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(54) **Drum type washing machine having a drying mechanism**

Trommelwaschmaschine mit Trocknungsmechanismus

Machine à laver à tambour ayant un mécanisme de séchage

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(73) Proprietor: **Dongbu Daewoo Electronics Corporation**
Seoul 100-769 (KR)

(72) Inventors:
- **Joo, Sung Su**
  Seoul 100-769 (KR)
- **Park, Jong Won**
  Seoul 100-769 (KR)

(74) Representative: **Rau, Schneck & Hübner Patentanwälte Rechtsanwälte PartGmbB**
Königstraße 2
90402 Nürnberg (DE)

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a washing machine, and more particularly, to a drum type washing machine having an improved drying function.

BACKGROUND

[0002] In general, a drum type washing machine washes laundry using a force generated when the laundry is raised by a lifter and then dropped as the drum rotates. The drum type washing machine advantageously minimizes damage to the clothing due to less friction generated during the washing process, and consumes a minimal amount of water due to the use of the water only at the bottom part of the drum.

[0003] The drum type washing machine includes a cabinet that forms the exterior of the washing machine; a tub in the cabinet that accommodates water therein; a rotary drum in the tub that accommodates the laundry therein; a motor in or under the tub that provides a motive power to the drum; a water supplying device that supplies water to the tub; and a drain device that drains water from the tub to the outside of the cabinet after completion of the washing process.

[0004] A detergent case may be at one side of the cabinet, and a water supply pipe may provide water to the tub through the detergent case. As the water is supplied through the water supply pipe by the water supplying device, detergent in the detergent case is also supplied to the tub along with the water.

[0005] A circulation duct for drying the laundry may be at one side of the tub. The circulation duct may have a fan configured to circulate air in the tub; a condensing device configured to condense moisture in the air; and a heating device configured to heat the air after the condensing process. Once a drying process starts, the fan draws the air in the tub into the circulation duct. The air in the circulation duct may be subjected to a condensing process for eliminating moisture from the air by the condensing device, and a heating process for heating the air using the heating device.

[0006] Conventionally, a nozzle is at an upper side of the circulation duct, and configured to jet or spray coolant directly to the inside of the circulation duct. The coolant jetted from the upper side of the circulation duct freely falls or runs down along the circulation duct while directly contacting the air, and lowers the temperature of the ambient air around the circulation duct and/or condenses the moisture in the air flowing in the circulation duct into water droplets. The water droplets may fall or run down along the circulation duct and be collected in a separate water tray.

[0007] In a conventional washing machine, moisture can be substantially condensed only for the time during which the coolant actually passes through and contacts the high-temperature and high-humidity air in the circulation duct. As a result, to effectively reduce moisture in the air, the coolant needs to be continuously supplied into the circulation duct. Thus, as compared to the amount of the moisture removed from the air, an excessive amount of coolant may be consumed.

[0008] A conventional drum type washing machine is disclosed in Korean Patent Application Publication No. 10-2007-0064017.

[0009] The document US 5 146 693 A discloses a steam condensation device in a dryer or combination washer/dryer and shows the features of the preamble of claim 1. There seems to be a need for an improved efficiency in said steam condensation device. Further on the document KR 2013 0018466 A discloses a drum type washing machine according to the preamble of claim 1.

SUMMARY

[0010] The present disclosure has been made in an effort to provide a drum type washing machine capable of effectively drying laundry by using a small amount of coolant. This object is achieved by the characterising features of claim 1.

[0011] In accordance with the present invention, a drum type washing machine comprises a tub; a heating duct outside the tub to heat air that circulates back to the duct; a condensing duct having one end connected to the tub and another end connected to the heating duct, configured to reduce moisture in the air from the tub; and a coolant supplying unit configured to supply coolant into the condensing duct, wherein the condensing duct comprises an inner tube in which the air from the tub flows, and an outer tube surrounding at least a part or section of the inner tube, and the coolant supplying unit is configured to supply the coolant into a space between the inner tube and the outer tube. Further on an upper end of the inner tube is open and has a location below an upper end of the outer tube, and the coolant supplied in the space overflows the space and enters the inner tube through the upper end of the inner tube. Finally according to the invention the coolant supplying unit is connected to a lower side of the outer tube to provide the coolant into the space at a lower section thereof and the condensing duct further comprises a fluid guiding member provided within the space along a longitudinal direction of the condensing duct to form one or more coolant paths in the space.

[0012] In exemplary embodiments of the present disclosure, the condensing duct may extend vertically, and the outer tube and the inner tube may be engaged or connected to each other and seal a bottom of the space.

[0013] In exemplary embodiments of the present disclosure, the inner tube may comprise an insert having an outer diameter smaller than an inner diameter of the outer tube; and a connector extending from a lower end of the insert and having an outer diameter larger than the inner diameter of the outer tube, wherein the outer tube and

the inner tube may engage with or connect to each other, and a lower end of the outer tube contacts an upper end of the connector (e.g., while the insert is in the outer tube).

[0014] In exemplary embodiments of the present disclosure, the coolant supplying unit may be configured to supply additional coolant before the coolant in the space reaches a thermal equilibrium with the air in the inner tube.

[0015] In exemplary embodiments of the present disclosure, the fluid guiding member may include a protrusion or extension from an inner surface of the outer tube or an outer surface of the inner tube, which may spirally extend in the longitudinal direction of the condensing duct.

[0016] According to the exemplary embodiments of the present disclosure, it may be possible to achieve a more effective drying process by using a relatively small amount of coolant.

[0017] In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a cross sectional view schematically illustrating a drum type washing machine in accordance with exemplary embodiments of the present disclosure.

FIG. 2 is an enlarged cross sectional view of an exemplary condensing duct.

FIG. 3 is an exploded perspective view of the exemplary condensing duct of FIG. 1.

FIG. 4 is an enlarged cross sectional view of an exemplary condensing duct applied to a drum type washing machine in accordance with exemplary embodiments of the present disclosure.

FIG. 5 is an enlarged perspective view of the exemplary condensing duct of FIG. 4.

[0019] The embodiment according to figures 2 and 3 does not fall within the scope of the claims.

DETAILED DESCRIPTION

[0020] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof.

[0021] Hereinafter, one or more exemplary embodiments according to the present disclosure will be described in detail with reference to the accompanying drawings. Various configurations of the present disclosure, and operations and/or effects according to the configurations of the present disclosure, will be clearly understood by the detailed description below.

[0022] It should be noted that the drawings are schematically provided and not necessarily to scale. The relative dimensions and ratios of the parts illustrated in the drawings may be exaggerated or reduced in size for clarity and convenience in the drawings, and the dimensions are only examples, without limitation. In the following description, the same elements will be designated by the same reference numerals, although the elements are illustrated in different drawings, and a detailed explanation of known related constitutions may be omitted so as to avoid unnecessarily obscuring the subject matter of the present disclosure.

[0023] Exemplary embodiments of the present disclosure show ideal examples of the present disclosure. Accordingly, the exemplary embodiments shown in the drawings are expected to be changed in various ways. Therefore, the exemplary embodiments are not limited to specific configurations in the drawings, and may be changed to have various shapes and/or arrangements by manufacturing.

[0024] Hereinafter, a drum type washing machine 1 in accordance with exemplary embodiments of the present disclosure will be described with reference to FIG. 1 through FIG. 3. FIG. 1 is a cross sectional view schematically illustrating a drum type washing machine 1 in accordance with exemplary embodiments of the present disclosure. FIG. 2 is an enlarged cross sectional view of an exemplary condensing duct 30, and FIG. 3 is an exploded perspective view of the exemplary condensing duct 30 of FIG. 2.

[0025] Referring to FIG. 1 through FIG. 3, the drum type washing machine 1 in accordance with exemplary embodiments of the present disclosure may include a tub 10, a heating duct 20, a condensing duct 30 and a coolant supplying unit 40. The tub 10 holds or accommodates water, and the heating duct 20 may be outside the tub 10. One end of the condensing duct 30 may be connected to the tub 10, and another end of the condensing duct 30 may be connected to the heating duct 20. The coolant supplying unit 40 may be configured to supply coolant to the condensing duct 30. The heating duct 20 and the condensing duct 30 may form a flow path through which the air in the tub 10 circulates. Furthermore, the drum type washing machine 1 may further include a rotatable drum 61, a driving device 62 and a draining device 63. The drum 61 is in the tub 10 and configured to hold the laundry. The driving device 62 may be adjacent to the tub 10 and configured to rotate the drum 61. The draining device 63 may be configured to drain the water from the tub 10 after the washing process is completed. The heating duct 20 may be equipped with a fan 21 and a heater 22. Further, a water supplying device 64 that supplies the water to the drum 61 may be above the drum 61.

[0026] When the drying operation begins, the air in the tub 10 may be circulated via the condensing duct 30 and the heating duct 20. Here, with the fan 21 operating, the air in the tub 10 may enter or be drawn into the condens-

ing duct 30. In the condensing duct 30, moisture in the air from the tub 10 may be reduced by condensation. After passing the heating duct 10, air from which the moisture is removed in the condensing duct 30 may flow back into the tub 10. While passing through the heating duct 10, the air with reduced moisture may be heated by the heater 22 after passing the fan 21. Subsequently, the air returns back to the tub 10 as high-temperature dry air.

[0027] The heating duct 20 may be oriented horizontally above the tub 10, and the condensing duct 30 may extend in a vertical direction at a rear section of the tub 10. In such a configuration, the fan 21 may be adjacent to a joint, connector or connecting portion of the heating duct 20 and the condensing duct 30, and the heater 22 may be in the heating duct 20. A lower end of the vertically extending condensing duct 30 may be connected to a lower section of the tub 10, and an upper end of the condensing duct 30 may be connected to the heating duct 20.

[0028] The coolant supplying unit 40 is configured to supply coolant to the condensing duct 30. The condensation of the moisture in the air flowing in the condensing duct 30 may be enhanced by the coolant. In the present exemplary embodiments, the coolant supplying unit 40 may be configured as a pipe branching from the water supplying device 64. Thus, the coolant may comprise water (e.g., cold tap water). However, this configuration is merely an example, and the invention is not limited thereto. For example, the coolant supplying unit 40 may be separate from the water supplying device 64, and may include a driving unit configured to supply the coolant. Furthermore, a coolant valve 50 configured to control a supply or flow rate of the coolant may be in the coolant supplying unit 40.

[0029] The condensing duct 30 may include an outer tube 31 and an inner tube (or air tube) 32. The air discharged from the tub 10 may pass through the inner tube 32, and at least a part or section of the inner tube 32 may be in the outer tube 31. The entire inner tube 32 may be in the outer tube 31, or only a part or section of the inner tube 32 may be in the outer tube 31. An outer surface of the section of the inner tube 32 in the outer tube 31 may be spaced apart or separate from an inner surface of the outer tube 31, so that a space 33 exists between the outer tube 31 and the inner tube 32.

[0030] The space 33 may be sealed at the bottom, and the coolant may fill the space 33 when supplied thereto. By way of example, as shown in FIG. 2, the outer tube 31 and the inner tube 32 may be firmly engaged with or connected to each other such that the bottom of the space 33 is tightly sealed (e.g., water-tight).

[0031] For example, the outer tube 31 may be configured to have a predetermined inner diameter and a predetermined outer diameter. Meanwhile, the inner tube 32 may include an insert 321 having an outer diameter smaller than the inner diameter of the outer tube 31; and a connector 322 having an outer diameter larger than the inner diameter of the outer tube 31. The connector 322 is provided below the insert 321 and may extend downward from a lower end of the insert 321. As depicted in FIG. 2 and FIG. 3, the outer tube 31 and the inner tube 32 may be engaged or connected to each other such that the insertion 321 is in the outer tube 31, and a lower end of the outer tube 31 is in contact with an upper end of the connector 322 at the same time. In this case, since the outer diameter of the insert 321 is smaller than the inner diameter of the outer tube 31, the space 33 can be between the outer surface of the inner tube 32 and the inner surface of the outer tube 31. Meanwhile, since the outer diameter of the connector 322 is larger than the inner diameter of the outer tube 31, the connector 322 is located under the lower end of the outer tube 31, rather than being in the outer tube 31. As the upper end of the connector 322 and the lower end of the outer tube 31 are firmly in contact with each other, the bottom of the space 33 can be sealed.

[0032] The inner tube 32 may be forcibly inserted into the outer tube 31. Furthermore, a stepped section 323 may be at the joint section of the insert 321 and the connector 322. The stepped section 323 may have an outer diameter that allows the stepped section 323 to make an interference fit with the outer tube 31. As the stepped section 323 is forcibly fitted into the outer tube 31, the inner tube 32 and the outer tube 31 can tightly engage with or connect to each other. For example, the inner tube 32 may have a lip or ring-like projection around the part that contacts the outer tube 31, and the outer tube 31 may have a matching groove or indentation on the part that contacts the inner tube 32.

[0033] The connector 322 may be connected to the draining device 63 to allow condensed water produced during the condensation of the air, or overflowing coolant (which is described later) to be discharged out of the washing machine 1.

[0034] The coolant supplying unit 40 is configured to supply the coolant to the space 33. For example, a coolant inlet 311 may be at or on the outer tube 31 of the condensing duct 30, and the coolant inlet 311 may be connected to the coolant supplying unit 40 that may branch from the water supplying device 64. The coolant valve 50 in the coolant supplying unit 40 (or a tube thereof) controls the flow rate of the coolant supplied to the coolant inlet 311, thus adjusting the amount and/or rate of the coolant filling in the space 33.

[0035] An upper end of the inner tube 32 is open and the upper end is below an upper end of the outer tube 31. When the bottom of the space 33 is sealed, the top of the space 33 is open. In such a configuration, when the coolant is continuously supplied into the space 33, the coolant fills the entire space 33, and then may flow over the open top of the space 33. The overflowing coolant may enter the inner tube 32 via the open upper end of the inner tube 32. After reaching the inner tube 32, the coolant falls or runs down along the inner surface of the inner tube 32 and be drained in the lower section thereof by the draining device 63.

[0036] As discussed above, before the coolant sup-

plied to the space 33 overflows into the inner tube 32 after filling the space 33, the coolant may first come into contact with the outer surface of the inner tube 32 within the space 33. As a result, a preliminary heat exchange may first occur between the coolant and the air in the inner tube 32. Thereafter, when the coolant in the inner tube 32 comes into direct contact with the air in the inner tube, a secondary heat exchange may occur between the coolant and the air. Accordingly, the moisture in the air may be reduced effectively with a smaller amount of coolant.

[0037] When the coolant is supplied to the space 33, the condensed water drops produced during the condensation of the air may form on and/or cling to the inner surface of the inner tube 32. These condensed water drops may be effectively removed from the inner surface of the inner tube 32 by the coolant in the inner tube 32 flowing down along the inner surface of the inner tube 32.

[0038] The coolant supplying unit 40 may be connected to a lower side of the outer tube 31. In such a configuration, the coolant may fill the space 33, starting from a bottom section of the space 33. Since the bottom of the space 33 is tightly sealed, the coolant may fill from the bottom of the space 33. As the coolant is supplied from the bottom of the space 33, the coolant may be prevented from reaching the heating duct 20 even with the fan 21 operating.

[0039] An operation and an effect of the drum type washing machine 1 having the above-described configuration in accordance with exemplary embodiments of the present disclosure will be explained in further detail.

[0040] When the fan 21 operates, the air in the tub 10 may move into the condensing duct 30. The condensing duct 30 has a double-tube structure and a space 33 that is filled with the coolant supplied from the coolant supplying unit, as discussed above. The air from the tub 10 may move into the heating duct 20 through the inner tube 32 that forms the inner sidewall of the space 33. In FIG. 2 and FIG. 4, dashed-line arrows indicate a flow of the air in the condensing duct 30, and solid-line arrows indicate a flow of the coolant through the space 33.

[0041] When the coolant passes through the space 33, there may be an exchange of heat between the coolant and the air passing through the inner tube 32. As a result, the temperature of the air may decrease. Accordingly, a dew point may also decrease, and moisture in the air can condense (e.g., on the inner surface of the inner tube 32).

[0042] The air may come into indirect contact (e.g., the coolant with the sidewall of the inner tube 32). The indirect contact may be made throughout the entire side surface area of the inner tube 32. Since the coolant is in the condensing duct 30 as it fills the space 33, the coolant in the space 33 is capable of reducing the temperature of the air passing through the inner tube 32 continuously until the coolant and the air reach a thermal equilibrium state (e.g., at or near the top of the inner tube 32). In such a case, the flow rate of the coolant can be relatively low. Thus, an efficient heat exchange may be performed between the coolant and the air, so that the moisture in the air can be effectively reduced with a relatively small amount of coolant.

[0043] Furthermore, when the coolant remains in the space 33 statically (i.e., without new coolant continuously flowing into the space 33), before the coolant and the air passing through the inner tube 32 reach thermal equilibrium, the temperature of the coolant may become close to thermal equilibrium. When a predetermined time has elapsed after the coolant is supplied, the coolant supplying unit 40 may replenish the space 33 with new coolant. Accordingly, the coolant can be provided to the condensing duct 30 intermittently, and reduction of condensing efficiency from relatively warm coolant may be prevented.

[0044] If additional coolant is supplied from the coolant supplying unit 40, the coolant previously supplied in the space 33 may overflow into the inner tube 32 through the top opening of the space 33. This overflowing coolant may fall or run down, while effectively removing condensed water drops clinging to the inner surface of the inner tube 32, and absorbing moisture in the air. Then, the coolant may be discharged through the draining device 63.

[0045] Hereinafter, a condensing duct 30a included in a drum type washing machine in accordance to the invention will be discussed with reference to FIG. 4 and FIG. 5. The embodiments according to the invention of FIGS. 4 and 5 are similar to or substantially the same as the above-described exemplary embodiments of FIGS. 1 through 3, except a fluid guiding member 34 is further included in the condensing duct 30a. Thus, like parts will be assigned like reference numerals and redundant description thereof will be omitted. Below, only distinctive parts will be elaborated.

[0046] FIG. 4 is an enlarged cross sectional view of an exemplary condensing duct 30a applied to the drum type washing machine according to the invention. FIG. 5 is an exploded perspective view of the exemplary condensing duct 30a of FIG. 4.

[0047] As depicted in FIG. 4 and FIG. 5, the condensing duct 30a of the drum type washing machine in accordance to the invention, further includes a fluid guiding member 34 in the space 33 between the outer tube 31 and the inner tube 32. The fluid guiding member 34 is in the space 33 along a longitudinal and/or horizontal direction of the condensing duct 30a, so as to form one or more coolant fluid paths within the space 33. The fluid guiding member 34 may form a single long path in the space 33, or form multiple paths in the space 33 by partitioning the space 33 in plural or multiple sections. In the case of a single long path, the long path may be formed by a spiral fluid guiding member 34 (e.g., extending more in the longitudinal direction than in the vertical direction of the condensing duct 30a).

[0048] In the exemplary embodiments of the present disclosure, the fluid guiding member 34 may be a protrusion or extension on an inner surface of the outer tube

31 having a preset height. The protrusion or extension may be spiral, extending more in the longitudinal direction than vertical direction of the outer tube 31. Further, the height of the protrusion or extension may be equal to or smaller than a gap between the outer surface of the inner tube 32 and the inner surface of the outer tube, and an end of the protrusion or extension may be in contact with the outer surface of the inner tube 32. By the presence of such a protrusion or extension, a spiral fluid path may be formed. In FIG. 4 and FIG. 5, the exemplary embodiments are illustrated.

[0049] Alternatively, the fluid guiding member34 may be a protrusion or extension on the outer surface of the inner tube 32 having a preset height. The protrusion or extension may be spirally extended in the longitudinal direction of the inner tube 32. As in the above example, the height of this protrusion or extension may be equal to or smaller than the gap between the outer surface of the inner tube32 and the inner surface of the outer tube 31, and an end of this protrusion or extension may be in contact with the inner surface of the outer tube 31. By the presence of such a protrusion or extension, a spiral flow path may be formed.

[0050] The coolant supplied into the space 33 may flow along the fluid path defined by the fluid guiding member 34 in the space 33. For example, when the spiral fluid path is in the longitudinal direction of the condensing duct 30, the coolant may flow spirally up the inner tube 32. Accordingly, the fluid path through which the coolant flows in the space 33 may be lengthened, thus a time period during which the air and the coolant are in indirect contact with each other can be lengthened. As a result, the moisture in the air can be more effectively reduced with a relatively small amount of coolant.

[0051] Furthermore, the fluid guiding member 34 may also prevent the occurrence of convection of the coolant within the space 33. Accordingly, coolant having an increased temperature due to the heat transferred from the air can be prevented from mixing with newly supplied, low-temperature coolant. Accordingly, the newly supplied coolant can effectively maintain a low temperature. Particularly, when an inlet through which the new low-temperature coolant is provided in the inner tube 32 at an upstream side of the air, the newly introduced or provided coolant may be allowed to come into contact with the air before experiencing a temperature rise by heat exchange. As a result, the air with the highest temperature indirectly contacts the newly introduced coolant with the lowest temperature, and thus, the temperature of the air can be lowered more effectively.

[0052] Furthermore, as set forth above, the fluid guiding member 34 may protrude from the outer tube 31 and be in contact with the inner tube 32, or may protrude from the inner tube 32 and be in contact with the outer tube 32. With this configuration, the fluid guiding member 34 is capable of connecting the outer tube 31 and the inner tube 32 across the space 33, and thus is capable of supporting the inner tube 32 effectively within the outer tube 31. Thus, the double-tube structure of the condensing duct 30a may be stronger.

Claims

1. A drum type washing machine, comprising:

a tub (10);
a heating duct (20) outside the tub (10), configured to heat air that circulates back to the tub (10);
a condensing duct (30) having one end connected to the tub (10) and another end connected to the heating duct (20), configured to reduce moisture in the air from the tub (10); and
a coolant supplying unit (40) configured to supply coolant to the condensing duct (30),
wherein the condensing duct (30) comprises an inner tube (32) in which the air from the tub (10) flows and an outer tube (31) surrounding at least a section or part of the inner tube (32), and
the coolant supplying unit (40) is connected to a lower side of the outer tube (31), and is configured to supply the coolant into a lower section of a space (33) between the inner tube (32) and the outer tube (31),
wherein the inner tube (32) comprises an open upper end that has a location below an upper end of the outer tube (31), and the coolant supplied in the space (33) overflows the space (33) and enters the inner tube (32) through the upper end of the inner tube (32),
characterized in that
the condensing duct (30) further comprises a fluid guiding member (34) within the space (33) along a longitudinal direction of the condensing duct (30), configured to form one or more coolant paths in the space (33).

2. The drum type washing machine of claim 1, wherein the condensing duct (30) extends vertically, and the outer tube (31) and the inner tube (32) engage with or connect to each other and seal a bottom of the space (33).

3. The drum type washing machine of claim 1, wherein the inner tube (32) comprises:

an insert (321) having an outer diameter smaller than an inner diameter of the outer tube (31); and
a connector (322) extending from a lower end of the insert (321) and, having an outer diameter larger than the inner diameter of the outer tube (31) and connected to the outer tube (31),
wherein the outer tube (31) and the inner tube (32) engage with or connect to each other, and a lower end of the outer tube (31) contacts an

upper end of the connector (322) when the insert (321) is in the outer tube (31).

4. The drum type washing machine of claim 1, wherein the fluid guiding member (34) comprises an extension or protrusion on an inner surface of the outer tube (31) or an outer surface of the inner tube (32).

5. The drum type washing machine of claim 4, wherein the fluid guiding member (34) comprises a spiral fluid guiding member (34) that extends in the longitudinal direction of the condensing duct (30).

6. The drum type washing machine of claim 1, wherein the heating duct (20) comprises a fan (21) and a heater (22).

7. The drum type washing machine of claim 1, wherein the heating duct (20) is horizontally oriented above the tub (10), and the condensing duct (30) extends vertically behind the tub (10).

8. The drum type washing machine of claim 1, wherein the coolant supplying unit (40) comprises a pipe branching from a water supplying device and a valve (50) configured to control a flow rate of the coolant.

9. The drum type washing machine of claim 1, wherein the coolant from the coolant supplying unit (40) enters the inner tube (32) after contacting an outer surface of the inner tube (32), and exchanges heat with the air in the inner tube(32).

10. The drum type washing machine of claim 9, wherein the fluid guiding member (34) comprises a protrusion or extension at a preset height from an inner surface of the outer tube (31) equal to a gap between the outer surface of the inner tube (32) and the inner surface of the outer tube (31), and an end of the protrusion or extension contacts with the outer surface of the inner tube (32).

Patentansprüche

1. Eine Trommel-Waschmaschine, umfassend:

einen Bottich (10),
eine Heizleitung (20) außerhalb des Bottichs (10) zum Aufheizen von Luft, die in den Bottich (10) zurückströmt,
eine Kondensatleitung (30), deren eines Ende mit dem Bottich (10) und das andere Ende mit der Heizleitung (20) verbunden ist, um Feuchtigkeit in der Luft von dem Bottich (10) zu reduzieren, und
eine Kühlmittel-Zuführ-Einheit (40) zum Zuführen von Kühlmittel in die Kondensatleitung (30),
wobei die Kondensatleitung (30) ein Innenrohr (32), in das die Luft von dem Bottich (10) strömt, und ein Außenrohr (31), das zumindest einen Abschnitt oder Teil des Innenrohrs (32) umgibt, umfasst, und
die Kühlmittel-Zuführ-Einheit (40) mit einer Unterseite des Außenrohrs (31) verbunden ist und so ausgelegt ist, dass das Kühlmittel in einen unteren Abschnitt eines Raums (33) zwischen dem Innenrohr (32) und dem Außenrohr (31) zugeführt wird,
wobei das Innenrohr (32) ein offenes oberes Ende umfasst, das eine Position unter einem oberen Ende des Außenrohrs (31) aufweist, und
das dem Raum (33) zugeführte Kühlmittel den Raum (33) überflutet und durch das obere Ende des Innenrohrs (32) in den das Innenrohr (32) gelangt,
dadurch gekennzeichnet, dass
die Kondensatleitung (30) ferner ein Fluid-Führungs-Element (34) in dem Raum (33) entlang einer Längsrichtung der Kondensatleitung (30) umfasst, das einen oder mehrere Kühlpfade in dem Raum (33) bildet.

2. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei die Kondensatleitung (30) sich vertikal erstreckt und das Außenrohr (31) sowie das Innenrohr (32) miteinander in Eingriff stehen oder miteinander verbunden sind und einen Boden des Raumes (33) abdichten.

3. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei das Innenrohr (32) umfasst:

einen Einschub (321) mit einem Außendurchmesser, der kleiner ist als ein Innendurchmesser des Außenrohrs (31), und
ein Verbindungselement (322), das sich von einem unteren Ende des Einschubs (321) aus erstreckt und einen Außendurchmesser aufweist, der größer ist als der Innendurchmesser des Außenrohrs (31) und mit dem Außenrohr (31) verbunden ist,
wobei das Außenrohr (31) und das Innenrohr (32) miteinander in Eingriff stehen oder miteinander verbunden sind, und ein unteres Ende des Außenrohrs (31) mit einem oberen Ende des Verbindungselements (322) in Kontakt steht, wenn der Einschub (321) sich in dem Außenrohr (31) befindet.

4. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei das Fluid-Führungs-Element (34) einen Fortsatz oder Vorsprung an einer Innenfläche des Außenrohrs (31) oder einer Außenfläche des Innenrohrs (32) umfasst.

5. Die Trommel-Waschmaschine gemäß Anspruch 4, wobei das Fluid-Führungs-Element (34) ein spiralförmiges Fluid-Führungs-Element (34) umfasst, das sich in die Längsrichtung der Kondensatleitung (30) erstreckt.

6. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei die Heizleitung (20) einen Lüfter (21) sowie ein Heizelement (22) umfasst.

7. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei die Heizleitung (20) horizontal oberhalb des Bottichs (10) orientiert ist und die Kondensatleitung (30) sich vertikal hinter dem Bottich (10) erstreckt.

8. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei die Kühlmittel-Zuführ-Einheit (40) ein Rohr umfasst, das von einer Wasser-Zuführ-Vorrichtung abzweigt, sowie ein Ventil (50) zum Steuern einer Durchflussmenge des Kühlmittels.

9. Die Trommel-Waschmaschine gemäß Anspruch 1, wobei das Kühlmittel von der Kühlmittel-Zuführ-Einheit (40), nachdem es mit einer Außenfläche des Innenrohrs (32) in Kontakt gekommen ist, in das Innenrohr (32) gelangt und Wärme mit der Luft in dem Innenrohr (32) austauscht.

10. Die Trommel-Waschmaschine gemäß Anspruch 9, wobei das Fluid-Führungs-Element (34) einen Vorsprung oder einen Fortsatz an einer voreingestellten Höhe von einer Innenfläche des Außenrohrs (31) umfasst, die gleich einem Abstand zwischen der Außenfläche des Innenrohrs (32) und der Innenfläche (32) des Außenrohrs (31) ist, und wobei ein Ende des Vorsprungs oder Fortsatzes mit der Außenfläche des Innenrohrs (32) in Kontakt steht.

Revendications

1. Machine à laver de type à tambour comprenant :

une cuve (10) ;
un conduit de chauffage (20) à l'extérieur de la cuve (10), configuré pour chauffer l'air qui circule vers la cuve (10) ;
un conduit de condensation (30) ayant une extrémité raccordée à la cuve (10) et une autre extrémité raccordée au conduit de chauffage (20), configuré pour réduire l'humidité dans l'air provenant de la cuve (10) ; et
une unité d'alimentation en réfrigérant (40) configuré pour amener le réfrigérant au conduit de condensation (30),
dans laquelle le conduit de condensation (30) comprend un tube interne (32) dans lequel l'air provenant de la cuve (10) s'écoule et un tube externe (31) entourant au moins une section ou une partie du tube interne (32), et
l'unité d'alimentation en réfrigérant (40) est raccordée à un côté inférieur du tube externe (31), et est configurée pour amener le réfrigérant dans une section inférieure d'un espace (33) entre le tube interne (32) et le tube externe (31),
dans laquelle le tube interne (32) comprend une extrémité supérieure ouverte qui a un emplacement au-dessous d'une extrémité supérieure du tube externe (31), et le réfrigérant amené dans l'espace (33) déborde de l'espace (33) et pénètre dans le tube interne (32) par l'extrémité supérieure du tube interne (32),
caractérisée en ce que
le conduit de condensation (30) comprend en outre un élément de guidage de fluide (34) à l'intérieur de l'espace (33) le long d'une direction longitudinale du conduit de condensation (30), configuré pour former une ou plusieurs trajectoires de réfrigérant dans l'espace (33).

2. Machine à laver de type à tambour selon la revendication 1, dans laquelle le conduit de condensation (30) s'étend verticalement, et le tube externe (31) et le tube interne (32) se mettent en prise avec ou se raccordent entre eux et scellent un fond de l'espace (33).

3. Machine à laver de type à tambour selon la revendication 1, dans laquelle le tube interne (32) comprend :

un insert (321) ayant un diamètre externe inférieur à un diamètre interne du tube externe (31) ; et
un connecteur (322) s'étendant à partir d'une extrémité inférieure de l'insert (321) et ayant un diamètre externe supérieur au diamètre interne du tube externe (31) et raccordé au tube externe (31),
dans laquelle le tube externe (31) et le tube interne (32) se mettent en prise ou se raccordent entre eux, et une extrémité inférieure du tube externe (31) est en contact avec une extrémité supérieure du connecteur (322) lorsque l'insert (321) est dans le tube externe (31).

4. Machine à laver de type à tambour selon la revendication 1, dans laquelle l'élément de guidage de fluide (34) comprend une extension ou une saillie sur une surface interne du tube externe (31) ou une surface externe du tube interne (32).

5. Machine à laver de type à tambour selon la revendication 4, dans laquelle l'élément de guidage de fluide (34) comprend un élément de guidage de fluide en spirale (34) qui s'étend dans la direction lon-

gitudinale du conduit de condensation (30).

6. Machine à laver de type à tambour selon la revendication 1, dans laquelle le conduit de chauffage (20) comprend un ventilateur (21) et un dispositif de chauffage (22).

7. Machine à laver de type à tambour selon la revendication 1, dans laquelle le conduit de chauffage (20) est orienté horizontalement au-dessus de la cuve (10), et le conduit de condensation (30) s'étend verticalement derrière la cuve (10).

8. Machine à laver de type à tambour selon la revendication 1, dans laquelle l'unité d'alimentation en réfrigérant (40) comprend un tuyau bifurquant à partir d'un dispositif d'alimentation en eau et une vanne (50) configurée pour réguler un débit du réfrigérant.

9. Machine à laver de type à tambour selon la revendication 1, dans laquelle le réfrigérant provenant de l'unité d'alimentation en réfrigérant (40) pénètre dans le tube interne (32) après avoir été en contact avec une surface externe du tube interne (32), et échange la chaleur avec l'air dans le tube interne (32).

10. Machine à laver de type à tambour selon la revendication 9, dans laquelle l'élément de guidage de fluide (34) comprend une saillie ou une extension à une hauteur prédéterminée par rapport à une surface interne du tube externe (31) égale à un espace entre la surface externe du tube interne (32) et la surface interne du tube externe (31), et une extrémité de la saillie ou de l'extension est en contact avec la surface externe du tube interne (32).

FIG. 1

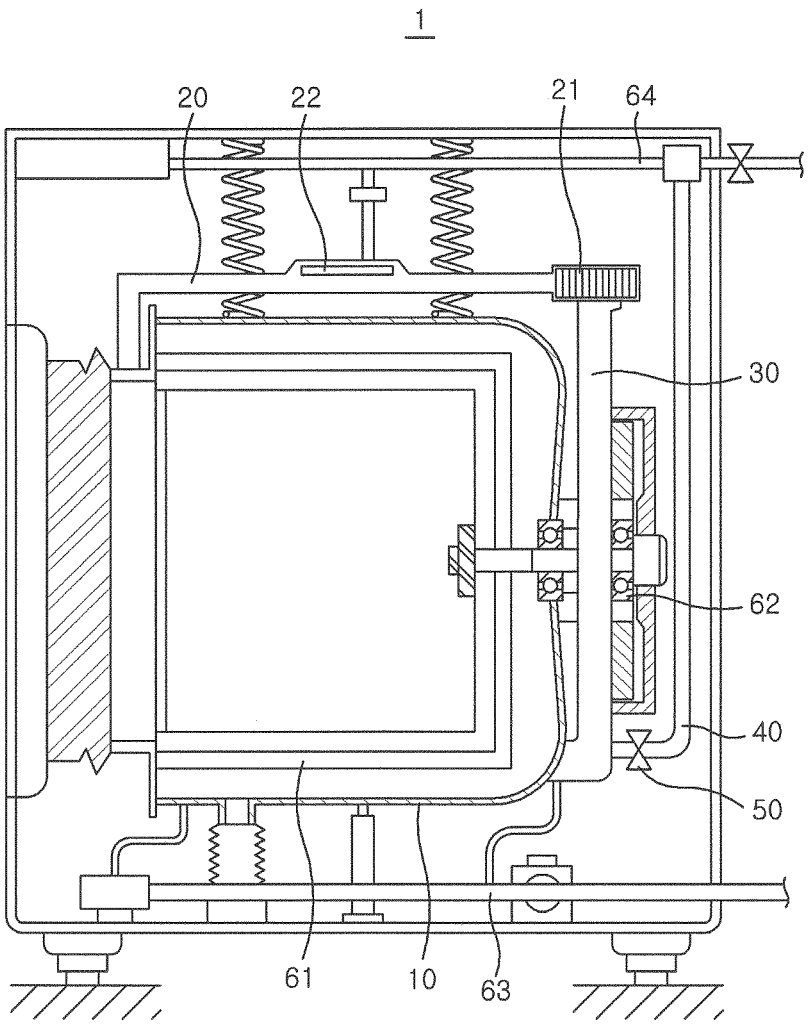


FIG.2

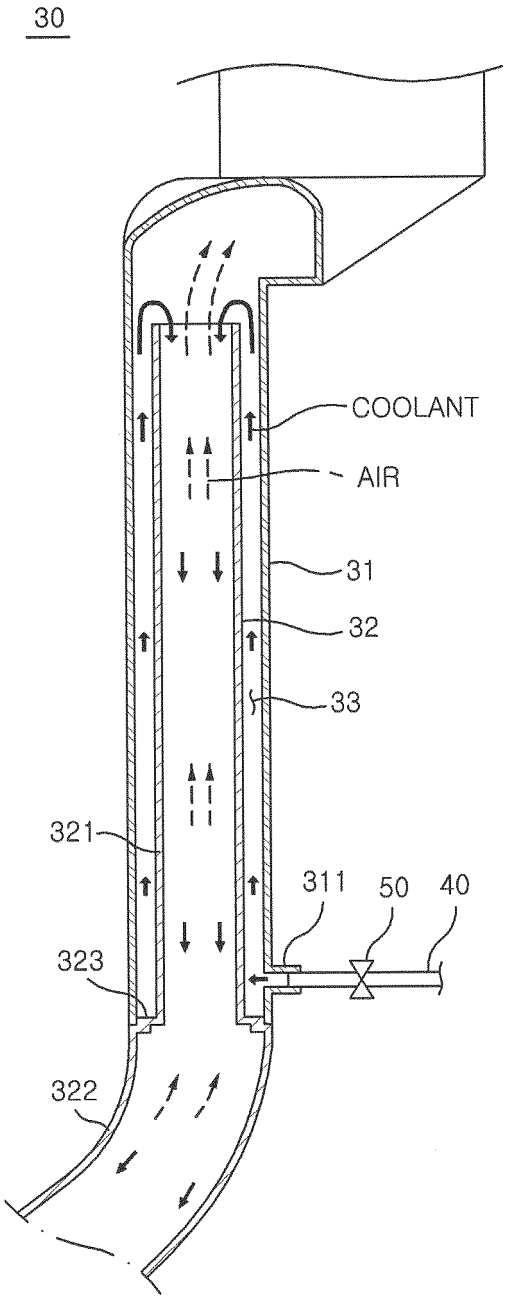


FIG. 3

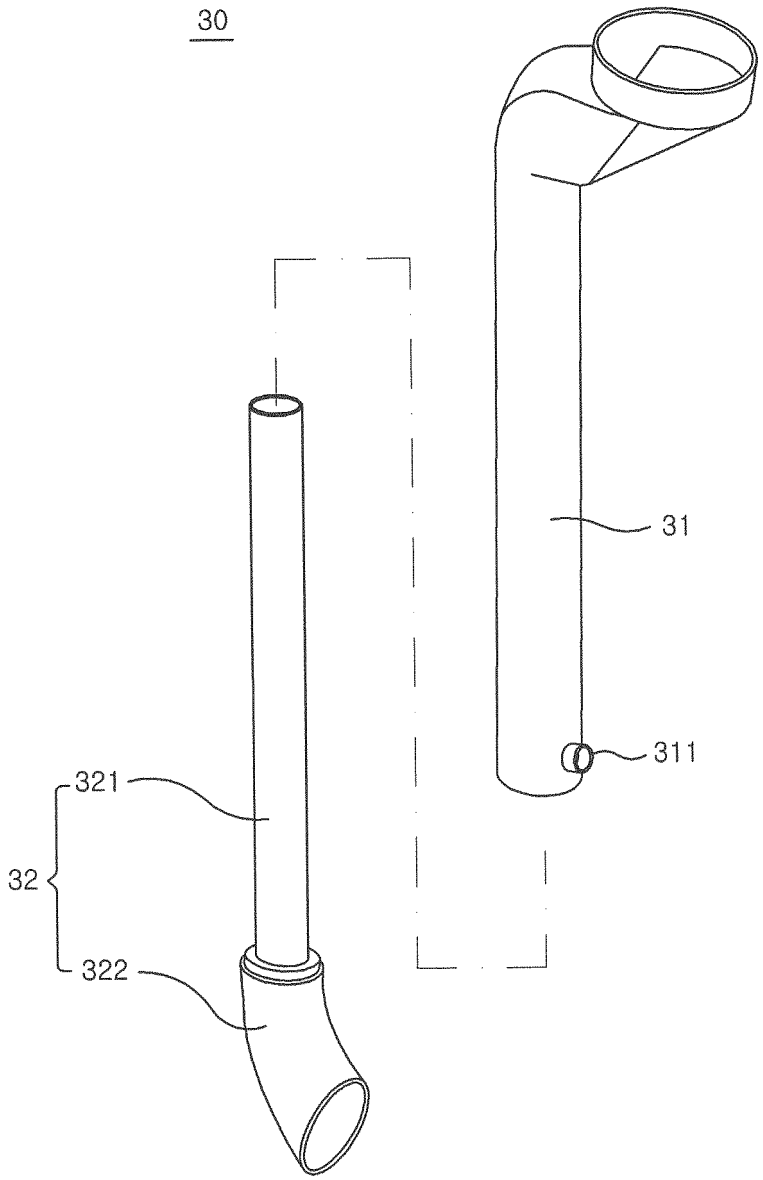


FIG. 4

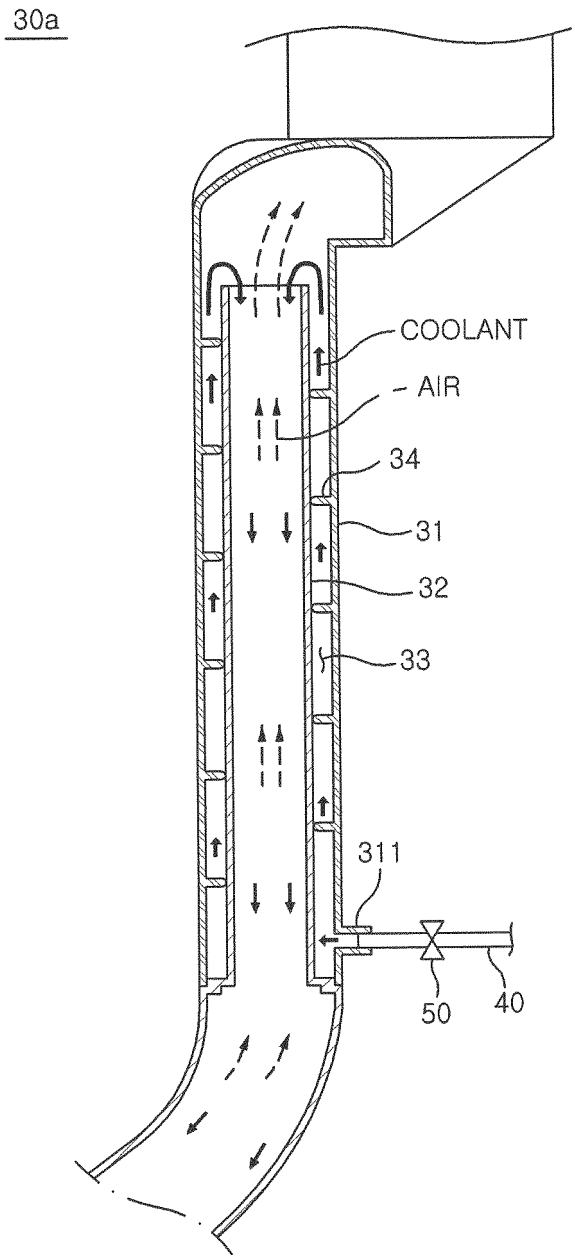
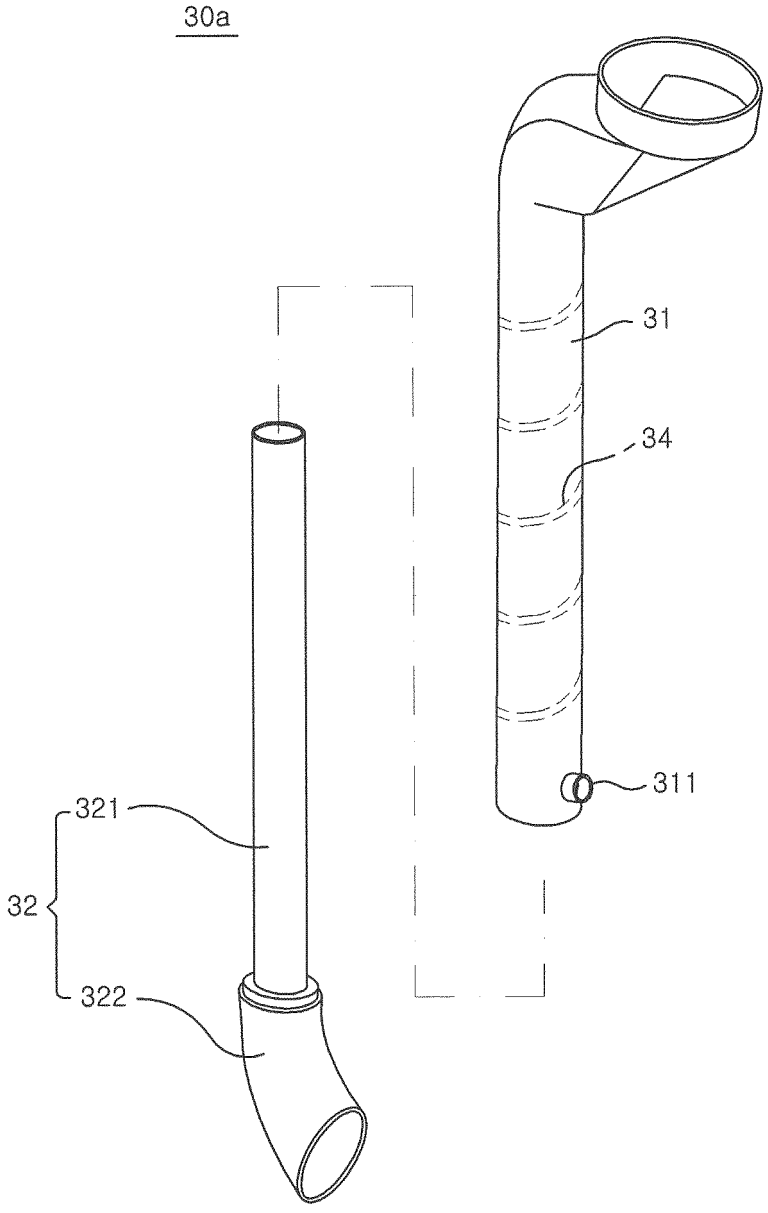


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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