Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
Description

TECHNICAL FIELD

[0001] The present invention relates to a washing machine and dryer with a drying function, and more particularly, to a washing machine and dryer with an improved drying duct structure, which dries air whose moisture is removed flows through.

BACKGROUND ART

[0002] Generally, a washing machine is an apparatus which performs washing, rinsing and dewatering so as to separate dirt from clothes by the interaction of detergent and water, and is classified into agitator type, pulsator type and drum type washing machines.

[0003] Among them, in the drum type washing machine, water, detergent and laundry are loaded into a drum with a plurality of protruded tumbling ribs installed in an inner surface of the drum and the drum is rotated at a low speed. Then, the laundry is washed due to an impact caused when the laundry is lifted by the tumbling ribs and then drops. The drum type washing machine has an advantage in that the laundry is not damaged. In addition, a small amount of water is consumed and the laundry is not tangled with each other.

[0004] Meanwhile, a dryer is a machine for automatically drying a wet laundry after completing a washing operation. In general, the wet laundry is loaded into a drum installed in an inner side of a cabinet and the drum is rotated. Then, a hot wind is supplied to an inside of the drum to thereby dry the wet laundry.

[0005] Recently, a combination dryer and drum washing machine, in which a dryer function as well as a washing function is added to the drum type washing machine, is practically available and its use increases gradually.


[0007] FIG. 1 is a cross-sectional perspective view showing a duct structure of a conventional washing machine and dryer, and FIG. 2 is a cross-sectional view showing an internal structure of the conventional washing machine and dryer. Referring to FIGS. 1 and 2, the conventional washing machine and dryer includes a cabinet 10, a tub 20, a drum 25, a condensation duct 40, a motor 5, a heater 50, a circulation fan 35 and a drain pump 6.

[0008] The cabinet 10 constitutes an outer shell of the washing machine and dryer, and includes a loading portion 11 and a door 15 for opening/closing the loading portion 11, which are formed at one portion thereof. The tub 20 is formed in a cylinder shape. The tub 20 is installed within the cabinet 10 and supported by a spring 3 and a damper 4. The drum 25 is rotatably installed within the tub 20 and the motor 5 is installed in order to enable the drum 25 to be rotated.

[0009] The condensation duct 40 is connected with the tub 20, and a drying duct 30 has one end connected to the tub 20 and the other end connected to the condensation duct 40. Here, as shown in FIGS. 1 and 2, the drying duct 30 is disposed at a middle upper portion of the tub 20. One end of the drying duct 30 is connected to a discharge part 33 at a lower portion, in which the discharge part 33 is directly connected with an inside of the tub 20. The drying duct 30 installed as above is fixedly connected to a support bar 35 using a fastener member such as a bolt, in which the support bar 35 crosses an upper portion of an inner space of the cabinet 10.

[0010] The heater 50 is installed within the drying duct 30, and the circulation fan 35 is installed in a portion to which the drying duct 30 and the condensation duct 40 are connected. In addition, the drain pump 6 is installed so as to drain water gathered in a lower portion of the tub 20. A reference numeral 9 denotes a cooling-water supplying unit for supplying cooling water to an inside of the condensation duct 40.

[0011] Meanwhile, as shown in FIG. 3, in the conventional washing machine and dryer constructed as above, the drying duct 30 includes a lower part 31 whose upper portion is opened, an upper part 32 covering the opened upper portion of the lower part 31, and the discharge part 33 connected to a lower portion of one end of the lower part 31. Further, a communication hole 31a is formed at a lower portion of the other end of the lower part 31 in order to connect the drying duct 30 with the condensation duct 40.

[0012] Hereinafter, a drying operation of the conventional washing machine and dryer will be described in detail.

[0013] First, a wet laundry is loaded into the drum 25 and the drum 25 is rotated. Then, the circulation fan 35 is rotated to circulate internal air of the drum 25 via the condensation duct 40 and the drying duct 30. The heater is operated to heat air. The air heated by the heater 50 dries the laundry within the drum 25. At this time, moisture evaporated from the laundry is contained in air and introduced into the condensation duct 40. In the condensation duct 40, a heat exchange happens between the cooling water supplied from the cooling-water supplying unit 9 and air, so that moisture contained in the air is condensed and removed. The dried air whose moisture is removed is introduced into the drying duct 30. The air introduced into the drying duct 30 is heated by the heater 50 and then again introduced into the drum 25. By repeatedly performing the above procedures, the conventional washing machine and dryer removes the moisture of the wet laundry loaded into the drum 25, thus drying the wet laundry.

[0014] However, the conventional washing machine and dryer with the above-described duct structure has following problems.

[0015] First, because the drying duct is disposed at the middle upper portion of the tub, the internal space utilization of the cabinet is degraded and the equipment generally increases in height.

[0016] Second, after the lower part, the upper part and
the discharge part contained in the drying duct are separately manufactured, the respective parts are assembled so that the number of parts increases. Further, the number of assembly processes also increases, thereby causing a degradation of productivity.

[0017] Third, when the drum is rotated, the tub and the drying duct connected thereto are vibrated together. In this case, the connection portion between the lower part and the discharge part perpendicularly connected thereto may be loose and a gap therebetween may occur. In an excessive case, the connection portion between the lower part and the discharge part may be broken.

[0018] Fourth, because the vibration causes a gap in the connection portion between the lower part and the discharge part, air flowing in the drying duct may be leaked out and thus noise may occur.

DISCLOSURE OF THE INVENTION

[0019] Accordingly, the present invention is directed to a washing machine and dryer that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0020] An object of the present invention is to provide a washing machine and dryer with an improved drying duct structure, in which an internal space utilization of a cabinet is enhanced and an entire height of the equipment is reduced.

[0021] Another object of the present invention is to provide a washing machine and dryer, in which the number of elements of a drying duct is reduced and thus the productivity is improved.

[0022] Further another object of the present invention is to provide a washing machine and dryer with an improved drying duct structure, in which a damage and an air leakage, caused by vibration of a tub, and a flowing noise caused by the air leakage are prevented.

[0023] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realised and attained by the structure particularly pointed out in the written description and claims thereof as well as the appended drawings. The present invention is set out in the independent claim. Some optional features are set out in the claims dependent thereto.

[0024] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, according to one embodiment there is provided a washing machine and dryer according to claim 1.

[0025] A surface of the drying duct, which is adjacent to the tub, is formed to be slant. For example, the adjacent surface of the drying duct is formed in a curved surface with the same curvature as an outer surface of the tub.

[0026] The drying duct includes: a lower part of which an upper portion is opened, in which a discharge part connected to a front side of the tub is downwardly extended from one end in one body and a communication hole for connecting the lower part with the condensation duct is formed in a lower portion of the other end; and an upper part covering the opened upper portion of the lower part. The other end of the lower part in which the communication hole is formed is widely formed. The circulation fan is inserted into the other end of the lower part. A surface of the lower part, which is adjacent to the outer surface of the tub, is formed to be slant. The adjacent surface of the lower part is formed in a curved surface with the same curvature as an outer surface of the tub. A portion in which the discharge part is extended from one end of the lower part is formed roundly so as to smoothly guide air.

[0027] Meanwhile, the discharge part is extended to be slant from the lower part in a downward direction. In this case, for example, the discharge part is formed to be slant when viewed from the front of the tub so as to discharge air in the tangential direction with respect to the rotation direction of the drum.

[0028] The washing machine and dryer of the present invention further comprises a guidance part extended from one end portion of the discharged part in a tangential direction with respect to the rotation direction of the tub when viewed from the front of the tub so as to discharge air in the tangential direction with respect to the rotation direction of the drum.

[0029] The drying duct may have both ends fixed and supported to an inner surface of the cabinet by a first fixing member and a second fixing member.

[0030] Here, the first fixing member includes: a plurality of brackets protruded at one portion of an inner surface of the cabinet; and a fixing load protruded at one end portion of the drying duct and fixedly inserted between the plurality of brackets. At this time, the brackets and the fixing load are connected with each other by bolts and nuts. In addition, the washing machine and dryer can further comprises a plurality of reinforcement ribs for connecting a side surface of the fixing load with the drying duct, thereby reinforcing the fixing load.

[0031] The second fixing member includes: a fixing projection protruded at the other end of the drying duct; and a fixing angle protruded at other portion of an inner surface of the cabinet, for supporting the fixing projection at a lower portion. At this time, the fixing projection and the fixing angle are fixedly connected with each other by a bolt and a nut.

[0032] Meanwhile, in the washing machine and dryer of the present invention, the heater may be installed in an inside of the drying duct. The condensation duct has one end connected to the drying duct and the other end connected to a rear lower portion of the tub.

[0033] The tub and the drum may be installed in parallel with a horizontal plane or may be installed to be slant, such that openings of the tub and the drum are disposed at an upper portion with respect to a horizontal plane.

[0034] It is to be understood that both the foregoing general description and the following detailed description
are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0036] In the drawings:

FIG. 1 is a partial cross-sectional perspective view showing a duct structure of a conventional washing machine and dryer;

Fig. 2 is a cross-sectional view showing an internal structure of the conventional washing machine and dryer;

FIG. 3 is an exploded perspective view showing the drying duct structure of the conventional washing machine and dryer;

FIG. 4 is a partial cross-sectional perspective view showing a duct structure of a washing machine and dryer illustrated for better understanding of the present invention;

FIG. 5 is a cross-sectional view showing an internal structure of the washing machine and dryer illustrated for better understanding of the present invention;

FIG. 6 is an exploded perspective view of the drying duct illustrated for better understanding of the present invention;

FIG. 7 is a cross-sectional perspective view of the drying duct installed illustrated for better understanding of the present invention;

FIG. 3 is a partial cross-sectional perspective view showing a duct structure of a washing machine and dryer in accordance with another embodiment of the present invention;

FIG. 9 is a cross-sectional view showing the drying duct fixed to the cabinet by the first fixing member; and

FIG. 10 is a cross-sectional view showing the drying duct fixed to the cabinet by the second fixing member.

BEST MODE FOR CARRYING OUT THE INVENTION

[0037] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0038] In embodiments of the present invention, the same reference numerals and symbols denote the same elements and structures and the duplicate descriptions will be omitted below.

[0039] In FIGs. 4 and 5, there is shown an internal structure of a washing machine and dryer. Referring to FIGs. 4 and 5, the washing machine and dryer of the present invention includes a cabinet 100, a tub 200, a drum 250, a motor 130, a condensation duct 400, a drying duct 300, a heater 800 and a circulation fan 350.

[0040] The cabinet 100 forms an outer shell of the washing machine and dryer and has a loading portion 110 formed on one side (c. q. a predetermined front side). The laundry is loaded/unloaded through the loading portion 110. A door 150 is installed near the loading portion 110 and rotates around a hinge 160 to open/close the loading portion 110.

[0041] The tub 200 is formed in a cylinder shape and installed in an inner side of the cabinet 100. An opening of the tub 200 is disposed corresponding to the loading portion 110. The tub 200 installed as above can be installed in parallel with a horizontal plane. In addition, for the sake of user's convenience, the tub 200 can be installed to be slant with respect to the horizontal plane such that its opening faces slightly upwardly.

[0042] Both ends of the tub 200 is supported by a plurality of springs 115 and a damper 116, which are connected to an outer face of the tub 200 and an inner face of the cabinet 100, respectively. The springs 115 and the damper 116 attenuate a vibration transferred from the drum 250.

[0043] The drum 250 is formed in a cylinder shape and disposed corresponding to the loading portion 110 of the cabinet 100 so that the drum 250 can be rotatable in an inner side of the cabinet 100. As shown in FIG. 5, a plurality of tumbling ribs 251 are protruded in an inner side of the drum 250. The tumbling ribs 251 functions to lift and drop the laundry while the drum 250 is rotated. Further although not shown, a plurality of passage holes are formed in a circumference face of the drum 250. By way of the passage holes, washing water required for the washing operation or water dropped from the laundry in the dehydrating and drying operations moves between the drum 250 and the tub 200.

[0044] The motor 130 is installed to rotate the drum 250, and a drain pump 120 is installed to drain water from the inside of the tub 200 to the outside of the cabinet 100 via a drain hose 125.

[0045] Figures 4-7 are included to assist in understanding the present invention shown in Figures 8-10.

[0046] In the washing machine and dryer of the present invention, the drying duct 300 is installed to have one end connected to the inside of the tub 200. As shown in FIG. 4, when viewed from the front of the tub 200, the drying duct 300 is installed in an upper portion of the tub 200 disposed to be eccentric toward one side from left
and right central lines of the tub 200. A more detailed construction of the drying duct 300 installed as above will be described with reference to FIGs. 6 and 7.

[0047] In accordance with FIG. 6, the drying duct 300 is divided into two bodies, i.e., a lower part 310 and an upper part 320. The lower part 310 is formed in a channel shape, in which an upper portion of the lower part 310 is opened and both ends thereof are closed. A discharge part 330 is downwardly extended in one body at one end of the lower part 310. Here, is shown in FIG. 6, the portion in which the discharge part 330 is extended, i.e., a connection portion between the lower part 310 and the discharge part 330 is formed roundly so as to reduce a fluid resistance and smoothly guide air.

[0048] As shown in FIG. 4, the discharge part 330 constructed as above can be formed extended downwardly in a vertical direction. Meanwhile, it is desirable to form the discharge part 330 to be slant toward one side thereof so as to smoothly guide air toward the inside of the tub 200, as shown in FIG. 6. At this time, when viewed from the front of the tub 200, the slant direction is formed in a direction in which air can be discharged in the rotation direction of the drum 250. If the discharge part 330 is formed to be slant as above, it is possible to reduce a turbulent air and a flowing noise, which are caused by a collision between air discharged from the discharge part 330 and other air existing within the rotating drum 250.

[0049] Meanwhile, disposed at an opposite side of the discharge part 330, the other end of the lower part 310 is widely formed roughly in a cylinder shape. A communication hole 311 is formed at a lower bottom portion of the other end of the lower part 310 so as to connect the drying duct 300 to the condensation duct 400. The circulation fan 350 is installed in the other end of the lower part 310 formed widely as above.

[0050] The upper part 320 is formed in a channel shape whose lower portion is opened. The upper part 320 is connected to an upper portion of the lower part 310 to cover the opened upper portion of the lower part 310. At this time, the lower part 310 and the upper part 320 are connected to each other with a screw or a bolt and nut.

[0051] The drying duct 300 assembled with the separately manufactured lower and upper parts 310 and 320 is disposed at a position that is eccentric from the left and right center of the tub 200, and the drying duct 300 is installed in the upper portion of the tub 200. At this time, the drying duct 300 enhances the space utilization of the cabinet in the washing machine and dryer, and the upper face of the drying duct 300 is installed in a lower portion than that of the tub 200 so as to reduce an entire height of the equipment. However, in case of designing the above structure in consideration of a correlation between the condensation duct 400 and all other components, it is desirable to design the arrangement to have a small difference in height between the upper face of the tub 200 and that of the drying duct 300 if it is not easy to make the above arrangement, as shown in FIG. 5.

[0052] Meanwhile, as shown in FIGs. 6 and 7, in order to reduce an interference between the drying duct 300 and the circumference surface of the tub 200 and enhance the space utilization, the drying duct 300 disposed eccentrically to one side from the left and right center of the tub 200 is formed to have a surface, which is adjacent to the circumference surface of the tub 200 (e.g., a surface adjacent to the circumference surface of the lower part 310), to be slant. At this time, for example, the slant surface 315 is formed to have a curved surface and it is desirable that the curved surface should have the same curvature as the outer surface of the tub 200.

[0053] A drying duct 300 in accordance with another embodiment of the present invention further includes a guidance part 340 and the guidance part 340 will be described with reference to FIG. 8. When the drying duct 300 in accordance with another embodiment of the present invention is described, the same description as FIGs. 6 and 7 will be omitted and only the description related to the guidance part 340 will be made below.

[0054] As shown in FIG. 8, the guidance part 340 is extended from one end portion of the discharge part 330. When viewed from the front of tub 200, it is desirable that the guidance part 340 be extended in a tangential direction with respect to the rotation direction of the drum 250. The reason is that the flowing resistance and the flowing noise can be effectively reduced because air is discharged via the guidance part 340 in the tangential direction with respect to the rotation direction of the drum 250 and thus its direction is more similar to the flowing direction of air existing within the drum 250.

[0055] Meanwhile, the drying duct 300 of the washing machine and dryer in accordance with the present invention has both ends fixed and supported to the inner surface of the cabinet 100 by a first fixing member 600 and a second fixing member 700. The first and second fixing members 600 and 700 will be described below in detail with reference to the drawings.

[0056] Referring to FIGs. 5, 8 and 9, the first fixing member 600 fixes one end of the drying duct 300, in which the discharge part 330 is formed, to the inner side of the cabinet 100. The first fixing member 600 includes a plurality of brackets 620 and a fixing load 610. Here, a plurality of the brackets 620 are protruded at one portion of the inner surface of the cabinet 100. As shown in FIG. 8, the fixing load 610 is protruded at one end of the drying duct 300 in which the discharge duct 330 is formed. As shown in FIG. 9, the loading load 610 is inserted between the plurality of brackets 620 and rigidly fixed to the brackets 620 by a screw or a bolt and nut. Meanwhile, in order to reinforce the strength of the prolongedly protruded fixing load 610, a plurality of reinforcement ribs 615 are formed to connect a side surface of the fixing load 610 with an outer surface of the drying duct 300, as shown in FIG. 9.

[0057] Meanwhile, referring to FIGs. 5, 8 and 10, the second fixing member 700 includes a fixing projection 710 and a fixing angle 720. Here, the fixing projection 710 is protruded at the other end of the drying duct 300,
which is disposed at an opposite side of the discharge part 330. The fixing angle 720 is protruded at other portions of the inner surface of the cabinet 100 such that the fixing projection 710 can be supported at a lower portion. As shown in FIGs. 10, the fixing projection 710 and the fixing angle 720 can be fixed by a bolt 730 and a nut 735 or can be fixed to each other by a screw and so on.

If both ends of the drying duct 300 is fixed and supported to the cabinet 100 by the first and second fixing members 600 and 700, a height of the washing machine and dryer can be reduced much more.

Meanwhile, in the washing machine and dryer of the present invention, a heater 800 is formed in an inner side of the drying duct 300.

As shown in FIGs. 4 and 5, the condensation duct 400 has one end connected to the drying duct 300 and the other end connected to a rear lower portion of the tub 200. A cooling-water supplying unit 160 is provided to supply a cooling water to an inside of the condensation duct 400 installed as above.

Hereinafter, a drying operation of the washing machine and dryer constructed as above in accordance with the present invention will be described in detail, in which the wet laundry is loaded into the drum 250.

First, the wet laundry is loaded into the drum 250 and the motor 130 is operated to rotate the drum 250. Simultaneously, the circulation fan 350 is rotated and the heater 800 is operated.

Then, air existing within the drum 250 sequentially passes through the condensation duct 400 and the drying duct 300 and is again introduced into the inside of the drum 250. At this time, air passing through the drying duct 300 is hotly heated by the heater 800 and the heated air dries the laundry loaded into the drum 250. In addition, moisture contained in the laundry is evaporated in an internal air of the drum 250.

Moist air containing moisture evaporated from the laundry is introduced into the condensation duct 400. Meanwhile, the cooling-water supplying unit 160 keeps on supplying a cooling water to the inside of the condensation duct 400. Thus, a heat exchange occurs between the moist air passing through the condensation duct 400 and the cooling water. At this time, moisture contained in air is condensed and removed, so that the air becomes dry.

The dried air passing through the condensation duct 400 passes through the circulation fan 350 and then is introduced into the drying duct 300. The dried air introduced into the drying duct 300 is again heated hotly by the heater 800 and supplied to the drum 250.

Meanwhile, the drying duct 300 of the present invention has a structure in which the discharge part 330 is extended from the lower part 310 in one body. Therefore, even when vibration occurs in the rotation of the drum 250, air is not leaked out and a loud flowing noise does not occur.

In addition, since air passing through the drying duct 300 of the present invention is exhausted in a tangential direction with respect to the rotation direction of the drum 250 while passing through the discharge part 330 and the guidance part 340, it is possible to prevent a turbulent air and a flowing noise, which are caused by a collision with air existing within the rotating drum 250.

Meanwhile, the washing machine and dryer in accordance with the present invention repeatedly performs the above procedures to dry the laundry loaded into the drum 250.

INDUSTRIAL APPLICABILITY

The washing machine and dryer in accordance with the present invention has following advantages.

First, unlike the related art in which the conventional drying duct is installed in the middle upper portion of the tub, the drying duct of the present invention is installed to be eccentric from the left and right center, so that the internal space utilization of the cabinet is improved and the washing machine and dryer becomes compact. Meanwhile, it is much more effective if the structure in which the drying duct is installed to be eccentric toward one side of the tub is applied to a washing machine and dryer in which the tub and the drum are installed to be slant.

Second, since the surface of the drying duct, which is adjacent to the tub, is formed to be slant, it is possible to minimize interference between the drying duct and the tub and effectively guide the surface through which air flows into the drying duct.

Third, unlike the related art in which the drying duct is separately manufactured and assembled with three bodies, the drying duct of the present invention is manufactured with two bodies, so that the number of parts and the number of assemble processes are reduced and the productivity is improved.

Fourth, since the discharge part and the lower part are formed in one body, it can fundamentally prevent the damage and the air leakage, caused in the connection portion due to vibration, and the flowing noise caused by them. Accordingly, the life of the equipment is prolonged.

Fifth, since the discharge part is formed to be slant and the guidance part is expended in the tangential direction with respect to the rotation direction of the drum, collision between air exhausted into the drum via the drying duct and air existing within the drum can be minimized, so that the occurrence of the turbulent air and the flowing noise is minimized.

While the present invention has been described and illustrate herein with reference to the preferred embodiments thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention that come within the scope of the appended claims and their equivalents.
Claims

1. A washing machine and dryer comprising:
   a cabinet (100);
   a cylinder-shaped tub (200) installed within the cabinet;
   a drum (250) rotatably installed within the tub;
   a drying duct (300) having one end connected to an inner side of the tub, the drying duct being installed in an upper portion of the tub to be eccentric toward one side of the tub when viewed from the front of the tub, the drying duct including a lower part in which a discharge part (330) is downwardly extended;
   a condensation duct (400) having one end connected to the drying duct and the other end connected to an inner side of the tub;
   a circulation fan (350) for circulating air existing within the tub through the condensation duct and the drying duct;
   a heater (800) for heating the air; and characterised in that the discharge part is formed to be slant when viewed from the front of the tub so as to discharge air in a rotation direction of the drum; and further including a guidance part (340) extended from one end portion of the discharge part in a tangential direction with respect to the rotation direction of the drum when viewed from the front of the tub so as to discharge air in the tangential direction with respect to the rotation direction of the drum.

2. The washing machine and dryer of claim 1, wherein a surface of the drying duct, which is adjacent to the tub, is formed to be slant.

3. The washing machine and dryer of claim 2, wherein the adjacent surface of the drying duct is formed in a curved surface with the same curvature as an outer surface of the tub.

4. The washing machine and dryer of claim 1, wherein the drying duct includes:
   a lower part (310) of which an upper portion is opened, in which the discharge part connected to a front side of the tub is downwardly extended from one end in one body and a communication hole for connecting the lower part with the condensation duct is formed in a lower portion of the other end; and an upper part (320) covering the opened upper portion of the lower part.

5. The washing machine and dryer of claim 4, wherein the other end of the lower part in which the communication hole (311) is formed is widely formed; and preferably wherein the circulation fan is inserted into the other end of the lower part.

6. The washing machine and dryer of claim 4, wherein a surface of the lower part, which is adjacent to the outer surface of the tub, is formed to be slant; and/or wherein the adjacent surface of the lower part is formed in a curved surface with the same curvature as an outer surface of the tub; and/or wherein a portion in which the discharge part is extended from one end of the lower part is formed roundly so as to smoothly guide air.

7. The washing machine and dryer of claim 1, wherein the drying duct has both ends fixed and supported to an inner surface of the cabinet by a first fixing member (600) and a second fixing member (700).

8. The washing machine and dryer of claim 7, wherein the first fixing member includes:
   a plurality of brackets (620) protruded at one portion of an inner surface of the cabinet and a fixing load (610) protruded at one end portion of the drying duct and fixedly inserted between the plurality of brackets.

9. The washing machine and dryer of claim 8, wherein the brackets and the fixing load are connected to each other by bolts and nuts; and/or further comprising a plurality of reinforcement ribs for connecting a side surface of the fixing load with the drying duct, thereby reinforcing the fixing load.

10. The washing machine and dryer of claim 7, wherein the second fixing member includes:
    a fixing projection (710) protruded at the other end of the drying duct; and a fixing angle (720) protruded at other portion of an inner surface of the cabinet, for supporting the fixing projection at a lower portion.

11. The washing machine and dryer of claim 10, wherein the fixing projection and the fixing angle are fixedly connected with each other by a bolt (730) and a nut (735).

12. The washing machine and dryer of claim 1, wherein the heater (800) is installed in an inside of the drying duct; and/or wherein the condensation duct (400) has one end connected to the drying duct and the other end connected to a rear lower portion of the tub; and/or wherein the tub and the drum are installed in parallel with a horizontal plane.

13. The washing machine and dryer of claim 1 wherein the tub and the drum are installed to be slant, such
that openings of the tub and the drum are disposed at an upper portion with respect to a horizontal plane; and/or wherein an upper face of the drying duct is installed in a lower portion than that of the tub.

**Patentansprüche**

1. Waschtrockner mit:
   - einem Gehäuse (100);
   - einer im Gehäuse angeordneten zylinderförmi-
     gen Wanne (200);
   - einer drehbar in der Wanne angeordneten Trommel (250);
   - einem Trockenrohr (300), das mit einem Ende mit einer Innenseite der Wanne verbunden ist, wobei das Trockenrohr in einem oberen Teil der Wanne so angeordnet ist, dass es sich, von der Vorderseite der Wanne aus gesehen, exzentrisch zu einer Seite der Wanne befindet, wobei das Trockenrohr einen unteren Teil aufweist, in dem sich ein Auslassteil (330) nach unten erstreckt;
   - einem Kondensationsrohr (400), das mit einem Ende mit dem Trockenrohr verbunden ist und dessen anderes Ende mit einer Innenseite der Wanne verbunden ist;
   - einem Umlüfter (350) zur Umwälzung von in der Wanne vorhandener Luft durch das Kondensationsrohr und das Trockenrohr;
   - einer Heizeinrichtung (800) zum Aufheizen der Luft; und
dadurch gekennzeichnet, dass der Auslassteil, von der Vorderseite der Wanne aus gesehen, schräg ausgebildet ist, so dass Luft in einer Drehrichtung der Trommel ausgelassen wird; und weiters mit einem Führungsteil (340), der sich, von der Vorderseite der Wanne aus gesehen, von einem Endteil des Auslassteils in tangentialer Richtung in Bezug auf die Drehrichtung der Trommel erstreckt, so dass Luft in tangentialer Richtung in Bezug auf die Drehrichtung der Trommel ausgelassen wird.

2. Waschtrockner nach Anspruch 1, wobei eine Fläche des Trockenrohrs, die an die Wanne angrenzt, schräg ausgebildet ist.

3. Waschtrockner nach Anspruch 2, wobei die angrenzende Fläche des Trockenrohrs in einer gekrümmten Fläche mit der gleichen Krümmung wie eine Außenfläche der Wanne ausgebildet ist.

4. Waschtrockner nach Anspruch 1, wobei das Trockenrohr aufweist:
   - einen unteren Teil (310), von dem ein oberer Abschnitt offen ist, in dem sich der mit einer Vorderseite der Wanne verbundene Auslassteil von einem Ende in einem Körper nach unten erstreckt, und eine Verbindungsoffnung zur Verbindung des unteren Teils mit dem Kondensationsrohr in einem unteren Abschnitt des anderen Endes ausgebildet ist; und
   - einen oberen Teil (320), der den offenen oberen Abschnitt des unteren Teils überdeckt.

5. Waschtrockner nach Anspruch 4, wobei das andere Ende des unteren Teils, in dem die Verbindungsoffnung (311) gebildet ist, breit ausgeführt ist; und wobei vorzugsweise der Umlüfter in das andere Ende des unteren Teils eingesetzt ist.

6. Waschtrockner nach Anspruch 4, wobei eine Fläche des unteren Teils, die an die Außenfläche der Wanne grenzt, schräg ausgebildet ist; und/oder wobei die angrenzende Fläche des unteren Teils in einer gekrümmten Fläche mit der gleichen Krümmung wie eine Außenfläche der Wanne ausgebildet ist; und/oder wobei ein Abschnitt, in dem sich der Auslassteil von einem Ende des unteren Teils wegb erstreckt, rund ausgeführt ist, um die Luft ruhig zu führen.

7. Waschtrockner nach Anspruch 1, wobei beide Enden des Trockenrohrs durch ein erstes Befestigungselement (600) und ein zweites Befestigungselement (700) an einer Innenfläche des Gehäuses befestigt bzw. gehalten sind.

8. Waschtrockner nach Anspruch 7, wobei das erste Befestigungselement enthält:
   - eine Mehrzahl von Trägern (620), die von einem Abschnitt einer Innenfläche des Gehäuses abgestehen, und
   - einen Befestigungslastteil (610), der von einem Endabschnitt des Trockenrohrs abgesteht und zwischen der Mehrzahl von Trägern fix eingesetzt ist.


10. Waschtrockner nach Anspruch 7, wobei das zweite Befestigungselement enthält:
    - einen Befestigungsvorsprung (710), der von einem Ende des Trockenrohrs absieht; und
    - einen Befestigungswinkel (720), der zur Abstü-
zung des Befestigungsvorsprungs im unteren Abschnitt von einem anderen Abschnitt einer Innенfläche des Gehäuses absteht.

11. Waschtrockner nach Anspruch 10, wobei der Befestigungsvorsprung und der Befestigungswinkel durch einen Bolzen (730) und eine Mutter (735) fix miteinander verbunden sind.

12. Waschtrockner nach Anspruch 1, wobei die Heizeinrichtung (800) an einer Innenseite des Trockenrohrs angeordnet ist, und/oder wobei ein Ende des Kondensationsrohrs (400) mit dem Trockenrohr verbunden ist und das andere Ende mit einem hinteren unteren Abschnitt der Wanne verbunden ist, und/oder wobei die Wanne und die Trommel parallel zu einer horizontalen Ebene angeordnet sind.

13. Waschtrockner nach Anspruch 1, wobei die Wanne und die Trommel schräg angeordnet sind, so dass sich Öffnungen der Wanne und der Trommel in Bezug auf eine horizontale Ebene in einem oberen Abschnitt befinden, und/oder wobei eine Oberseite des Trockenrohrs in einem weiter unten liegenden Abschnitt als die der Wanne angeordnet ist.

Revendications

1. Machine à laver et sécheuse comprenant :
   un caisson (100);
   une cuve de forme cylindrique (200) installée à l’intérieur du caisson;
   un tambour (250) installé de manière à pouvoir tourner à l’intérieur de la cuve;
   un conduit de séchage (300) ayant une extrémité connectée à un côté intérieur de la cuve, le conduit de séchage étant installé dans une portion supérieure de la cuve pour être excéntrique vers un côté de la cuve en vue de l’avant de la cuve, le conduit de séchage comprenant une partie inférieure dans lesquelles une partie d’évacuation (330) est étendue vers le bas, un conduit de condensation (400) ayant une extrémité connectée au conduit de séchage et l’autre extrémité connectée à un côté intérieur de la cuve;
   un ventilateur de circulation (350) pour faire circuler de l’air existant à l’intérieur de la cuve à travers le conduit de condensation et le conduit de séchage;
   un réchauffeur (800) pour chauffer l’air; et caractérisées en ce que la partie d’évacuation est formée pour être inclinée en vue de l’avant de la cuve de manière à évacuer l’air dans une direction de rotation du tambour; et comprenant en outre une partie de guidage (340) étendue d’une portion d’extrémité de la partie d’évacuation dans une direction tangentielle par rapport à la direction de rotation du tambour en vue de l’avant de la cuve de manière à évacuer l’air dans la direction tangentielle par rapport à la direction de rotation du tambour.

2. Machine à laver et sécheuse selon la revendication 1, dans lesquelles une surface du conduit de séchage, qui est adjacente à la cuve, est formée pour être inclinée.

3. Machine à laver et sécheuse selon la revendication 2, dans lesquelles la surface adjacente du conduit de séchage est formée dans une surface incurvée avec la même courbure qu’une surface extérieure de la cuve.

4. Machine à laver et sécheuse selon la revendication 1, dans lesquelles le conduit de séchage comprend :
   une partie inférieure (310) dont une portion supérieure est ouverte, dans lesquelles la partie d’évacuation connectée à un côté avant de la cuve est étendue vers le bas d’une extrémité dans un corps et un trou de communication pour connecter la partie inférieure au conduit de condensation est formé dans une portion inférieure de l’autre extrémité; et
   une partie supérieure (320) recouvrant la portion supérieure ouverte de la partie inférieure.

5. Machine à laver et sécheuse selon la revendication 4, dans lesquelles l’autre extrémité de la partie inférieure dans lesquelles le trou de communication (311) est formé est formée de manière large; et de préférence dans lesquelles le ventilateur de circulation est inséré dans l’autre extrémité de la partie inférieure.

6. Machine à laver et sécheuse selon la revendication 4, dans lesquelles une surface de la partie inférieure, qui est adjacente à la surface extérieure de la cuve, est formée pour être inclinée; et/ou dans lesquelles la surface adjacente de la partie inférieure est formée dans une surface incurvée avec la même courbure qu’une surface extérieure de la cuve; et/ou dans lesquelles une portion dans laquelle la partie d’évacuation est étendue depuis une extrémité de la partie inférieure est formée de manière ronde pour guider l’air sans problème.

7. Machine à laver et sécheuse selon la revendication 1, dans lesquelles le conduit de séchage a les deux extrémités fixées et supportées sur une surface inférieure du caisson par un premier élément de fixation (600) et un second élément de fixation (700).
8. Machine à laver et sécheuse selon la revendication 7, dans lesquelles le premier élément de fixation comprend :
   une pluralité de tasseaux (620) faisant saillie à une portion d’une surface intérieure du caisson, et
   une charge de fixation (610) faisant saillie à une portion d’extrémité du conduit de séchage et insérée de manière fixe entre la pluralité de tasseaux.

9. Machine à laver et sécheuse selon la revendication 8, dans lesquelles les tasseaux et la charge de fixation sont connectés entre eux par des boulons et des écrous ; et/ou comprenant en outre une pluralité de nervures de renfort pour connecter une surface latérale de la charge de fixation au conduit de séchage, en renforçant de ce fait la charge de fixation.

10. Machine à laver et sécheuse selon la revendication 7, dans lesquelles le second élément de fixation comprend :
   une projection de fixation (710) faisant saillie à l’autre extrémité du conduit de séchage ; et
   un angle de fixation (720) faisant saillie à une autre portion d’une surface intérieure du caisson, pour supporter la projection de fixation à une portion inférieure.

11. Machine à laver et sécheuse selon la revendication 10, dans lesquelles la projection de fixation et l’angle de fixation sont connectés de manière fixe entre eux par un boulon (730) et un écrou (735).

12. Machine à laver et sécheuse selon la revendication 1, dans lesquelles le réchauffeur (800) est installé dans un intérieur du conduit de séchage ; et/ou dans lesquelles le conduit de condensation (400) a une extrémité connectée au conduit de séchage et l’autre extrémité connectée à une portion inférieure arrière de la cuve ; et/ou dans lesquelles la cuve et le tambour sont installés en parallèle à un plan horizontal.

13. Machine à laver et sécheuse selon la revendication 1, dans lesquelles la cuve et le tambour sont installés pour être inclinés, de sorte que des ouvertures de la cuve et du tambour soient disposées à une portion supérieure par rapport à un plan horizontal ; et/ou dans lesquelles une face supérieure du conduit de séchage est installée dans une portion inférieure à celle de la cuve.
REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

• EP 1094141 A2 [0006]