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(54) **An induction heating system**

(57) In the device (A) developed by present invention, a heating coil (1) is formed by a conductive material coiled around the tank (1) provided in the device (A). Said heating coil (4) is powered by the driver unit (7) and the powered heating coil (4) creates an electromagnetic field within the tank (1). Electromagnetic field, which is creat-

ed, causes current inducing in the spinning tube (2) provided in the tank (1) and the spinning tube (2) is heated. In the device (A) developed by present invention, a single heating coil (4) is provided instead of heating systems known from prior art and thus, a device (A) which comprises an efficient and safety heating system is obtained.

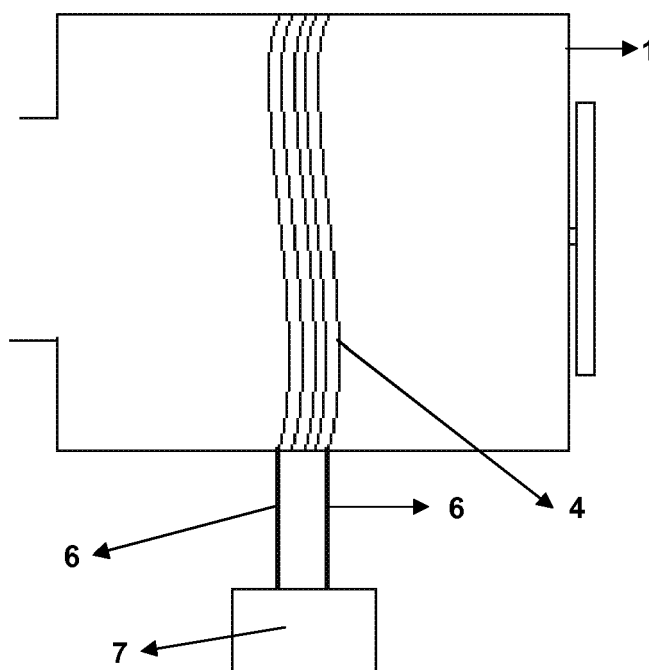


Figure 3

Description**Technical Field**

5 **[0001]** The present invention relates to washer and/or dryer devices in which the induction heating system is used in order to heat the water and/or air.

Prior Art

10 **[0002]** In washer and/or dryer devices, water and air are to be brought to optimal temperature and kept in that temperature during washing and drying respectively in order to ensure washing and/or drying to be effective.

[0003] In devices in prior art, conventional resistances to be used for processes of washing and drying are placed into the device. The resistances placed contact with water and/or air to be heated and transfer heat thereon to them.

15 **[0004]** There are various disadvantages of the heating systems used in devices in prior art. At least two resistances are to be used for heating process carried out with prior art. These resistances are to be in direct contact with water and/or air to be heated. Transfer efficiency of the systems of heating by resistances known from prior art is low. Moreover, in heating method by resistance known from prior art, since electrical insulation is required between water and/or air to be heated and the heated resistance, the efficiency of this heating system decreases much more. In addition, the resistances used in washer/dryer devices known from prior art may be affected by the foreign matters (for example, lime and heavy minerals in water) found at places where the resistances are used and their lifetime may be short due to this exposure.

20 **[0005]** Various embodiments are developed in order to solve the problems in state of the art. One of the embodiments developed for heating water and/or air in devices is an induction heating system disclosed in a patent document number US 4181846. Dryer device disclosed in said patent document comprises a spinning tube which is rotatably mounted in the device. In said system, an induction heating coil, which is in such a size and proximity that it can induce current in a part of the spinning tube within the device, is placed in the device. However, the system disclosed in said patent document can be life safety-threatening in case of possible electrical leakage since the induction heating coil is placed on the spinning tube.

25 **[0006]** In another patent document number JP 9094377 in state of the art, for the aim of solving this problem, an induction heating coil is placed at water inlet of the washer device and water coming from the inlet is heated by high-frequency induction. The invention disclosed in said document heats washing water of the device at inlet. However, it cannot provide a solution for keeping water hot in the tank.

30 **[0007]** In another patent document number JP2001070689 in prior art, a washer device, in which there are absorbing members holding water or releasing it into the spinning tube regarding temperature in the spinning tube and heating is carried out by an induction heating coil provided on one outer wall of the tank, is disclosed. By said system, when water temperature in the tank drops below a certain temperature, water in the tank is kept by said absorbing members and water in these absorbing members is heated by induction heating. By said system disclosed in said patent document, the induction heating system can be used in heating water in the tank. However, since the absorbing members are on stable temperature level for absorption and release of water, the washer cannot be operated in desired temperature.

35 **[0008]** In other patent document number JP2004135998, one dryer device, in which an alternative heating method is used, is mentioned. In said dryer device mentioned in said document, systems of infrared heating, induction heating and microwave heating placed within a definite distance to the spinning tube in the device are disclosed. In dryer device mentioned in said document, the spinning tube and accordingly air in the dryer spinning tube is heated by induction heating.

45 **Brief Disclosure of the Invention**

[0009] An induction heating system is used in washer and/or dryer device developed by present invention.

50 **[0010]** In the device developed by present invention, an induction heating coil is formed by coiling a conductive material around outer of at least one tank in the device. Induction heating coil formed outside of the tank is powered by at least one driver unit provided in the device. Operation of this driver unit is controlled by at least one control unit provided in the device. Powered induction heating coil ensures an electromagnetic field to be created within the tank. While the electromagnetic field created passes on at least one spinning tube provided in the tank, it induces current in this spinning tube. The induced current ensures said spinning tube to be heated. Thus, water and/or air in the tank are also heated. An electromagnetic shield can be placed around said induction heating coil in order to prevent electromagnetic field created by used heating coil from affecting the other parts in the device. Electromagnetic shield absorbs the electromagnetic field created outside of the tank and eliminates the effects of said electromagnetic field appearing outside part of the tank. Said electromagnetic shield may preferably comprise ferromagnetic materials.

55 **[0011]** By means of the device comprising induction heating system developed by present invention, a device com-

prising unique and efficient heating system is obtained instead of devices comprising many conventional resistances in prior art. The heating coil used in heating system is formed by coiling a conductive material around the tank and thus, said heating coil is prevented from contacting with water used in the device and the spinning tube provided in the tank. Thus, a device comprising a safety, efficient and effective heating system is obtained.

Objective of the Invention

[0012] An aim of present invention is to develop a washer and/or a dryer device comprising induction heating system.

[0013] Another aim of present invention is to develop a washer and/or a dryer device comprising a heating system which can be used both washing and drying.

[0014] A further aim of present invention is to develop a washer and/or a dryer device comprising a long-life and efficient heating system.

[0015] Still a further aim of the invention is to develop a washer and /or a dryer device comprising a safety induction heating system.

[0016] Yet a further aim of the invention is to prevent the electromagnetic field created by the induction heating system in a washer and/or a dryer device from affecting other parts of said device.

Brief Description of Drawings

[0017] An exemplary washer and/or a dryer device, in which an exemplary washer/dryer device of prior art and an induction heating system of the invention are used, is illustrated in annexed figures, and from these figures,

Figure 1 is the perspective view of the device known from prior art.

Figure 2 is front view of the device of the invention.

Figure 3 is side view of the tank provided in the device of the invention.

Figure 4 is side view of another embodiment of the tank provided in the device of the invention.

Figure 5 is the side view of the other embodiment of the tank provided in the device of the invention.

[0018] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

Washer and/or dryer device (prior art) (A')

Washer and/or dryer device (A)

Tank (1)

Spinning tube (2)

Washer Resistance (3)

Induction heating coil (4)

Cable (6)

Driver unit (7)

Electromagnetic shield (8)

Control unit (9)

Humidity sensor (10)

Air channel (11)

Fan (12)

Dryer resistance (13)

Condenser (14)

Heat Sensor (15)

Detailed Disclosure of the Invention

[0019] An example related to washer and/or dryer devices in state of art is shown in figure 1. For the aim of heating water to be used in washing process, the devices (A') in state of art comprise at least one resistance (3) which is provided between at least one tank (1) and at least one spinning tube (2) in the device (A'). There is another system for drying process in said washer/dryer devices (A'). In this system, there is provided a dryer resistance (13) in the device (A') for heating air.

[0020] This heating/drying system used in prior art comprises a complex structure consisting of many members. By present invention, a single induction heating system is used instead of two separate heating systems used in devices (A') in prior art and air and/or water is heated during both washing and drying. Induction heating system depends on a principle of current inducing on a material to be heated by magnetic field and heating efficiency herein is higher than efficiency in systems with conventional resistances.

[0021] An example of the system developed by present invention is given in figure 2. By means of the system developed by present invention, one heating coil (4) formed by coiling a conductive material around one tank (1) provided in the device (A) and at least one spinning tube (2), which is provided in the tank (1), accordingly water and/or air are heated. Said induction heating coil (4) is coiled around the tank (1) and thus, the heating coil (4) is prevented from contacting with any object in the tank (1) and with the spinning tube (2), thus, electrical safety can be provided. Moreover, since the heating coil (4) does not contact with any object or water in the tank (1), the heating coil (4) is not damaged as physically and lifetime of the heating system is extended. There are provided at least one driver unit (7) which is connected to heating coil (4) and at least one control unit (9) which controls this driver unit (7) placed in the device (A) for the aim of operating said induction heating system. Said control unit (9) sends signals to the driver unit (7) according to the values measured by at least one humidity sensor (10) and/or heat sensor (15) provided in the tank (1) and operates the induction heating system. The driver unit (7) is connected with the heating coil (4) coiled around the tank (1) via cables (6) and signals sent by the driver unit (7) are transmitted to heating coil (4) via cables (6). Signals transmitted to heating coil (4) ensure an electromagnetic field to be created by said heating coil (4). The electromagnetic created has effect on the spinning tube (2) and ensures current inducing on the spinning tube (2). Induced current heats up the spinning tube (2) and water and/or air in the spinning tube (2).

[0022] During washing process, the driver unit (7) powers the induction heating coil (4) after the command of the control unit (9) and the spinning tube (2) is heated by induction heating. Thus, the spinning tube (2) is heated and accordingly water in the spinning tube (2) is also heated. The temperature of water is measured by the heat sensor (15) connected to said control unit (9) and obtained data is transmitted to the control unit (9). The temperature of water reaches to desired degree, the control unit (9) stops the driver unit (7).

[0023] During the drying process, the spinning tube (2) is heated by the heating coil (4) and accordingly humid air within the spinning tube (2) is also heated. The temperature and humidity values of air within the tank (1) are continually measured by the heat sensor (15) and humidity sensor (10) connected to control unit (9). Temperature and/or humidity value of said air reaches to desired values; control unit (9) stops the driver unit (7).

[0024] In figure 3, an exemplary embodiment of the device (A), in which the induction heating system is used, is shown. In this embodiment, the heating coil (4) used for heating is coiled around the tank (1) on a tinier area than the depth of the tank (1). This limits the effective area used for heating of spinning tube (2) and ensures the magnetic field lines to be more orderly and thus, heating efficiency of said heating coil (4) is much higher.

[0025] In figure 4, another embodiment of the device (A), in which induction heating system is used, is shown. In this embodiment, the heating coil (4) is coiled around the tank (1) on a wider area than the area in the former embodiment. One heating coil (4), which is coiled on a wider area, causes much more heating coil material to be used and electromagnetic field lines to get disordered. However, since said heating coil (4) is coiled on a wider area, heating process becomes homogenous. The heating coil (4) is coiled throughout the depth of the tank (1) in order to make heating homogenous.

[0026] Magnetic field lines created by the heating coil (4) create a magnetic field not only inside of the tank (1) but also outside of the tank (1). At least one electromagnetic shield (8) is such formed outside of heating coil (4) that it surrounds the heating coil (4) in order to prevent electromagnetic field from affecting the other parts in the device (A). In figure 5, the tank (1) belonging to the device (A), the heating coil (4) coiled on the tank (1) and the electromagnetic shield (8) formed on the heating coil (4) are shown. Said electromagnetic shield (8) absorbs the electromagnetic field created outside of the tank (1) and this electromagnetic field is prevented from affecting the parts outside of the tank (1). Said electromagnetic shield (8) may preferably comprise ferromagnetic materials.

Claims

1. A washer and/or dryer device (A) comprising at least one tank (1) and at least one spinning tube (2) **characterized**

in that said device (A) comprises one induction heating coil (4) formed by coiling a conductive material around the tank (1).

5 **2.** A washer and/or dryer device (A) according to Claim 1 **characterized in that** it comprises at least one driver unit (7) which is connected to the induction heating coil (4) and powering this induction heating coil (4).

3. A washer and/or dryer device (A) according to Claim 2 **characterized in that** it comprises at least one control unit (9) which is connected to said driver unit (7) and controls the operation of said driver unit (7).

10 **4.** A washer and/or dryer device (A) according to Claim 1 **characterized in that** it comprises at least one electromagnetic shield (8) placed around said induction heating coil (4).

5. A washer and/or dryer device (A) according to Claim 4 **characterized in that** said electromagnetic shield (8) comprises at least one ferromagnetic material.

15 **6.** A washer and/or dryer device (A) according to Claim 1 **characterized in that** said induction heating coil (4) is coiled on a tinier area than the depth of said tank (1).

20 **7.** A washer and/or dryer device (A) according to Claim 1 **characterized in that** said induction heating coil (4) is coiled throughout the depth of the tank (1).

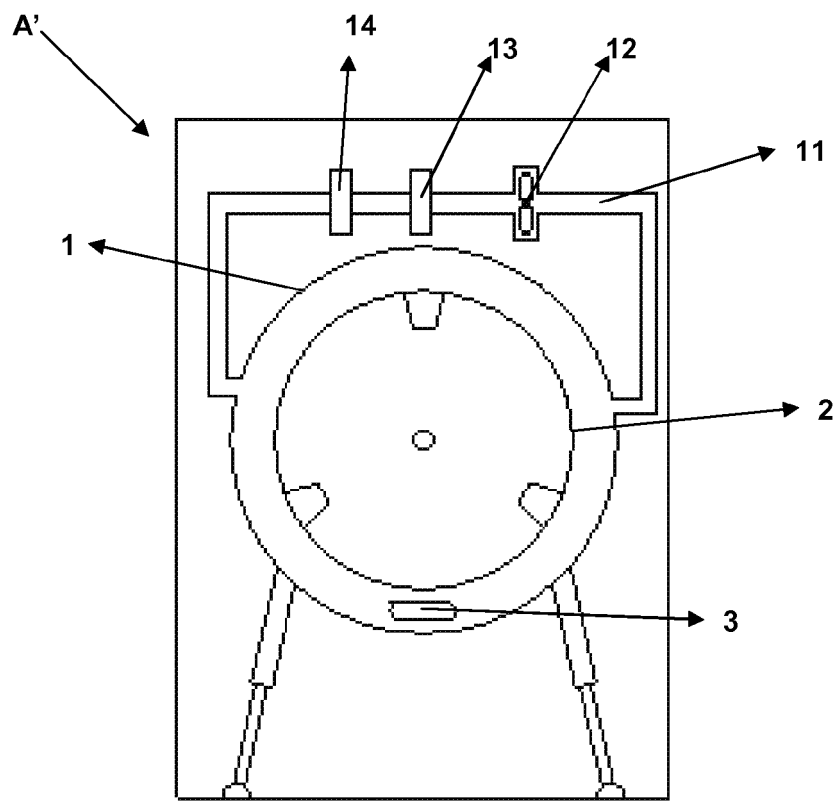


Figure 1

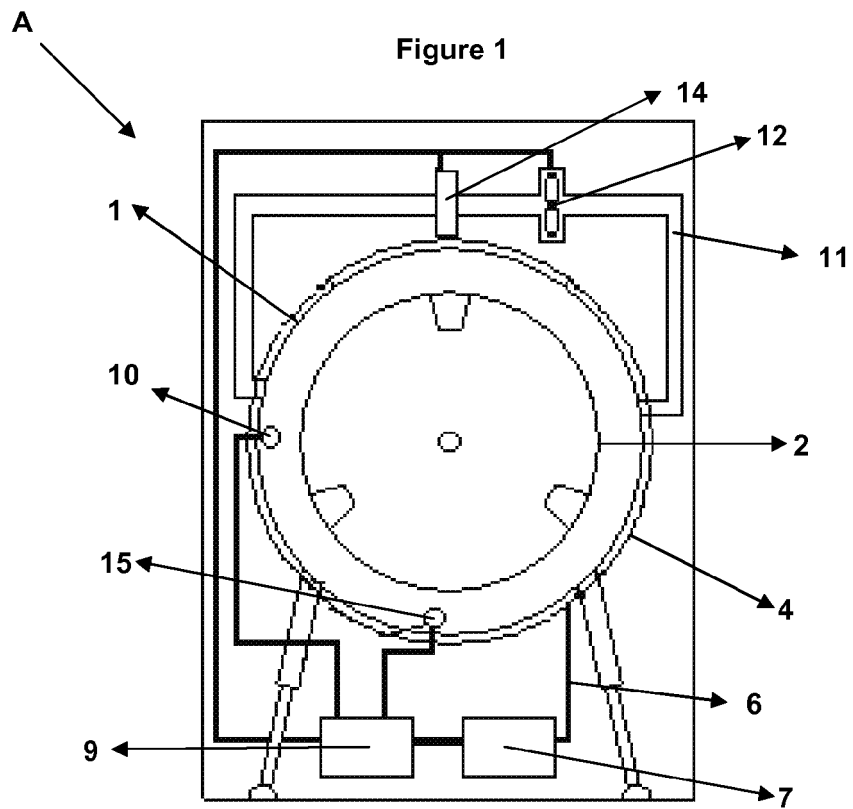


Figure 2

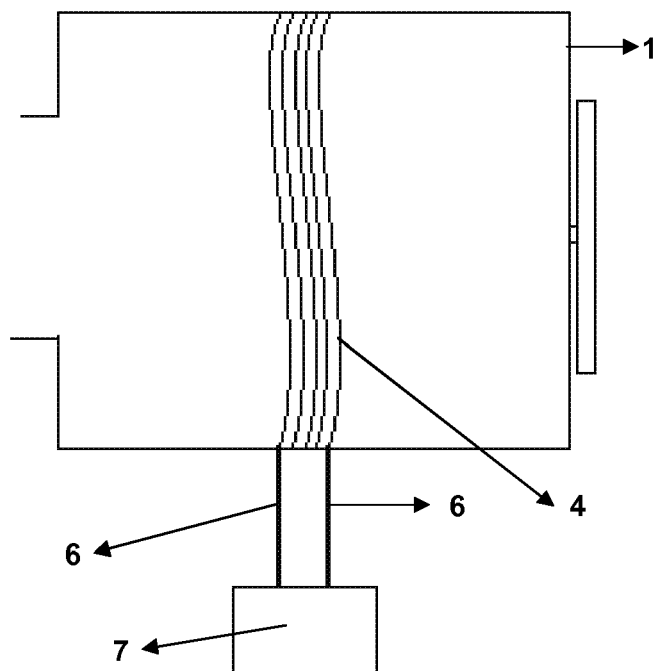


Figure 3

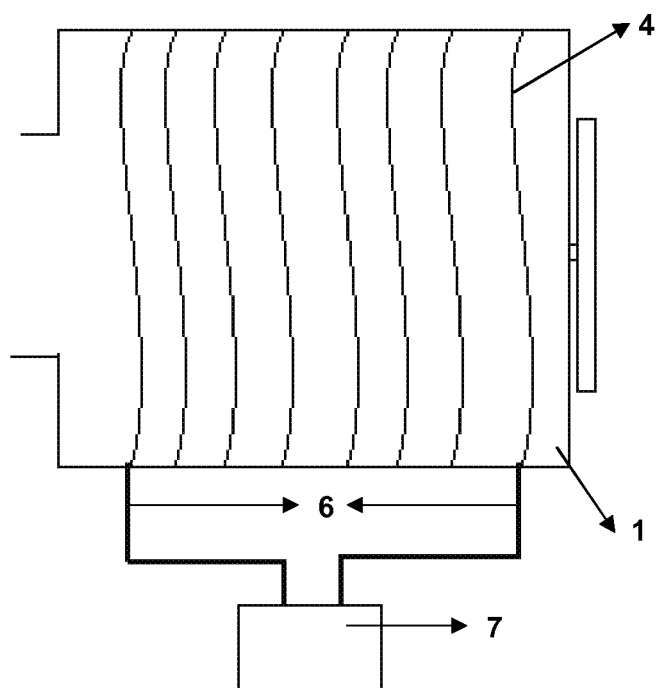


Figure 4

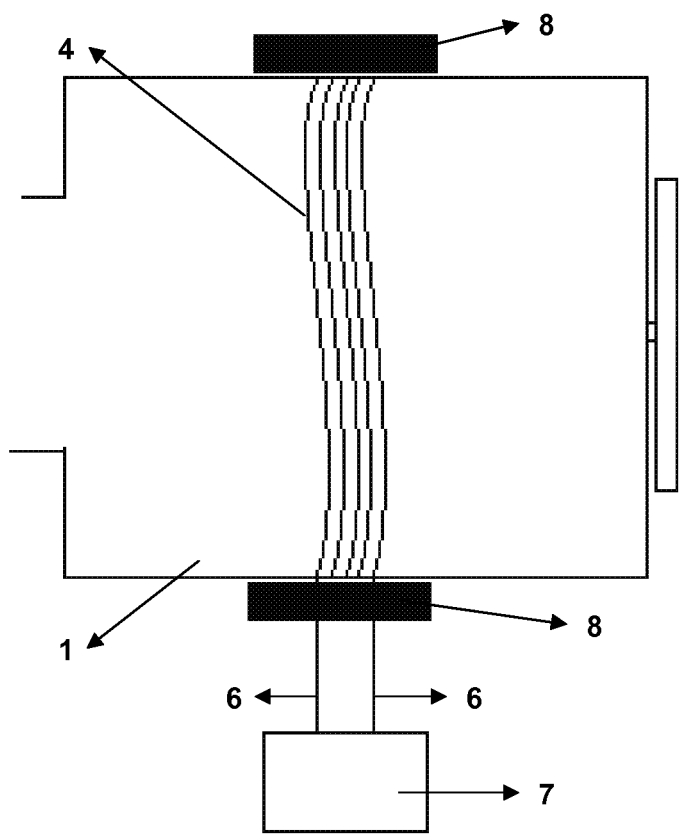


Figure 5



EUROPEAN SEARCH REPORT

Application Number
EP 11 16 9427

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			D06F H05B F26B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 October 2011	Examiner Westermayer, Wilhelm
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/82 (P04C01)

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

EP 11 16 9427

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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18-10-2011

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