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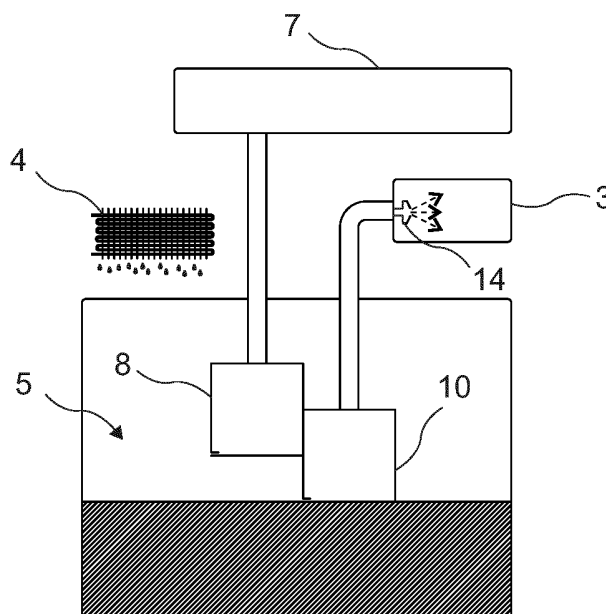
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(54)

A LAUNDRY DRYER

- (57) The present invention relates to a laundry dryer (1) comprising a body (2); a drum (3) which is disposed in the body (2) and wherein the laundry to be dried is loaded; a condenser (4) which is disposed in the body (2) and which dehumidifies the drying air; at least one sump (5) wherein the liquid formed in the condenser (4) is collected; a tank (7) which is connected to the sump (5) by means of a discharge line (6) and which receives the liquid in the sump (5); a discharge pump (8) which is disposed on the discharge line (6) and which is positioned in the sump (5); and at least one fluid inlet (9) which opens into the drum so as to enable the fluid to be supplied into the drum (3). At least one supply pump (10) is disposed in the sump (5) and at least one delivery line (11), one end of which is connected to the fluid inlet (9) and the other end is connected to the supply pump (10), enables the liquid to be taken from the sump (5) to be delivered to the fluid inlet (9) by means of the supply pump (10).

Figure 6



Description

[0001] The present invention relates to a laundry dryer wherein the wrinkles on the laundry are removed.

[0002] In laundry dryers, there are various embodiments which generally enable the wrinkles in the laundry to be reduced. The basic operation method of said embodiments is to remove the wrinkles in the laundry by delivering steam into the drum. For this purpose, it is known in the art to direct the condensate formed in the condenser into the drum. The condensate formed in a condenser which dehumidifies the drying air is collected in a sump on the casing. In the laundry dryers, the condensate collected in the sump is generally delivered through a discharge pump to a tank which is disposed in the body of the laundry dryer, which is detachably attached to the body and which enables the user to discharge the condensate. In case a single pump is used to direct the condensate into the drum and the tank, a guiding member is needed to control the delivery of the condensate to the drum and tank. In case a second sump and a second pump are used to deliver the water into the drum, the need for a three-way valve, a control unit controlling the liquid delivery to the drum and the tank and a complex algorithm arises in order to deliver the condensate from the sump to the second sump or the tank. Due to the complexity of the state of the art embodiments, the probability of encountering technical problems is quite high. Moreover, the cost of said embodiments are very high. Therefore, a cost-effective, simple and efficient solution to improve the wrinkles in the laundry is needed.

[0003] In the state of the art International Patent Application No. WO2020015914, a steam sprayer is disclosed, comprising a condensation pump which is provided on the casing, a waste water chamber which is provided on the casing and wherein the condensate is collected, a spray pump which is connected to the waste water chamber and which enables the water collected in the waste water chamber to be delivered into the drum, a spray hose which is connected to the spray pump and which extends to the port of the drum, and at least one nozzle which is connected to the end of the spray hose and which delivers the water steam into the drum. This is not an efficient embodiment since there may not always be condensate in the waste water chamber to be delivered to the spray pump.

[0004] The aim of the present invention is the realization of a laundry dryer wherein the wrinkles in the laundry are reduced in a simple, cost-effective and efficient manner.

[0005] 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 drum which is disposed in the body and wherein the laundry to be dried is loaded; a condenser which is disposed in the body and which dehumidifies the drying air; at least one sump wherein the condensate resulting from the moisture condensed in the condenser is collected; a dis-

charge pump which is disposed in the sump; a discharge line one end of which is connected to the discharge pump and the other end to a tank and which enables the condensate taken from the sump to be transferred to the tank by means of the discharge pump; at least one fluid inlet which opens into the drum so as to deliver liquid and/or steam into the drum; at least one supply pump which is disposed in the sump; and at least one delivery line one end of which is connected to the supply pump and the other end to the fluid inlet and which enables the condensate in the sump to be supplied to the fluid inlet through the supply pump. Thus, the need for a second sump is eliminated and cost advantage is provided. Moreover, the discharge line and the delivery line are completely separated from each other, thus eliminating the need for controlling flow directing devices such as valves to deliver the condensate to the tank or a separate sump.

[0006] In an embodiment of the present invention, the discharge pump is positioned in the sump so as to be at a higher level than the supply pump, and the distance, to the base of the sump, of the first suction port which is provided on the discharge pump and which enables the water in the sump to be taken into the discharge pump is greater than the distance, to the base of the sump, of the second suction port which is provided on the supply pump and which enables the liquid in the sump to be taken into the supply pump. Since the first suction port is higher than the second suction port compared to the base of the sump, the condensate volume remaining between the first suction port and the second suction port is collected to be delivered to the fluid inlet. Thus, the need for controlling the operating times of the discharge pump and the supply pump separately is eliminated. Even if the discharge pump is continuously operated, there is always liquid (condensate) in the sump to be delivered to the fluid inlet.

[0007] In another embodiment of the present invention, the first suction port and/or the second suction port are positioned on the lower face of the discharge pump and/or the supply pump facing the base of the sump. Thus, the vacuum effect is increased and the liquid in the sump is enabled to be easily sucked into the discharge pump and/or the supply pump.

[0008] In another embodiment of the present invention, the supply pump is disposed on the lower surface of the sump. In another preferred version of this embodiment, the second suction port is positioned so as to be flush with the base of the sump or at a very small distance therefrom. The reason for this is to use the liquid collected in the sump efficiently and to maximize the hydrostatic pressure created by the liquid in the sump at the second suction port.

[0009] In another embodiment of the present invention, on the fluid inlet, there is at least one spraying member which enables the liquid supplied to the fluid inlet to be sprayed into the drum through the fluid inlet. The spraying member which has a narrow outlet acts as an injector.

The liquid sprayed into the drum in the form of small water droplets evaporates in the drum. Thus, the wrinkles in the laundry are effectively reduced.

[0010] In another embodiment of the present invention, the supply pump is a centrifugal pump or a diaphragm pump and the delivery line is manufactured from flexible material. The flow rate of a centrifugal pump is relatively high compared to other pumps. Therefore, when it is preferred by the manufacturer to spray the liquid in the sump into the drum more quickly, a centrifugal pump is used. The reason for using a diaphragm pump is that the supply pump or the second suction port is easily positioned in the sump. Manufacturing the delivery line from a flexible material provides ease of assembly for the manufacturer. Moreover, the maintenance and repair process is enabled to be completed in a shorter time.

[0011] By means of the present invention, a laundry dryer is realized with a simplified structure and increased wrinkle removal performance in a cost-efficient manner by using the optimum number of components.

[0012] 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 related to an embodiment of the present invention.

Figure 2 - is the perspective view showing the tank, the drum and the sump related to another embodiment of the present invention.

Figure 3 - is the front partial cross-sectional view of the laundry dryer related to another embodiment of the present invention.

Figure 4 - is the schematic view of the sump, wherein the level of the liquid in the sump is higher than the level of the first suction port, related to another embodiment of the present invention.

Figure 5 - is the schematic view of the sump, wherein the level of the liquid in the sump is lower than the level of the first suction port and higher than the level of the second suction port, related to another embodiment of the present invention.

Figure 6 - is the view of the sump, wherein the level of the liquid in the sump drops to the level of the second suction port, related to another embodiment of the present invention.

[0013] The elements illustrated in the figures are numbered as follows:

1- Laundry dryer

2- Body

3- Drum

4- Condenser

5- Sump

6- Discharge line

7- Tank

8- Discharge pump

9- Fluid inlet

10- Supply pump

11- Delivery line

12- First suction port

13- Second suction port

14- Spraying member

[0014] h: Height difference between the first suction port and the second suction port relative to the base of the sump

[0015] The laundry dryer (1) comprises a body (2); a drum (3) which is disposed in the body (2) and wherein the laundry to be dried is loaded; a condenser (4) which is disposed in the body (2) and which dehumidifies the drying air; at least one sump (5) wherein the liquid formed in the condenser (4) is collected; a tank (7) which is connected to the sump (5) by means of a discharge line (6) and which receives the liquid in the sump (5); a discharge pump (8) which is disposed on the discharge line (6) and which is positioned in the sump (5); and at least one fluid inlet (9) which opens into the drum so as to enable the fluid to be supplied into the drum (3). The water formed in the condenser (4) is first collected in the sump (5). In the laundry dryers (1), there is generally a casing in the body (2) and at the bottom of the body (2), whereon components such as heat exchanger are placed. The sump (5) is preferred to be positioned on the casing. The condensate collected in the sump (5) is delivered to the tank (7) through the discharge line (6) by the discharge pump (8). The tank (7) can be preferably attached and detached by the user. The condensate directed to the tank (7) is discharged by the user. There is a fluid inlet (9) which opens into the drum (3) to deliver fluids such as steam or water droplets etc. into the drum (3).

[0016] The laundry dryer (1) of the present invention comprises at least one supply pump (10) which is disposed in the sump (5) and at least one delivery line (11) one end of which is connected to the fluid inlet (9) and the other end to the supply pump (10) and which enables the liquid to be taken from the sump (5) to be delivered to the fluid inlet (9) by means of the supply pump (10).

While the condensate in the sump (5) is being delivered to the tank (7) through the discharge line (6), the condensate in the sump (5) is delivered to the fluid inlet (9) through the delivery line (11). Thus, the need for using any valve to direct the water in the sump (5) to the tank (7) or the fluid inlet (9) is eliminated. In addition, since devices such as valves are not used, the strain on the control unit resulting from complex algorithms and therefore the occurrence of various technical problems are prevented.

[0017] In an embodiment of the invention, on the discharge pump (8), there is at least one first suction port (12) which enables the liquid in the sump (5) to be taken into the discharge pump (8), and on the supply pump (10), there is at least one second suction port (13) which enables the liquid in the sump (5) to be supplied into the supply pump (10), and the discharge pump (8) is positioned in the sump (5) such that the second suction port (13) is lower than the first suction port (12). The discharge pump (8) delivers the liquid collected above the level of the first suction port (12) to the tank (7). When there is no liquid left at the first suction port (12) to be sucked into the discharge pump (8), in other words, when the liquid level in the sump (5) drops below the level of the first suction port (12), the discharge pump (8) cannot deliver liquid to the tank (7). The liquid as much as the height difference (h) between the first suction port (12) and the second suction port (13) relative to the base of the sump (5) is kept ready in the sump (5) to be supplied to the fluid inlet (9). The supply pump (10) is operated at the time interval predetermined by the manufacturer or when a wrinkle removal program wherein the wrinkles in the laundry are reduced is activated. Since there is always liquid in the second suction port (13), the technical problem of the lack of liquid in the sump (5) when the supply pump (10) is operated, and therefore of the failure to supply liquid to the fluid inlet (9) is prevented.

[0018] In another embodiment of the present invention, the first suction port (12) and/or the second suction port (13) faces the base of the sump (5). The first suction port (12) is positioned at the base of the discharge pump (9) and the second suction port (13) is positioned at the base of the supply pump (10). Thus, by increasing the hydrostatic pressure of the liquid collected in the sump (5) on the first suction port (12) and/or the second suction port (13), supplying liquid into the discharge pump (8) and/or the supply pump (10) is facilitated.

[0019] In another embodiment of the present invention, the supply pump (10) is disposed on the base of the sump (5). Thus, the liquid is prevented from always being present in the sump (5) and the liquid collected in the sump (5) is prevented from causing bad odor over time.

[0020] In another embodiment of the present invention, on the fluid inlet (9), there is at least one spraying member (14) which enables the water carried by the delivery line (11) to be sprayed into the drum (3) in the form of droplets. Thus, during the drying cycle, the water droplets sprayed from the spraying member (14) into the drum (3) evapo-

rate due to the internal temperature of the drum (3), increasing the wrinkle removal performance. In a preferred version of this embodiment, the spraying member (14) sprays extremely small amounts of water droplets and thus the water droplets sprayed from the spraying member (14) evaporate instantly. Therefore, the spraying member (14) is also used as a steam provider. Thus, the wrinkle performance is increased at an optimum level.

[0021] In another embodiment of the present invention, the supply pump (10) is a centrifugal pump or a diaphragm pump. By using a centrifugal pump, the flow rate of the liquid supplied to the fluid inlet (9) is increased. The diaphragm pump is preferred because of its relatively smaller size and its ability to enable the second suction port (13) to be easily positioned in the region preferred by the manufacturer in the sump (5).

[0022] In another embodiment of the present invention, the delivery line (11) is manufactured from a flexible material. Thus, the placement of the delivery line (11) between the supply pump (10) and the fluid inlet (9) is facilitated.

[0023] By means of the present invention, a laundry dryer (1) is realized, wherein the wrinkles in the laundry are removed with a simple and cost-efficient embodiment by placing a supply pump (10) in the sump (5) where the condensate formed in the condenser (4) is collected in addition to the discharge pump (8). Moreover, by means of the present invention, by ensuring that the first suction port (12) and the second suction port (13) are positioned in the sump (5) at different heights relative to the base of the sump (5), the water to be supplied to the fluid inlet (9) is enabled to be always kept ready in the sump (5).

Claims

1. A laundry dryer (1) **comprising** a body (2); a drum (3) which is disposed in the body (2) and wherein the laundry to be dried is loaded; a condenser (4) which is disposed in the body (2) and which dehumidifies the drying air; at least one sump (5) wherein the liquid formed in the condenser (4) is collected; a tank (7) which is connected to the sump (5) by means of a discharge line (6) and which receives the liquid in the sump (5); a discharge pump (8) which is disposed on the discharge line (6) and which is positioned in the sump (5); and at least one fluid inlet (9) which opens into the drum so as to enable the fluid to be supplied into the drum (3), **characterized by** at least one supply pump (10) which is disposed in the sump (5) and at least one delivery line (11) one end of which is connected to the fluid inlet (9) and the other end to the supply pump (10) and which enables the liquid to be taken from the sump (5) to be delivered to the fluid inlet (9) by means of the supply pump (10).

2. A laundry dryer (1) as in Claim 1, **characterized by**

at least one first suction port (12) which is provided on the discharge pump (8) and which enables the liquid in the sump (5) to be taken into the discharge pump (8), at least one second suction port (13) which is provided on the supply pump (10) and which enables the liquid in the sump (5) to be supplied into the supply pump (10), and the discharge pump (8) which is positioned in the sump (5) such that the second suction port (13) is lower than the first suction port (12).

3. A laundry dryer (1) as in Claim 2, **characterized by** the first suction port (12) and/or the second suction port (13) which faces the base of the sump (5).
4. A laundry dryer (1) as in any one of the above claims, **characterized by** the supply pump (10) which is disposed on the base of the sump (5).
5. A laundry dryer (1) as in any one of the above claims, **characterized by** at least one spraying member (14) which is provided on the fluid inlet (9) and which enables the water carried by the delivery line (11) to be sprayed into the drum (3) in the form of droplets.
6. A laundry dryer (1) as in any one of the above claims, **characterized by** the supply pump (10) which is a centrifugal pump or a diaphragm pump.
7. A laundry dryer (1) as in any one of the above claims, **characterized by** the delivery line (11) which is manufactured from a flexible material.

Figure 1

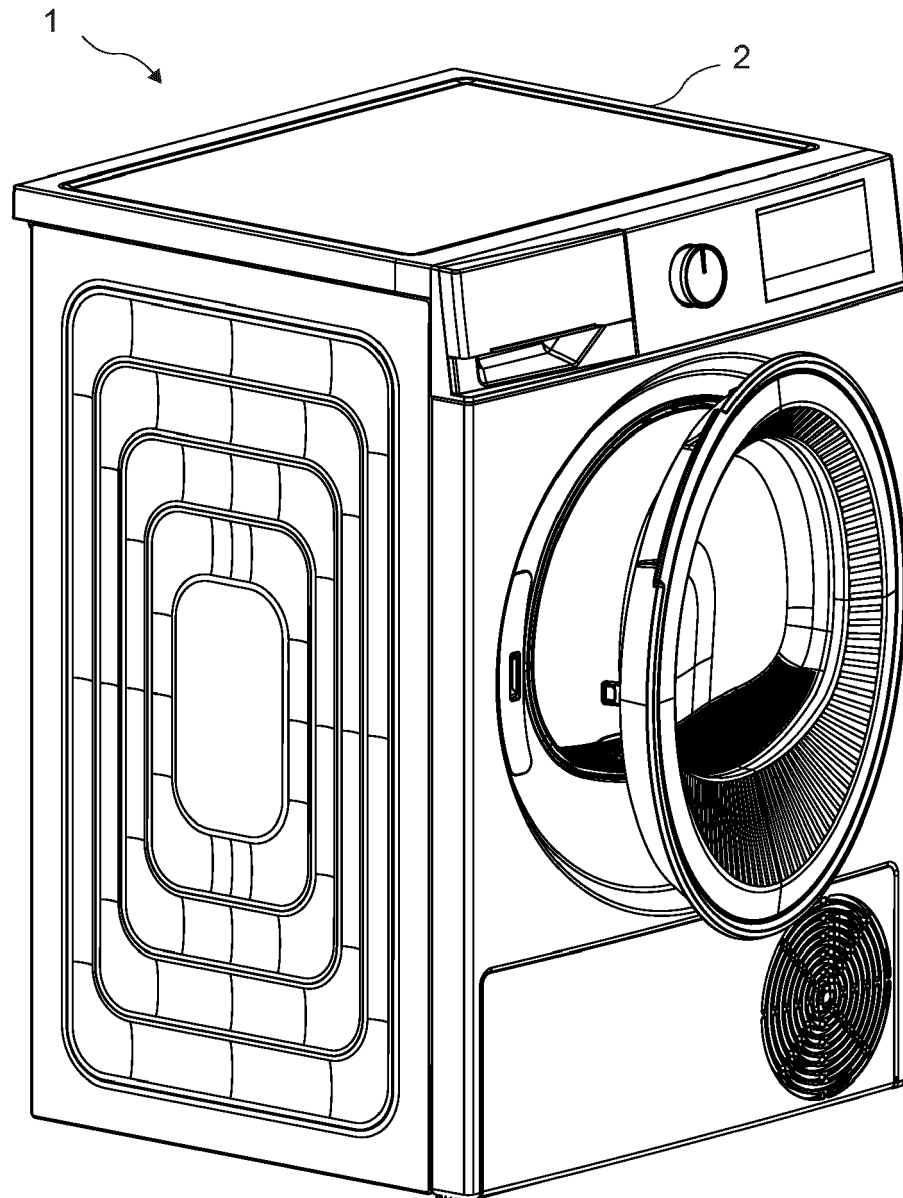


Figure 2

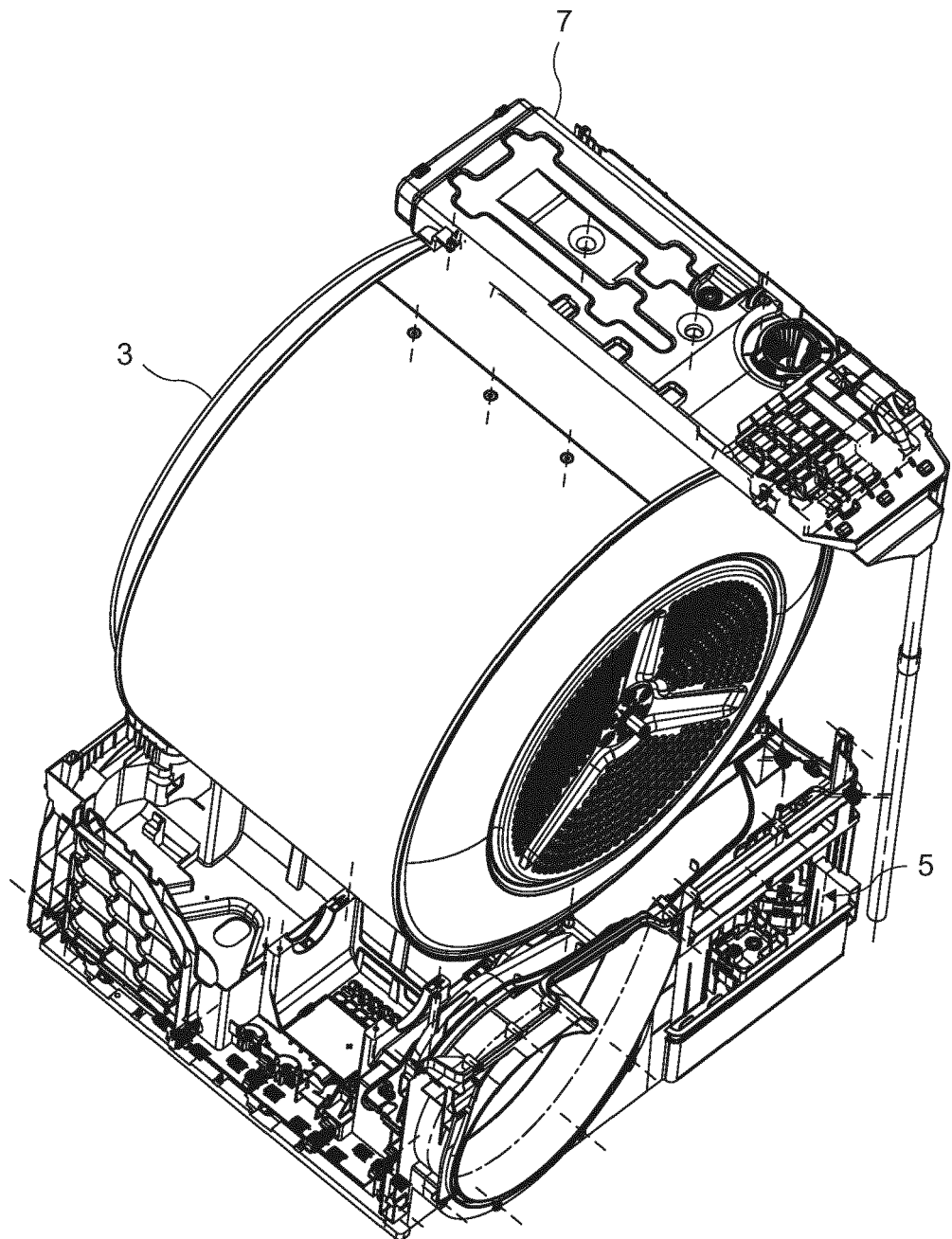


Figure 3

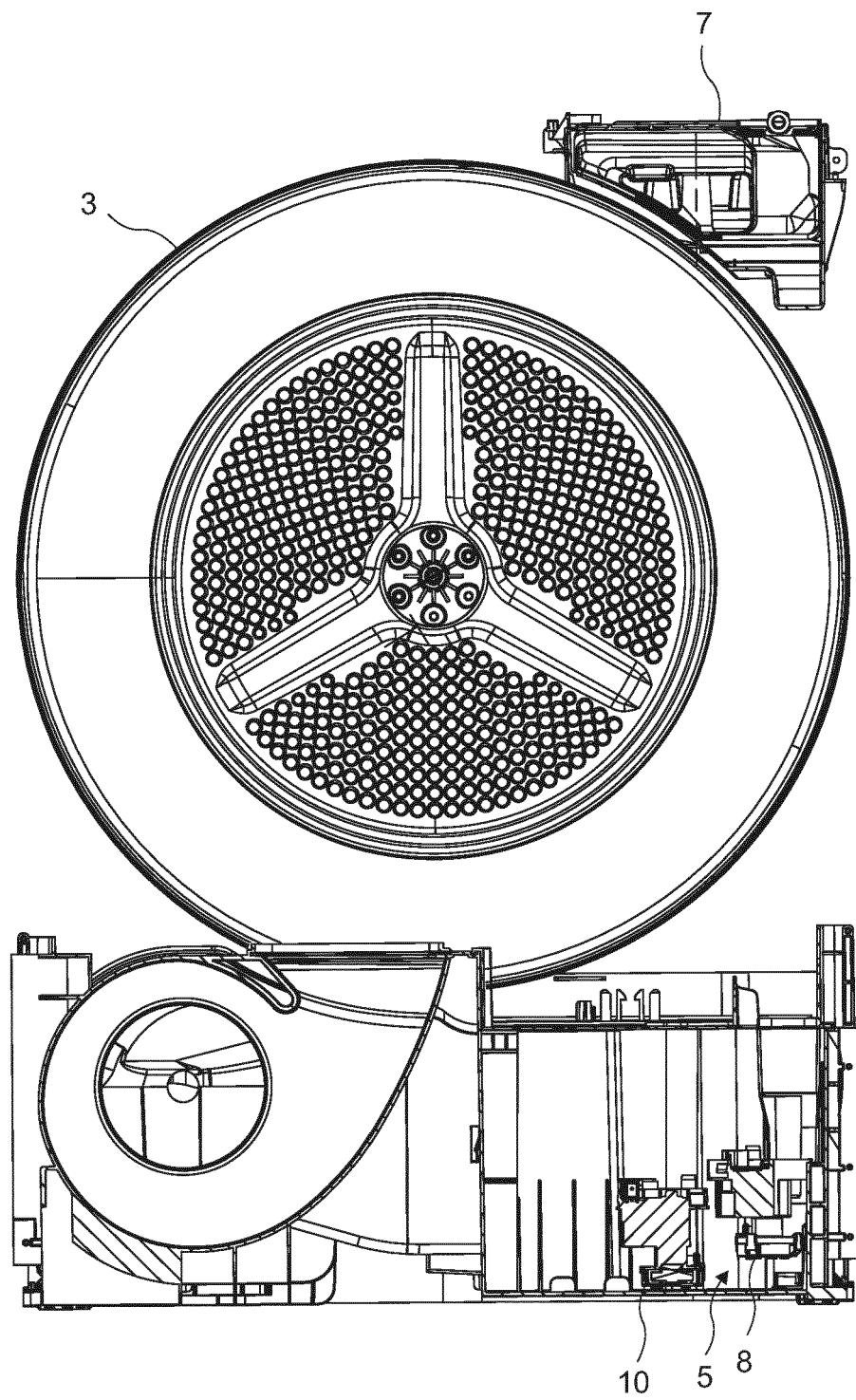


Figure 4

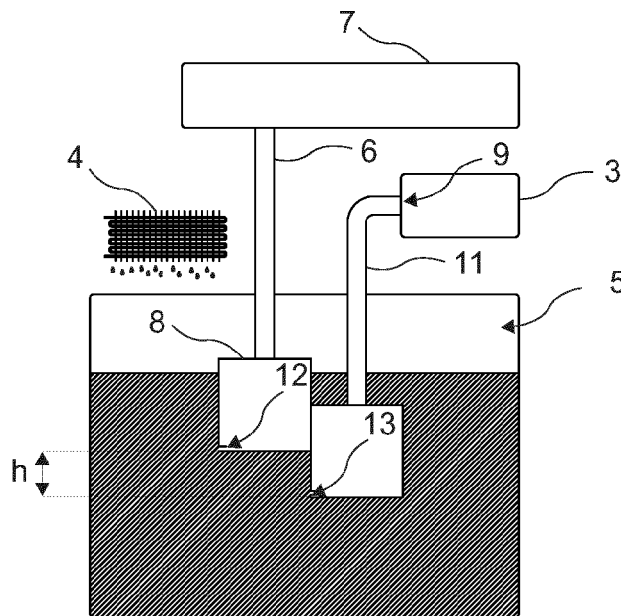


Figure 5

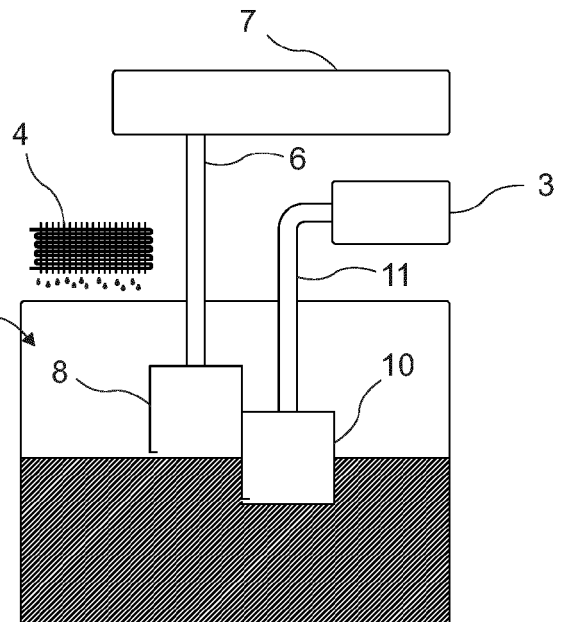
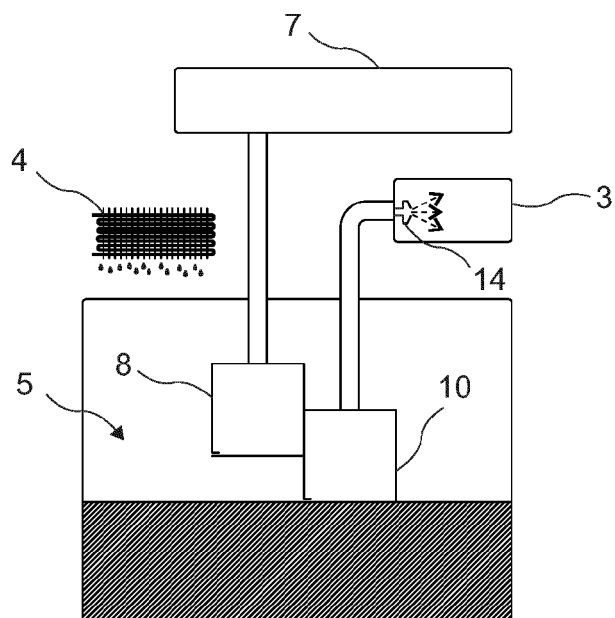


Figure 6





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Place of search Munich		Date of completion of the search 11 April 2024	Examiner Sabatucci, Arianna
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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