100.

[0075] As shown in FIG. 5, the first rail 110 may be fixed on the inner side of the tub 20.

[0076] As shown in FIG. 4, the first rail 110 may include a fastening unit 113 for fastening the first rail 110 to the tub 20. There may be multiple fastening units 113 formed on the first connection unit 112, and in FIG. 4, two fastening units 113 are shown to be separated at a certain distance.

[0077] The fastening unit 113 may be formed to protrude toward the inner side of the tub 20 so as to securely contact the tub 20. A fastening opening 172 may be formed on the fastening unit 113 for a fastening member 170 to go through. In order for the fastening member 170 to go through the first rail 110 and the tub 20, an opening 22 (see FIG. 3) corresponding to the fastening opening 172 may be formed on the tub 20.

[0078] The fastening member 170 may have a male screw form with a head part, as shown in FIG. 5, but is not limited thereto and may have various forms. The fastening member 170 may go through the first rail 110 and the tub 20 and be coupled with a fastening coupling member 178 placed on the outer side of the tub 20, thereby fastening the first rail 110 to the tub 20. Leakage protection members 174, 176 may be arranged on the inner and outer sides of the tub 20, respectively, to prevent cleaning water from being leaked through the opening 22 (see FIG. 3) formed on the tub 20.

[0079] FIG. 6 illustrates combination of the draw-out unit 100 and basket 40 of the dishwasher 1, according to an embodiment of the present disclosure.

[0080] As discussed above, the draw-out unit 100 may be coupled with the coupling unit 60 of the basket 40, and specifically, the third rail 130 may be coupled with the coupling unit 60. The coupling unit 60 may include a moving unit 64 coupled with the third rail 130, and a handle unit 66 and an elevator unit 68 for moving the basket 40 up and down.

[0081] The elevator unit 68 may be fixed onto a side of the basket 40, and the moving unit 64 may be movably coupled with the basket 40. When the user grips and takes down the handle unit 66, the elevator unit 68 ascends with the basket 40 and the moving unit 64 maintains its original position while descending along the wire of the basket 40. Moving the basket 40 up and down may lead to convenient loading of washable items.

[0082] The moving unit 64 may include a coupling projection 62 that protrudes toward the third rail 130, which may include a coupling groove 135 into which the coupling projection 62 is fit. There may be one or more coupling projections 62 and corresponding coupling grooves 135, and in FIG. 6, two pairs of coupling projections 62 and coupling grooves 135 are shown. The coupling projections 62 and coupling grooves 135 may each be located at a certain distance, and one of the coupling grooves 135 is not shown in FIG. 6 because it is hidden by the second rail 120.

[0083] The coupling projection 62 may be formed to include a wide head part, and the coupling groove 135 may be formed as a passage narrower than the width of the head part of the coupling projection 62. Accordingly, the coupling groove 135 may be formed as an opening having a groove formed at one end, and the coupling projection 62 may be inserted into the coupling groove 135 through the groove.

[0084] The coupling groove 135 may be formed such that the coupling projection 62 may be inserted from top to bottom of the coupling home 135 and be fastened by a movement to a side. Accordingly, the coupling projection 62 may be fastened in the vertical direction by being secured through the passage of the coupling groove 135. In this regard, in order to fasten the coupling projection 62 in the horizontal direction, the coupling groove 135 may include a coupling member 160 detachably coupled with the coupling groove 135.

[0085] The coupling member 160 may be fit in the coupling unit 133 that protrudes toward the basket 40 so as for the third rail 130 to form the coupling groove 135. The coupling member 160 includes a top end 162 and a bottom end 166 to be stuck in the coupling unit 133, and the top end 162 may include a hook. The coupling member 160 may also include a projection unit 164 that protrudes to be stuck in the coupling groove 135.

[0086] In other words, the coupling projection 62 may be fit through the passage into the coupling groove 135, and the coupling member 160 may be fit in the coupling unit 133 to secure the coupling projection 62. The bottom end 166 of the coupling member 160 may be fit in the coupling unit 133, and the top end 162 of the coupling member 160 may be fastened to the coupling unit 133 by being hooked up to the coupling unit 133.

[0087] According to the present disclosure, a slim draw-out unit may be provided by aligning ball bearings in vertical direction, thereby increasing the space utility of the dishwasher. Furthermore, the durability of the dishwasher may be improved with three-tier assembly of 'C'-shaped rails, and smooth operation may be guaranteed with the ball bearings.

[0088] Several embodiments have been described but a person of ordinary skill in the art will understand and appreciate that various modifications can be made without departing the scope of the present invention as defined by the claims.

Claims

1. A dishwasher comprising:

a tub;
a basket arranged inside the tub to load dishes; and
a draw-out unit arranged on a side of the basket to guide the basket to be drawn out forward from the tub,
wherein the draw-out unit includes first, second, and third rails, a plurality of first balls placed between the first and second rails, and a plurality of second balls placed between the second and third rails, and
wherein the plurality of first balls and the plurality of second balls are arranged in a vertical direction.

2. The dishwasher of claim 1, wherein the first, second, and third rails are each arranged to form a cross section including a coupling unit that extends in the vertical direction and upper and lower ends that bend toward one side.

3. The dishwasher of claim 2, wherein the upper and lower ends of each respective rail of the first, second, and third rails bend toward one side of the coupling unit of the respective rail in an identical form.

4. The dishwasher of claim 3, wherein the coupling unit of the first rail is formed to extend longer than the coupling unit of the second rail in the vertical direction, and the coupling unit of the second rail is formed to extend longer than the coupling unit of the third rail in the vertical direction.

5. The dishwasher of claim 4, wherein
the first and second rails are arranged such that the upper end of the second rail is placed below the upper end of the first rail and the lower end of the second rail is placed above the lower end of the first rail, and the second and third rails are arranged such that the upper end of the third rail is placed below the upper end of the second rail and the lower end of the third rail is placed above the lower end of the second rail.

6. The dishwasher of claim 5, wherein
the plurality of first balls include at least one first upper ball placed between the upper end of the first rail and the upper end of the second rail, and at least one first lower ball placed between the lower end of the first rail and the lower end of the second rail, and
the plurality of second balls include at least one second upper ball placed between the upper end of the second rail and the upper end of the third rail, and at least one second lower ball placed between the lower end of the second rail and the lower end of the third rail.

7. The dishwasher of claim 6, further comprising:

a first retainer to hold the at least one first upper ball and the at least one first lower ball; and
a second retainer to hold the at least one second upper ball and the at least one second lower ball.

8. The dishwasher of claim 3, wherein
the upper and lower ends of the second rail are arranged toward a same direction as that of the upper and lower ends of the first rail, and
the upper and lower ends of the third rail are arranged toward an opposite direction of that of the upper and lower ends of the first rail.

9. The dishwasher of claim 1, wherein the draw-out unit includes a first retainer placed between the first and second rails, and a second retainer placed between the second and third rails.

10. The dishwasher of claim 9, wherein the first retainer includes a plurality of first ball installation units that hold the plurality of first balls, and the second retainer includes a plurality of second ball installation units that hold the plurality of second balls.

11. The dishwasher of claim 9, wherein
the first retainer is installed to be able to move along the first rail, and the first rail includes a first fastening rib to prevent the first retainer from deviating from the first rail, and
the second retainer is installed to be able to move along the second rail, and the second rail includes a second fastening rib to prevent the second retainer from deviating from the second rail.

12. The dishwasher of claim 1, wherein the first rail is attached onto an inner side of the tub, the third rail is coupled with the basket, and the second rail is between the first and third rails.

13. The dishwasher of claim 12, further comprising:

a coupling unit on a side of the basket and being coupled with the third rail to movably support the basket.

14. The dishwasher of claim 13, wherein the coupling unit includes a coupling projection that protrudes toward the third rail, and the third rail includes a coupling groove into which the coupling projection is fit.

15. The dishwasher of claim 14, further comprising:

a coupling member detachably coupled with the third rail so as to fasten the coupling projection fit into the coupling groove.

FIG. 1

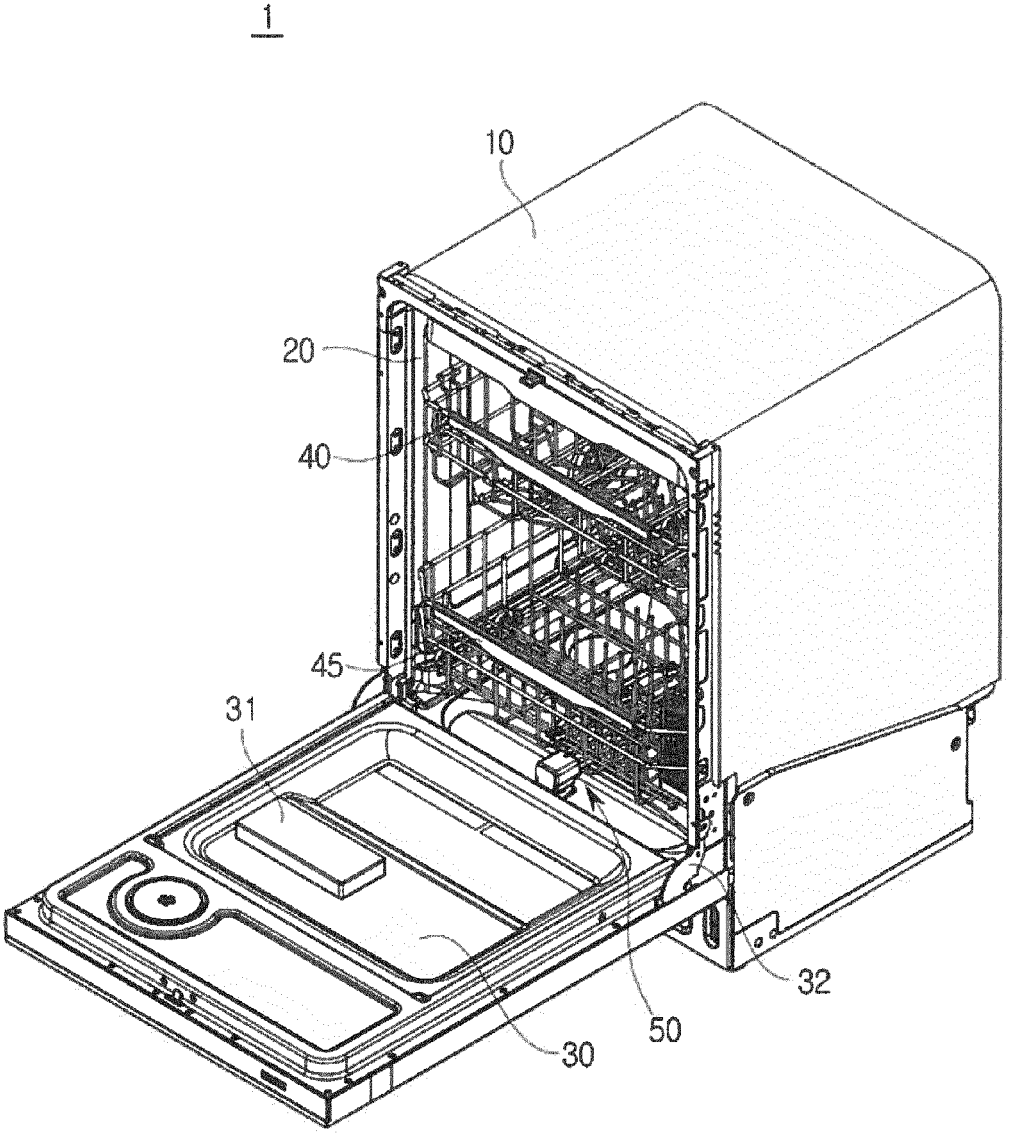


FIG. 2

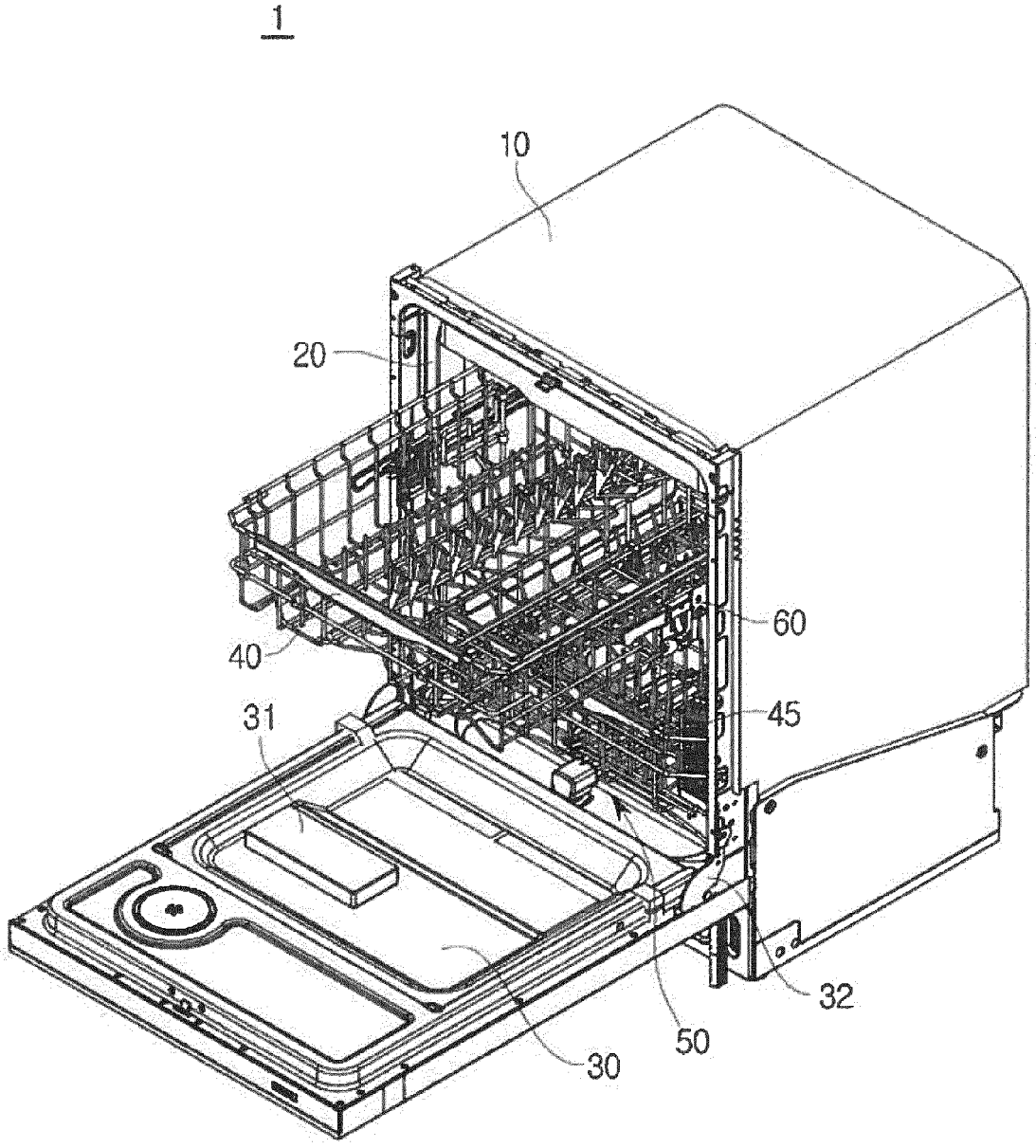


FIG. 3

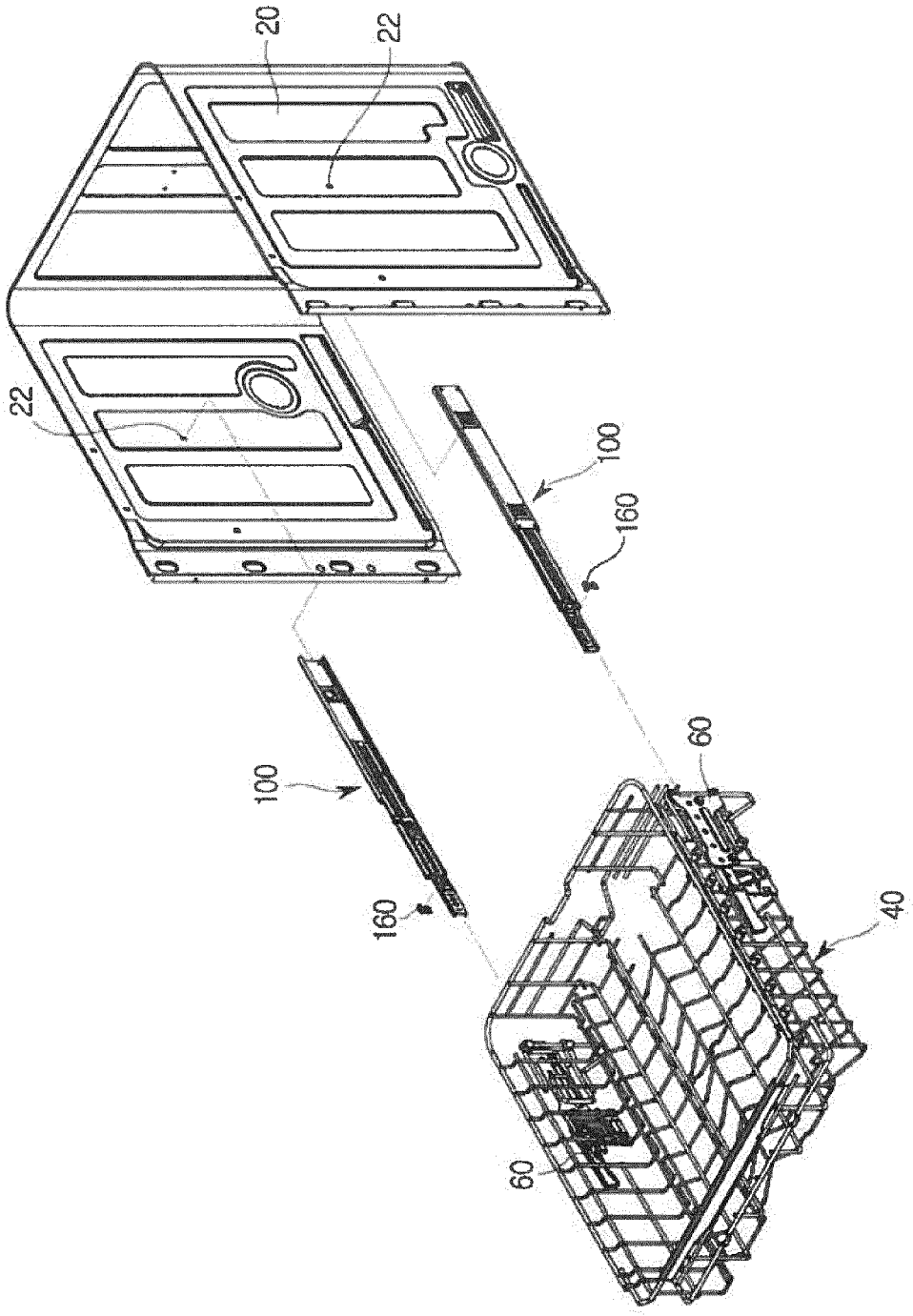


FIG. 4

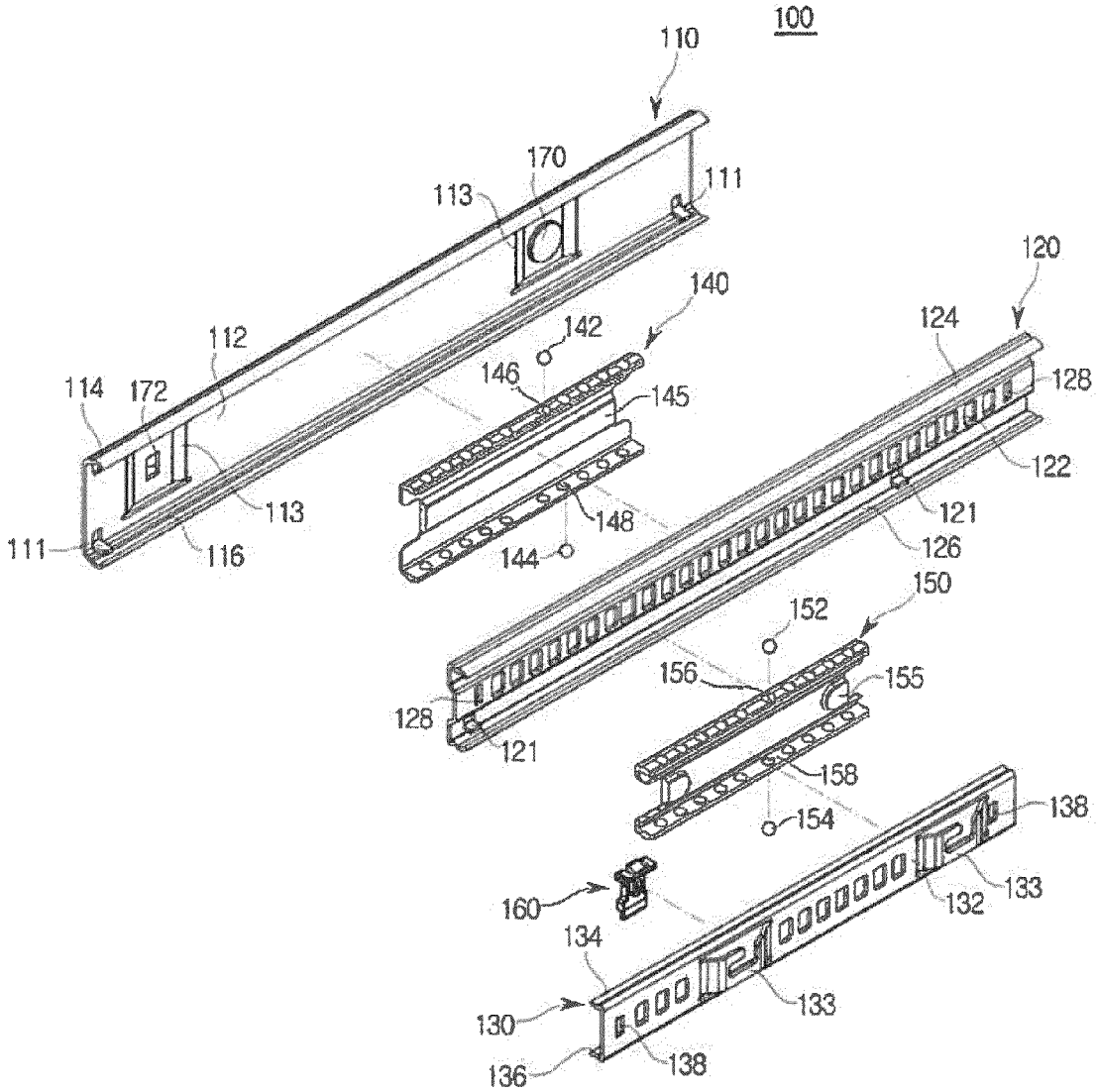

100
110
170
113
111
120
140
142
124
112
146
145
128
114
172
122
148
113
121
111
116
144
126
150
152
156
155
128
121
158
154
138
160
133
132
134
133
130
138
136

FIG. 5

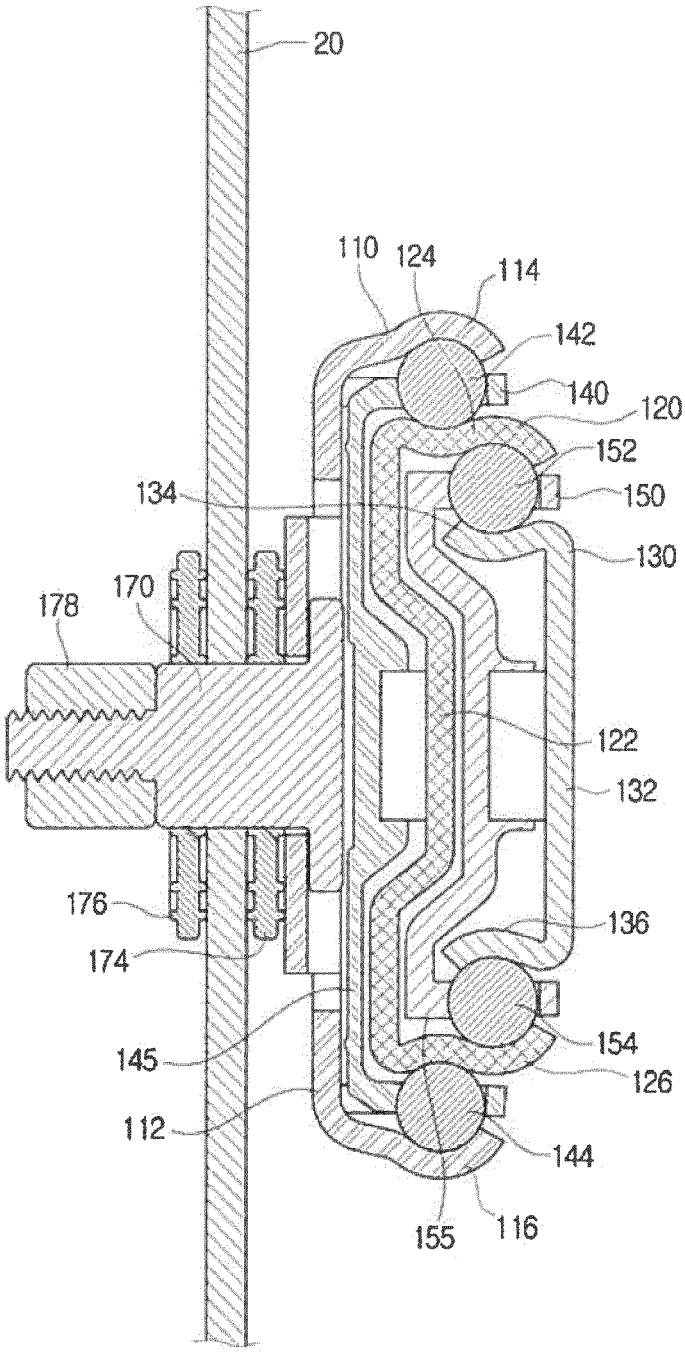
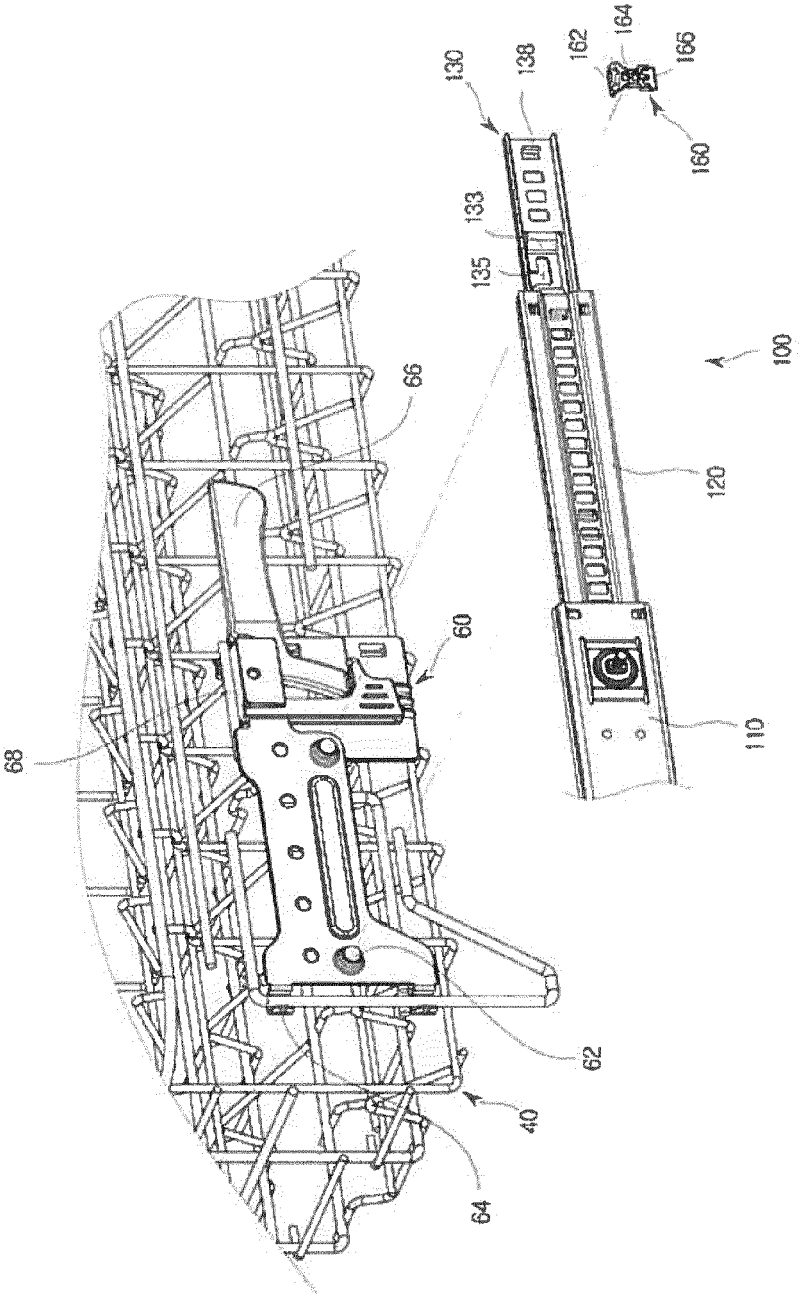

20
110
124
114
142
140
120
152
150
134
130
178
170
122
132
176
136
174
154
145
126
112
144
155
116

FIG. 6



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 15 0114

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	US 2010/051067 A1 (DALSING TROY [SE]) 4 March 2010 (2010-03-04) * paragraph [0028] *	1-15	INV. A47L15/50
X	WO 2012/025717 A2 (ACCURIDE INT LTD [GB]; FOSTER SAMUEL [GB]; BAYLES PETER WILLIAM [GB]) 1 March 2012 (2012-03-01) * the whole document *	1-11, 13-15	
X	DE 20 2008 000708 U1 (HETTICH PAUL GMBH & CO KG [DE]) 28 May 2009 (2009-05-28) * the whole document *	1-15	
X	EP 2 481 990 A1 (LAAG S R L [IT]) 1 August 2012 (2012-08-01) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC) A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 May 2015	Jezierski, Krzysztof

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 15 0114

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.

04-05-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010051067 A1	04-03-2010	US 2010051067 A1	04-03-2010
		US 2013154458 A1	20-06-2013
WO 2012025717 A2	01-03-2012	CN 103492735 A	01-01-2014
		DE 202011110428 U1	13-12-2013
		EP 2608698 A2	03-07-2013
		US 2014348447 A1	27-11-2014
		WO 2012025717 A2	01-03-2012
DE 202008000708 U1	28-05-2009	NONE	
EP 2481990 A1	01-08-2012	DE 102011120736 A1	02-08-2012
		DE 202012012545 U1	06-05-2013
		EP 2481990 A1	01-08-2012

EPO FORM P0459

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