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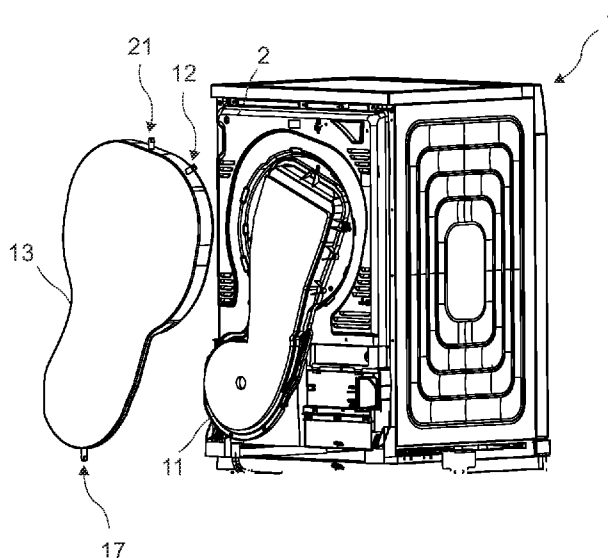
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(54) Title: A LAUNDRY DRYER AND A LAUNDRY WASHING-DRYING SYSTEM WHEREIN THE SAME IS USED

Figure 1



(57) Abstract: The present invention relates to a laundry dryer (1) comprising a body (4) having a rear wall (2) and two side walls (3); a drum (5) which is provided in the body (4) and wherein the laundry to be dried is placed; a condensation channel (7) into which the drying air in the drum (5) is drawn by means of the fan (6); a condenser (8) which is provided in the condensation channel (7) and which dehumidifies the drying air; at least one receptacle (9) wherein the condensate formed in the condenser (8) is collected; at least one air inlet (10) which is provided on the rear wall (2); and a rear lid (11) which is fixed to the rear wall (2) such that the drying air flows between the rear lid (11) and the rear wall (2) and which enables the drying air to be directed from the condensation channel (7) to the air inlet (10), and relates to a laundry washing-drying system wherein the laundry dryer (1) is used.

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**A LAUNDRY DRYER AND A LAUNDRY WASHING-DRYING SYSTEM
WHEREIN THE SAME IS USED**

The present invention relates to a laundry dryer having a reservoir wherein the condensate is collected, and to a laundry washing-drying system wherein said laundry dryer is used.

Laundry dryers have a drum provided in the body. After the laundry to be dried is placed in the drum, the drying air is delivered into the drum. The hot and humid drying air drawn from the drum by a fan is directed to the condensation channel. The drying air is passed over the condenser provided in the condensation channel, thus cooling and dehumidifying the drying air. The water condensed from the humid air in the condenser is collected in a receptacle located at the bottom of the laundry dryer. The condensate collected in the receptacle is sent to the tank by means of a delivery line and a pump provided on the delivery line to be collected in the tank. However, the volume of the tank is small due to the volume constraints inside the laundry dryer body. Therefore, the user is required to empty the tank at certain intervals such that the condensate collected in the tank does not overflow out of the tank. By means of a rear lid fixed on the rear wall, the drying air dehumidified by the condenser flows between the rear wall and the rear lid so as to be sent back to the drum and is directed to the air inlet on the rear wall and from there into the drum. The rear lid is usually attached to the rear wall of the body so as to cover the fan which circulates the drying air and the heater which provides the heating of the dehumidified air. The rear lid, through which the hot drying air is passed, gradually heats up and reaches high temperatures. As the temperature difference between the rear lid and the environment where the laundry dryer is installed increases, the heat transfer from the rear lid to the environment also increases, which causes the temperature of the drying air passed through the rear lid to decrease before being delivered to the drum. This situation causes an increase in thermal losses and a significant decrease in drying performance, especially when the laundry dryer is used in cold environments. Moreover, the drying air delivered into the drum through the condensation

channel flows turbulently while passing between the rear lid and the rear wall. This causes an increase in the sound level emitted from the rear lid to the outside and causes the laundry dryer to operate in a noisy manner.

In the state of the art European Patent Application No. EP2373840, a laundry
5 dryer is disclosed, comprising a second rear lid which is disposed on the rear lid.

In the state of the art Spanish Patent Application No. ES2712702, a laundry dryer is disclosed, comprising a tank wherein the condensate is collected.

The state of the art European Patent Application No. EP2511413 discloses a laundry dryer which is placed on the washing machine and a reservoir which is
10 disposed in the washing machine and wherein the condensate generated in the laundry dryer is temporarily stored.

The aim of the present invention is the realization of a laundry dryer which provides ease of use wherein sound insulation and energy efficiency are improved, and the realization of a washer-drying system wherein said laundry
15 dryer is used.

The laundry dryer realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof comprises a body; a rear wall, a front wall, and two side walls extending between the rear wall and the front wall which are all provided on the body; a drum wherein the laundry to be
20 dried is placed through a loading opening on the front wall; a fan which circulates the drying air in the drum; a condensation channel into which the drying air is drawn by means of the fan; a condenser which is provided in the condensation channel and which cools and dehumidifies the drying air; a receptacle wherein the condensate formed in the condenser is collected; at least one air inlet which is
25 provided on the rear wall and which enables the drying air to be delivered into the drum; a rear lid which is connected to the rear wall such that the drying air passes between the rear lid and the rear wall and which enables the drying air taken from the condensation channel to be delivered to the air inlet; at least one reservoir which is positioned on the rear lid so as to at least partially cover the rear lid and
30 whereon at least one inlet port is provided; and at least one delivery line which is connected to the inlet port and which, by means of a pump provided thereon,

enables the condensate collected in the receptacle to be delivered to the reservoir. The water formed in the condenser is sent to the inlet port by passing through the delivery line by means of the pump and into the reservoir from the inlet port. Thus, much more condensate is collected in the reservoir in volume than the tank
5 such that the user does not need to empty the condensate frequently. Moreover, by means of collecting the condensate in the reservoir, the temperature difference between the rear lid and the environment where the laundry dryer is installed is reduced, thus decreasing the heat transfer from the rear lid to the environment. Thus, the energy efficiency of the laundry dryer is increased.

10 In an embodiment of the present invention, there is a reservoir in almost the same form as the rear lid, covering the rear lid. Thus, the amount of collected water and the amount of heat transferred to the water are increased. Moreover, the aesthetic appearance of the laundry dryer is improved.

In another embodiment of the present invention, there is at least one outlet port
15 which is provided on the reservoir and which enables the condensate collected in the reservoir to be discharged through at least one discharge line. By means of the outlet port, it becomes possible to discharge the condensate collected in the reservoir from the reservoir. The discharge line, on the other hand, enables the condensate collected in the reservoir to be discharged, for example, by being
20 connected to a drain, as per user preference.

In another embodiment of the present invention, the laundry dryer comprises a tank which is detachably attached to the body and which has at least one water inlet thereon, and the reservoir having at least one water outlet which is suitable for being connected to the water inlet via at least one hose and through which the
25 condensate collected therein is sent to be delivered to the water inlet. Thus, when the reservoir is completely filled with the condensate, the condensate overflowing from the reservoir passes through the water outlet and is directed towards the water inlet by means of the hose. Thus, the tank acts as a second reservoir to collect the condensate. Moreover, by means of the tank which is detachably
30 attached to the body, ease of use is provided to the user in terms of easily emptying the condensate in the tank.

In another embodiment of the present invention, there is a valve which is provided on the outlet port and a first control unit which controls the valve so as to enable the condensate collected in the reservoir to pass to the discharge line or cuts the flow thereof to the discharge line as per user preference. Thus, the user is given
5 the opportunity to choose whether the condensate is discharged out of the reservoir or transferred from the reservoir to the tank by means of the hose.

In another embodiment of the present invention, there is at least one insulation member which is provided on the reservoir. Thus, the heat transfer between the reservoir and the outside environment is minimized.

10 The laundry washing-drying system of the present invention comprises the laundry dryer describe above having at least one reservoir whereon at least one inlet port is provided and which is positioned on the rear lid so as to at least partially cover the rear lid, at least one delivery line which is connected to the inlet port and which, by means of a pump provided thereon, enables the
15 condensate in the receptacle where the condensate is collected, to be delivered to the reservoir, and at least one outlet port which is provided on the reservoir and which enables the condensate collected in the reservoir to be discharged through at least one discharge line; and a second household appliance having a tub wherein the washing process is performed, a second control unit which enables
20 the washing process to be controlled, a mains line which enables the washing water to be used for the washing process to be taken so as to be delivered to the tub, at least one washing water inlet which is connected to the outlet port and the discharge line and through which the mains water and the condensate are taken into the tub to be used as washing water, and at least one control valve which is
25 provided on the washing water inlet and which enables the amount of washing water taken into the tub through the discharge line to be adjusted; and the second control unit enables the control valve to be operated such that an amount of water predetermined by the manufacturer is taken from the reservoir. The condensate generated in the laundry dryer is collected in the reservoir. When the washing
30 machine is operated, the washing water is taken into the tub through both the mains line and the discharge line. By using the condensate generated in the laundry dryer as washing water, less washing water is drawn from the mains line,

reducing water consumption. Due to the heat transfer between the reservoir and the rear lid, the temperature of the condensate is higher than the room temperature. The washing water taken through the mains line and the discharge line is heated to a certain temperature and used in the washing process. However, 5 the temperature of the washing water taken through the discharge line is relatively higher than the temperature of the washing water taken through the mains line. Therefore, less energy is consumed to bring the washing water in the tub to a certain temperature.

By means of the present invention, a dryer is realized, wherein energy efficiency 10 is increased and sound insulation is improved.

The laundry dryer realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of the laundry dryer before the reservoir is placed onto the rear lid related to an embodiment of the present invention.

15 Figure 2 - is the partial view of the laundry dryer showing the rear wall, the air inlet and the fan where the rear lid is divided by two in the middle related to another embodiment of the present invention.

Figure 3 - is the view of the reservoir and the insulation member related to another embodiment of the present invention.

20 Figure 4 - is the schematic view of the laundry washing-drying system related to an embodiment of the present invention, where the laundry dryer is installed on the second household appliance.

Figure 5 - is the perspective view of the laundry washing-drying system related to an embodiment of the present invention, showing the reservoir-discharge line 25 connection, the reservoir-delivery line connection and the reservoir-hose connection, where the laundry dryer is installed on the second household appliance.

The elements illustrated in the figures are numbered as follows:

1- Dryer

- 2- Rear wall
- 3- Side Wall
- 4- Body
- 5- Drum
- 5 6- Fan
- 7- Condensation channel
- 8- Condenser
- 9- Receptacle
- 10- Air inlet
- 10 11- Rear lid
- 12- Inlet port
- 13- Reservoir
- 14- Pump
- 15- Delivery line
- 15 16- Discharge line
- 17- Outlet port
- 18- Tank
- 19- Water inlet
- 20- Hose
- 20 21- Water outlet
- 22- Valve
- 23- First control unit
- 24- Insulation member
- 25- Tub
- 25 26- Mains line

27- Washing water inlet

28- Second control unit

29- Second household appliance

30- Control valve

5 31- Laundry washing/drying system

The laundry dryer (1) comprises a body (4) having a rear wall (2) and two side walls (3); a drum (5) which is provided in the body (4) and wherein the laundry to be dried is placed; a condensation channel (7) into which the drying air in the drum (5) is drawn by means of the fan (6); a condenser (8) which is provided in
10 the condensation channel (7) and which dehumidifies the drying air; at least one receptacle (9) wherein the condensate formed in the condenser (8) is collected; at least one air inlet (10) which is provided on the rear wall (2); and a rear lid (11) which is fixed to the rear wall (2) such that the drying air flows between the rear lid (11) and the rear wall (2) and which enables the drying air to be directed from
15 the condensation channel (7) to the air inlet (10). The drying air in the drum (5) is sucked into the condensation channel (7) by a fan (6). The condenser (8) is provided in the condensation channel (7). The water condensed from the humid air in the condenser (8) is collected in a receptacle (9) located at the bottom of the body (4). There are air inlets (10) provided on the rear wall (2) in order to deliver
20 the dehumidified drying air back into the drum (5). The rear lid (11) is fixed to the rear wall (2) so as to cover the fan (6) and the air inlets (10). The drying air is directed to the air inlets (10) on the rear wall (2) by the rear lid (11). Thus, the circulation of the drying air is ensured.

The laundry dryer (1) of the present invention comprises a reservoir (13) which is
25 disposed on the rear lid (11) so as to at least partially cover the rear lid (11) and which has at least one inlet port (12), and at least one delivery line (15) which is connected to the inlet port (12), which has a pump (14) thereon and which enables the condensate collected in the receptacle (9) to be delivered to the reservoir (13). The reservoir (13) is fixed on the rear wall (2) by being disposed on the rear lid
30 (11) preferably so as to complete cover the rear lid (11). The inlet port (12) is

provided on the upper side of the reservoir (13). The condensate collected from the condenser (8) to the receptacle (9) is delivered through the delivery line (15) to the inlet port (12) by means of the pump (14) provided on the delivery line (15). Thus, the condensate is collected in the reservoir (13) disposed on the rear lid (11). Consequently, the sound generated when the drying air is flowing turbulently between the rear lid (11) and the rear wall (2) is damped and sound insulation is provided. Moreover, the reservoir (13) minimizes the heat transfer from the rear lid (11) to the environment and prevents the temperature of the drying air flowing between the rear lid (11) and the rear wall (2) from decreasing. In addition, since more condensate is collected in the reservoir (13), the condensate collection volume is increased and the user is prevented from emptying the reservoir (13) frequently, increasing user satisfaction.

In an embodiment of the present invention, the reservoir (13) has almost the same form as the rear lid (11) so as to cover the rear lid (11). Thus, the contact surface between the rear lid (11) and the tank (13) is increased, and the reservoir (13) is prevented from covering an open area located on the rear wall (2), opening into the body (4) through the rear wall (2) and allowing access to components such as the pump (14), etc., and a plurality of gaps which are arranged on the rear wall (2) and which enable the hot and humid air in the body (4) to be discharged through the rear wall (2).

In another embodiment of the present invention, the reservoir (13) has at least one outlet port (17) which enables the condensate collected therein to be discharged through at least one discharge line (16). The outlet port (17) is provided at the lower side of the reservoir (13). Thus, water is prevented from remaining in the reservoir (13). The condensate in the reservoir (13) passes through the outlet port (17) so as to be discharged through the discharge line (16). Thus, the user is enabled to discharge the condensate collected in the reservoir (13) without detaching the reservoir (13) from the rear wall (2).

In another embodiment of the present invention, the laundry dryer (1) comprises a tank (18) which is provided in the body (4) so as to be taken out of the body (4); at least one water inlet (19) which is provided on the tank (18), and the reservoir

(13) having at least one water outlet (21) which is suitable for being connected to the water inlet (19) by means of at least one hose (20) and through which the condensate collected therein is discharged to be supplied to the water inlet (19). In case the reservoir (13) is completely filled with the condensate, the condensate
5 passes through the water outlet (21) to be delivered to the water inlet (19) through the hose (20). Then, the condensate taken into the tank (18) through the water inlet (19) fills the tank (18). In case the water in the reservoir (13) is not discharged, the tank (18) is pulled out of the body (4) and the condensate collected in the tank (18) is emptied. Thus, an additional volume wherein the condensate is
10 collected is provided in the body (4) and the condensate is prevented from overflowing from the reservoir (13), and the reservoir (13) and the tank (18) are enabled to be connected to each other in fluid communication in a manner suitable for multiple uses as per user preference.

In another embodiment of the present invention, the laundry dryer (1) comprises
15 at least one valve (22) which is connected to the outlet port (17) and a first control unit (23) which controls the valve (22) so as to enable the condensate collected in the reservoir (13) to be delivered to the discharge line (16) or cuts the flow thereof to the discharge line (16) as per user preference. The first control unit (23) enables that the water in the reservoir (13) to be discharged in a controlled manner.
20 Preferably, the first control unit (23) comprises a user interface which enables the user to choose whether or not to discharge the condensate collected in the reservoir (13). In case the user decides to discharge the condensate from inside the reservoir (13), the first control unit (23) opens the valve (22) connected to the outlet port (17) and allows the liquid flow from the reservoir (13) to the discharge
25 line (16). In case the user decides to discharge the condensate from inside the reservoir (13), the first control unit (23) closes the valve (22) connected to the outlet port (17) and cuts off the liquid flow from the reservoir (13) to the discharge line (16).

In another embodiment of the present invention, there is at least one insulation
30 member (24) which is provided on the reservoir (13). The insulation member (24) provides thermal insulation, minimizing the heat transfer between the reservoir (13) and the outside environment. The insulation member (24) is disposed on the

reservoir (13) so as to surround the reservoir (13). As a result of the heat transfer between the rear lid (11) and the reservoir (13), the condensate collected in the reservoir (13) heats up for a certain amount. By means of the insulation member (24), it is ensured that the condensate in the reservoir (13) maintains its temperature for a long time.

The laundry washing-drying system (31) of the present invention comprises the laundry dryer (1) described above; a second household appliance (29) having a tub (25) wherein the washing process is performed and a second control unit (28) which enables the washing process to be controlled; at least one washing water inlet (27) which is provided on the second household appliance (29), which is suitable for being connected to the outlet port (17) via the discharge line (16) and through which the condensate taken from the reservoir (13) is taken to be delivered to the tub (25), and the second control unit (28) which provides the control of at least one control valve (30) connected to the washing water inlet (27) so as to adjust the amount of washing water taken into the tub (25) through the discharge line (16). Preferably, the second household appliance (29) is a washing machine which provides the washing of laundry. One end of the discharge line (16) is connected to the outlet port (17) and the other end to the washing water inlet (27). The condensate collected in the reservoir (13) is delivered to the washing water inlet (27) through the discharge line (16). The condensate taken into the tub (25) through the washing water inlet (27) is used as washing water in the second household appliance (29). The condensate with slightly higher temperature as a result of the heat transfer between the rear lid (11) and the reservoir (13) is heated in the second household appliance (29) so as to reach a predetermined temperature value by the manufacturer without consuming much energy. Thus, less energy is consumed for the washing process in the second household appliance (29). Moreover, by means of this embodiment, less washing water is taken into the tub (25) through the mains line (26) during the washing process performed in the second household appliance (29), thus less water is consumed.

By means of the present invention, a laundry dryer (1) is realized, wherein sound insulation is improved and energy efficiency is increased. Moreover, by means of

the present invention, a laundry washing-drying system is realized, wherein energy consumption is reduced by increasing water saving.

CLAIMS

1. A laundry dryer (1) **comprising** a body (4) having a rear wall (2) and two side walls (3); a drum (5) which is provided in the body (4) and wherein the laundry to be dried is placed; a condensation channel (7) into which the drying air in the drum (5) is drawn by means of the fan (6); a condenser (8) which is provided in the condensation channel (7) and which dehumidifies the drying air; at least one receptacle (9) wherein the condensate formed in the condenser (8) is collected; at least one air inlet (10) which is provided on the rear wall (2); and a rear lid (11) which is fixed to the rear wall (2) such that the drying air flows between the rear lid (11) and the rear wall (2) and which enables the drying air to be directed from the condensation channel (7) to the air inlet (10), **characterized by** a reservoir (13) which is disposed on the rear lid (11) so as to at least partially cover the rear lid (11) and which has at least one inlet port (12), and at least one delivery line (15) which is connected to the inlet port (12), which has a pump (14) thereon and which enables the condensate collected in the receptacle (9) to be delivered to the reservoir (13).
2. A laundry dryer (1) as in Claim 1, **characterized by** the reservoir (13) which has almost the same form as the rear lid (11) so as to cover the rear lid (11).
3. A laundry dryer (1) as in Claim 1 or 2, **characterized by** the reservoir (13) which has at least one outlet port (17) which enables the condensate collected therein to be discharged through at least one discharge line (16).
4. A laundry dryer (1) as in any one of the above claims, **characterized by** a tank (18) which is provided in the body (4) so as to be taken out of the body (4); at least one water inlet (19) which is provided on the tank (18), and the reservoir (13) having at least one water outlet (21) which is suitable for being connected to the water inlet (19) by means of at least one hose (20) and through which the condensate collected therein is discharged to be supplied to the water inlet (19).

5. A laundry dryer (1) as in Claim 4 or Claim 5, **characterized by** at least one valve (22) which is connected to the outlet port (17) and a first control unit (23) which controls the valve (22) so as to enable the condensate collected in the reservoir (13) to be delivered to the discharge line (16) or
5 cuts the flow thereof to the discharge line (16) as per user preference.
6. A laundry dryer (1) as in any one of the above claims, **characterized by** at least one insulation member (24) which is provided on the reservoir (13).
7. A laundry washing-drying system (3) comprises a laundry dryer (1) as in Claim 3 and a second household appliance (29) having a tub (25) wherein
10 the washing process is performed and a second control unit (28) which enables the washing process to be controlled; **characterized by** at least one washing water inlet (27) which is suitable for being connected to the outlet port (17) via the discharge line (16) and through which the condensate taken from the reservoir (13) is taken to be delivered to the tub
15 (25), and the second control unit (28) which provides the control of at least one control valve (30) connected to the washing water inlet (27) so as to adjust the amount of washing water taken into the tub (25) through the discharge line (16).

Figure 1

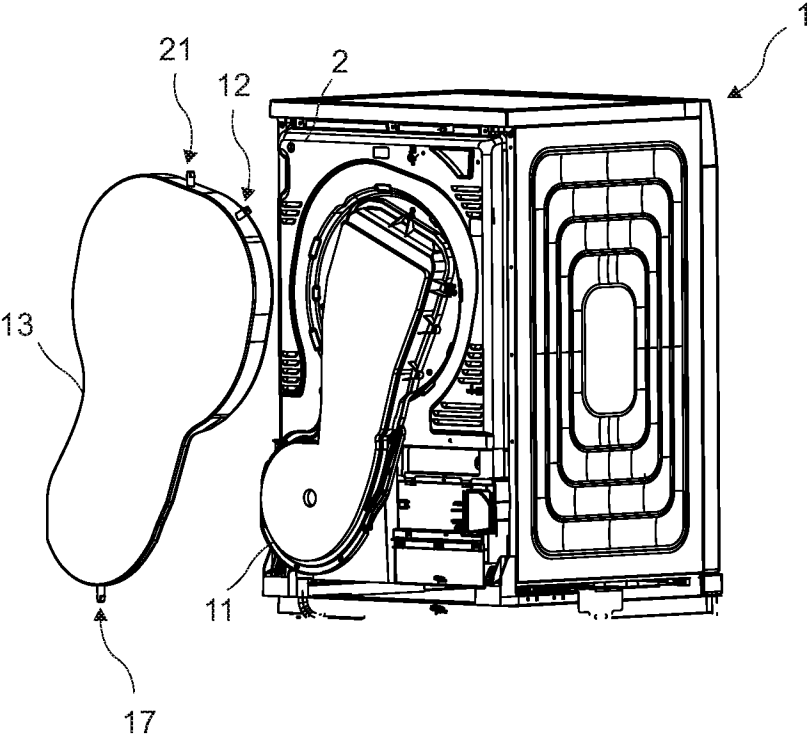


Figure 2

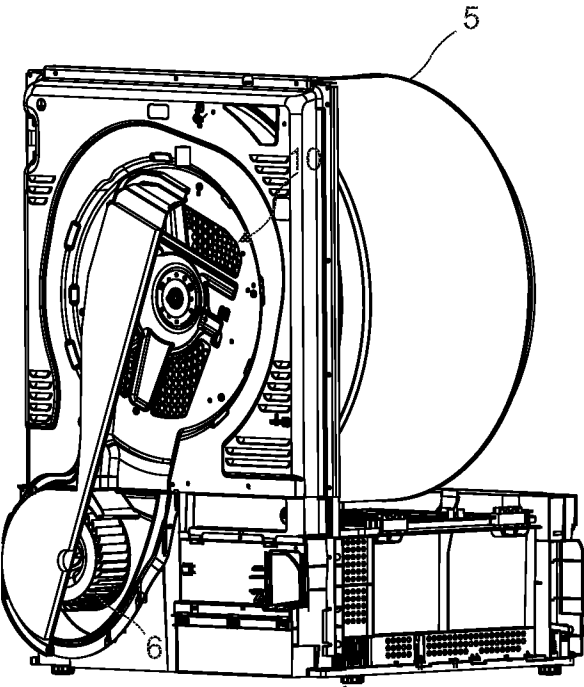
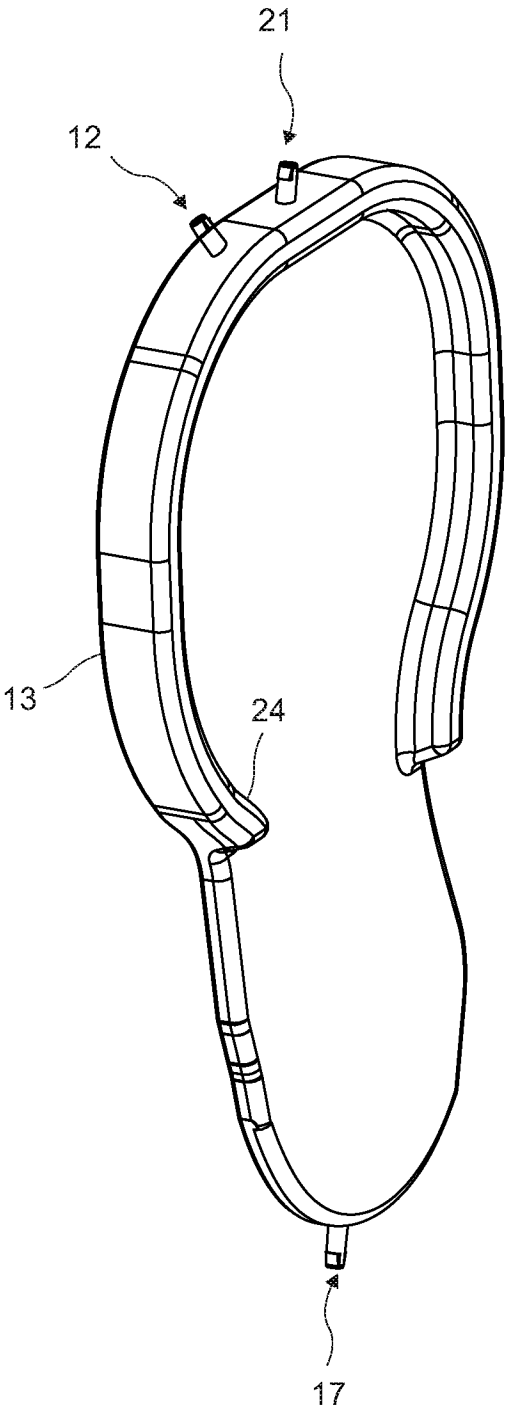
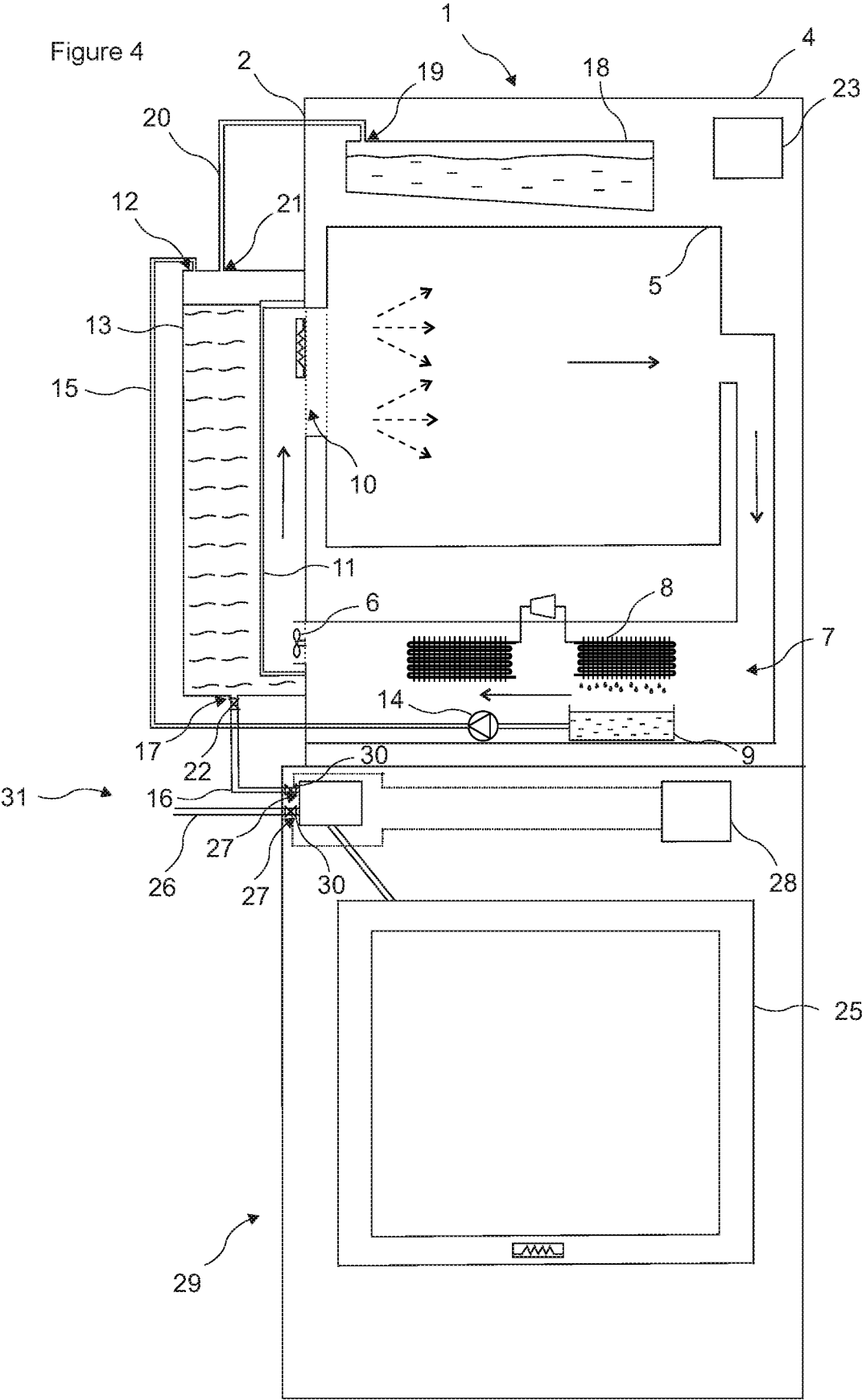


Figure 3



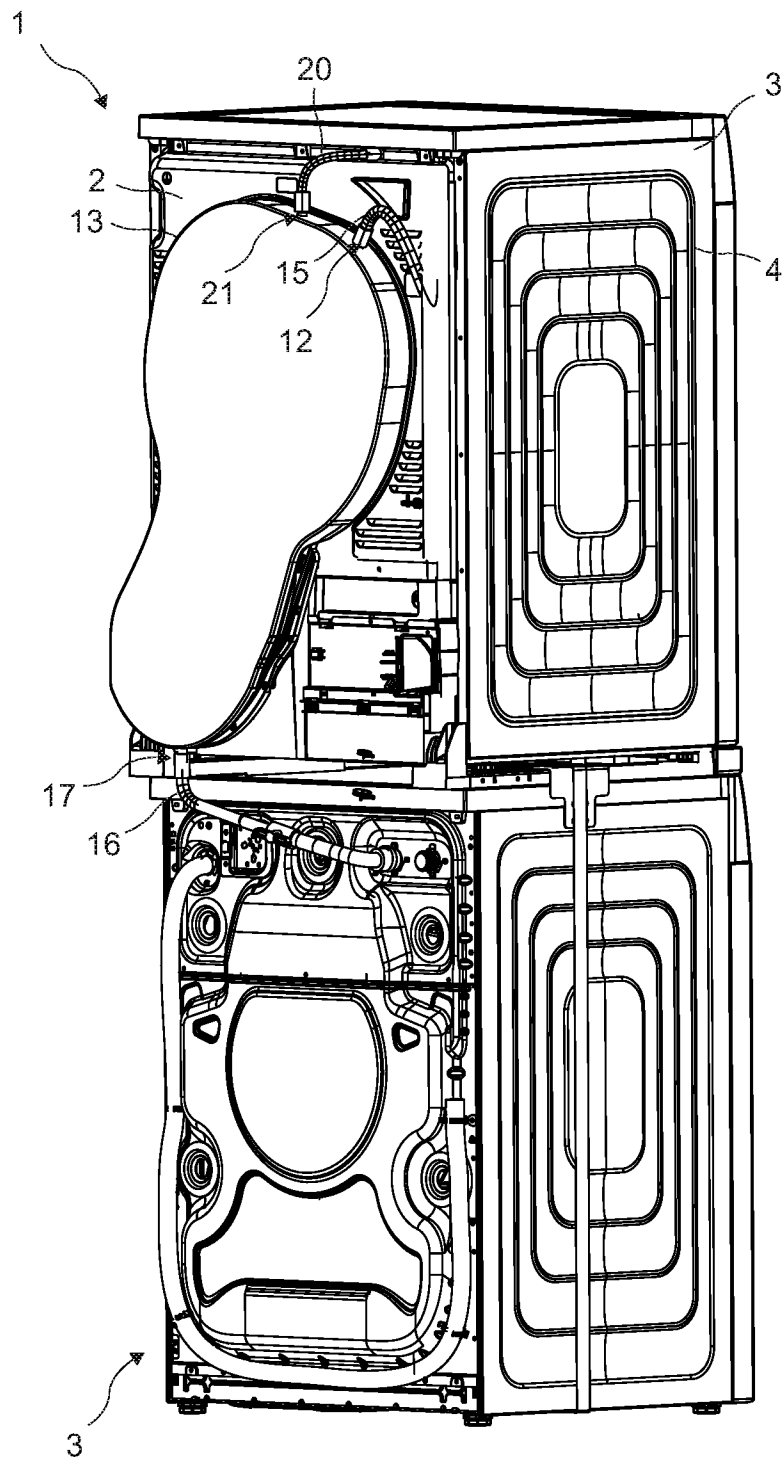
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Figure 4



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Figure 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/TR2023/050653

A. CLASSIFICATION OF SUBJECT MATTER		
D06F 58/20 (2006.01)i; D06F 58/24 (2006.01)i; D06F 39/00 (2020.01)i; D06F 39/08 (2006.01)i; D06F 33/34 (2020.01); D06F 33/72 (2020.01)		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) D06F 58/20; D06F 58/24; D06F 39/00; D06F 39/08; D06F 33/34; D06F 33/72		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC (search terms: laundry, clothes, treatment, dryer, washing, stacked, condense, water, multiple, second, reservoir, container, tank, storage, collect, chamber, receptacle, flow, transfer, convey, deliver, conduit, pipe, tube, hose, passage, waterway, channel, canal, control, recycle, regeneration, reuse, inlet, intake, inflow, outlet, exit)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
D,A	EP 2511413 A1 (V ZUG AG [CH]) 17 October 2012 (2012-10-17) Whole document	1-7
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A	EP 2586904 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 01 May 2013 (2013-05-01) Whole document	1-7
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 31 October 2023		Date of mailing of the international search report 31 October 2023
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