



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
25.09.2019 Bulletin 2019/39

(51) Int Cl.:
D06F 58/04 ^(2006.01) **D06F 58/20** ^(2006.01)
D06F 58/26 ^(2006.01)

(21) Application number: **17870979.6**

(86) International application number:
PCT/KR2017/013114

(22) Date of filing: **17.11.2017**

(87) International publication number:
WO 2018/093201 (24.05.2018 Gazette 2018/21)

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

(30) Priority: **17.11.2016 KR 20160153266**

(71) Applicant: **LG Electronics Inc.**
Seoul 07336 (KR)

(72) Inventors:
• **KIM, Woore**
Seoul 08592 (KR)
• **HONG, Sangwook**
Seoul 08592 (KR)

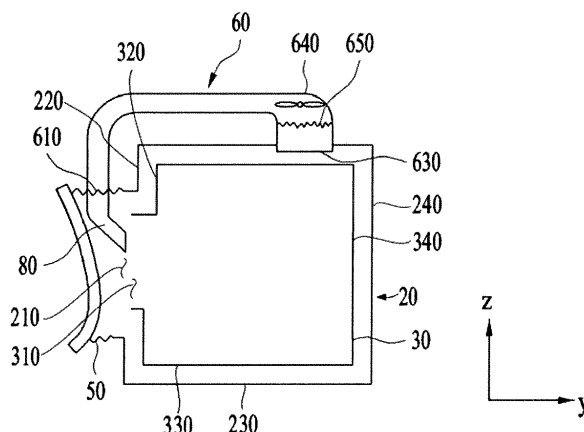
(74) Representative: **Vossius & Partner**
Patentanwälte Rechtsanwälte mbB
Siebertstrasse 3
81675 München (DE)

(54) **CLOTHING TREATMENT APPARATUS**

(57) The present invention relates to a clothing treatment apparatus comprising: a cabinet forming the exterior of the clothing treatment apparatus and provided with a door; a tub including a tub body for accommodating clothing and a tub opening in a front side thereof; a drum rotatably disposed within the tub and including a drum

opening in a front side thereof; an air circulation duct including an air inlet communicating with an upper end of the tub opening, an air outlet communicating with the tub body, and a fan generating air flow inside the tub; and a guider that communicates with the air inlet and guides the air to the drum opening.

[FIG.3]



Description

TECHNICAL FIELD

[0001] The present invention relates to an apparatus for treating laundry capable of increasing an effective air volume heading for the laundry.

BACKGROUND ART

[0002] A laundry treatment machine is a home appliance capable of washing, drying or washing/drying of laundry and conceptually includes a washer, a dryer and a dryer washer.

[0003] The laundry treatment machine can be mainly categorized into a pulsator washer having a drum standing in a vertical direction and a drum washer having a drum lying in a horizontal direction.

[0004] After a wash object, a detergent and the like have been put into the laundry treatment machine, the laundry treatment machine can be driven through manipulation of a course selection unit, a sub-course input unit and/or the like provided to an outside of the laundry treatment machine.

[0005] And, a laundry treatment machine capable of drying laundry supplies high-temperature air (hot air) to laundry and can be categorized into an exhaust type laundry treatment machine or a circulation type (condensation type) laundry treatment machine based on an air flow type.

[0006] The circulation type laundry treatment machine is configured in a manner of circulating air of a laundry receiving part having laundry stored therein, dehumidifying (removing humidity from) air discharged from the laundry receiving part, heating the dehumidified air, and then resupplying the heated air to the laundry receiving part.

[0007] The exhaust type laundry treatment machine is configured in a manner of supplying heated air to a laundry receiving part and discharging the air discharged from the laundry receiving part out of the laundry treatment machine without circulating the air discharged from the laundry receiving part.

[0008] The overall contents of the laundry treatment machine are disclosed in Korean Open-laid Gazette No. 10-2013-0044508.

[0009] Meanwhile, the related art has a problem that some of the heated air supplied to the laundry receiving part fails to exchange heat with the laundry but leaks to a blind spot, which results in a drying rate fall and the waste of energy.

DISCLOSURE OF THE INVENTION

TECHNICAL TASK

[0010] One technical task of the present invention is to provide a laundry treatment apparatus that prevents

air heated in an air circulation duct from being dispersed.

[0011] Another technical task of the present invention is to provide a laundry treatment apparatus that guides air heated in an air circulation duct to laundry.

TECHNICAL SOLUTIONS

[0012] In one technical aspect of the present invention, provided herein is an apparatus for treating laundry, the apparatus including a cabinet forming an exterior and having a door, a tub including a tub body receiving the laundry therein and a tub opening provided to a front side thereof, a drum rotatably provided within the tub and including a drum opening provided to a front side thereof, an air circulation duct including a first communicating portion communicating with the tub opening, a second communicating portion communicating with the tub body, and a fan generating an air flow within the tub, and a guider communicating with the first communicating portion and guiding air to the drum opening, whereby most of the air within the air circulation duct heads for the laundry within the drum.

[0013] According to one embodiment of the present invention, the guider includes a first body including a guider inlet communicating with the first communicating portion and a second body communicating with the first body and changing a flow of air within the first body in a direction of the drum opening, whereby adjustments of direction and length of the guider within the drum are facilitated owing to the divided first and second bodies.

[0014] According to one embodiment of the present invention, the second body includes a guider outlet discharging air through the second body and a cross-section of the guider outlet is positioned side by side with a cross-section of the drum opening, whereby a horizontal component velocity of the discharged air can be maximized.

[0015] According to one embodiment of the present invention, a cross-sectional area of a connecting portion connecting the first body to the second body is smaller than that of the guider inlet, whereby a velocity of the discharged air can be further increased.

[0016] According to one embodiment of the present invention, a width of the first body gradually decreases toward the connecting portion from the guider inlet, whereby turbulence is prevented from being generated from air flow in a manner of decreasing the width gradually.

[0017] According to one embodiment of the present invention, a cross-sectional area of the guider outlet is smaller than that of a connecting portion connecting the first body to the second body, whereby a horizontal component velocity of the discharged air can be maximized.

[0018] According to one embodiment of the present invention, a top-bottom height width of the second body gradually decreases toward the guider outlet from the connecting portion, whereby turbulence is prevented from being generated from air flow.

[0019] According to one embodiment of the present

invention, a right-left width of the second body gradually decreases toward the guider outlet from a spot at which the first body is connected to the second body, whereby turbulence is prevented from being generated from air flow.

[0020] According to one embodiment of the present invention, a cross-sectional area of the guider outlet is equal to or greater than 50% of the cross-sectional area of the guider inlet, whereby air flow resistance, which is generated when air flows, can be minimized.

[0021] According to one embodiment of the present invention, a right-left width of the guider outlet is greater than a height width thereof, whereby air flow resistance can be minimized.

[0022] According to one embodiment of the present invention, an inner surface of the second body is curved, whereby turbulence is prevented from being generated from air flow.

[0023] According to one embodiment of the present invention, the first communicating portion is provided to a top end of the tub opening.

[0024] According to one embodiment of the present invention, the apparatus further includes a gasket provided between the tub opening and the door to prevent leakage of wash water, and the first communicating portion of the air circulation duct is provided to the gasket.

[0025] According to one embodiment of the present invention, the second communicating portion of the air circulation duct is provided to an outer circumference of the tub.

[0026] According to one embodiment of the present invention, the first communicating portion and the second communicating portion are located in a diagonal direction with reference to a cross-section of the tub positioned side by side with a ground surface supporting the cabinet.

ADVANTAGEOUS EFFECTS

[0027] According to one embodiment of the present invention, there is an effect of providing a laundry treatment apparatus that prevents air heated in an air circulation duct from being dispersed.

[0028] According to one embodiment of the present invention, there is an effect of providing a laundry treatment apparatus that guides air heated in an air circulation duct to laundry.

DESCRIPTION OF DRAWINGS

[0029]

FIG. 1 is a perspective diagram of a laundry treatment apparatus according to one embodiment of the present invention.

FIG. 2 is a perspective diagram of the laundry treatment apparatus shown in FIG. 1, viewed at a different angle.

FIG. 3 is a lateral view diagram of a laundry treatment

apparatus having a guider according to one embodiment of the present invention.

FIG. 4 is a perspective diagram showing details of a guider according to one embodiment of the present invention.

FIG. 5 is a front view diagram of a guider according to one embodiment of the present invention.

FIG. 6 is a diagram showing schematic contents of a continuous equation applied to a guider structure.

FIG. 7 is a diagram showing a lateral view of a guider according to one embodiment of the present invention.

FIG. 8 is a diagram showing a lateral view of a guider according to another embodiment of the present invention.

FIG. 9 is a diagram showing a lateral view of a laundry treatment apparatus having a rib structure according to one embodiment of the present invention.

BEST MODE FOR INVENTION

[0030] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Detailed description disclosed together with the accompanying drawings is intended to explain not a unique embodiment of the present invention but an exemplary embodiment of the present invention. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or similar parts.

[0031] Referring to FIG. 1 and FIG. 2, a laundry treatment apparatus 1 according to the present invention includes a cabinet 10 forming an exterior, a laundry receiving part 20 and 30 provided within the cabinet to store wash targets (e.g., laundry) and wash water therein, an exhaust duct 61 configured to externally discharge some of air in the laundry receiving part 20 and 30 from the laundry receiving part 20 and 30, an intake duct 62 configured to supply external air into the laundry receiving part 20 and 30, and a heater 670 configured to supply heated air to the tub 20.

[0032] Particularly, a detergent box 15 is provided to a top end of the cabinet 10 and wash water flows into the detergent box 15 via a wash water supply pipe 14. And, the laundry receiving part 20 and 30 may be supported through a multitude of support parts 21. Each of the support parts 21 may include a damper.

[0033] The cabinet 10 includes a front panel 11 forming a front side of the laundry treatment apparatus 1, and an entrance 13 for putting laundry into the laundry receiving part or taking out the laundry from the laundry receiving part is provided to the front panel 11.

[0034] The entrance is opened/closed by a door 40 rotatably coupled to the cabinet 10.

[0035] A control panel 17 may be provided as a user interface to the front channel 11. The control panel 17 is a means for enabling a user to exchange information with a controller (not shown) of the laundry treatment appa-

ratus 1.

[0036] The laundry receiving part provided to the cabinet 10 may include a tub 20 storing wash water and a drum rotatably configured within the tub to store laundry therein.

[0037] The tub 20 is configured in a cylindrical shape and fixed within the cabinet 10 by the tub support part 21. And, a tub opening 210 configured to communicate with the entrance 13 is provided to a front side 220 of the tub 20.

[0038] A gasket 50 is provided between the tub opening 210 and the entrance 13. The gasket 50 is preferably formed of elastic material such as rubber to prevent the leakage of the wash water stored in the tub 20 as well as to prevent vibration, which is generated from the tub 20, from being transferred to the cabinet 10.

[0039] The drum 30 is rotatably supported within the tub 20 by a drive part provided to a backside of the tub 20, and includes a drum opening 310 communicating with the tub opening 210 and a perforated hole 31 formed to perforate a circumference of the drum 30.

[0040] Moreover, the present invention may further include an air circulation duct 60 circulating air within the laundry receiving part. As the air circulation duct 60 is included, a laundry treatment apparatus of a hybrid type, in which a circulation type laundry treatment apparatus and an exhaust type laundry treatment apparatus are mixed, can be provided in a manner of circulating some air within the laundry receiving part and exhausting some air to the exhaust duct 61.

[0041] For clarity of the following description, the laundry treatment apparatus including the air circulation duct 60 is assumed.

[0042] The air circulation duct 60 is a flow path for discharging the air within the tub 20 to a space outside the tub 20 and then guiding the discharged air to the tub 20 and may be provided to a top circumference 230 of the tub 20.

[0043] For the coupling to the air circulation duct 60, a first communicating portion 610 and a second communicating portion 630 may be provided to the tub 20.

[0044] As shown in FIG. 2, the first communicating portion 610 is a flow path for guiding the air within the air circulation duct 60 to the tub 20 and the second communicating portion 630 becomes a passage for guiding the air within the tub 20 to the air circulation duct 60.

[0045] The first communicating portion 610 may be provided to the gasket 50. Namely, the first communicating portion 610 is configured as a hole that perforates the gasket 50, and an air discharge port of the air circulation duct 60 may be coupled to the hole formed in the gasket 50.

[0046] The first communicating portion 610 may be provided to the circumference 230 of the tub like the second communicating portion 630. Instead, if the first communicating portion 610 is provided to the gasket 50, the air discharged from the air circulation duct 60 can be supplied to a central portion of the drum 30 through the

drum opening 310, thereby being advantageous in raising efficiency of heat exchange between the laundry and the air.

[0047] A heating part provided heated air to the tub 20 may include a fan 640 and a heater 670 provided within the air circulation duct 60. The fan 640 is a means for enabling the air in the tub 20 to flow into the air circulation duct 60 through the first communicating portion 610 and also moving the air having flown into the air circulation duct 60 to the tub 20 again. The heater 670 is a means for heating the air flowing from the tub 20 through the second communicating portion 630 owing to the operation of the fan 640.

[0048] In this case, the first communicating portion 610 and the second communicating portion 630 are preferably configured to be located in a diagonal direction with reference to a cross-section of the tub positioned side by side with the ground surface that supports the cabinet 10. And, the heater 670 may be configured to include a portion extending along a length direction of the air circulation duct 60. This is to secure a sufficient time for heating air moving along the air circulation duct 60 by increasing the length of the flow path formed by the air circulation duct 60.

[0049] Some of the air supplied to the tub 20 through the air circulation duct 60 is discharged from the tub 20 via the exhaust duct 61, and some of the air flowing into the air circulation duct 60 by the fan 640 is supplied through the intake duct 62 externally as well as from the tub 20.

[0050] The intake duct 62 is preferably provided on a flow path through which the air in the tub 20 flows into the fan 640. This is to enable the air circulation within the tub 20 and the inflow of the air outside the tub 20 into the air circulation duct 60 using the fan 640 provided to the air circulation duct 60 without providing a separate air inflow means to the intake duct 62.

[0051] FIG. 2 is a diagram showing one example of a case that the intake duct 62 enables air outside the tub 20 to flow into the air circulation duct 60 via the first communicating portion 610. In this case, if the fan 640 is activated, a negative pressure is formed in the second communicating portion 630, whereby the air inside the tub 20 and the air outside the tub 20 can flow into the air circulation duct 60.

[0052] Meanwhile, the intake duct 62 of the present invention does not require a separate control means (e.g., a valve, etc.) for controlling ON/OFF of the intake duct 62. Namely, the intake duct 62 of the present invention may be configured to maintain an open state all the time.

[0053] As shown in FIG. 1 and FIG. 2, the exhaust duct 61 may be configured to guide the air flowing into the exhaust duct 61 to the outside of the cabinet 10 by enabling an inside of the tub 20 to communicate with the outside of the cabinet 10. Preferably, the exhaust duct 61 is connected to a drain flow path 90 configured to discharge wash water in the tub 20.

[0054] Since the air discharged through the exhaust duct 61 has high humidity, if the exhaust duct 61 is configured to directly communicate with the outside of the cabinet 10, it may cause a problem that the air discharged from the exhaust duct 61 condenses on an indoor wall.

[0055] As the laundry treatment apparatus 1 according to the present invention includes the drain flow path 90 for discharging the wash water in the tub 20 to the outside of the cabinet 10, if the exhaust duct 61 is connected to the drain flow path 90, the above-mentioned problem can be solved.

[0056] In this case, a flow path switching part 16 configured to control ON/OFF of the exhaust duct 61 and the drain flow path 90 is preferably provided to a connection point of the exhaust duct 61 and the drain pass flow 90. This is to prevent the air discharged through the exhaust duct 61 from re-flowing into the tub 20 and prevent water discharged through the drain flow path 90 from re-flowing into the tub 20.

[0057] The flow path switching part 16 provided to the connection point of the exhaust duct 61 and the drain flow path 90 is preferably provided to a position higher than a maximum water level set for the tub 20.

[0058] Like the present invention, if the flow path switching part 16 is provided to the position higher than the maximum water level set for the tub 20, since the exhaust duct 61 plays a role in preventing siphon, as a water trap is formed between the flow path switching part 16 and a pump 93 (i.e., on a second drain flow path), it is able to prevent odor from flowing into the tub 20.

[0059] Since the air flowing into the exhaust duct 61 can be externally discharged to the outside of the tub through the flow path switching part 17, it is unnecessary to control the number of revolutions of the fan 640 to remove the water trap.

[0060] Moreover, the above-described structure can prevent the wash water from being discharged to the outside of the tub 20 through the drain flow path 6 despite that the wash water is supplied up to the maximum water level set for the tub 20.

[0061] Meanwhile, FIG. 1 and FIG. 2 show the hybrid laundry treatment apparatus 1 in which the circulation type structure and the exhaust type structure are mixed, by which the present invention is non-limited. For example, either the circulation type structure or the exhaust type structure can be employed.

[0062] FIG. 3 shows one embodiment of the laundry treatment apparatus having a guider 80 capable of changing a direction and speed of air discharged through the first communicating portion 610 according to one embodiment of the present invention. To clearly illustrate the structure of the guider 80, the laundry treatment apparatus 1 shown in FIG. 1 and FIG. 2 is schematically shown or some components are omitted.

[0063] FIG. 3 is a diagram showing a lateral view of the laundry treatment apparatus 1, and mainly shows the tub 20, the drum 30, the door 40, the gasket 50, the air circulation duct 60, and the guider 80.

[0064] The tub 20 may be configured in a cylindrical shape and includes a tub body and the tub opening 210 that is a passage for receiving laundry. The tub body may include a tub front side 220, a tub circumference 230, and a tub rear side 240. Particularly, the tub opening 210 is provided to the tub front side 220.

[0065] The drum 30 is configured rotatably within the tub 20, includes a drum body consisting of a drum front side 320, a drum circumference 330 and a drum rear side, and a drum opening 310 that is a passage for receiving laundry is provided to the drum front side 320.

[0066] The air circulation duct 60 communicates with the tub 20 through the first communicating portion 610 and the second communicating portion 630, and the first communicating portion 610 is provided to a top end of the tub opening 210 or a top end of the gasket 50 provided to the tub opening 210. The second communicating portion 630 communicates with the tub body, and more particularly, with a rear end portion of the tub circumference 230 in case of one embodiment of the present invention. The fan 640, the heater 670 and the filter 650 may be included within the air circulation duct 60, which are mentioned in detail in the above description.

[0067] The guider 80 communicates with the first communicating portion 610. The air flow generated by the fan 640 heads for the laundry within the drum 30 via the first communicating portion 610, the guider 80 and the drum opening 310.

[0068] The air is discharged in a ground surface direction through the air circulation duct 60, the first communicating portion 610, and a top portion of the gasket 50 or the tub opening 210. Particularly, regarding the velocity vector of the discharged air, a vertical velocity vector is considerably greater than a horizontal velocity vector.

[0069] Hence, if the guider 80 is not provided, most of the air discharged through the first communicating portion 610 heads for a bottom side of the gasket 50 or the tub opening 210. Namely, air flows in a ground surface direction. As the air flows in the ground surface direction, the discharged air collides with the door 40 or the bottom side of the gasket 50 or the tub opening 210, thereby diffusing into the tub 20.

[0070] Some of the diffusing air diffuses into a space between the tub 20 and the drum 30 while the rest of the diffusing air flows into the drum 20. The air flowing between the tub 20 and the drum 30 fails to exchange heat with the laundry within the drum 30 but is collected into the second communicating portion 630 again.

[0071] Namely, a considerable amount of the heated air circulates within the tub 20 and the air circulation duct 60 without heat exchange with the laundry. Thus, as considerable energy is consumed to heat air, the related art laundry treatment machine failing to include the guider 80 disadvantageously consumes unnecessary energy.

[0072] The air-discharged first communicating portion 610 is located in a distance from the drum opening 310. According to the structural feature that the drum 30 is provided within the tub 20, the drum opening 310 is pro-

vided in a diagonal ground surface direction from the first communicating portion 610. Namely, a height of the first communicating portion 610 is greater than that of the drum opening 310. Moreover, the drum opening 310 is located in a plane vertical to the ground surface in general. Hence, in order to supply the heated air into the drum opening 310 as much as possible, an air flow having a great horizontal velocity vector is preferably generated. And, a start point of the discharged air is preferably located in the same horizontal plane of the drum opening 310.

[0073] To solve the above problem, the guider 80 is provided to communicate with the first communicating portion 610. The guider 80 plays a role in changing the heated air discharged through the first communicating portion 610 into a horizontal velocity vector dominant state from a vertical velocity vector dominant state.

[0074] Schematically, the guider 80 is preferably configured in a manner of extending downward in a prescribed distance from the first communicating portion 610 with a final air-discharged portion bent toward the drum opening 310.

[0075] The structure of the guider 80 is described in detail with reference to FIG. 4. The guider 80 includes a first body 810 extending in a prescribed distance from the first communicating portion 610 toward the ground surface and a second body 820 communicating with the first body 810 and having an end portion bent toward the drum opening 310.

[0076] One end of the first body 810 includes a guider inlet 811 connected to the first communicating portion 610 and the other end of the first body 810 communicates with the second body 820. One end of the second body 820 communicates with the first body 810 and the other end of the second body 820 includes a guider outlet 821 for discharging the air flowing into the guider 80 externally.

[0077] The first body 810 is projected in a prescribed distance toward the ground surface so that the discharged air can be discharged at the same height of the drum opening 310 with reference to the ground surface.

[0078] The second body 820 communicates with the first body 810 and may bend in a direction of the drum opening 310 or incline at a prescribed angle. Finally, the guider outlet 821 is situated at the same height of the drum opening 310. Hence, most of the air discharged from the guider outlet 821 can flow into the drum opening 310.

[0079] Meanwhile, as described above, if a horizontal component velocity vector of the air discharged through the guider outlet 821 is increased, most of the air can flow into the drum opening 310. In order to maximize the horizontal component velocity vector of the discharged air, a cross-section of the guider outlet 821 preferably stays in parallel with a cross-section of the drum opening 310. Namely, a plane including the guider outlet 821 is preferably vertical to the ground surface.

[0080] The second body 820 is provided in form of a

straight line and configured to have a gradient of a prescribed angle with the first body 810. Yet, in case of having the above structure, although the guider outlet 821 is in parallel with the drum opening 310, a velocity vector of the discharged air has a vector component amounting to an angle of the second body 820 inclining from the first body 810. Namely, there still remains a considerable amount of a vertical velocity vector component.

[0081] Therefore, the second body 820 or an inside of the second body 820 preferably forms a flow path in a curved shape. If the end portion of the second body 820 is bent in a curved shape at least, a horizontal velocity vector of the discharged air can be maximized.

[0082] FIG. 5, FIG. 7 and FIG. 8 show embodiments that widths of the first body 810 and the second body 820 are changed.

[0083] FIG. 5 shows the guider 80 viewed in a direction of the guider outlet 821. Typically, it is observed that widths of the first body 810 and the second body 820 are not constant. First of all, regarding the first body 810, an area of the guider inlet 811 is greater than that of a spot at which the first body 810 and the second body 820 meet each other.

[0084] According to the equation of continuity related to fluid, it is observed that mass of water flowing in a pipe is exactly constant at any point. This corresponds to a fact that law of mass conservation applies to a flow of fluid in a stationary flow state.

[0085] FIG. 6 handles the contents of the equation of continuity, and symbols shown in FIG. 6 are described as follows. ρ : Fluid density, A_1 : Cross-sectional area of ①, v_1 : Flow velocity of cross-section ①, A_2 : Cross-sectional area of ②, v_2 : Flow velocity of cross-section ②, Q : Flux

[0086] In brief, since a flux at any point in a pipe is constant, if a cross-sectional area of a prescribed point increases, a fluid velocity at the corresponding point decreases typically. On the contrary, if a cross-sectional area of a prescribed point decreases, a fluid velocity at the corresponding point increases.

[0087] Described in the following is an effect that can be obtained from the uneven widths of the first and second bodies 810 and 820 shown in FIG. 5 on the basis of the equation of continuity.

[0088] First of all, regarding the first body 810, a portion of the guider inlet 811 is defined as ① of FIG. 6 and a spot at which the first and second bodies 810 and 820 meet each other is defined as ②. Since a cross-sectional area of the guider inlet 811 is greater than an area of the spot at which the first and second bodies 810 and 820 meet each other, a fluid velocity at the guider inlet 811 is smaller.

[0089] Likewise, in case of the second body 820, an area of a spot at which the first and second bodies 810 and 820 meet each other is greater than an area of the guider outlet 821. Hence, according to the equation of continuity, a fluid velocity at the guider outlet 821 is greater than that at the spot at which the first and second

bodies 810 and 820 meet each other.

[0090] In brief, by decreasing the area of the guider outlet 821 to be smaller than that of the guider inlet 811, there is an effect that a discharged velocity of the finally discharged air can be raised.

[0091] Preferably, a cross-sectional area of the guider gradually decreases from the guider inlet 811 to the guider outlet 821. When a fluid flows in a pipe, it comes into contact with the pipe so as to generate fluid resistance. If the fluid resistance becomes severe, turbulence is generated, whereby a velocity of the fluid is lowered. Hence, it is preferable that a cross-sectional area decreases continuously to minimize the generation of turbulence.

[0092] Particularly, a cross-sectional area (width) ranging from the guider inlet 811 to the spot at which the first and second bodies 810 and 820 meet each other decreases gradually. Moreover, a cross-sectional area (width) ranging from the spot at which the first and second bodies 810 and 820 meet each other to the guider outlet 821 decreases gradually.

[0093] FIG. 7 is a lateral view diagram showing that a cross-sectional area or width of the first body 810 decreases gradually, and FIG. 8 shows that a cross-sectional area or width of the second body 820 decreases gradually as well as a cross-sectional area or width of the first body 820.

[0094] In case of the second body 820, a right-left or top-bottom width of the second body 820 can decrease gradually toward the guider outlet 821 from the spot at which the first and second bodies 810 and 820 are connected to each other.

[0095] Yet, a final cross-sectional area of the guider outlet 821 is preferably formed in a manner that a right-left width is greater than a height width. Considering the structures of the air circulation duct 60 and the guider 80, if the right-left width of the guider outlet 821 is longer, air flow resistance within the guider 80 is reduced, whereby a finally discharged velocity is increased.

[0096] If the finally discharged velocity is fast, it means that a horizontal vector component increases more, which means that an amount of air flowing into the drum 30 via the drum opening 310 increases more. Thus, it is able to prevent air from leaking through an unnecessary part.

[0097] Moreover, a cross-sectional area of the guider outlet 821 is preferably equal to or greater than 50% of a cross-sectional area of the guider inlet 811. On an experimental basis, if a cross-sectional area of the guider outlet 821 becomes excessively smaller than that of the guider inlet 811, a velocity of the discharged air is lowered to the contrary. Namely, according to the features of fluid, if a cross-sectional area difference is excessively big, turbulence is generated. As a cross-sectional area of the guider outlet 821 is reduced, a velocity is raised up to a prescribed level. Yet, if the velocity exceeds a specific threshold, it is rather lowered.

[0098] Meanwhile, an inner surface of each of the first and second bodies 810 and 820 is curved. Or, the inner

surface forms a continuous line and plane mathematically. If an area decreases rapidly or a projection and the like exist, fluid resistance increases rapidly, whereby a finally discharged velocity is affected considerably.

[0099] FIG. 8 shows that a structure of a rib 70 is further included in the laundry treatment apparatus 1. The rib 70 includes a gasket rib 710, a tub rib 720 and a drum rib 730. If at least one of the ribs 70 of the three types is included, it is able to remarkably prevent the air, which flows into the tub 20 via the first communicating portion 610, from leaking through the space between the tub 20 and the drum 30.

[0100] The gasket rib 710 is provided onto the gasket 50 provided to the tub opening 210, the tub rib 720 is provided to an inner circumference of the tub front side 220, and the drum rib 730 is provided to an outer circumference of the drum front side 320.

[0101] The rib 70 may be installed in the laundry treatment apparatus 1 together with the guider 80, whereby the heated air can head for the laundry within the drum 30 only.

[0102] As described above, while the present invention has been described and illustrated herein with reference to the preferred embodiments thereof, this description is intended to be illustrative, and not to limit the scope of the claims. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. An apparatus for treating laundry, the apparatus comprising:

a cabinet forming an exterior and having a door;
a tub including a tub body receiving the laundry therein and a tub opening provided to a front side thereof;
a drum rotatably provided within the tub and including a drum opening provided to a front side thereof;
an air circulation duct including a first communicating portion communicating with the tub opening, a second communicating portion communicating with the tub body, and a fan generating an air flow within the tub; and
a guider communicating with the first communicating portion and guiding air to the drum opening.

2. The apparatus of claim 1, the guider comprising:

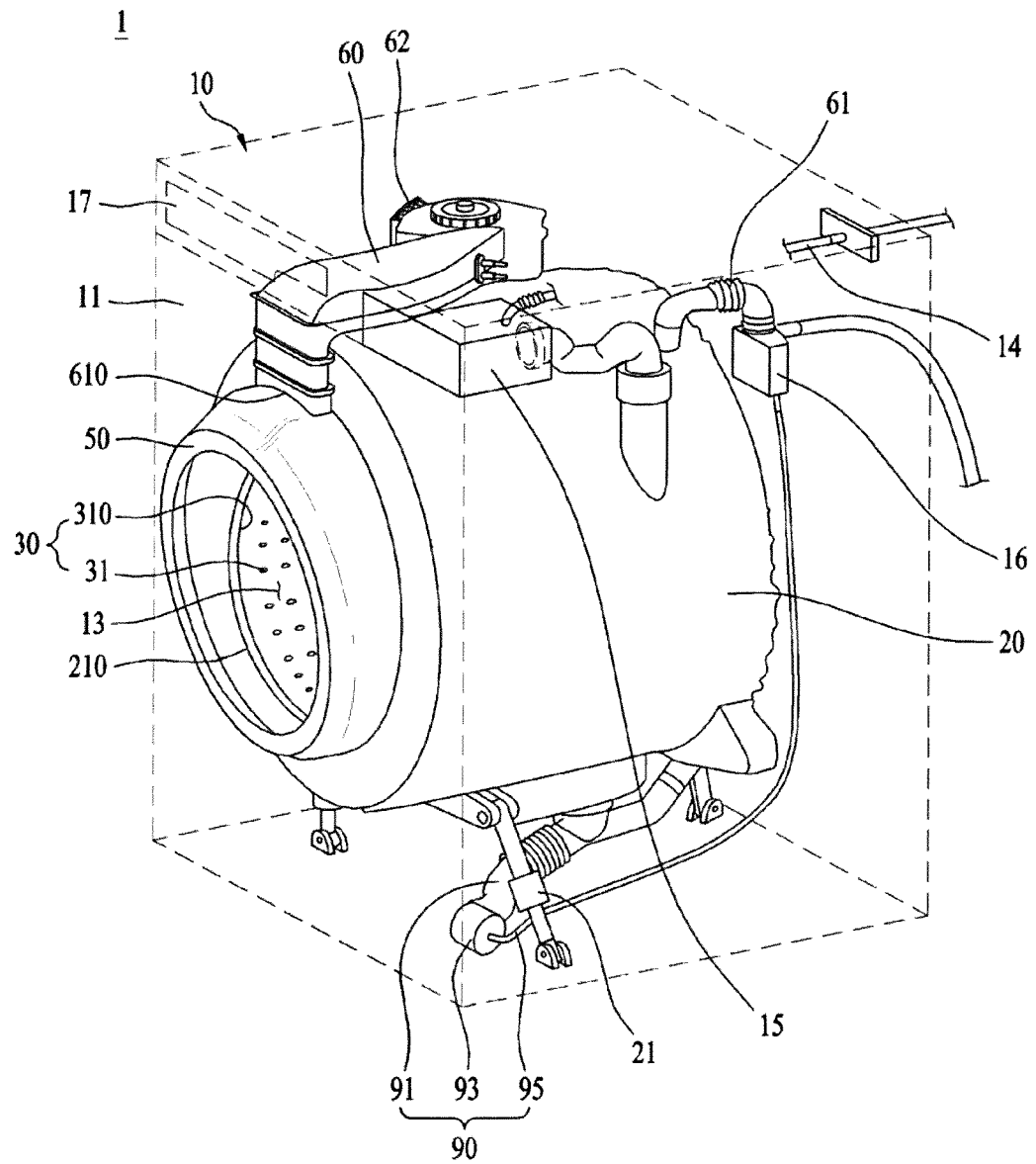
a first body including a guider inlet communicating with the first communicating portion; and
a second body communicating with the first body and changing a flow of air within the first body

in a direction of the drum opening.

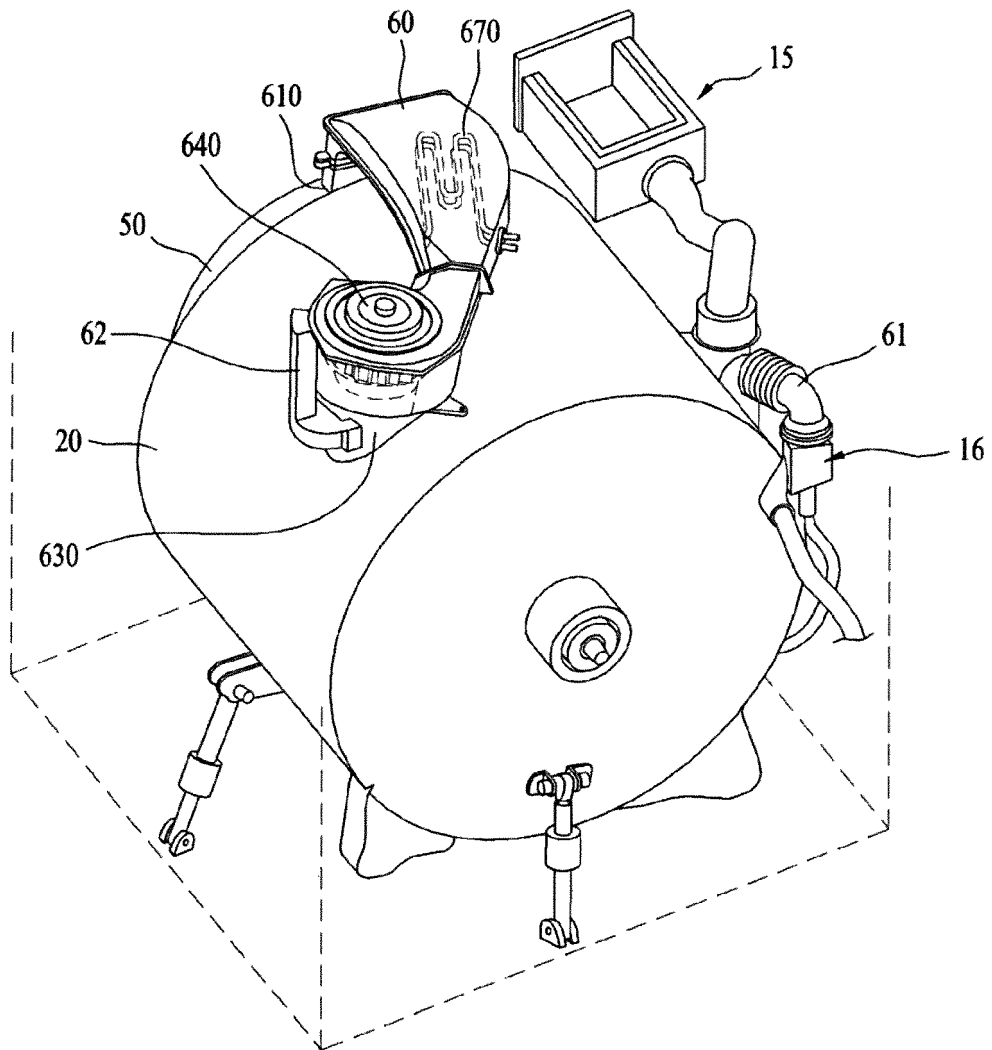
3. The apparatus of claim 2, wherein the second body includes a guider outlet discharging air through the second body and wherein a cross-section of the guider outlet is positioned side by side with a cross-section of the drum opening. 5
4. The apparatus of claim 3, wherein a cross-sectional area of a connecting portion connecting the first body to the second body is smaller than that of the guider inlet. 10
5. The apparatus of claim 4, wherein a width of the first body gradually decreases toward the connecting portion from the guider inlet. 15
6. The apparatus of claim 3, wherein a cross-sectional area of the guider outlet is smaller than that of a connecting portion connecting the first body to the second body. 20
7. The apparatus of claim 6, wherein a top-bottom height width of the second body gradually decreases toward the guider outlet from the connecting portion. 25
8. The apparatus of claim 7, wherein a right-left width of the second body gradually decreases toward the guider outlet from a spot at which the first body is connected to the second body. 30
9. The apparatus of one of claims 3 to 8, wherein a cross-sectional area of the guider outlet is equal to or greater than 50% of the cross-sectional area of the guider inlet. 35
10. The apparatus of one of claims 3 to 8, wherein a right-left width of the guider outlet is greater than a height width thereof. 40
11. The apparatus of claim 3, wherein an inner surface of the second body is curved.
12. The apparatus of claim 1, wherein the first communicating portion is provided to a top end of the tub opening. 45
13. The apparatus of claim 1, further comprising a gasket provided between the tub opening and the door to prevent leakage of wash water, wherein the first communicating portion is provided to the gasket. 50
14. The apparatus of one of claim 12 and claim 13, wherein the second communicating portion is provided to an outer circumference of the tub. 55
15. The apparatus of claim 1, wherein the first communicating portion and the second communicating por-

tion are located in a diagonal direction with reference to a cross-section of the tub positioned side by side with a ground surface supporting the cabinet.

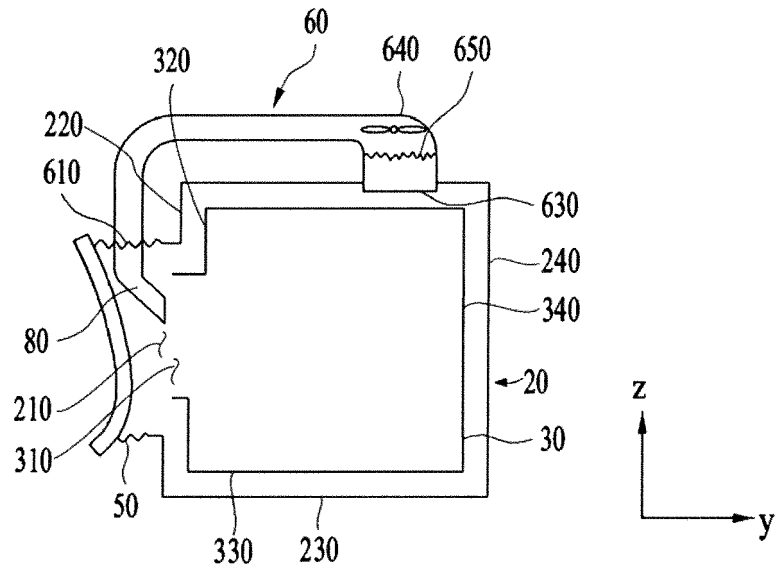
[FIG.1]



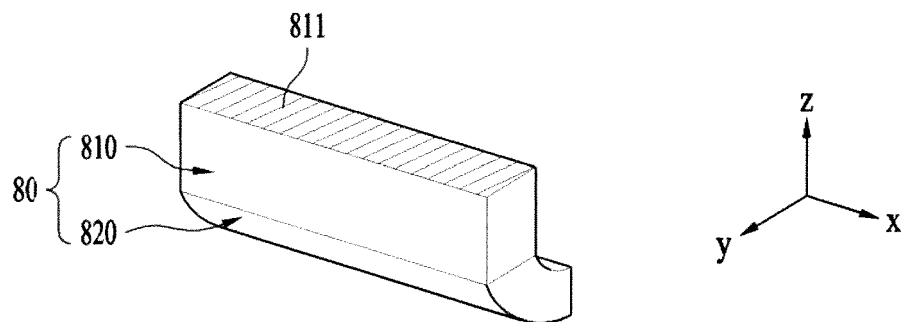
[FIG.2]



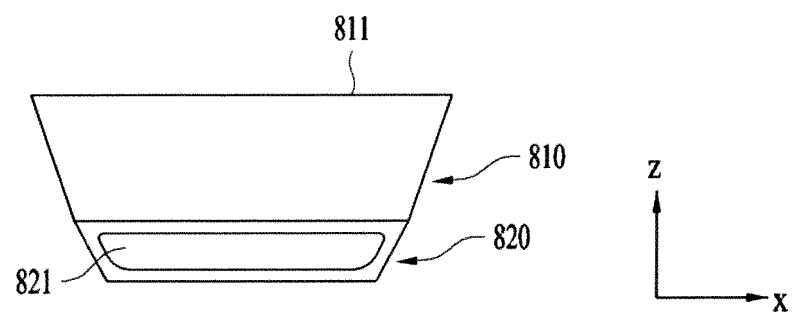
[FIG.3]



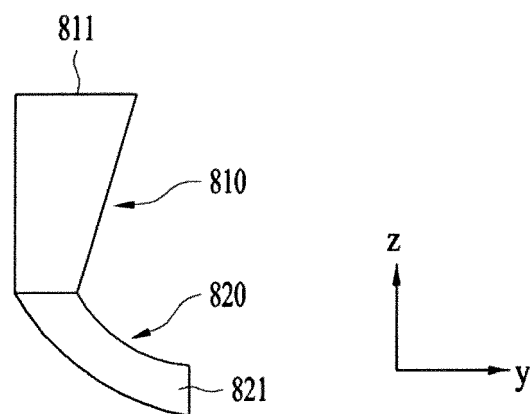
[FIG.4]



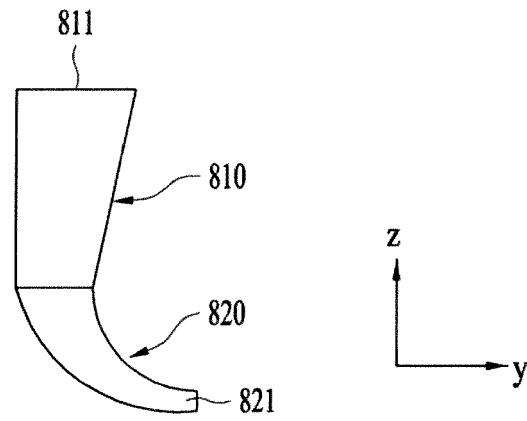
[FIG.5]



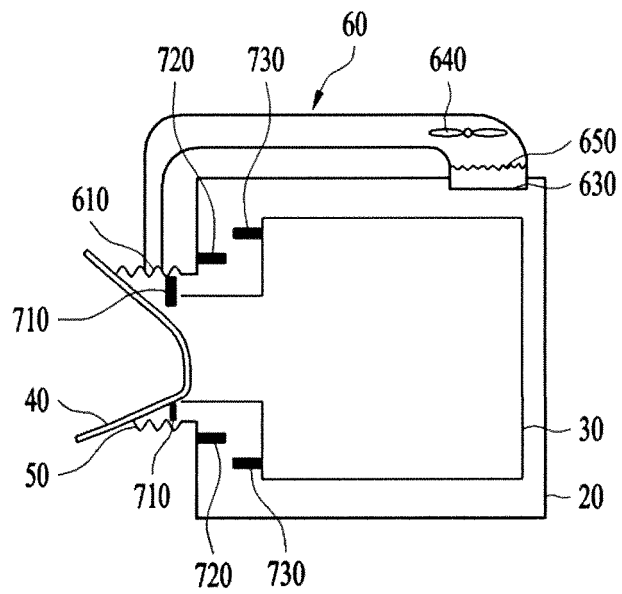
[FIG.6]



[FIG.7]



[FIG.8]



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020130044508 [0008]