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(54) A LAUNDRY DRYING APPLIANCE

(57) A laundry drying machine is provided, including a drying chamber (2) and an air heating channel (3) in fluid communication with the drying chamber. A heating apparatus (5) is disposed in the air heating channel (3); a liquid flow-through apparatus (6; 61; 62; 63) is disposed close to or surrounding the heating apparatus, and an input channel (7) and an output channel (8) are connected to the liquid flow-through apparatus (6; 61; 62; 63). A fluid is heated by the heating apparatus (5) after entering the liquid flow-through apparatus (6; 61; 62; 63) from the input channel (7), and then flows out of the output channel (8), so that the heated liquid is obtained. When the liquid flow is relatively small, high-temperature steam after the liquid is evaporated may be obtained.

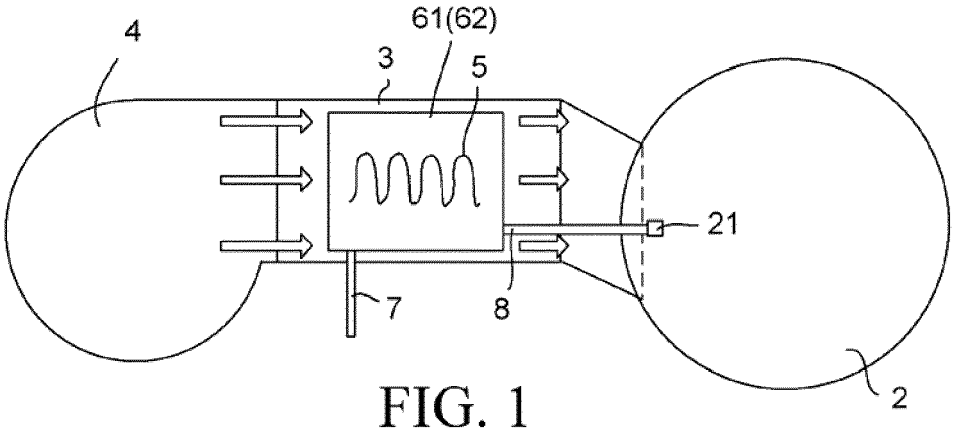

FIG. 1

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Description

[0001] The present invention relates to a laundry drying machine, including a drying chamber and an air heating channel in fluid communication with the drying chamber, where a heating apparatus is disposed in the air heating channel.

[0002] A laundry drying machine usually includes a drying chamber. An air heating channel is in fluid communication with the drying chamber. A heating apparatus is disposed in the air heating channel, so as to provide heated air to the drying chamber, by circulating through the air heating channel and the drying chamber.

[0003] An objective of the present invention is to enable a laundry drying machine to be suitable for heating a liquid or converting water into high-temperature steam.

[0004] To achieve the foregoing objective, the present invention provides a laundry drying machine as defined in the independent claim. Preferred and facultative embodiments of the invention are defined in respective dependent claims, described in the subsequent description or exhibited in the figures of the attached drawing.

[0005] To achieve the foregoing objective, the present invention accordingly provides a laundry drying machine, including a drying chamber and an air heating channel in fluid communication with the drying chamber. A heating apparatus is disposed in the air heating channel; a liquid flow-through apparatus is disposed close to or surrounding the heating apparatus, and an input channel and an output channel are connected to the liquid flow-through apparatus.

[0006] The laundry drying machine may be simply a laundry drying machine, or a washing and drying machine integrated with washing and drying functions.

[0007] A fluid is heated by the heating apparatus after entering the liquid flow-through apparatus from the input channel, and then flows out of the output channel, so that the heated liquid or steam is obtained. When the liquid flow is relatively small, high-temperature steam after the liquid is evaporated may be obtained. The heated liquid or high-temperature steam may be designed to be conveyed to a suitable part of the laundry drying machine, so as to perform cleaning, sterilization, laundry wrinkle elimination, and the like. In addition, transformation on a prior art laundry drying machine is small.

[0008] Preferably, the liquid flow-through apparatus is a curved-shaped pipe that has a shape similar to that of the heating apparatus and at least partially extends therealong. In general, the liquid flow-through apparatus designed in this way is closer to the heating apparatus, to facilitate heat transfer.

[0009] Preferably, the liquid flow-through apparatus is a plate-shaped structure with an open top, and the heating apparatus is located in the plate-shaped structure, or is located above or below the plate-shaped structure.

[0010] Preferably, the liquid flow-through apparatus is a water tank with a closed top, and the heating apparatus is located in the water tank, or is located above or below the water tank.

[0011] Preferably, a fan that blows air to the drying chamber is connected to the air heating channel, and an outlet of the output channel is located in the air heating channel. Then, the liquid that flows out of the output channel directly falls on the bottom of the air heating channel, to form a high-temperature water film. Air under the effect of the fan drives heat dissipation of the heating apparatus, to make the high-temperature water film quickly evaporated into steam, and blown into the drying chamber.

[0012] Preferably, a hydrophilic coating is covered on an inner surface of the bottom of the air heating channel. The hydrophilic coating facilitates the high-temperature liquid to form a water film with a larger surface area and a smaller thickness on an inner surface of the drying chamber.

[0013] Preferably, a nozzle that converts a liquid into water mist is disposed on a tail end of the output channel.

[0014] Preferred and facultative embodiments of the present invention will be further described below by using a washing and drying machine as an example with reference to the accompanying drawing. The disclosure will become more fully understood from the detailed description given hereinbelow for illustration only, and thus not limitative of the disclosure. In the drawing:

FIG. 1 is a partial schematic diagram of a washing and drying machine according to a first implementation;

FIG. 2 is a partial schematic diagram of a washing and drying machine according to a second implementation;

FIG. 3 is a partial schematic diagram of a washing and drying machine according to a third implementation;

FIG. 4 is a partial schematic diagram of a washing and drying machine according to a fourth implementation;

FIG. 5 is a partial schematic diagram of a washing and drying machine according to a fifth implementation; and

FIG. 6 is a schematic diagram of connection of a control system of a washing and drying machine.

[0015] As shown in FIG. 1, a washing and drying machine includes a processing chamber 2 for accommodating laundry, and an air heating channel 3 in fluid communication with the processing chamber 2. A fan 4 is disposed upstream of the air heating channel 3, to promote air to enter the processing chamber 2 from the air heating channel 3. A heating apparatus 5 is disposed in the air heating channel 3, to heat air that flows through the air heating channel 3. A liquid flow-through apparatus 6 is

disposed in close proximity to the heating apparatus 5. The liquid flow-through apparatus 6 is connected to an input channel 7 and an output channel 8. A liquid, mainly water or washing water formed by mixing water and detergent, enters the liquid flow-through apparatus 6 from the input channel 7, and then is heated because the liquid is close to the heating apparatus 5. Then the liquid is output from the output channel 8 into the processing chamber 2.

[0016] The liquid flow-through apparatus 6 is constructed into a shape suitable for flowing of the liquid therein.

[0017] For example, in the implementation shown in FIG. 1, the liquid flow-through apparatus 6 is a plate-shaped structure 61 with an open top, and the heating apparatus 5 is located in the plate-shaped structure 61. In other alternative implementations, the heating apparatus 5 may alternatively be located above or below the plate-shaped structure 61. In other alternative implementations, the liquid flow-through apparatus 6 is a water tank 62 with a closed top, and the heating apparatus 5 is located in the water tank 62 or located above or below the water tank 62.

[0018] The difference between the plate-shaped structure 61 and the water tank 62 may lie only in whether the top is open or closed, and it can be seen from top-view projection images that the plate-shaped structure 61 is relatively similar to the water tank 62. Therefore, the liquid flow-through apparatus 6 in the form of the plate-shaped structure 61 and the water tank 62 is represented by using a same mechanism in FIG. 1. A person skilled in the art can clearly determine content of the foregoing implementation with reference to the specification and the accompanying drawings.

[0019] In the implementation shown in FIG. 2, a liquid flow-through apparatus 63 is an extending curved-shaped pipe 63 that has a shape similar to that of a heating apparatus 5. The liquid flow-through apparatus 63 is adjacent to the heating apparatus 5 and is closer to a heat source, and therefore can absorb more heat, so that a liquid therein can be quickly heated.

[0020] In the implementation shown in FIG. 3, an outlet of an output channel 8 is located in an air heating channel 3. Then, a liquid flowing out of the output channel 8 directly falls onto the bottom of the air heating channel 3. A hydrophilic coating 20 is covered on an inner surface of the bottom of the air heating channel 3. Then, the high-temperature liquid expands on the inner surface of the bottom of the air heating channel 3 to form a water film. When being further heated by a heating apparatus 5, the water film can be vaporized to generate steam into a processing chamber 2. When a fan 4 is started, hot air quickly evaporates the liquid on a surface of the water film to form a large amount of steam.

[0021] If high-temperature water mist is generated for objectives such as cleaning and sterilization, in some implementations, a nozzle 21 that converts a liquid into water mist may be disposed on a tail end of the output channel 8. The nozzle 21 may be disposed on the output channel 8 in the foregoing various implementations.

[0022] Alternatively, an input channel 7 may be enabled to input a relatively small amount of liquid within unit time, and the heating apparatus 5 may be enabled to generate a relatively high temperature, so that the liquid is evaporated under the effect of high temperature to generate steam. A water valve 9 controlled by a control apparatus 10 is disposed on the input channel 7, as shown in FIG. 5, or a circulation pump 11 is disposed as shown in FIG. 4. An input end of the circulation pump 11 is connected to the processing chamber 2, so as to pump the liquid in the processing chamber 2 into the liquid flow-through apparatus 6.

[0023] The processing chamber 2 mentioned above not only can be used as a drying chamber, but also can be used as a washing chamber.

[0024] A high-temperature liquid or a high-temperature liquid-vapor mixture output in the output channel 8 can be conveyed to a suitable part according to a design requirement.

[0025] As shown in FIG. 4, an output channel 8 is connected to a door gasket 12. An outlet 81 of the output channel 8 is close to the bottom of the door gasket 12, and a washing liquid and foam easily accumulate on this part, and consequently a bacterial film is formed. A high-temperature liquid or high-temperature liquid-vapor mixture output by the output channel 8 can rinse the part, to prevent generation of a bacterial film and keep clean. Subsequently, the high-temperature liquid flows into the processing chamber 2 to participate in washing laundry.

[0026] Alternatively, the output channel 8 may be directly connected to the processing chamber 2, in particular, on a rear part, on which dirt easily accumulates, of the processing chamber 2, so that not only the part can be kept clean, but also the high-temperature liquid can subsequently participate in washing laundry.

[0027] In addition, as shown in FIG. 5, in other implementations, the output channel 8 may further be connected to a detergent dispenser 13 and/or a condensation channel 14, so as to perform cleaning, sterilization, mildew prevention, and the like.

[0028] The output channel 8 may be connected to a single component in the foregoing implementations, or may include multiple pipes to be connected to multiple components.

[0029] As shown in FIG. 6, a control apparatus 10 is connected to a fan 4, a heating apparatus 5, and a water valve 9 or a circulation pump 11. The temperature of a liquid or a water-vapor mixture output by an output channel 8 can be adjusted by adjusting the power or on/off rhythm of the heating apparatus 5, the rotation speed of the fan 4, and/or the on/off rhythm of the water valve 9 or circulation pump 11 by using the control apparatus 10. By adjusting the rotation speed of the fan 4, a ratio of heat of the heating apparatus 5 transferred to the liquid to air can be adjusted. By reducing the rotation speed of the fan 4, the air flow can be reduced, so that heat trans-

ferred to air is reduced. Then, the temperature of the liquid or water-vapor mixture discharged by the output channel 8 can be increased. In particular, when the fan 4 is switched off, air in the air heating channel 3 performs natural convection. After air reaches a particular temperature, most heat of the heating apparatus 5 is used to heat the liquid in the liquid flow-through apparatus 6.

[0030] The control apparatus 10 further controls a washing program. The washing program includes a main washing phase, a rinsing phase, and a spin-drying phase. Before the main washing phase of the washing program, the heating apparatus 5 and the water valve 9 are first started. Water is heated by the heating apparatus 5 after entering the liquid flow-through apparatus 6 from an input channel 7, and then is output into a processing chamber 2 from the output channel 8. High-temperature water or a liquid-vapor mixture may be output into the processing chamber 2. Preferably, the control apparatus 10 simultaneously starts the fan 4, so that the air heating channel 3 outputs heated air to the processing chamber 2 when the output channel 8 outputs the heated water or liquid-vapor mixture to the processing chamber 2. High-temperature air, water, liquid-vapor mixture, and the like entering the processing chamber 2 come into contact with laundry to heat and sterilize the laundry. Because the laundry is in a relatively dry state at the moment, the laundry can quickly reach a relatively high temperature, so as to kill bacteria in the laundry. Moreover, damage such as fading and shrinkage of laundry is reduced when heating is performed in a dry state. Laundry that enters the subsequent main washing phase after the sterilization is completed is more hygienic. Moreover, the laundry is already in a high-temperature state at the moment, and the activity of detergent in the subsequent main washing phase is improved. In addition, the high-temperature water or liquid-vapor mixture entering the processing chamber 2 from the output channel 8 is also used in the subsequent main washing phase.

[0031] In addition, the heating apparatus 5 and the water valve 9 may also be in a started state in the main washing phase and/or the rinsing phase. For example, the heating apparatus 5 and the water pump 9 may also be started in an initial part of the main washing phase. When the input channel 7 is connected to the circulation pump 11, the heating apparatus 5 and the circulation pump 11 are started in the main washing phase and/or rinsing phase. Then the washing liquid in the processing chamber 2 is circularly heated, and can clean and sterilize a detergent dispenser 13, a door gasket 12, and a condensation channel 14 before entering the processing chamber 2.

Claims

1. A laundry drying machine, comprising a drying chamber (2) and an air heating channel (3) in fluid communication with the drying chamber; a heating apparatus (5) being disposed in the air heating channel, **characterized in that:** a liquid flow-through apparatus (6, 61, 62, 63) is disposed close to or surrounding the heating apparatus, and an input channel (7) and an output channel (8) are connected to the liquid flow-through apparatus (6, 61, 62, 63).

2. The laundry drying machine according to claim 1, **characterized in that**: the liquid flow-through apparatus is a curved-shaped pipe (63) that has a shape similar to that of the heating apparatus and at least partially extends therealong.

3. The laundry drying machine according to claim 1, **characterized in that**: the liquid flow-through apparatus is a plate-shaped structure (61) with an open top, and the heating apparatus is located in the plate-shaped structure, or is located above or below the plate-shaped structure.

4. The laundry drying machine according to claim 1, **characterized in that**: the liquid flow-through apparatus is a water tank (62) with a closed top, and the heating apparatus is located in the water tank, or is located above or below the water tank.

5. The laundry drying machine according to claim 1, **characterized in that**: a fan (4) that blows air to the drying chamber is connected to the air heating channel, and an outlet of the output channel is located in the air heating channel.

6. The laundry drying machine according to claim 5, **characterized in that**: a hydrophilic coating (20) is covered on an inner surface of the bottom of the air heating channel.

7. The laundry drying machine according to claim 1, **characterized in that**: a nozzle (21) that converts a liquid into water mist is disposed on a tail end of the output channel.

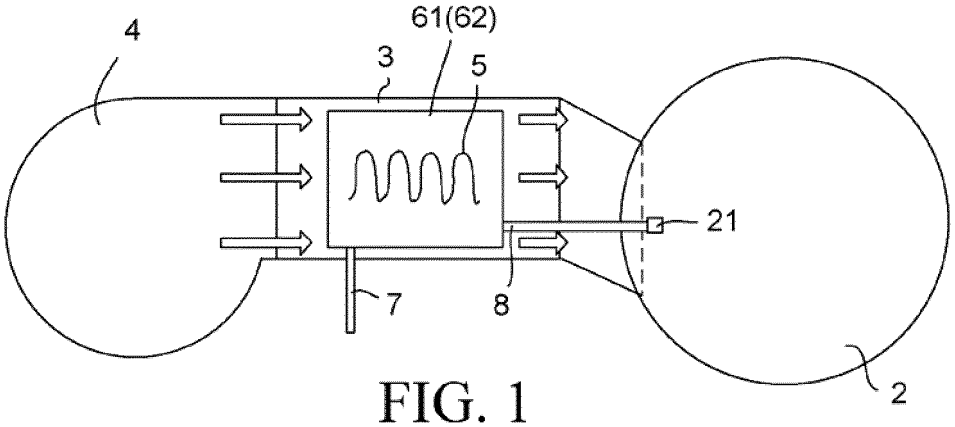

FIG. 1

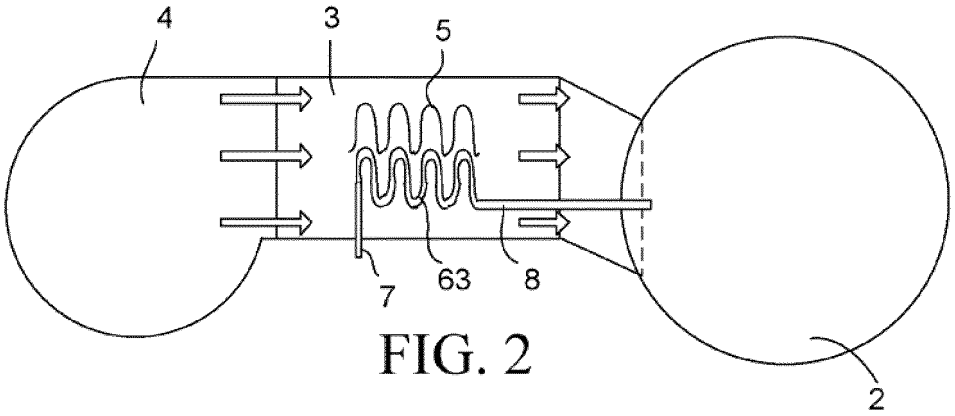

FIG. 2

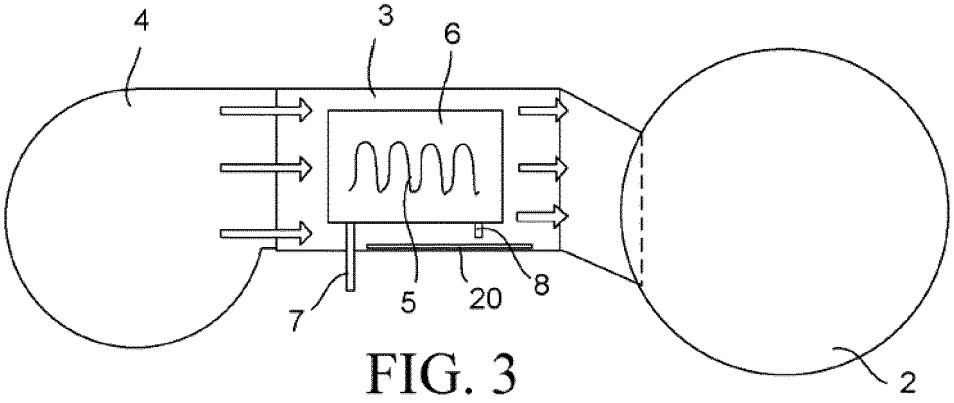

FIG. 3

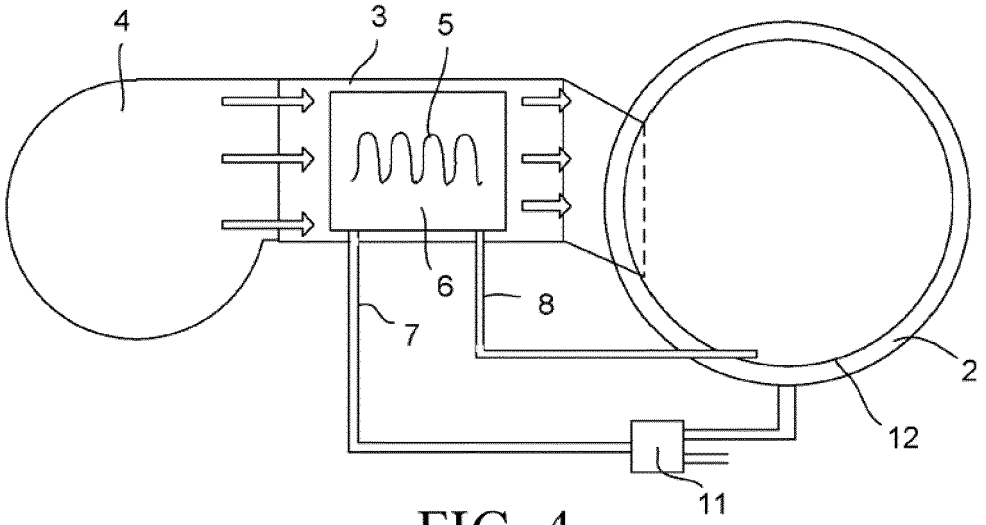

FIG. 4

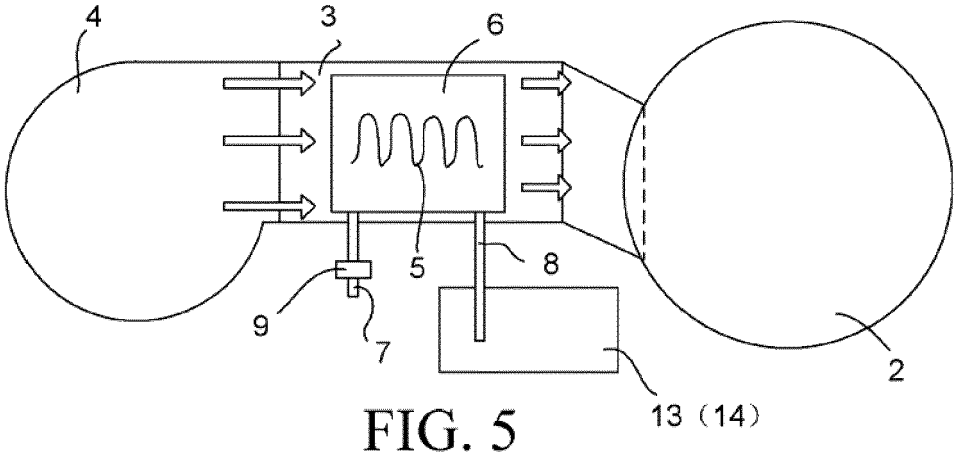

FIG. 5

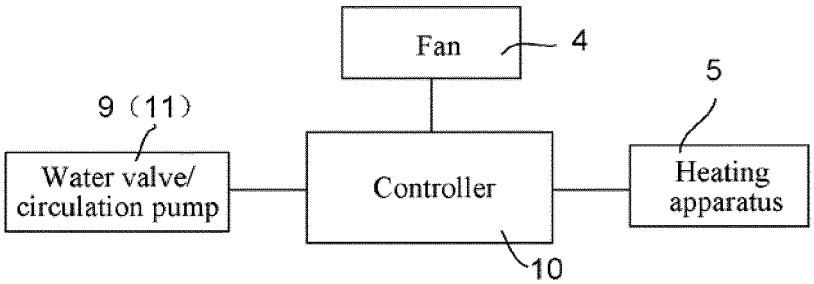

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 7782

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 March 2018	Weinberg, Ekkehard

CATEGORY OF CITED DOCUMENTS

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