

ENERGY-SAVING ELECTRIC STEAMING METHOD AND DEVICE AND ELECTRIC HEATING PLATE USED THEREIN

Technical Field

5 [0001] The present invention relates to the field of food processing technologies and food processing machine, in particular to an energy-saving electric steaming method and device and an electric heating plate used therein.

Technical Background

10 [0002] An electric steaming device, which is also called as an electric steamer, is a kitchen appliance which is developed on the basis of the traditional wooden steamer, aluminum steamer, bamboo steamer, etc., and is used for directly steaming a variety of foods using the principle of generating steam by electricity. In particular, an electric steaming cabinet may be regarded as a large electric steaming device and is applied widely in canteens, restaurants, and a variety of
15 food processing enterprises.

[0003] The existing electric steaming device, such as a household electric steaming device, an electric steaming cabinet or an electric steaming boiler, can generate saturated steam with a temperature of 100°C, but suffers from a low heating speed, and the steam is likely condensed at the top of the housing of the electric steaming device, but not on the heated foods, thus causing
20 an energy waste and a low heating efficiency.

Summary of the Invention

[0004] An object of the present invention is to provide an energy-saving electric steaming method and device, which is used to generate overheated steam with a temperature over 100°C
25 during the food processing. The overheated steam is unlikely condensed and hence can continuously heat foods, thus improving the energy utilization and the heating efficiency.

[0005] In order to achieve this object, the present invention employs the following technical solutions:

[0006] An energy-saving electric steaming method includes the steps of: immersing a lower
30 part of an electric heating plate in the water within the electric steaming device, while extending an upper part of the electric heating plate from the surface of the water; heating the water within the electric steaming device by the lower part of the electric heating plate, to generate normal saturated steam above the water; heating the normal saturated steam by an upper part of the electric heating plate, to generate the overheated steam; when the water is boiling, alternately

heating the normal saturated steam and the boiling water by a middle part and/or the upper part of the electric heating plate during the boiling of the water; and heating stuffs within the electric steaming device by the normal saturated steam and the overheated steam.

[0007] The temperature of the overheated steam is in a range from 105℃ to 135℃.

5 **[0008]** The upper and lower parts of the electric heating plate have different resistances. Preferably, the resistance of the upper part of the electric heating plate is higher than that of the lower part of the electric heating plate; and the resistance of the middle part of the electric heating plate is between the resistance of the upper part of the electric heating plate and that of the lower part of the electric heating plate.

10 **[0009]** The electric heating plate has a sliced structure in its thickness direction and has a reversed-T shaped structure in a plane perpendicular to the thickness direction, where the lower part of the reversed-T shaped structure is immersed in the water within the electric steaming device but the upper part of the reversed-T shaped structure is extended from the surface of the water. The lower part of the reversed-T shaped structure is connected with power supply lines
15 for electrically connecting with the external power supply.

[0010] Preferably, the housing of the electric heating plate is made of insulating material, and the housing of the upper part of the reversed-T shaped structure is connected sealedly with the housing of the lower part of reversed-T shaped structure.

20 **[0011]** Preferably, one end of the lower part of the reversed-T shaped structure is connected with a mounting board, through which the power supply lines extend from the electric steaming device.

[0012] Preferably, a plurality of electric heating plates arranged in parallel are connected to the mounting board.

25 **[0013]** The present invention also provides an electric steaming device which embodies the above electric steaming method.

[0014] An energy-saving electric steaming device includes a housing and an electric heating plate with a certain height in a vertical direction that is located in the lower part of the housing, wherein water is added into the housing, a lower part of the electric heating plate is configured to be immersed in the water, while an upper part of the electric heating plate is configured to extend from the surface of the water; the lower part of the electric heating plate is further configured to heat the water within the electric steaming device to generate normal saturated steam above the water; the upper part of the electric heating plate is further configured to heat the normal saturated steam to generate the overheated steam; when the water is boiling, a
30 middle part and/or the upper part of the electric heating plate alternately heats the normal

saturated steam and the boiling water during the boiling of the water, so that stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

[0015] The temperature of the overheated steam is in a range from 105°C to 135°C.

[0016] The density of resistance wires in the upper part of the electric heating plate is different from that of resistance wires in the lower part of the electric heating plate. Preferably, the density of resistance wires in the upper part of the electric heating plate is higher than that of resistance wires in the lower part of the electric heating plate; and the density of resistance wires in the middle part of the electric heating plate is between the density of resistance wires in the upper part of the electric heating plate and that of resistance wires in the lower part of the electric heating plate.

[0017] Preferably, the electric heating plate has a reversed-T shaped structure, the lower part of which is to be immersed in the water within the electric steaming device, and the upper part of which is to be extended from the surface of the water.

[0018] Preferably, the housing of the electric heating plate is made of insulating material, and the housing of the upper part of the reversed-T shaped structure is connected sealedly with the housing of the lower part of reversed-T shaped structure.

[0019] One end of the lower part of the reversed-T shaped structure is connected with a mounting board; more than two electric heating plates are arranged in parallel, and each of electric heating plates is provided with individual power supply lines.

[0020] The device further includes a steamer which is located at the top inside the housing.

[0021] The beneficial effects of the present invention are brought about by an energy-saving electric steaming method including the steps of immersing a lower part of an electric heating plate in the water within the electric steaming device, while extending an upper part of the electric heating plate from the surface of the water; heating the water within the electric steaming device by the lower part of the electric heating plate, to generate normal saturated steam above the water; heating the normal saturated steam by an upper part of the electric heating plate, to generate the overheated steam; when the water is boiling, alternately heating the normal saturated steam and the boiling water by a middle part and/or the upper part of the electric heating plate during the boiling of the water; and heating stuffs within the electric steaming device by the normal saturated steam and the overheated steam. Due to fluctuating of the water surface caused by the boiling of the water, the middle and/or upper part of the electric heating plate alternately heats the normal saturated steam and the boiling water, and the heat transfer state of the middle and/or upper part of the electric heating plate is close to the critical point between the nucleate boiling and transition boiling, resulting in the fast heat transfer and

high heat exchange efficiency. For the stuffs are food, thanks to the low overheat degree of the saturated steam, the nutrient loss of the food is low and the food tastes delicious.

Description of Drawings

5 **[0022]** To more clearly and effectively illustrate the technical solutions in the embodiments of the present invention, the accompanying drawings to be used in the embodiments are briefly introduced. It is apparent that the drawings in the following description show just some embodiments of the present invention. Based on these drawings, other drawings can also be made by those skilled in the art without creative work.

10 **[0023]** Figure 1 is a schematic diagram showing the structure of an energy-saving electric steaming method according to the present invention;

[0024] Figure 2 is a schematic diagram showing the heat transfer coefficient versus the overheat degree of the electric heating plate 2 in the process of heating the liquid;

15 **[0025]** Figure 3 is a schematic diagram showing the structure of an energy-saving electric steaming device according to an embodiment of the present invention; and

[0026] Figure 4 is a schematic diagram showing the structure of an electric heating plate of the energy-saving electric steaming device according to the present invention.

Reference numeral list:

[0027] 1: Housing; 2: Electric heating plate; 3: Mounting board.

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Detailed description of the Preferred Embodiment

25 **[0028]** The accompanying drawings used for describing the embodiments are briefly introduced in order to more clearly and effectively illustrate the technical solutions of the embodiments of the application. It is apparent that the drawings in the following description illustrate just some embodiments of the application. Based on these drawings, other drawings can also be made by those skilled in the art without creative work.

[0029] The technical solutions of the present invention will be further illustrated below through the specific embodiments in conjunction with the drawings.

30 **[0030]** Figures 1 to 3 show an energy-saving electric steaming method and device provided by the specific embodiments of the present invention.

[0031] [A first embodiment]

[0032] An energy-saving electric steaming method includes the following steps 101 to 105.

[0033] In the step 101, water is added into an electric steaming device such that the lower part

of an electric heating plate 2 is immersed in the water, and the upper part of the electric heating plate 2 is extended from the surface of the water.

[0034] In the step 102, the lower part of the electric heating plate 2 is used to heat the water within the electric steaming device to generate normal saturated steam above the water.

5 **[0035]** In the step 103, the upper part of the electric heating plate 2 is used to heat the normal saturated steam to generate the overheated steam,

[0036] In the step 104, when the water is boiling, the middle and/or upper part of the electric heating plate alternately heats the normal saturated steam and the boiling water during the boiling of the water, in order to generate the overheated steam and the normal saturated steam.

10 **[0037]** In the step 105, stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

[0038] The process of generating the normal saturated steam includes generating the steam from the water during and before boiling thereof. Due to fluctuating of the water surface during the boiling of the water, the middle and/or upper part of the electric heating plate 2 alternately
15 heats the normal saturated steam and the boiling water, in order to generate the overheated steam and the normal saturated steam, in other words, the middle and/or upper part of the electric heating plate alternately heats the normal saturated steam and the boiling water during the boiling of the water. The heat exchange state of the middle and/or upper part of the electric heating plate 2 is close to the critical point between the nucleate boiling and the transition
20 boiling, resulting in the fast heat transfer and high heat exchange efficiency. For the stuffs are food, thanks to the low overheat degree of the saturated steam, the nutrient loss of the food is low and the food tastes delicious.

[0039] As mentioned above, the heat exchange state of the middle and/or upper part of the electric heating plate 2 is close to the critical point between the nucleate boiling and the
25 transition boiling, which is particularly described as follows:

[0040] as shown in Figure 2, the following four phases occur along with the changes of the overheat degree in the process of heating water, and the four phases are that: 1) when the overheat degree is low, the heat exchange is conducted in a manner of the natural convection; 2) as the overheat degree increases, bubbles are increasingly generated, so that the heat exchange
30 is intensive and enters into the nucleate boiling state; 3) bubbles are excessively generated to form a gas film which covers the heated surface, so that the heat exchange effect becomes worsen, and this phase will last until the heat transfer coefficient is the minimal; and 4) the heat exchange is conducted in a film state, that is, when a stable gas film layer is formed, the heat exchange effect becomes better, but the temperature of the heating device would be likely out of

control, which may result in an equipment damage. With the heating method provided by the present invention, the upper part of the electric heating plate 2 is away from the water and thus has a high overheat degree; the lower part of the electric heating plate 2 is immersed in the water and thus substantially will not be overheated; and the transition region between the lower
5 part and the upper part of the electric heating plate 2 has a relatively modest overheat degree; the saturated steam and the boiling water are alternatively heated by the middle and/or upper part of the electric heating plate 2 due to the fluctuating of the water surface during boiling of the water, and the overheat degree is controlled to be within a relatively small range, so that the heat transfer state can be well controlled to be close to the critical point between the nucleate
10 boiling and the transition boiling.

[0041] [A second embodiment]

[0042] An energy-saving electric steaming method includes the following steps 101 to 105.

[0043] In the step 101, water is added into an electric steaming device such that the lower part of an electric heating plate 2 is immersed in the water, and the upper part of the electric heating
15 plate 2 is extended from the surface of the water.

[0044] In the step 102, the lower part of the electric heating plate 2 is used to heat the water within the electric steaming device to generate normal saturated steam above the water.

[0045] In the step 103, the upper part of the electric heating plate 2 is used to heat the normal saturated steam to generate the overheated steam.

[0046] In the step 104, when the water is boiling, the middle and/or upper part of the electric heating plate alternately heats the normal saturated steam and the boiling water during the boiling of the water, in order to generate the overheated steam and the normal saturated steam.

[0047] In the step 105, stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

[0048] The process of generating the normal saturated steam includes generating the steam from the water during and before boiling thereof. Due to fluctuating of the water surface during the boiling of the water, the middle and/or upper part of the electric heating plate 2 alternately heats the normal saturated steam and the boiling water, in order to generate the overheated steam and the normal saturated steam. The heat exchange state of the middle and/or upper part
25 of the electric heating plate 2 is close to the critical point between the nucleate boiling and the transition boiling, resulting in the fast heat transfer and high heat exchange efficiency.
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[0049] In the present embodiment, the temperature of the overheated steam is in a range from 105°C to 135°C. Due to the low overheat degree of such saturated steam, the food is evenly and quickly heated and is made delicious, and the nutritious loss of the food is low.

[0050] The upper and lower parts of the electric heating plate 2 have different resistances, so that the overheat degree can be well controlled to be within an ideal range as desired by, for example, the type of the foods and the tastes.

[0051] [A third embodiment]

5 **[0052]** An energy-saving electric steaming method includes the following steps 101 to 105.

[0053] In the step 101, water is added into an electric steaming device such that the lower part of an electric heating plate 2 is immersed in the water, and the upper part of the electric heating plate 2 is extended from the surface of the water.

10 **[0054]** In the step 102, the lower part of the electric heating plate 2 is used to heat the water within the electric steaming device to generate normal saturated steam above the water.

[0055] In the step 103, the upper part of the electric heating plate 2 is used to heat the normal saturated steam to generate the overheated steam.

15 **[0056]** In the step 104, when the water is boiling, the middle and/or upper part of the electric heating plate alternately heats the normal saturated steam and the boiling water during the boiling of the water, in order to generate the overheated steam and the normal saturated steam.

[0057] In the step 105, stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

20 **[0058]** The process of generating the normal saturated steam includes generating the steam from the water during and before boiling thereof. Due to fluctuating of the water surface during the boiling of the water, the middle and/or upper part of the electric heating plate 2 alternately heats the normal saturated steam and the boiling water, in order to generate the overheated steam and the normal saturated steam. The heat exchange state of the middle and/or upper part of the electric heating plate 2 is close to the critical point between the nucleate boiling and the transition boiling, resulting in the fast heat transfer and high heat exchange efficiency.

25 **[0059]** In the present embodiment, the resistance of the upper part of the electric heating plate 2 is higher than that of the lower part of the electric heating plate 2; and the resistance of the middle part of the electric heating plate 2 is between the resistance of the upper part of the electric heating plate 2 and that of the lower part of the electric heating plate 2. The overheat degree of the saturated steam can be controlled more flexibly.

30 **[0060]** The electric heating plate 2 has a reversed-T shaped structure, the lower part of which is to be immersed in the water within the electric steaming device, and the upper part of which is to be extended from the surface of the water.

[0061] The lower part of the reversed-T shaped structure is placed in the liquid to be heated,

in order to heat the liquid to generate the steam; and the upper part of the reversed-T shaped structure is placed in the space above the liquid, in order to heat the steam. Therefore, with the placement of the lower part of the reversed-T shaped structure in the liquid to be heated, heat on the surface of the lower part of the reversed-T shaped structure can be timely transferred to the liquid; and with the placement of the upper part of the reversed-T shaped structure in the steam, the steam can be further heated. Due to the fast steam flow, the heat on the surface of the upper part of the sliced reversed-T shaped structure can be taken away quickly, thus further taking out the heat inside of the upper part. Therefore, not only the temperature inside the upper part of the electric heating plate can be reduced, but also the temperature inside the lower part of the electric heating plate can be reduced under the effect of the temperature gradient since the upper part and lower part of the reversed-T shaped structure are integrated, thus improving the heating efficiency, reducing the power consumption and saving the energy.

[0062] The housing of the electric heating plate 2 is made of insulating material, and the housing of the upper part of the reversed-T shaped structure is connected sealedly with the housing of the lower part of reversed-T shaped structure. In this way, the resistance wires can be effectively prevented from being exposed, thus improving the security in the use of the resistance wires.

[0063] One end of the lower part of the reversed-T shaped structure is connected with a mounting board 3; more than two electric heating plates are arranged in parallel, and each of the electric heating plates is connected with individual power supply lines. With the plurality of electric heating plates arranged in parallel, the heating efficiency can be further improved; furthermore, since each of the electric heating plates is connected with individual power supply lines which may be controlled separately from other power supply lines, the operating state of each of the electric heating plates can be controlled individually, so that the use of the device is more convenient and comfortable.

[0064] The device further includes a steamer which is located at the top inside the housing.

[0065] The present invention also provides an energy-saving electric steaming device, which will be illustrated below in conjunction with the Figs. 1-3.

[0066] [A first embodiment]

[0067] An energy-saving electric steaming device includes: a housing 1; and an electric heating plate 2 with a certain height in the vertical direction that is located in the lower part inside the housing 1; where water is added into the housing 1 such that the lower part of the electric heating plate 2 is configured to be immersed in the water, while the upper part of the electric heating plate 2 is configured to extend from the surface of the water; the lower part of

the electric heating plate 2 is further configured to heat the water within the electric steaming device 1 to generate normal saturated steam above the water; the upper part of the electric heating plate 2 is further configured to heat the normal saturated steam to generate the overheated steam; when the water is boiling, a middle part and/or the upper part of the electric heating plate 2 alternately heats the normal saturated steam and the boiling water during the boiling of the water, so that stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

[0068] As mentioned above, the middle and/or upper part of the electric heating plate 2 alternately heats the normal saturated steam and the boiling water during boiling of the water, particularly, the saturated steam and the boiling water are alternatively heated by the middle and/or upper part of the electric heating plate 2 due to the fluctuating of the water surface during boiling of the water, therefore, the normal saturated steam and the boiling water are alternately heated.

[0069] The middle and/or upper part of the electric heating plate 2 alternately heats the normal saturated steam and the boiling water during the boiling of the water, and the heat exchange state of the middle and/or upper part of the electric heating plate 2 is close to the critical point between the nucleate boiling and the transition boiling, resulting in fast heat transfer and a high heat exchange efficiency.

[0070] In the present embodiment, the temperature of the overheated steam is in a range from 105°C to 135°C. Due to the low overheat degree of such saturated steam, the food is evenly and quickly heated and is made delicious, and the nutritious loss of the food is low.

[0071] The upper and lower parts of the electric heating plate 2 have different densities of resistance wires, so that the overheat degree can be well controlled to be within an ideal range as desired, for example, the type of the foods and the tastes.

[0072] [A second embodiment]

[0073] An energy-saving electric steaming device includes: a housing 1; and an electric heating plate 2 with a certain height in the vertical direction that is located in the lower part inside the housing 1; water is added into the housing 1 such that the lower part of the electric heating plate 2 is configured to be immersed in the water, while the upper part of the electric heating plate 2 is configured to extend from the surface of the water; the lower part of the electric heating plate 2 is configured to heat the water within the electric steaming device 1 to generate normal saturated steam above the water; the upper part of the electric heating plate 2 is configured to heat the normal saturated steam to generate the overheated steam; when the water is boiling, a middle part and/or the upper part of the electric heating plate 2 alternately heats the

normal saturated steam and the boiling water during the boiling of the water; so that stuffs within the electric steaming device are heated by the normal saturated steam and the overheated steam.

[0074] In the present embodiment, the destiny of the resistance wires in the upper part of the electric heating plate 2 is higher than the density of the resistance wires in the lower part of the electric heating plate 2, thereby obtaining the saturated steam with a higher overheat degree, so that the temperature of the overheated steam can be up to 135°C. The destiny of the resistance wires in the middle part of the electric heating plate 2 is between the destiny of the resistance wires in the upper part of the electric heating plate 2 and that in the lower part of the electric heating plate 2, so that the temperature transfer gradient of the electric heating plate 2 is gentle, to prolong the service life of the electric heating plate.

[0075] In the present embodiment, the device further includes a steamer which is located at the top inside the housing 1 and used to receive foods. Since the steamer is located in the path through which the saturated steam and overheated steam rise up, additional auxiliary equipments for managing the steam path are not required, so that the device has a simple and compact structure and good heat transfer effect.

[0076] The electric heating plate 2 has a reversed-T shaped structure, where the lower part of the reversed-T shaped structure is immersed in the water within the electric steaming device but the upper part of the reversed-T shaped structure is extended from the surface of the water.

[0077] The lower part of the reversed-T shaped structure is placed in the liquid to be heated, in order to heat the liquid to generate the steam, and the upper part of the reversed-T shaped structure is placed in the space above the liquid, in order to heat the steam. Therefore, with the placement of the lower part of the reversed-T shaped structure in the liquid to be heated, heat on the surface of the lower part of the reversed-T shaped structure can be timely transferred to the liquid; and with the placement of the upper part of the reversed-T shaped structure in the steam, the steam can be further heated. Due to the fast steam flow, the heat on the surface of the upper part of the sliced reversed-T shaped structure can be taken away quickly, thus further taking out the heat inside of the upper part. Therefore, not only the temperature inside the upper part of the electric heating plate can be reduced, but also the temperature inside the lower part of the electric heating plate can be reduced under the effect of the temperature gradient since the upper part and lower part of the reversed-T shaped structure are integrated, thus improving the heating efficiency, reducing the power consumption and saving the energy.

[0078] The housing of the electric heating plate 2 is made of insulating material, and the housing of the upper part of the reversed-T shaped structure is connected sealedly with the

housing of the lower part of reversed-T shaped structure. In this way, the resistance wires can be effectively prevented from being exposed, thus improving the security in the use of the resistance wires.

[0079] In the present embodiment, the upper part of the reversed-T shaped structure is rectangular, but may have another shape such as triangle in practice, and the invention is not limited thereto.

[0080] One end of the lower part of the reversed-T shaped structure is connected with a mounting board 3, so that the electric heating plates 2 can be steadily placed in use, for the purpose of safety in use; five electric heating plates 2 are arranged in parallel, so that the heating efficiency can be further improved. More electric heating plates 2 can also be provided as desired. Generally, two electric heating plates 2 are provided, but it is possible to provide only one electric heating plate 2 for household usage. Each of the electric heating plates 2 is provided with individual power supply lines and hence may be individually controlled to be closed or open, and the power of the device is adjustable, thus improving the flexibility of the device.

[0081] The technical principles of the present invention are described as above in conjunction with the specific embodiments. However, the above description is only intended to explain the principles of the present invention, but not construed in any way as limiting the scope of protection of the present invention. Based on the explanation herein, other implementations of the present invention may occur to those skilled in the art without any creative work, and all these implementations should fall into the scope of the present invention.

CLAIMS

1. An energy-saving electric steaming method, comprising steps of:

heating water within an electric steaming device by a lower part of an electric heating plate
5 (2), to generate normal saturated steam above the water;

heating the normal saturated steam by an upper part of the electric heating plate (2), to
generate the overheated steam;

when the water is boiling, alternately heating the normal saturated steam and the boiling
water by a middle part and/or the upper part of the electric heating plate (2) during the boiling
10 of the water; and

heating stuffs within the electric steaming device by the normal saturated steam and the
overheated steam,

wherein the lower part of the electric heating plate (2) is immersed in the water within the
electric steaming device, while the upper part of the electric heating plate (2) is extended from
15 the surface of the water.

2. The method of claim 1, wherein the temperature of the overheated steam is in a range from
105°C to 135°C.

3. The method of claim 1, wherein the upper and lower parts of the electric heating plate (2)
have different resistances.

4. The method of claim 3, wherein the resistance of the upper part of the electric heating plate
(2) is higher than that of the lower part of the electric heating plate (2); and the resistance of the
middle part of the electric heating plate (2) is between the resistance of the upper part of the
electric heating plate (2) and that of the lower part of the electric heating plate (2).

5. An energy-saving electric steaming device, comprising: a housing (1); and an electric
heating plate (2) with a certain height in a vertical direction that is located in the lower part of
25 the housing (1), wherein,

a lower part of the electric heating plate (2) is configured to be immersed in water within
the electric steaming device, while an upper part of the electric heating plate (2) is configured to
extend from the surface of the water; the lower part of the electric heating plate (2) is further
30 configured to heat the water within the electric steaming device to generate normal saturated
steam above the water; the upper part of the electric heating plate (2) is further configured to
heat the normal saturated steam to generate the overheated steam; when the water is boiling, a
middle part and/or the upper part of the electric heating plate (2) alternately heats the normal
saturated steam and the boiling water during the boiling of the water, so that stuffs within the

electric steaming device are heated by the normal saturated steam and the overheated steam.

6. The device of claim 5, wherein the temperature of the overheated steam is in a range from 105°C to 135°C.

5 7. The device of claim 6, wherein the density of resistance wires in the upper part of the electric heating plate (2) is higher than that of resistance wires in the lower part of the electric heating plate (2); and the density of resistance wires in a middle part of the electric heating plate (2) is between the density of resistance wires in the upper part of the electric heating plate (2) and that of resistance wires in the lower part of the electric heating plate (2).

10 8. An energy-saving electric heating plate used in an electric steaming device, wherein the electric heating plate (2) has a reversed-T shaped structure, a lower part of the reversed-T shaped structure is configured to be immersed in water within the electric steaming device, and an upper part of the reversed-T shaped structure is configured to extend from the surface of the water.

15 9. The electric heating plate of claim 8, wherein one end of the lower part of the reversed-T shaped structure is connected with a mounting board (3); and more than two electric heating plates (2) are arranged in parallel.

10. The electric heating plate of claim 9, wherein each of the electric heating plates (2) is provided with individual power supply lines.