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(54) **STEAM GENERATION DEVICE FOR AN OVEN**

(57) Steam generation device (5) for an oven (1) for cooking foods, such device intended to be mechanically associated with a support structure (2) of the oven (1) and to be placed in fluid communication with a cooking chamber (3) at least partially delimited by the aforesaid support structure (2) in order to introduce a steam flow in said cooking chamber (3).

Such steam generation device (5) is provided with a containment tank (6) for containing a liquid dose, intended to be in fluid communication with the cooking chamber (3) and to be placed at least partially below a lower wall (4) of the support structure (2), with heating means (8) in order to heat the liquid dose and generate the steam flow and with supply means (10) in order to restore the liquid dose in the containment tank (6).

The heating means (8) also comprise an electrical heating element (9) within the containment tank (6) and the supply means (10) comprise a supply circuit (41) provided with a supply source (43) in order to introduce water and with a container (44) for containing a cleaning substance in order to introduce the cleaning substance into the containment tank (6). Also provided is an electronic control unit actuatable in a cleaning mode of the oven (1), in which it controls the supply means (10) to supply the containment tank (6) with water and cleaning substance in order to form a cleaning mixture in the containment tank (6) and wherein it controls the electrical heating element (9) to heat the cleaning mixture in order to generate a vapor of cleaning mixture adapted to be diffused in the cooking chamber (3).

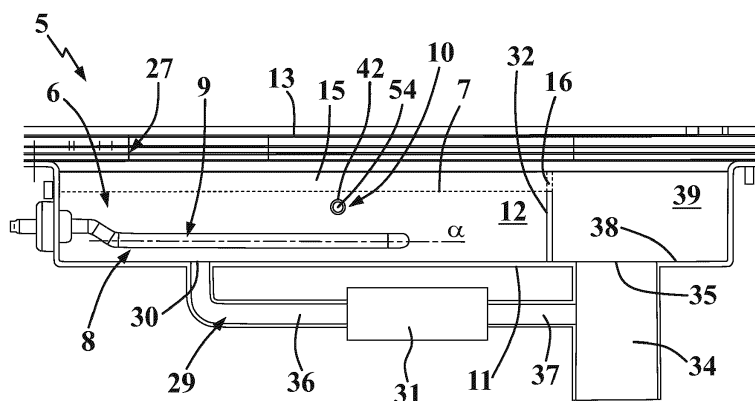


Fig. 6

Description

Field of application

[0001] The present invention regards a steam generation device for an oven for cooking foods, an oven for cooking foods comprising the aforesaid device and a method for cleaning the oven.

[0002] The present oven and the relative steam generation device are advantageously intended for use professionally, for example in the fields of dining, gastronomy, pastry-making and bread-making, or in the home, so as to cook foods placed within the oven itself.

[0003] Therefore, the present invention is inserted in the industrial field of production of household appliances, in particular ovens, both of professional and home type.

Field of the art

[0004] Known on the market are ovens for cooking foods, in particular for professional use, which conventionally comprise a support structure, known in the technical jargon of the field with the term "mitten", which internally delimits a cooking chamber, and within which the foods to be cooked are intended to be placed.

[0005] The support structure is on the front part provided with an access opening to the cooking chamber in order to allow the introduction of the foods to be cooked into the cooking chamber itself and to extract such foods from the latter once cooked.

[0006] Also provided for is a door hinged to the support structure and movable in order to close the access opening during the cooking of the foods.

[0007] The oven also comprises heating means, arranged for heating the air within the cooking chamber, and a fan, which is placed within the cooking chamber, or within suitable technical space made inside the support structure and separated from the cooking chamber, for example by means of a perforated wall.

[0008] The aforesaid fan is selectively drivable in order to cook the foods by means of the forced convection of a flow of hot air into the cooking chamber, or on the contrary deactivatable in order to cook the foods only by natural convection.

[0009] In addition, the ovens of known type comprise a device for cleaning the oven itself, which is actuatable for cleaning the interior of the support structure or at least for softening and removing part of the encrusted dirt, thus facilitating a subsequent manual cleaning by the user.

[0010] For example, ovens are known on the market whose cleaning device comprises multiple first nozzles, which are arranged for spraying against the walls of the support structure at least one cleaning substance, and at least one second nozzle, which is arranged for spraying water against the fan.

[0011] In particular, the cleaning substance tends to slowly trickle along the lateral wall of the support structure in order to soften and make at least part of the grease,

dirt and possible food residues - which have been deposited thereon during a preceding cooking - drip down.

[0012] In addition, following the emission of the cleaning substance by the first nozzles, the heating means of the oven are actuated in order to increase the temperature within the cooking chamber and the second nozzles are actuated for spraying a water jet against the fan of the rotating oven. In this manner, the water jet issued by the second nozzles hits the rotating fan of the oven and is divided into small-size water drops, which are distributed by the fan within the entire cooking chamber.

[0013] The water drops subsequently easily evaporate due to the high temperature in the cooking chamber set by the heating means, generating a quantity of steam.

[0014] The aforesaid quantity of steam allows heating, softening and removing the grease and the dirt, previously affected by the cleaning substance, and allows removing the cleaning substance still deposited on the walls of the support structure.

[0015] Indeed, the steam at least partly condenses on the lateral walls of the support structure, thus forming water drops, which tend to drip in order to wash and rinse the walls.

[0016] The oven for cooking foods of known type briefly described up to now has in practice shown that it does not lack drawbacks.

[0017] The main drawback lies in the fact that such device for cleaning the oven is unable to efficiently clean the walls of the support structure of the oven, since it requires a great quantity of cleaning substance in order to be able to soften and remove the grease, the dirt and the possible food residues.

[0018] In addition, since the quantity of cleaning substance employed is particularly high, e.g. more than 150 grams of cleaning substance per cleaning cycle, the steam might be unable to remove it and rinse it completely, with the risk that residues of such cleaning substance remain deposited on the walls of the oven.

[0019] In order to at least partially resolve the problems of the above-described oven of the prior art, further ovens for cooking foods have been developed, which are indicated in the technical jargon of the field with the term "pyrolytic".

[0020] Such ovens are provided with heating means of the cooking chamber capable of bringing the temperature therewithin up to 500°C.

[0021] In particular, the aforesaid heating means are employed not just for cooking the foods, but also in cleaning cycles of the oven for carbonizing the grease, the dirt and the possible food residues that have remained adhered to the walls of the support structure during a preceding cooking, in order to facilitate the remove thereof by a user simply by means of a moist cloth.

[0022] Nevertheless, even such pyrolytic ovens have in practice shown that they do not lack drawbacks.

[0023] The main drawback lies in the high energy consumptions of the heating means, which must bring the temperature within the cooking chamber to about 500°C

and maintain it there for time intervals of about 3 hour duration in order to carbonize, and suitably reduce into ashes, grease and encrusted dirt.

[0024] A further drawback lies in the fact that such ovens must be provided with a safety block and with means for cooling the hinged door.

[0025] In particular, the aforesaid safety block prevents a user from accidentally opening the door of the oven during a cleaning cycle, hence preventing the user from being burned by the air at about 500°C which would exit from the access opening of the cooking chamber.

[0026] In addition, the cooling means are arranged for maintaining at least the surface of the door directed towards the outside of the oven at a temperature substantially equal to or slightly greater than the ambient temperature, since - even if the door itself is normally made with thermally insulating material - during a cleaning cycle at 500°C, its temperature could increase up to being able to burn the user upon his/her touch.

[0027] Therefore, the pyrolytic ovens are structurally complex, since they are provided with the safety block and with cooling means, and they are expensive.

[0028] In order to at least partially overcome the problems of the pyrolytic ovens of the prior art briefly described up to now, further ovens for cooking foods have been developed, which are indicated in the technical jargon of the field with the term "hydrolytic".

[0029] Such ovens are provided with a slot made on the lower wall of the support structure, within which a user can pour a specific quantity of water. In addition, the heating means of the oven are provided with an electrical heating element placed below the slot and actuable in order to heat the water contained in the aforesaid slot, so as to produce steam that softens and makes at least part of the dirt and the grease attached to the walls of the containment structure trickle.

[0030] In particular, the hydrolytic ovens have lower energy consumptions than a pyrolytic oven, since it is sufficient that they bring the water to boil without heating the cooking chamber to 500°C in order to carbonize grease and dirt, and do not even require blocking systems or means for cooling the hinged door.

[0031] Nevertheless, even the ovens of hydrolytic type described briefly up to now have in practice shown that they do not lack drawbacks.

[0032] Indeed, such ovens have proven hard to use by users, since, during the cooking of the foods, grease and dirt could drip and be deposited within the same slot for the washing water. Therefore, the user must clean and remove the dirt at least from the slot before being able to pour the same water and actuate the electrical heating element.

[0033] In addition, even if such ovens consume a quantity of energy that is lower than that consumed by pyrolytic ovens, they have proven not particularly efficient, since the electrical heating element is placed outside the cooking chamber, for safety reasons. Therefore, the electrical heating element must heat the lower wall of the support

structure (on which the slot is obtained) in order to bring the water for the washing to boil.

[0034] A further drawback lies in the fact that it is difficult for a user to meter and pour into the slot, together with the water, a precise dose of cleaning substance, which collaborates with the steam to degrease and clean the walls of the containment structure of the oven.

Presentation of the invention

[0035] In this situation, the problem underlying the present invention is therefore that of eliminating the problems of the abovementioned prior art, by providing an oven for cooking foods and a steam generation device for an oven for cooking foods, which are capable of cleaning and degreasing thoroughly the walls of the containment structure of the oven itself.

[0036] A further object of the present invention is to provide an oven for cooking foods and a steam generation device, which are capable of cleaning and degreasing the walls of the containment structure of the oven itself in an automated manner.

[0037] A further object of the present invention is to provide an oven for cooking foods and a steam generation device, which are capable of cleaning and degreasing the walls of the containment structure of the oven itself with low energy consumptions.

[0038] A further object of the present invention is to provide an oven for cooking foods and a steam generation device, which are capable of cleaning and degreasing the walls of the containment structure of the oven itself in narrow time intervals.

[0039] A further object of the present invention is to provide an oven for cooking foods and a steam generation device, which are entirely reliable in operation.

[0040] A further object of the present invention is to provide an oven for cooking foods and a steam generation device, which are simple and inexpensive to attain.

Brief description of the drawings

[0041] The technical characteristics of the invention, according to the aforesaid objects, can be clearly seen in the contents of the below-reported claims and the advantages thereof will be more evident in the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows a perspective view of an oven for cooking foods, object of the invention;
- figure 2 shows a perspective view of a steam generation device of the oven for cooking foods of figure 1, in accordance with a first embodiment;
- figure 3 shows a perspective view of the steam generation device of figure 2, with some parts removed in order to better illustrate other parts thereof;

- figure 4 shows a perspective view of the steam generation device of figure 2, with some parts removed in order to better illustrate other parts thereof;
- figure 5 shows a perspective view of the steam generation device of figure 2, with some parts removed in order to better illustrate other parts thereof;
- figure 6 shows a sectional view in side section of the steam generation device of figure 2, with some parts removed in order to better illustrate other parts thereof;
- figure 7 shows a schematic view of a supply circuit of supply means of the present oven for cooking foods;
- figure 8 shows a perspective view of a steam generation device, in accordance with a second embodiment;
- figure 9 shows a perspective view of the steam generation device of figure 7, with some parts removed in order to better illustrate other parts thereof;
- figure 10 shows a perspective view of the steam generation device of figure 7, with some parts removed in order to better illustrate other parts thereof;
- figure 11 shows a perspective view of the steam generation device of figure 7, with some parts removed in order to better illustrate other parts thereof.

Detailed description of a preferred embodiment

[0042] With reference to the enclosed figures, reference number 1 overall indicates an oven for cooking foods according to the present invention.

[0043] The present invention has particular application in the industrial field of home appliances, in particular of ovens, both of professional and home type.

[0044] The present oven 1 comprises a support structure 2, known in the technical jargon of the field with the term "mitten", which at least partially delimits a cooking chamber 3 and is provided with a lower wall 4.

[0045] More in detail, such support structure 2 preferably comprises an upper wall 17, opposite the lower wall 4 and parallel thereto, and a perimeter wall 18, which is extended projectingly from the aforesaid lower wall 4 and at least partially encloses, together with the lower and upper walls 4, 17, the cooking chamber 3.

[0046] Preferably, the aforesaid support structure comprises a dividing wall at its interior, for separating the same cooking chamber 3 from a technical space, within which a selectively activatable fan is in particular placed in order to execute a cooking of the foods placed in the cooking chamber 3 with forced convection or with natural convection of the air. Advantageously, the support structure 2 comprises an access opening 19 to the cooking chamber 3, preferably made on the perimeter wall 18, which allows the insertion and extraction of the foods from the cooking chamber 3.

[0047] Advantageously, in addition, the present oven 1 comprises a door 20, hinged to the support structure 2 and movable for opening and closing the access opening

19.

[0048] More in detail, the door 20 can be hinged to the support structure 2 on the lower part, as illustrated in figure 1, or it can be hinged to the side or on the upper part, in accordance with embodiment variants not illustrated in the enclosed figures, in order to be able to move the same door 20 respectively as a wing or as a flap.

[0049] The present oven 1 also comprises a steam generation device 5, which is mechanically associated with the support structure 2 and is placed in fluid communication with the cooking chamber 3 in order to introduce a steam flow into the same cooking chamber 3.

[0050] Such steam generation device 5 is provided with a containment tank 6 for containing liquid dose.

[0051] The aforesaid containment tank 6 is in fluid communication with the cooking chamber 3 and is placed at least partially below the lower wall 4 of the support structure 2 of the oven 1.

[0052] More in detail, such containment tank 6 is preferably placed completely below the lower wall 4 of the support structure 2.

[0053] Otherwise, the containment tank 6 is placed mainly below the aforesaid lower wall 4 and in part projects within the same cooking chamber 3, traversing a suitable mounting opening made on the lower wall 4.

[0054] In addition, the steam generation device 5 is provided with heating means 8, which are placed at the containment tank 6 in order to heat the liquid dose and in order to generate the steam flow. The steam generation device 5 is also provided with supply means 10 for supplying liquid in the containment tank 6 in order to restore the aforesaid liquid dose.

[0055] In particular, the placement of the containment tank 6 at least partially below the lower wall 4 facilitates the access of the steam flow in the cooking chamber 4, and such steam flow naturally tends to flow upward.

[0056] More in detail, in addition, the supply means 10 allow continuously restoring the liquid dose in the containment tank 6, in order to meet the quantity of liquid dose which passes to the steam state per unit of time and thus avoid that the user will have to manually and continuously fill up the same containment tank 6 with the liquid dose.

[0057] In addition, the heating means 8 comprise at least one electrical heating element 9, which is extended at least partially within the containment tank 6, in a manner such that the transfer of heat from the electrical heating element 9 to the liquid dose in the containment tank 6 is as efficient as possible.

[0058] In particular, indeed, the electrical heating element 9 placed in direct contact with the liquid dose involves a greater thermal exchange between the heating means 8 and the liquid dose, with consequent energy savings in order to bring the same liquid dose to boil and thus produce the steam flow.

[0059] Preferably, each electrical heating element 9 comprises at least one heating body 91, which is housed in the containment tank 6 and is arranged for generating

heat by means of Joule effect and transferring the aforesaid heat to the liquid dose contained in the containment tank 6, an electrical power supply outlet 93, which is placed outside the containment tank 6 and is arranged for supplying electric current to the heating body 91, and a support body 92, which carries, mounted thereon, the aforesaid heating body 91 and the electrical power supply outlet 93 and is mechanically connected to the containment tank 6.

[0060] Preferably, the containment tank 6 is made of metallic material, e.g. stainless steel.

[0061] According to the idea underlying the present invention, the supply means 10 comprise a supply circuit 41 provided with at least one supply source 43, which is placed in fluid connection with the containment tank 6 in order to introduce at least water in the containment tank 6, and with at least one container 44 of a cleaning substance, which is placed in fluid connection with the aforesaid containment tank 6 in order to introduce at least the cleaning substance in the containment tank 6.

[0062] In addition, still according to the idea underlying the present invention, the steam generation device 5 comprises an electronic control unit operatively connected to the supply means 10 and actuatable at least in a cleaning mode of the oven 1.

[0063] In such cleaning mode of the oven 1, the electronic control unit is arranged for controlling the supply means 10 to supply, to the containment tank 6, water from the supply source 43 and the cleaning substance from the container 44 in order to form a cleaning mixture in the aforesaid containment tank 6.

[0064] In addition, in such cleaning mode of the oven 1, the electronic control unit is also arranged for controlling the electrical heating element 9 of the heating means 8 to heat the cleaning mixture in the containment tank 6 in order to generate a vapor of such cleaning mixture adapted to be diffused in the cooking chamber 3.

[0065] More in detail, therefore, when the electronic control unit is actuated into the cleaning mode of the oven 1, the liquid dose collected in the containment tank 6 is a cleaning mixture comprising water and the cleaning substance coming from the container 44, i.e. in particular a surfactant substance, which is able to optimally degrease the interior of the support structure 2 of the present oven 1.

[0066] In addition, the heating means 8 are in particular arranged for transferring heat to the cleaning mixture for producing a vapor of the aforesaid cleaning mixture formed by water and cleaning substance, and such vapor is introduced in the cooking chamber 3, it softens the grease and the encrusted dirt by heating them, and condenses in contact with the support structure 2, i.e. in particular at least on the upper wall 17 and perimeter wall 18, forming drop of water and cleaning substance that trickle via gravity towards the lower wall 4, removing the aforesaid heat-softened grease and dirt.

[0067] In particular, the cleaning substance with surfactant properties modifies the surface tension of the con-

densed water within the containment structure 2, in a manner such that this can be easily inserted between the support structure 2 and the encrusted dirt, which has already been softened by the transferred by the same steam before at least partly condensing.

[0068] More in detail, the synergistic action of the heat, transferred by the steam flow, and of the cleaning substance, contained in the drops condensed at least on the upper 17 and perimeter 18 wall of the support structure 2, allows obtaining a deep cleaning of the support structure 2, hence without requiring a subsequent manual cleaning by the user.

[0069] The aforesaid synergistic action allows obtaining a deep cleaning of the support structure 2, even with a reduced quantity of cleaning substance, e.g. comprised between 20 and 80 g per liter of water that has been brought to boil. This allows reducing the consumption of cleaning substance and allows reducing the pollution of the water used during cleaning, thus reducing the environmental impact of a single washing cycle.

[0070] Advantageously, the electronic control unit is actuatable also in a steam cooking mode, in which the electronic control unit is arranged for controlling the supply means 10 to supply the containment tank 6 with the water from the supply source 43.

[0071] In particular, in such steam cooking mode, the electronic control unit is arranged for controlling the same supply means 10 to isolate the container 44 from the containment tank 6, in a manner such to prevent the cleaning substance from accessing the containment tank 6 during the cooking of the foods and, transported by the steam, come to contaminate the foods.

[0072] In addition, in the steam cooking mode, the electronic control unit is arranged for controlling the electrical heating element 9 of the heating means 8 to heat the water in the containment tank 6 in order to generate a water vapor.

[0073] More in detail, therefore, when the electronic control unit is actuated into the steam cooking mode, the liquid dose collected in the containment tank 6 is only water coming from the supply source 43.

[0074] Preferably, the electronic control unit is operatively connected to a control panel externally mounted on the support structure 2 of the oven 1, and by means of such control panel a user can select and activate one from between the steam cooking mode and the cleaning mode of the oven 1.

[0075] In particular, in operation, the user will activate the cleaning mode of the oven 1 following a steam cooking mode and following the removal of the foods from the cooking chamber 3, in a manner such that the support structure 2 of the oven 1 is internally washed in an automated manner after it has been dirtied due to grease or other residues that may have dripped down from the foods during the preceding cooking.

[0076] Advantageously, the containment tank 6 is provided with a maximum level height 7 and with an upper cover 13 provided with at least one through opening 14

placed above the maximum level height 7 and arranged for directly placing the interior of the containment tank 6 in fluid communication with the cooking chamber 3 of the support structure 2 of the oven 1 for the cooking of the foods.

[0077] More in detail, with the expression "maximum level height" it must be intended hereinbelow the maximum level within the containment tank 6 that can be reached by the liquid dose when the containment tank 6 itself is completely filled.

[0078] In accordance with the embodiments illustrated in the enclosed figures, the containment tank 6 of the steam generation device 5 advantageously comprises at least one overflow opening 16 placed at the maximum level height 7. In particular, such overflow opening 16 is adapted to make the liquid exit from the containment tank 6 when the liquid reaches the aforesaid maximum level height 7.

[0079] In this manner, in operation, if a quantity of liquid is introduced in the containment tank 6 that is greater than the liquid dose expected, the excess liquid exceeds the maximum level height 7 and, thus, must flow through the overflow opening 16, exiting from the same containment tank 6.

[0080] Therefore, more in detail, it is the same overflow opening 16 which defines the level at which the maximum level height 7 is placed.

[0081] In particular, the arrangement of the upper cover 13 ensures that the produced steam is collected within the containment tank 6 between the maximum level height 7 and the upper cover 13 itself, thus involving an increase of the air pressure within the containment tank 6 itself and an increase of the temperature at which the same liquid dose (cleaning mixture when the cleaning mode of the oven 1 is activated and water when the steam cooking mode is activated) passes to the gaseous state. In operation, the same steam produced then naturally tends to access the cooking chamber 3, under the thrust of the same pressure thereof, without requiring the use of any fan downstream of the containment tank 6 and upstream of the cooking chamber 3 in order to suction the steam from the containment tank 6 and forcibly introduce it into the cooking chamber 3.

[0082] More in detail, in addition, the same through opening 14 which places the interior of the containment tank 6 directly in fluid communication with the cooking chamber 3 ensures that the steam that exits from the containment tank 6 in order to access the cooking chamber 3 does not have to cross other areas of the oven 1, i.e. in particular it does not have to cross the technical space within which the fan of the oven 1 is placed. In particular, if the interior of the containment tank 6 was in fluid communication with the cooking chamber 3 through the technical space where the fan of the oven 1 is situated, such fan, when actuated, would generate a decrease of the air pressure within the containment tank 6, lowering - in a manner that is hard to control or know - the temperature at which the liquid dose inside the con-

tainment tank 6 evaporates.

[0083] Advantageously, the containment tank 6 of the steam generation device 5 internally delimits a free interspace 15 extended between the maximum level height 7 and the upper cover 13.

[0084] In particular, therefore, the high quantity of steam produced by the electrical heating element 9 is capable of inducing, during use, in the free interspace 15 between the maximum level height 7 and the upper cover 13, an air pressure such to increase the temperature at which the liquid dose, which is situated in the containment tank 6, passes to the steam state.

[0085] Therefore, during use, the use of the upper cover 13 with through opening 14 - which places the interior of the containment tank 6 (or in particular the free interspace 15) directly in fluid communication with the cooking chamber 3 - ensures that the steam produced by the steam generation device 5 has higher temperature than that of boiling of the liquid dose in atmospheric pressure conditions. Hence, such steam at higher temperature, when of a cleaning mixture, allows an improved cleaning of the oven 1, since it more greatly softens the encrusted grease, and, when of water, allows executing an improved steam cooking of the foods placed in the cooking chamber 3.

[0086] In addition, the upper cover 13 ensures that possible grease, dirt or food residues - that fall, during cooking, from a pan, a plate or a grill that support the foods - do not come to be deposited within the containment tank 6, the latter being at least partially protected by the same upper cover 13.

[0087] In this manner, the liquid dose is not contaminated by the grease or by the dirt and can be made to evaporate by the heating means 8, to execute a steam cooking or to clean the interior of the support structure 2, without having to clean the same containment tank 6 before using the steam generation device 5.

[0088] In addition, the same upper cover 13 has, in particular, the advantage that the electrical heating element 9 of the heating means 8 can be placed directly and safely within the containment tank 6.

[0089] Indeed, more in detail, the same upper cover 13 prevents accidental contact by a user with the electrical heating element 9, hence making the use of the steam generation device 5 safer.

[0090] The upper cover 13 advantageously comprises only one through opening 14, preferably circular and provided with a diameter at least equal to 30 mm, and still more preferably, substantially equal to 50 mm, in a manner such to allow an easy passage of the steam from within the containment tank 6 to the cooking chamber 3.

[0091] Otherwise, the upper cover 13 comprises multiple through openings 14, which are placed next to each other and each have diameter at least equal to several millimeters, e.g. comprised between 3 and 10 mm.

[0092] Advantageously, the containment tank 6 comprises a box-like body provided with at least one bottom wall 11 and with at least one lateral wall 12, which is

extended projectingly from the bottom wall 11 up to at least the maximum level height 7 and carries the upper cover 13 mounted thereon.

[0093] In accordance with the embodiments illustrated in the enclosed figures, at least part of the lateral wall 12 has extension, starting from the bottom wall 11, greater than the maximum level height 7, in a manner such that the upper cover 13 mounted thereon can delimit an empty space (or in particular the free interspace 15) above the maximum level height 7 itself.

[0094] In accordance with a different embodiment not illustrated in the enclosed figures, the entire lateral wall 12 has extension, starting from the bottom wall 11, substantially equal to the maximum level height 7 and the upper cover 13 has at least one concavity, at which the through opening 14 is made and which is directed towards the bottom wall 11, in a manner such to delimit - above the maximum level height 7 - an empty space (or in particular the free interspace 15), in which, during use, the produced steam can be collected before flowing into the cooking chamber 3 through the through opening 14 itself.

[0095] Preferably, the upper cover 13 comprises multiple retention pins 21, extended projectingly from the upper cover 13 towards the bottom wall 11, and the box-like body of the containment tank 6 comprises at least one retention flange 22 on which multiple reception openings 23 are made, which are engaged by the aforesaid retention pins 21 in order to maintain the upper cover 13 in position on the lateral wall 12.

[0096] In particular, the electronic control unit and the supply means 10 allow automating the operations of the steam generation device 5, since they allow an automatic filling up of the liquid dose (water when the steam cooking mode is activated and cleaning mixture when the cleaning mode is activated of the oven 1) within the tank 6, limiting the manual interventions by the user. In addition, the electronic control unit and the supply means 10 thus configured allow continuously restoring the liquid dose even in the event in which the quantity of liquid dose that passes to the steam state per unit of time is particularly high.

[0097] Preferably, the supply circuit 41 is provided with at least one first duct 42, placed to fluidly connect the containment tank 6 at least with the water supply source 43, in order to introduce water into the containment tank 6.

[0098] For example, the water supply source 43 can be a water distribution system, or in particular an aqueduct, or a water cistern.

[0099] Preferably, the aforesaid first duct 42 is at least partially extended within the containment tank 6 and terminates with a first supply mouth 54 in turn placed within the containment tank 6 itself. In accordance with the first and second embodiments illustrated in the enclosed figures, the first duct 42 is placed to traverse the lateral wall 12 of the box-like body of the containment tank 6. In addition, the first supply mouth 54 of the first duct 42 is

preferably placed within the containment tank 6 just above the electrical heating element 9 of the heating means 8. Preferably, the supply circuit 41 is provided with at least one second duct 45 placed to fluidly connect (directly or indirectly) the containment tank 6 with the container 44 in order to introduce the cleaning substance in the containment tank 6.

[0100] Preferably, as illustrated in the schematic view of figure 7, the first duct 42 of the supply circuit 41 comprises at least one branch point 55 interposed between the containment tank 6 and the supply source 43 and the second duct 45 is extended branched from the aforesaid first duct 42 between the branch point 55 and the container 44.

[0101] In this manner, the assembly of the steam generation device 5 is simplified, since it is sufficient to make an opening on the box-like body of the containment tank 6, for example at its lateral wall 12, and place the first duct 42 to traverse the aforesaid opening, at which the second branched duct 45 is coupled.

[0102] Advantageously, the supply means 10 comprise at least one mixing group 46 placed to intercept the supply circuit 41 and arranged for receiving a specific quantity of water from the supply source 43 and a specific quantity of cleaning substance from the container 44 and to provide the containment tank 6 with a cleaning mixture of water and at least such cleaning substance.

[0103] The mixing group 46 is preferably placed to intercept the supply circuit 41 at the branch point 55, where the second duct 45 is connected to the first duct 42.

[0104] Otherwise, in accordance with a further embodiment not illustrated in the enclosed figures, the second duct 45, similar to the first duct 42, is at least partially extended within the containment tank 6 and terminates with a second supply mouth in turn placed within the containment tank 6 itself.

[0105] In such case, the mixing group can be connected to the first supply mouth 54 of the first duct 42 in order to receive water from the supply source 43 and to the second supply mouth of the second duct 45 in order to receive cleaning substance from the container 44 (in a manner such that the supply means 10 can supply the cleaning mixture already-formed to the containment tank 6), or it might not be present (in a manner such that the first duct 42 and the second duct 45 separately supply water and cleaning substance to the containment tank 6, within which the cleaning mixture is then formed).

[0106] The mixing group 46 is also preferably actuable in order to selectively enable the supply to the containment tank 6 of only water from the supply source 43 (e.g. when the steam cooking mode is activated), of cleaning mixture (e.g. when the cleaning mode of the oven 1 is activated), or possibly also of only cleaning substance from the container 44.

[0107] Preferably, the electronic control unit is operatively connected to the mixing group 46 of the supply means 10 and is arranged at least for controlling the aforesaid mixing group 46 to selectively enable the sup-

ply to the containment tank 6 of cleaning mixture, of only water, or of only cleaning substance.

[0108] In addition, the electronic control unit preferably comprises a printed circuit board and an electronic processor mounted on the aforesaid printed circuit board.

[0109] In an entirely conventional manner, as mentioned above, the control panel (not illustrated) of the oven 1 is advantageously operatively connected to the electronic control unit. In particular, this is provided with a suitable user interface, through which the user can set a particular operating mode of the present oven 1, i.e. an operating mode between at least the cleaning mode of the oven 1 and the steam cooking mode.

[0110] In particular, the control panel is arranged for sending a control signal to the electronic processor of the electronic control unit, based on the operating mode (steam cooking mode or cleaning mode of the oven 1) set by the user through the user interface, and such electronic processor is in turn arranged for reading the aforesaid control signal and consequently controlling the mixing group 46.

[0111] For example, in the event in which the steam cooking mode has been set, the mixing group 46 is controlled by the electronic control unit to enable supplying the containment tank 6 with water. In addition, in the event in which the cleaning mode of the present oven 1 has been set, the mixing group 46 is controlled to enable supplying the containment tank 6 with the cleaning mixture of water and cleaning substance.

[0112] The mixing group 46 can for example comprise a mixer, a three-way valve, a proportional volumetric meter or the like, which are known to the man skilled in the art of the field and therefore not described in detail hereinbelow.

[0113] Moreover, in addition or as an alternative to the aforesaid mixing group 46, the supply means 10 advantageously comprise a pumping device (not illustrated in the enclosed figures) placed to intercept the supply circuit 41 and arranged at least for picking up, from the container 44, the cleaning substance and for supplying at least such cleaning substance to the containment tank 6. Advantageously, the electronic control unit of the steam generation device 5 is operatively connected to the aforesaid pumping device.

[0114] Preferably, the pumping device can for example comprise a peristaltic pump, a membrane pump, a piston pump or any other pump adapted for supplying a precise quantity of cleaning substance to the containment tank 6.

[0115] In the event in which the second duct 45 is at least partially extended within the containment tank 6 and terminates with a second supply mouth thereof within the containment tank 6 itself, the pumping device is preferably placed to intercept the second duct 45 itself and is arranged only for picking up the cleaning substance from the container 44 and supplying it to the containment tank 6. Consequently, a further pumping device can be provided to intercept the first duct 42 in order to pick up the water from the supply source 43, in particular for example

in the event in which the supply source 43 is a cistern. Or, in the event in which the supply source 43 is the water distribution system, the hydraulic head of the water distribution system itself can be sufficient to ensure that the water flows up to the containment tank 6 in an autonomous manner and a valve is also provided that is actuatable to intercept the first duct 42, which is actuatable in opening and closing in order to allow the water of the water distribution system to supply or not supply the aforesaid containment tank 6.

[0116] In the event in which the second duct 45 is connected to the first duct 42 at the branch point 55, the pumping device can be placed to intercept the same second duct 45, in order to only pick up the cleaning substance from the container 44 and introduce it into the first duct 42, or it can be placed to intercept the first duct 42 downstream of the branch point 55, such that it pumps both the cleaning substance from the container 44 and the water from the supply source 43.

[0117] In accordance with an embodiment variant of the supply circuit 41, not illustrated in the enclosed figures, the supply source 43 is the water distribution system and the supply means 10 comprise an actuatable valve (like that described above) and a first check valve, which are placed to intercept the first duct 42 upstream of the branch point 55, and the pumping device and a second check valve, which are placed to intercept the second duct 45. In particular, the first check valve prevents the cleaning substance pumped by the pumping device from flowing through the first duct 42 towards the supply source 43 and the second check valve prevents the water from flowing from the supply source 43 through the second duct 45 towards the container 44. In addition, preferably, the electronic control unit is operatively connected to the pumping device and to the actuatable valve of the supply means 10 and is arranged at least for controlling such pumping device and such actuatable valve to selectively supply the containment tank 6 only with water, only with cleaning substance or with water and cleaning substance in succession so as to form the aforesaid cleaning mixture directly within the containment tank 6. In operation, it is then possible to provide only water to the containment tank 6, in order to execute for example a steam cooking of the foods, by acting on the actuatable valve in opening in order to allow the water of the supply source 43 to flow up to the aforesaid containment tank 6. Otherwise, it is possible to supply first water, by acting on the actuatable valve, and then supply the cleaning substance, by actuating the pumping device in a manner such that it picks up a specific quantity of cleaning substance from the container 44 and introduces it into the containment tank 6, where the water has already been collected.

[0118] In addition to the container 44 of cleaning substance, the containment tank 6 preferably comprises a supply opening 27, so as to allow a user to manually pour a further cleaning substance within the containment tank 6.

[0119] Preferably, the aforesaid supply opening 27 is made on the upper cover 13 of the containment tank 6.

[0120] In addition, advantageously, the containment tank 6 removably carries, mounted thereon, a closure body 28 at the supply opening 27, and such closure body 28 is preferably removably coupled to the upper cover 13, in order to selectively free and obstruct the aforesaid insertion opening 27, in particular so as to allow the manual introduction of the further cleaning substance in the containment tank 6 through the supply opening 27 and to reclose it immediately afterward.

[0121] Preferably, the electrical heating element 9 of the heating means 8 is extended on a lying plane α that is substantially horizontal and parallel to the lower wall 4.

[0122] In addition, the containment tank 6 preferably has a capacity of 0.5 - 3.8 dm³ for the liquid dose and the density of electrical power per unit of volume of the containment tank 6, absorbed by the at least one electrical heating element 9, is comprised between 1.1 kW/dm³ and 2.5 kW/dm³. More in detail, the placement of the electrical heating element 9 of the heating means 8 on a substantially horizontal lying plane α allows placing each portion of the electrical heating element 9 at the same distance from the maximum level height 7 of the containment tank 6, at which, during use, the surface of the liquid dose is situated.

[0123] In this manner, in the event in which the electrical heating element 9 is placed on a lying plane α in proximity to the maximum level height 7, each steam bubble that is formed at the interface between the electrical heating element 9 and the liquid dose must only follow a brief section from the electrical heating element 9 to the maximum level height 7 itself.

[0124] In addition, such particular placement of the electrical heating element 9 allows attaining a containment tank 6 having a reduced depth, which can then be placed below the lower wall 4 of the containment structure 2 without negatively affecting the overall vertical size of the present oven 1.

[0125] The reduced capacity of the containment tank 6, comprised between 0.5 and 3.8 dm³, i.e. substantially comprised between 0.5 and 3.8 liters of water, in particular ensures that the liquid dose contained in the containment tank 6 has a reduced thermal inertia.

[0126] This means that the aforesaid liquid dose can be easily brought to the boiling temperature by the electrical heating element 9 of the supply means 8.

[0127] The aforesaid reduced capacity, together with the density of electrical power absorbed per unit of volume comprised between 1.1 kW/dm³ and 2.5 kW/dm³, facilitates the transfer of heat from the electrical heating element 9 to the liquid dose, reducing the time necessary for bringing the liquid dose itself to boil.

[0128] Advantageously, in order to maximize the surface of the liquid dose within the containment tank 6, the containment tank 6 has main extension in the two directions of the horizontal plane.

[0129] In particular, the width and the length of the con-

tainment tank 6 in plan view are advantageously of an order of magnitude greater than the depth of the containment tank 6. Advantageously, the ratio between the horizontal section of the containment tank 6, at least at the maximum level height 7, and the volume of the containment tank 6 is substantially comprised between 1.8 and 3.2 dm²/dm³.

[0130] Such ratio between horizontal section and volume of the containment tank 6 allows obtaining a surface of the liquid dose that is quite extensive with respect to the volume which the latter occupies, thus facilitating the passage of the steam from the liquid dose to the air.

[0131] In accordance with the preferred embodiment illustrated in the enclosed figures, the bottom wall 11 of the containment tank 6 has substantially rectangular shape and the lateral wall 12 is projectingly extended from the aforesaid bottom wall 11 substantially perpendicular thereto with four first sides 24 that are two-by-two parallel.

[0132] Advantageously, the four first sides 24 together delimit a volume with substantially parallelepiped shape and determine a horizontal section of the containment tank 6 that is substantially rectangular, and preferably constant with the variation of the level of the liquid dose.

[0133] More in detail, the bottom wall 11 of the containment tank 6 has a width comprised between 210 mm and 250 mm and a length comprised between 260 mm and 300 mm.

[0134] Preferably, the maximum level height 7 is placed at a distance comprised between 20 mm and 60 mm, measured from the aforesaid bottom wall 11.

[0135] In accordance with the first embodiment of a steam generation device illustrated in the enclosed figures 2 to 6, the width of the containment tank 6 is substantially equal to 234 mm, its length is substantially equal to 280 mm, while the aforesaid distance between the maximum level height 7 and the bottom wall 11 is substantially equal to 40 mm.

[0136] In this manner, therefore, the volume delimited between the four first sides 24 is substantially equal to 2.6 dm³, and is therefore adapted to contain a liquid dose slightly greater than 2.5 liters of water.

[0137] In addition, preferably, the surface of the aforesaid bottom wall 11 and the horizontal section of the containment tank 6 at the maximum level height 7 have a same extension of about 6.55 dm² and thus preferably determine a ratio between horizontal section and volume substantially equal to 2.55 dm²/dm³, the containment tank 6 having parallelepiped shape.

[0138] Advantageously, the lying plane α of the at least one electrical heating element 9 is placed at a distance from the maximum level height 7 preferably lower than 55 mm and, preferably, substantially lower than 40 mm.

[0139] In accordance with the first embodiment, the aforesaid lying plane α is preferably placed at a distance from the maximum level height 7 substantially equal to 28 mm. In addition, since such maximum level height 7 is placed at about 40 mm from the bottom wall 11, in

accordance with the preferred embodiment, the lying plane α of the electrical heating elements 9 is preferably also placed at about 12 mm from the bottom wall 11, in a manner such that the electrical heating elements 9 also heat the bottom wall 11.

[0140] In such a manner, the bottom wall 11 distributes the heat received from the electrical heating elements 9, this preferably being made of stainless steel with good thermal conductivity characteristics.

[0141] In accordance with the second embodiment of a steam generation device 5 illustrated in the enclosed figures 7 to 10, the width and the length of the containment tank 6 are substantially equal respectively to 234 mm and 280 mm, such as for the first embodiment, while the distance between the maximum level height 7 and the bottom wall 11 is substantially equal to 50 mm, in a manner such that the volume delimited between the four first sides 24 is substantially equal to 3.2 dm³ and thus adapted to contain a liquid dose of about 3.2 liters of water.

[0142] Therefore, since the containment tank 6 has parallelepiped shape, the ratio between horizontal section, both at the maximum level height 7 and at the bottom wall 11, and the volume is substantially equal to 2 dm²/dm³.

[0143] In addition, still in accordance with such second embodiment, the lying plane α of the at least one electrical heating element is placed at a distance from the maximum level height 7 substantially equal to 33 mm and, hence, also at about 17 mm from the bottom wall 11 in order to heat it in turn and better distribute the heat.

[0144] Preferably, the heating means 8 comprise two electrical heating elements 9, which are placed alongside each other within the containment tank 6 on a same lying plane α and are each adapted to absorb an electric power of about 2 kW.

[0145] Consequently, for the first embodiment, the electric power per unit of volume is preferably around 1.6 kW/dm³, while for the second embodiment it is preferably around 1.25 kW/dm³.

[0146] More in detail, the technical specifications reported above for the first and second embodiments of the heat generation device 5 allow obtaining a flow rate of produced steam substantially comprised between 180 and 220 g/min and, hence, on average of about 50 g/min for each kW of electric power absorbed by the electrical heating elements 9 of the heating means 8.

[0147] In order to bring the liquid dose substantially to the maximum level height 7 or maintain it there during use without the level of the liquid dose falling below the lying plane α of the electrical heating elements 9, the electronic control unit advantageously comprises a timer module programmed for actuating the supply means 10 at regular time intervals. In addition, the timer module is preferably integrated directly in the electronic processor of the electronic control unit by means of a suitable functional software.

[0148] In particular, the time intervals set by the timer

module are preferably adjusted with reference to the producible steam flow, in a manner such to compensate for the portion of liquid dose that has evaporated during the actuation of the heating means 8.

5 **[0149]** Preferably, such timer module is programmed for controlling, at each minute, the supply means 10 to restore the liquid dose with a liquid flow rate of 20 g/s for a time interval of 10 s.

10 **[0150]** Of course, without departing from the protective scope of the present invention, the introduction of the liquid dose within the containment tank 6 can be controlled in a different manner. For example, the steam generation device 5 can comprise at least one level sensor (not illustrated) placed within the containment tank 6, operatively connected to the electronic control unit and arranged for sending a level signal to the electronic control unit with the liquid within the containment tank 6 at a pre-established lower threshold level.

15 **[0151]** In such case, the electronic control unit can be arranged for reading the level signal sent by the liquid level sensor and controlling the supply means 10, on the basis of the aforesaid level signal, to restore the liquid dose substantially to the maximum level height 7.

20 **[0152]** More in detail, such level sensor can for example be a pressure switch, which is placed within the containment tank 6 at the lower threshold level and arranged for detecting at least one pressure variation due to the passage of the surface of the liquid dose from above to below the aforesaid lower threshold level.

25 **[0153]** In accordance with the first and second embodiment, the steam generation device 5 advantageously comprises a first discharge duct 29, which is mechanically connected to the containment tank 6 and is extended starting from a first discharge opening 30 in fluid communication with the interior of the aforesaid containment tank 6.

30 **[0154]** In addition, the steam generation device 5 preferably comprises a controllable valve 31, which is placed to intercept the first discharge duct 29 and is actuatable between an open configuration, in which the controllable valve 31 frees the discharge duct 29 in order to flow the liquid dose from the containment tank 6, and a closed configuration, in which the controllable valve 31 obstructs the discharge duct 29 in order to retain the liquid dose within the containment tank 6. Preferably, the first discharge opening 30 of the first discharge duct 29 is placed at the bottom wall 11.

35 **[0155]** In addition, the controllable valve 31 is preferably a solenoid valve, which is operatively connected to the electronic control unit in order to be actuated between the closed configuration and the open configuration.

40 **[0156]** Advantageously, the electronic control unit is actuatable also in a rinsing mode of the containment tank 6, in which the electronic control unit is arranged for controlling the supply means 10 to supply the containment tank 6 with water from the supply source 43 and preferably also to isolate the container 44 from the containment tank 6.

[0157] In addition, in the rinsing mode of the containment tank 6, the electronic control unit is preferably arranged for maintaining the controllable valve 31 in open configuration, in a manner such that the water supplied to the containment tank 6 passes within the containment tank 6, cleaning it, and is directly made to flow through the discharge duct 29.

[0158] In this manner, it is possible for example to remove possible residues of cleaning substance following the activation of the cleaning mode of the oven 1 and before a new activation of the steam cooking mode, thus preventing the foods to be cooked from being contaminated by a vapor that still transports undesired cleaning substance.

[0159] In accordance with the preferred embodiment illustrated in the enclosed figures, three of the first sides 24 of the lateral wall 12 of the box-like body are extended beyond the maximum level height 7, in a manner such to define, together with the upper cover 13, the free interspace 15, and the remaining of the four first sides 24 is a leveling side 32 extended from the bottom wall 11 up to the maximum level height 7 in order to define an overflow opening 16 that is substantially rectangular and extended between the same maximum level height 7 and the upper cover 13.

[0160] In addition, the steam generation device 5 preferably comprises a discharge space 33 mechanically coupled to the containment tank 6 and in fluid communication with the latter through the aforesaid overflow opening 16, in a manner such that the liquid in excess with respect to the maximum level height 7 flows from the containment tank 6 to the discharge space 33.

[0161] Preferably, the steam generation device 5 comprises a second discharge duct 34, which is mechanically connected to the discharge space 33 and is extended starting from a second discharge opening 35 in fluid communication with the interior of the aforesaid discharge space 33 in order to make the excess liquid - which has traversed the overflow opening 16 from the containment tank 6 - flow therethrough.

[0162] In addition, the first discharge duct 29 preferably comprises a first section 36, which is extended from the first discharge opening 30 to the controllable valve 31, and a second section 37, which is extended from the controllable valve 31 to the second discharge duct 34 downstream of the second discharge opening 35 thereof.

[0163] Preferably, the aforesaid discharge space 33 comprises a containment body, which is provided with a terminal wall 38 and with a delimitation wall 39, which is extended projectingly from the aforesaid terminal wall 38.

[0164] Similar to the box-like body of the containment tank 6, the terminal wall 38 of the containment body of the discharge space 33 has substantially rectangular shape, or alternatively square shape, and the delimitation wall 39 is extended projectingly from the aforesaid terminal wall 38 substantially perpendicular thereto with four second sides 40 that are two-by-two parallel.

[0165] In order to facilitate the assembly of the steam

generation device 5, at least the bottom wall 11 and the terminal wall 38 are made in a single body, e.g. by means of a single plate, and the two first sides 24 adjacent to the leveling side 32 are made in a single body, each with a second side 40 adjacent to the leveling side 32.

[0166] In addition, the leveling side 32 is preferably in common with the lateral wall 12 and with the delimitation wall 39.

[0167] In accordance with the first and second embodiments, the upper cover 13 of the containment tank 6 is extended to also cover the discharge space 33 and is also mechanically coupled to the delimitation wall 39 of the containment body of the discharge space 33, at least two of the first sides 24 of the lateral wall 12 being made in a single body with two corresponding second sides 40 of the delimitation wall 39.

[0168] In addition, the through opening 14 of the upper cover 13, through which the steam flow flows into in the cooking chamber 3, is preferably made above the discharge space 33.

[0169] In operation, the steam flow produced is thus collected in the free interspace 15 of the containment tank 6 between maximum level height 7 and upper cover 13, flows through the overflow opening 16 made on the lateral wall 12 in order to access the discharge space 33 and exits therefrom through the through opening 14 of the upper cover 13.

[0170] In this manner, in case of fall - through the through opening 14 of the upper cover 13 - of dirt and/or of foreign bodies during the cooking, these are not deposited within the containment tank 6, contaminating the liquid dose, but are deposited within the discharge space 33, where they can be removed by the possible excess liquid that crosses the overflow opening 16 and flows into the second discharge opening 35.

[0171] In accordance with the second embodiment, the steam generation device 5 advantageously comprises ventilation means 60 in fluid communication with the containment tank 6 and arranged for insufflating an air flow within the containment tank 6.

[0172] In particular, the air flow insufflated by the ventilation means 60 within the containment tank 6 involves an increase of the air pressure within the same containment tank 6, thus facilitating the passage of the steam flow generated by the heating means 8 to the cooking chamber 3 of the present oven 1.

[0173] In addition, since the air pressure within the containment tank 6 can be increased by simply actuating the ventilation means 60, also the temperature at which the liquid dose boils can be increased with respect to the temperature at which the same liquid dose would boil in the case of pressure equal to atmospheric pressure.

[0174] More in detail, the ventilation means 60 comprise at least one ventilator (not illustrated) in order to generate the air flow and an insufflation duct 62 extended between such ventilator and the containment tank 6 in order to introduce the air flow within the latter.

[0175] In addition, the containment tank 6 advanta-

geously comprises at least one insufflation opening 63 connected to the insufflation duct 62 in order to allow the entrance of the aforesaid air flow at its interior.

[0176] Preferably, the insufflation opening 63 is made on the lateral wall 12 of the containment tank 6, for example on the first side 24 to which the support bodies 92 of the electrical heating elements 9 are coupled and above such electrical heating elements 9.

[0177] In particular, the insufflation opening 63 is at least partially extended above the maximum level height 7 in order to introduce the air flow into the free interspace 15 between the maximum level height 7 and the upper cover 13.

[0178] Advantageously, the containment tank 6 comprises a barrier 64 provided with at least one first wall 65 extended frontally with respect to the insufflation opening 63, preferably parallel to the first side 24 on which the same is made, with vertical extension lower than that of the insufflation opening 63.

[0179] More in detail, such barrier 64, being placed across from the insufflation opening 63 with lower vertical extension, allows the entrance of the air flow produced by the ventilation means 60 but, when the ventilation means 60 are not activated, it at least partly obstructs the passage of the steam flow from within the containment tank 6 to the insufflation duct 62 through the insufflation opening 63.

[0180] In accordance with the second embodiment, the insufflation opening 63 is partly extended also below the maximum level height 7 and the barrier 64 comprises at least one second wall 66 extended between the lateral wall 12, in particular the first side 24 on which the insufflation opening 63 is made, and the first wall 65, so as to prevent the liquid dose from flowing from the containment tank 6 to the insufflation duct 62 through the insufflation opening 63 part that is extended below the maximum level height 7.

[0181] More in detail, as illustrated in the enclosed figures 9 and 10, the insufflation opening 63 has extension along a horizontal direction that is smaller than the width of the containment tank 6 and the second wall 66 of the barrier 64 comprises a smaller side 67, substantially parallel to the bottom wall 11, and two lateral flanks 68, which are extended transverse to the aforesaid smaller side 67, to the first wall 65 of the same barrier 64 and to the first side 24 on which the insufflation opening 63 is made, so as to isolate the latter from the liquid dose.

[0182] Advantageously, the insufflation duct 62 comprises an initial section 69, provided with a first transverse section and connected to the ventilator, and a plenum section 70, which is provided with a second transverse section having extension greater than the first transverse section and connected to the insufflation opening 63.

[0183] In particular, such plenum section 70 reduces possible turbulences of the air flow, reducing the speed thereof before it traverses the insufflation opening 63 and accesses the containment tank 6, i.e. in particular the free interspace 15.

[0184] Preferably, the ventilation means 60 comprise a third check valve 71 placed to intercept the insufflation duct 62, which is arranged for allowing the passage of the air flow with the ventilator activated and for preventing the steam flow from flowing through the insufflation duct 62 with the ventilator deactivated.

[0185] In particular, such third check valve 71 is placed to intercept the aforesaid insufflation duct 62 at its initial section 69.

[0186] More in detail, the third check valve 71 can be driven between a passage configuration, in which the third check valve 71 frees the insufflation duct 62 in order to allow the air flow to flow through the latter when the ventilator is activated, and an obstruction configuration, in which the third check valve 71 obstructs the insufflation duct 62 when the ventilator is deactivated in order to prevent the steam flow from flowing through the insufflation duct 62 itself.

[0187] Preferably, the ventilation means 60 are operatively connected to the logic control unit and the logic control unit is arranged for selectively controlling the aforesaid ventilation means 60 to insufflate the air flow within the containment tank 6.

[0188] In particular, the ventilator and the third check valve 71 are operatively connected to the aforesaid electronic control unit, which is arranged for driving the third check valve 71 into passage configuration with the ventilator activated and for driving the third check valve 71 into obstruction configuration with the ventilator deactivated.

[0189] Also forming the object of the present invention is a steam generation device 5 for an oven 1 for cooking foods, advantageously of the type described up to now and regarding which the same reference numbers will be maintained for the sake of description simplicity.

[0190] In the present description, all the characteristics described with reference to the steam generation device 5 of the oven 1 for cooking foods must be intended as referable without variations also to only the steam generation device 5, object of the present invention.

[0191] The steam generation device 5, object of the invention, is intended to be mechanically associated with a support structure 2 of an oven 1 for cooking foods and to be placed in fluid communication with a cooking chamber 3 at least partially delimited by the aforesaid support structure 2 in order to introduce a steam flow at its interior.

[0192] Such steam generation device 5 is provided with a containment tank 6 for containing a liquid dose, and such containment tank 6 is intended to be in fluid communication with the cooking chamber 3 of the oven 1 and to be placed at least partially below the lower wall 4 of the support structure 2 of the oven 1, with heating means 8, which are placed substantially at the containment tank 6 in order to heat the liquid dose and generate the steam flow, and with supply means 10 for supplying liquid in the containment tank 6 in order to restore the aforesaid liquid dose.

[0193] In addition, the heating means 8 comprise at

least one electrical heating element 9, which is extended at least partially within the containment tank

[0194] According to the idea underlying the present invention, the supply means 10 comprise a supply circuit 41 provided with at least one supply source 43, which is placed in fluid connection with the containment tank 6 in order to introduce at least water in the containment tank 6, and with at least one container 44 for containing a cleaning substance, which is placed in fluid connection with the containment tank 6 in order to introduce at least the cleaning substance in the containment tank 6.

[0195] In addition, the steam generation device 5 comprises an electronic control unit operatively connected to the supply means 10 and actuatable at least in a cleaning mode of the oven 1. In such cleaning mode of the oven 1, the electronic control unit is arranged for controlling the supply means 10 to supply, to the containment tank 6, the water from the supply source 43 and the cleaning substance from the container 44 in order to form a cleaning mixture in the containment tank 6 and, in addition, in order to control the electrical heating element 9 of the heating means 8 to heat the cleaning mixture in the containment tank 6 in order to generate a vapor of cleaning mixture adapted to be diffused in the cooking chamber 3.

[0196] Also forming the object of the present invention is a method for cleaning the oven 1 for cooking foods, of the type described up to now and regarding which the same reference numbers will be maintained for description simplicity. The aforesaid method comprises a filling up step, in which the supply means 10 of the steam generation device 5 introduce water into the containment tank 6, by means of the supply source 43, and a cleaning substance, from the container 44, in order to form a cleaning mixture and, in addition, comprise an evaporation step, in which the electrical heating element 9 of the heating means 8 heats the cleaning mixture in the containment tank 6 in order to generate a vapor of the cleaning mixture, which is diffused in the cooking chamber (3).

[0197] The oven 1 for cooking foods and the steam generation device 5 thus conceived therefore attain the pre-established objects.

Claims

1. Steam generation device (5) for an oven (1) for cooking foods, said steam generation device (5) being intended to be mechanically associated with a support structure (2) of said oven (1) for cooking foods and to be placed in fluid communication with a cooking chamber (3) at least partially delimited by said support structure (2) in order to introduce a steam flow in said cooking chamber (3) and being provided with:

- at least one containment tank (6) for containing a liquid dose, said containment tank (6) being intended to be in fluid communication with said

cooking chamber (3);

- heating means (8) placed at said containment tank (6) in order to heat said liquid dose and in order to generate said steam flow;

- supply means (10) for supplying said liquid in said containment tank (6) in order to restore said liquid dose;

said containment tank (6) being intended to be placed at least partially below a lower wall (4) of said support structure (2) of said oven (1) for cooking foods;

said heating means (8) comprising at least one electrical heating element (9), which is extended at least partially within said containment tank (6); said steam generation device (5) being **characterized in that** said supply means (10) comprise a supply circuit (41) provided with:

- at least one supply source (43) placed in fluid connection with said containment tank (6) in order to introduce at least water into said containment tank (6);

- at least one container (44) for containing a cleaning substance placed in fluid connection with said containment tank (6) in order to introduce at least said cleaning substance in said containment tank (6);

said steam generation device (5) comprising an electronic control unit operatively connected to said supply means (10) and actuatable at least in a cleaning mode of the oven (1), wherein said electronic control unit is arranged for:

- controlling said supply means (10) to provide, to said containment tank (6), said water from said supply source (43) and said cleaning substance from said container (44) in order to form a cleaning mixture in said containment tank (6);
- controlling the electrical heating element (9) of said heating means (8) to heat said cleaning mixture in said containment tank (6) in order to generate a vapor of said cleaning mixture adapted to be diffused in said cooking chamber (3).

2. Device according to claim 1, **characterized in that** said electronic control unit is actuatable in a steam cooking mode, wherein said electronic control unit is arranged for:

- controlling said supply means (10) to provide said containment tank (6) with said water from said supply source (43);
- controlling said heating means (8) to heat said

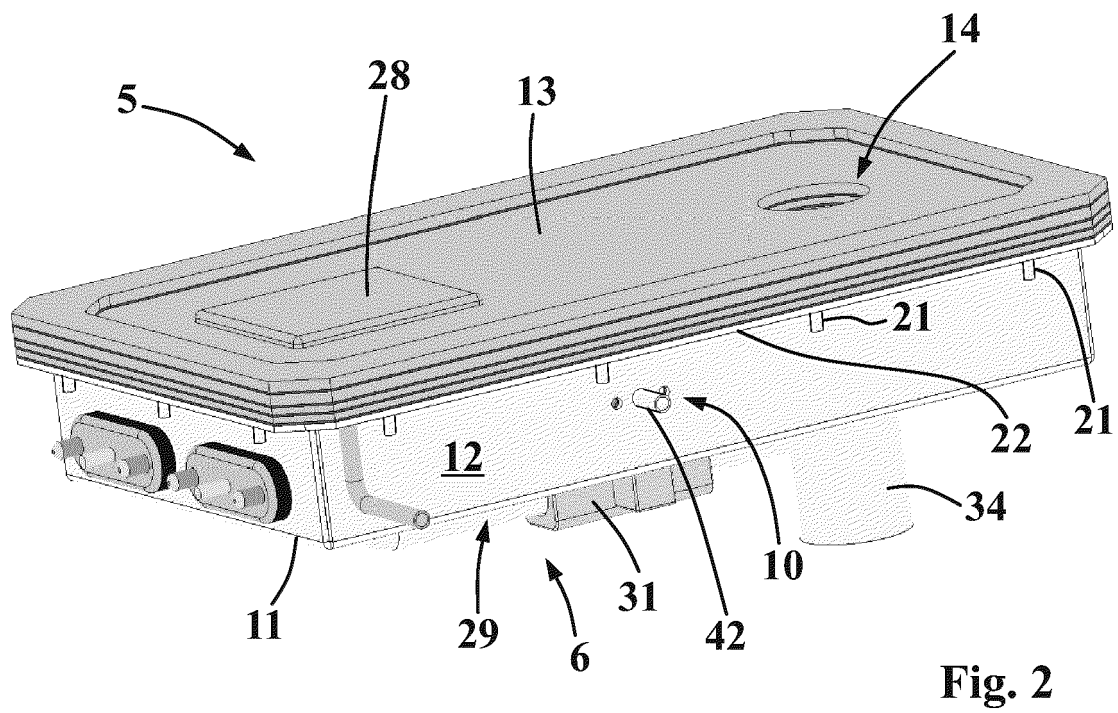
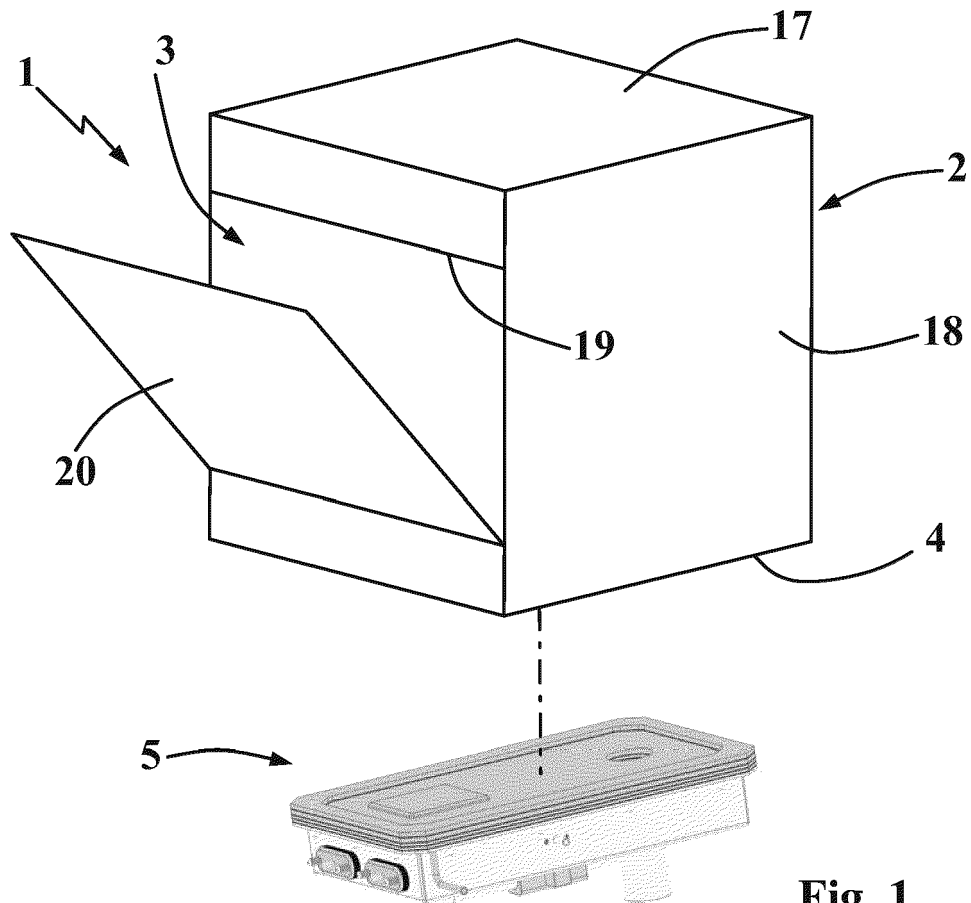
- water in said containment tank (6) in order to generate a water vapor.
3. Device according to claim 1 or 2, **characterized in that** said supply means (10) comprise at least one mixing group (46) placed to intercept said supply circuit (41) and arranged for receiving a specific quantity of water from said supply source (43) and a specific quantity of said cleaning substance from said container (44) and to provide said containment tank (6) with at least one cleaning mixture of water and said cleaning substance. 5 10
 4. Device according to any one of the preceding claims, **characterized in that** said supply means (10) comprise a pumping device placed to intercept said supply circuit (41) and arranged at least for picking up, from said container (44), said cleaning substance and for providing at least said cleaning substance to said containment tank (6). 15 20
 5. Device according to any one of the preceding claims, **characterized in that** said containment tank (6) is provided with a maximum level height (7) and with an upper cover (13) provided with at least one through opening (14) placed above said maximum level height (7) and arranged for directly placing in fluid communication the interior of said containment tank (6) with the cooking chamber (3) of the support structure (2) of said oven (1) for the cooking of the foods. 25 30
 6. Device according to claim 5, **characterized in that** said containment tank (6) internally delimits a free interspace (15) extended between said maximum level height (7) and said upper cover (13). 35
 7. Device according to claim 5 or 6, **characterized in that** said containment tank (6) comprises at least one overflow opening (16) placed at said maximum level height (7). 40
 8. Device according to any one of the claims from 5 to 7, **characterized in that** said containment tank (6) comprises a box-like body provided with at least one bottom wall (11) and with at least one lateral wall (12), which is extended projectingly from said bottom wall (11) up to at least said maximum level height (7) and carries said upper cover (13) mounted thereon. 45 50
 9. Device according to any one of the preceding claims, **characterized in that** it comprises ventilation means (60) in fluid communication with said containment tank (6) and arranged for insufflating an air flow within said containment tank (6). 55
 10. Oven for cooking foods, which comprises:

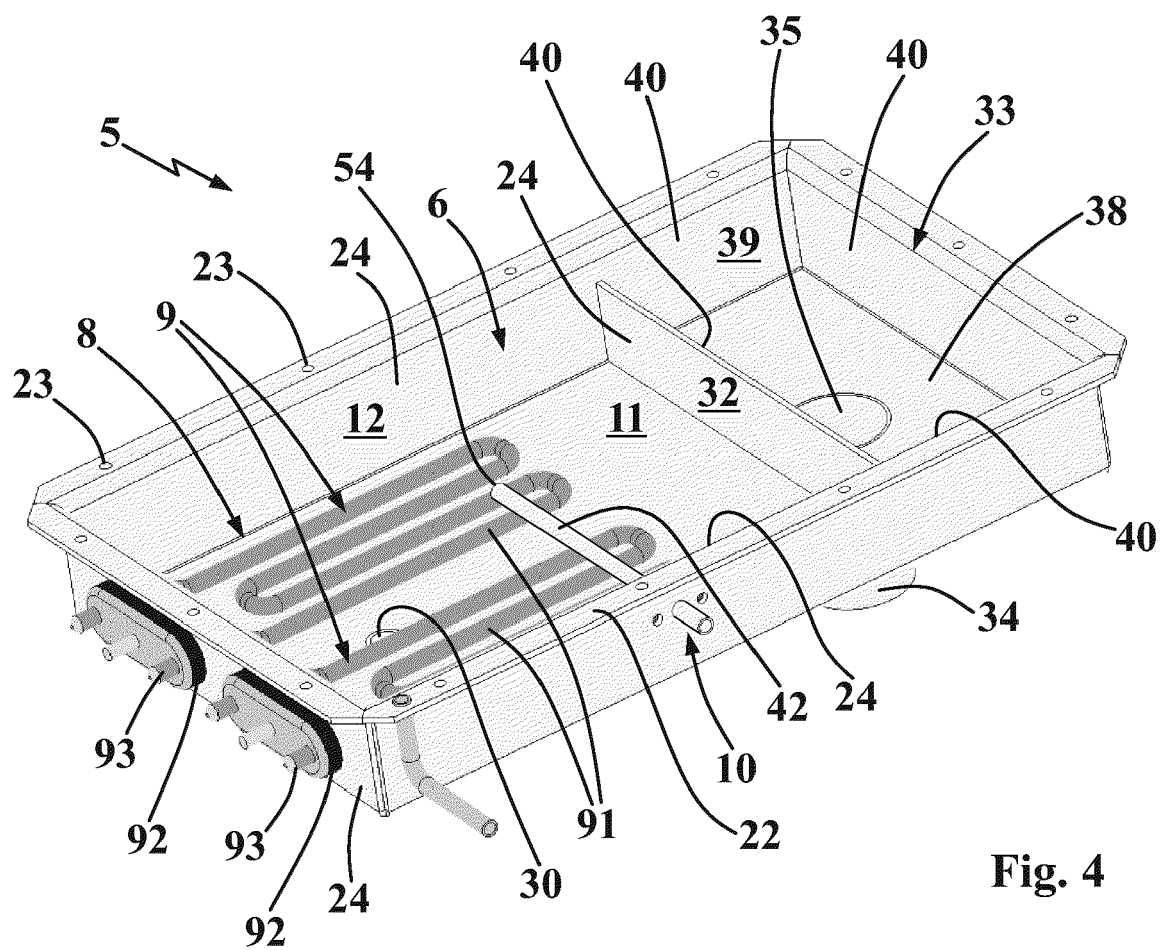
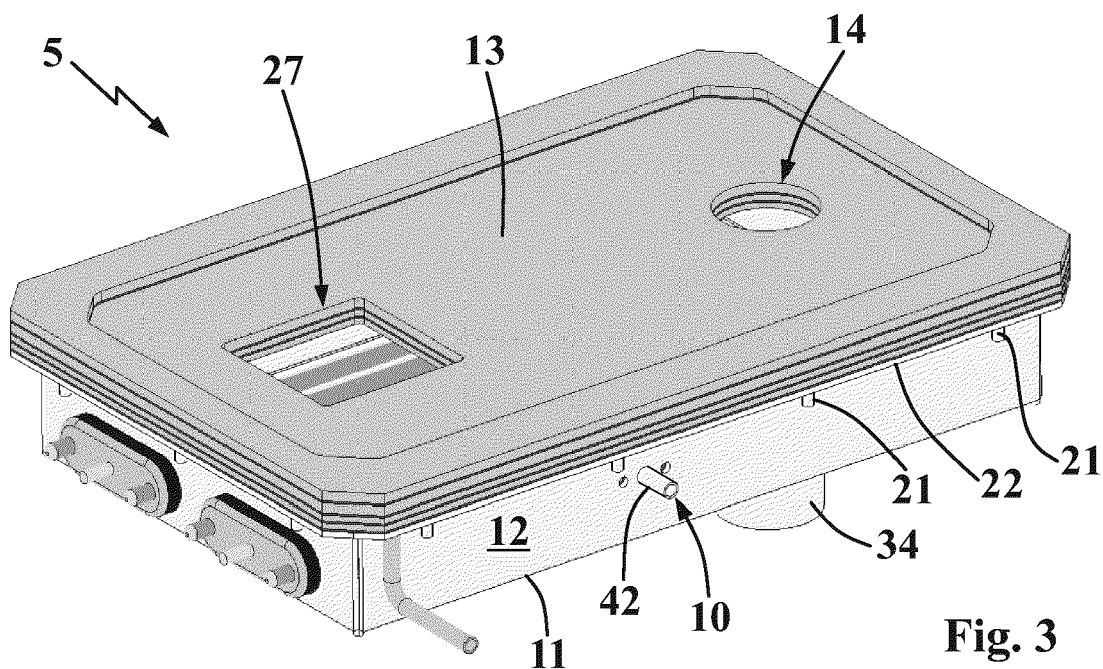
- a support structure (2) at least partially delimiting a cooking chamber (3) and provided with a lower wall (4);
- a steam generation device (5) according to any one of the preceding claims, which is mechanically associated with said support structure (2) and is placed in fluid communication with said cooking chamber (3) in order to introduce a steam flow in said cooking chamber (3);

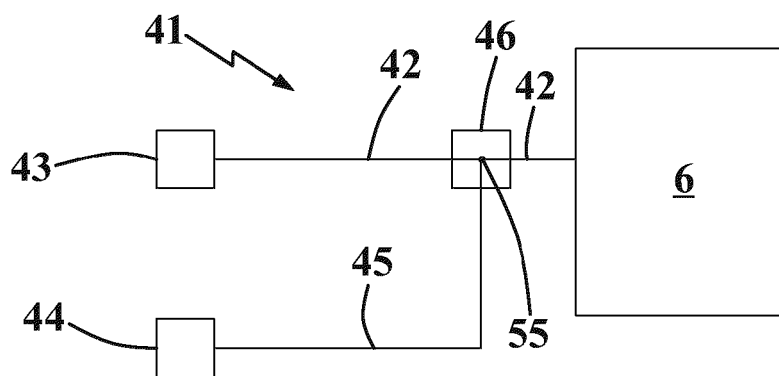
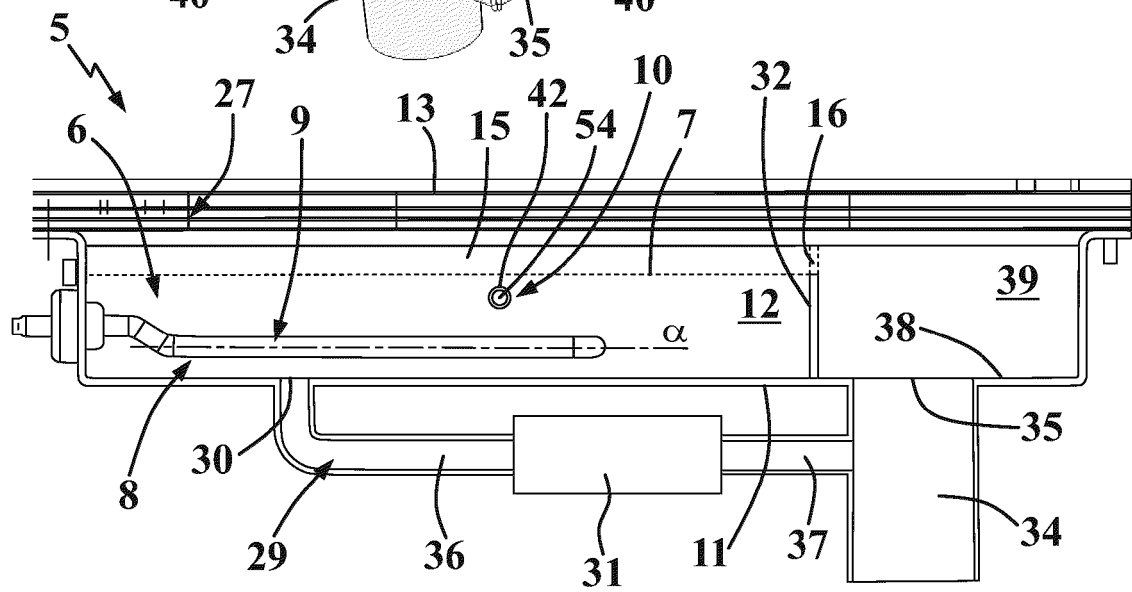
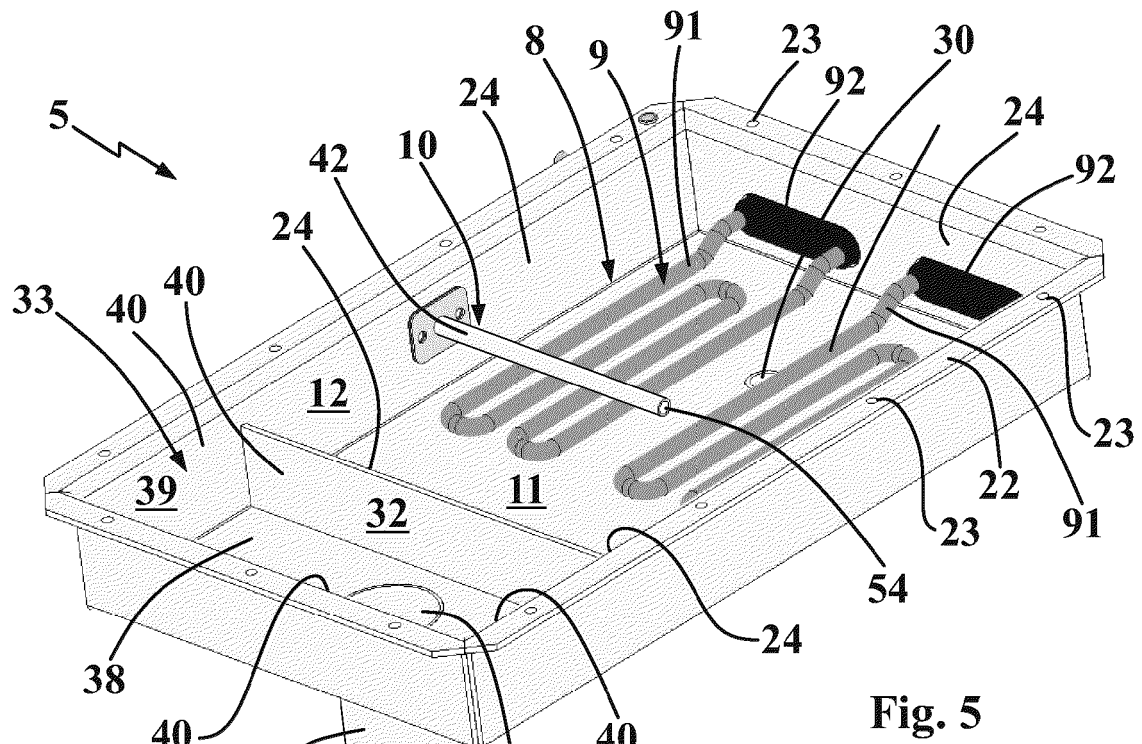
the containment tank (6) of said steam generation device (5) being placed at least partially below the lower wall (4) of said support structure (2) and being in fluid communication with said cooking chamber (3).

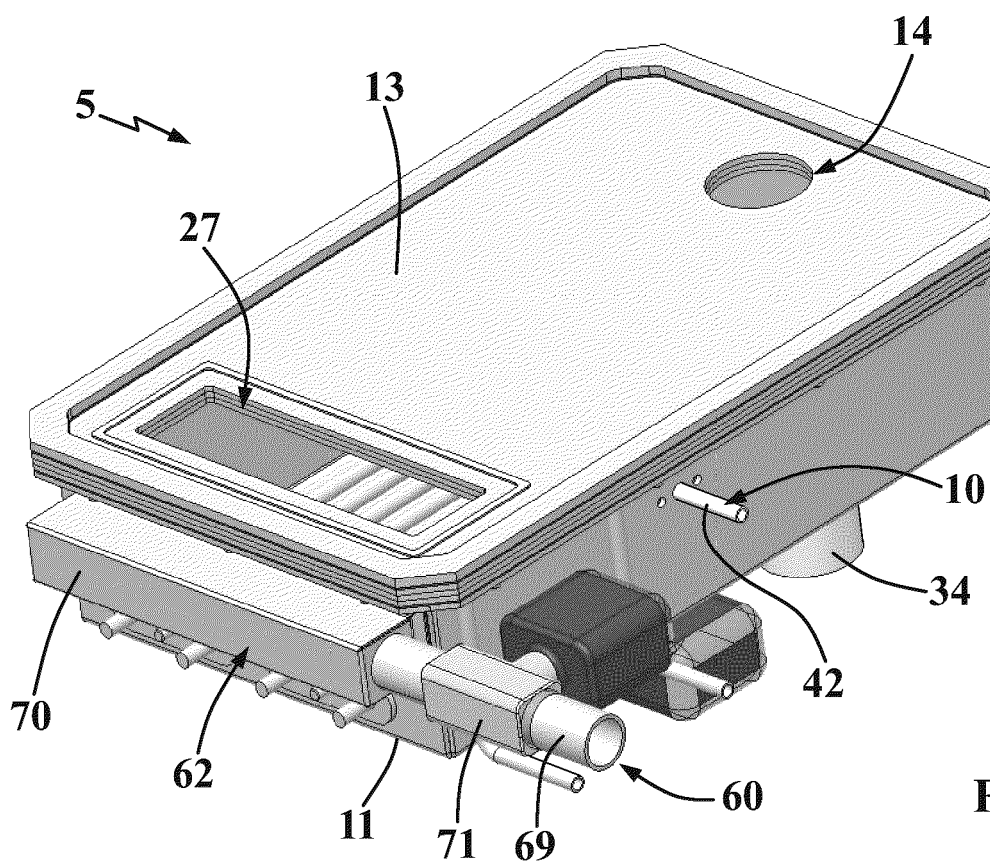
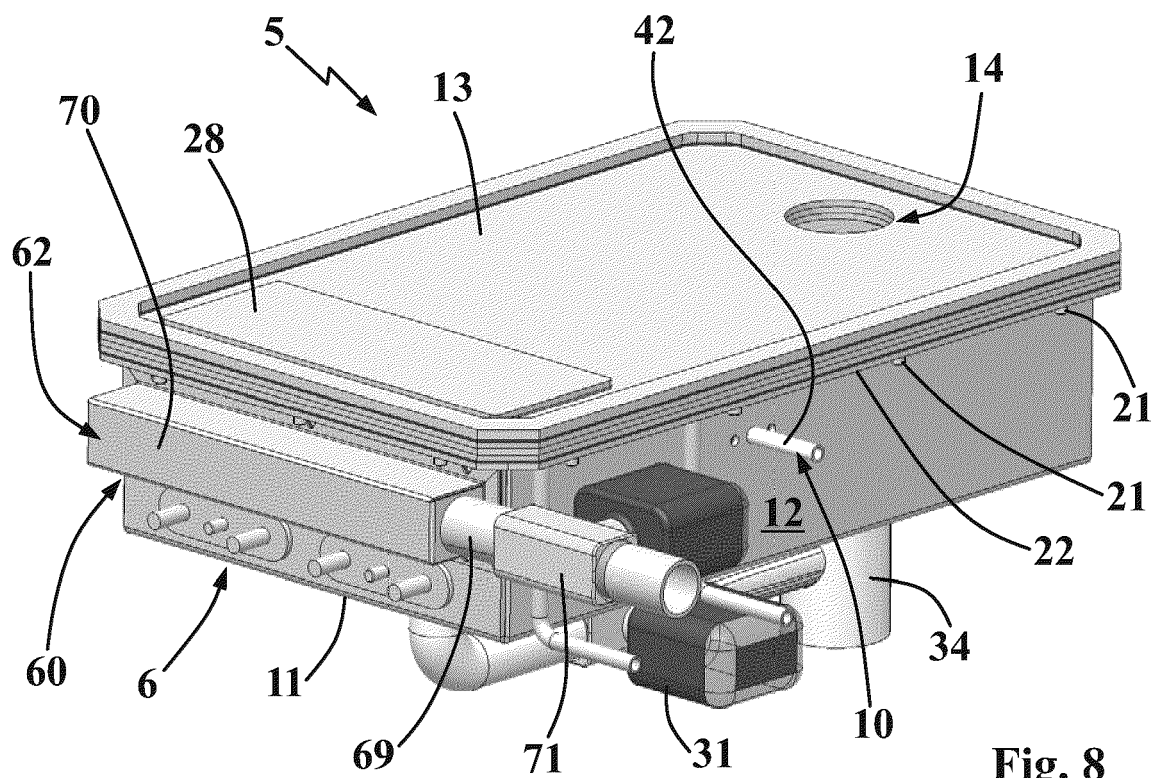
11. Method for cleaning an oven for cooking foods according to claim 10, said method comprising:

- a filling up step, wherein the supply means (10) of said steam generation device (5) introduce water in said containment tank (6), by means of said supply source (43), and a cleaning substance, from said container (44), in order to form a cleaning mixture; and
- an evaporation step, wherein the electrical heating element (9) of said heating means (8) heats said cleaning mixture in said containment tank (6) in order to generate a vapor of said cleaning mixture, which is diffused in said cooking chamber (3).









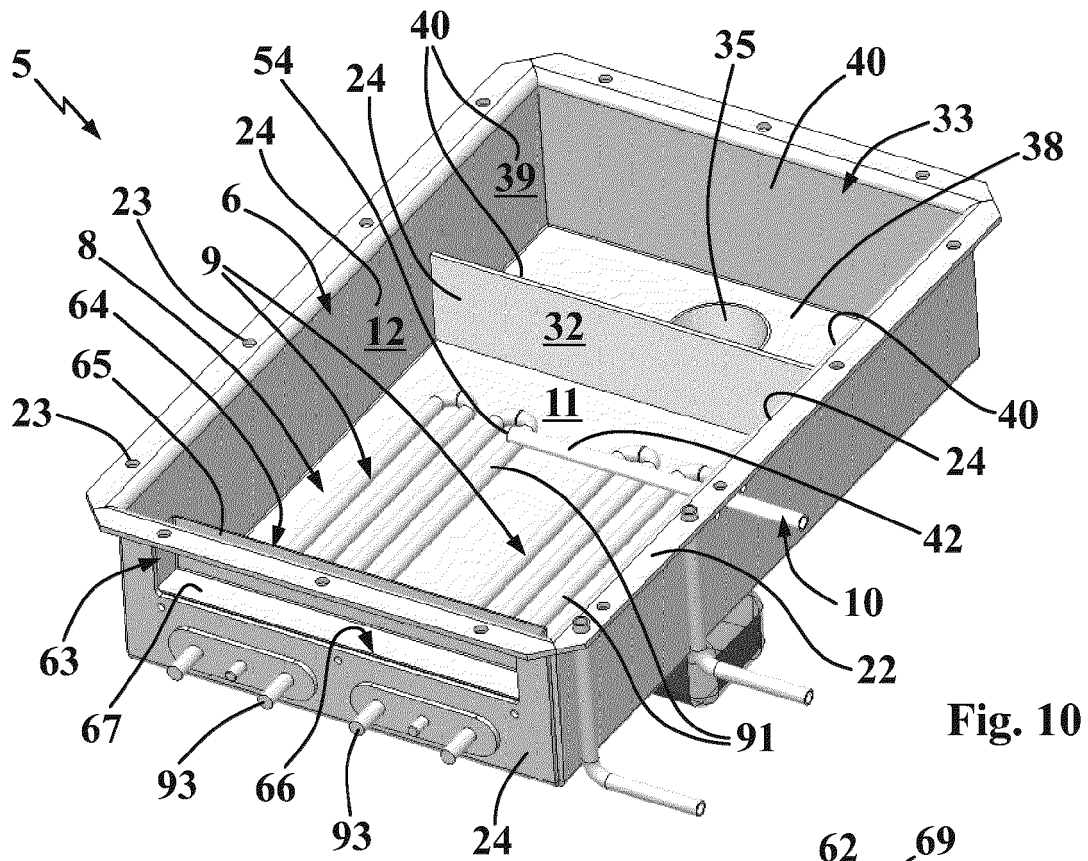


Fig. 10

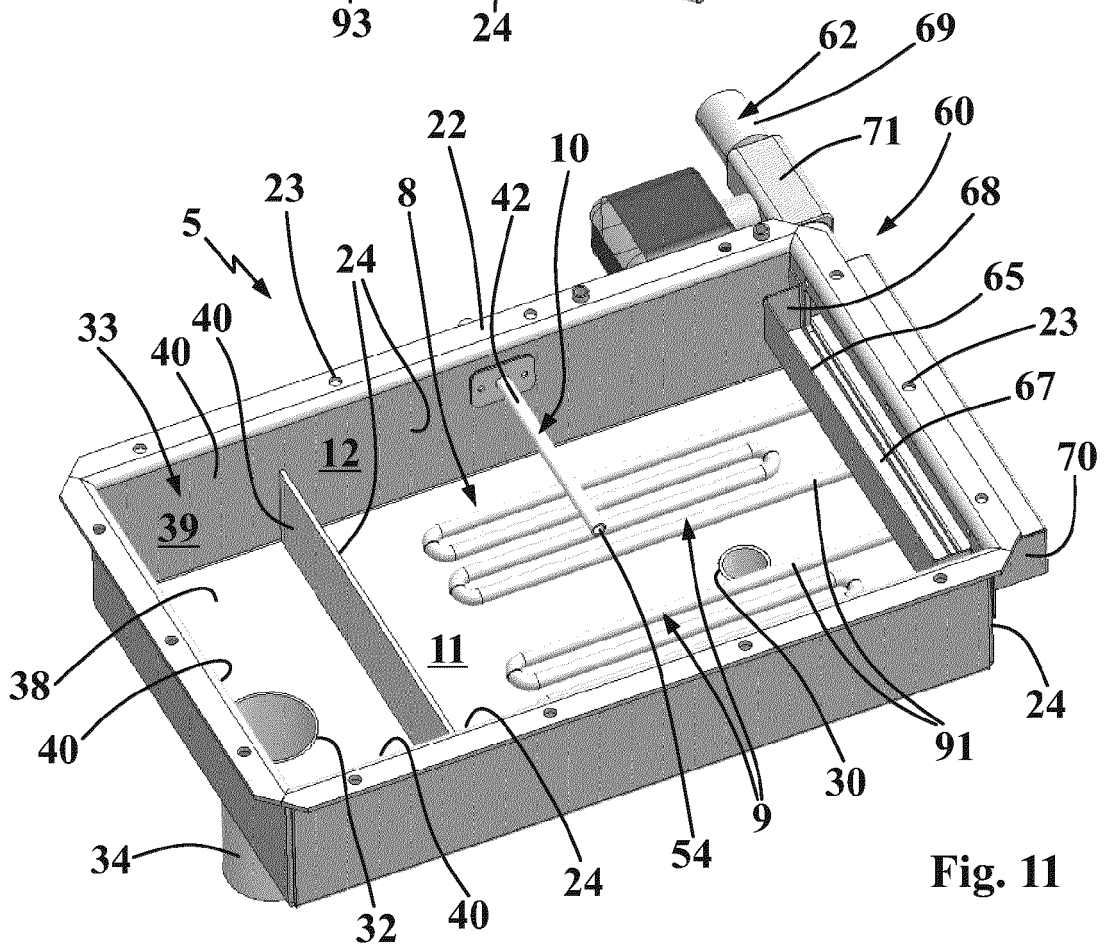


Fig. 11



EUROPEAN SEARCH REPORT

Application Number

EP 22 16 4854

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 2 218 328 A (E & R MOFFAT LIMITED [GB]) 15 November 1989 (1989-11-15) * figure 1 * * page 1, line 2 - page 1, line 5 * * page 5, line 2 - page 5, line 6 * * page 4, line 30 - page 4, line 31 * * page 4, line 24 - page 5, line 10 * -----	1-11	INV. F24C14/00 F24C15/32
A	EP 3 531 028 A1 (SMEG SPA [IT]) 28 August 2019 (2019-08-28) * figure 3 * * paragraph [0040] * -----	1-11	
Y	EP 1 975 517 A2 (EGO ELEKTRO GERAETEBAU GMBH [DE]) 1 October 2008 (2008-10-01) * figure 4 * * paragraph [0022] * -----	9	
A	CA 2 484 213 A1 (CLEVELAND RANGE INC [US]) 6 November 2003 (2003-11-06) * figure 1 * * page 4, line 13 - page 4, line 20 * -----	1-11	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 6 213 002 B1 (BATTEN WILLIAM C [US] ET AL) 10 April 2001 (2001-04-10) * figure 1 * * column 5, line 58 - column 6, line 19 * -----	1-11	F24C
A	DE 10 2016 220529 A1 (CONVOTHERM ELEKTROGERAETE [DE]) 19 April 2018 (2018-04-19) * figure 1 * -----	1-11	
Y	EP 2 543 932 A1 (STEEL S R L [IT]) 9 January 2013 (2013-01-09) * figure 4 * * paragraphs [0001], [0035], [0054] * * figure 1 * -----	1-11	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 July 2022	Examiner Jalal, Rashwan
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	

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

EP 22 16 4854

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2218328 A	15-11-1989	NONE	
EP 3531028 A1	28-08-2019	EP 3531028 A1	28-08-2019
		ES 2887029 T3	21-12-2021
		PL 3531028 T3	13-12-2021
		SI 3531028 T1	30-11-2021
EP 1975517 A2	01-10-2008	DE 102007016501 A1	02-10-2008
		EP 1975517 A2	01-10-2008
		US 2008236404 A1	02-10-2008
CA 2484213 A1	06-11-2003	AU 2003221740 A1	10-11-2003
		CA 2484213 A1	06-11-2003
		US 2003213792 A1	20-11-2003
		WO 03091646 A2	06-11-2003
US 6213002 B1	10-04-2001	CA 2325235 A1	12-05-2001
		US 6213002 B1	10-04-2001
		US 6435078 B1	20-08-2002
DE 102016220529 A1	19-04-2018	NONE	
EP 2543932 A1	09-01-2013	NONE	