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(54) WASHING AND DRYING MACHINE

WASCHTROCKNER

LAVE-LINGE SECHE-LINGE

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Description

Technical Field

[0001] The present invention relates to a washing machine, and more particularly, to a washing and drying machine which can dry a laundry using hot air after completion of washing and dewatering.

Background Art

[0002] Generally, a washing machine is a representative home appliance for washing a laundry using a detergent and water. Such a washing machine can be categorized according to a laundry loading position into a top loading type and a front loading type. The top loading type washing machine generally comprises a vertical tub containing a laundry therein, a pulsator rotatably provided within the tub to wash the laundry, and a lid provided to a top portion of the washing machine to open and close the tub. And, the front loading type washing machine generally comprises a horizontal drum containing a laundry therein, lifters provided to an inside of the drum to lift the laundry on rotating the drum and a door provided to a front portion of the washing machine to open and close the drum.

[0003] Recently, a function of drying a washed and dewatered laundry using hot air is applied to a front loading type washing and drying machine. Hence, such a front loading type washing and drying machine is generally provided with a condensing duct for condensing air flowing out of a tub and a drying duct for heating dry air flowing from the condensing duct to supply heated air to the tub. For example JP 01-249093 discloses a drum type washing drier.

Disclosure of Invention

Technical Problem

[0004] Generally, the drying duct supplies hot air to the drum via a space between a front portion of the drum and the door, and the condensing duct sucks the air within the drum via a lateral side of the tub. In doing so, the hot air supplied to the drum via the drying duct fails to be fully used in drying the laundry within the drum but then proceeds to the condensing duct. Hence, drying efficiency is lowered, a drying time is elongated, and power consumption is increased.

[0005] Meanwhile, a gasket is provided between the door and a front portion of the drum to prevent leakage of water and hot air. And, the drying duct is configured to penetrate the gasket. Hence, a connection part between the drying duct and the gasket is occasionally torn by vibration of the tub.

[0006] Moreover, the drying duct is closely provided over the tub. The air heated in the drying duct is blown downward via the space and is then introduced into the drum along a tilted portion of the door. Hence, the tub and door are unnecessarily heated to waste energy.

Technical Solution

[0007] Accordingly, the present invention is directed to a washing and drying machine that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0008] An object of the present invention is to provide a washing and drying machine, in which hot air for drying a laundry within a drum is discharged outside the drum after being fully used in drying the laundry so that drying efficiency and performance are enhanced.

[0009] Another object of the present invention is to provide a washing and drying machine, by which a gasket provided between a door and a drum is prevented from being torn.

[0010] Another object of the present invention is to provide a washing and drying machine, by which a tub and door are prevented from being unnecessarily heated by hot air.

[0011] Another object of the present invention is to provide a washing and drying machine, by which thermal transformation of the tub and the drum due to heat supplied from a drying duct can be minimized.

[0012] Another object of the present invention is to provide method of manufacturing a drum of which has holes provided a front portion to introduce hot air therein without being clogged by lint contained in the hot air so that drying efficiency and performance are enhanced.

[0013] 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.

[0014] These objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, are achieved by means of a washing and drying claim 1. machine according to case, a drum rotatably.

[0015] The drying duct may supply the hot air along an axial direction of the drum.

[0016] The tub may comprise an air inlet provided to the front portion of the tub, wherein the drying duct may be configured to be connected to the air inlet to introduce the hot air to the tub. The air inlet may be configured to be provided to an upper part of the front portion of the tub.

[0017] The tub may further comprise a plurality of reinforcement ribs projected from a vicinity of the air inlet of the tub to prevent the tub from transformation by heat. Wherein, each of the reinforcement rib may be configured to have a predetermined length in a direction perpendicular to each side forming the air inlet of the tub. Further,

the plurality of reinforcement ribs may be configured to be provided to an inside of the tub along a rim of the air inlet.

[0018] The tub may further comprise an air guide extending from the vicinity of the air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum. The air guide is configured to be inclined downward from the tub toward the drum.

[0019] The air guide may be configured to be formed as a unitary body with a rim of the air inlet. The air guide and the tub may be configured to be formed as a unitary body. Alternatively, the air guide and the tub may be configured to be separately formed each other, wherein the air guide is further configured to be attached to an inside of the tub.

[0020] The drum may comprise a plurality of air holes provided to a front portion thereof and confronting the front portion of the tub to introduce the hot air in the tub into the drum. The plurality of air holes may be configured to be provided to the front portion of the drum in a circumferential direction.

[0021] The drum may further comprise a plurality of embossed portions outwardly projected from the front portion of the drum, wherein each of the air hole may be configured to be provided to a center of each of the embossed portion. Wherein, each tip of each embossed portion may be configured to be smoothly cut.

[0022] In another aspect of the present invention, a washing and drying machine according to the present invention includes a case, a tub provided within the case, a drum rotatably provided within the tub, a drying duct connected to the tub to supply dry and hot air to the tub, and a condensing duct connected to the drying duct and a rear portion of the tub for sucking air in the tub therein to condense sucked-in air and to lead condensed air to the drying duct.

[0023] The condensing duct may be configured to suck the air from the drum along an axial direction of the tub. The condensing duct may be configured to be connected to a lower rear portion of the drum.

[0024] The condensing duct may comprise a water supply pipe connected to an upper portion of the condensing duct to supply cooling water for condesing air into the condensing duct.

[0025] In another aspect of the present invention, a washing and drying machine according to the present invention includes a case, a tub provided within the case, a drum rotatably provided within the tub, a condensing duct connected to any one of a front and rear portion of the tub for sucking air of the tub therein to condense the sucked-in air, and a drying duct connected to the condensing duct and the other one of the front and rear portion of the tub to supply dry and hot air to the tub.

[0026] The drying duct may be configured to be connect to an upper part of the front portion of the tub and the condensing duct may be configured to be connected to a lower part of the rear portion of the drum.

[0027] The drum may comprise a plurality of air holes provided to a front portion of the drum and confronting the front portion of the tub to introduce the hot air in the tub into the drum.

[0028] The drum may further comprise a plurality of embossed portions outwardly projected from the front portion of the drum, wherein the plurality of the air holes may be configured to bed provided to centers of the plurality of the embossed portions, respectively. Wherein, tips of a plurality of the embossed portions may be configured to be smoothly cut.

[0029] In another aspect of the present invention, a method of manufacturing a drum of washing and drying machine according to the present invention includes the steps of forming a plurality of holes at a front portion of the drum of the washing and drying machine, and removing a plurality of burrs of the plurality of holes, respectively.

[0030] The plurality of the holes may be configured to introduce hot air flowing from a front portion of tub into the drum. The plurality of holes may be configured to be formed by punching an inside of the drum outwardly.

[0031] the method according to the present invention may further comprise the step of embossing each vicinity of the plurality of holes toward an outside of the drum. Wherein, the plurality of burrs may be configured to be removed in a manner of cutting tips of embossed portions of the plurality of holes, respectively.

[0032] 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.

[0033] Further prefered embodiments are described as follows:

[1] A washing and drying machine comprising:

a case;
a tub provided within the case;
a drum rotatably provided within the tub;
a condensing duct connected to the tub, the condensing duct sucking air of the
tub therein to condense the sucked-in air, and
a drying duct connected to a front portion of the tub and the condensing duct to supply dry and hot air to the tub.

[2] The washing and drying machine of embodiment 1, wherein the drying duct supplies the hot air along an axial direction of the drum.

[3] The washing and drying machine of embodiment 1, wherein the tub comprises an air inlet provided to the front portion of the tub, further wherein the drying duct is configured to be connected to the air inlet to introduce the hot air to the tub.

[4] The washing and drying machine of embodiment 3, wherein the air inlet is configured to be provided to an upper part of the front portion of the tub.

[5] The washing and drying machine of embodiment 1, wherein the drum comprises a plurality of air holes provided to a front portion thereof and confronting the front portion of the tub to introduce the hot air in the tub into the drum.

[6] The washing and drying machine of embodiment 5, wherein the plurality of air holes are configured to be provided to the front potion of the drum in a circumferential direction.

[7] The washing and drying machine of embodiment 5, wherein the drum further comprises a plurality of embossed portions outwardly projected from the front portion of the drum, further wherein each of the air hole is configured to be provided to a center of each of the embossed portion.

[8] The washing and drying machine of embodiment 7, wherein each tip of each embossed portion is configured to be smoothly cut.

[9] The washing and drying machine of embodiment 1, further comprising an insulator provided between the tub and the drying duct to prevent heat of the drying duct from being transferred to the tub.

[10] the washing and drying machine of embodiment 3, wherein the tub further comprises a plurality of reinforcement ribs projected from a vicinity of the air inlet of the tub to prevent the tub from transformation by heat.

[11] The washing and drying machine of embodiment 10, wherein each of the reinforcement rib is configured to have a predetermined length in a direction perpendicular to each side forming the air inlet of the tub.

[12] The washing and drying machine of embodiment 10, wherein the plurality of reinforcement ribs are configured to be provided to an inside of the tub along a rim of the air inlet.

[13] The washing and drying machine of embodiment 3, wherein the tub further comprises an air guide extending from the vicinity of the air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum.

[14] the washing and drying machine of embodiment 13, wherein the air guide is configured to be formed as a unitary body with a rim of the air inlet.

[15] The washing and drying machine of embodiment 13, wherein the air guide and the tub are configured to be separately formed each other, further wherein the air guide is further configured to be attached to an inside of the tub.

[16] The washing and drying machine of embodiment 13 wherein the air guide and the tub are configured to be formed as a unitary body.

[17] The washing and drying machine of embodiment 13, wherein the air guide is configured to be inclined downward from the tub toward the drum.

[18] The washing and drying machine of embodiment 13, wherein the tub further comprises a plurality of reinforcement ribs projected from the tub and an outer circumference of the air guide to prevent the tub from transformation by heat.

[19] A washing and drying machine comprising:

a case;
a tub provided within the case;
a drum rotatably provided within the tub;
a drying duct connected to the tub to supply dry and hot air to the tub; and
a condensing duct connected to the drying duct and a rear portion of the tub, the condensing duct sucking air in the tub therein to condense sucked-in air and to
lead condensed air to the drying duct.

[20] The washing and drying machine of embodiment 19, wherein the condensing duct is configured to suck the air from the drum along an axial direction of the tub.

[21] The washing and drying machine of embodiment 19, wherein the condensing duct is configured to be connected to a lower rear portion of the drum.

[22] The washing and drying machine of embodiment 19, wherein the condensing duct comprises a water supply pipe connected to an upper portion of the condensing duct to supply cooling water for condesing air into the condensing duct.

[23] The washing and drying machine of embodiment 19, further comprising an insulator provided between the tub and the drying duct to prevent heat of the drying duct from being transferred to the tub.

[24] The washing and dying machine of embodiment 19, wherein the tub comprises an air - inlet provided to a front portion of the tub, further wherein the drying duct is configured to be connected to the air inlet to introduce the hot air into the tub.

[25] The washing and drying machine of embodiment 24, wherein the tub further comprises a plurality of reinforcement ribs projected from a vicinity of the air inlet of the tub to prevent the tub from transformation by heat.

[26] The washing and drying machine of embodiment 24, wherein the tub further comprises an air guide extending from the vicinity of the air inlet toward an inner space of the tub to guide the hot air blown out of the drying duct toward the drum.

[27] A washing and drying machine comprising:

a case;
a tub provided within the case;
a drum rotatably provided within the tub;
a condensing duct connected to any one of a front and rear portion of the tub, the condensing duct sucking air of the tub therein to condense the sucked-in air; and
a drying duct connected to the condensing duct and the other one of the front and rear portion of the tub to supply dry and hot air to the tub.

[28] The washing and drying machine of embodiment 27, wherein the drying duct is configured to be connected to an upper part of the front portion of the tub.

[29] The washing and drying machine of embodiment 27, wherein the condensing duct is configured to be connected to a lower part of the rear portion of the drum.

[30] The washing and drying machine of embodiment 27, wherein the drum comprises a plurality of air holes provided to a front portion of the drum and confronting the front portion of the tub to introduce the hot air in the tub into the drum.

[31] The washing and drying machine of embodiment 30, wherein the plurality of air holes are configured to be provided to the front portion of the drum in a circumferential direction.

[32] The washing and drying machine of embodiment 30, wherein the drum further comprises a plurality of embossed portions outwardly projected from the front portion of the drum, further wherein the plurality of the air holes are configured to bed provided to centers of the plurality of the embossed portions, respectively.

[33] The washing and drying machine of embodiment 32, wherein tips of a plurality of the embossed portions are configured to be smoothly cut.

[34] A method of manufacturing drum of washing and drying machine, comprising the steps of:

forming a plurality of holes at a front portion of the drum of the washing and
drying machine; and
removing a plurality of burrs of the plurality of holes, respectively.

[35] The method of manufacturing a drum of washing and drying machine of embodiment 34, wherein the plurality of the holes are configured to introduce hot air flowing from a front portion of tub into the drum.

[36] The method of manufacturing a drum of washing and drying machine of embodiment 34, wherein the plurality of holes are configured to be formed by punching an

[37] The method of manufacturing a drum of washing and drying machine of embodiment 34, further comprising the step of embossing each vicinity of the plurality of holes toward an outside of the drum.

[38] The method of manufacturing a drum of washing and drying machine of embodiment 37, wherein the plurality of burrs are configured to be removed in a manner of cutting tips of embossed portions of the plurality of holes, respectively.

Brief Description of the Drawings

[0034] 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:

[0035] FIG. 1 is a cross-sectional view of a washing and drying machine according to one embodiment of the present invention;

[0036] FIG. 2 is an exploded perspective view showing a tub, drum, condensing duct, and drying duct of the washing and drying machine in FIG. 1;

[0037] FIG. 3 is a front view of a drum according to one embodiment of the present invention;

[0038] FIG. 4 is a front view of a drum according to another embodiment of the present invention;

[0039] FIG. 5 is a magnified cross-sectional view of an air hole provided to a front portion of a drum of the washing and drying machine in FIG. 1;

[0040] FIG. 6 is cross-sectional views for explaining a process of forming the air hole in FIG. 4;

[0041] FIG. 7 is a rear view of a front portion of the tub of the washing and drying machine in FIG. 1;

[0042] FIG. 8 is a cross-sectional view of a washing and drying machine according to another embodiment of the present invention; and

[0043] FIG. 9 is a perspective view of a front portion of a tub of the washing and drying machine in FIG. 8.

Best Mode for Carrying Out the Invention

[0044] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0045] FIG. 1 is a cross-sectional diagram of a washing and drying machine according to the present invention. Referring to FIG. 1, an opening 11 as a laundry entrance is provided to a front portion of a case 10, and a door 15 is assembled to the case 10 to open and close the opening 11. A tub 20 is provided within the case 10 to contain a laundry therein. The tub 20 is, for example, made of a plastic based material by injection molding. The tub 20 is suspended within the case 10 by a spring (not shown in the drawing) connected to both sides of the case 10 and a damper (not shown in the drawing) connected to a bottom of the case 10 elastically supports a bottom of the tub 20. The spring and damper elastically support the tub 20 and play a role in attenuating vibration appearing on the tub 20 on operating the washing and drying machine to prevent the vibration from transferring to the case 10.

[0046] The tub 20 is horizontally arranged in general, and an opening 21 is provided to a front portion thereof to confront the opening 11 of the case 10. A water supply inlet (not shown in the drawing) for supplying water is provided to one upper side of the tub 20, and a drain 29 for draining the water is provided to one lower side of the tub 20. A gasket 13 is provided between the opening 21

of the tub 20 and the opening 11 of the case 10 to prevent water leakage and laundry escape. The water supply inlet of the tub 20 is connected to a water supply hose 5 via a detergent box (not shown in the drawing), and the drain 29 is connected to a drain hose 8 via a drain pump 6.

[0047] A drum 30 is rotatably provided within the tub 20. For example, the drum 30 is rotated by a motor 60 attached to a rear portion of the tub 20. And, the motor 60 includes a stator 63 fixed to the rear portion of the tub 20, a rotatable rotor 62 enclosing the stator 63 therein, and a shaft 61 connecting the drum 30 and the rotor 62 to rotate the drum 30. An opening 31 is provided to a center of a front portion of the drum 30 to confront the opening 21 of the tub 20 and to be closed and opened by the door 15, and a plurality of lifters 35 are provided within the drum 30. The plurality of lifters 35 lift laundry contained within the drum 30 that is rotating. Water is stored in the tub 20, and a multitude of apertures 39 are provided to a circumference of the drum 30 to allow the water to communicate between the tub 20 and the drum 30 therethrough.

[0048] A condensing duct 50 is connected to the tub 20 to draw out air from the tub 20 and the drum 30. Specifically, the condensing duct 50, as shown in FIG. 1 and FIG. 2, is connected to a lower rear portion of the tub 20 to condense the air introduced therein using cooling water. For this purpose, a water supply pipe 51, as shown in FIG. 1, is connected to the condensing duct 50 to supply the cooling water to the condensing duct 50.

[0049] The water supply pipe 51 is connected to an upper portion of the condensing duct 50. The cooling water supplied to the condensing duct 50 from the water supply pipe 51 flows down along an inner circumference of the condensing duct 50 to be collected on a bottom of the tub 20. Hence, humidity contained in the warm and humid air introduced into the condensing duct 50 becomes condensed by the cold cooling water flowing along the inner circumference of the condensing duct 50, whereby the air flowing in the condensing duct 50 becomes drier. Meanwhile, it is unnecessary to provide a separate gasket for vibration absorption and leakage prevention to a connection portion between the condensing duct 50 and the tub 20.

[0050] A drying duct 40 is connected to the condensing duct 50 and the tub 20 to supply dry and hot air to an inside of the tub 20. Specifically, provided within the drying duct 40 are a fan 42 sucking the air from the tub 20 and the drum 30 via the condensing duct 50 and supplying the sucked air into the tub 20 via the drying duct 50, and a heater 41 heating the dry air supplied to the tub 20 via the drying duct 40. Hence, the dry air, which was sucked into the drying duct 50 to have its humidity removed, is heated on passing through the drying duct 40 and is then re-supplied to the tub 20.

[0051] Both ends of the drying duct 40 are connected to an upper end of the condensing duct 50 and a front portion of the tub 20, respectively. Specifically, one end of the drying duct 40, as shown in FIG. 1 and FIG. 2, is connected to an upper front portion of the tub 20. For this, an air inlet 20a, which is connected to the drying duct 40 and introduces the hot air supplied from the drying duct 40 into the tub 20, is provided to the upper front portion of the tub 20. A sealing member (not shown in the drawings) may be provided to a connection part between the drying duct 40 and the tub 20 to prevent the heat of the drying duct 40 from leaking. The hot air introduced into the tub 20 via the air inlet 20a can be supplied to the drum 30 via the apertures 39 provided to the circumference of the drum 30.

[0052] In order to supply the hot air to the drum 30 more efficiently, a plurality of air holes 30a are provided to a front portion of the drum 30 to introduce the hot air into the drum 30. The plurality of air holes 30a, as shown in FIG. 1 and FIG. 2, are provided to the front portion of the drum 30 confronting the front portion of the tub 20, and more particularly, are provided to confront the air inlet 20a on rotating the drum 30.

[0053] For this, the air holes 30a, as shown in FIG. 3 and FIG. 4, are provided to the front portion of the drum 30 in a circumferential direction. In other words, the opening 31 is formed at a center of the front portion of the drum 30 and the plurality of air holes 30a are arranged on the front portion of the drum 30 to surround the opening 31 therein. Specifically, each column of the air holes 30a, as shown in FIG. 3, forms a straight line in a radial direction of the drum 30. Alternatively, each column of the air holes 30a, as shown in FIG. 4, slants against the radial direction of the drum 30. Further, the plurality of air holes 30a may be arranged at the front portion of the drum 30 randomly.

[0054] If the plurality of air holes 30a are provided to along the circumference of the front portion of the drum 30, the hot air introduced into the tub 20 via the air inlet 20a of the tub 20 can be effectively introduced into the drum 30 via the air holes 30a of the drum 30 despite the rotation of the drum 30.

[0055] Meanwhile, the air holes 30a provided to the front portion of the drum 30 are formed by punching for example. Specifically, in manufacturing the drum 30, the front portion of the drum 30 is punched from its inside to its outside. Hence, if the air holes 30a are formed in the above manner, a burr 30C occurring in the vicinity of each of the air holes 30a, as shown in FIG. 5 and FIG. 6, faces outwardly. Hence, the laundry within the drum 30 is effectively prevented from being damaged by the burrs 30c.

[0056] Yet, in drying the laundry, lint is included in the hot air introduced into the tub 20 via the drying duct 40 and the air inlet 20a. Hence, the lint included in the hot air may be caught on the burr 30c in the vicinity of the air holes 30a when the hot air passes through the air holes 30a. And, it is highly probable that each of air hole 30a is clogged with a bunch of the lint. Preferably, the burr 30c needs to be removed in spite of being located at an outside of the drum 30. For this, in manufacturing the drum 30, the burr 30c formed in the vicinity of each of the air holes 30a is cut from the outside of the drum 30

to provide a smooth surface thereof.

[0057] Meanwhile, if the plurality of air holes 30a are provided to the front portion of the drum 30, rigidity of the drum 30 can be lowered. To prevent the lowered rigidity of the drum 30, embossing processing is carried out on the front portion of the drum 30. Specifically, after the air hole 30a has been formed in manufacturing the drum 30, an outer rim of the air hole 30a, as shown in FIG. 6, is embossed outward to form an embossed portion 30b projected outward from the front portion of the drum 30. As a result, the corresponding air hole 30a is provided to a center of a tip of the corresponding embossed portion 30b and the corresponding burr 30c is formed around the corresponding tip of the corresponding embossed portion 30b. Hence, by cutting the tip of the embossed after completion of the embossing processing, the burr 30c, as shown in FIG. 6, can be cleanly removed.

[0058] Meanwhile, the drying duct 40 is stably fixed over an upper portion of the tub 20 by a coupling member such as a screw or bolt. A prescribed space is provided between the top portion of the tub 20 and a bottom of the drying duct 40, and an insulator 43 is provided to the prescribed space to prevent heat of the drying duct 40 from being transferred to the tub 20.

[0059] The insulator 43, as shown in Fig. 1 and FIG. 2, is attached to the top portion of the tub 20 to be fixed thereto and has a size and thickness enough to effectively prevent the heat of the drying duct 40 from being transferred to the tub 20. And, a middle part of the drying duct 40 can be installed to be supported by the insulator 43. Since the insulator 43 supporting the drying duct 40 is capable of absorbing vibration of the drying duct 40, a separate vibration-absorbing member is unnecessary.

[0060] Meanwhile, a plurality of reinforcement ribs 23 for enhancing rigidity of the tub 20 are provided in the vicinity of the air inlet 20a of the tub 20 to prevent the vicinity of the air inlet 20a of the tub 20 from being transformed by the influence of the hot air blown out of the drying duct 40. In doing so, the air inlet 20a of the tub 20 is formed approximately rectangular and each of the reinforcement rib 23 protrudes from an inside of the tub 20 to have a predetermined length in a direction perpendicular to a corresponding side of the rectangular air inlet 20a. Alternatively, the reinforcement ribs 23 can be provided to an outside of the tub 20 unless interfering the coupling with the drying duct 40. Further, the plurality of reinforcement ribs 23 may be provided to an inside of or outside of the tub 20 along a rim of the air inlet 20a.

[0061] A washing and drying machine according to another embodiment of the present invention is shown in FIG. 8 and FIG. 9 and now will be explained as follows. The configuration of the washing and drying machine 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 an air guide 25 is provided to the tub 20 to guide the hot air blown out of the drying duct 40 to an inside of the drum 30.

[0062] The air guide 25 extends from an entire rim of the air inlet 20a toward an inside of the tub 20. The air guide 25 is, for example, formed as a unitary body with a rim of the air inlet 20a. Alternatively, the air guide 25 may be formed as a body separate from the tub 20 and then may be attached to an inside of the tub 20. The air guide 25 may be inclined downward toward the drum 30. Moreover, even if the drawing shows that an entrance of the air guide 25 connected to the air inlet 20a has a cross-sectional area, i.e., a passage area, approximately similar to that of an exit of the air guide 25 in the vicinity of the drum 30, the cross-sectional area of the air guide 25 may gradually increase or decrease toward the exit of the air guide 25.

[0063] The reinforcement ribs 23 may be projected from an outer circumference of the air guide 25 and the front portion of the tub 20 to reinforce the rigidity of the vicinity of the air guide 25 and the front portion of the tub 20. Specifically, the reinforcement ribs 23 and the air guide 25 may be provided as a unitary body. In this case, the air guide 25 and the reinforcement ribs 23 can be formed by injection molding with the tub 20 as a unitary body all together. Alternatively, the air guide 25 can be separately formed of steel or synthetic resin based material unlike the tub 20 to be assembled to an inside of the air inlet 20a.

[0064] As mentioned in the foregoing description, by the air guide 25 provided to the inside of the air inlet 20a of the tub 20, the air introduced into the air inlet 20a via the drying duct 40 can be smoothly introduced into the drum 30 via the air holes 30a of the drum 30 without scattering in front of the drum 30, whereby the drying efficiency can be further enhanced.

[0065] A process of drying a laundry in the above-configured washing and drying machine according to the present invention is explained as follows. First of all, once a drying cycle is initiated, the heater 41 and the fan 42 within the drying duct 40 are actuated. The hot air generated from the heater and fan 41 and 42 within the drying duct 40 is introduced into the drum 30 via the air inlet 20a of the tub 20 and the air holes 30a of the drum 30. In doing so, the hot air is introduced into an inner upper part of the drum 30 in an axial direction of the drum 30. Hence, the hot air is supplied up to a rear part of the drum 30, thereby drying the laundry contained in the drum 30 effectively. In supplying the hot air to the tub 20 via the air inlet 20a, the vicinity of the air inlet 20a of the tub 20 avoids being transformed by the heat since the reinforcement ribs 23 provided in the vicinity of the air inlet 20a of the tub 20.

[0066] The warm and humid air having dried the laundry within the drum 30 is discharged outside the tub 20 via the condensing duct 50. In doing so, the condensing duct 50 sucks the air in the lower inner part of the drum 30 along the axial direction of the drum 30, for example. Then, the air in the inner front lower part of the drum 30 is sucked into the condensing duct 50, whereby the laun-

dry contained within the drum 30 can be effectively dried.

[0067] As mentioned in the foregoing description, the drying duct 40 supplies the hot air to the upper space of the drum 30 along the axial direction of the drum 30 and the condensing duct 50 sucks the air in the lower space of the drum 30 along the axial direction of the drum 30 as well. With the flow of the air, another airflow is generated in the drum 30 in a diagonal direction. Namely, a portion of the air having supplied to the drum 30 via the upper front portion of the drum 30 traverses a diagonal path that is the shortest path to be passed through the drum 30 via the lower rear potion of the drum 30. In this case, if the air guide 25 is provided as downwardly inclined form, the air flow traversing the diagonal path become larger. Hence, the hot air smoothly circulates the entire parts within the drum 30 to evenly dry the laundry.

[0068] Meanwhile, the drum 30 keeps being rotated by the motor 60. The laundry within the drum 30 is lifted by the lifters 35 to fall, thereby being evenly exposed to the hot air supplied to the drum 30. Hence, drying efficiency is enhanced.

[0069] The warm and humid air having dried the laundry within the drum 30 is then introduced into the condensing duct 50. The humidity of the warm and humid air is condensed by the cooling water supplied to the condensing duct 50 via the water supply pipe 51. The humidity-removed dry air passes through the fan 42 and the heater 41 to be transformed into hot air and the hot air is then supplied to the tub 20 again.

[0070] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. For instance, the drying duct can be connected to the rear portion of the drum and the condensing duct can connected to the front portion of the tub. 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.

Industrial Applicability

[0071] As explained in the above description of the present invention, the hot air is introduced into the drum via the front portion of the drum and the air within the drum is drawn out via the rear portion of the drum. And, the hot air is smoothly led to the drum by the air guide in the vicinity of the hot air inlet. Hence, the air can be supplied to everywhere within the drum, thereby drying the laundry effectively.

[0072] And, the drying duct is directly connected to the tub, whereas the related art drying duct is connected to the gasket. Hence, the gasket is previously prevented from being damaged.

[0073] Moreover, the hot air is directly supplied to the drum without guidance of the tilted portion of the door. And, the insulator prevents the heat of the drying duct from being transferred to the tub. Therefore, the present invention prevents the door and the tub from being unnecessarily heated, thereby reducing energy consumption and enhancing the drying performance.

[0074] Furthermore, the drum of the present invention is provided with the air holes at its front portion to introduce the hot air therein. And, the air holes are formed by punching, embossing, and deburring. Therefore, the present invention effectively prevents the rigidity reduction of the drum and the laundry damage and air hole clogging.

[0075] Meanwhile, the reinforcement ribs in the vicinity of the air inlet can prevent the transformation of the tub which is caused by the heat of the hot air introduced via the air inlet.

[0076] And furthermore, 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 between the tub and the condensing duct or the drying duct.

[0077] 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.

Claims

1. A washing and drying machine comprising:

a case (10);
a tub (20) provided within the case (10);
a drum (30) rotatably provided within the tub (20);
a condensing duct (50) connected to any one of a front and rear portion of the tub (20), the condensing duct (50) sucking air of the tub therein to condense the sucked-in air; and
a drying duct (40) connected to the condensing duct (50) and the other one of the front and rear portion of the tub to supply dry and hot air to the tub;
characterized in that:

the drying duct (40) is fixed over a top portion of the tub (20), a space being provided between said top portion of the tub (20) and a bottom portion of the drying duct (40); and
an insulator (43) is provided between said top portion of the tub (20) and the drying duct (40), the insulator (43) supporting the drying duct and preventing heat of the drying duct from being transferred to the tub.

2. The washing and drying machine of claim 1, wherein the tub (20) comprises an air inlet (20a) provided to the front portion of the tub (20), further wherein the drying duct (40) is configured to be connected to the air inlet (20a) to introduce the hot air to the tub, wherein the air inlet is configured to be provided to an upper part of the front portion of the tub.

3. The washing and drying machine of claim 1 or 2, wherein the drum (30) comprises a plurality of air holes (30a) provided to a front portion thereof and confronting the front portion of the tub (20) to introduce the hot air in the tub into the drum, wherein the plurality of air holes (30a) are configured to be provided to the front portion of the drum in a circumferential direction.

4. The washing and drying machine of any one of claims 1-3, wherein the drum (30) further comprises a plurality of embossed portions (30b) outwardly projected from the front portion of the drum, further wherein an air hole (30a) is provided to a center of each of the embossed portions.

5. The washing and drying machine of claim 4, wherein each tip of each embossed portion (30b) is configured to be smoothly cut.

6. The washing and drying machine of claim 1, wherein the drum (30) comprises a plurality of air holes (30a) provided to a front portion thereof, wherein the tub (20) further comprises a plurality of reinforcement ribs (23) projected from a vicinity of the air inlet of the tub to prevent the tub from transformation by heat.

7. The washing and drying machine of claim 1, wherein the tub (20) further comprises an air guide (25) extending from the vicinity of an air inlet (20a), which is provided to a front portion of the tub, toward an inner space of the tub to guide the hot air blown out of the drying duct (40) toward the drum (30).

8. The washing and drying machine of claim 7, wherein the air guide (25) is configured to be formed as a unitary body with a rim of the air inlet or with the tub, or the air guide (25) and the tub (20) are configured to be separately formed each other and the air guide is attached to an inside of the tub.

9. The washing and drying machine of claim 7, wherein the air guide (25) is configured to be inclined downward from the tub toward the drum.

10. The washing and drying machine of any one of the preceding claims, wherein the condensing duct (50) is configured to be connected to a lower rear portion of the drum.

Patentansprüche

1. Waschtrockner mit:

einem Gehäuse (10);
einem Laugenbehälter (20), der im Gehäuse (10) vorgesehen ist;
einer Trommel (30), die im Laugenbehälter (20) drehbar vorgesehen ist;
einem Kondensationskanal (50), der mit einer Komponente aus einem vorderen oder einem hinteren Abschnitt des Laugenbehälters (20) verbunden ist, wobei der Kondensationskanal (50) Luft aus dem Laugenbehälter einsaugt, um die eingesaugte Luft zu kondensieren; und
einem Trockenkanal (40), der mit dem Kondensationskanal (50) und der anderen Komponente aus dem vorderen und hinteren Abschnitt des Laugenbehälters verbunden ist, um dem Laugenbehälter Trocken- und Warmluft zuzuführen;

dadurch gekennzeichnet, daß:

der Trockenkanal (40) über einem oberen Abschnitt des Laugenbehälters (20) befestigt ist, wobei ein Raum zwischen dem oberen Abschnitt des Laugenbehälters (20) und einem unteren Abschnitt des Trockenkanals (40) vorgesehen ist; und
eine Isolierung (43) zwischen dem oberen Abschnitt des Laugenbehälters (20) und dem Trokkenkanal (40) vorgesehen ist, wobei die Isolierung (43) den Trockenkanal abstützt und verhindert, daß Wärme des Trockenkanals zum Laugenbehälter übertragen wird.

2. Waschtrockner nach Anspruch 1, wobei der Laugenbehälter (20) einen Lufteinlaß (20a) aufweist, der am vorderen Abschnitt des Laugenbehälters (20) vorgesehen ist, wobei ferner der Trockenkanal (40) so konfiguriert ist, daß er mit dem Lufteinlaß (20a) verbunden ist, um die Warmluft in den Laugenbehälter einzuleiten, wobei der Lufteinlaß so konfiguriert ist, daß er an einem Oberteil des vorderen Abschnitts des Laugenbehälters vorgesehen ist.

3. Waschtrockner nach Anspruch 1 oder 2, wobei die Trommel (30) mehrere Luftlöcher (30a) aufweist, die an einem vorderen Abschnitt davon vorgesehen sind und gegenüber dem vorderen Abschnitt des Laugenbehälters (20) liegen, um die Warmluft im Laugenbehälter in die Trommel einzuleiten, wobei die mehreren Luftlöcher (30a) so konfiguriert sind, daß sie am vorderen Abschnitt der Trommel in Umfangsrichtung vorgesehen sind.

4. Waschtrockner nach einem der Ansprüche 1 bis 3, wobei die Trommel (30) ferner mehrere erhabene Abschnitte (30b) aufweist, die vom vorderen Abschnitt der Trommel nach außen vorstehen, wobei ferner ein Luftloch (30a) an einer Mitte jedes der erhabenen Abschnitte vorgesehen ist.

5. Waschtrockner nach Anspruch 4, wobei jede Spitze jedes erhabenen Abschnitts (30b) so konfiguriert ist, daß sie geschlichtet ist.

6. Waschtrockner nach Anspruch 1, wobei die Trommel (30) mehrere Luftlöcher (30a) aufweist, die an einem vorderen Abschnitt davon vorgesehen sind, wobei der Laugenbehälter (20) ferner mehrere Verstärkungsrippen (23) aufweist, die von einer Umgebung des Lufteinlasses des Laugenbehälters vorstehen, um den Laugenbehälter an Umformung durch Wärme zu hindern.

7. Waschtrockner nach Anspruch 1, wobei der Laugenbehälter (20) ferner eine sich von der Umgebung eines Lufteinlasses (20a) erstreckende Luftführung (25) aufweist, die an einem vorderen Abschnitt des Laugenbehälters zu einem Innenraum des Laugenbehälters vorgesehen ist, um die aus dem Trockenkanal (40) geblasene Warmluft zur Trommel (30) zu führen.

8. Waschtrockner nach Anspruch 7, wobei die Luftführung (25) so konfiguriert ist, daß sie als einteiliger Körper mit einem Rand des Lufteinlasses oder mit dem Laugenbehälter ausgebildet ist, oder die Luftführung (25) und der Laugenbehälter (20) so konfiguriert sind, daß sie getrennt voneinander ausgebildet sind und die Luftführung an einer Innenseite des Laugenbehälters angebracht ist.

9. Waschtrockner nach Anspruch 7, wobei die Luftführung (25) so konfiguriert ist, daß sie vom Laugenbehälter zur Trommel nach unten geneigt ist.

10. Waschtrockner nach einem der vorstehenden Ansprüche, wobei der Kondensationskanal (50) so konfiguriert ist, daß er mit einem unteren hinteren Abschnitt der Trommel verbunden ist.

Revendications

1. Machine lave-linge et sèche-linge, comprenant:

➢ une carrosserie (10) ;
➢ une cuve (20) prévue à l'intérieur de la carrosserie (10) ;
➢ un tambour (30) prévu de manière rotative à l'intérieur de la cuve (20) ;
➢ un conduit de condensation (50) raccordé à l'une quelconque parmi une partie avant et une partie arrière de la cuve (20),
➢ le conduit de condensation (50) aspirant l'air de la cuve à l'intérieur de celui-ci pour condenser l'air aspiré ; et
➢ un conduit de séchage (40) raccordé au conduit de condensation (50) et l'autre parmi la partie avant et la partie arrière de la cuve pour alimenter de l'air sec et chaud à la cuve ;

caractérisé en ce que :

➢ le conduit de séchage (40) est fixé sur une partie supérieure de la cuve (20), un espace étant prévu entre ladite partie supérieure de la cuve (20) et une partie inférieure du conduit de séchage (40) ; et
➢ un isolant (43) est prévu entre ladite partie supérieure de la cuve (20) et le conduit de séchage (40), l'isolant (43) supportant le conduit de séchage et empêchant de transférer la chaleur du conduit de séchage à la cuve.

2. Machine lave-linge et sèche-linge selon la revendication 1, dans laquelle la cuve (20) comprend une entrée d'air (20a) prévue sur la partie avant de la cuve (20), dans laquelle en outre le conduit de séchage (40) est configuré pour être raccordé à l'entrée d'air (20a) afin d'introduire l'air chaud dans la cuve, dans laquelle l'entrée d'air est configurée pour être amenée jusqu'à une partie supérieure de la partie avant de la cuve.

3. Machine lave-linge et sèche-linge selon la revendication 1 ou 2, dans laquelle le tambour (30) comprend une pluralité de trous d'air (30a) prévus sur sa partie avant et en face de la partie avant de la cuve (20) pour introduire l'air chaud dans la cuve dans le tambour, dans laquelle la pluralité de trous d'air (30a) est configurée pour être prévue sur la partie avant du tambour dans une direction circonférentielle.

4. Machine lave-linge et sèche-linge selon l'une quelconque des revendications 1 à 3, dans laquelle le tambour (30) comprend en outre une pluralité de parties gaufrées (30b) faisant saillie vers l'extérieur à partir de la partie avant du tambour, dans laquelle en outre un trou d'air (30a) est prévu sur un centre de chacune des parties gaufrées.

5. Machine lave-linge et sèche-linge selon la revendication 4, dans laquelle chaque pointe de chaque partie gaufrée (30b) est configurée pour être découpée de manière lisse.

6. Machine lave-linge et sèche-linge selon la revendication 1, dans laquelle le tambour (30) comprend une pluralité de trous d'air (30a) prévue sur sa partie avant, dans laquelle la cuve (20) comprend en outre une pluralité de nervures de renforcement (23) en saillie à partir d'une proximité de l'entrée d'air de la cuve pour empêcher la transformation de la cuve par la chaleur.

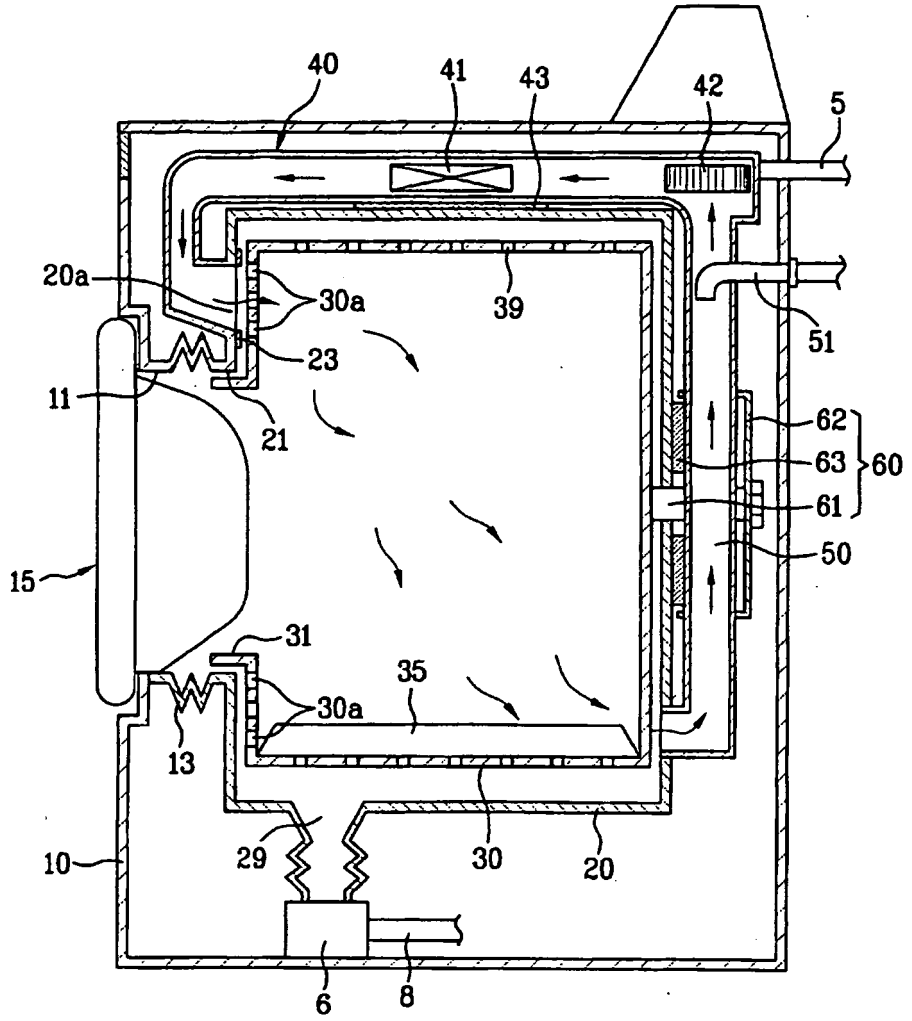
7. Machine lave-linge et sèche-linge selon la revendication 1, dans laquelle la cuve (20) comprend en outre un guide d'air (25) s'étendant à partir de la proximité d'une entrée d'air (20a) qui est prévue sur une partie avant de la cuve, vers un espace interne de la cuve pour guider l'air chaud soufflé à l'extérieur du conduit de séchage (40) vers le tambour (30).

8. Machine lave-linge et sèche-linge selon la revendication 7, dans laquelle le guide d'air (25) est configuré pour être formé comme un corps unitaire avec un bord de l'entrée d'air ou avec la cuve, ou bien le guide d'air (25) et la cuve (20) sont configurés pour être formés séparément l'un de l'autre et le guide d'air est fixé sur un intérieur de la cuve.

9. Machine lave-linge et sèche-linge selon la revendication 7, dans laquelle le guide d'air (25) est configuré pour être incliné vers le bas à partir de la cuve vers le tambour.

10. Machine lave-linge et sèche-linge selon l'une quelconque des revendications précédentes, dans laquelle le conduit de condensation (50) est configuré pour être raccordé à une partie arrière inférieure du tambour.

[Fig. 1]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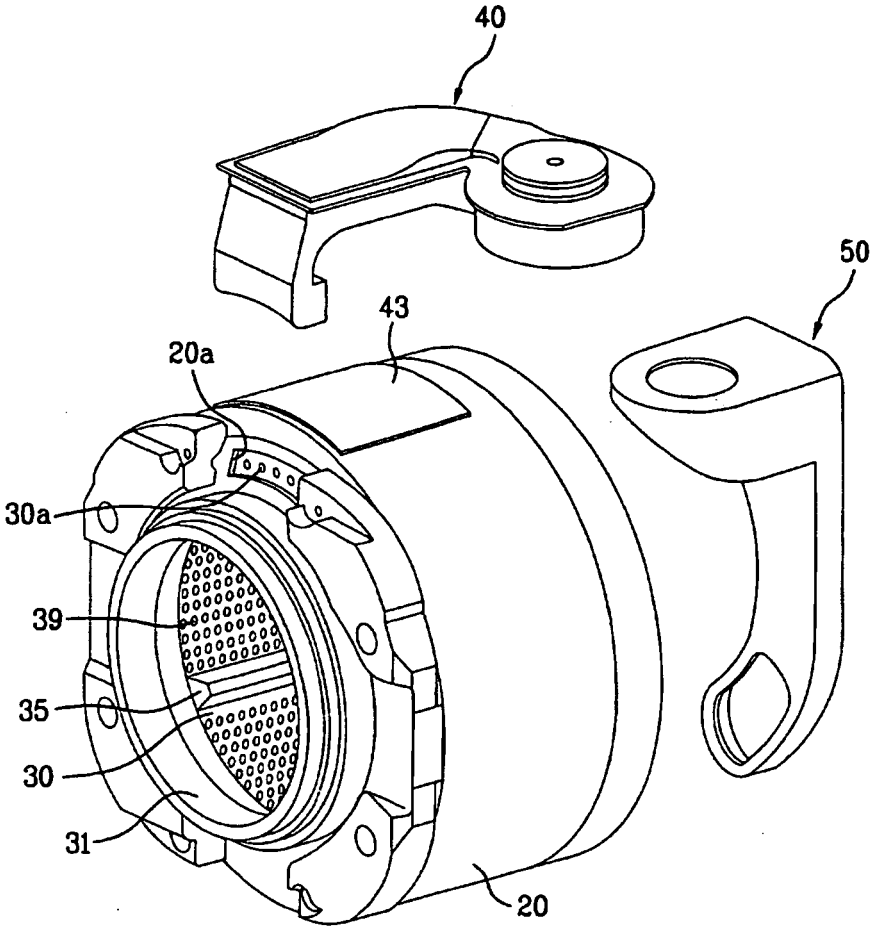
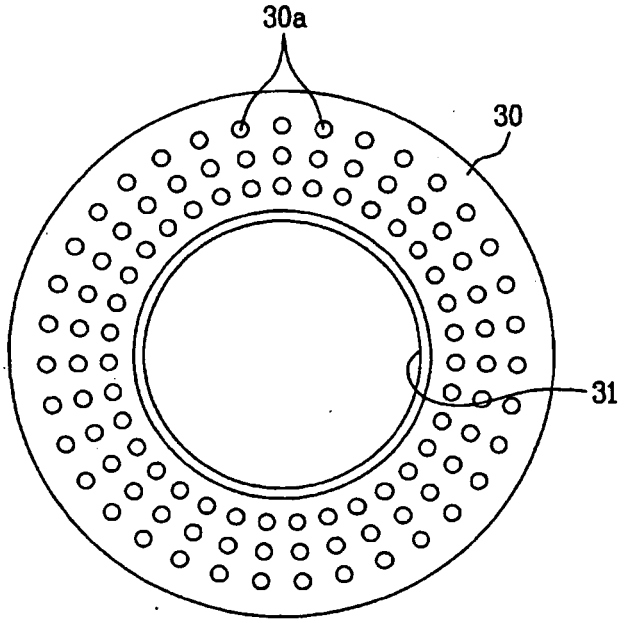
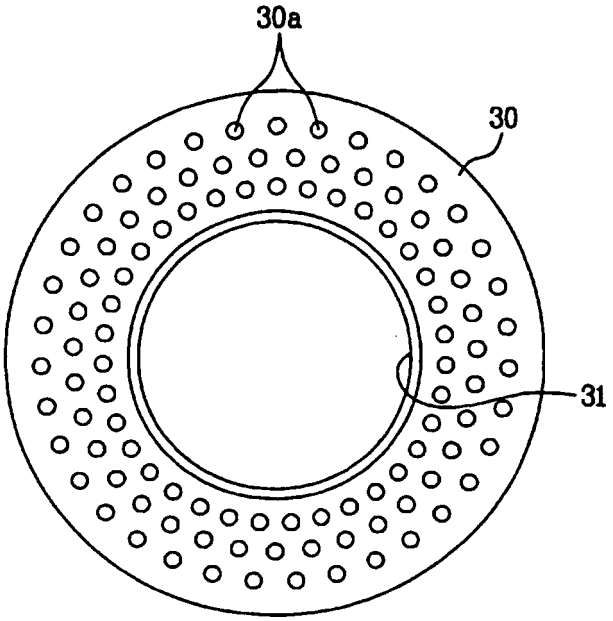
[Fig. 2]



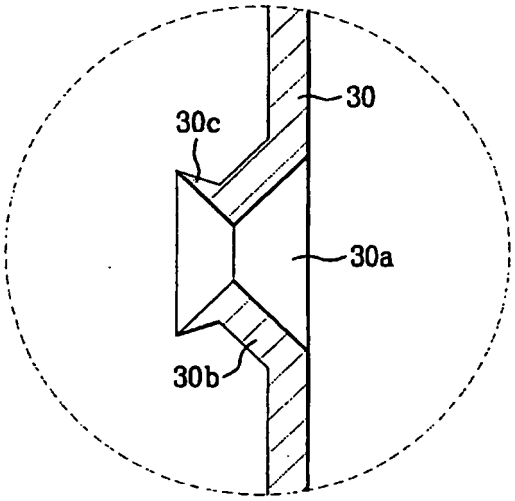
[Fig. 3]



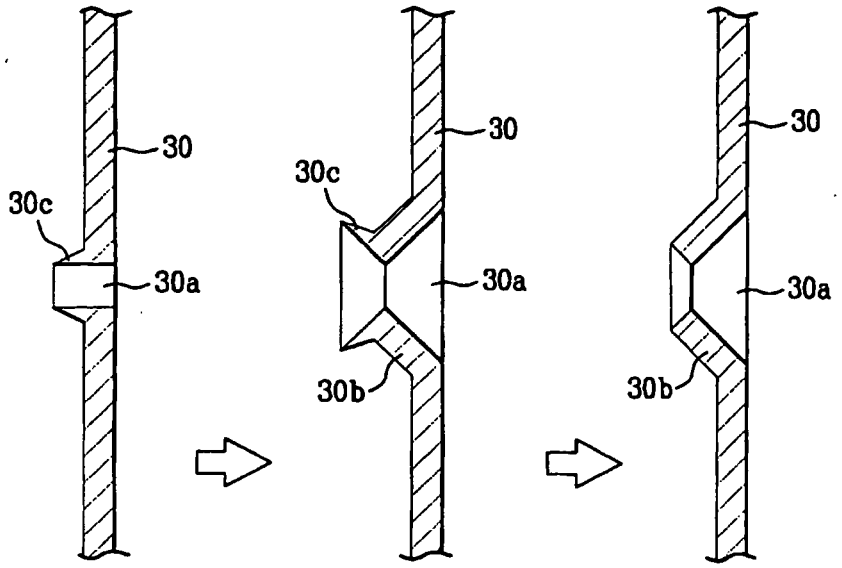
[Fig. 4]



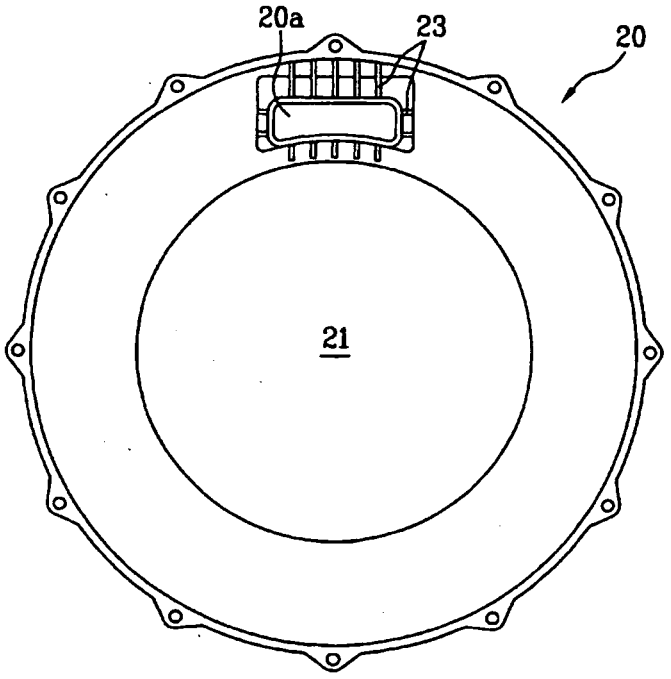
[Fig. 5]



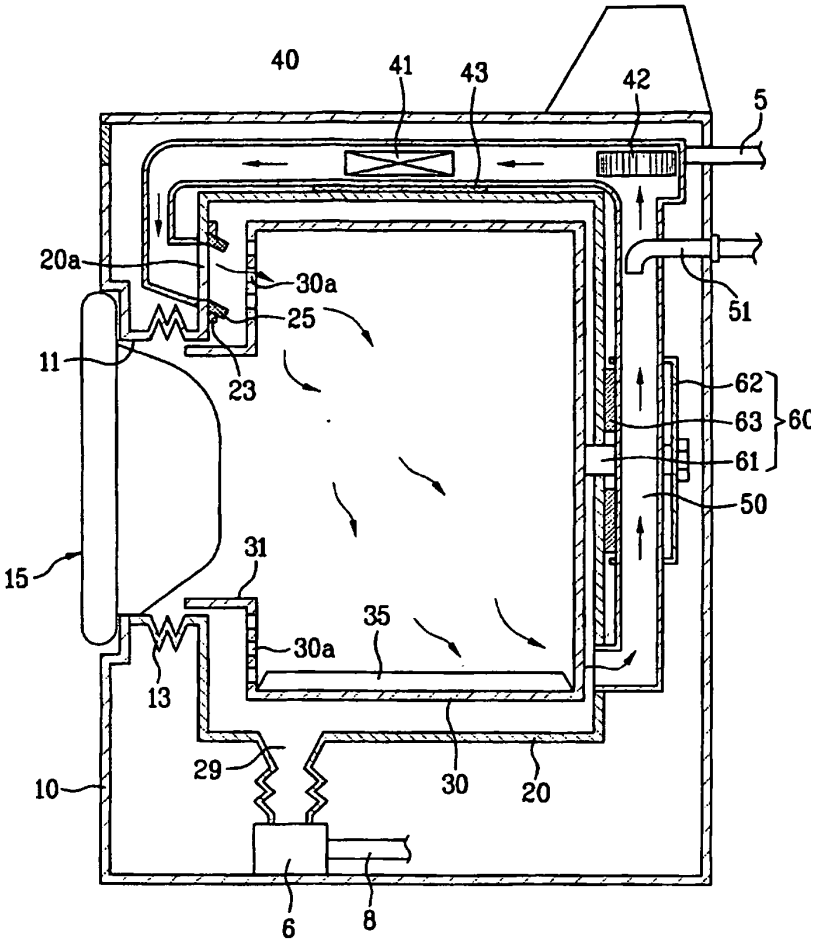
[Fig. 6]



[Fig. 7]



[Fig. 8]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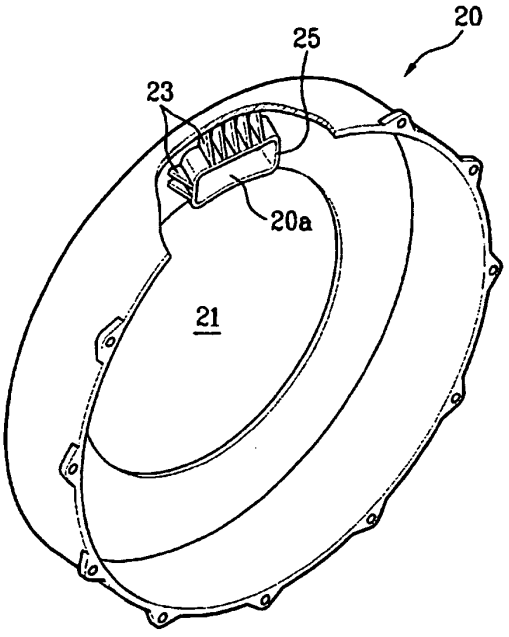
[Fig. 9]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