The present invention provides a drum type washer and dryer, by which drying efficiency and performance are enhanced and by which thermal transformation of the tub due to heat supplied from a drying duct can be minimized. The present invention includes a tub having a hot air inlet on its upper front portion, a drum rotatably provided within the tub, a drying duct having one end connected to the hot air inlet of the tub to supply hot air to the drum, the drying duct including a heater and blower fan therein to generate the hot air, a condensing duct having one end communicating with one side of the tub and the other end communicating with the drying duct, the condensing duct removing humidity of air discharged from the tub to lead the humidity-removed air to the drying duct, and a plurality of reinforcement ribs projected from a vicinity of the hot air inlet of the tub.
DRUM TYPE WASHER AND DRYER

[0001] This application claims the benefit of the Korean Application Nos. P2004-26996; P2004-26997 and P2004-26997, three of which are filed on Apr. 20, 2004, which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a drum type washer and dryer, by which drying efficiency and performance are enhanced in a manner of improving a drying system supplying hot air to a tub.

[0004] 2. Discussion of the Related Art

[0005] Generally, a drum type washer is an apparatus for washing a laundry put in a drum together with water and detergent by rotating the drum using a drive force of a motor. The drum type washer causes less damage to the laundry, avoids raveling of the laundry, and brings about washing effects of beating and rubbing.

[0006] A drum type washer according to a related art is explained in detail with reference to FIG. 1 as follows.

[0007] FIG. 1 is a cross-sectional diagram of a drum type washer according to a related art.

[0008] Referring to FIG. 1, a drum type washer consists of a cabinet 1 having a laundry entrance provided to its front side, a door 2 provided to the laundry entrance of the cabinet 1 to open/close the laundry entrance, a metallic tub 3 provided within the cabinet 1 to store water therein, a drum 4 rotatably provided within the tub 3, and a motor device 5 provided to the tub 3 to transfer its drive force to the drum 4.

[0009] A door glass 2a is provided to the door 2 to be projected to an opening of the tub 3.

[0010] A suspension spring 6 is provided between an inside of a top portion of the cabinet 1 and an upper outer circumference of the tub 2 to support the tub 2. And, a friction damper (not shown in the drawing) is provided between an inside bottom of the cabinet 1 and a lower outer circumference of the tub 2 to attenuate vibration of the tub 2 generated from operating the drum type washer.

[0011] An indirect drive system is applied to the motor device 5 to rotate the drum 4 by transferring a drive force generated from the motor 5a to a washing shaft 5c via a belt 5b.

[0012] Meanwhile, a drying duct 7 is installed under the top portion of the cabinet 1. And, a blower fan 7a and a heater 7b are built in the drying duct 7 to blow out hot air. Moreover, one end of the drying duct 7 is configured to communicate with the opening of the tub 3 in the vicinity of the door 2.

[0013] The opening of the tub 3 is connected to one end of the drying duct 7 via a gasket 8. The gasket 8 is provided along an inside rim of a front side of the tub 3 and has a bellows shape to absorb vibration of the tub 3. Hence, the gasket 8 prevents the hot air from leaking via a connecting part between the drying duct 7 and the tub 3.

[0014] A condensing duct 9 is provided to the tub 3 to communicate with the drying duct 7. One end of the condensing duct 9 is connected to an outside of the tub 3 and the other end of the condensing duct 9 is connected to the drying duct 7. A water supplier 9a supplying cooling water is provided to the condensing duct 9 to condense to remove humidity of air.

[0015] Meanwhile, the above-configured drum type washer carries out washing, rinsing, dewatering, and drying cycles. The drying cycle of the drum type washer is explained as follows.

[0016] First of all, once the drying cycle of the drum type washer is executed, power is applied to the heater 7b of the drying duct 7. In doing so, the blower fan 7a blows out the hot air as the heater 7b and the blower fan 7a are actuated.

[0017] The hot air guided by the drying duct 7 collides with a tilted portion of the door glass 2a and is then re-introduced into the drum 4.

[0018] The hot air introduced into the drum 4 heats a laundry within the drum 4 to evaporate water involved in the laundry. In doing so, the laundry is agitated by a slow rotation of the drum 4, thereby being evenly exposed to the hot air to help the evaporation of the water.

[0019] The evaporated water is discharged via the condensing duct 9. In doing so, the water supplier 9a of the condensing duct 9 injects cooling water to remove the humidity of the air. The humidity-removed air is introduced into the drying duct 7 again to be transformed into hot air by the heater 7b and the blower fan 7a and is then re-introduced into the drum 4 to dry the laundry.

[0020] Such a cycle is repeatedly performed to dry the laundry.

[0021] However, in the related art drum type washer, the drying air is supplied to the drum via the drying duct connected to one top portion of the gasket and the supplied dry air is discharged via a front lateral side of the tub for air circulation. Hence, the related art drum type washer has various problems such as drying efficiency and the like.

[0022] First of all, the air supplied to the drum fails to intrude deep in the drum but is discharged via the front lateral side of the tub. Hence, the laundry lying deeply in the drum fails to be normally dried, whereby the air circulation passage of the related art washer lowers the drying efficiency and performance.

[0023] Secondly, the drying duct is connected to the gasket. The drying duct is fixed to the cabinet but the gasket is shaken by the vibration of the tub, whereby the gasket is abraded or torn. Hence, an expensive gasket having a relatively small thermal transformation is needed to raise a product cost.

[0024] Thirdly, the drying duct is vertically bent downward via the gasket, which deviates from an axial direction of the drum. And, the blown hot air comes into colliding with the door glass to face the resistance thereof, thereby having difficulty in intruding into the drum deeply. To overcome such a difficulty, the blower needs a relatively high capacity.

[0025] Fourthly, the hot air of the drying duct is diverted from its course at the tilted portion of the door glass 2a via the gasket 8 to be introduced into the drum 4, whereby the door 2 and the tub 3 are unnecessarily heated.
SUMMARY OF THE INVENTION

[0026] Accordingly, the present invention is directed to a drum type washer and dryer that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0027] An object of the present invention is to provide a drum type washer and dryer, by which drying efficiency and performance are enhanced and by which thermal transformation of the tub due to heat supplied from a drying duct can be minimized.

[0028] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0029] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a drum type washer and dryer according to the present invention includes a tub having a hot air inlet on its upper front portion, a drum rotatably provided within the tub, a drying duct having one end connected to the hot air inlet of the tub to supply hot air to the drum, the drying duct including a heater and a blower fan therein to generate the hot air, a condensing duct having one end communicating with one side of the tub and the other end communicating with the drying duct, the condensing duct removing humidity of air discharged from the tub to lead the humidity-removed air to the drying duct, and a plurality of reinforcement ribs projected from a vicinity of the hot air inlet of the tub.

[0030] In another aspect of the present invention, a drum type washer and dryer includes a tub having a hot air inlet on its upper front portion, the tub formed of a synthetic resin based material by injection molding, a drum rotatably provided within the tub, a drying duct having one end connected to the hot air inlet of the tub to supply hot air to the drum, the drying duct including a heater and a blower fan therein to generate the hot air, a condensing duct having one end communicating with one side of the tub and the other end communicating with the drying duct, the condensing duct removing humidity of air discharged from the tub to lead the humidity-removed air to the drying duct, a plurality of reinforcement ribs projected from a vicinity of the hot air inlet of the tub, and a guide rib extending from the vicinity of the hot air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum.

[0031] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0033] FIG. 1 is a cross-sectional diagram of a drum type washer and dryer according to a related art;

[0034] FIG. 2 is a cross-sectional diagram of a drum type washer and dryer according to one embodiment of the present invention;

[0035] FIG. 3 is a projected perspective diagram of the drum type washer and dryer in FIG. 2;

[0036] FIG. 4 is a front diagram of a drum of the drum type washer and dryer in FIG. 2 according to one embodiment of the present invention;

[0037] FIG. 5 is a front diagram of a drum of the drum type washer and dryer in FIG. 2 according to another embodiment of the present invention;

[0038] FIG. 6 is a front diagram of a tub of the drum type washer and dryer in FIG. 2 in inner view of a front portion of the tub;

[0039] FIG. 7 is a cross-sectional diagram of a drum type washer and dryer according to another embodiment of the present invention; and

[0040] FIG. 8 is a perspective diagram of a front portion of a tub of the drum type washer and dryer in FIG. 7.

DETAILED DESCRIPTION OF THE INVENTION

[0041] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Whenever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0042] First of all, a drum type washer and dryer according to one embodiment of the present invention is explained in detail with reference to Figs. 2 to 6 as follows.

[0043] Referring to FIG. 2 and FIG. 3, a drum type washer and dryer according to one embodiment of the present invention includes a tub 20 provided within a cabinet 10 to store water therein and having a hot air inlet 20a on its upper front portion, a drum 30 rotatably provided within the tub 20 and having a multitude of holes 30a arranged on its front portion, a drying duct 40 closely fixed to an upper outer circumference of the tub 20 and having one end connected to the hot air inlet 20a of the tub 20 to supply hot air generated from inside to the drum 30, and a condensing duct 50 having one end connected to a rear portion of the tub 20 and the other end connected to the drying duct 40.

[0044] The tub 20 is formed of a plastic based material by injection molding. And, the hot air inlet 20a of the tub 20 is provided to the upper front portion of the tub 20.

[0045] A heater 41 and a blower fan 42 are installed within the drying duct 40 to generate the hot air and to supply the generated hot air to the tub 20, respectively.

[0046] The drying duct 40 is fixed to the upper outer circumference of the tub 20 by a locking member. A heat shield bracket 43 is provided between the tub 20 and the drying duct 40 to prevent the heat generated from the drying
duct 40 from being transferred to the tub 20. The heat shield bracket 43 plays a role in supporting the drying duct 40 as well as preventing the heat generated from the drying duct 40 from being transferred to the tub 20.

[0047] A sealing member (not shown in the drawing) is preferably provided to a connecting part between the drying duct 40 and the tub 20 to prevent the heat of the drying duct 40 from leaking.

[0048] The condensing duct 50 is provided in the vicinity of the rear portion of the tub 20. The condensing duct 50 removes humidity involved in the air discharged from the tub 20 and guides the air to the drying duct 40. A water supply 51 is provided to one upper side of the condensing duct 50 to supply condensing water to the condensing duct 50.

[0049] In case that the condensing duct 50 is connected to the rear portion of the tub 20, an inflow direction of the hot air introduced into the drum 30 becomes diagonal to an outflow direction of the hot air blown out to the condensing duct 50. Hence, the hot air can dry the laundry evenly without heat leakage in flowing within the drum 30.

[0050] Moreover, it is unnecessary to provide a gasket for vibration absorption and leakage prevention to the connecting portion between the condensing duct 50 and the tub 20.

[0051] Meanwhile, the drum 30 is rotated by a direct drive mechanism using an outer rotor type motor including a shaft 60 penetrating into the tub 20 to be connected to the drum 30, a rotor 62 connected to a rear end of the shaft 61, and a stator 63 provided within the rotor 62. Yet, the drum 30 can be rotated by a different drive mechanism as well.

[0052] A multitude of the holes 30a of the drum 30, as shown in FIG. 4, are preferably arranged on the front portion of the drum 30a in a circumferential direction to always confront the hot air inlet 20a of the tub 20 despite the rotation of the drum 30. This is to smoothly supply the hot air, which is introduced from the drying duct 40 via the hot air inlet 20a, to the drum 30 via the holes 30a.

[0053] In doing so, the holes 30a provided to the front portion of the drum 30 are arranged to leave a uniform interval from each other in a circumferential direction and each column of the holes 30a can be arranged on a same radial line.

[0054] Alternatively, the holes 30a provided to the front portion of the drum 30, as shown in FIG. 5, are arranged to leave a uniform interval from each other in a circumferential direction and the holes 30a can be arranged to form zigzag patterns radially.

[0055] Alternatively, the holes 30a can be randomly provided without following the fixed hole arrangement rule of FIG. 4 or FIG. 5.

[0056] Rigidity reinforcement ribs 21 for enhancing rigidity of the tub 20 are provided in the vicinity of the hot air inlet 20a of the tub 20 to prevent the vicinity of hot air inlet 20a of the tub 20 from being transformed by the influence of the hot air blown out of the drying duct 40.

[0057] In doing so, the hot air inlet 20a of the tub is formed approximately rectangular and each of the rigidity reinforcement ribs 21 protrudes from an inside of the tub 20 to have a predetermined length in a direction perpendicular to a corresponding side of the rectangular hot air inlet 20a.

[0058] Alternatively, the rigidity reinforcement ribs can be provided to an outside of the tub 20 unless interrupting the coupling with the drying duct 40.

[0059] A drying process of the above-configured drum type washer and dryer is explained as follows.

[0060] First of all, once a drying cycle is executed, power is applied to the heater 41 provided within the drying duct 40 and the blower fan 42 is driven to generate hot air.

[0061] The hot air generated from the drying duct 40 are sequentially passed through the hot air inlet 20a of the tub 20 and the hot air intakes holes 30a of the drum 30 to be introduced into the drum 30.

[0062] In doing so, since the hot air intake holes 30a are provided to the entire front portion of the drum 30, the hot air inlet 20a can always communicate with the hot air intake holes 30a despite the rotation of the drum 30. Hence, the hot air flowing in the tub 20 via the hot air inlet 20a can be smoothly supplied to the drum 30.

[0063] In supplying the hot air to the tub 20 via the hot air inlet 20a, the vicinity of the hot air inlet 20a of the tub 20 avoids being transformed by the heat since the rigidity reinforcement ribs 21 provided in the vicinity of the hot air inlet 20a of the tub 20.

[0064] Meanwhile, the hot air introduced into the drum 30 dries the laundry in a manner of evaporating water involved in the laundry.

[0065] In doing so, the laundry is agitated by a slow rotation of the drum 30, thereby being evenly exposed to the hot air to enhance efficiency of drying the laundry.

[0066] The air containing the evaporated water therein is discharged to the condensing duct 50. Since the condensing duct 50 is connected to the lower rear portion of the tub 20 arranged diagonal to the upper front portion of the drum 30 confronting the hot air inlet 20a of the tub 20, the air discharged from the drum 30 can be smoothly discharged to the condensing duct 50.

[0067] Subsequently, the water supplier 51 injects condensing water into the condensing duct 50 to remove the humidity of the air discharged from the drum 30 to the condensing duct 50.

[0068] The humidity-removed air is introduced into the drying duct 40 again by the blower fan 42 provided within the drying duct 40 to be heated by the heater 41 provided within the drying duct 40 and is then re-introduced into the drum 30 by a blowing force of the blower fan 42.

[0069] Such a cycle is repeatedly performed to dry the laundry.

[0070] A drum type washer and dryer according to another embodiment of the present invention is explained with reference to FIG. 7 and FIG. 8 as follows.

[0071] The configuration of the drum type washer and dryer according to another embodiment of the present invention is basically identical to that according to the former embodiment of the present invention. Yet, the latter embodiment of the present invention differs from the former
embodiment of the present invention in that a guide rib 22 is provided to the hot air inlet 20a of the tub 20 to guide the hot air blown out of the drying duct 40 to an inside of the drum 30.

[0072] The guide rib 22 extends from an entire rim of the hot air inlet 20a toward an inside of the tub 20. The guide rib is preferably inclined downward toward the drum 30. Moreover, even if the drawing shows that an entrance of the guide rib 22 connected to the hot air inlet 20a has a cross-sectional area, i.e., a passage area, approximately similar to that of an exit of the guide rib 22 in the vicinity of the drum 30, the cross-sectional area of the guide rib 22 may gradually increase or decrease toward the exit of the guide rib 22.

[0073] Rigidity reinforcement ribs 21 are built in one body of an outer circumference of the guide rib 22 to reinforce the rigidity of the vicinity of the hot air inlet 20a.

[0074] The guide rib 22 may be separately formed of a steel or synthetic resin based material unlike the tub 20 to be assembled to an inside of the hot air inlet 20a. Alternatively, the guide rib 22 can be formed by injection molding together with the tub 20.

[0075] As mentioned in the foregoing description, by the guide rib 2 provided to the inside of the hot air inlet 20a of the tub 20, the hot air introduced into the hot air inlet 20a via the drying duct 40 can be smoothly introduced into the drum 30 via the holes 30a of the drum 30 without scattering in front of the drum 30, whereby the drying efficiency can be further enhanced.

[0076] Accordingly, the present invention provides the following effects or advantages.

[0077] First of all, since the hot air generated from the drying duct is introduced into the upper front portion of the drum to be discharged to the lower rear portion of the drum lying in the diagonal direction to the introduced direction, the air supplied to the drum can intrude deeply into the drum to dry the entire laundry within the drum evenly. Therefore, the present invention enhances the drying efficiency and performance.

[0078] Secondly, since the drying duct is connected to the tub to avoid the wear and tear of the gasket. Specifically, the rigidity reinforcement ribs in the vicinity of the hot air inlet can prevent the transformation of the tub which is caused by the heat of the hot air introduced via the hot air inlet.

[0079] Thirdly, the blown hot air is introduced into the drum without the interruption of the resistance generated from colliding with the door glass, thereby intruding into the drum deeply to enhance the drying efficiency. Moreover, the hot air is smoothly led to the drum by the guide rib in the vicinity of the hot air inlet, whereby the drying efficiency can be further enhanced.

[0080] Fourthly, since the drying duct and the condensing duct are fixed to the tub, it is unnecessary to install a separate gasket to the connection part. And, it is also able to shorten each airflow passage of the ducts.

[0081] Finally, since the drying duct is fixed to the top portion of the tub to play a role as a counterweight, the present invention facilitates the balance of the tub.

[0082] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. 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.

What is claimed is:

1. A drum type washer and dryer comprising:
a tub having a hot air inlet on its upper front portion;
a drum rotatably provided within the tub;
a drying duct having one end connected to the hot air inlet of the tub to supply hot air to the drum, the drying duct including a heater and blower fan therein to generate the hot air;
a condensing duct having one end communicating with one side of the tub and the other end communicating with the drying duct, the condensing duct removing humidity of air discharged from the tub to lead the humidity-removed air to the drying duct; and
a plurality of reinforcement ribs projected from a vicinity of the hot air inlet of the tub.

2. The drum type washer and dryer of claim 1, wherein the tub is formed of a synthetic resin based material by injection molding.

3. The drum type washer and dryer of claim 1, wherein each of a plurality of the reinforcement ribs is configured to have a predetermined length in a direction perpendicular to each side forming the hot air inlet of the tub.

4. The drum type washer and dryer of claim 1, wherein a plurality of the reinforcement ribs are provided to an inside of the tub along a rim of the hot air inlet.

5. The drum type washer and dryer of claim 1, wherein a plurality of the reinforcement ribs are provided to an outside of the tub along a rim of the hot air inlet.

6. The drum type washer and dryer of claim 1, further comprising a guide rib extending from the vicinity of the hot air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum.

7. The drum type washer and dryer of claim 6, wherein the guide rib is built in one body of a rim of the hot air inlet.

8. The drum type washer and dryer of claim 6, wherein each guide rib and the tub are separately formed and wherein the guide rib is attached to an inside of the tub.

9. The drum type washer and dryer of claim 8, wherein the guide rib is formed of a metallic material.

10. The drum type washer and dryer of claim 8, wherein the guide rib is formed of a synthetic resin based material.

11. The drum type washer and dryer of claim 6, wherein the guide rib is inclined downward from the tub toward the drum.

12. The drum type washer and dryer of claim 6, wherein the guide rib is built in one body of the tub.

13. The drum type washer and dryer of claim 12, wherein a plurality of the reinforcement ribs are built in one body of an outer circumference of the guide rib.

14. The drum type washer and dryer of claim 1, wherein a multitude of holes are provided to a front portion of the drum to perforate.

15. The drum type washer and dryer of claim 14, wherein a multitude of the holes are provided to the front portion of the drum in a circumferential direction.
16. The drum type washer and dryer of claim 14, wherein each of a multitude of the holes has a shape selected from the group consisting of a circle, an oval, and a long hole.

17. The drum type washer and dryer of claim 1, wherein one end of the condensing duct communicates with a lower rear portion of the tub.

18. The drum type washer and dryer of claim 1, wherein the drying duct is fixed to a top portion of the tub.

19. The drum type washer and dryer of claim 18, wherein a heat-shielding bracket is provided to a fixing part of the drying duct and the tub.

20. A drum type washer and dryer comprising:

    a tub having a hot air inlet on its upper front portion, the tub formed of a synthetic resin based material by injection molding;

    a drum rotatably provided within the tub;

    a drying duct having one end connected to the hot air inlet of the tub to supply hot air to the drum, the drying duct including a heater and blower fan therein to generate the hot air;

    a condensing duct having one end communicating with one side of the tub and the other end communicating with the drying duct, the condensing duct removing humidity of air discharged from the tub to lead the humidity-removed air to the drying duct;

    a plurality of reinforcement ribs projected from a vicinity of the hot air inlet of the tub; and

    a guide rib extending from the vicinity of the hot air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum.

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