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(54) Self-cleaning method for an oven

(57) Self-cleaning method for an oven, comprising an initial phase (Es) in which the temperature in a cavity of the oven is increased to approximately a first preset temperature (T1) at the most, and an adjustment phase (Ea), subsequent to the initial phase (Es), in which the temperature of the cavity is increased to approximately a second preset temperature (T2) at the most, said second temperature (T2) being higher than the first temperature (T1). The second temperature (T2) is a temperature that is sufficiently high for pyrolysis to occur, the method also comprising a maintenance phase (Em), subsequent to the adjustment phase (Ea), in which the second temperature (T2) in the cavity is kept substantially constant.

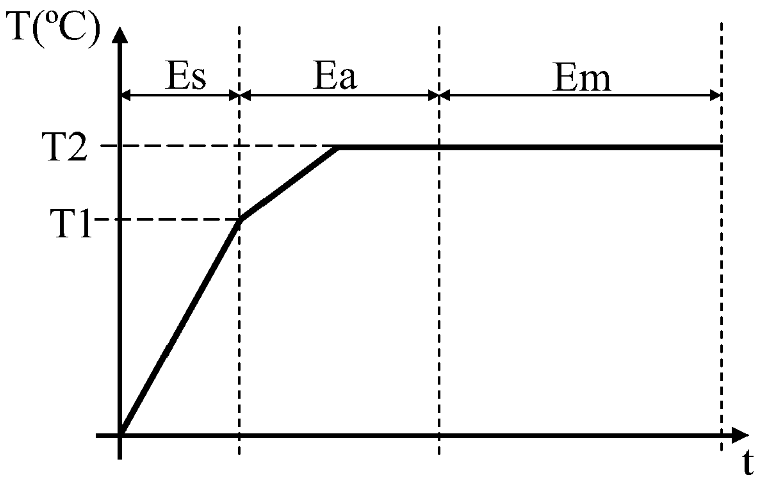

Fig. 3

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Description

TECHNICAL FIELD

[0001] This invention relates to self-cleaning methods for ovens, and in particular to self-cleaning methods for ovens using a pyrolysis process.

PRIOR ART

[0002] There are known ovens in the prior art that comprise a self-cleaning function, which is performed by means of a pyrolysis process. During this process a high temperature is generated in a cavity of the oven to eliminate the fat or solid bodies deposited on the walls delimiting the cavity. As a minimum the high temperature has to be around 500°C, and must be maintained for a preset time period to allow the self-cleaning to be performed correctly, which is usually stipulated as approximately 45 minutes.

[0003] The prior art contains numerous pyrolysis procedures. Smoke is generated during these processes as the waste present in the cavity of the oven is burnt, and generally speaking these processes or methods begin with an initial phase, the purpose of which is to reduce the generation of smoke. One of these methods is described in document US 6417493 B1. In the method or pyrolysis process described in this document the temperature of the cavity of the oven is increased in an initial phase to a first preset temperature, lower than the temperature necessary to perform the self-cleaning process. The temperature is subsequently increased to a second temperature that corresponds with a temperature that is sufficiently high for self-cleaning to occur by means of pyrolysis. Said method then comprises a plurality of subsequent phases that cause the repeated decrease and increase of the temperature in the cavity according to a preset criterium.

BRIEF DISCLOSURE OF THE INVENTION

[0004] It is an object of the invention to provide a self-cleaning method for ovens, by means of pyrolysis, as described in the claims.

[0005] The self-cleaning method for an oven of the invention comprises an initial phase in which the temperature in a cavity of the oven is increased to approximately a first preset temperature preset at the most, and an adjustment phase, subsequent to an initial phase, in which the temperature in the cavity is increased to approximately a second preset temperature preset at the most.

[0006] The second temperature corresponds with an appropriate temperature for performing the pyrolytic process, which is what enables the self-cleaning of the oven, and the first temperature is lower than said second temperature, but is sufficiently high to burn the scraps in the cavity of the oven.

[0007] The method also comprises a maintenance phase, subsequent to the adjustment phase, in which the second internal temperature of the oven is maintained for a specific period of time, the aim being that said second temperature is maintained in the cavity of the oven for a sufficient and necessary time to allow the self-cleaning to be performed correctly.

[0008] As a result, the smallest possible amount of smoke is generated (with the initial phase), and a high temperature (the second temperature) is reached in the cavity of the oven that is sufficient for the self-cleaning process to occur, and which is kept substantially constant, the cleaning being performed correctly.

[0009] These and other advantages and characteristics of the invention will be made evident in the light of the drawings and the detailed description thereof.

DESCRIPTION OF THE DRAWINGS

[0010]

Figure 1 shows a perspective view of an embodiment of an oven in which the method of the invention is performed.

Figure 2 shows an embodiment of a first heating element and a second heating element of the oven of Figure 1.

Figure 3 shows the development of the temperature in the cavity of the oven of Figure 1, in a first embodiment of the method of the invention.

Figure 4 shows the development of the temperature in the cavity of the oven of Figure 1, in a second embodiment of the method of the invention.

DETAILED DISCLOSURE OF THE INVENTION

[0011] The self-cleaning method of the invention is designed for its use in ovens 100, preferably domestic ones, comprising a cavity 101, where the food to be cooked and/or heated is disposed, and at least three heating elements 1, 2 and 3. As shown in Figure 1, a first heating element 1 and a second heating element 2 are disposed in the top part of said cavity 101, and a third heating element 3 is disposed beneath said cavity 101. The first heating element 1 corresponds with the heating element of an oven that is commonly known as a "dome", and the second heater corresponds with the heating element of an oven that is commonly known as a "grill", such as those shown by way of example in Figure 2, the third element 3 corresponding with the heating element of an oven that is commonly known as a "base". In general terms, of the three heating elements 1, 2 and 3 the one with most power is the second heating element 2 due to the fact that it needs high power to perform the main function for which it has mostly been designed (a grill). By way of example, the first heater 1 comprises a power of 1400W, the second heater 2 comprises a power of 1600W, and the third heater 3 comprises a power of 1300W. Evidently, the method of the invention is not limited to the use of heating elements comprising these powers, it being capable of being used in an oven comprising heating elements with different powers to those defined, for example.

[0012] The method comprises an initial phase Es in which the temperature in the cavity 101 of the oven 100 is increased to approximately a first preset temperature T1 at the most, which preferably corresponds with approximately 435°C, only the heating elements 1 and 2 being activated for this purpose. Most of the dirt is usually deposited in the bottom part of the cavity 101, so that if the third heating element 3 is activated from the beginning, a lot of smoke can be generated, which is not advisable as the user can notice its effects and be discomforted by it. If it is not activated, less smoke is generated by said dirt deposited in the bottom part of the oven 100 as said dirt burns at a slower rate. To determine the temperature in the cavity 101, the oven 100 comprises a temperature sensor not shown in these figures, which is preferably disposed in the centre of said cavity 101, fixed to the rear wall 101 a of said cavity.

[0013] The method comprises, subsequent to the initial phase ES, an adjustment phase Ea in which the temperature in the cavity 101 of the oven 100 is increased to approximately a second preset temperature T2 at the most. Said second temperature T2 corresponds with a temperature necessary for pyrolysis to occur, which is sufficient if it is around 500°C. Preferably, said second temperature T2 is comprised within a range delimited between approximately 500°C and approximately 550°C. The walls 101 a that delimit the cavity 101, except, generally speaking, a door 102 of the oven that provides access to said cavity 101, are covered with enamel, as a result of which it is recommended that the temperature of 550°C not be exceeded on said walls 101 a in order to prevent the enamel from being damaged.

[0014] Preferably, in the initial phase Es the heating elements 1 and 2 are activated to 100% of their power. When the temperature in the cavity 101 equals the first temperature T1 the adjustment phase Ea begins, although preferably a maximum time period for the duration of the initial phase Es is established, so that said adjustment phase Ea begins if, once said time period has elapsed, the temperature in the cavity 101 has not reached said first temperature T1. Preferably said time period is approximately 35 minutes.

[0015] Figure 3 shows a first embodiment of the method of the invention, the temperature T (°C) in the cavity 101 being represented on the ordinate axis, and the development of the method in time t being represented on the abscissa axis. The first embodiment of the method lasts approximately 120 minutes. The duration of the adjustment phase Ea is fixed, being approximately 35 minutes. The duration of the maintenance phase Em thus depends on the time required in the initial phase Es for the first temperature T1 to be reached, its minimum duration being 50 minutes (in the event that once the 35 minutes of the initial phase have elapsed, the temperature in the cavity 101 has not reached the first temperature T1), which is sufficient time for the pyrolysis to be performed correctly. Generally speaking, 45 minutes at the necessary temperature (a minimum in the region of 500°C) is required for the pyrolysis to be performed correctly.

[0016] With the heating elements 1 and 2 it is possible to increase the temperature in the cavity 101 to the temperature required to generate the pyrolysis, although there are areas of said cavity 101 that are heated less than the average. To help heat these areas, in the adjustment phase Ea of the first embodiment the third heating element 3 is activated. In addition, as the cavity 101 has been heated previously in the initial phase Es, said activation does not cause the excessive generation of smoke (it can even be the case that no smoke is generated). As with the heating elements 1 and 2 the cavity 101 has already been heated in the initial phase Es, and as said heating elements 1 and 2 remain activated in said adjustment phase Ea, the power of the third heating element 3 remains activated, so that said third heating element 3 provides only the heat necessary to heat said areas, thereby preventing damage from being caused to the enamel of the closest walls 101 a due to excessive temperature. As a result, said third heating element 3 is delimited between approximately 30% and approximately 40% of its maximum power, preferably at 35%. Despite being very limited in power, said third heating element 3 does not emanate heat only to said areas as they are not disposed with means for directing the heat, for example. As a result, as there is an increase of heat sources in the cavity 101, to compensate for said increase the power of the heating elements 1 and 2 is also limited. Preferably, the first heating element 1 is delimited between approximately 65% and approximately 75% of its maximum power, preferably at 70%, and the second heating element 2 is delimited between approximately 85% and approximately 95% of its maximum power, preferably at 90%. This thus prevents the overheating of the walls 101 a of the cavity 101 and prevents the risk of the enamel on them from being damaged.

[0017] In the first embodiment, in the maintenance phase Em a fan 4 disposed in the cavity 101 is activated at the same time as the three heating elements 1, 2 and 3 remain activated, so that a flow of air is generated that distributes the heat generated by the heating elements 1, 2 and 3 by the entire cavity 101. Preferably, as shown in Figure 1, the fan 4 is attached to a rear wall 101 a of the cavity 101. As a result, areas of said cavity 101 at a distance from the heating elements 1, 2 and 3, such as the door 102 of said oven 100 are heated for their cleaning by pyrolysis, thereby enabling access to the cavity 101, for example, which comprises a surface that corresponds with one of the walls 101a that delimit said cavity 101. To prevent excessively high temperatures being reached in said cavity 101, as there is a flow of air that distributes the heat, the power of the first heating element 1 is delimited between approximately 45% and approximately 55% of its maximum power, preferably at 50%, and the power of the third heating element 3 is delimited between approximately 43% and approximately 53% of its maximum power, preferably at 48%. It has been found that if the power of the first heating element 1 is limited, it is not necessary to limit the power of the second heater 2, as thanks to the flow of air and said limit the wall 101 a closest to the heating elements 1 and 2 does not suffer excessively high temperatures. In addition, it is advantageous that the power of the second heating element 2, which is greater than the power of the first heating element 1, can be disposed in order to keep the temperature in the cavity 101 substantially equal to the second temperature T2.

[0018] In any of the phases of the first embodiment of the method of the invention the limiting of a heating element 1, 2, 3 does not mean that said heating element 1, 2, 3 operates at said power. It means that it operates at that power at the most. The oven 100 comprises control means (not shown in the figures) whose function is to limit the powers, and which also have the function of causing the passage from one phase to another of the method, and of ensuring the temperature in the cavity 101 is substantially equal to the second temperature T2 when required. To keep said second temperature T2 substantially constant said control means are adapted to adjust the power used at each moment by each heating element 1, 2 and 3, without them exceeding the maximum power to which they have been limited, and, preferably, they cause proportional changes in the powers at which said heating elements 1, 2 and 3 operate, thereby increasing and/or decreasing all of them by the same percentage. The control means correspond with a microcontroller, a microprocessor, a printed circuit control board or with an equivalent device.

[0019] Figure 4 shows a second embodiment of the method of the invention, the temperature T (°C) in the cavity 101 being represented on the ordinate axis, and the development of the method in time t being represented on the abscissa axis. The second embodiment of the method lasts approximately 90 minutes. The duration of the adjustment phase Ea and the maintenance phase Em depends on the time required in the initial phase Es for the first temperature T1 to be reached, its minimum duration being 50 minutes (in the event that once the 35 minutes of the initial phase have elapsed, the temperature in the cavity 101 has not reached the first temperature T1), which is sufficient time for the pyrolysis to be performed correctly. Generally speaking, 45 minutes at the necessary temperature (a minimum in the region of 500°C) are required for the pyrolysis to be performed correctly.

[0020] In the second embodiment of the method of the invention, in the adjustment phase Ea the third heating element 3 and the fan 4 are activated, and the first heating element 1 and the second heating element 2 remain activated. In the maintenance phase Em both the fan 4 and the three heating elements remain activated. In the adjustment phase Ea the first heating element 1 is delimited, at the most, between approximately 45% and 55% of its maximum power, preferably at 50%, the second heating element 2 has no power limits, and the third heating element 3 between approximately 43% and approximately 53% of its maximum power, at the most, preferably at 48%. In the maintenance phase Em the same limits are maintained as in the adjustment phase Ea, so that in the second embodiment the powers are only limited once (at the beginning of the adjustment phase Ea). The aforementioned advantages of the first embodiment are obtained in said second embodiment, although there is a greater risk of smoke being generated and discomforting a user in the adjustment phase Ea, as the fan 4 is activated from the start. On the other hand, the self-cleaning method is shorter than that of the first embodiment.

[0021] As occurs in the first embodiment of the method of the invention, in any of the phases of the second embodiment the limiting of a heating element does not mean that said heating element operates at said power. It means that it operates at that power as a maximum. The oven 100 comprises control means (not shown in the figures) whose function is to limit the powers, and which also have the function of causing the passage from one phase to another of the method, and of ensuring the temperature in the cavity 101 is substantially equal to the second temperature T2 when required. To keep said second temperature T2 substantially constant said control means are adapted to adjust the power used at each moment by each heating element 1, 2 and 3, without them exceeding the maximum power to which they have been limited, and, preferably, they cause proportional changes in the powers at which said heating elements 1, 2 and 3 operate, thereby increasing and/or decreasing all of them by the same percentage.

Claims

1. Self-cleaning method for an oven, comprising
an initial phase (Es) in which the temperature in a cavity (101) of the oven (100) is increased to approximately a first preset temperature (T1) at the most, and
an adjustment phase (Ea), subsequent to the initial phase (Es), in which the temperature of the cavity (101) is increased to approximately a second preset temperature (T2) at the most,
characterised in that
the second temperature (T2) is a temperature sufficiently high for pyrolysis to occur,
the method also comprising a maintenance phase (Em), subsequent to the adjustment phase (Ea), in which the second temperature (T2) in the cavity (101) is kept substantially constant.

2. Method according to claim 1, wherein in the initial phase (Es) a first heating element (1) of the oven (100) and a second heating element (2) of said oven (100), which are disposed in the top part of the cavity (101) of said oven (100), are activated at 100% of their power.

3. Method according to any of the preceding claims, wherein the adjustment phase (Ea) begins when the temperature in the cavity (101) of the oven (100) reaches the first temperature (T1) or when a preset time period has elapsed from the beginning of the initial phase (Es) if, once said time period has elapsed, the temperature in said cavity (101) is lower than the first temperature (T1).

4. Method according to claim 3, wherein the preset time period is approximately 35 minutes.

5. Method according to any of the preceding claims, wherein the first temperature (T1) is approximately 435°C.

6. Method according to any of the preceding claims, wherein the second temperature (T2) is within a delimited range between approximately 500°C and approximately 550°C.

7. Method according to any of the preceding claims, wherein
in the adjustment phase (Ea) a third heating element (3) of said oven (100), which is disposed beneath the cavity (101) of said oven (100), is activated, and the first heating element (1) and the second heating element (2) remain activated, and
in the maintenance phase (Em), a fan (4) disposed in the cavity (101) of the oven (100) is activated and the three heating elements (1, 2, 3) remain activated.

8. Method according to claim 7, wherein, in the adjustment phase (Ea), the third heating element (3) is activated, its power being reduced to a maximum delimited between approximately 30% and approximately 40%, preferably 35%, the first heating element (1) remains activated its power being reduced to a maximum delimited between approximately 65% and approximately 75%, preferably 70%, and the second heating element (2) remains activated its power being reduced to a maximum delimited between approximately 85% and approximately 95%, preferably 90%.

9. Method according to claim 8, wherein, in the maintenance phase (Em), the first heating element (1) remains activated its power being reduced to a maximum delimited between approximately 45% and approximately 55%, preferably 50%, the second heating element (2) remains activated without any power limits, and the third heating element (3) remains activated its power being reduced to a maximum delimited between approximately 43% and approximately 53%, preferably 48%.

10. Method according to any of claims 7 to 9, wherein the adjustment phase (Ea) lasts approximately 35 minutes.

11. Method according to any of claims 7 to 10, wherein it lasts approximately 120 minutes.

12. Method according to any of claims 1 to 6, wherein
in the adjustment phase (Ea) a third heating element (3) of said oven (100), which is disposed beneath the cavity (101) of said oven (100), and a fan (4) disposed in said cavity (101) are activated, and the first heating element (1) and the second heating element (2) remain activated, and
in the maintenance phase (Em) the fan (4) and the three heating elements (1, 2, 3) remain activated.

13. Method according to claim 12, wherein, in the adjustment phase (Ea) and in the maintenance phase (Em), the first heating element (1) is limited between approximately 45% and approximately 55% of its maximum power, preferably at 50%, the second heating element (2) has no power limits, and the third heating element (3) is limited between approximately 43% and approximately 53% of its maximum power, preferably at 48%.

14. Method according to claims 12 or 13, wherein it lasts approximately 90 minutes.

15. Pyrolytic oven comprising
a cavity (101),
a plurality of heating elements (1, 2, 3) adapted to increase and/or maintain the temperature of the cavity (101), and
control means,
characterised in that
the control means are adapted to perform a method according to any of the preceding claims.

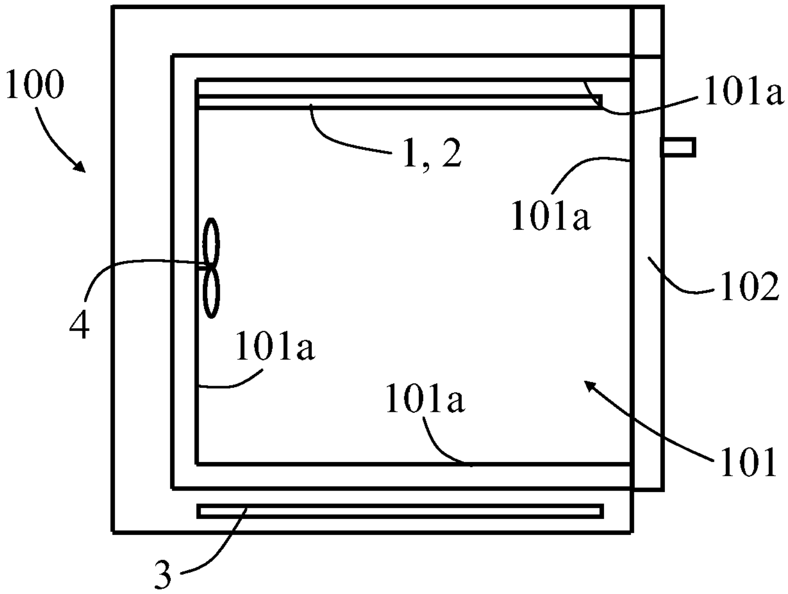

Fig. 1

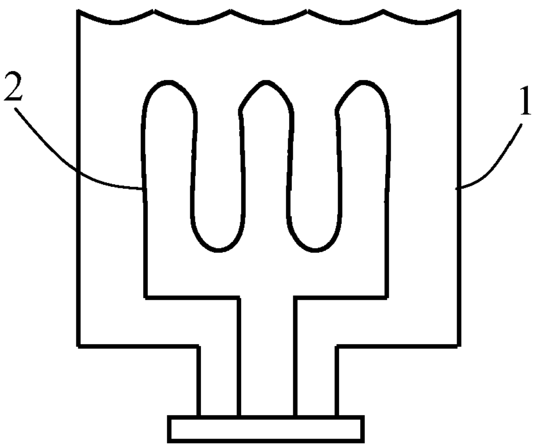

Fig. 2

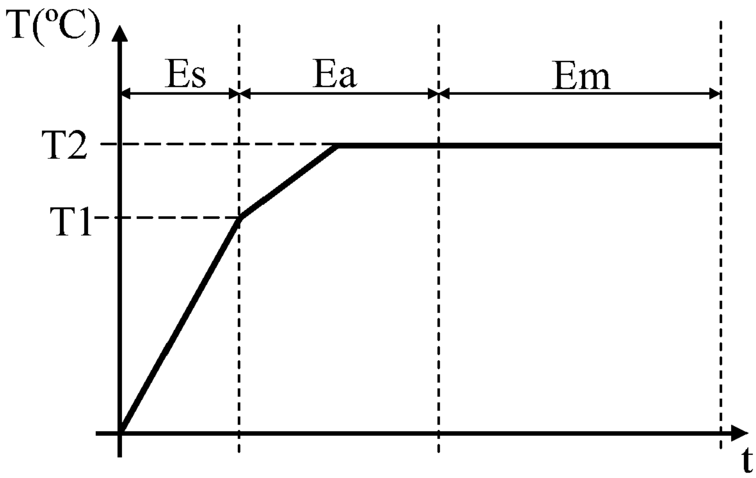

Fig. 3

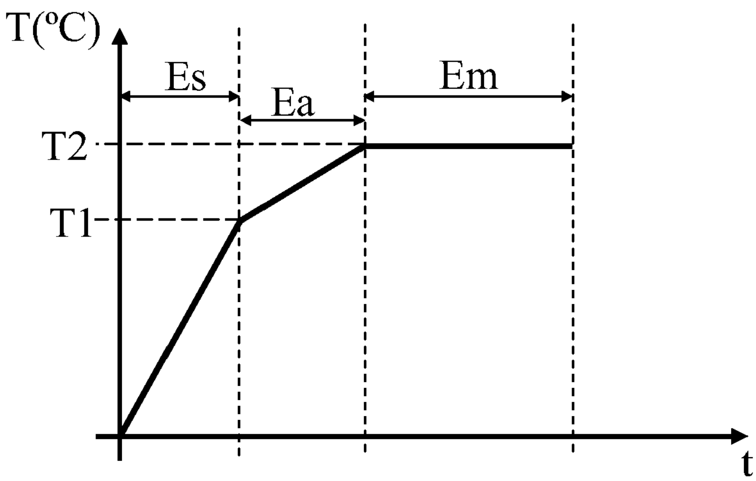

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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