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(54) Title: A COOKING METHOD SUITABLE FOR OVEN

(57) Abstract: This invention relates to a cooking method suitable for an oven (1) comprising a body (2), a cooking chamber (3) in which cooking takes place inside the body (2), a door (4) which enables the user to place food inside the cooking chamber (3), an upper heater (5) located in the upper side of the cooking chamber (3), a lower heater (6) located in the lower side of the cooking chamber (3), a sensor providing the temperature of the cooking chamber, a control unit which controls the cooking process based on the data received from the sensor.



WO 2023/086049 A2

A COOKING METHOD SUITABLE FOR OVEN

The present invention relates to a method, suitable for ovens, comprising some steps to enhance the cooking efficiency and performance.

- 5 Conventionally, the browning level is one of the most critical quality indicators for the foods cooked in the oven. While a good browning is desired on the upper surface at the end of cooking in foods such as fish and chicken, the level of browning on the bottom surface is more important in doughy foods and is perceived as a quality indicator. In order to achieve an ideal browning, users usually complete the cooking by placing the baking
- 10 tray on a lower or upper shelf after cooking the food in a shelf position for a certain period of time. As a prerequisite, in order for the food surface to reach a certain level of browning during cooking, the food center must first reach a sufficient degree of cooking. Otherwise, as a result of transporting food to an upper or lower shelf, the surface of the food remains raw while the surface is overcooked. While the cooking level of the surface is increased
- 15 by changing the shelf, the inner temperature of the oven decreases as the oven door is opened during cooking and energy loss occurs indirectly. In this case, while the energy consumption during cooking increases, the total cooking time may also increase depending on the temperature decrease and the type of food. During the shelf change, the user inevitably interrupts the ideal cooking process, negatively affecting the cooking
- 20 performance and significantly reducing the energy efficiency. Moreover, because the tray or the food is quite hot during shelf change, the risk of burns, dropping the tray and accident can be quite high for the user. In the state of the art, for optimizing solutions related to the browning level of the food in ovens is generally based on more sensor-based, costly and energy-consuming techniques and apparatus.
- 25 In the state of the art, the European patent application EP0296527 describes an oven in which cooking process and remaining cooking time can be performed with the help of browning degree captured by browning sensor.

In the state of the art, the European patent application EP2519773B1 describes an oven in which cooking can be performed according to consecutive on-off cycle times of the heater with the pre-determined phases.

The aim of the present invention is to realize a method suitable for use in ovens where the browning level is provided ideally without any user intervention and energy loss.

The cooking method is suitable for an oven comprising a body, a cooking chamber in which cooking takes place inside the body, a door which enables the user to place food inside the cooking chamber, an upper heater located in the upper side of the cooking chamber, a lower heater located in the lower side of the cooking chamber, a sensor providing the temperature of the cooking chamber, an interface which enables the user to manage the cooking process, a control unit which controls the cooking process based on the data received from the sensor. The cooking method realized in order to achieve the aim of the present invention and described in the claims, comprises the consecutive steps.

Firstly, cooking process is started and according to the set temperature upper and lower heater is activated conventionally. Then, surface cooking mode is activated by the interface. Interface can be considered as a control panel. After that, it is detected that a temperature range determined by the manufacturer according to the set temperature continues for a period determined by the manufacturer. This step is basically for detecting availability of the surface cooking mode operating conditions properly. When detected, upper heater is operated for an additional time(t_1) determined by the manufacturer more than the remaining operating period(t_r) of the upper heater if the upper surface is selected by the interface. Otherwise, lower heater is operated for an additional time(t_1) determined by the manufacturer more than the remaining operating period(t_r) of the lower heater if the lower surface is selected by the interface. At the end of both cases, the other heater is operated for less time(t_2) determined by the manufacturer than the remaining operating period(t_r). Basically the method mimics the user's manual movements when food is transported to an upper or lower shelf by the user during the end section of the cooking process. In this way, desired browning level is achieved without any user interventions such as opening the door or relocating the tray. For the upper or lower surfaces, cooking level can be adjusted easily without any extra cost such as sensors or switches. Moreover,

product safety is enhanced substantially because of the no touch operations of the oven. Additionally, the energy saving can be provided thanks to no heat loss compared with the food transportation case.

5 In one embodiment, cooking method comprises the step of adjusting the t1 and t2 periods determined by the manufacturer according to at least one of the selected food types, function, set temperature and temperature data from the sensor. By choosing those kinds of information over the interface, based on the look-up tables determined by the manufacturer, much better cooking and browning performances are achieved.

10 In one embodiment, cooking method comprises the step of adjusting the t1 and t2 determined by the manufacturer with a certain coefficient according to the remaining operating period. Thus, the on and off periods of upper and lower heaters can be determined by the manufacturer with respect to the proven test results in order to get ideal cooking performance.

15 In one embodiment, cooking method comprises the step of setting the energy used in the t1 and t2 periods determined by the manufacturer to be at most the energy used during the remaining operating period(tr). In this way, the energy used in that period is limited with the help of predetermined the values according to the manufacturer test results so that energy efficiency is provided under any circumstances.

20 In another embodiment, cooking method comprises the step of adjusting the t1 and t2 periods determined by the manufacturer by measuring the core temperature of the cooked food. With the help of an apparatus such as rod or prob, the core temperature of the cooked food can be used to determine operating time of the upper and lower heater. The data stability and reliability of the method is enhanced by using this measurement.

25 In another embodiment, an oven suitable for use with the cooking method described above.

An oven realized to achieve the aim of the present invention is shown in the attached figure;

Figure 1- It is the schematic view of the oven.

The parts in the figure are numbered one by one and the equivalents of these numbers are given below.

1. Oven
2. Body
- 5 3. Cooking chamber
4. Door
5. Upper heater
6. Lower heater
7. Sensor
- 10 8. Interface
9. Control unit

An cooking method(1), which is subject matter of the invention, is suitable for oven(1) comprising a body(2), a cooking chamber(3) in which cooking takes place inside the body(2), a door(4) which enables the user to place food inside the cooking chamber(3),
 15 an upper heater(5) located in the upper side of the cooking chamber(3), a lower heater(6) located in the lower side of the cooking chamber(3), a sensor(7) providing the temperature of the cooking chamber(3), an interface(8) which enables the user to manage the cooking process, a control unit(9) which controls the cooking process based on the data received from the sensor(7). The sensor(7) is preferably PT100 OR PTC type sensor for receiving
 20 the temperature data. Also, all steps are executed by the control unit(9). The cooking method comprises the some consecutive steps. Firstly, cooking process is started and according to the set temperature upper(5) and lower heater(6) is activated conventionally. Then, surface cooking mode(M) is activated by the interface(8). Surface cooking mode(M) can be divided into two different modes fo upper and lower surfaces
 25 of the food inside the cooking chamber(3). Also, the interface(8) can be considered as a control panel. Afterwards, it is detected that a temperature range determined by the manufacturer according to the set temperature continues for a period(tx) determined by the manufacturer. For example, after selecting the fan mode with 180 C set temperature, the temperature range and tx can be respectively determined as 170-190 C and 5 minutes.
 30 It means the surface cooking mode(M) becomes active after these conditions are satisfied.

In addition, if the user activates the surface cooking mode(M), especially in the early stage of cooking e.g. preheating, it is checked that sufficient temperature and energy are provided in the cooking chamber(3). Accordingly, this step is basically for detecting availability of the operating conditions of surface cooking mode(M) properly. When
5 detected, upper heater(5) is operated for an additional time(t1) determined by the manufacturer more than the remaining operating period(tr) of the upper heater(5) if the upper surface is selected by the interface(8). Otherwise, lower heater(6) is operated for an additional time(t1) determined by the manufacturer more than the remaining operating period(tr) of the lower heater(6) if the lower surface is selected by the interface(8). During
10 the both cases, the non-selected other heater is operated for less time(t2) determined by the manufacturer than the remaining operating period(tr). For the periods t1, t2 and tr, it is considered as operating time of the heaters(5,6), not cooking time.

As an example, for the last 10 minutes of cooking process, upper heater(5) and lower heater(6) operate 2 minutes for each as a default value. After selecting the upper surface
15 by surface cooking mode(M), it is designed 3 minutes for upper heater(5) and 1 minutes for lower heater(6). As stated before, it means upper heater(5) is operated 1 minutes more and lower heater(6) is operated 1 minutes less. In this case, it can be inferred that t1 and t2 is determined by the manufacturer as 1 minute. Basically, this method mimics the user's manual movements when food is transported to an upper or lower shelf by the user
20 during the end section of the cooking process. Thanks to the surface cooking mode(M), an ideal browning is achieved on the upper surface in foods such as fish and chicken and also on the bottom surface in doughy foods. In other words, desired browning level is achieved at the end section of cooking process and it is achieved without any user interventions such as opening the door(4) or relocating the tray. For the upper or lower
25 surfaces, cooking level can be adjusted easily without any extra cost such as sensors or switches. Moreover, product safety is enhanced substantially because of the no touch operations of the oven(1). Additionally, the energy saving can be provided due to no heat loss compared with the food transportation case by the user.

In one embodiment, cooking method comprises the step of adjusting the t1 and t2 periods
30 determined by the manufacturer according to at least one of the selected food types,

function, set temperature and temperature data from the sensor(7). By choosing those kinds of information over the interface(8), based on the look-up tables determined by the manufacturer for control unit(9), much better cooking and browning performances are achieved. For example, for a bread baking function, all the time and temperature parameters can be designed such that bread surface is baked at ideal crunchiness level. Either, for a lasagne baking function, upper surface of the lasagne is cooked at ideal browning level.

In one embodiment, cooking method comprises the step of adjusting the t_1 and t_2 determined by the manufacturer with a certain coefficient according to the remaining operating period(t_r). Thus, the on and off periods of upper(5) and lower heaters(6) can be determined by the manufacturer with respect to the proven test results in order to get ideal cooking performance. For example, when the remaining operating period(t_r) is 2 minutes, t_1 and t_2 can be determined respectively 3 and 1 minute. It means that 1.5 and 0.5 is determined by the manufacturer for the t_1 and t_2 as coefficients in this case.

In one embodiment, cooking method comprises the step of setting the energy used in the t_1 and t_2 periods determined by the manufacturer to be at most the energy used during the remaining operating period(t_r). In this way, the energy used in that period is limited with the help of predetermined the values according to the manufacturer test results so that energy efficiency is provided under any circumstances. For example, in case of not selecting the surface cooking mode(M), the energy used in the cooking process 1 kwh. It is approximately shared by upper(5) or lower heater(6) equally for regular case, i.e 0.5 kwh for each one. In case of selecting surface cooking mode, it is limited for upper heater(5) and lower heater(6) 0.6 kwh and 0.3 kwh respectively. It means the energy is always limited by using some look-up tables or database registers in any cases.

In another embodiment, cooking method comprises the step of adjusting the t_1 and t_2 periods determined by the manufacturer by measuring the core temperature of the cooked food. With the help of an apparatus such as rod or prob, the core temperature of the cooked food can be used to determine operating time of the upper(5) and lower heater(6). The

data stability and reliability of the method is enhanced by using this measurement. Some accessories e.g meat probes are generally used for that kind of purpose.

In another embodiment, an oven(1) suitable for use with the cooking method described above. In any types of the oven(1), this method is used for getting ideal browning level.

- 5 For different embodiments, some moisture sensors can be used to determine the ranges and t_1 , t_2 times as well. By using turbo fan and turbo heater, the periods can be regulated and designed for different types of ovens(1).

- In the cooking method, suitable for oven(1), of the present invention, by adjusting the upper(5) and lower heater(6) operating time, the browning level is provided ideally
10 without any need to transport the food between the shelves.

CLAIMS

1. A cooking method, suitable for an oven(1) comprising a body(2), a cooking chamber(3) in which cooking takes place inside the body(2), a door(4) which enables the user to place food inside the cooking chamber(3), an upper heater(5) located in the upper side of the cooking chamber(3), a lower heater(6) located in the lower side of the cooking chamber(3), a sensor(7) providing the temperature of the cooking chamber(3), an interface(8) which enables the user to manage the cooking process, a control unit(9) which controls the cooking process based on the data received from the sensor(7), **comprising the steps of**

 - starting the cooking process and activating the heaters(5,6) according to the set temperature
 - activating the surface cooking mode(M) by the interface(8)
 - detecting that a temperature range determined by the manufacturer according to the set temperature continues for a period(tx) determined by the manufacturer
 - when detected, operating the upper heater(5) for an additional time(t1) determined by the manufacturer more than the remaining operating period(tr) of the upper heater(5) if the upper surface is selected by the interface(8)
 - operating the lower heater(6) for an additional time(t1) determined by the manufacturer more than the remaining operating period(tr) of the lower heater(6) if the lower surface is selected by the interface
 - operating the other heater for less time(t2) determined by the manufacturer than the remaining operating period(tr).
2. A cooking method as in claim 1, **comprising the step of** adjusting the t1 and t2 periods determined by the manufacturer according to at least one of the selected food types, function, set temperature and temperature data from the sensor(7).
3. A cooking method as in claim 1 or 2, **comprising the step of** adjusting the t1 and t2 determined by the manufacturer with a certain coefficient according to the remaining operating period(tr).

4. A cooking method as in any one of the above claims, **comprising the step of** setting the energy used in the t1 and t2 periods determined by the manufacturer to be at most the energy used during the remaining operating period(tr).
5. A cooking method as in any one of the above claims, **comprising the step of** adjusting the t1 and t2 periods determined by the manufacturer by measuring the core temperature of the cooked food.
6. An oven(1) suitable for use with the cooking method described above.

Figure 1

