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(54) **Washing and drying machine**

Wasch- und Trockenmaschine

Machine à laver et à sécher le linge

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(73) Proprietor: **Panasonic Corporation**
Kadoma-shi
Osaka 571-8501 (JP)

(72) Inventors:
- **Ushijima, Hideaki**
  Osaka 540-6207 (JP)
- **Nakanishi, Takehiro**
  Osaka 540-6207 (JP)
- **Nitta, Hidehiko**
  Osaka 540-6207 (JP)
- **Taguchi, Tomoyuki**
  Osaka 540-6207 (JP)

(74) Representative: **Schwabe - Sandmair - Marx**
Patentanwälte Rechtsanwalt
Partnerschaft mbB
Joseph-Wild-Straße 20
81829 München (DE)

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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a drying apparatus and a washing and drying machine that dry clothes using a heat pump device as a heat source.

BACKGROUND ART

[0002] In the related art, a washing and drying machine equipped with a drying apparatus using a heat pump device has been proposed (for example, refer to Japanese Patent Unexamined Publication No. 2009-273489).

[0003] Fig. 7 illustrates a cross-sectional configuration of washing and drying machine 200 in the related art.

[0004] Drum 152 is rotatably disposed inside water tub 151. Motor 153 is attached to an outer peripheral lower portion of water tub 151. Motor 153 rotates drum 152 via belt 154. Compressor 155, evaporator 156 and condenser 157 of the heat pump device configuring a drying apparatus are connected to each other by a pipeline so as to circulate a refrigerant, and are arranged below water tub 151. Evaporator 156 and condenser 157 are arranged inside air duct 158.

[0005] Air for drying which comes into contact with clothes inside drum 152 and becomes moist is caused to pass through air discharge duct 160 by blowing fan 159, is cooled and dehumidified by evaporator 156, and then is heated by condenser 157. The hot dried air for drying is introduced into drum 152 through air supply duct 161, is circulated and dries the clothes inside drum 152.

[0006] However, as described above, washing and drying machine 200 which is configured to have the heat pump device needs to include the heat pump device and air duct for circulating the air. Accordingly, heat pump type washing and drying machine 200 requires a lot of configuring parts compared to a heater type washing and drying machine, thereby causing a problem of a housing increased in size.

[0007] In heat pump type washing and drying machine 200, water tub 151 is arranged at a relatively higher position, thereby causing another problem that drum 152 is caused to vibrate violently during rotation of drum 152.

[0008] JP 2007 209 526 A discloses the features of the preamble of claim 1. Preferred embodiments are claimed in dependent claims 2 to 6.

SUMMARY OF THE INVENTION

[0009] The present invention is made in view of the above-described problems in the related art, and aims to provide a washing and drying machine in which a housing can be miniaturized by arranging configuring parts in an empty space inside the housing, and in which vibration during high-speed rotation of a drum can be reduced by lowering the center of gravity of the washing and drying machine.

[0010] A washing and drying machine according to the present invention includes the features of claim 1. According to such a configuration, it is possible to miniaturize the housing in height and depth and to reduce vibration during high-speed rotation of the drum by lowering the center of gravity of the washing and drying machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 illustrates a cross-sectional configuration of a main portion (in a side view) of a washing and drying machine according to an embodiment of the present invention;

Fig. 2 illustrates a cross-sectional configuration of a main portion (in a front view) of a washing and drying machine according to an embodiment of the present invention;

Fig. 3 illustrates a cross-sectional configuration of a main portion (in a rear view) of a washing and drying machine according to an embodiment of the present invention;

Fig. 4 illustrates a cross-sectional configuration of a main portion (in a top view) of a washing and drying machine according to an embodiment of the present invention;

Fig. 5 illustrates a schematic system configuration of a heat pump device in a washing and drying machine according to an embodiment of the present invention;

Fig. 6A illustrates an operation when a heat pump device is detached from a washing and drying machine according to an embodiment of the present invention;

Fig. 6B illustrates an operation when a heat pump device is detached from a washing and drying machine according to an embodiment of the present invention;

Fig. 6C illustrates an operation when a heat pump device is detached from a washing and drying machine according to an embodiment of the present invention; and

Fig. 7 illustrates a cross-sectional configuration of a washing and drying machine in the related art.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0012] Hereinafter, an embodiment of the present invention will be described with reference to the drawings. The present invention is not limited to the embodiment.

[0013] Fig. 1 illustrates a cross-sectional configuration of a main portion (in a side view) of washing and drying machine 100 according to an embodiment of the present invention. Fig. 2 illustrates a cross-sectional configura-

tion of the main portion (in a front view) of washing and drying machine 100. Fig. 3 illustrates a cross-sectional configuration of the main portion (in a rear view) of washing and drying machine 100. Fig. 4 illustrates a cross-sectional configuration of the main portion (in a top view) of washing and drying machine 100 according to an embodiment of the present invention. Fig. 5 illustrates a schematic system configuration of heat pump device 17 in washing and drying machine 100. Figs. 6A to 6C illustrate operations when heat pump device 17 is detached from washing and drying machine 100.

[0014] Washing and drying machine 100 includes housing 1 which forms an outer shell. Substantially cylindrical water tub 2 for storing washing water is disposed inside housing 1. Drum 4 having a bottomed cylindrical shape is disposed inside water tub 2. Drum 4 is disposed rotatably around rotary shaft 3 which extends in a front-back direction.

[0015] Water tub 2 is elastically supported from below by a pair of dampers 5 disposed in a lateral direction in a front view and suspended by a pair of springs 6 in the lateral direction in the front view. Water tub 2 is arranged so that opening 7 side disposed on a front surface of water tub 2 is located above as compared to a bottom surface side, in a state where rotary shaft 3 is tilted forward and upward.

[0016] Bearing 8 and pulley 9 which rotatably support rotary shaft 3 are disposed on rear outer surface of water tub 2. Motor 10 is mounted on an outer peripheral lower portion of water tub 2. Driving power of motor 10 is transmitted to drum 4 via belt 11 to rotate drum 4.

[0017] Motor 10 is attached close to a rear portion (further rear side than a center in a top view illustrated in Fig. 4) of water tub 2 so that rotary shaft 10a thereof is parallel to rotary shaft 3 of drum 4. As illustrated in Fig. 3, in a rear view, motor 10 is positioned near vertical line 2b passing through rotary shaft 3 of drum 4. Motor 10 is arranged below rear surface 1a side inside housing 1, below an outer periphery of water tub 2.

[0018] In the present embodiment, motor 10 has been described as a belt drive type motor, but the present invention is not limited to the example. For example, motor 10 of a direct drive type which can be attached to a rear surface side of water tub 2 may be used.

[0019] Multiple penetrating holes 12 are disposed on a peripheral side surface of drum 4. Through penetrating holes 12, drum 4 and water tub 2 internally communicate with each other. A plurality of baffles 13 protruding inward are provided on the peripheral side surface of drum 4.

[0020] Air supply port 14 for introducing air for drying is disposed on a rear surface of water tub 2. Air discharge port 15 for discharging the air for drying is disposed in front upper portion of water tub 2. Air supply port 14, air discharge port 15 and air duct 16 (including air discharge duct 16a, duct 16b, air supply duct 16c and duct 16d) are connected to and communicate with each other.

[0021] As illustrated in Fig. 5, heat pump device 17 is configured to circulate a refrigerant by connecting compressor 18, condenser 19, throttle unit 20 and evaporator 21 through pipeline 22. Condenser 19 functions as a radiator for radiating heat of the refrigerant compressed by compressor 18. Throttle unit 20 is configured to have a throttle valve or a capillary tube for reducing a pressure of the high pressure refrigerant. Evaporator 21 functions as heat sink in which the decompressed refrigerant having a low pressure removes heat from a surrounding section. The refrigerant is circulated by flowing in a direction of arrow A illustrated in Fig. 5, thereby achieving a heat pump cycle. Evaporator 21 and condenser 19 of heat pump device 17 are arranged inside air duct 16.

[0022] In heat pump device 17, compressor 18, condenser 19 connected to compressor 18 by pipeline 22, throttle unit 20 and evaporator 21 are accommodated inside case 23 forming air duct 16, thereby configuring a heat pump unit. Air inlet 23a through which the air for drying flows in from a rear surface side and air outlet 23b through which the air for drying which passes through evaporator 21 and condenser 19 flows out to the rear surface side are disposed in case 23 (refer to Fig. 4).

[0023] Air inlet 23a is connected to and communicates with duct 16d and air discharge duct 16a which configure air duct 16, and is connected to air discharge port 15. Air outlet 23b is connected to be attachable to and detachable from and communicates with blower 24 via duct 16b configuring air duct 16.

[0024] As illustrated in Figs. 2 and 4, heat pump device 17 is positioned on front surface 1b side of housing 1, that is, substantially in the center in the lateral direction when viewed from the front (front surface side). When viewed from the front, condenser 19 and evaporator 21 inside case 23 are arranged side by side in the lateral direction. Accordingly, when the air passes through condenser 19 from evaporator 21, the air flows from the right to the left direction when viewed from the front. As illustrated in Fig. 4, when viewed from above, the air for drying flows inside air duct 16 meandering in a U-shape.

[0025] Blower 24 is arranged on left wall 1d side of housing 1. Blower 24 is installed at the rear of heat pump device 17 so that a direction of rotary shaft 24b of blowing fan 24a faces a direction of heat pump device 17 (direction of front surface) (refer to Fig. 4). Blower 24 is configured so that radially upper portion 24c of blowing fan 24a is positioned above lowest portion 2a of water tub 2 to have distance H (refer to Fig. 3). Blower 24 is arranged so that a suction side of blower 24 faces the front surface side (forward).

[0026] Blower 24 is connected to and communicates with air supply duct 16c configuring air duct 16, and is connected to air supply port 14. Blower 24 supplies the air for drying into water tub 2 from air supply port 14 in the rear of water tub 2, through air supply duct 16c which is formed in an arc shape along an outer peripheral edge of pulley 9.

[0027] Heat pump device 17 is connected to and communicates with blower 24 via duct 16b which is configured to be attachable and detachable. Heat pump device 17

is connected to and communicates with air discharge duct 16a via duct 16d which is configured to be attachable and detachable. In this manner, heat pump device 17 installed inside housing 1 is configured to be removable from front surface 1b of housing 1.

[0028] In order to collect yarn waste contained in the air for drying which flows from air discharge port 15 to air discharge duct 16a, drying filter 25 is disposed. Drying filter 25 is arranged to be attachable to and detachable from an upper portion inside housing 1, and is disposed to be removable on upper surface 1e side. Drying filter 25 is connected to air discharge duct 16a positioned on a rear surface side.

[0029] Washing water inside water tub 2 is discharged outward from the washing machine through drain channel 27 which is connected to and communicates with drain port 26 disposed in a bottom portion of water tub 2. Drain filter 28 which collects foreign matters from the washing water is disposed in the middle of drain channel 27. Drain filter 28 is positioned in front of motor 10, disposed to be attachable to and detachable from a front portion inside housing 1, and disposed to be removable to front surface 1b side.

[0030] Door 29 to open and close opening 7 of water tub 2 is disposed on front surface 1b of housing 1. Below door 29, cover 30 which covers heat pump device 17 from the front surface side is attached to be removable by screw 31 (refer to Fig. 6A).

[0031] Drain pump 33 which discharges the water obtained through the dehumidification which is condensed in evaporator 21 is disposed in a bottom portion of case 23 of heat pump device 17. Drain pipe 34 connected to drain channel 27 is connected to and communicates with drain pump 33, and the water to be discharged is discharged outward from drain channel 27 through drain pipe 34.

[0032] A lower portion of housing 1 is supported by underframe 35. Underframe 35 also supports a lower end of damper 5 which elastically supports water tub 2 from below. Case 23 of heat pump device 17 and blower 24 connected to case 23 via duct 16b are also installed on underframe 35.

[0033] Control unit 36 controls compressor 18 of heat pump device 17, motor 10 which drives drum 4 to rotate, and blower 24 which supplies the air for drying, thereby sequentially controlling each process of washing, rinsing, spin-drying and drying.

[0034] Hereinafter, an operation and a function of washing and drying machine 100 configured as above will be described.

[0035] First, a procedure in a washing process will be presented. A user opens door 29, loads laundry such as clothes into drum 4 through opening 7, and then closes door 29 to push an operation button (not illustrated). Based on a desired operating program which is selected, control unit 36 starts operation of washing and drying machine 100.

[0036] Control unit 36, after confirming the door 29 is closed, drives motor 10 and determines an amount of loaded clothes using load information such as the number of rotations. Thereafter, control unit 36 opens a water supply valve (not illustrated) and the water starts to be stored in water tub 2. If a preset amount of water is supplied according to the amount of clothes, control unit 36 stops water supply and rotates drum 4 according to a predetermined program which causes motor 10 to repeat forward rotations and rearward rotations.

[0037] Clothes L inside drum 4 are lifted up in a rotating direction by baffle 13 and are caused to drop from above inside drum 4. Such a beat-washing function enables dirt of clothes L to be removed and control unit 36 completes the washing process if a predetermined time has elapsed.

[0038] Subsequent to the washing process, a rinsing process is performed. In the rinsing process, operations such as water drainage, water supply and drive of motor 10 are performed.

[0039] Control unit 36 drives motor 10 in a state where the water is stored in water tub 2, thereby performing the rinsing operation to remove the dirt by moving detergent components or dirt components adhering to clothes L into the water which is clean. If the predetermined time has elapsed, control unit 36 completes the first time rinsing operation, and after repeating the rinsing process by a predetermined number of times (for example, twice), discharges the water inside water tub 2 outward to complete the rinsing process.

[0040] Subsequent to the rinsing process, a spin-drying process is performed. In the spin-drying process, control unit 36 drives motor 10 and causes drum 4 to perform a high speed rotation (for example, 1,100 rpm). At this time, as a rotational speed is increased, centrifugal force applied to clothes L becomes stronger, thereby causing clothes L to cling to an inner peripheral surface of drum 4. Moisture contained in clothes L is moved into water tub 2 through penetrating holes 12 of drum 4 by the centrifugal force. The moisture subjected to spin-drying is discharged outward through drain channel 27.

[0041] Next, a drying process will be described. Control unit 36, after performing each process of the washing, the rinsing and the spin-drying, performs the drying process for clothes.

[0042] In the drying process, control unit 36 rotates motor 10 to rotate drum 4 and rotates blower 24. In this manner, the air for drying is caused to flow (arrow B in Figs. 2, 3 and 5). Drum 4 is driven to rotate by motor 10 via belt 11, and clothes L are agitated inside drum 4.

[0043] The air for drying, after removing the moisture from clothes L inside drum 4 and becoming humid, passes through drying filter 25, passes through air discharge duct 16a and is introduced to evaporator 21 of heat pump device 17.

[0044] Control unit 36 operates compressor 18 of heat pump device 17 to compress refrigerant. This pressure enables the refrigerant to circulate in condenser 19, throttle unit 20 and evaporator 21. In condenser 19, heat is

radiated from the refrigerant in a high pressure state. In evaporator 21, the heat is absorbed to the refrigerant in a low pressure state which is decompressed by throttle unit 20. The air for drying which is caused to flow in air duct 16 in the direction of arrow B by blower 24 is heated by radiation of condenser 19 to become warm air.

[0045] The air for drying which has become the warm air is supplied from air supply port 14 into drum 4 through air supply duct 16c by blower 24. The air for drying becomes humid by removing the moisture when passing through clothes L and then passes through drying filter 25 from air discharge port 15. Thereafter, the air for drying, after the foreign matters such as lint are removed, is introduced to evaporator 21 of heat pump device 17 through air discharge duct 16a. The air for drying which has become humid, when passing through evaporator 21, is dehumidified by removing sensible heat and latent heat so as to be divided into dry air and water obtained through dehumidification.

[0046] Then, the dry air is re-heated by condenser 19 to become the warm air and is re-supplied into drum 4 by blower 24. On the other hand, the water obtained through the dehumidification which is condensed in evaporator 21 is discharged outward from drain pipe 34 through drain channel 27 by drain pump 33.

[0047] The humid air which has removed the moisture from clothes L and is to be discharged through air discharge port 15 passes through air discharge duct 16a and flows to case 23 positioned close to front surface 1b inside housing 1 through air inlet 23a disposed on a rear surface side (refer to Fig. 4). As illustrated in Fig. 3, air discharge duct 16a is positioned in the rear of water tub 2 and extends downward from a top of water tub 2 along right wall 1c of housing 1.

[0048] The air for drying flowing into case 23 flows from right wall 1c side inside housing 1 toward left wall 1d side and passes through evaporator 21 and condenser 19. The air for drying discharged from air outlet 23b of case 23 reaches blower 24 disposed near rear surface 1a inside housing 1 (refer to Fig. 4). Then, the air for drying passes through air supply duct 16c which extends the rear side of water tub 2 upward, and is introduced into water tub 2 through air supply port 14 (refer to Fig. 3).

[0049] That is, in the present embodiment, the air for drying which is discharged from air discharge port 15 is circulated between the inside of drum 4 and the inside of heat pump device 17 disposed below water tub 2, by using air supply duct 16c and air discharge duct 16a which are disposed on rear surface 1a side inside housing 1.

[0050] On the other hand, motor 10 which drives drum 4 to rotate is positioned below water tub 2, close to right wall 1c side rather than the center inside housing 1. In the present embodiment, motor 10 is arranged near vertical line 2b passing through rotary shaft 3 of drum 4 and in the right side in a front view. Then, blower 24 is arranged in the left side of vertical line 2b in the front view so as not to be overlapped with motor 10 in the front view (refer to Fig. 3) . Heat pump device 17 is arranged in a position not to be overlapped with motor 10 and blower 24 in a top view (front lower portion) (refer to Fig. 4). In this manner, it is possible to effectively utilize a lower space of water tub 2 in view of vertical, lateral and front-back directions. Accordingly, it becomes unnecessary to move a position of water tub 2 upward inside housing 1.

[0051] Therefore, according to the present embodiment, in washing and drying machine 100, when performing a spin-drying operation in which drum 4 is rotated at a high speed, it is possible to reduce violent vibration occurring when the laundry is biased inside drum 4. According to the present embodiment, the position of water tub 2 can be moved downward compared to the position in the related art. Therefore, it is possible to lower the height of housing 1, thereby enabling miniaturization.

[0052] In the present embodiment, motor 10, blower 24, and compressor 18 of heat pump device 17, all of which are heavier in configuring components, are arranged below inside housing 1 in the front-back direction (refer to Fig. 4). In this manner, it is possible to improve weight balance, thereby enabling enhanced stability during installation and operation.

[0053] In the present embodiment, blower 24 is arranged in the rear of heat pump device 17. Blower 24 is installed so that the direction of rotary shaft 24b of blowing fan 24a faces heat pump device 17 (so as to face the front surface direction). In this manner, in the lower space formed between the rear surface of water tub 2 tilted forward and upward and rear surface 1a of housing 1, blower 24 can be arranged so that radially upper portion 24c of blowing fan 24a is positioned above lowest portion 2a of water tub 2. Accordingly, it is possible to compactly install blower 24 having a large diameter in the limited space inside housing 1, thereby enabling blowing capacity to be increased.

[0054] In the present embodiment, heat pump device 17 can be removed from the front surface side of housing 1. As illustrated in Fig. 6A, cover 30 is generally attached to front surface 1b of housing 1, but as illustrated in Fig. 6B, cover 30 can be removed by unscrewing the screw 31 which attaches cover 30.

[0055] Next, as illustrated in Fig. 6C, case 23 installed on underframe 35 is lifted upward and then drawn forward. Then, case 23 inserted to duct 16b and air supply duct 16c is detached. In this manner, it is possible to remove case 23 of heat pump device 17 in a state where duct 16b is held by blower 24 and air supply duct 16c is held by underframe 35 respectively. This enables heat pump device 17 to be removed without moving housing 1 from the installation place, thereby enabling easy maintenance work in a confined place.

[0056] As described above, washing and drying machine 100 according to the present embodiment includes housing 1, water tub 2 which is elastically supported inside housing 1 and which has air supply port 14 and air discharge port 15 for the air for drying, and drum 4 which has opening 7 on the front surface side and rotates inside

water tub 2. In addition, washing and drying machine 100 includes motor 10 which rotates drum 4, air duct 16 which is connected to and communicates with air supply port 14 and air discharge port 15 in water tub 2, the heat pump unit which internally has compressor 18, a radiator (condenser 19) and a heat sink (evaporator 21) arranged, and blower 24 which supplies the air for drying of air duct 16. Blower 24 is disposed on the rear surface side of water tub 2 so that the suction side faces the front surface. The heat pump unit below water tub 2 is disposed close to the front surface rather than the center inside housing 1, and has air inlet 23a for supplying the air for drying and air outlet 23b for discharging the air for drying on the rear surface side.

[0057] According to such a configuration, the heat pump unit can be compactly configured below water tub 2, thereby enabling miniaturization of housing 1 in height and depth. When installing washing and drying machine 100, it is possible to flexibly correspond to the limited installation space. Furthermore, it is possible to reduce the vibration during the high speed rotation of drum 4 by lowering the center of gravity of washing and drying machine 100.

[0058] Blower 24 is arranged so that the suction side faces the front surface. Thus, even if blower 24 has the large diameter, blower 24 can be arranged in a gap between water tub 2 and the rear surface side of housing 1. Accordingly, it is possible to compactly accommodate blower 24 having the large diameter in the rear of heat pump device 17, and it is possible to realize highly efficient drying by using blower 24 which has the large diameter to allow a strong wind.

[0059] Water tub 2 and drum 4 may be arranged to be tilted so that the front surface side is located above the rear surface side.

[0060] According to such a configuration, a larger space can be further made on the front surface side than the rear surface side in the lower portion inside housing 1. Thus, it is possible to lower the height of housing 1 by arranging the heat pump unit which requires a certain height on the front surface side.

[0061] Compressor 18 may be arranged close to the side surface rather than the center of housing 1.

[0062] Since water tub 2 has a cylindrical shape, the side surface side has the more space than that of the center side. Thus, it is possible to lower the height of housing 1 by arranging compressor 18 which is relatively high especially on the side surface side.

[0063] The heat pump unit may be configured to be removable from the front surface side.

[0064] In this manner, even if the heat pump unit has a malfunction, it is possible to remove only the heat pump unit from the inside of housing 1, repair and inspect the heat pump unit without moving housing 1 from the installation place, thereby enabling washing and drying machine 100 to be provided with good workability.

[0065] Drying filter 25 may be disposed in an upper part of housing 1 inside air duct 16 in order to collect the yarn waste in the air for drying.

[0066] In this manner, a user can easily carry out the maintenance work by disposing drying filter 25 above housing 1.

[0067] The heat pump unit may be configured so that condenser 19 and evaporator 21 are arranged in the lateral direction in a front view.

[0068] In this manner, in the configuration of the heat pump unit where the air flows in from the rear surface side and flows out from the rear surface side, it is possible to suppress resistance in the air duct. Accordingly, it is possible to maintain the drying performance by preventing the air volume from being decreased.

[0069] In the present embodiment, case 23 has been described where case 23 of the heat pump unit is arranged close to the front surface. However, when using motor 10 of the direct drive type, case 23 is not necessarily arranged close to the front surface. Case 23 may be arranged close to the center or close to the rear surface.

[0070] In the above-described configuration, the compressor may be arranged close to the side surface of the housing.

[0071] Since the water tub has the cylindrical shape, the side surface side has the more space than that of the center side. Thus, it is possible to lower the height of the housing by arranging the compressor which is relatively high especially on the side surface side.

[0072] In the present embodiment, the description has been made by using washing and drying machine 100 which has a washing function, but the present invention is not limited to this example. For example, the present invention can also be applied to a drying machine for clothes which has no washing function.

[0073] As described above, according to the present invention, particularly advantageous effects can be achieved in that it is possible to miniaturize the housing by arranging configuring parts in the empty space inside the housing, and it is possible to reduce the vibration during the high speed rotation of the drum by lowering the center of gravity of the water tub. Accordingly, the present invention is useful as the drying apparatus and the washing and drying machine which dry the clothes by using the heat pump device as the heat source.

Claims

1. A washing and drying machine (100) comprising:

a housing (1);
a water tub (2) that is elastically supported inside the housing (1) and has an air supply port (14) and an air discharge port (15) of air for drying;
a drum (4) that has an opening on a front surface side (1b) and is rotated inside the water tub (2);
a motor (10) that rotates the drum (4);
an air duct (16) that is connected to and com-

municates with the air supply port (14) and the air discharge port (15) of the water tub (2);
a heat pump unit (17) that internally has a compressor (18), a radiator (19) and a heat sink (21); and
a blower (24) that blows the air for drying in the air duct (16),
wherein the blower (24) is disposed on a rear surface side (1a) of the water tub (2) so that a sucking side faces a front surface, and
wherein the heat pump unit (17) is disposed below the water tub (2) and close to the front surface (1b) inside the housing (1), and has an air inlet (23a) to which the air for drying is supplied and an air outlet (23b) from which the air for drying is discharged, on the rear surface side (1a),
characterized in that
the heat pump unit (17) is disposed below the water tub (2) and in a front lower portion of the housing (1) before a center of the housing (1) in a position not to be overlapped with the motor (10) and the blower (24) in a top view, and
the compressor (18), the motor (10) and the blower (24) are arranged below inside the housing (1) in a front-back direction.

2. The washing and drying machine (100) of Claim 1, wherein the water tub (2) and the drum (4) are tilted so that their centres of the front surface sides are located higher than their centres of the rear surface sides.

3. The washing and drying machine (100) of Claim 1 or 2,
wherein the compressor (18) is arranged close to a side surface of the housing (1).

4. The washing and drying machine (100) of any one of Claims 1 to 3, wherein the heat pump unit (17) is located behind a cover (30) attached to the front surface (1b) of the housing (1).

5. The washing and drying machine (100) of any one of Claims 1 to 4, further comprising:

a drying filter (25) that is disposed in an upper part of the housing (1) in the air duct (16) and collects yarn waste in the air for drying.

6. The washing and drying machine (100) of any one of Claims 1 to 5,
wherein the radiator (19) and the heat sink (21) are arranged in the heat pump unit (17) in a lateral direction in a front view.

Patentansprüche

1. Wasch- und Trockenmaschine (100), die umfasst:

ein Gehäuse (1);
eine Wasserwanne (2), die innerhalb des Gehäuses (1) elastisch gelagert wird und einen Luftzuführungsanschluss (14) und einen Luftablassanschluss (15) von Luft zum Trocknen hat;
eine Trommel (4), die eine Öffnung an der vorderen Oberflächenseite (1 b) hat und innerhalb der Wasserwanne (2) gedreht wird;
einen Motor (10), der die Trommel (4) dreht;
eine Luftleitung (16), die mit dem Luftzuführungsanschluss (14) und dem Luftablassanschluss (15) der Wasserwanne (2) verbunden ist und mit ihnen kommuniziert;
eine Wärmepumpeneinheit (17), die intern einen Kompressor (18), einen Radiator (19) und einen Kühlkörper (21) hat, und
ein Gebläse (24), das Luft zum Trocknen in die Luftleitung (16) bläst,
wobei das Gebläse (24) an einer hinteren Oberflächenseite (1a) der Wasserwanne (2) angeordnet ist, so dass eine Saugseite einer vorderen Fläche zugewandt ist, und
wobei die Wärmepumpeneinheit (17) unter der Wasserwanne (2) und nahe zur vorderen Oberfläche (1b) innerhalb des Gehäuses (1) angeordnet ist und einen Lufteinlass (23a), an dem die Luft zum Trocknen zugeführt wird, und einen Luftauslass (23b) an der hinteren Oberflächenseite (1a) hat, von dem die Luft zum Trocknen abgeführt wird,
dadurch gekennzeichnet, dass
die Wärmepumpeneinheit (17) unter der Wasserwanne (2) und in einem vorderen unteren Teil des Gehäuses (1) vor einer Mitte des Gehäuses (1) und in einer Position angeordnet ist, die sich nicht mit dem Motor (10) und dem Gebläse (24) in einer Draufsicht überlappen soll, und
der Kompressor (18), der Motor (10) und das Gebläse (24) unten innerhalb des Gehäuses (1) in einer Richtung von vorn nach hinten angeordnet sind.

2. Wasch- und Trockenmaschine (100) nach Anspruch 1,
wobei die Wasserwanne (2) und die Trommel (4) geneigt sind, so dass deren Mitten der vorderen Oberflächenseiten höher angeordnet sind als die Mitten der hinteren Oberflächenseiten.

3. Wasch- und Trockenmaschine (100) nach Anspruch 1 oder 2,
wobei der Kompressor (18) nahe an einer Seitenfläche des Gehäuses (1) angeordnet ist.

4. Wasch- und Trockenmaschine (100) nach einem der Ansprüche 1 bis 3,
wobei sich die Wärmepumpeneinheit (17) hinter einer Abdeckung (30) befindet, die an der vorderen Oberflächenseite (1b) des Gehäuses (1) angebracht ist.

5. Wasch- und Trockenmaschine (100) nach einem der Ansprüche 1 bis 4, die des Weiteren umfasst:

einen Trocknungsfilter (25), der in einem oberen Teil des Gehäuses (1) in der Luftleitung (16) angeordnet ist und Garnabfälle in der Luft zum Trocknen sammelt.

6. Wasch- und Trockenmaschine (100) nach einem der Ansprüche 1 bis 5,
wobei der Radiator (19) und der Kühlkörper (21) in der Wärmepumpeneinheit (17) in einer seitlichen Richtung in einer Vorderansicht angeordnet sind.

Revendications

1. Lave-linge séchant (100) comprenant :

un boîtier (1) ;
une cuve à eau (2) qui est élastiquement supportée à l'intérieur du boîtier (1) et comporte une ouverture d'alimentation en air (14) et une ouverture d'évacuation d'air (15) d'air de séchage ;
un tambour (4) qui comporte une ouverture sur un côté de surface avant (1b) et est mis en rotation à l'intérieur de la cuve à eau (2) ;
un moteur (10) qui fait tourner le tambour (4) ;
une conduite d'air (16) qui est connectée à l'ouverture d'alimentation en air (14) et l'ouverture d'évacuation d'air (15) de la cuve à eau (2) et communique avec celles-ci ;
une unité de pompe à chaleur (17) qui comprend intérieurement un compresseur (18), un radiateur (19) et un dissipateur thermique (21) ; et
une souffleuse (24) qui souffle l'air de séchage dans la conduite d'air (16),
où la souffleuse (24) est disposée sur un côté de surface arrière (1a) de la cuve à eau (2) de telle sorte qu'un côté d'aspiration fait face à la surface avant, et
où l'unité de pompe à chaleur (17) est disposée sous la cuve à eau (2) et à proximité de la surface avant (1b) à l'intérieur du boîtier (1) et comporte une entrée d'air (23a) alimentée en air de séchage et une sortie d'air (23b) par laquelle l'air de séchage est évacuée sur le côté de surface arrière (1a), **caractérisé en ce que**
l'unité de pompe à chaleur (17) est disposée sous la cuve à eau (2) et dans une partie inférieure avant du boîtier (1) devant un centre du boîtier (1) en une position non superposée au moteur (10) et à la souffleuse (24) dans une vue d'en haut, et
le compresseur (18), le moteur (10) et la souffleuse (24) sont agencés dans le bas de l'intérieur du boîtier (1) dans une direction avant-arrière.

2. Lave-linge séchant (100) selon la revendication 1,
où la cuve à eau (2) et le tambour (4) sont inclinés de telle manière que les centres de leurs côtés de surface avant sont situés plus haut que les centres de leurs côtés de surface arrière.

3. Lave-linge séchant (100) selon la revendication 1 ou 2,
où le compresseur (18) est agencé à proximité d'une surface latérale du boîtier (1).

4. Lave-linge séchant (100) selon l'une quelconque des revendications 1 à 3,
où l'unité de pompe à chaleur (17) est située derrière un capot (30) attaché à la surface avant (1b) du boîtier (1).

5. Lave-linge séchant (100) selon l'une quelconque des revendications 1 à 4, comprenant en outre :

un filtre de séchage (25) qui est disposé dans une partie supérieure du boîtier (1) dans la conduite d'air (16) et recueille des peluches contenues dans l'air de séchage.

6. Lave-linge séchant (100) selon l'une quelconque des revendications 1 à 5,
où le radiateur (19) et le dissipateur thermique (21) sont agencés dans l'unité de pompe à chaleur (17) dans une direction latérale dans une vue de face.

FIG. 1

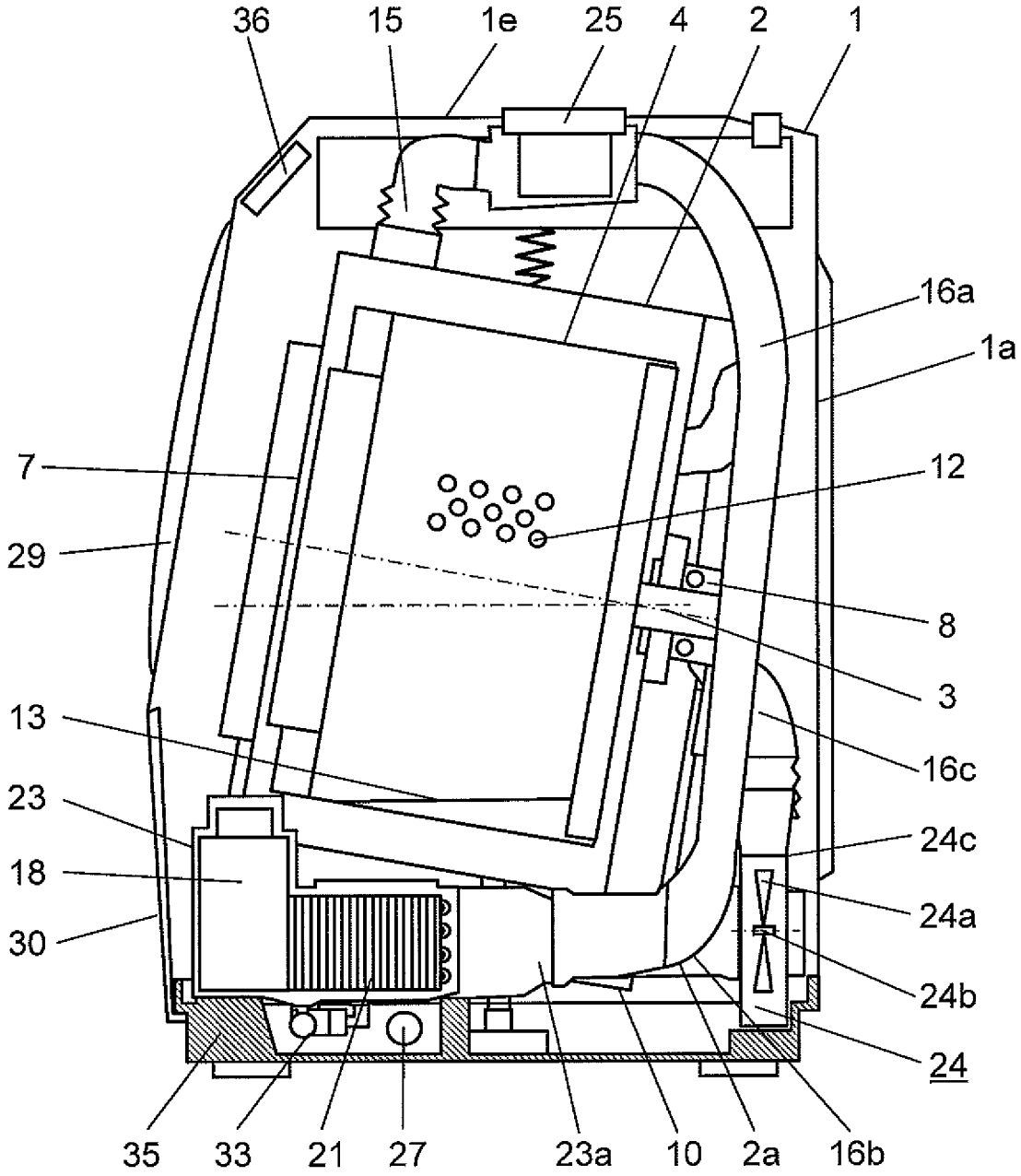

36
15
1e
25
4
2
1
16a
1a
7
12
29
8
3
13
16c
23
24c
18
24a
30
24b
24
35
33
21
27
23a
10
2a
16b
100

FIG. 2

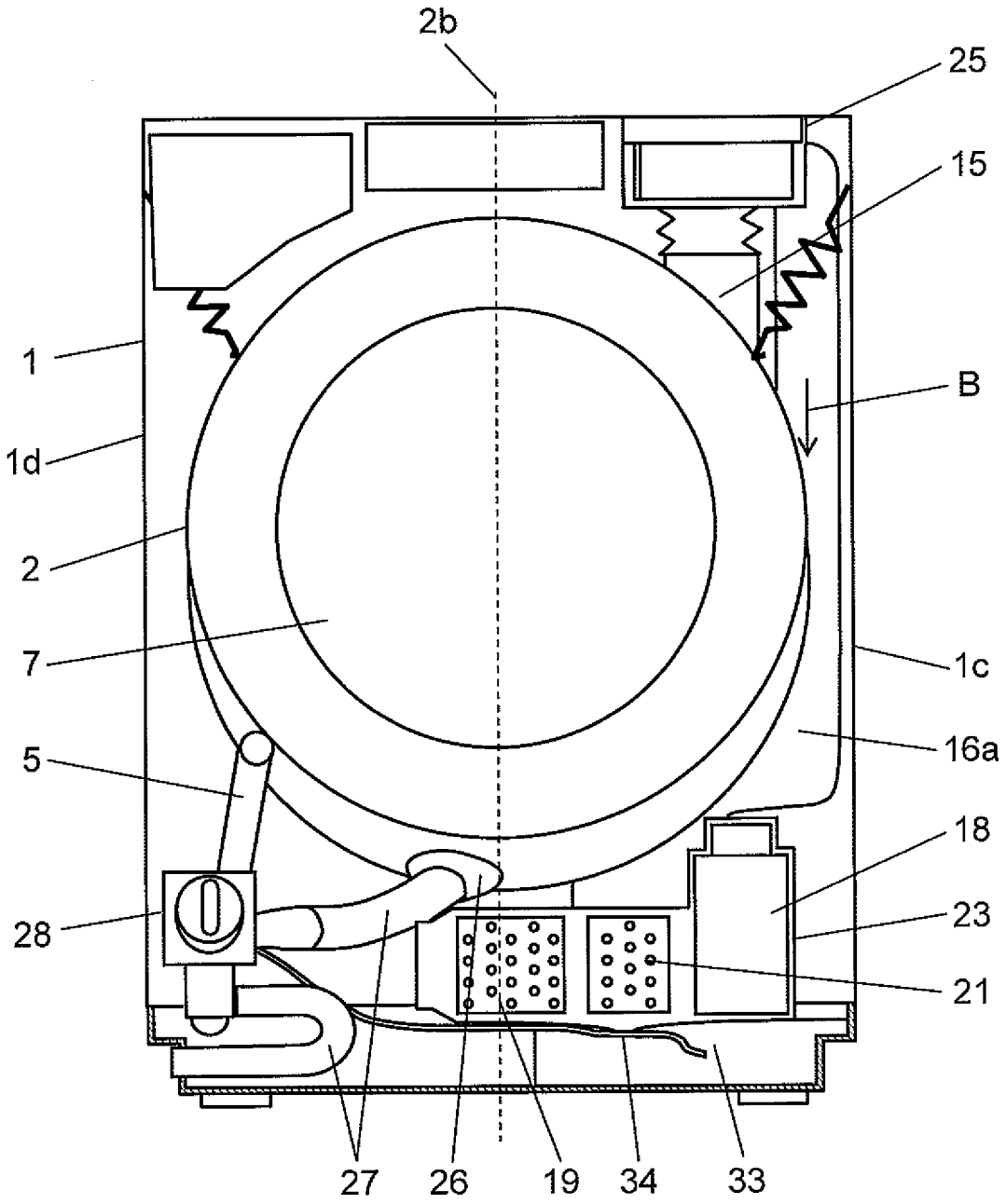


FIG. 3

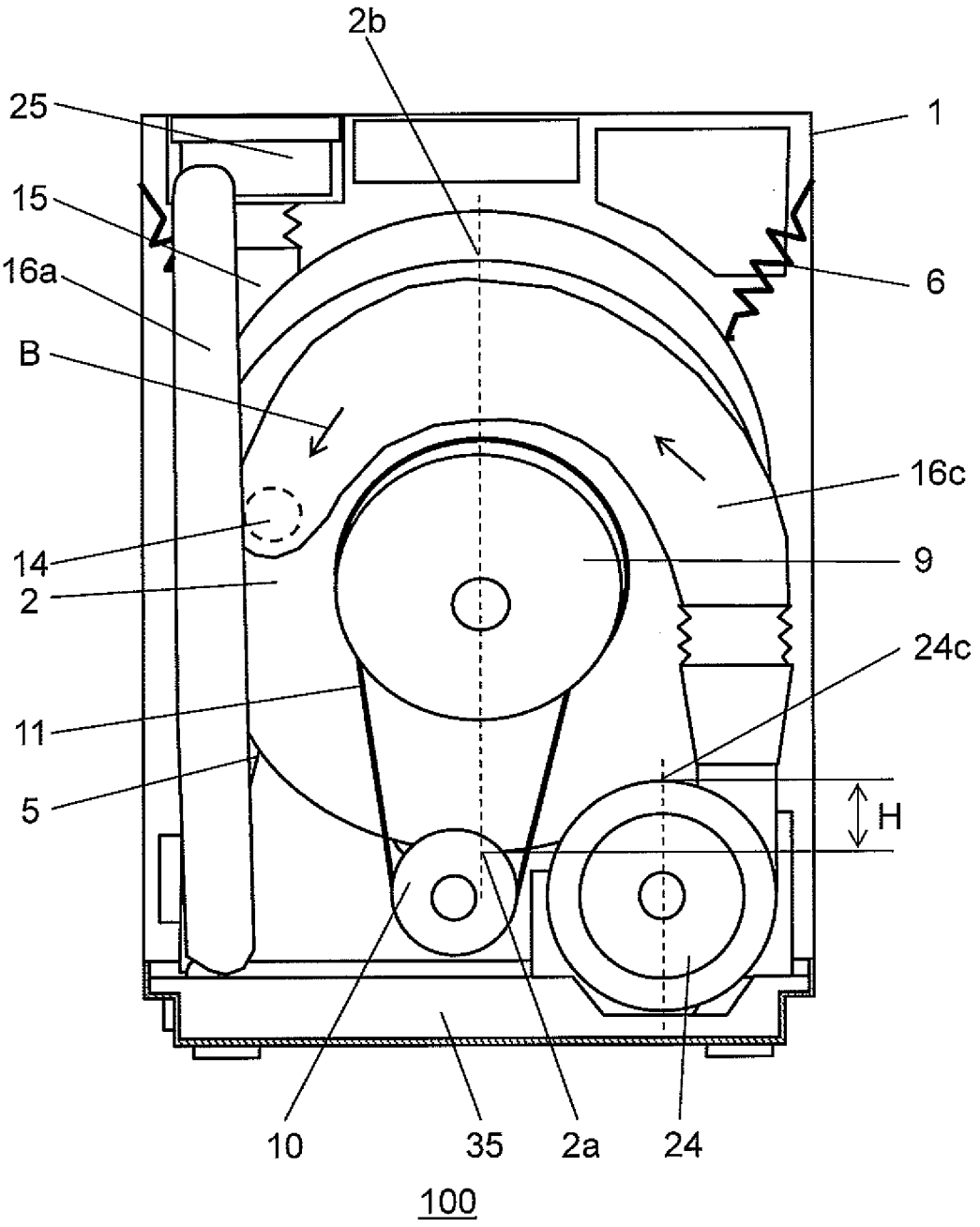


FIG. 4

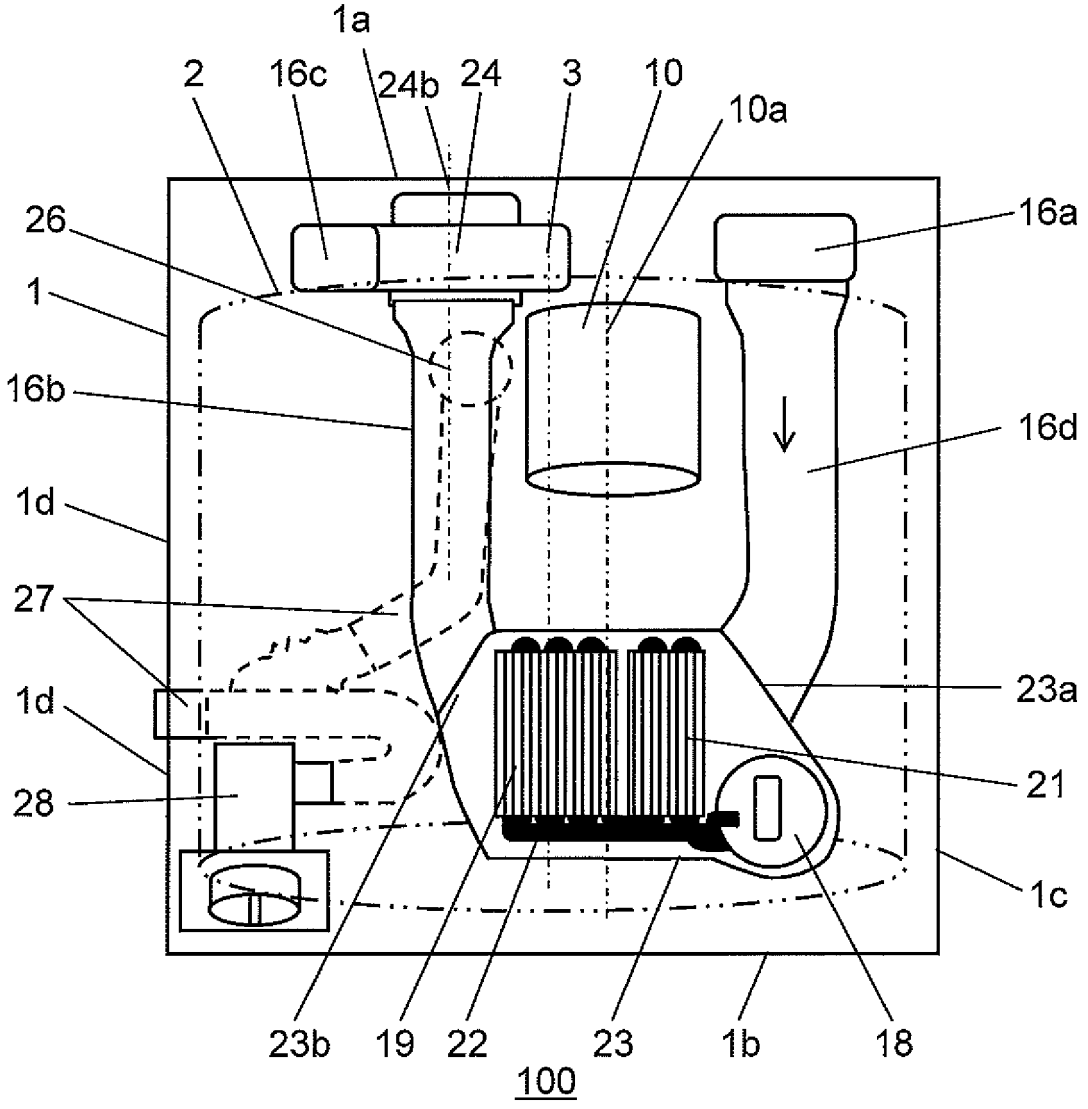

1a
2
16c
24b
24
3
10
10a
26
16a
1
16b
16d
1d
27
23a
1d
21
28
1c
23b
19
22
23
1b
18
100

FIG. 5

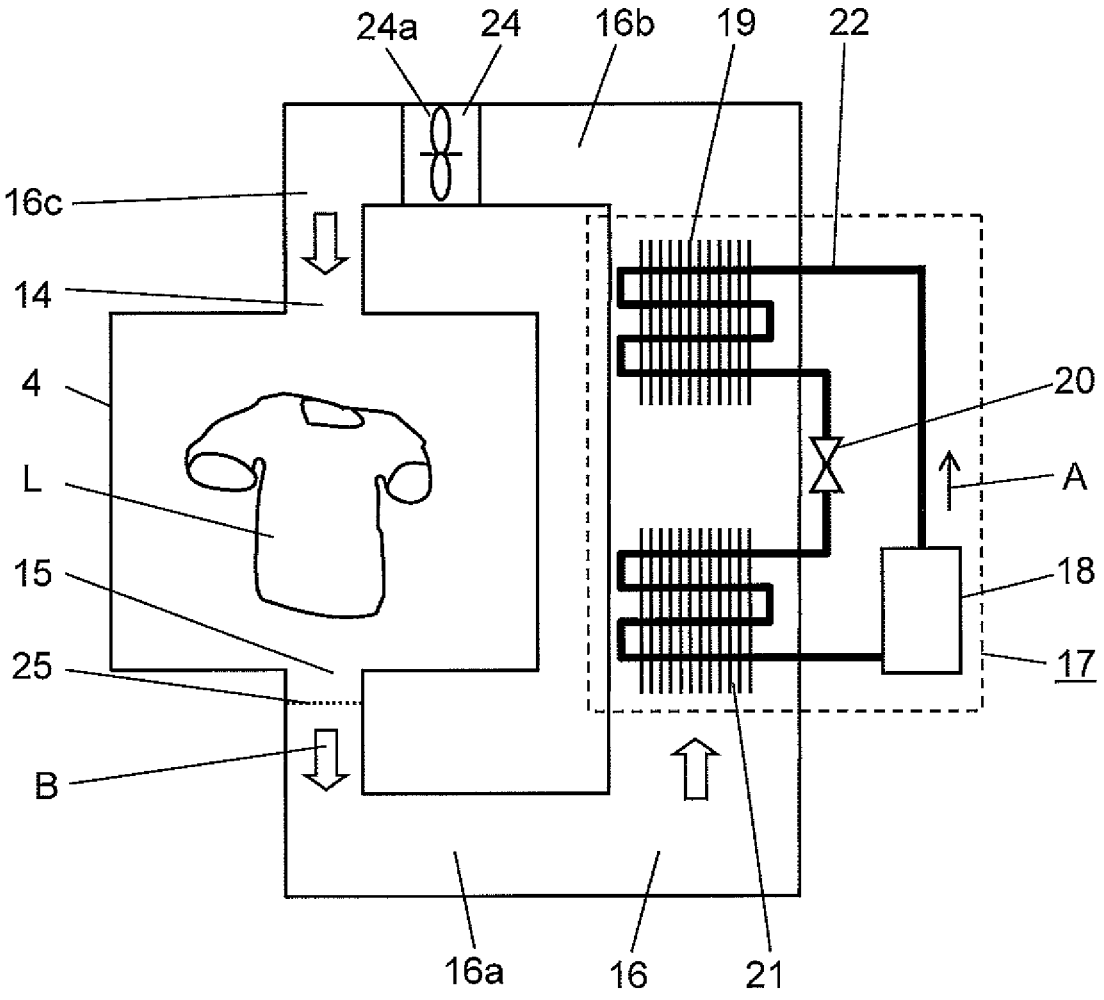


FIG. 6A

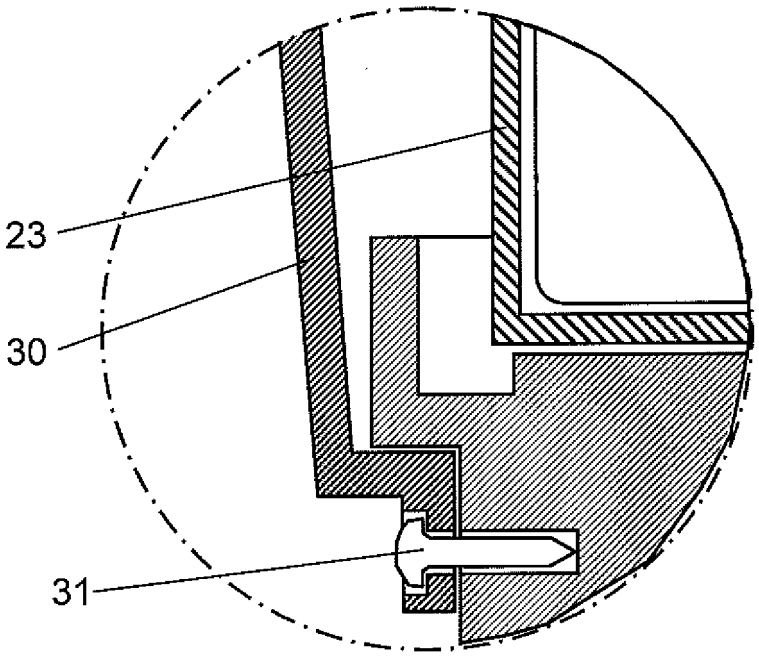


FIG. 6B

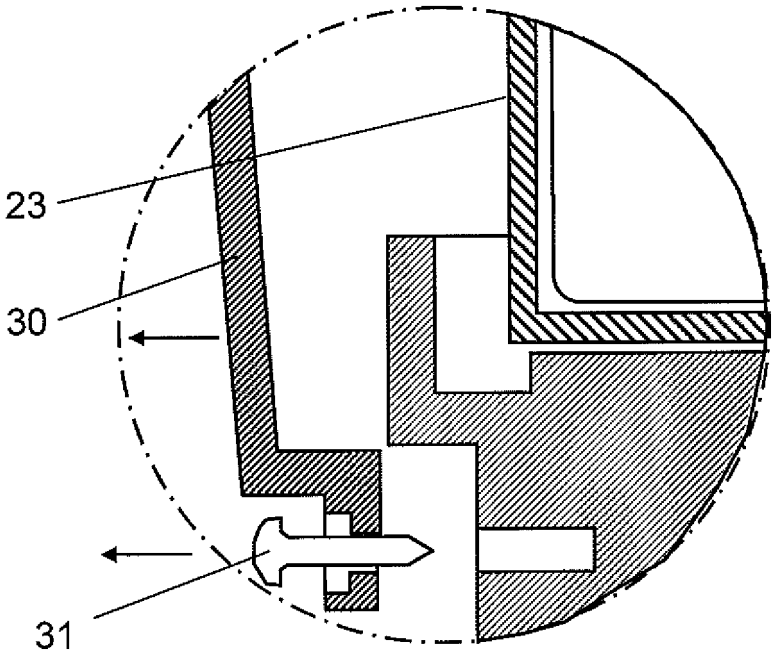


FIG. 6C

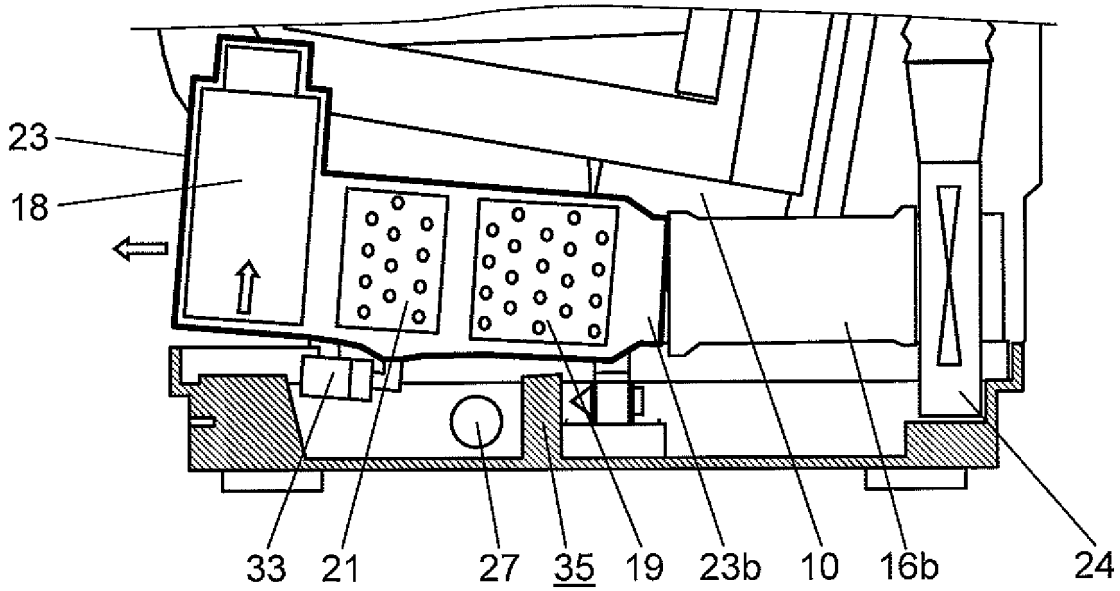
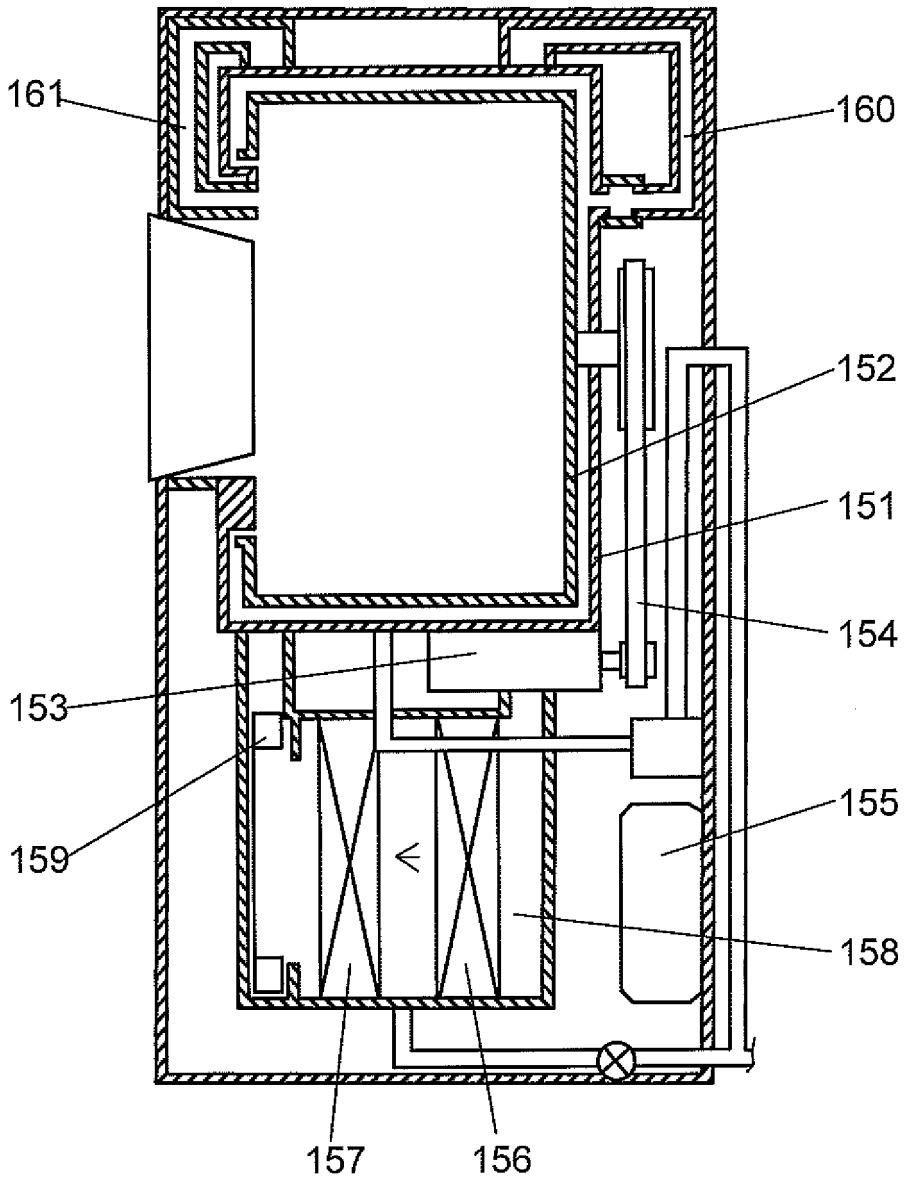


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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- JP 2007209526 A **[0008]**