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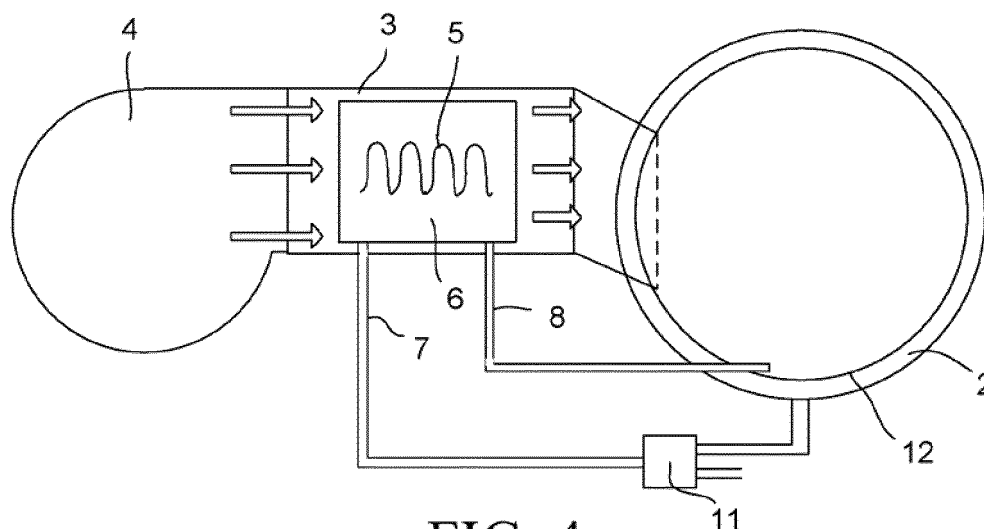
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(54) **CONTROL METHOD OF A LAUNDRY WASHER-DRYER**

(57) A method for controlling a washing and drying machine is provided. The washing and drying machine includes a processing chamber (2) and an air heating channel (3) in fluid communication with the processing chamber (2). 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 (5); an input channel (7) and an output channel (8) are connected to the liquid flow-through apparatus (6, 61, 62, 63); a liquid control apparatus (9, 11) is disposed on the input channel (7); a control apparatus

(10) is electrically connected to the heating apparatus (5) and the liquid control apparatus (9, 11) and controls a washing procedure; and the washing procedure includes starting the heating apparatus (5) and the liquid control apparatus (9, 11), so that the output channel (8) outputs a heated liquid or liquid-vapor mixture to the processing chamber (2). The liquid or generated liquid-vapor mixture heated by the heating apparatus (5) in the air heating channel (3) can heat laundry in the processing chamber (2) after entering the processing chamber (2), so as to perform sterilization.



**FIG. 4**

## Description

**[0001]** The present invention relates to a method for controlling a washing and drying machine, and in particular, to heating and sterilizing water in a washing procedure.

**[0002]** A washing and drying machine usually includes a processing chamber, and an air heating channel in fluid communication with the processing chamber, for circulating an air flow through the air heating channel and the processing chamber. A heating apparatus is disposed in the air heating channel for heating air supplied to the processing chamber in a drying procedure.

**[0003]** To enhance the activity of detergent in a washing liquid and improve the washing efficiency in the washing process of the washing and drying machine, and to achieve the objective of sterilization, the washing liquid is usually heated. Such heating is usually implemented by a heater disposed at the bottom of the processing chamber. The heater is immersed in the washing liquid in the washing process. Because the amount of the washing liquid, that is, a mixed solution of water and detergent, is relatively large, the heating speed is relatively slow, and a relatively large amount of energy is consumed. If steam needs to be introduced in the washing process, an additional steam device is needed.

**[0004]** An objective of the present invention is to provide a method for controlling a washing and drying machine, so as to perform a high-temperature sterilization operation on laundry in a washing procedure with relatively low energy consumption and relatively high efficiency.

**[0005]** To achieve the foregoing objective, the present invention provides a method for controlling a washing and drying machine as defined in the independent claim attached. 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.

**[0006]** To achieve the foregoing objective, the present invention accordingly provides a method for controlling a washing and drying machine, where the washing and drying machine includes a processing chamber and an air heating channel in fluid communication with the processing 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; an input channel and an output channel are connected to the liquid flow-through apparatus; a liquid control apparatus is disposed on the input channel; a control apparatus is electrically connected to the heating apparatus and the liquid control apparatus and controls a washing procedure; and the washing procedure includes starting the heating apparatus and the liquid control apparatus, so that the output channel outputs a heated liquid or liquid-vapor mixture to the processing chamber.

**[0007]** The liquid heated by or liquid-vapor mixture generated by the heating apparatus in the air heating

channel can heat laundry in the processing chamber after entering the processing chamber, so as to perform sterilization. The liquid or liquid-vapor mixture easily has relatively high temperature, and the sterilization effect is relatively good. Moreover, the liquid or liquid-vapor mixture immerses laundry in the processing chamber after entering the processing chamber, and can be used as washing water or rinsing water. Because the washing water or rinsing water has relatively high temperature, higher efficiency, higher energy conservation, and higher water conservation can be achieved. Because the heating apparatus in the air heating channel can heat the washing water, and even the need for a water heating apparatus usually disposed at the bottom of the processing chamber can be avoided, the costs and space are reduced.

**[0008]** Preferably, the washing and drying machine includes a fan that blows air from the air heating channel to the processing chamber, and the washing procedure includes starting the fan by a control apparatus, so that the air heating channel outputs heated air to the processing chamber when the output channel outputs the heated liquid or liquid-vapor mixture to the processing chamber. Air enters the processing chamber after being heated by the heating apparatus, and can heat laundry in the processing chamber. Because hot air is located in the space of the entire processing chamber, the laundry is heated more fully and quickly, so that the sterilization and washing effects are improved more obviously.

**[0009]** Preferably, the output channel is connected to at least one of a detergent dispenser, a door gasket, or a condensation channel, so as to be in communication with the processing chamber, or directly connected to the processing chamber. When the output channel is connected to at least one of the detergent dispenser, the door gasket, or the condensation channel, the high-temperature liquid or liquid-vapor mixture output by the output channel cleans and sterilizes at least one of the detergent dispenser, the door gasket, or the condensation channel before entering the processing chamber for heating and washing laundry.

**[0010]** Preferably, the liquid control apparatus includes a circulation pump, and an input end of the circulation pump is connected to the processing chamber. In this way, the washing liquid in the processing chamber can be repeatedly heated.

**[0011]** Preferably, a nozzle that converts a liquid into a liquid-vapor mixture is disposed on a tail end of the output channel. The high-temperature liquid-vapor mixture diffuses in the space within the entire processing chamber after entering the processing chamber, and quickly and uniformly wets and heats the laundry.

**[0012]** Preferably, the control apparatus controls an on/off rhythm of the liquid control apparatus, so as to adjust the temperature of the liquid or liquid-vapor mixture output by the output channel.

**[0013]** Preferably, the washing procedure includes a main washing phase, a rinsing phase, and a spin-drying

phase, where the heating apparatus and the liquid control apparatus are in a started state at least in the main washing phase.

**[0014]** Preferably, the washing procedure includes a main washing phase, a rinsing phase, and a spin-drying phase, where the step of starting the heating apparatus and the liquid control apparatus is prior to the main washing phase or in an initial part of the main washing phase.

**[0015]** The present invention will be further described below 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.

**[0016]** 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. A fan 4 is disposed upstream of the air heating channel 3, to blow 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 close 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.

**[0017]** The liquid flow-through apparatus 6 is constructed into a shape suitable for flowing of the liquid therein.

**[0018]** 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.

**[0019]** 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.

**[0020]** 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.

**[0021]** 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.

**[0022]** 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.

**[0023]** Alternatively, an input channel 7 may be enabled to input a relatively small amount of liquid within a 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.

[0024] The processing chamber 2 mentioned above not only can be used as a drying chamber, but also can be used as a washing chamber.

[0025] 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.

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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 transferred 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.

[0031] The control apparatus 10 further controls a washing procedure. The washing procedure includes a main washing phase, a rinsing phase, and a spin-drying phase. Before the main washing phase of the washing procedure, the heating apparatus 5 and the water valve 9 are first started. Water is heated by the heating appa-

ratus 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, damages such as fading and shrinkage of laundry are reduced when heating is performed in a dry state. Laundry that enters the subsequent main washing phase after the sterilization is completed are 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.

[0032] 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.

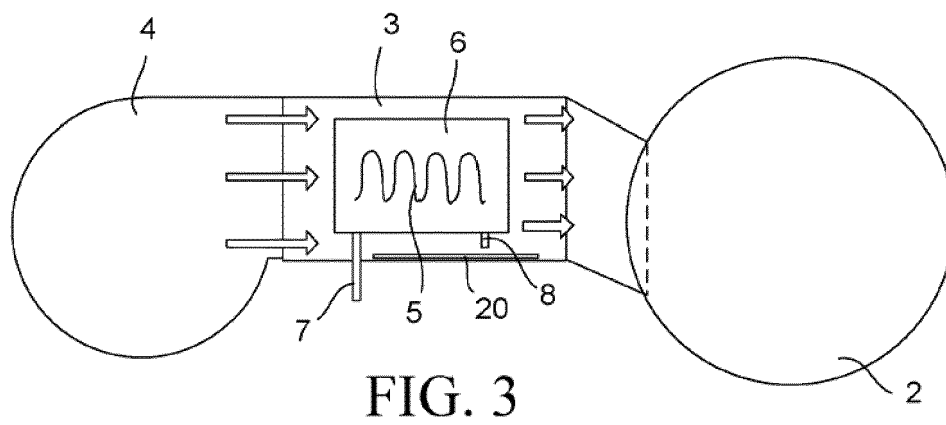
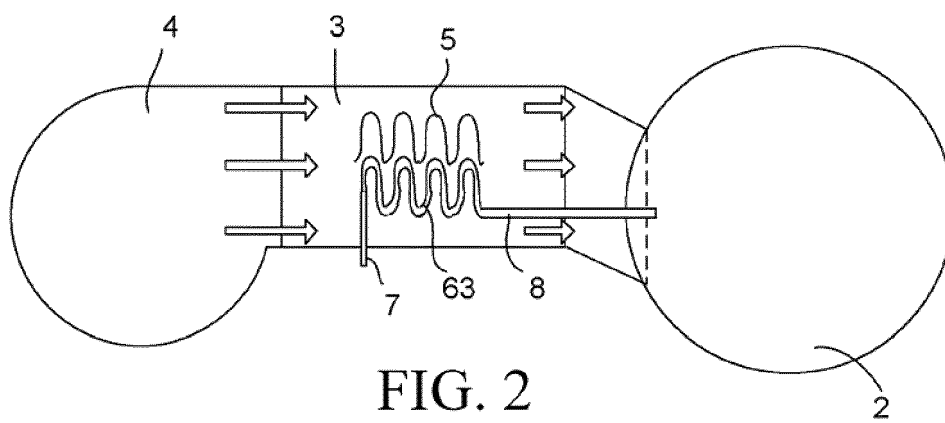
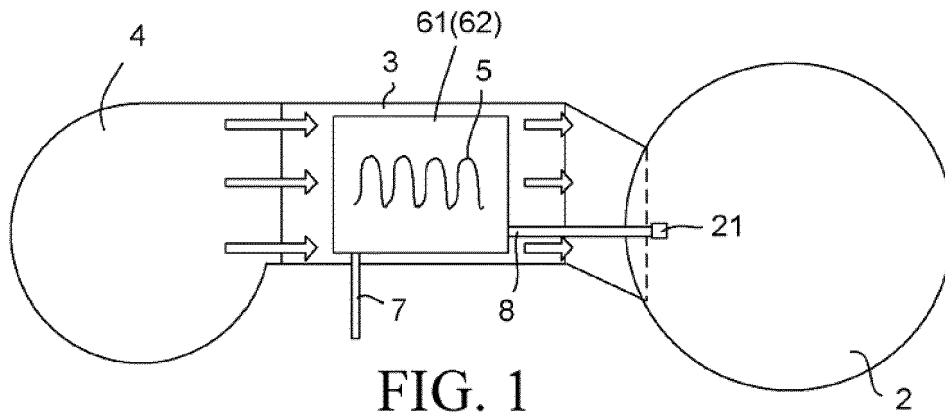
## Claims

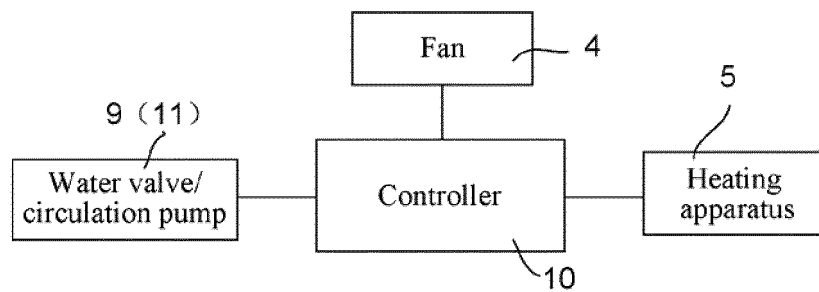
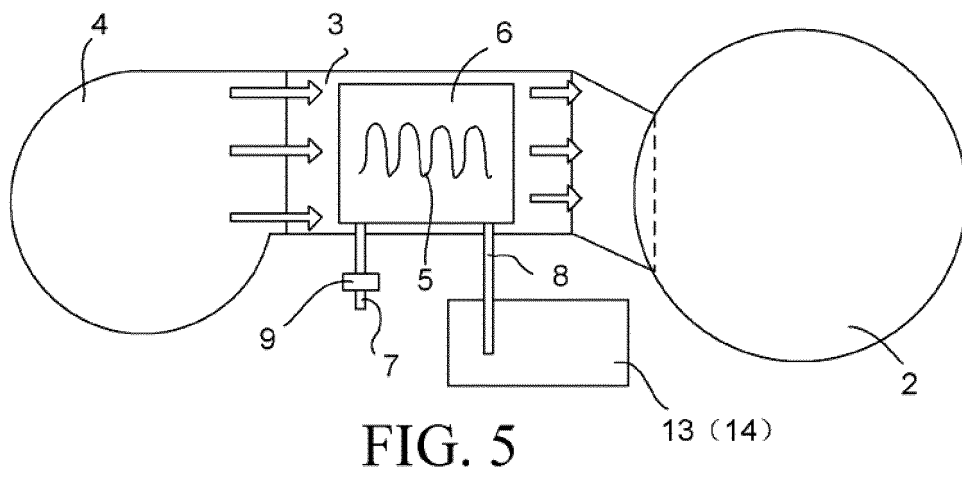
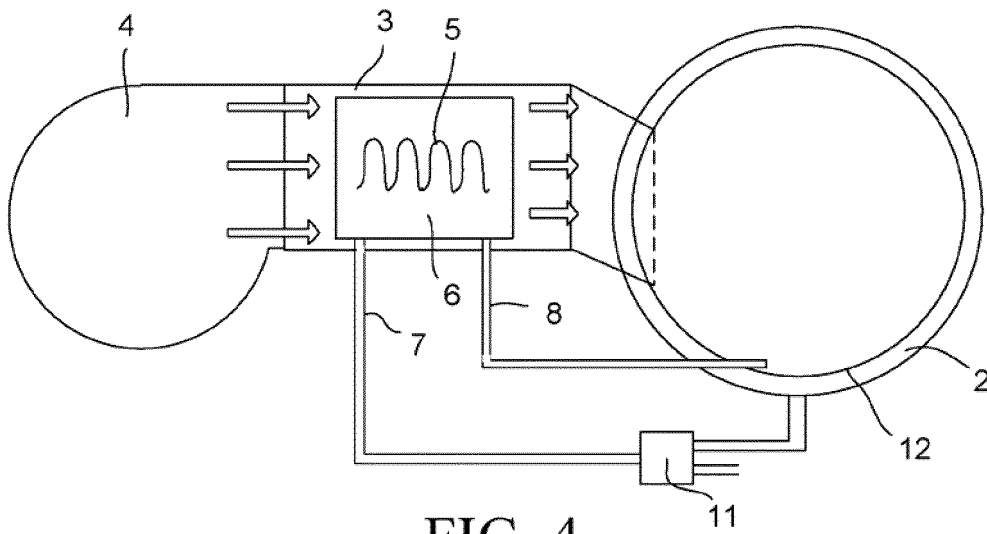
1. A method for controlling a washing and drying machine, wherein the washing and drying machine comprises a processing chamber (2) and an air heating channel (3) in fluid communication with the processing chamber; a heating apparatus (5) is disposed in the air heating channel; a liquid flow-through apparatus (6, 61, 62, 63) is disposed close to or surrounding the heating apparatus; an input channel (7) and an output channel (8) are connected to the liquid flow-through apparatus; a liquid control apparatus (9, 11) is disposed on the input channel; and a control apparatus (10) is electrically connected to the heating apparatus (5) and the liquid control apparatus (9, 11) and controls a washing procedure, **characterized in that:** the washing procedure comprises starting the heating apparatus and the liquid

control apparatus, so that the output channel outputs a heated liquid or liquid-vapor mixture to the processing chamber.

2. The control method according to claim 1, **characterized in that:** the washing and drying machine comprises a fan (4) that blows air from the air heating channel to the processing chamber, and the washing procedure comprises starting the fan by a control apparatus, so that the air heating channel outputs heated air to the processing chamber simultaneously when the output channel outputs the heated liquid or liquid-vapor mixture to the processing chamber. 5  
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3. The control method according to claim 1, **characterized in that:** the output channel is connected to at least one of a detergent dispenser (13), a door gasket (12), or a condensation channel (14), and then be in communication with the processing chamber, or directly connected to the processing chamber. 15  
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4. The control method according to claim 1, **characterized in that:** the liquid control apparatus comprises a circulation pump (11), and an input end of the circulation pump is connected to the processing chamber. 25
5. The control method according to claim 1, **characterized in that:** a nozzle (21) that converts liquid into liquid-vapor mixture is disposed on a tail end of the output channel. 30
6. The control method according to claim 1, **characterized in that:** the control apparatus (10) controls an on/off rhythm of the liquid control apparatus (9, 11), so as to adjust the temperature of the liquid or liquid-vapor mixture output by the output channel. 35
7. The control method according to claim 1, **characterized in that:** the washing procedure comprises a main washing phase, a rinsing phase, and a spin-drying phase, wherein the heating apparatus and the liquid control apparatus are in a started state at least in the main washing phase. 40  
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8. The control method according to claim 1, **characterized in that:** the washing procedure comprises a main washing phase, a rinsing phase, and a spin-drying phase, wherein the step of starting the heating apparatus and the liquid control apparatus is prior to the main washing phase or in an initial part of the main washing phase. 50

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## EUROPEAN SEARCH REPORT

Application Number  
EP 17 19 7770

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                            |                                                         |                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                              | Relevant to claim                                       | CLASSIFICATION OF THE APPLICATION (IPC)     |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EP 1 992 730 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 19 November 2008 (2008-11-19)                                                                                            | 1-3,5-8                                                 | INV.<br>D06F58/20<br>D06F58/28<br>D06F39/00 |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | * paragraphs [0010] - [0026] *<br>* paragraphs [0041] - [0054] *<br>* paragraphs [0058] - [0064] *<br>* figures 1-12 *                                                     | 4                                                       | ADD.<br>D06F58/26<br>D06F25/00              |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -----<br>KR 2009 0030128 A (SAMSUNG ELECTRONICS CO LTD [KR]) 24 March 2009 (2009-03-24)<br>* paragraphs [0032] - [0071] *<br>* figures 1-7 *                               | 1-3                                                     |                                             |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -----<br>US 2004/237603 A1 (KIM JIN WOONG [KR] ET AL) 2 December 2004 (2004-12-02)<br>* paragraphs [0023] - [0032] *<br>* paragraphs [0096] - [0099] *<br>* figures 1-10 * | 4                                                       |                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -----                                                                                                                                                                      |                                                         |                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                            |                                                         | TECHNICAL FIELDS SEARCHED (IPC)             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                            |                                                         | D06F                                        |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                            |                                                         |                                             |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                            | Date of completion of the search<br><b>5 March 2018</b> | Examiner<br><b>Weinberg, Ekkehard</b>       |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                                            |                                                         |                                             |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 19 7770

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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05-03-2018

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| EP 1992730 A1                             | 19-11-2008          | CN 101307547 A             | 19-11-2008          |
|                                           |                     | EP 1992730 A1              | 19-11-2008          |
|                                           |                     | KR 20080101128 A           | 21-11-2008          |
|                                           |                     | US 2008282750 A1           | 20-11-2008          |
| -----                                     |                     |                            |                     |
| KR 20090030128 A                          | 24-03-2009          | CN 101392447 A             | 25-03-2009          |
|                                           |                     | KR 20090030128 A           | 24-03-2009          |
| -----                                     |                     |                            |                     |
| US 2004237603 A1                          | 02-12-2004          | CN 1537996 A               | 20-10-2004          |
|                                           |                     | US 2004237603 A1           | 02-12-2004          |
|                                           |                     | US 2007107472 A1           | 17-05-2007          |
| -----                                     |                     |                            |                     |