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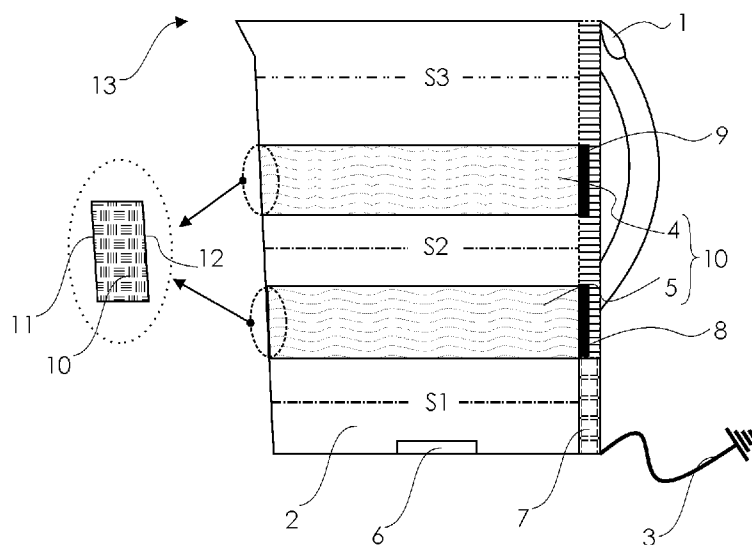
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(54) Title: SMART AND SILENT WATER HEATER

Figure 1



(57) Abstract: The present invention relates to a smart and silent water heater (13) comprising a switch (1) turning the device on and off, a water reservoir (2) in which water is stored, a cable (3) through which power is received, and heating members (10) heating the water.

Description**SMART AND SILENT WATER HEATER**

- [0001] The present invention relates to a smart water heater operating silently.
- [0002] Water heaters operate with a constant power independent of the amount of water filled into the water reservoir. When the heater disposed in the water reservoir or on the base is turned on, a temperature difference forms between the heating member and water. Due to slow heat transmission, the temperature of the region proximate to the base is higher than the upper regions distant to the base. The heating member causes formation of small vapor bubbles by providing a plurality of nucleation regions for bubble formation. Said bubbles precipitate by being pressured when they reach layers with lower temperatures. During said precipitation, (besides the sound during boiling) a loud sound emerges. Said sound emerges by turning the heater on and it is known that said sound may be at a disturbing level for the users. Appliances having a lowest volume level of 79 dB (decibel) are known among the water heater appliances of the prior art, and the volume level may be as high as 95 dB. In current water heaters, the heating members are provided in the reservoir or on the reservoir base.
- [0003] State of the art utility model document no. CN204483843 (U) discloses a water heater in which the heaters are positioned on a side surface of the water reservoir. Since the heaters are provided on the side surface of the water reservoir, heat dissipation occurs in an orderly manner and less sound is generated during operation of the water heater.
- [0004] In state of the art utility model document no. CN204363736 (U), the heating plate is provided on the base of the water reservoir. Heat transmission tubes extending upwards are provided on the side surface of the water reservoir. Since heat dissipation occurs orderly and rapidly in the water reservoir, the water heater operates silently.
- [0005] The methods used in the state of the art relate to accelerating heat dissipation in the liquid present in the heater, and comprise a heating surface or heat transmission tubes provided on the side surface of the water reservoir.

- [0006] The aim of the present invention is to increase the temperature of the liquid present in the water heater in an orderly manner.
- [0007] The smart and silent water heater realized to achieve the aim of the present invention and disclosed in the first claim and the dependent claims, comprises a switch, a reservoir, a heater, a sensor and a microprocessor.
- [0008] In an embodiment of the invention, a resistance wire is applied on the reservoir surface as heater.
- [0009] In another embodiment of the invention, a film heater is applied on the reservoir surface as heater.
- [0010] In another embodiment of the invention, sensors making optical level measurement, mechanical level measurement, RF level measurement or level measurement with conductivity sensor are used as sensor.
- [0011] The smart and silent water heater realized to achieve the aims of the present invention is illustrated in the accompanying drawings, wherein:
- [0012] Figure 1 is the view of the smart and silent water heater of an embodiment of the invention.
- [0013] Figure 2 is the view of the method for controlling the smart and silent water heater of an embodiment of the invention.
- [0014] The elements in the figures are numbered individually and the correspondence of these numbers are given hereinafter.
1. Switch
 2. Water reservoir
 3. Cable
 4. Lower heating member
 5. Upper heating member
 6. Weight sensor
 7. Microprocessor
 8. Lower heating member power connection
 9. Upper heating member power connection
 10. Heating member
 11. Outer reservoir
 12. Inner reservoir

[0015] 13. Water heater

S1. Lowest water level

[0016] S2. Middle water level

[0017] S3. Highest water level

[0018] The smart and silent water heater (13) comprises a switch (1) turning the device on and off, a water reservoir (2) in which water is stored, a cable (3) through which power is received, and heating members (10) heating the water.

[0019] The smart and silent water heater (13) of the invention comprises an inner reservoir (12) forming the inner walls of the water reservoir (2), on which the heating members (10) are positioned, an outer reservoir (11) positioned around the inner reservoir (12), isolating the heating members (10) from interacting with the environment, a lower heating member (4) positioned at a certain height proximate to the base of the water reservoir (2), enabling heating water, an upper heating member (5) positioned at a certain height proximate to the upper level of the water reservoir (2), enabling heating water, a lower heating member power connection (8) and an upper heating member power connection (9) providing the power connection between the microprocessor (7) and, the lower heating member (4) and the upper heating member (5), and a weight sensor (6) sending signals related to the amount of water present in the water reservoir (2), to the microprocessor (7) controlling the smart and silent water heater (13).

[0020] In an embodiment of the invention, a smart and silent water heater (13) is applied, comprising a switch (1) turning the device on and off, a water reservoir (2) in which water is stored, a cable (3) through which power is received, and heating members (10) heating the water, characterized by an inner reservoir (12) forming the inner walls of the water reservoir (2), on which the heating members (10) are positioned, an outer reservoir (11) positioned around the inner reservoir (12), isolating the heating members (10) from interacting with the environment, a lower heating member (4) positioned at a certain height proximate to the base of the water reservoir (2), enabling heating water, an upper heating member (5) positioned at a

certain height proximate to the upper level of the water reservoir (2), enabling heating water, a lower heating member power connection (8) and an upper heating member power connection (9) providing the power connection between the microprocessor (7) and, the lower heating member (4) and the upper heating member (5), and a weight sensor (6) sending signals related to the amount of water present in the water reservoir (2), to the microprocessor (7) controlling the smart and silent water heater (13). The water reservoir (2) is applied as double layered. The heating members (10) are provided on the face of the inner reservoir (12) facing outwards, between the outer reservoir (11) and the inner reservoir (12). The outer reservoir (11) reduces the heat transmission of the heating members (10) to the outer environment. The heating members (10) are applied on the water reservoir (2) as the lower heating member (4) and the upper heating member (5). Resistance wires or thin film heater are used as heating member (10). The water reservoir (2) is made of ceramic, glass or dielectric metal material. The heating members (10) are distributed such that the lower heating member (4) is between the lowest water level (S1) and middle water level (S2); and the upper heating member (5) is between the middle water level (S2) and the highest water level (S3). The heating members (10) are resistance wires or film heater converting electrical energy to thermal energy. The resistance wire is a type of alloy composed of metals in varying proportions, and dissipates heat when current passes therethrough. It is obtained from chromium, iron alloys containing aluminum or nickel containing alloys.

[0021] In another embodiment of the invention, as the heating member (10), resistance wire is applied made of alloy material containing any one of iron, nickel, chromium, aluminum metals, or thin film heater is applied made of any one of silver nanowire, FTO or graphene materials. By the execution of the coating of the film heater, a dielectric layer is coated thereon to prevent it from being removed from the surface of the water reservoir (2) due to mechanical or other effects. The height, thickness and the resistance value of the heating members (10) vary depending on the capacity of the water reservoir (2). A weight sensor (6) is provided on the

base of the water reservoir (2). The amount of water present in the water reservoir (2) is measured by means of the weight sensor (6).

[0022] In another embodiment of the invention, a smart and silent water heater (13) is applied characterized by the lower heating member (4) and by the upper heating member (5) connected to each other in parallel, having in between a circuit member executing switching function. The switching is controlled by the microprocessor (7) according to the signals received from the weight sensor (6). Instead of the weight sensor (6), sensors utilized for measuring the water amount, making optical level measurement, mechanical level measurement, RF level measurement or level measurement with conductivity sensor are also applied.

[0023] With the invention, the level measurement data received from the weight sensor (6) are processed by the microprocessor (7), and a level decision is made between the water levels (S1, S2, S3) present in the water reservoir (2). The microprocessor (7) is capable of separately controlling the lower heating member (4) by means of the lower heating member power connection (8), and the upper heating member (5) by means of the upper heating member power connection (9). The lower heating member (4) and the upper heating member (5) are connected to each other in parallel. A circuit member for switching is provided between the lower heating member (4) and the upper heating member (5). The circuit member for switching is controlled by the microprocessor (7). By this, the heating members (10) can separately or simultaneously switch to active heating state. When both heating members (10) are operating, they are enabled to operate with more power by reducing the resistance value.

[0024] In another embodiment of the invention, a smart and silent water heater (13) is applied having the microprocessor (7) enabling only the lower heating member (4) to be turned on when the water amount in the water reservoir (2) is between the lowest water level (S1) and the middle water level (S2), and enabling the lower heating member (4) and the upper heating member (5) to be turned on together when the water amount in the water reservoir (2) is between the middle water level (S2) and the highest water level (S3). When the water reservoir (2) is filled below the lowest

water level (S1), both water heaters are in passive heating state. When the water reservoir (2) is filled between the lowest water level (S1) and the middle water level (S2), only the lower heating member (4) is in active heating state, and there power is not transmitted to the upper heating member (5). When the water reservoir (2) is filled between the middle water level (S2) and the highest water level (S3), the lower heating member (4) and the upper heating member (5) are in active heating state simultaneously.

- [0025] In another embodiment of the invention, a smart and silent water heater (13) is applied characterized by the microprocessor (7) preventing the water heater (13) from operating when the water level in the water reservoir (2) is below the lowest water level (S1). By this, the water heater is prevented from operating when it is filled with a low level of water.
- [0026] With the invention, as a result of the heating members (10) being on the side surface of the water reservoir (2) and being used with power adjustable according to water amount, water temperature is increased equally at each level, preventing formation of high temperature difference between layers occurring in present water heater appliances. The heat dissipates homogeneously in the water reservoir (2) as a result of the heating members (10) operating according to water level. Since the water vapor bubbles are not pressurized due to heat difference during their upwards movement from the base, the sound level they generate is considerably reduced.

Claims

1. A smart and silent water heater (13) **comprising** a switch (1) turning the device on and off, a water reservoir (2) in which water is stored, a cable (3) through which power is received, and heating members (10) heating the water, **characterized**
by an inner reservoir (12) forming the inner walls of the water reservoir (2), on which the heating members (10) are positioned, and an outer reservoir (11) positioned around the inner reservoir (12), isolating the heating members (10) from interacting with the environment,
by a lower heating member (4) positioned at a certain height proximate to the base of the water reservoir (2), enabling heating water, and an upper heating member (5) positioned at a certain height proximate to the upper level of the water reservoir (2), enabling heating water,
by a lower heating member power connection (8) and an upper heating member power connection (9) providing the power connection between the microprocessor (7) and, the lower heating member (4) and the upper heating member (5), and
by a weight sensor (6) sending signals related to the amount of water present in the water reservoir (2), to the microprocessor (7) controlling the smart and silent water heater (13).
2. A smart and silent water heater (13) according to claim 1, **characterized by** the heater members (10) being resistance wire made of alloy material containing any one of iron, nickel, chromium, aluminum metals, or film heater made of any one of silver nanowire, FTO or graphene materials.
3. A smart and silent water heater (13) according to claim 1 or 2, **characterized by** the lower heating member (4) and the upper heating member (5) connected to each other in parallel, having in between a circuit member executing switching function
4. A smart and silent water heater (13) according to claim 1, 2, or 3, **characterized by** the microprocessor (7) enabling only the lower heating member (4) to be turned on when the water amount in the water reservoir (2) is between the lowest water level (S1) and the middle water level (S2),

and

enabling the lower heating member (4) and the upper heating member (5) to be turned on together when the water amount in the water reservoir (2) is between the middle water level (S2) and the highest water level (S3).

5. A smart and silent water heater (13) according to claim 4, **characterized by** the microprocessor (7) preventing the water heater (13) from operating when the water level in the water reservoir (2) is below the lowest water level (S1).
6. A smart and silent water heater (13) according to any one of the preceding claims, **characterized by** the heating members (10) coated with a dielectric material.
7. A smart and silent water heater (13) according to any one of the preceding claims, **characterized by** the water reservoir (2) comprising any sensor making weight measurement, optical level measurement, mechanical level measurement, RF level measurement, or level measurement by conductivity, **and by** the microprocessor (7) controlling switching.

Figure 1

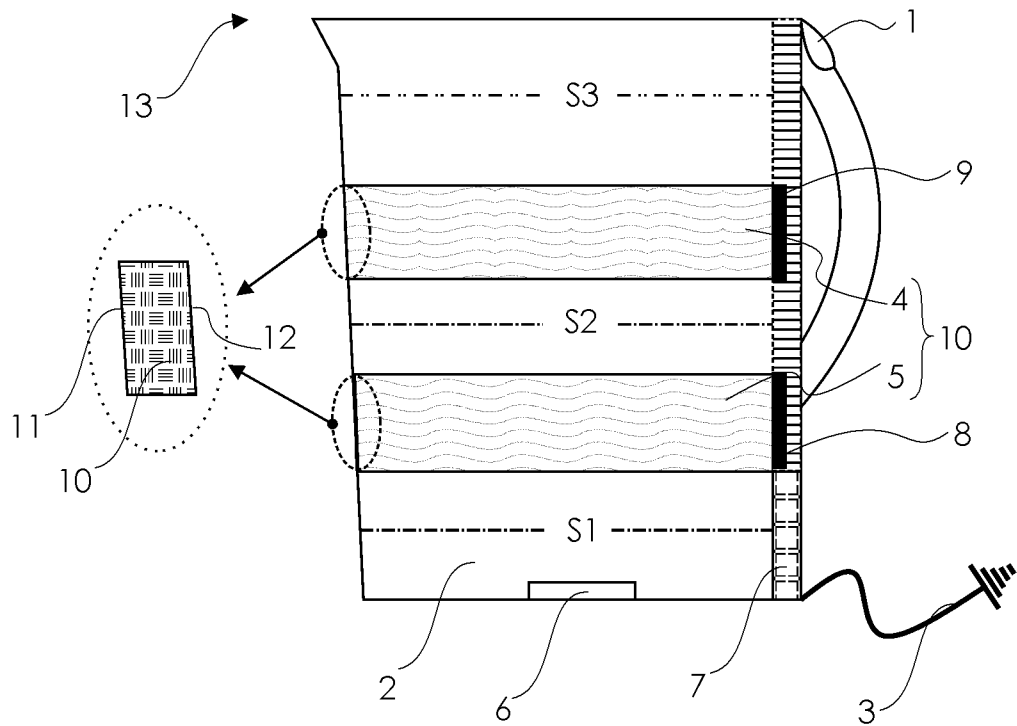
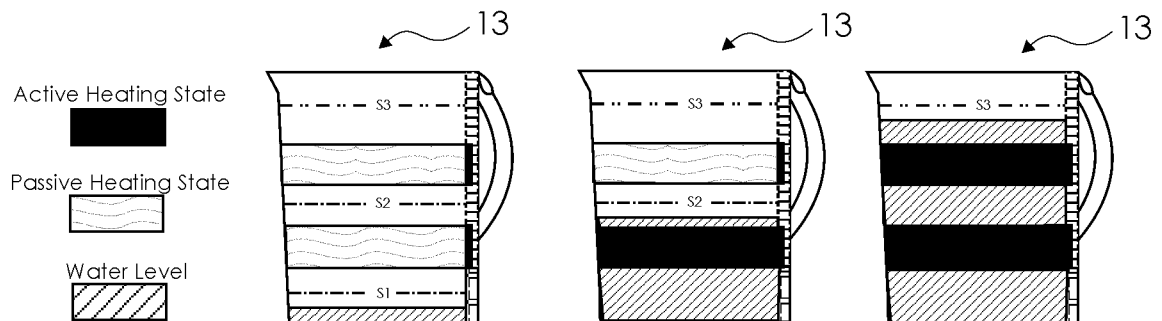


Figure 2



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J27/21
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 106 473 597 A (ZHU JIANQIN) 8 March 2017 (2017-03-08) paragraphs [0006], [0015], [0021] - [0030]; claims; figures -----	1-7
X	DE 298 06 373 U1 (CLOER ELEKTROGERAETE GMBH [DE]) 25 June 1998 (1998-06-25)	1-4,6,7
A	page 4, line 13 - page 4, line 26 page 6, line 4 - page 8, line 14; claims; figures -----	5
Y	US 2010/314379 A1 (LIN HSI-MEI [TW]) 16 December 2010 (2010-12-16)	1-3,6,7
A	paragraphs [0002], [0005], [0006], [0015] - [0021]; claims; figures ----- -/--	4,5



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/058297

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 3 141 162 A1 (SMARTER APPLICATIONS LTD [GB]) 15 March 2017 (2017-03-15)	1-3,6,7
A	paragraphs [0038] - [0045]; claims; figures -----	4,5
A	DE 100 11 428 A1 (SCHREITMUELLER BERND [DE]) 13 September 2001 (2001-09-13) the whole document -----	1-7
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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