(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 791 016 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
25.06.2025 Bulletin 2025/26

(21) Application number: **18723480.2**

(22) Date of filing: **08.05.2018**

(51) International Patent Classification (IPC):
D06F 58/20 *(2006.01)* *D06F 25/00* *(2006.01)*
D06F 58/02 *(2006.01)* *D06F 58/22* *(2006.01)*
D06F 58/24 *(2006.01)* *D06F 58/32* *(2020.01)*
D06F 103/50 *(2020.01)* *D06F 103/58* *(2020.01)*
D06F 105/00 *(2020.01)* *D06F 105/26* *(2020.01)*

(52) Cooperative Patent Classification (CPC):
D06F 58/20; D06F 58/206; D06F 25/00; D06F 58/02; D06F 58/22; D06F 58/24; D06F 58/32; D06F 2103/50; D06F 2103/58; D06F 2105/00; D06F 2105/26

(86) International application number:
PCT/EP2018/061831

(87) International publication number:
WO 2019/214805 (14.11.2019 Gazette 2019/46)

(54) **LAUNDRY DRYER**
WÄSCHETROCKNER
SÈCHE-LINGE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
17.03.2021 Bulletin 2021/11

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Description

Technical Field

[0001] The present invention relates to a domestic laundry-dryer, i.e. to a household device for drying laundry. In one aspect, it relates to a washer-dryer, i.e. laundry dryer that can also wash laundry.

Background Art

[0002] State of the art domestic laundry dryers are heavy appliances that occupy a large volume of space. Therefore, they are not very suitable for being installed in a small apartment or kitchenette.

[0003] WO 2017/174766 relates to a laundry washing and/or drying machine comprising a heat pump which is arranged in the rear part of the machine. EP 2 471 998 describes a laundry drying appliance with a heat pump arranged in the rear part of the machine. The evaporator can automatically be cleaned in order to remove possible fluff that is not retained by the defluff filter.

Disclosure of the Invention

[0004] The problem to be solved by the present invention is therefore to provide a compact domestic laundry dryer.

[0005] This problem is solved by the subject of the independent claim.

[0006] Accordingly, the invention relates to a laundry dryer with a cabinet and a drum, wherein the drum is rotatably placed within the cabinet. Advantageously, the drum has an essentially cylindrical shape with the axis of the cylinder extending horizontally within the cabinet.

[0007] The drum has an opening at its front side for loading the laundry, and it is closed at its back side, i.e. at the end of the drum facing away from the front side.

[0008] The laundry dryer further comprises a heat pump with a condenser and an evaporator. The condenser and the evaporator are arranged on the back side of the drum.

[0009] The laundry dryer further comprises an air circulating system connecting the drum to the condenser and the evaporator. The air circulating system comprises a ventilator configured to circulate the air in the system from the drum to the evaporator, the condenser, and back to the drum. Advantageously, the ventilator is located between the condenser and the drum, i.e. the air from the condenser passes the ventilator and then enters the drum.

[0010] The laundry drier further comprises a control unit adapted and structured to control the operation of the individual components of the device.

[0011] At least part of the condenser and of the evaporator are arranged at the back side of the drum. In other words, when viewing the machine from the front side, i.e. the side of the opening of the drum, at least part of the condenser and the evaporator are arranged behind the drum. This allows to exploit space behind the drum.

[0012] The condenser as well as the evaporator comprise plates for exchanging heat between the fluid ducts of the heat pump and the process air. Said plates can be aligned vertically.

[0013] The shortest distance between individual plates of the condenser is larger than the shortest distance between individual plates of the evaporator. In particular, the distance between the plates of the condenser can be at least twice the distance between the plates of the evaporator.

[0014] In an advantageous embodiment of the invention, the laundry dryer is configured to be a washer-dryer with a tub. The drum is rotatably arranged in the tub. The tub retains the process water while washing the laundry.

[0015] In a further embodiment, the laundry dryer can be configured to be a dryer only and to perform only a drying of the laundry. In this embodiment, no tub is required.

[0016] In a compact embodiment of the device, the condenser and the evaporator are arranged above each other.

[0017] Advantageously, the condenser is positioned vertically above at least a part of the evaporator. In other words, when seen from above, the condenser and evaporator overlap.

[0018] Advantageously, at least part of a lower end of the condenser is adjacent to at least part of an upper end of the evaporator. Advantageously, the lower end of the condenser fully aligns with the upper end of the evaporator.

[0019] Arranging the evaporator below the condenser provides a compact design. Further, it prevents water from the evaporator from entering the condenser as well as from entering the parts of the air ducts that lead air from the condenser back to the drum.

[0020] In an advantageous embodiment of the invention, the condenser and/or the evaporator horizontally extends along at least 60%, in particular at least 75%, of the full width of the cabinet, therefore, exploiting the space within the cabinet. The width of the condenser and/or the evaporator is defined to be the widest extension of the condenser or evaporator in the horizontal direction perpendicular to the rotation axis of the drum.

[0021] Advantageously, at least a section of the condenser and/or the evaporator is arranged horizontally behind the drum. In other words, when viewing the drum from its front side along its axis of rotation, at least part of the condenser and/or the evaporator is hidden behind it. This provides a compact machine design.

[0022] Using plates that are closer to each other in the evaporator than in the condenser improves the lint-filtering effect that can be achieved by means of the evaporator.

[0023] In another advantageous embodiment, the laundry dryer comprises a water trough arranged below the evaporator. It can be configured and positioned to

collect water, in particular condensed water and/or rinsing water, from the evaporator and or condenser. Further, a water duct connecting the trough to the tub can be provided.

[0024] In another advantageous embodiment, the laundry dryer comprises at least one first rinsing duct. Said first rinsing duct is arranged adjacent to the evaporator and has or is connected to a plurality of nozzles directed towards the evaporator.

[0025] A further advantageous embodiment comprises at least one further rinsing duct having or being connected to a plurality of nozzles directed towards the evaporator and/or condenser. The further rinsing duct is advantageously arranged above the first rinsing duct.

[0026] In a further advantageous embodiment, the laundry dryer comprises three or four rinsing ducts.

[0027] Advantageously, the first rinsing duct and the further rinsing duct are mounted directly onto a housing forming an air duct around the evaporator and/or the condenser.

[0028] In an embodiment, said first and further rinsing ducts are adapted to rinse lint from the condenser and/or evaporator.

[0029] The rinsing ducts are advantageously fed by either water already processed during the washing cycle or by fresh water.

[0030] In an advantageous embodiment of the washer-dryer, the device comprises a lint filter arranged in the air circulation system between the drum and the evaporator, i.e. the air from the drum has first to pass the lint filter before it reaches the evaporator, thus reducing the amount of lint accumulating in the evaporator.

[0031] In an advantageous embodiment of the laundry dryer as a washer-dryer, the water duct further comprises a siphon. A siphon is an essentially "U"-shaped duct section that forms a trap for water, such that after flushing, an amount of residual water is retained in the siphon. In this embodiment, the siphon prevents air from passing through the water duct (and thereby circumventing the filter) while drying the laundry.

[0032] In a further preferred embodiment, the lowest part of the lint filter is arranged higher than a lower end of the evaporator, in particular higher than all the evaporator. This makes it unlikely that water from the evaporator flows into the lint filter.

[0033] A further advantageous embodiment of the invention is free of any lint filter apart from the evaporator and condenser. In other words, the air circulation system does not comprise any dedicated lint filter. In particular, there is no lint filter arranged between the drum and the evaporator. Such a device requires less maintenance. In this case, the water duct can be used to guide the moisture-loaded air from the drum to the evaporator and also as a drain for guiding condensed water and rinsing water from the evaporator to the tub or a drain pipe.

[0034] Other advantageous embodiments are listed in the dependent claims as well as in the description below.

Brief Description of the Drawings

[0035] The invention will be better understood and objects other than those set forth above will become apparent from the following detailed description thereof. Such description makes reference to the annexed drawings, wherein:

Fig. 1 shows a first perspective view of a laundry dryer from with its housing represented in dashed lines only,
Fig. 2 shows a second perspective view of the laundry dryer of Fig. 1,
Fig. 3 shows the assembly of the heat exchanging device, the water duct, and the laundry recipient;
Fig. 4 shows a rear view of Fig. 3 with the heat exchanging device and the laundry recipient;
Fig. 5 shows the heat exchanging device only, with the rinsing ducts in partially cut-off view;
Fig. 6 shows a sectional view along line A-A of Fig. 5;
Fig. 7 shows a schematic of a laundry dryer without a lint filter; and
Fig. 8 shows a schematic of a laundry dryer with a lint filter.

Modes for Carrying Out the Invention

Overview:

[0036] Figs. 1 and 2 show an embodiment of a washer dryer comprising a laundry recipient 1 with a drum 10 arranged in a tub 11. Drum 10 is rotatable about an axis of rotation 12 by means of a rotation drive (not shown). Axis of rotation 12 is substantially horizontal.

[0037] Laundry recipient 1 is suspended from a yoke 13, which rests on a base frame 14.

[0038] The device comprises a cabinet 15, which is also mounted to frame 14.

[0039] Cabinet 15 is substantially a cuboid having a width w, a height h, and a depth d (Fig. 2).

[0040] In an advantageous embodiment of the invention, the cabinet has the maximum dimensions of h = 60 cm in height, w = 60 cm in width, and d = 60 cm in depth. These dimensions allow the cabinet to fit into most of the common kitchen cupboards or niches.

[0041] On its front side, drum 10 comprises a front opening 16, which mates with a door (not shown) in the front side of cabinet 15.

[0042] A heat exchanging device 2 is arranged at the back side of laundry recipient 1. It is advantageously mounted to laundry recipient 1, i.e. laundry recipient 1 bears the weight of heat exchanging device 2.

[0043] Figs. 3 and 4 show views of heat exchanging device 2 and laundry container 1. A water duct 41 connects heat exchanging device 2 to drum 10.

[0044] Heat exchanging device 2 comprises a condenser 21 and an evaporator 22 of a heat pump 8.

[0045] Heat pump 8 is schematically shown in Fig. 4. It

comprises a compressor 80 that feeds a heat pump medium to condenser 21, from where it passes an expansion valve 81 and enters evaporator 22. From evaporator 22, the fluid returns to compressor 80.

[0046] In operation of heat pump 8, the fluid condenses in condenser 21, thereby heating condenser 21 up, and it evaporates in evaporator 22, thereby cooling evaporator 22 down.

[0047] A motor 82 is provided for operating pump 80.

[0048] As schematically shown in Fig. 4, motor 82 and compressor 80 can be arranged in a foot section of the device.

[0049] In an advantageous embodiment, motor 82 and compressor 80 are vertically arranged. In a further advantageous embodiment, motor 82 can further be arranged horizontally beside the compressor 80. Such arrangement allows to exploit unused volume below heat exchanging device 2 and/or laundry recipient 1.

[0050] Condenser 21 is arranged on top of evaporator 22.

[0051] Heat exchanging device 2 comprises at least a first rinsing duct 31. In addition, there may be further rinsing ducts 32.

[0052] Each rinsing duct 31, 32 extends in a substantially horizontal direction. Advantageously, for making it easier to drain all water from the rinsing ducts 31, 32, the rinsing ducts 31, 32 are arranged, as shown, under a small angle to the horizontal direction, with said angle being e.g. larger than 1° and/or smaller than 10°.

[0053] First rinsing duct 31 and, in the shown embodiment, the bottommost of the further rinsing ducts 32, are arranged adjacent to evaporator 22. The remaining further rinsing ducts 32 are arranged adjacent to condenser 21.

[0054] A trough 4 is arranged adjacent to the lower end of the evaporator 22. It is configured to collect water from the heat exchanging device 2 and in particular from evaporator 22. The water might result from condensation in the evaporator 22 or from water that entered heat exchanging device 2 through the rinsing ducts 31, 32.

[0055] A water duct 41 is connected to trough 4 and is configured to guide the collected water from trough 4 to laundry recipient 1, in particular to a bottom section of tub 11. Alternatively, water duct 41 can be connected to a drain pipe of the device.

[0056] In the present embodiment, water duct 41 also serves to guide moisture-loaded air from the drum to evaporator 22.

[0057] As it is best seen in Fig. 4, most of heat exchanging device 2 is arranged horizontally behind laundry recipient 1 and drum 10.

[0058] Condenser 21 and evaporator 22 both have vertically arranged plates 201, 202 in order to increase the heat exchanging surface.

[0059] The shortest distance between the individual plates 201 of condenser 21 is larger than the shortest distance of the individual plates 202 of the evaporator 22. Therefore, in the shown embodiment, condenser 21 comprises a smaller number of plates 201 than evaporator 22.

[0060] Heat exchanging device 2 forms part of an air circulating system best explained in reference to Figs. 1 and 2.

[0061] The air circulating system comprises, apart from heat exchanging device 2, at least the following components:

- Water duct 41 and trough 4 for guiding air from tub 11 into heat exchanging device 2.
- A first air duct 24 receiving air from heat exchanging device 2 and guiding it to a ventilator 20.
- A second air duct 25 guiding the air from ventilator 20 back to tub 11, e.g. via the door of the device and/or a gasket arranged between the door and tub 11.

[0062] Ventilator 20 is advantageously arranged at the bottom of the device, i.e. in the lowest 25% of the device. This allows to exploit room that is available there. Also, this design allows to mount ventilator 20 on the bottom parts of the device, in particular on frame 14, which allows to reduce the amount of vibration and noise transmitted to cabinet 15.

[0063] In the embodiment shown, ventilator 20 is a radial ventilator with a substantially vertical axis of rotation, which allows to better exploit the room available at the bottom of the device.

[0064] One of the advantages of mounting condenser 21 above evaporator 22 lies in the fact that any water in evaporator 22 and/or condenser 21 will flow downwards and not enter first air duct 24. This is particularly true if first air duct 24 is connected to the top end of condenser 21 as shown.

[0065] First air duct 24 has an input end 24a located at a top end of condenser 21. Further, it has an output end 24b located below evaporator 22 and connected to ventilator 20.

[0066] Second air duct 25 is connected, at its input end 25a, to ventilator 20 at the bottom of the device. Its output end 25b is located at a level higher than the axis of rotation 12, in particular at a level higher than a maximum water level during washing the laundry. This prevents water from entering second air duct 25 from that end.

[0067] As mentioned, rinsing ducts 31, 32 are arranged on heat exchanging device **2.** They are best seen in Figs. 5 and 6, with Fig. 5 showing the ducts 31, 32 in partially cut-off view. As can be seen, each rinsing duct 31, 32 carries a plurality of nozzles 300 directed towards evaporator 22 or condenser 21.

[0068] The ducts 31, 32 are mounted directly to a housing 2a forming an air duct around evaporator 22 and condenser 21. The nozzles 300 are **e.g.** located at openings in housing 2a.

[0069] In the embodiment shown, the nozzles 300 are elongate slits or other openings arranged in the wall of each rinsing duct 31, 32. Alternatively, the nozzles may also be formed by separate elements from the rinsing

ducts 31, 32 and be connected thereto.

[0070] Fig. 7 shows a schematic of a laundry dryer, in particular washer-drier. This may **e.g.** be the device of Figs. 1 - 6 or any other similar device.

[0071] As shown, the device comprises heat exchanging device 2 with condenser 21 and evaporator 22. Condenser 21 and evaporator 22 each can comprise the plates 201, 202.

[0072] Trough 4 is arranged underneath heat exchanging device 2 to collect water therefrom.

[0073] Heat exchanging device 2 is connected to ventilator 20. Ventilator 20 is configured to circulate air in the device.

[0074] A control unit 9 is provided to control the components of the device. It is **e.g.** a microprocessor equipped with suitable software to carry out all operations of the methods described herein.

[0075] For example, control unit 9 controls ventilator 20 and therefore the transport of air through the air circulating system. It can also control the rotation of drum 10, the operation of heat pump 8, the feeding of water through the water ducts 31, 32, etc.

Drying laundry:

[0076] When laundry is to be dried, **e.g.** at the end of a washing process or in a stand-alone process, control unit 9 activates heat pump 8 and ventilator 20. Further, drum 10 is rotated.

[0077] Due to the operation of ventilator 20, moisture-loaded air is drawn from laundry recipient 1 and fed from below into evaporator 22. In Fig. 7, this wet air is designated as a2.

[0078] In evaporator 22, the air is cooled and loses moisture. Condensed water accumulates on the plates 202 and/or other parts of evaporator 22 and drops down into trough 4.

[0079] Next, the dried air rises into condenser 21, where it is heated up again. It leaves condenser 21 through its top end.

[0080] Finally, the hot, dry air is conveyed back into laundry recipient 1. In Fig. 7, this hot, dry air is designated as a1. Advantageously, the air a1 coming from heat exchanging device 2 enters drum 10 through front opening 16.

[0081] In drum 10, the heated and dry air a1 coming from the condenser 21 absorbs the water of the wet laundry, whereupon it is returned to evaporator 22.

[0082] During this process, the water falling into trough 4 flows through water duct 41 into the bottom of tub 11 and/or directly to a waste water drain.

[0083] Control unit 9 can operate a drain pump to convey the water from the device.

[0084] In an advantageous embodiment, the lowest part of trough 4 is located at a higher level m1 than the lowest part of tub 11, which is at a level m2. This design allows to convey water from trough 4 to tub 11 by means of gravity.

Rinsing the heat exchanging device:

[0085] In the embodiment of Figs. 1 - 7, the device does not contain a fluff filter separate from heat exchanging device 2. Hence, fluff will accumulate in heat exchanging device 2 and in particular in evaporator 22.

[0086] To remove such fluff, control unit 9 can feed water to one or more of the rinsing ducts 31, 32. When doing so, the water will leave the rinsing ducts 31, 32 through the nozzles 300 and enter the evaporator 22 and/or condenser 21 for washing the same.

[0087] This rinsing water will enter trough 4 and water duct 41, where it is guided to tub 11 and/or to the drain pipe.

[0088] Such a rinsing process can e.g. take place when required, e.g. before, during, or after drying laundry.

Washing laundry:

[0089] As mentioned, the present device can be designed to not only dry laundry but also to wash it. In that case, process water for washing the laundry has to be fed to laundry recipient 1.

[0090] Advantageously, at least part of said process water is fed to laundry recipient 1 and therefore drum 11 through the rinsing pipes 31, 32. This allows to re-use the rinsing water for rinsing the evaporator 22 and/or condenser 21 as process water in the washing process, thereby reducing the total water consumption.

[0091] In one embodiment, not all of the water used for rinsing evaporator 22 and/or condenser 21 is used as process water for washing the laundry. Rather, control unit 9 is adapted to first feed a first batch of water from the rinsing pipe(s) 31, 32 through the condenser 21 and/or evaporator 22 and to discard this first batch from the machine without it coming into contact with the laundry.

[0092] Next, control unit 9 can feed a second batch of water from the rinsing pipe(s) 31, 32 through the condenser 21 and/or evaporator 22 and to use this second batch for washing the laundry.

[0093] This process is based on the understanding that the first batch of water will be heavily contaminated with lint. Hence, discarding it and not using it for washing reduces the amount of lint that comes into contact with the laundry.

[0094] In one embodiment, the user may select, depending on the type of laundry and the desired quality of the washing, if the first batch of rinsing water is to be discarded or not.

[0095] Once water has been filled into laundry recipient 1, washing proceeds basically as in a conventional machine.

[0096] In one advantageous embodiment, the bottom end of evaporator 22 is at a level m3 that is higher than a maximum level m4 of the process water in drum 10 while washing the laundry. Control unit 9 is adapted to keep the water level in drum 10 during washing below said maximum level m4. This design prevents washing water from

flooding evaporator 22 and/or condenser 21.

Machine with lint filter:

[0097] Fig. 8 shows a schematic of another advantageous laundry dryer. In contrast to the one of Fig. 7, this embodiment comprises a lint filter 5 arranged in the path of the air a2 between laundry recipient 1 and evaporator 22.

[0098] To avoid lint filter 5 from coming into contact with water, it is, in this embodiment, not arranged in water duct 41. Rather, a separate air duct 51 is provided between laundry container 1 and evaporator 22, with laundry filter 5 arranged therein.

[0099] In this embodiment, water collected by trough 4 still flows through water duct 41 into tub 11. However, when drying laundry, the air must be forced through filter 5. To do so, a siphon 6 is located in water duct 41. Control unit 9 is adapted to make sure that water is present in siphon 6 while drying. This water blocks water duct 41 for air. Thus, when control unit 9 activates ventilator 20, the wet air a2 from drum 10 passes through air duct 51 and filter 5 but not through water duct 41. Thus, it is filtered before entering heat exchanging device 2.

[0100] In order to prevent water from entering lint filter 5, the lowest part of lint filter 5 is advantageously arranged at a level m5 that is above maximum level m4 of the water in drum 10 and/or above the level m3 of the lower end of evaporator 22.

Notes:

[0101] Unless otherwise noted, the following advantageous aspects apply to all embodiments of the machine.

[0102] As shown above, the machine may comprise several rinsing ducts 31, 32, and control unit 9 can be adapted to individually and selectively feed water to said ducts.

[0103] This allows to control the order in which the various parts of heat exchanging device 2 can be rinsed.

[0104] Control unit 9 is advantageously adapted to control the rinsing cycle in a sequence of first rinsing evaporator 22 and second rinsing condenser 21. This gives the condenser more time to cool before it is flushed with water, which avoids an excessive calcification of condenser 21.

[0105] In one embodiment, control unit 9 is adapted to only rinse the condenser 21 if it has a temperature below a threshold temperature T_P, in particular with $T_P < 50°C$.

[0106] The rinsing water can, as mentioned, be collected by means of trough 4. It can be drained from trough 4 to drum 10 and be reused for the next washing cycle. Alternatively, part or all of it may be discarded and drained from the machine without using it for washing.

[0107] In one embodiment, control unit 9 can be adapted to rinse evaporator 22 and/or condenser 21 with water from the rinsing duct(s) 31 and/or 32 while turning on and off ventilator 20 in cycles. While ventilator 20 is running, air is pushed against the top-down-flow of the water into heat exchanging device 2 from below. This allows to keep at least part of the water in heat exchanging device 2, to be released once ventilator 20 is switched off. At that time, the trapped water will leave heat exchanging device 2 in a gush, which increases the cleaning efficiency of the process.

[0108] Even though the shown example is a domestic washer-dryer, the design of heat exchanging device 2 and of the other components shown here, and the means and methods for operating the machine and in particular for rinsing the heat exchanging device, can also be used in a domestic laundry dryer without laundry washing functionality.

[0109] While there are shown and described presently preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

Claims

1. A laundry dryer, in particular a washer-dryer, comprising

- a cabinet (15),
- a drum (10) rotatably placed within the cabinet (15) having an opening (16) on a front side for loading laundry,
- a heat pump with a condenser (21) and an evaporator (22),
- an air circulating system connecting the drum (10) to the condenser (21) and the evaporator (22), wherein said air circulating system comprises a ventilator (20) configured to circulate air in the air circulating system (2) between the drum (10) and the evaporator (22) and the condenser (21),
- a control unit (9),
- at least part of the condenser (21) and of the evaporator (22) are arranged at a back side of the drum (10), wherein said back side faces away from the opening (16),

wherein the condenser (21) and the evaporator (22) each comprise, in particular vertically aligned, plates (201, 202) for exchanging heat between fluid ducts of the heat pump and process air of the air circulating system,

characterized in that a shortest distance between the individual plates (201) of the condenser (21) is larger than a shortest distance between the individual plates (202) of the evaporator (22).

2. The laundry dryer according to claim 1 being a washer-dryer and further comprising a tub (11), wherein said drum (10) is rotatably arranged in said

tub (10).

3. The laundry dryer according to any of the preceding claims, wherein the condenser (21) is positioned vertically above, in particular adjacent to, at least part of the evaporator (22).

4. The laundry dryer according to any of the preceding claims wherein the condenser (21) and/or the evaporator (22) horizontally extends along at least 60%, in particular at least 75%, of a full width of the cabinet (15).

5. The laundry dryer of any of the preceding claims wherein at least a section of the condenser (21) and/or of the evaporator (22) is arranged horizontally behind the drum.

6. The laundry dryer according to any of the preceding claims comprising at least one first rinsing duct (31) arranged adjacent to the evaporator (22), wherein said first rinsing duct (31) has or is connected to a plurality of nozzles (200) directed at the evaporator (22).

7. The laundry dryer according to claim 6 comprising at least one further rinsing duct (32), wherein said further rinsing duct (32) has or is connected to a plurality of nozzles (200) directed at the condenser (21),
and in particular wherein said further rinsing duct is arranged above the first rinsing duct (31).

8. The laundry dryer according to claim 7 wherein said control unit (9) is adapted to first rinse the evaporator (22) and second the condenser (21).

9. The laundry dryer according to claim 7 or 8 wherein said control unit (9) is adapted to rinse condenser (21) only if the condenser has a temperature below a threshold temperature T_P.

10. The laundry dryer according to any of the preceding claims comprising a water trough (4) arranged below the evaporator (22).

11. The laundry dryer according to claim 10 further comprising a water duct (41) connecting the trough (4) to a tub (11) or a drain pipe.

12. The laundry dryer according to any of the preceding claims further comprising a lint filter (5) arranged in said air circulation system between said drum (10) and said evaporator (22).

13. The laundry dryer of the claims 11 and 12 wherein the water duct (41) comprises a siphon (6).

14. The laundry dryer of any of the claims 12 or 13 wherein said lint filter (5) is arranged higher than a lower end of said evaporator (22).

15. The laundry dryer according to any of the preceding claims 1 to 11 without a lint filter (5) being arranged in the air circulation system.

16. The laundry dryer according to any of the preceding claims, wherein the heat pump (8) comprises a compressor (80) with a motor (82) arranged vertically or horizontally beside the compressor (80).

17. The laundry dryer according to any of the preceding claims wherein the cabinet (15) has the maximum dimensions of 60 cm in height, 60 cm in width, and 60 cm in depth.

18. The laundry dryer of any of the preceding claims wherein said ventilator (20) is arranged at a level lower than said evaporator (22), wherein said laundry dryer further comprises

- a first air duct (24) having an input end (24a) located at a top end of said condenser (21) and an output end (24b) located below said evaporator (22) and connected to said ventilator (20).
- a second air duct (25) connected, at an input end (25a), to said ventilator (20) and having an output end (25b) located higher than an axis of rotation (12) of said drum (10), in particular at a level higher than a maximum water level during washing the laundry.

Patentansprüche

1. Wäschetrockner, insbesondere ein Waschtrockner, umfassend

- ein Gehäuse (15),
- eine Trommel (10), die drehbar in dem Gehäuse (15) angeordnet ist und eine Öffnung (16) an einer Vorderseite zum Laden von Wäsche aufweist
- eine Wärmepumpe mit einem Verflüssiger (21) und einem Verdampfer (22),
- ein Luftzirkulationssystem, das die Trommel (10) mit dem Kondensator (21) und dem Verdampfer (22) verbindet, wobei das Luftzirkulationssystem einen Ventilator (20) umfasst, der so konfiguriert ist, dass er Luft in dem Luftzirkulationssystem (2) zwischen der Trommel (10) und dem Verdampfer (22) und dem Kondensator (21) zirkulieren lässt,
- eine Steuereinheit (9),
- zumindest ein Teil des Kondensators (21) und des Verdampfers (22) an einer Rückseite der

Trommel (10) angeordnet sind, wobei die Rückseite von der Öffnung (16) weggerichtet ist,
wobei der Kondensator (21) und der Verdampfer (22) jeweils, insbesondere vertikal ausgerichtete, Platten (201, 202) zum Wärmeaustausch zwischen Fluidleitungen der Wärmepumpe und Prozessluft des Umluftsystems aufweisen,
dadurch gekennzeichnet, dass ein kürzester Abstand zwischen den einzelnen Platten (201) des Verflüssigers (21) grösser ist als ein kürzester Abstand zwischen den einzelnen Platten (202) des Verdampfers (22).

2. Wäschetrockner nach Anspruch 1, der ein Waschtrockner ist und ferner einen Bottich (11) umfasst, wobei die Trommel (10) drehbar im Bottich (10) angeordnet ist.

3. Wäschetrockner nach einem der vorhergehenden Ansprüche, wobei der Kondensator (21) vertikal über, insbesondere neben, zumindest einem Teil des Verdampfers (22) angeordnet ist.

4. Wäschetrockner nach einem der vorangehenden Ansprüche, wobei sich der Kondensator (21) und/oder der Verdampfer (22) horizontal über mindestens 60 %, insbesondere mindestens 75 %, der gesamten Breite des Gehäuses (15) erstreckt.

5. Wäschetrockner nach einem der vorhergehenden Ansprüche, wobei zumindest ein Abschnitt des Kondensators (21) und/oder des Verdampfers (22) horizontal hinter der Trommel angeordnet ist.

6. Wäschetrockner nach einem der vorhergehenden Ansprüche, mit mindestens einem ersten Spülkanal (31), der benachbart zum Verdampfer (22) angeordnet ist, wobei der erste Spülkanal (31) eine Vielzahl von Düsen (200) aufweist oder mit diesen verbunden ist, die auf den Verdampfer (22) gerichtet sind.

7. Wäschetrockner nach Anspruch 6, umfassend mindestens einen weiteren Spülkanal (32), wobei der weitere Spülkanal (32) eine Mehrzahl von auf den Kondensator (21) gerichteten Düsen (200) aufweist oder mit diesen verbunden ist,
und wobei insbesondere der weitere Spülkanal oberhalb des ersten Spülkanals (31) angeordnet ist.

8. Wäschetrockner nach Anspruch 7, wobei die Steuereinheit (9) dazu ausgestaltet ist, zuerst den Verdampfer (22) und anschliessend den Kondensator (21) zu spülen.

9. Wäschetrockner nach Anspruch 7 oder 8, wobei die Steuereinheit (9) so ausgestaltet ist, dass sie den Kondensator (21) nur spült, wenn die Temperatur des Kondensators unter einer Schwellentemperatur TP liegt.

10. Wäschetrockner nach einem der vorhergehenden Ansprüche mit einer unterhalb des Verdampfers (22) angeordneten Wasserwanne (4).

11. Wäschetrockner nach Anspruch 10 mit einer Wasserleitung (41), die die Wasserwanne (4) mit einem Bottich (11) oder einem Ablaufrohr verbindet.

12. Wäschetrockner nach einem der vorhergehenden Ansprüche, der ferner einen Flusenfilter (5) umfasst, der in dem Luftzirkulationssystem zwischen der Trommel (10) und dem Verdampfer (22) angeordnet ist.

13. Wäschetrockner nach einem der Ansprüche 11 und 12, wobei die Wasserleitung (41) einen Siphon (6) umfasst.

14. Wäschetrockner nach einem der Ansprüche 12 oder 13, bei dem der Flusenfilter (5) höher als ein unteres Ende des Verdampfers (22) angeordnet ist.

15. Wäschetrockner nach einem der vorhergehenden Ansprüche 1 bis 11, ohne dass ein Flusensieb (5) im Luftumlaufsystem angeordnet ist.

16. Wäschetrockner nach einem der vorhergehenden Ansprüche, wobei die Wärmepumpe (8) einen Kompressor (80) mit einem senkrecht oder waagerecht neben dem Kompressor (80) angeordneten Motor (82) aufweist.

17. Wäschetrockner nach einem der vorhergehenden Ansprüche, wobei das Gehäuse (15) die maximalen Abmessungen von 60 cm Höhe, 60 cm Breite und 60 cm Tiefe aufweist.

18. Wäschetrockner nach einem der vorhergehenden Ansprüche, bei dem der Ventilator (20) auf einem niedrigeren Niveau als der Verdampfer (22) angeordnet ist, wobei der Wäschetrockner ferner umfasst

- einen ersten Luftkanal (24) mit einem Eingangsende (24a), das sich an einem oberen Ende des Kondensators (21) befindet, und einem Ausgangsende (24b), das sich unterhalb des Verdampfers (22) befindet und mit dem Ventilator (20) verbunden ist.
- einen zweiten Luftkanal (25), der an einem Eingangsende (25a) mit dem Ventilator (20) verbunden ist und ein Ausgangsende (25b) aufweist, das höher als eine Drehachse (12) der Trommel (10) angeordnet ist, insbesondere auf einem Niveau, das höher als ein maximaler

Wasserstand während des Waschens der Wäsche ist.

Revendications

1. Sèche-linge, en particulier lave-linge séchant, comprenant

   - un boîtier (15),
   - un tambour (10) placé de manière rotative à l'intérieur du boîtier (15) et ayant une ouverture (16) sur un côté avant pour charger le linge,
   - une pompe à chaleur avec un condenseur (21) et un évaporateur (22),
   - un système de circulation d'air reliant le tambour (10) au condenseur (21) et à l'évaporateur (22), dans lequel ledit système de circulation d'air comprend un ventilateur (20) configuré pour faire circuler l'air dans le système de circulation d'air (2) entre le tambour (10) et l'évaporateur (22) et le condenseur (21),
   - une unité de commande (9),
   - au moins une partie du condenseur (21) et de l'évaporateur (22) étant disposés à l'arrière du tambour (10), ladite face arrière étant opposée à l'ouverture (16),

   dans lequel le condenseur (21) et l'évaporateur (22) comprennent chacun, en particulier alignées verticalement, des plaques (201, 202) pour échanger la chaleur entre des conduites de fluide de la pompe à chaleur et de l'air de traitement du système de circulation d'air,
   caractérisé en ce que la distance la plus courte entre les plaques individuelles (201) du condenseur (21) est supérieure à la distance la plus courte entre les plaques individuelles (202) de l'évaporateur (22).

2. Le sèche-linge selon la revendication 1, étant un lave-linge séchant et comprenant en outre une cuve (11), dans lequel ledit tambour (10) est disposé de manière rotative dans ladite cuve (10).

3. Le sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le condenseur (21) est positionné verticalement au-dessus, en particulier à côté, d'au moins une partie de l'évaporateur (22).

4. Le sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le condenseur (21) et/ou l'évaporateur (22) s'étend horizontalement sur au moins 60%, en particulier au moins 75%, d'une largeur totale du boîtier (15).

5. Le sèche-linge selon l'une quelconque des revendications précédentes, dans lequel au moins une partie du condenseur (21) et/ou de l'évaporateur (22) est disposée horizontalement derrière le tambour.

6. Le sèche-linge selon l'une quelconque des revendications précédentes, comprenant au moins un premier conduit de rinçage (31) disposé à proximité de l'évaporateur (22), dans lequel ledit premier conduit de rinçage (31) comporte ou est relié à une pluralité de buses (200) dirigées vers l'évaporateur (22).

7. Le sèche-linge selon la revendication 6, comprenant au moins un conduit de rinçage supplémentaire (32), dans lequel ledit conduit de rinçage supplémentaire (32) comporte ou est relié à une pluralité de buses (200) dirigées vers le condenseur (21),
   et en particulier dans lequel ledit conduit de rinçage supplémentaire est disposé au-dessus du premier conduit de rinçage (31).

8. Le sèche-linge selon la revendication 7, dans lequel ladite unité de commande (9) est adaptée pour rincer d'abord l'évaporateur (22) et ensuite le condenseur (21).

9. Le sèche-linge selon la revendication 7 ou 8, dans lequel ladite unité de commande (9) est adaptée pour rincer le condenseur (21) uniquement si le condenseur a une température inférieure à une température seuil T_P.

10. Le sèche-linge selon l'une quelconque des revendications précédentes, comprenant un bac à eau (4) disposé sous l'évaporateur (22).

11. Le sèche-linge selon la revendication 10, comprenant en outre un conduit d'eau (41) reliant le bac (4) à une cuve (11) ou à un tuyau d'évacuation.

12. Le sèche-linge selon l'une quelconque des revendications précédentes, comprenant en outre un filtre à peluches (5) disposé dans ledit système de circulation d'air entre ledit tambour (10) et ledit évaporateur (22).

13. Le sèche-linge selon les revendications 11 et 12, dans lequel le conduit d'eau (41) comprend un siphon (6).

14. Le sèche-linge selon l'une quelconque des revendications 12 ou 13, dans lequel ledit filtre à peluches (5) est disposé plus haut qu'une extrémité inférieure dudit évaporateur (22).

15. Le sèche-linge selon l'une quelconque des revendications 1 à 11 précédentes, sans filtre à peluches (5) disposé dans le système de circulation d'air.

16. Le sèche-linge selon l'une quelconque des revendi-

cations précédentes, dans lequel la pompe à chaleur (8) comprend un compresseur (80) avec un moteur (82) disposé verticalement ou horizontalement à côté du compresseur (80).

17. Le sèche-linge selon l'une quelconque des revendications précédentes, dans lequel le boîtier (15) a des dimensions maximales de 60 cm en hauteur, 60 cm en largeur et 60 cm en profondeur.

18. Le sèche-linge selon l'une quelconque des revendications précédentes, dans lequel ledit ventilateur (20) est disposé à un niveau inférieur audit évaporateur (22), dans lequel ledit sèche-linge comprend en outre

- un premier conduit d'air (24) ayant une extrémité d'entrée (24a) située à une extrémité supérieure dudit condenseur (21) et une extrémité de sortie (24b) située en dessous dudit évaporateur (22) et reliée audit ventilateur (20).
- un deuxième conduit d'air (25) relié, à une extrémité d'entrée (25a), audit ventilateur (20) et ayant une extrémité de sortie (25b) située plus haut qu'un axe de rotation (12) dudit tambour (10), en particulier à un niveau plus élevé qu'un niveau d'eau maximal pendant le lavage du linge.

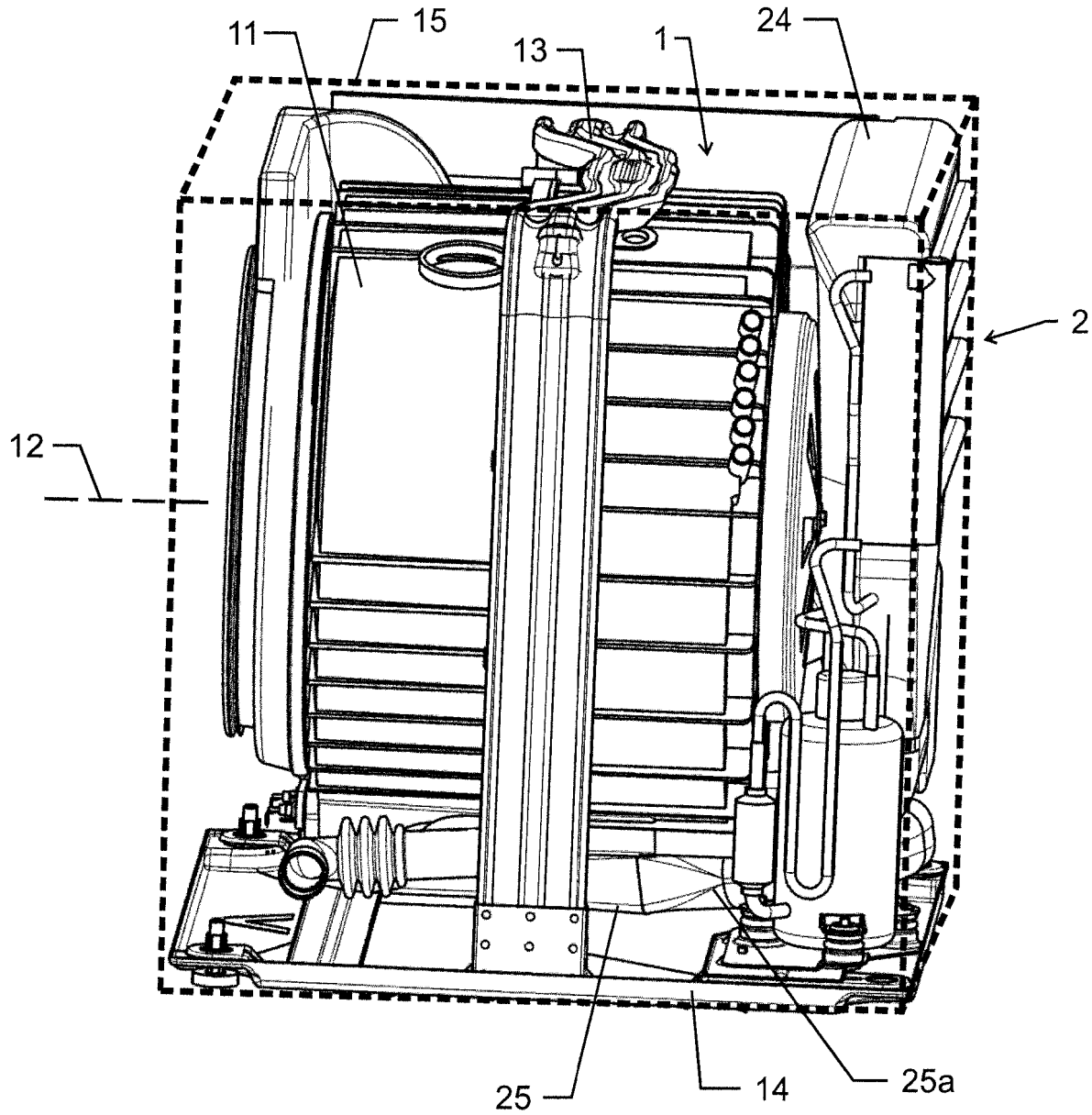

Fig. 1

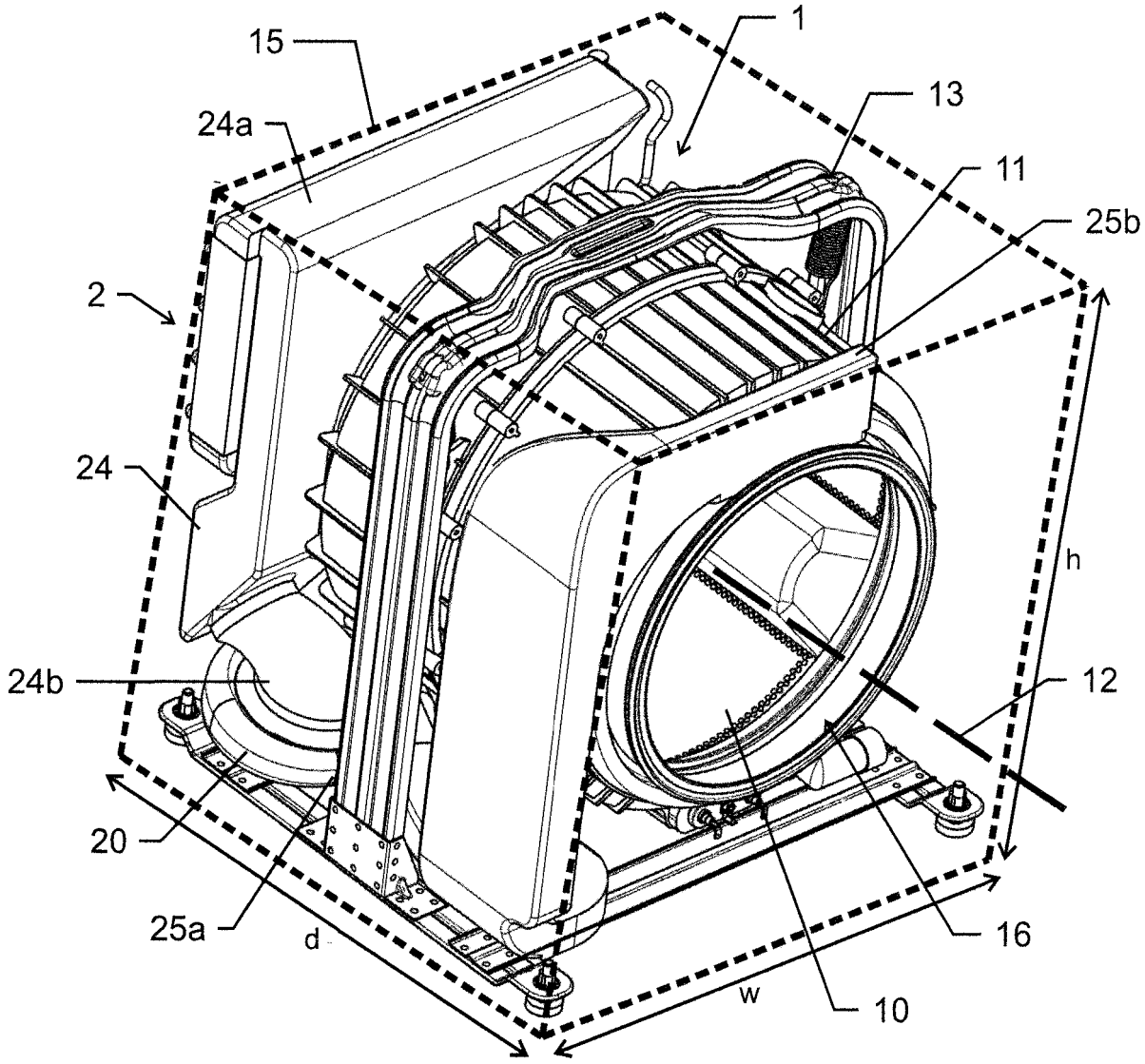

Fig. 2

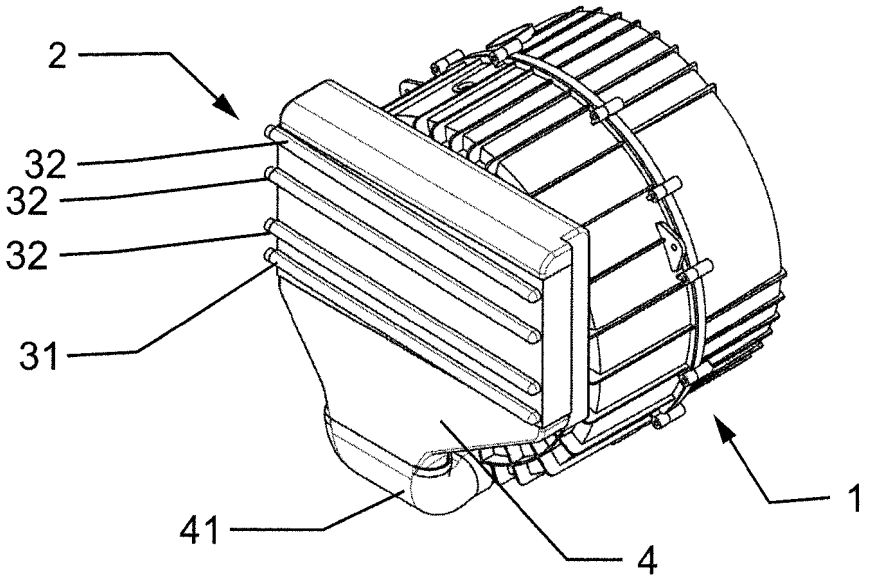

Fig. 3

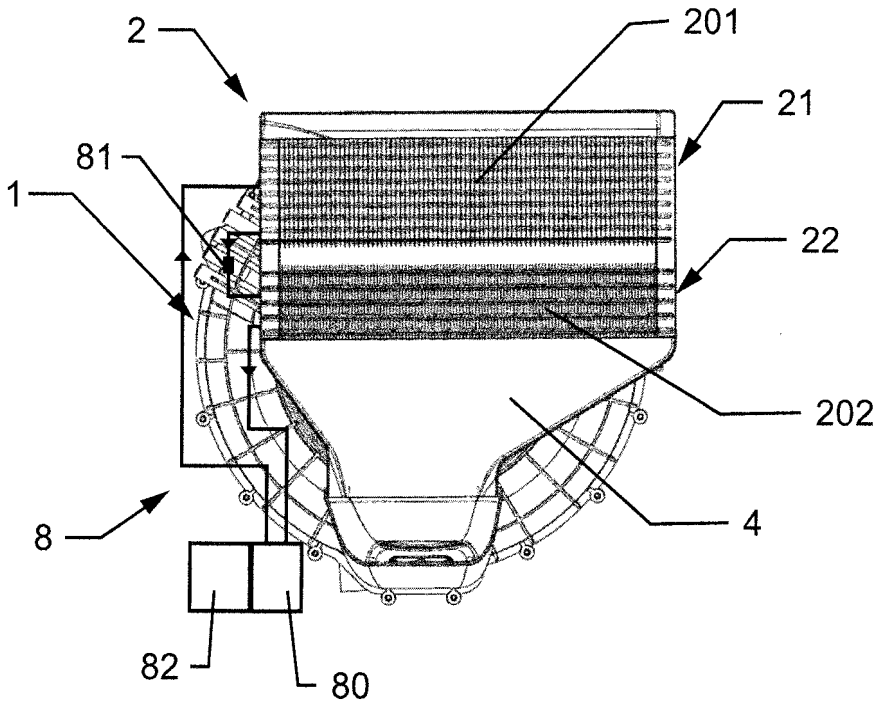

Fig. 4

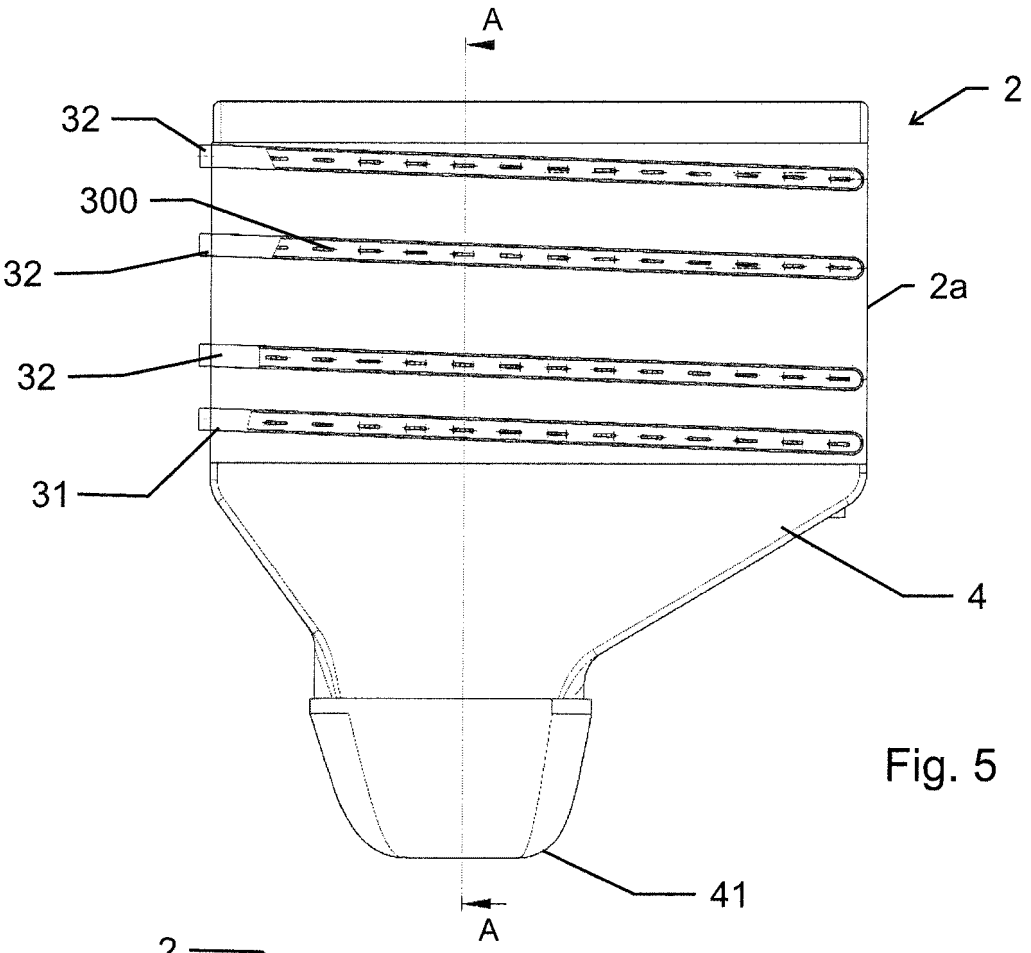

Fig. 5

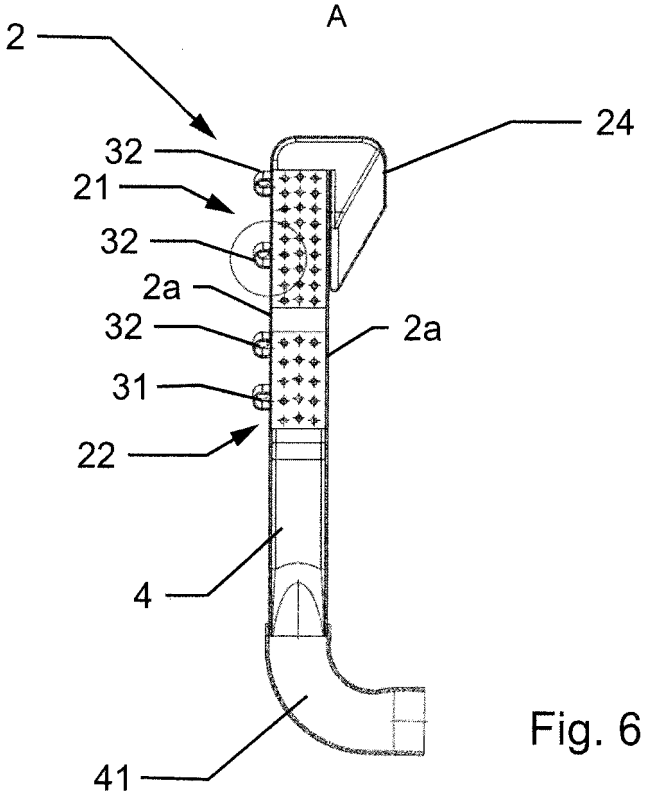

Fig. 6

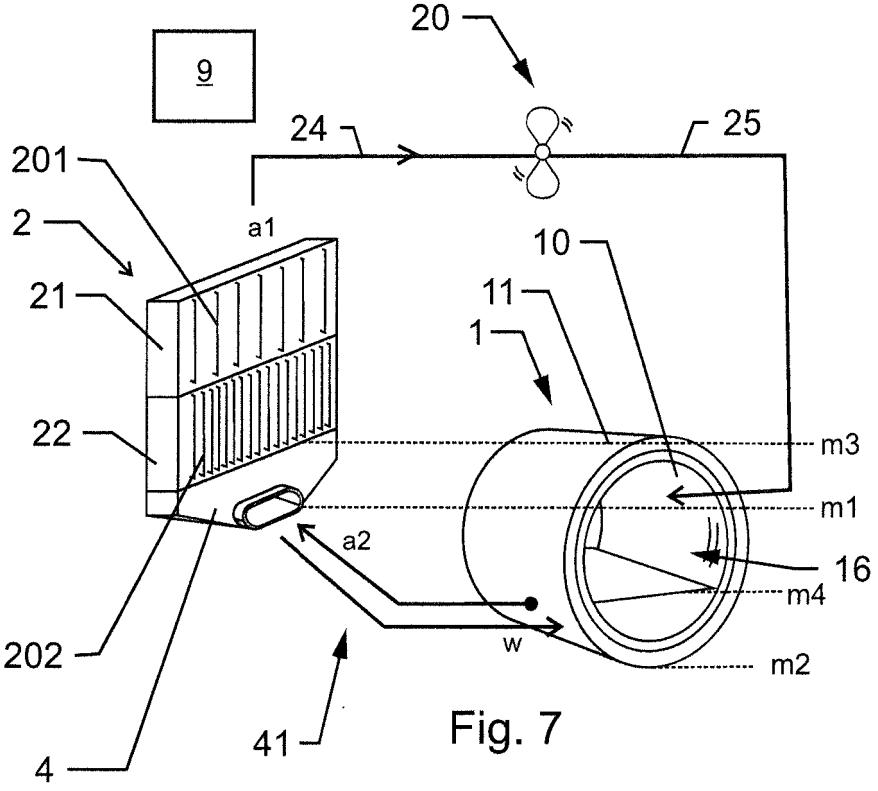
9
20
24
25
201
2
a1
21
10
11
1
22
m3
m1
a2
16
m4
w
202
m2
41
4

Fig. 7

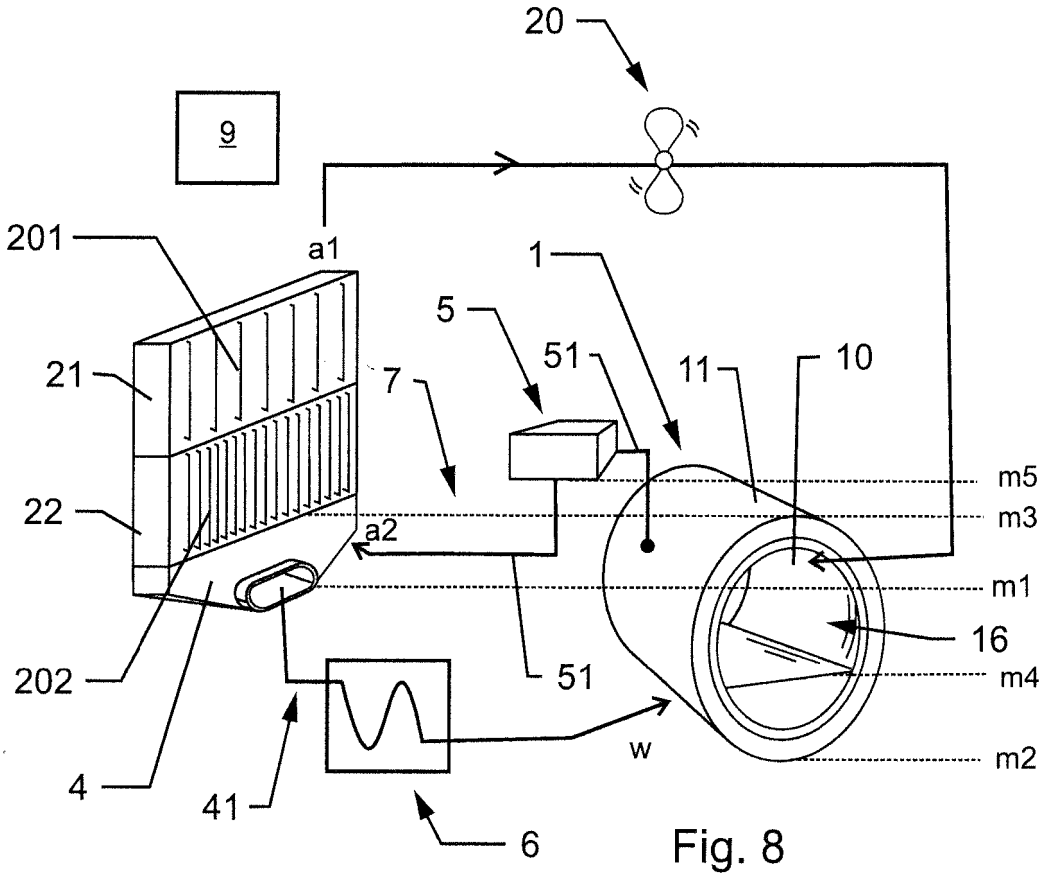
9
20
201
a1
1
5
51
11
10
21
7
m5
22
m3
a2
m1
16
202
51
m4
w
4
41
m2
6

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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