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(54) **CLOTHES DRIER**

WÄSCHETROCKNER

SÈCHE-LINGE

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Description

TECHNICAL FIELD

[0001] The present invention relates to a clothes dryer for drying clothes.

BACKGROUND ART

[0002] A conventional clothes dryer is provided with a yarn waste catcher called lint filter. The lint filter catches lint generated from clothes (for example, see PTL 1 and PTL 2).

[0003] The conventional clothes dryer includes at least a drying drum provided with a loading port through which clothes are loaded, and a door. The drying drum has a bottomed cylindrical shape having the loading port on a front surface side, and a bottom portion on a rear surface side. The drying drum rotates around a rotation axis defined horizontally. The door is opened when a user loads clothes into the drying drum or removes clothes from the drying drum.

[0004] An air supply fan is provided on the rear surface side of the drying drum. Drying air is supplied from the rear surface side of the drying drum to the front surface side thereof by rotation of the air supply fan. The drying air supplied into the drying drum passes through the door and flows through a circulating path formed below the drying drum, and again reaches the air supply fan. Clothes are dried by utilizing circulation of drying air in this manner.

[0005] In this case, the circulating drying air contains lint generated from clothes. The lint generated from clothes reaches the air supply fan or a heater, and causes problems in some cases. To prevent these problems, a lint filter is provided on the door to catch the lint.

[0006] When cleaning the lint filter, the user opens the door, and detaches the lint filter from the door. Then, the user discards foreign matters such as lint caught by the lint filter.

[0007] In the conventional clothes dryer, the lint filter is detachably attached to the door. In this case, if the lint filter is not securely accommodated within the door, a gap produced between the lint filter and the door may cause leakage of circulating drying air from the circulating path. When this leakage occurs, a supply amount of the drying air circulating within the circulating path decreases, and deteriorates clothes drying performance within the drying drum. In addition, lint which has not been caught by the lint filter and has passed therethrough may reach a heat exchanger in the circulating path, and accumulate on the heat exchanger. As a result, heat exchange efficiency of the heat exchanger lowers, and the drying performance further deteriorates.

[0008] Simplification and easiness of attachment and detachment are desired for the lint filter which is repeatedly attached and detached, considering labor of maintenance and the like. In addition, secure sealing is also desired so as to prevent deterioration of drying performance caused by leakage of drying air from a circulating duct. Similarly, excellent sealing is required so as to prevent contamination of an exterior of the clothes dryer by lint or the like contained in drying air and leaked from circulating duct.

Citation list

Patent Literatures

[0009]

PTL 1: Unexamined Japanese Patent Publication No. 2005-177502
PTL 2: WO 2005/121437 A

[0010] DE 85 35 335 U1 relates to a lint filter device for a domestic laundry clothes dryer. The lint filter is arranged in an upwardly open chute which is a part of the pot of the loading door of the laundry clothes dryer.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide an improved and useful clothes dryer in which the above-mentioned problems are eliminated. In order to achieve the above-mentioned object, there is provided a clothes dryer according to claim 1. Advantageous embodiments are defined by the dependent claims.

[0012] Advantageously, the clothes dryer includes a drying chamber that accommodates clothes, a loading port through which clothes are loaded into and removed from the drying chamber, a door that closes the loading port, and a lint filter that is detachably attached to the door. The door includes an accommodating unit that is disposed opposed to the loading port and that accommodates the lint filter. The lint filter and the accommodating unit are connected with each other via a sealing unit. The sealing unit is inclined with respect to a vertical direction.

[0013] According to this structure, the lint filter is accommodated within the accommodating unit along a sloped surface formed in an inner surface of the accommodating unit of the door. This structure air-tightly seals the sealing unit between the lint filter and the sloped surface of the accommodating unit by utilizing the weight of the lint filter, thereby providing a secure sealing structure between the lint filter and the accommodating unit. Accordingly, this structure prevents leakage of dust such as lint from the interior of an air path where drying air circulates. As a result, this structure facilitates attachment and detachment of the lint filter to and from the accommodating unit of the door, and increases sealing. This structure therefore provides a clothes dryer capable of achieving high drying performance.

BRIEF DESCRIPTION OF DRAWINGS

[0014]

FIG. 1 is a front view of a clothes dryer according to an exemplary embodiment of the present invention.
FIG. 2 is a cross-sectional side view of the clothes dryer according to the exemplary embodiment.
FIG. 3 is a rear perspective view of the clothes dryer according to the exemplary embodiment.
FIG. 4 is a view schematically illustrating a heat pump device of the clothes dryer according to the exemplary embodiment.
FIG. 5 is a front perspective view of a door of the clothes dryer according to the exemplary embodiment.
FIG. 6 is a rear perspective view of the door of the clothes dryer according to the exemplary embodiment.
FIG. 7A is a side view of the door of the clothes dryer according to the exemplary embodiment.
FIG. 7B is a rear view of the door of the clothes dryer according to the exemplary embodiment.
FIG. 8 is a cross-sectional view taken along line 8-8 in FIG. 7B.
FIG. 9A is a cross-sectional side view illustrating a part of the door of the clothes dryer according to the exemplary embodiment.
FIG. 9B is a cross-sectional side view illustrating a part of the door of the clothes dryer according to the exemplary embodiment.
FIG. 9C is an enlarged view illustrating a main part of the clothes dryer according to the exemplary embodiment.
FIG. 10A is a perspective view illustrating an upper part of the door of the clothes dryer according to the exemplary embodiment.
FIG. 10B is a perspective view illustrating the upper part of the door of the clothes dryer according to the exemplary embodiment.

DESCRIPTION OF EMBODIMENT

[0015] A clothes dryer according an exemplary embodiment of the present invention is hereinafter described with reference to the drawings. The following description is merely a specific example of the present invention, and therefore does not intend to limit the scope of the present invention.

EXEMPLARY EMBODIMENT

[0016] A structure of a clothes dryer according to an exemplary embodiment of the present invention is hereinafter described with reference to FIGS. 1 to 4.

[0017] FIG. 1 is a front view of the clothes dryer according to the exemplary embodiment of the present invention. FIG. 2 is a cross-sectional side view of the clothes dryer according to the exemplary embodiment. FIG. 3 is a rear perspective view of the clothes dryer according to the exemplary embodiment. FIG. 4 is a view schematically illustrating a heat pump device of the clothes dryer according to the exemplary embodiment.

[0018] As illustrated in FIGS. 1 to 4, clothes dryer 100 according to this exemplary embodiment includes housing 110, and provides a drying function for drying clothes within housing 110 by utilizing circulation of drying air.

[0019] Housing 110 includes front wall 111, rear wall 112 on a side opposite to front wall 111, left wall 113 standing between front wall 111 and rear wall 112, right wall 114 on a side opposite to left wall 113, and top wall 115 closing an area surrounded by upper edges of these walls 111 to 114. Loading port 116 is formed in front wall 111 of housing 110. Loading port 116 is a port through which a user loads clothes into housing 110.

[0020] As illustrated in FIGS. 1 and 2, clothes dryer 100 includes door 120 attached to front wall 111. Door 120 has opening handle 123. Door 120 rotationally shifts between an opened position and a closed position on body coupling hinge 125 (see FIG. 7B). Door 120 shown in FIG. 1 is in the closed position.

[0021] A clothes drying operation performed by the clothes dryer according to this exemplary embodiment is hereinafter described briefly.

[0022] First, the user shifts door 120 to the opened position by pulling opening handle 123 provided on door 120 to the front to open loading port 116. Then, the user loads clothes into housing 110 through loading port 116. Thereafter, the user shifts door 120 to the closed position to close loading port 116. At this time, door 120 is fixed to the closed position by door lock lever 124 (see FIG. 7B).

[0023] When controller 200 shown in FIG. 2 detects the closure of door lock lever 124 to a body side of clothes dryer 100, controller 200 brings clothes dryer 100 into a state for starting clothes drying. Then, clothes drying is started to dry the clothes loaded into rotary drum 320 constituting a drying chamber.

[0024] Clothes drying is performed by the foregoing operation.

[0025] As illustrated in FIG. 1, clothes dryer 100 according to this exemplary embodiment further includes operation panel 201. Operation panel 201 is equipped as a part of front wall 111 of housing 110. The user is allowed to set various types of operation courses by operating operation panel 201.

[0026] Clothes dryer 100 performs drying operation based on course information output from operation panel 201. At this time, the user shifts door 120 to the opened position in advance, and loads clothes into rotary drum 320 through loading port 116. Thereafter, the user shifts door 120 to the closed position to start the clothes drying operation.

[0027] Rotary drum 320 constituting the drying chamber has a bottomed cylindrical shape. Rotary drum 320 is disposed such that an axial center of the rotation axis

of rotary drum 320 is horizontal, and that loading port 116 is located on the front surface side.

[0028] As illustrated in FIGS. 2 and 3, double-shaft drive motor 310 is provided on a bottom surface of clothes dryer 100. Drum drive pulley 311 for rotating rotary drum 320 is provided on front rotary drive shaft 310a of double-shaft drive motor 310. Drum drive belt 312 fitted to drum drive pulley 311 is attached to an outer circumference of rotary drum 320. On the other hand, fan drive pulley 313 for rotating air supply fan 331 is provided on rear rotary drive shaft 310b of double-shaft drive motor 310. A driving force of double-shaft drive motor 310 is transmitted to air supply fan 331 via fan drive belt 314 fitted to fan drive pulley 313.

[0029] In this case, air supply fan 331 disposed on a downstream side of heat pump device 420 sucks drying air supplied from upstream air-supply path 480. Then, air supply fan 331 delivers drying air to downstream air-supply path 332 of fan case 330.

[0030] With rotation of double-shaft drive motor 310, the clothes accommodated into rotary drum 320 is repeatedly agitated, in which the clothes are raised in a rotation direction, and dropped from an appropriate position. At this time, drying air is supplied from circulating duct 430 into rotary drum 320 in accordance with rotation of air supply fan 331.

[0031] The drying air is then introduced into rotary drum 320 where the clothes are agitated as described above, and the drying air is caused to efficiently collide with the clothes. As a result, the clothes are dried in an appropriate manner.

[0032] As illustrated in FIG. 2, circulating duct 430 for circulating drying air provided in clothes dryer 100 according to this exemplary embodiment includes lint filter 510, filter 482, heat pump device 420, and fan case 330 accommodating the air supply fan. Fan case 330 is coupled with rear plate 117 provided between rotary drum 320 and rear wall 112 of housing 110. Lint filter 510 accommodated in an accommodating unit of door 120 catches lint. Filter 482 disposed in a lower part of clothes dryer 100 and on an upstream side of heat pump device 420 catches foreign matters having passed through lint filter 510. Circulating duct 430 further includes upstream air-supply path 480 disposed between lint filter 510 and filter 482.

[0033] Clothes dryer 100 according to this exemplary embodiment includes heat pump device 420 illustrated in FIG. 4. Heat pump device 420 exchanges heat with drying air having passed through rotary drum 320 within circulating duct 430. Heat pump device 420 is disposed on a flow path of drying air flowing from rotary drum 320 to air supply fan 331. Heat pump device 420 exchanges heat with air flowing toward air supply fan 331, and produces high-temperature and dry air to supply the air to rotary drum 320.

[0034] Further, as illustrated in FIG. 4, heat pump device 420 includes dehumidifier 421 for dehumidifying air, and heater 422 for heating air. Both dehumidifier 421 and heater 422 are provided within circulating duct 430. While drying air passes through dehumidifier 421 of heat pump device 420 after passing through lint filter 510, dehumidifier 421 dehumidifies the drying air and lowers a humidity of the drying air. Then, the dehumidified drying air passes through heater 422 to be heated. In other words, heat pump device 420 exchanges heat with most drying air having passed through rotary drum 320 to produce high-temperature and low-humidity drying air used for drying clothes.

[0035] The structure of the heat pump device in the clothes dryer according to this exemplary embodiment is hereinafter described in detail with reference to FIG. 4.

[0036] As illustrated in FIG. 4, heat pump device 420 includes at least compressor 423, expansion valve 424, first circulating tube 425, and second circulating tube 426. Compressor 423 compresses working medium (for example, refrigerant). Expansion valve 424 reduces pressure of the working medium. First circulating tube 425 guides the working medium flowing from expansion valve 424 to compressor 423. Second circulating tube 426 guides the working medium flowing from compressor 423 to expansion valve 424. First circulating tube 425 and second circulating tube 426 form a closed loop passing through compressor 423 and expansion valve 424. First circulating tube 425 and second circulating tube 426 are provided so as to project into circulating duct 430 which guides air sucked by air blower 410.

[0037] Specifically, the pressure of the working medium flowing through first circulating tube 425 is reduced by expansion valve 424, whereby the temperature of the working medium is reduced to a low temperature. The working medium flowing through second circulating tube 426 is compressed by compressor 423, whereby the temperature of the working medium is increased to a high temperature.

[0038] First circulating tube 425 of heat pump device 420 is folded multiple times to define a flow path of the working medium within circulating duct 430. A number of fins are attached to first circulating tube 425 thus folded. Thus, first circulating tube 425 and fins 427 within circulating duct 430 constitute dehumidifier 421 of heat pump device 420.

[0039] Similarly, second circulating tube 426 of heat pump device 420 is folded multiple times to define a flow path of the working medium within circulating duct 430. A number of fins are attached to second circulating tube 426 thus folded. Second circulating tube 426 and fins 428 within circulating duct 430 constitute heater 422 of heat pump device 420.

[0040] The operation of the heat pump device and the flow of drying air in the clothes dryer are now described more specifically.

[0041] First, drying air flowing within circulating duct 430 is cooled by first circulating tube 425 and fins 427 constituting dehumidifier 421 and cooled by the low-temperature working medium. As a result, water vapors within the drying air condense on first circulating tube 425

and fins 427. The drying air is dehumidified in this manner.

[0042] Thereafter, the dehumidified drying air is heated by second circulating tube 426 and fins 428 constituting heater 422 and heated by the high-temperature working medium. As a result, the drying air becomes high-temperature dry air suitable for drying clothes.

[0043] In other words, dehumidifier 421 and heater 422 exchanges heat with air flowing within circulating duct 430 to produce drying air.

[0044] Then, air supply fan 331 sucks the drying air dehumidified and heated by heat pump device 420, and supplies the drying air to downstream air-supply path 332 of fan case 330. The supplied drying air flows through opening 432 of rear plate 117 into space 450 between the bottom surface of rotary drum 320 and rear plate 117.

[0045] Thereafter, the drying air flows through a number of ventilation holes (not shown) formed in bottom wall 321 of rotary drum 320, and enters rotary drum 320. The drying air thus entered collides with the clothes while passing through rotary drum 320. This collision between the drying air and the clothes dries the clothes. At this time, the drying air discharged from rotary drum 320 receives water vapors or the like from the clothes, and the humidity of the drying air rises. Simultaneously, dust containing lint generated from the clothes, hair attached to the clothes and the like are captured, and made to float by the drying air discharged from rotary drum 320.

[0046] Thereafter, the drying air containing dust such as lint and having a high humidity is supplied to door air-supply holes 122 (see FIG. 6) of accommodating unit 121 attached to a rear surface of door 120. The drying air supplied to door air-supply holes 122 passes through lint filter 510. At this time, lint filter 510 catches the dust such as lint floating within the drying air and removes the dust.

[0047] The drying air having passed through lint filter 510 further passes through upstream air-supply path 480, and then through filter 482. Then, the lint or the like having passed through lint filter 510 is caught by filter 482 and removed.

[0048] Thereafter, the drying air flows from suction introduction port 481 into heat pump device 420, where the drying air is dehumidified by dehumidifier 421 and heated by heater 422. The drying air dehumidified and heated to high-temperature passes through suction discharge port 429. Then, the drying air is again sucked by air supply fan 331, and supplied to downstream air-supply path 332.

[0049] The clothes are therefore dried by the drying air allowed to circulate within circulating duct 430 and rotary drum 320 by the operation of the heat pump device and the flow of the drying air described above.

[0050] A structure of lint filter 510 in the clothes dryer according to this exemplary embodiment is hereinafter described with reference to FIGS. 5 to 10B.

[0051] FIG. 5 is a front perspective view illustrating the door of the clothes dryer according to the exemplary embodiment of the present invention. FIG. 6 is a rear perspective view illustrating the door of the clothes dryer according to the exemplary embodiment. FIG. 7A is a side view of the door illustrating the clothes dryer according to the exemplary embodiment. FIG. 7B is a rear view illustrating the door of the clothes dryer according to the exemplary embodiment. FIG. 8 is a cross-sectional view taken along line 8-8 in FIG. 7B. FIGS. 10A and 10B are perspective views illustrating an upper part of the door of the clothes dryer according to the exemplary embodiment.

[0052] As described above, lint filter 510 according to this exemplary embodiment catches dust such as lint floating within drying air discharged from rotary drum 320.

[0053] Lint filter 510 is inserted into accommodating unit 121 of door 120 from above with door 120 opened, and is detachably attached to accommodating unit 121 of door 120.

[0054] On the other hand, filter 482 is inserted from below front wall 111 of housing 110, for example, and detachably attached to suction introduction port 481 connected with heat pump device 420 on a downstream side of upstream air-supply path 480. Filter 482 is formed of a sponge material, for example.

[0055] Lint filter 510 and filter 482 are removed from accommodating unit 121 of door 120 and from below front wall 111 of housing 110, respectively. Then, lint accumulated on lint filter 510 and filter 482 is removed. Maintenance work for lint filter 510 and filter 482 is achieved in this manner. Moreover, dust such as lint contained in the circulating drying air can be almost completely removed by lint filter 510 and filter 482.

[0056] As illustrated in FIGS. 6 to 8, lint filter 510 at least includes mesh filter 511 constituting a filter unit, frame 512, seal packing 513, and lock unit 514. Mesh filter 511 catches dust such as lint to remove the dust. Frame 512 fixes and holds mesh filter 511. Seal packing 513 is provided on a rear surface side of lint filter 510 (door air-supply holes 122 side of accommodating unit 121) to function as a sealing unit. In addition, seal packing 513 makes contact with press-contact wall 126 of accommodating unit 121 of door 120 shown in FIG. 8 to maintain airtightness between accommodating unit 121 and lint filter 510. Note that the sealing unit is only required to maintain airtightness between door 120 and lint filter 510, and therefore may be provided on a door 120 side, for example.

[0057] Lock unit 514 provided in an upper portion of lint filter 510 fixes lint filter 510 to accommodating unit 121 of door 120, to lock lint filter 510 thereto.

[0058] Lock unit 514 includes lock mechanism 516 for locking lint filter 510 to door 120, and operation unit 517 for shifting lock mechanism 516 toward left and right.

[0059] As illustrated in FIG. 7B, when lint filter 510 is accommodated within accommodating unit 121 of door 120, lock unit 514 is locked with operation unit 517 of lock unit 514 located at a center, and is unlocked with operation unit 517 slid toward the right and located on a right side.

[0060] Specifically, when operation unit 517 and lock mechanism 516 of lock unit 514 are located at positions shown in FIG. 6, a position of recess 129 of accommodating unit 121 does not agree with a position of lock mechanism 516 as indicated by solid line arrow A in FIG. 6 (see FIG. 10B). Therefore, lint filter 510 cannot be accommodated within accommodating unit 121. For accommodating lint filter 510, operation unit 517 of lock unit 514 is slid toward the right to shift lock mechanism 516 toward the right and bring lock unit 514 into an unlocked state, as illustrated in FIG. 6. In this state, lint filter 510 is inserted into accommodating unit 121 of door 120 from above. At this time, the position of recess 129 of accommodating unit 121 agrees with the position of lock mechanism 516 as indicated by broken line arrow B in FIG. 6. As a result, lock mechanism 516 of lock unit 514 is fitted into recess 129 located in an upper portion of accommodating unit 121. When operation unit 517 of lock unit 514 is slid toward the left with lock mechanism 516 fitted to recess 129, lock mechanism 516 shifts from recess 129 of accommodating unit 121 toward the left. As a result, lint filter 510 is accommodated within door 120 (see FIG. 10A). This allows lint filter 510 to be securely accommodated within accommodating unit 121 of door 120.

[0061] As illustrated in FIG. 7A, communicating port 130 communicating with upstream air-supply path 480 is formed in a lower portion of accommodating unit 121 of door 120 in which lint filter 510 is accommodated. Accordingly, drying air circulated by air supply fan 331 flows from rotary drum 320 through door air-supply holes 122 of door 120, and then passes through lint filter 510 accommodated in accommodating unit 121. Subsequently, the drying air flows from communicating port 130 of accommodating unit 121 toward upstream air-supply path 480.

[0062] Simplification and easiness of attachment and detachment are desired for lint filter 510 which is repeatedly attached and detached, considering labor of maintenance and the like. In addition, secure sealing is also desired so as to prevent deterioration of drying performance caused by leakage of drying air from circulating duct 430. Similarly, excellent sealing is required so as to prevent contamination of an exterior of clothes dryer 100 by lint or the like contained in drying air and leaked from circulating duct 430.

[0063] Therefore, projection 515 is further provided on side surface 512b of frame 512 of lint filter 510 according to this exemplary embodiment so as to secure simplification of attachment and detachment, and a high degree of sealing.

[0064] Operation and effect of projection 515 provided on lint filter 510 according to this exemplary embodiment are hereinafter described with reference to FIGS. 9A to 9C.

[0065] FIGS. 9A and 9B are cross-sectional side views illustrating a part of the door of the clothes dryer according to the exemplary embodiment. FIG. 9C is an enlarged view of portion C shown in FIG. 9A.

[0066] As illustrated in FIG. 9A, projection 515 of lint filter 510 shifts along groove-shaped guide portion 127 formed on an inner side of accommodating unit 121 of door 120, for example. With this structure, lint filter 510 is guided toward an accurate position of accommodating unit 121 of door 120 and accommodated in accommodating unit 121. In other words, guide portion 127 of accommodating unit 121 guides projection 515 of lint filter 510, whereby attachment of lint filter 510 to accommodating unit 121 is facilitated. Moreover, lint filter 510 is accurately attached to accommodating unit 121, whereby leakage of air caused by attachment of lint filter 510 to an inaccurate position is prevented.

[0067] Moreover, guide portion 127 further includes bent portion 128 in a lower portion (communicating port 130 side) of guide portion 127 as illustrated in FIG. 9A. Bent portion 128 is configured such that a predetermined angle is formed by upper portion 128a and lower portion 128b of bent portion 128.

[0068] When lint filter 510 is accommodated within accommodating unit 121 as illustrated in FIG. 9B, projection 515 shifts toward press-contact wall 126 side of accommodating unit 121 by the angle of bent portion 128. In this case, seal packing 513 of lint filter 510 is pressed against press-contact wall 126 of accommodating unit 121, and lint filter 510 is accommodated within accommodating unit 121. Accordingly, lint filter 510 is securely accommodated within accommodating unit 121 without looseness between lint filter 510 and accommodating unit 121 and without easy separation therebetween. Moreover, bent portion 128 is bent in such a direction as to press seal packing 513 of lint filter 510 against press-contact wall 126 of accommodating unit 121. In this case, tight contact between lint filter 510 and accommodating unit 121 produced by seal packing 513 increases. This structure prevents leakage of air from a gap between lint filter 510 and accommodating unit 121, thereby improving drying performance.

[0069] As illustrated in FIG. 8, press-contact wall 126 of accommodating unit 121 in contact with seal packing 513 of lint filter 510 is inclined from accommodating port 121b of accommodating unit 121 toward communicating port 130 with respect to the vertical direction. In other words, lint filter 510 is inclined so as to ride on a wall surface of press-contact wall 126. Specifically, in the closed state of door 120, upper portion 126a of press-contact wall 126 projects from lower portion 126b toward loading port 116. In this case, press-contact wall 126 is inclined such that lower portion 126b is larger in thickness than upper portion 126a as viewed in the cross section of press-contact wall 126. In other words, the inner surface of accommodating unit 121 forms a sloped surface of a substantially trapezoidal shape (including trapezoidal shape) as viewed in the cross-sectional view. In this case, lint filter 510 is brought into press-contact with press-contact wall 126 of accommodating unit 121 by a weight of lint filter 510. As a result, airtightness between lint filter 510 and accommodating unit 121 is further im-

proved by seal packing 513 of lint filter 510 provided on the surface opposed to press-contact wall 126.

[0070] Moreover, as illustrated in FIG. 9A, an attachment surface of seal packing 513 attached to lint filter 510 has a substantially trapezoidal shape (or trapezoidal shape) having a sloped surface which substantially agrees (or agrees) with a reversed shape of the inner surface of accommodating unit 121. Specifically, in the closed state of door 120, upper portion 510a of the attachment surface of seal packing 513 of lint filter 510 projects from lower portion 510b toward loading port 116. In this case, the weight of lint filter 510 is given in such a direction as to bring lint filter 510 into tight contact with press-contact wall 126, whereby the seal structure is more securely formed. This structure prevents leakage of lint or the like, and leakage of drying air from the air duct ranging from door air-supply holes 122 to communicating port 130 by a simple seal structure. Accordingly, this structure secures sufficient drying performance allowed by circulation of drying air, and the dehumidification and heating functions of heat pump device 420.

[0071] Furthermore, lock unit 514 of lint filter 510 disposed in an upper portion of frame 512 securely attaches and fixes lint filter 510 to door 120. In this case, it is required to properly fix lint filter 510 to accommodating unit 121 by lock unit 514.

[0072] When lint filter 510 is not properly accommodated in accommodating unit 121, lint filter 510 has the following structure so as to prevent closure of door 120.

[0073] That is, as illustrated in FIG. 9B, closure of door 120 is allowed in a state where upper end 512a of frame 512 of lint filter 510 and upper end 121a of accommodating unit 121 are substantially in alignment (or in alignment) with each other. On the other hand, when upper end 512a of frame 512 and upper end 121a of accommodating unit 121 do not substantially in alignment with each other, lint filter 510 makes contact with loading port 116, and door 120 cannot be properly closed.

[0074] Moreover, when it is attempted to accommodate link filter 510 into accommodating unit 121 with lock unit 514 slid to a locked state as indicated by solid line arrow A in FIG. 6, lock mechanism 516 of lock unit 514 interferes with upper end 121a of accommodating unit 121. In this case, lint filter 510 cannot be properly accommodated in accommodating unit 121 (see FIG. 10A). Therefore, as indicated by broken line arrow B in FIG. 6, lock mechanism 516 of lint filter 510 is inserted into recess 129 of accommodating unit 121 in the unlocked state (state where operation unit 517 is slid toward the right) of lock unit 514. Then, operation unit 517 of lock unit 514 is slid toward the left to bring lock unit 514 into the locked state (see FIG. 10B).

[0075] Lint filter 510 having the foregoing structure prevents closure of door 120 when lint filter 510 is not properly accommodated in accommodating unit 121. This structure allows drying operation to be performed while maintaining sufficient sealing between lint filter 510 and press-contact wall 126 of accommodating unit 121.

[0076] Furthermore, this structure prevents attachment of lint filter 510 to an inaccurate position of accommodating unit 121. Accordingly, this structure prevents leakage of air from the press-contact surface between lint filter 510 and accommodating unit 121. In addition, this structure prevents leakage of lint or the like to the outside from the air duct ranging from door air-supply holes 122 to communicating port 130. As a result, this structure secures the drying function achieved by circulation of drying air and the dehumidification and heating functions provided by the heat pump device.

[0077] Note that, such a structure is allowed in which an elastic body such as a spring is disposed in a lower portion of lock unit 514, for example, so as to prevent closure of door 120 when the user attempts to close door 120 without locking lock unit 514. In this case, if lock unit 514 is in the unlocked state without locking of lock unit 514, an upper end of lock unit 514 (such as upper end of operation unit 517) interferes with loading port 116 by a push-up force of the spring as an elastic body. Therefore, closure of door 120 is not allowed. For closing door 120, lock unit 514 is pushed downward while resisting the elastic repulsive force of the spring. Then, lock unit 514 is slid toward the left to come into the locked state (see FIG. 10B) and the upper end of lock unit 514 is lowered to a height not interfering with loading port 116. This structure more securely attaches lint filter 510 to accommodating unit 121 while preventing such a problem that lock unit 514 of lint filter 510 is left unlocked. Accordingly, this structure prevents lowering of sealing caused when lint filter 510 floats upward during drying operation. Moreover, this structure more securely prevents leakage of lint or the like, and leakage of drying air to the outside from the air duct ranging from door air-supply holes 122 to communicating port 130. Accordingly, this structure secures sufficient drying performance allowed by circulation of drying air, and the dehumidification and heating functions of heat pump device 420.

[0078] In addition, lint filter 510 includes the elastic body such as the foregoing spring within lock unit 514 so as to allow locking of lock unit 514 when the upper end of frame 512 and the upper end of accommodating unit 121 are substantially in alignment with each other. In this case, lock unit 514 pressed downward by the elastic body comes into contact with accommodating unit 121 of door 120, and lint filter 510 is pressed downward via lock unit 514. This structure prevents lowering of sealing caused when lint filter 510 floats upward during drying operation. Moreover, this structure more securely prevents leakage of lint or the like to the outside from the air duct ranging from door air-supply holes 122 to the communicating port 130. Accordingly, this structure secures sufficient drying performance allowed by circulation of drying air, and the dehumidification and heating functions of heat pump device 420.

[0079] In addition, such a structure is allowed which merely interferes with lock unit 514, for example, prevents locking by lock unit 514 when the user attempts to

slide lock unit 514 positioned in the upper portion of lint filter 510 to the locked state in a state where projection 515 has not reached bent portion 128 of guide portion 127. This structure allows the user to easily recognize an inaccurate use state. As a result, this structure prevents leakage of air caused by attachment of lint filter 510 to an inaccurate position of accommodating unit 121, thereby improving drying performance.

[0080] As described above, the clothes dryer according to the present invention includes a drying chamber that accommodates clothes, a loading port through which the clothes are loaded into and removed from the drying chamber, a door that closes the loading port, and a lint filter that is detachably attached to the door. The door includes an accommodating unit that is disposed opposed to the loading port and that accommodates the lint filter. The lint filter and the accommodating unit are connected with each other via a sealing unit. The sealing unit is inclined with respect to a vertical direction.

[0081] According to this structure, the lint filter is accommodated within the accommodating unit along a sloped surface formed in an inner surface of the accommodating unit of the door. This structure air-tightly seals the sealing unit between the lint filter and the sloped surface of the accommodating unit by utilizing the weight of the lint filter, thereby providing a secure sealing structure between the lint filter and the accommodating unit. Accordingly, this structure prevents leakage of dust such as lint from the interior of an air path where drying air circulates. As a result, this structure facilitates attachment and detachment of the lint filter to and from the accommodating unit of the door, and increases sealing. This structure therefore provides a clothes dryer capable of achieving high drying performance.

[0082] According to the clothes dryer of the present invention, the lint filter may include a filter unit that catches lint, and a frame that holds the filter unit. An upper portion of the frame may be thicker than a lower portion of the frame.

[0083] This structure forms the inclined sealing unit. The lower portion of the frame of the lint filter has a tapered shape. Accordingly, this structure further facilitates attachment and detachment of the lint filter to and from the accommodating unit.

[0084] According to the clothes dryer of the present invention, the door includes a guide portion. The lint filter includes a projection fitted to the guide portion.

[0085] According to this structure, the guide portion guides the projection to allow the lint filter to be accommodated in the accommodating unit. Accordingly, this structure facilitates attachment of the lint filter to the accommodating unit. In addition, this structure accurately attaches the lint filter to the accommodating unit. This structure therefore prevents attachment of the lint filter to an inaccurate position of the accommodating unit. Accordingly, this structure prevents displacement of the lint filter from the accommodating unit, with reduction of leakage of drying air, thereby preventing deterioration of drying performance.

[0086] According to the clothes dryer of the present invention, the guide portion further includes is a bent portion. The bent portion is configured to have an upper portion and a lower portion bent into a predetermined angle.

[0087] This structure securely accommodates the lint filter into the accommodating unit without looseness, and reduces separation between the lint filter and the accommodating unit. Moreover, this structure increases tight contact of the sealing unit. Accordingly, this structure prevents leakage of air from a gap between the lint filter and the accommodating unit, and improves drying performance.

INDUSTRIAL APPLICABILITY

[0088] The present invention is advantageous in such fields as clothes dryers where easy attachment and detachment of a lint filter and high airtightness are demanded.

REFERENCE MARKS IN THE DRAWINGS

[0089]

100 clothes dryer
110 housing
111 front wall
112 rear wall
113 left wall
114 right wall
115 top wall
116 loading port
117 rear plate
120 door
121 accommodating unit
121a, 512a upper end
121b accommodating port
122 door air-supply hole
123 opening handle
124 door lock lever
125 body coupling hinge
126 press-contact wall
126a, 128a, 510a upper portion
126b, 128b, 510b lower portion
127 guide portion
128 bent portion
129 recess
130 communicating port
200 controller
201 operation panel
310 double-shaft drive motor
310a front rotary drive shaft
310b rear rotary drive shaft
311 drum drive pulley
312 drum drive belt
313 fan drive pulley
314 fan drive belt

320 rotary drum (drying chamber)
321 bottom wall
330 fan case
331 air supply fan
332 downstream air-supply path
410 air blower
420 heat pump device
421 dehumidifier
422 heater
423 compressor
424 expansion valve
425 first circulating tube
426 second circulating tube
427,428 fin
429 suction discharge port
430 circulating duct
432 opening
450 space
480 upstream air-supply path
481 suction introduction port
482 filter
510 lint filter
511 mesh filter (filter unit)
512 frame
512b side surface
513 seal packing (sealing unit)
514 lock unit
515 projection
516 lock mechanism
517 operation unit

Claims

1. A clothes dryer (100) comprising:

   a drying chamber (320) that accommodates clothes;
   a loading port (116) through which the clothes are loaded into and removed from the drying chamber (320);
   a door (120) that closes the loading port (116); and
   a lint filter (510) that is detachably attached to the door (120),
   wherein the door (120) includes an accommodating unit (121) that is disposed opposed to the loading port (116) and that accommodates the lint filter (510),
   the lint filter (510) and the accommodating unit (121) are connected with each other via a sealing unit (513), **characterized in that**
   the sealing unit (513) is inclined with respect to a vertical direction,
   wherein
   the door (120) includes a guide portion (127), and
   the lint filter (511) includes a projection (515) fitted to the guide portion (127),
   wherein
   the guide portion (127) further includes a bent portion (128) in a lower portion of the guide portion (127) and configured to have an upper portion and a lower portion bent into a predetermined angle, wherein the sealing unit (513) of the lint filter (510) is pressed against a press-contact wall (126) of the accommodating unit (121).

2. The clothes dryer (100) according to claim 1, wherein the lint filter (510) includes a filter unit (511) that catches lint, and a frame (512) that holds the filter unit (511), and
   an upper portion of the frame (512) is thicker than a lower portion of the frame (512).

Patentansprüche

1. Wäschetrockner (100), der Folgendes umfasst:

   eine Trocknungskammer (320), die Wäsche aufnimmt;
   eine Ladeöffnung (116), durch die die Wäsche in die Trocknungskammer (320) geladen wird und aus ihr entnommen wird;
   eine Tür (120), die die Ladeöffnung (116) schließt; und
   einen Flusenfilter (510), der abnehmbar an der Tür (120) angebracht ist,
   wobei die Tür (120) eine Aufnahmeeinheit (121) enthält, die gegenüber der Ladeöffnung (116) angeordnet ist und die den Flusenfilter (510) aufnimmt,
   wobei
   der Flusenfilter (510) und die Aufnahmeeinheit (121) über eine Dichtungseinheit (513) miteinander verbunden sind, **dadurch gekennzeichnet, dass**
   die Dichtungseinheit (513) in Bezug auf eine vertikale Richtung geneigt ist,
   wobei die Tür (120) einen Führungsabschnitt (127) enthält, und
   der Flusenfilter (511) einen Vorsprung (515) aufweist, der in den Führungsabschnitt (127) eingepasst ist,
   wobei
   der Führungsabschnitt (127) ferner in einem unteren Abschnitt des Führungsabschnitts (127) einen Biegeabschnitt (128) enthält und so konfiguriert ist, dass er einen oberen Abschnitt und einen unteren Abschnitt, die in einem vorgegebenen Winkel gebogen sind, besitzt, wobei die Dichtungseinheit (513) des Flusenfilters (510) gegen eine Druckkontaktwand (126) der Aufnahmeeinheit (121) gedrückt wird.

2. Wäschetrockner (100) nach Anspruch 1, wobei der Flusenfilter (510) eine Filtereinheit (511), die Flusen fängt, und einen Rahmen (512), der die Filtereinheit (511) hält, enthält und
ein oberer Abschnitt des Rahmens (512) dicker als ein unterer Abschnitt des Rahmens (512) ist.

Revendications

1. Sèche-linge (100) comprenant :

une chambre de séchage (320) qui reçoit des vêtements ;
une ouverture de chargement (116) par laquelle les vêtements sont chargés dans et retirés de la chambre de séchage (320) ;
une porte (120) qui ferme l'ouverture de chargement (116) ; et
un filtre à charpie (510) qui est attaché de manière amovible à la porte (120),
où la porte (120) inclut une unité de réception (121) qui est disposée à l'opposé de l'ouverture de chargement (116) et qui reçoit le filtre à charpie (510) ;
le filtre à charpie (510) et l'unité de réception (121) sont connectés l'un à l'autre par l'intermédiaire d'une unité de d'étanchéité (513), **caractérisé en ce que**
l'unité d'étanchéité (513) est inclinée par rapport à une direction verticale,
où
la porte (120) inclut une partie de guidage (127), et
le filtre à charpie (511) inclut une saillie (515) encastrée dans la partie de guidage (127),
où
la partie de guidage (127) inclut en outre une partie courbée (128) dans une partie inférieure de la partie de guidage (127) et configurée pour avoir une partie supérieure et une partie inférieure inclinées selon un angle prédéterminé, où l'unité d'étanchéité (513) du filtre à charpie (510) est pressée contre une paroi de contact à pression (126) de l'unité de réception (121).

2. Sèche-linge (100) selon la revendication 1, où le filtre à charpie (510) inclut une unité de filtrage (511) qui retient des charpies et un cadre (512) qui maintient l'unité de filtrage (511), et
une partie supérieure du cadre (512) est plus épaisse qu'une partie inférieure du cadre (512).

FIG. 1

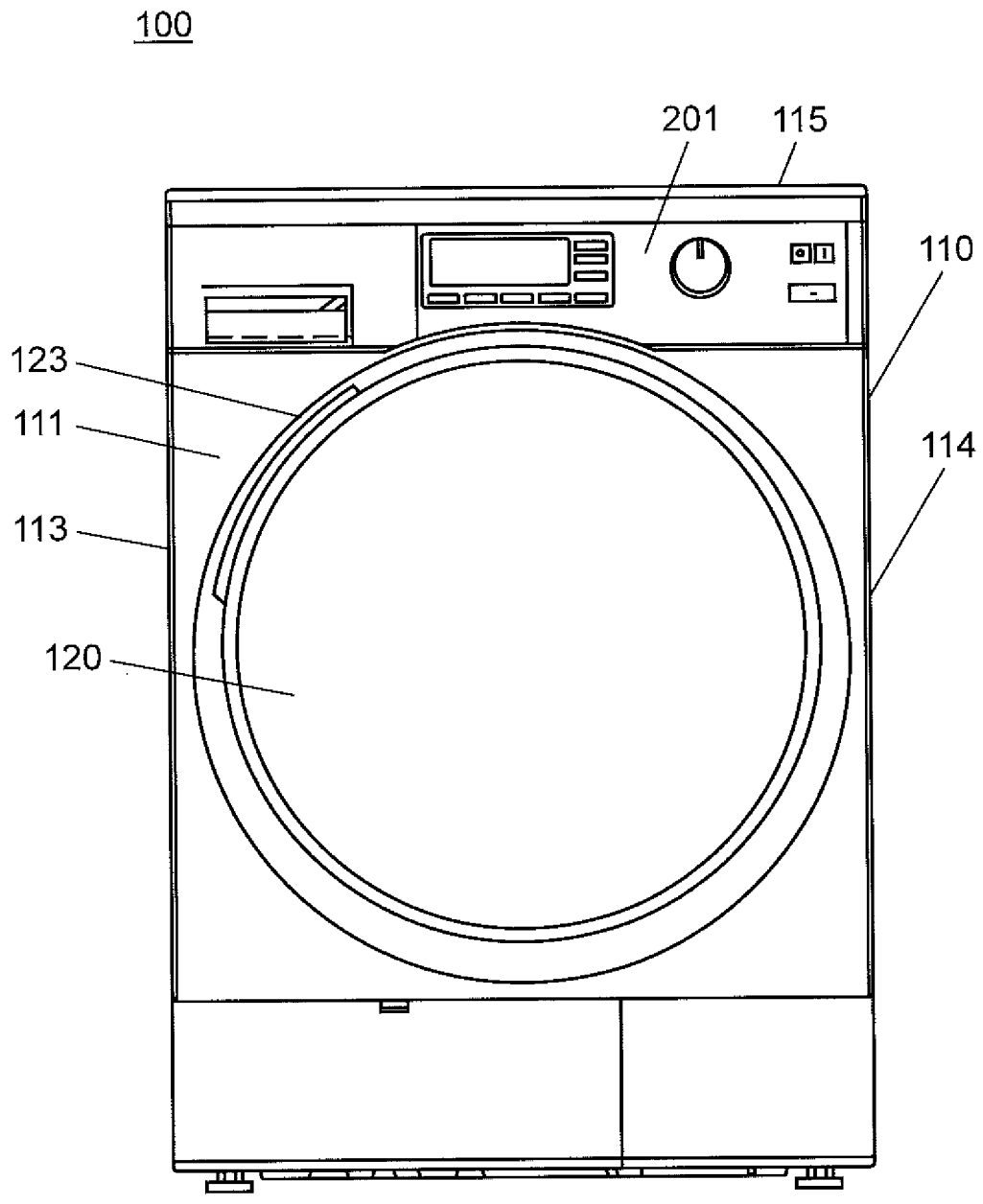


FIG. 2

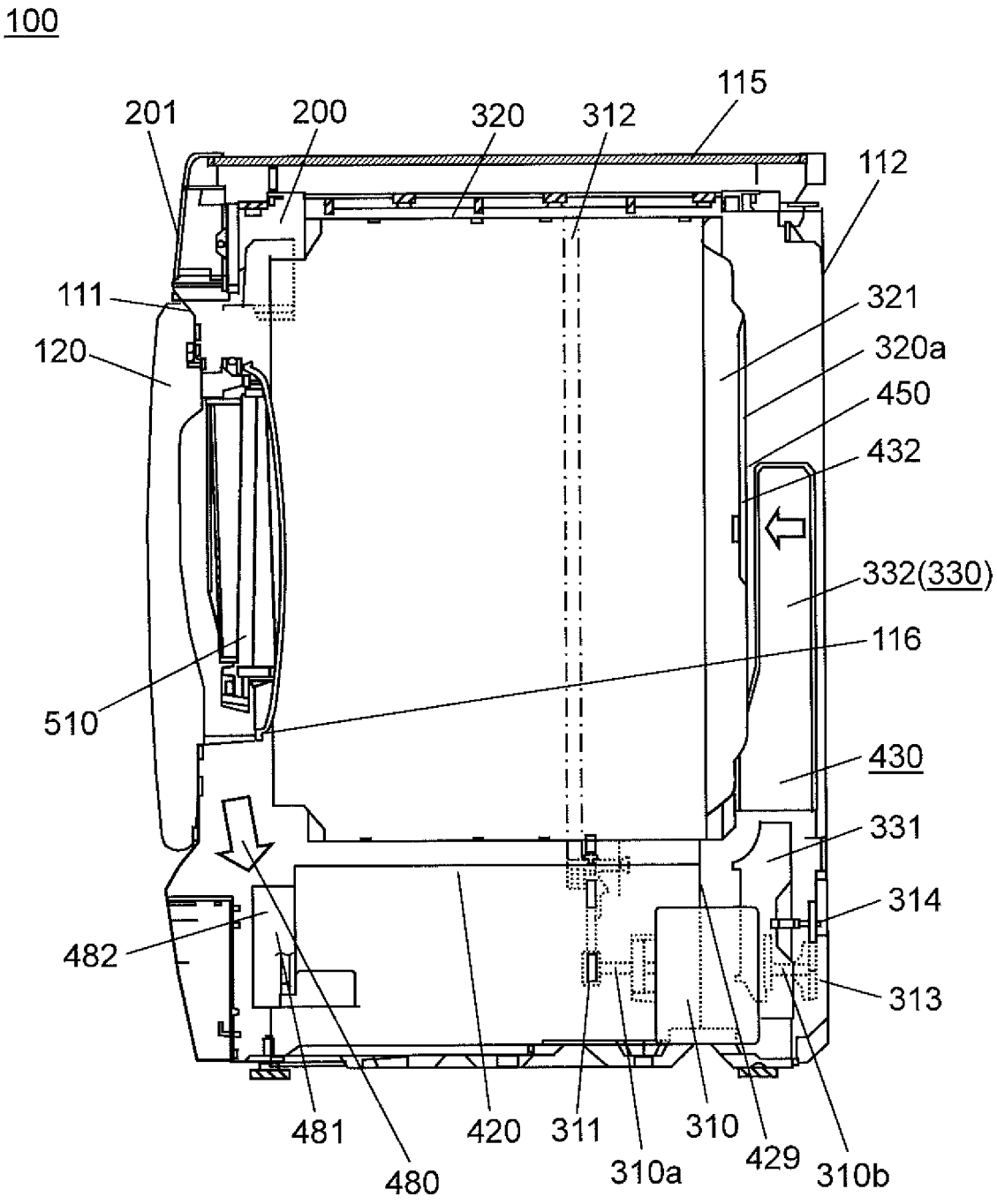

100
201
200
320
312
115
112
111
120
321
320a
450
432
332(330)
116
510
430
331
314
482
313
481
480
420
311
310a
310
429
310b

FIG. 3

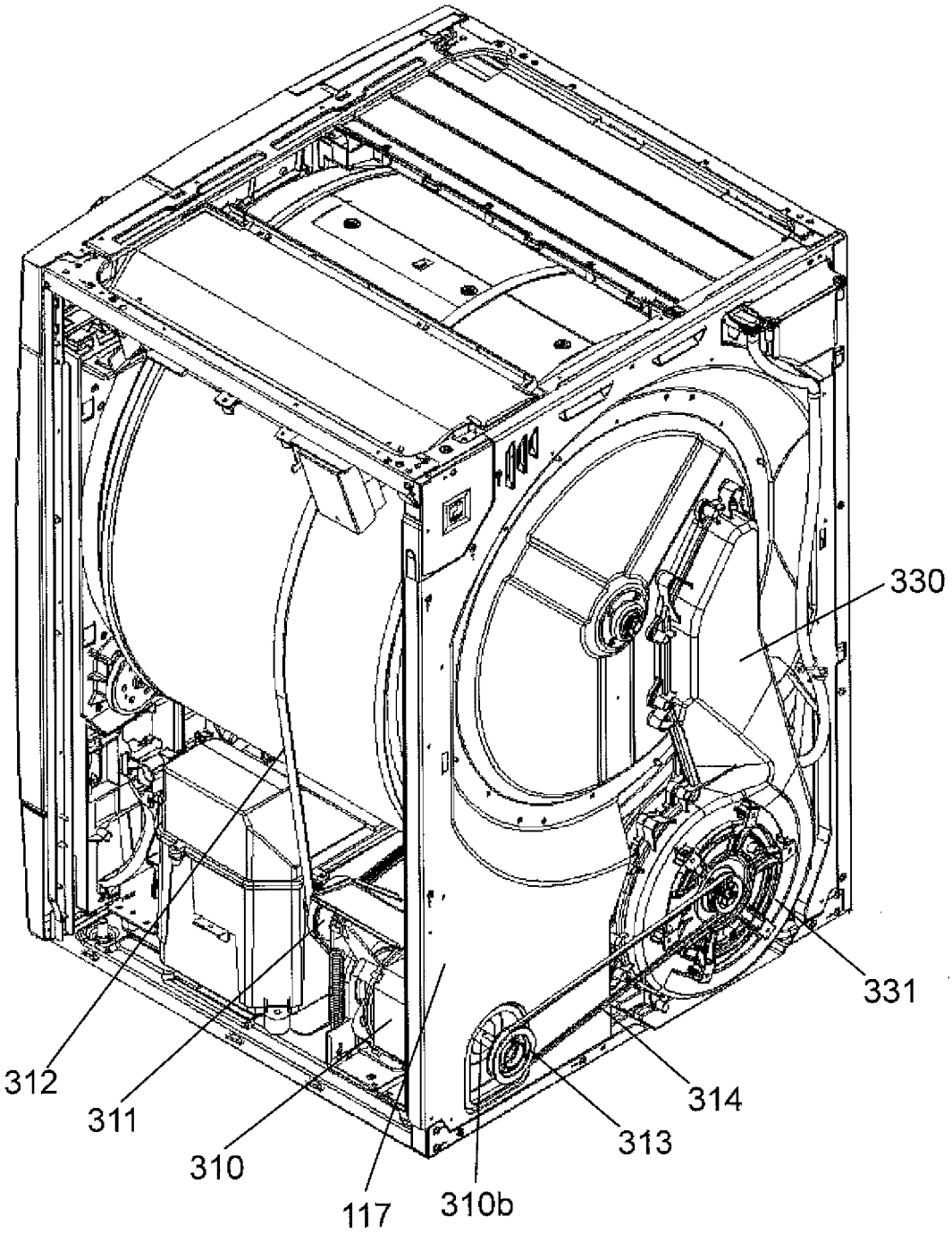


FIG. 4

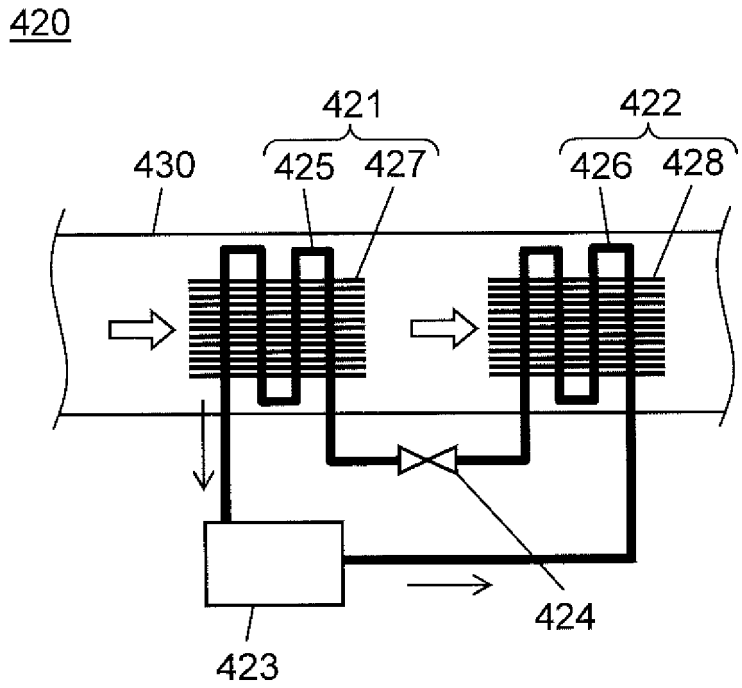


FIG. 5

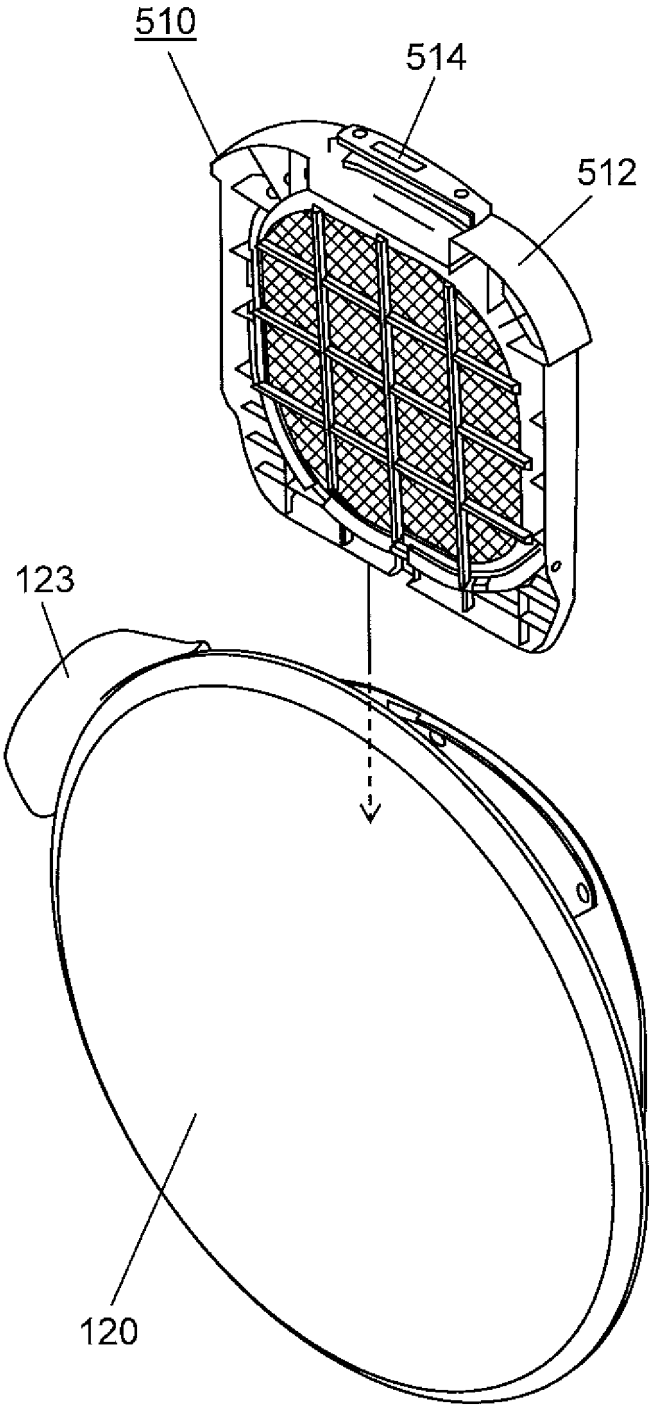


FIG. 6

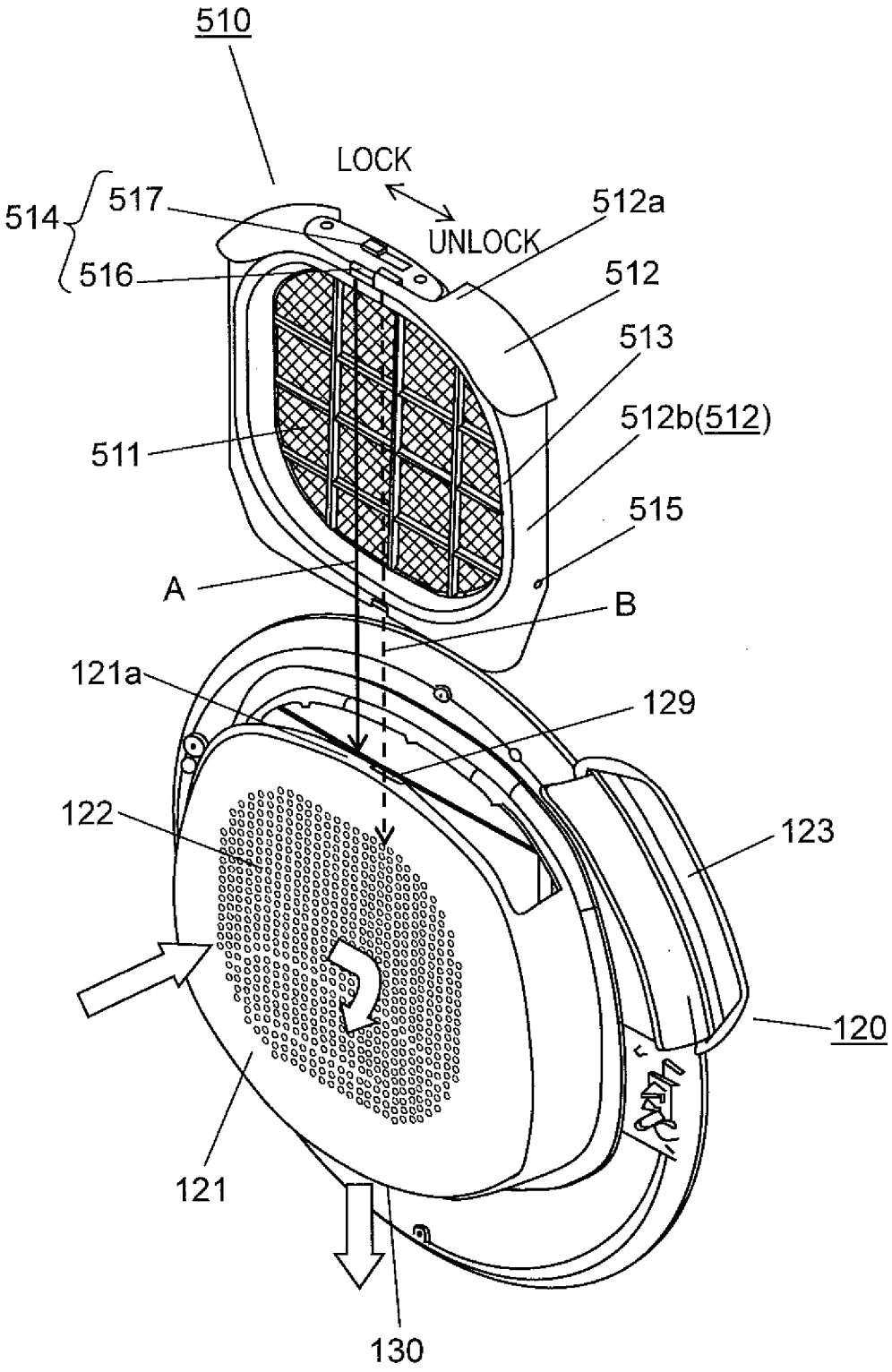

510
LOCK
UNLOCK
514
517
516
512a
512
513
512b(512)
511
515
A
B
121a
129
122
123
120
121
130

FIG. 7A

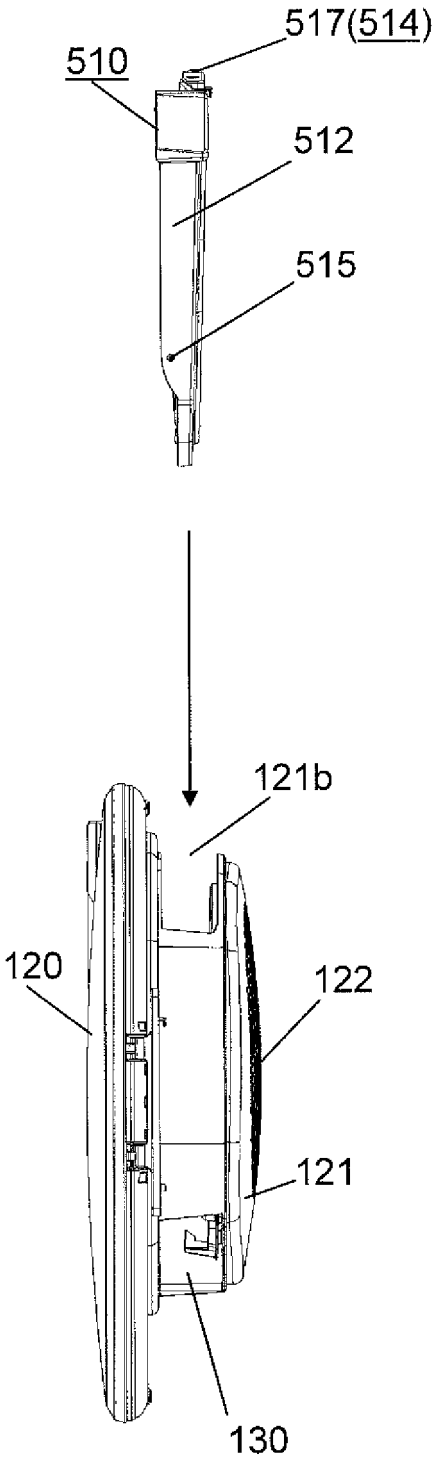

517(514)
510
512
515
121b
120
122
121
130

FIG. 7B

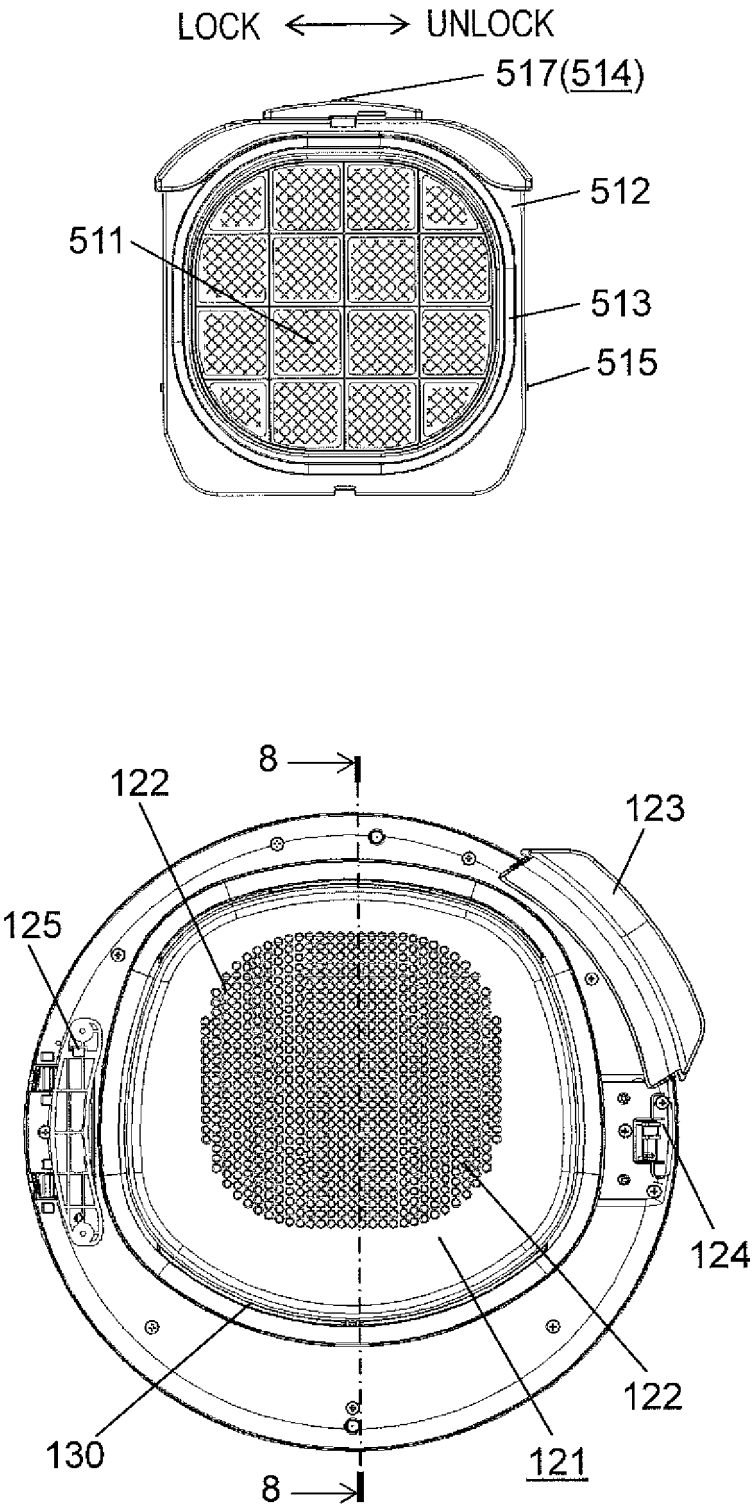

LOCK ⟷ UNLOCK
517(514)
512
511
513
515
8
122
123
125
124
122
130
121
8

FIG. 8

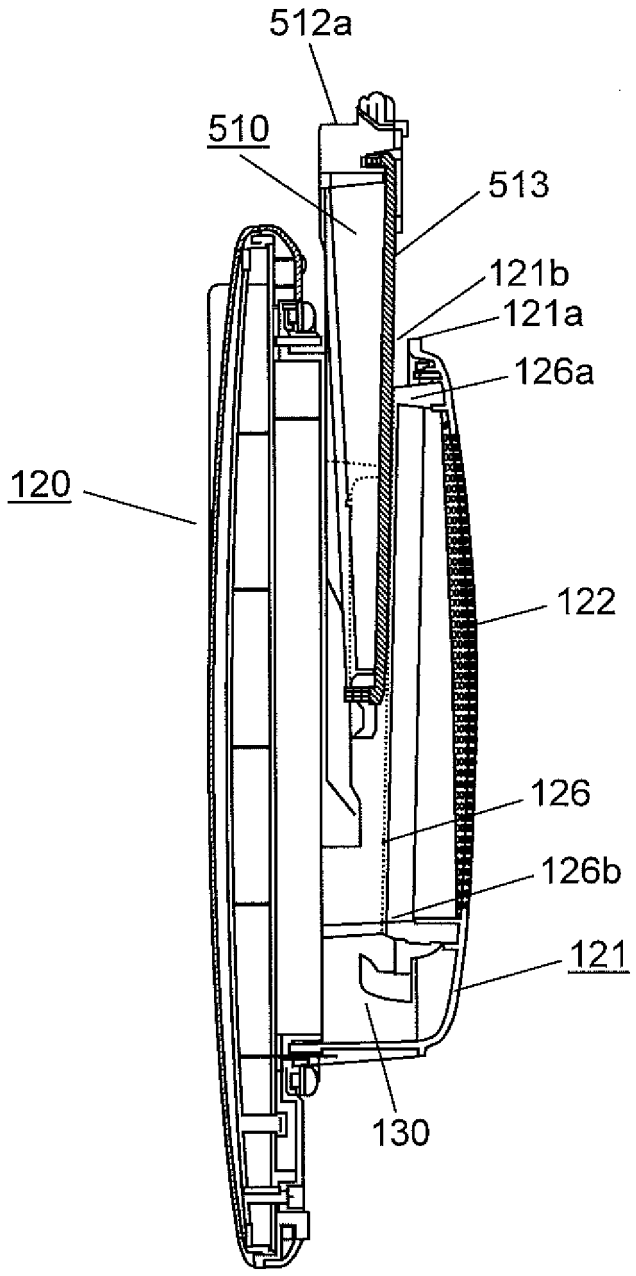


FIG. 9A

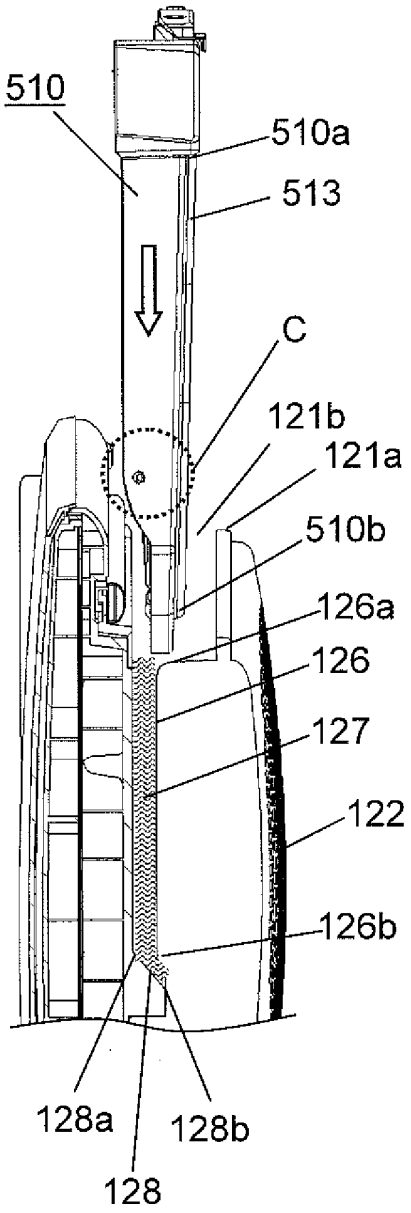


FIG. 9B

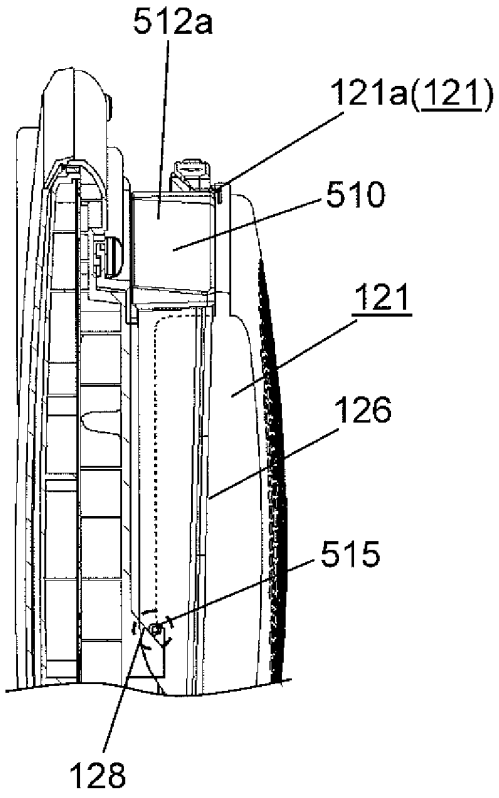


FIG. 9C

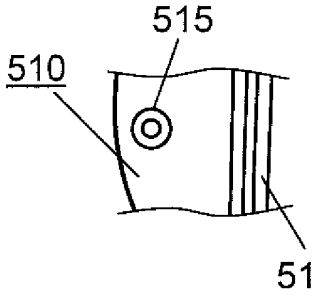


FIG. 10A

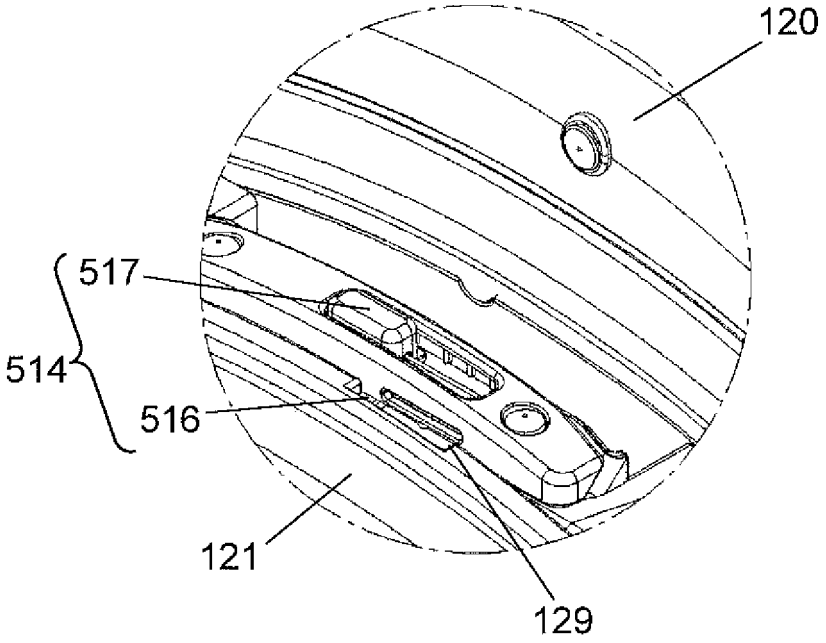
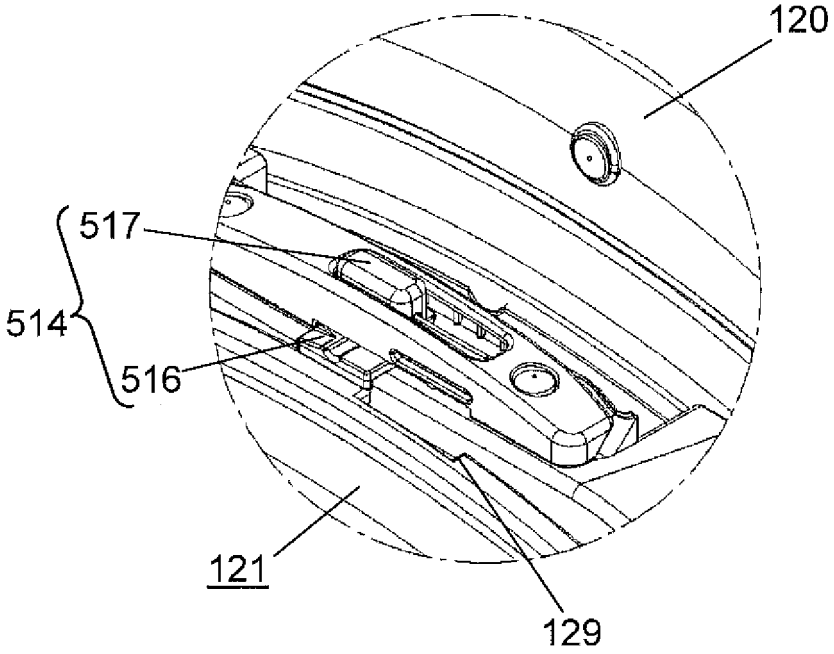
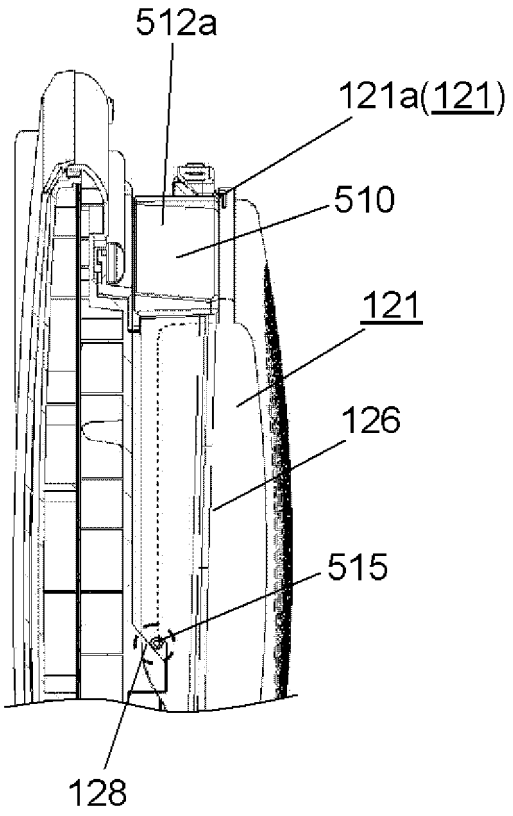


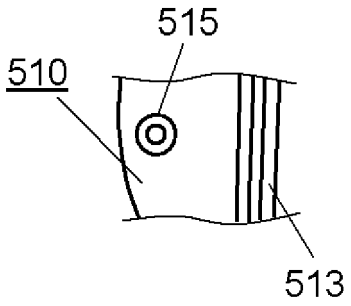
FIG. 10B



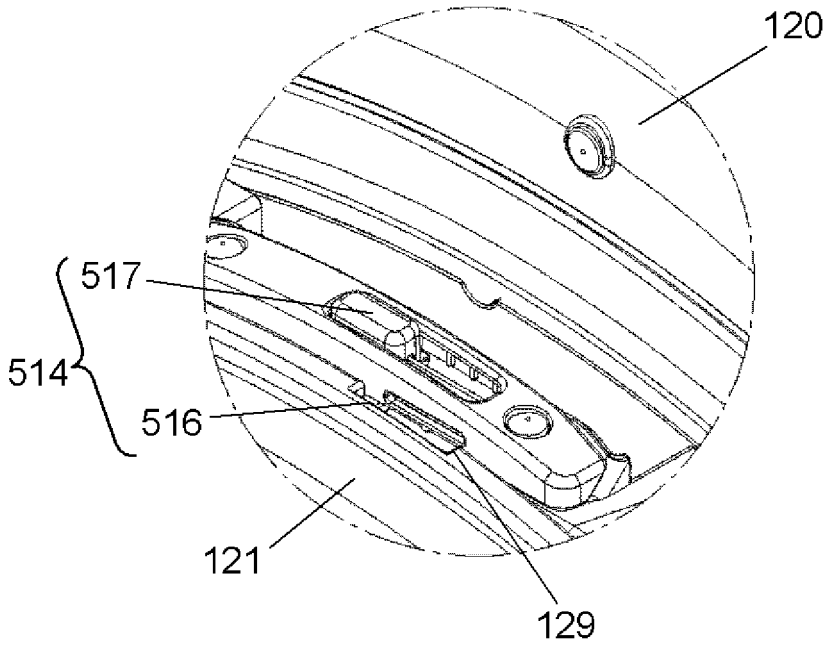
[FIG.9B]



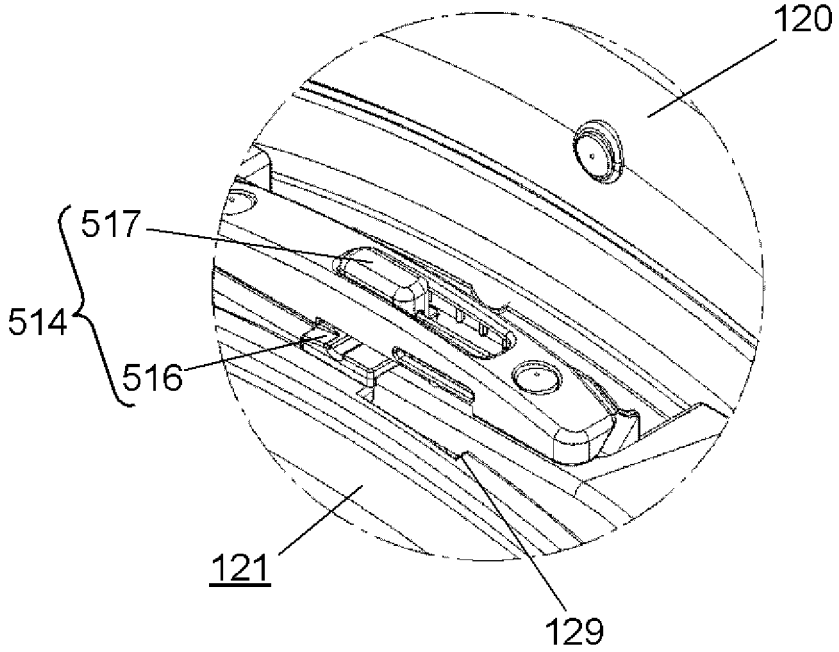
[FIG.9C]



[FIG.10A]



[FIG.10B]



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005177502 A **[0009]**
- WO 2005121437 A **[0009]**
- DE 8535335 U1 **[0010]**