(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 904 330 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
14.12.2016 Bulletin 2016/50

(21) Application number: **13766093.2**

(22) Date of filing: **24.09.2013**

(51) Int Cl.:
F24C 7/08 *(2006.01)* ***H05B 6/64*** *(2006.01)*

(86) International application number:
PCT/EP2013/069806

(87) International publication number:
WO 2014/053354 (10.04.2014 Gazette 2014/15)

(54) **OVEN WITH INCREASED COOKING EFFECTIVENESS**

OFEN MIT ERHÖHTER KOCHEFFIZIENZ

FOUR AYANT UNE EFFICACITÉ DE CUISSON ACCRUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **03.10.2012 TR 201211315**

(43) Date of publication of application:
12.08.2015 Bulletin 2015/33

(73) Proprietor: **Arçelik Anonim Sirketi**
34950 Istanbul (TR)

(72) Inventors:
- **OZYURT, Bekir**
  34950 Istanbul (TR)
- **KAYIHAN, Saime Asli**
  34950 Istanbul (TR)
- **BUYUKKOYUNCU, Demet**
  34950 Istanbul (TR)

(56) References cited:
EP-A1- 1 685 781
JP-A- H11 223 344
JP-A- S60 232 430
US-A- 4 868 357

EP 2 904 330 B1

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to an oven, the cooking effectiveness of which is increased.

[0002] In ovens, the water contained in the food evaporates due to the heat transferred to the food during the cooking process and the weight of food decreases in the course of the cooking duration. For some food types, the water amount that can be retained in the food is important with respect to cooking quality. Formation of crust is intended on the outer surfaces of foods, for example in pastry like breads and cakes or in some meat types, by means of various cooking functions. The crust formed at the outer surface encloses the moisture inside the food and the desired cooking quality is provided by preventing the interior from drying. The oven comprises a heat generation means that provides the heating of the interior of the oven cavity and an air circulation means that provides the oven cavity air to be moved. Hybrid cooking can be performed by using at least two of the various cooking modes like static, turbo or microwave and by operating different combinations of the above-mentioned heat generation means and/or air circulation means. Fast formation of crust is observed in hybrid cooking wherein the microwave cooking mode and the static cooking mode are operated together. The microwaves are concentrated to the center of the food since the moisture rate remains high at the middle portion of the food after fast formation of crust. As a result of this, burning or hardening occurs at the middle portion of the food.

[0003] In the Japanese Patent Document No. JP6113714, an oven is described wherein cooking is performed by implementing radiation and high frequency methods together.

[0004] In the Japanese Patent Document No. JP60232430, an oven is described wherein the cooking process is ended depending on the hardness level of the food cooked in the cooking chamber. The hardness level of the food is detected by a probe inserted into the cooking food and the speed it moves inside the food.

[0005] In the European Patent Document No. EP2188572, an oven is described comprising a humidity sensor that detects the relative humidity in the oven cavity, wherein the cooking parameters are adjusted by means of the control unit that detects crust formation on outer surface of the food during the cooking process according to the type of food to be cooked and the amount of moisture in the oven cavity.

[0006] In the Japanese Patent Document No. JP2004239455, an oven is described having a sensor that measures the outer surface hardness of the food being cooked by microwave cooking method and a control unit that provides the antenna enabling to emit microwaves to change position when the outer surface of the food reaches a determined temperature.

[0007] Japanese Patent Document No. JPH11223344 discloses a microwave oven comprising an antenna that can be inserted into food for thawing purposes. Movement of the antenna is controlled to avoid its damaging in not yet thawed parts of the food.

[0008] European Patent Application EP 1 685 781 A1 discloses an "intelligent cooking method" in which the heating intensity is automatically controlled based on various data inputs, optionally including data from sensors for measuring hardness and crispness.

[0009] The aim of the present invention is the realization of an oven wherein the foodstuffs on the outer surface of which a crust forms during cooking are cooked with the desired quality.

[0010] The oven realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a heating means that provides the heating of the interior of the oven cavity and/or an air circulation means that provides the oven cavity air to be moved. Hybrid cooking can be performed by using various cooking modes like static, turbo or microwave and by operating different combinations of the heat generation means and/or the air circulation means. In each cooking mode, the different operation combinations of the heat generation means and/or the air circulation means the oven comprises are predetermined. Furthermore, the oven comprises an oven cavity wherein the cooking process is performed, at least one sensor that detects the hardness of the crust of the foods being cooked in the oven cavity and a control unit that controls the cooking process.

[0011] The oven of the present invention comprises the control unit that regulates the operation of the cooking modes depending on the hardness value detected by the sensor. The control unit decides on the cooking mode/modes depending on the type of food selected by the user from the program menu and starts the cooking process. The control unit forms the cooking algorithm by deciding on the operation of the cooking mode/modes, the operation duration and power depending on the hardness value transmitted from the sensor. According to this algorithm, the operating power and/or duration of the heat generation means and/or the air circulation means is determined. Consequently, the food is provided to be cooked homogeneously by preventing the inner or outer surfaces of the food being cooked from burning.

[0012] In an embodiment of the present invention, the control unit compares the hardness value detected by the sensor with the limit hardness value predetermined by the producer and regulates the operation of different cooking modes depending on the difference between the detected hardness value and the limit hardness value. More frequent measurements are made as the difference between the detected hardness value and the limit hardness value decreases, and the inner/outer surfaces of the food are prevented from burning or hardening.

[0013] In an embodiment of the present invention, if the detected hardness value is equal to the limit hardness value predetermined by the producer when the sensor contacts the food contained in the oven cavity, the control unit ends the current cooking mode and starts a different

cooking mode or provides the operating powers of different cooking modes to be changed. Thus, drying, hardening or burning on the inner or outer surfaces of the food due to overcooking is prevented.

[0014] In an embodiment of the present invention, the control unit decides on the cooking mode according to more than one limit hardness value predetermined by the producer depending on the type of food to be cooked inside the oven cavity. Thus, the cooking process is controlled according to the hardness value of each food.

[0015] In an embodiment of the present invention, the heat generation means is a heater. The heat generation means is disposed inside the oven cavity and provides the heating of the oven cavity. Operation of the heat generation means is regulated by the control unit depending on the hardness value detected by the sensor. The control unit provides the activation of different cooking modes by controlling the operation of the heat generation means.

[0016] In an embodiment of the present invention, the air circulation means is a fan. The air circulation means provides the oven cavity air to be moved. The operation of the air circulation means is regulated by the control unit depending on the hardness value detected by the sensor. The control unit provides the activation of different cooking modes by controlling the operation of the air circulation means.

[0017] In an embodiment of the present invention, the heat generation means is a microwave generator. The heat generation means provides the microwaves to be dispersed into the oven cavity. The operation of the heat generation means is regulated by the control unit depending on the hardness value detected by the sensor.

[0018] In an embodiment of the present invention, the oven comprises the control unit that provides shifting from the static cooking mode to the microwave cooking mode or from the microwave cooking mode to the static cooking mode depending on the hardness value detected by the sensor. Hybrid cooking can be performed by using at least two of the various cooking modes like static, turbo or microwave and by operating different combinations of the heat generation means and/or the air circulation means. In the oven, two different heat generation means are used. One of the heat generation means is the heater, while the other is the microwave generator. The operation of the heat generation means which is the microwave generator and the heat generation means which is the heater are controlled by the control unit and the food is provided to be cooked under appropriate conditions.

[0019] In an embodiment of the present invention, the control unit increases the frequency of hardness measurements when the detected hardness value approaches the limit hardness value predetermined by the producer. Furthermore, measurements are made at different periods, at different points of the foods and the food is provided to be cooked homogeneously.

[0020] In an embodiment of the present invention, the oven comprises a movement mechanism that provides the sensor to contact the food by being moved. The control unit provides the movement mechanism to be moved at periods determined for hardness measurement.

[0021] In an embodiment of the present invention, the sensor is a texture probe.

[0022] By means of the present invention, an oven is realized having a control unit that provides the regulation of the cooking algorithm depending on the hardness value. The control unit decides on the cooking algorithm depending on the data transmitted by the sensor. Consequently, burning, drying or hardening of the food being cooked is prevented.

[0023] The oven realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the partial perspective view of an oven.
Figure 2 - is the front perspective view of the oven related to an embodiment of the present invention.
Figure 3 - is the front perspective view of the oven related to another embodiment of the present invention.

[0024] The elements illustrated in the figures are numbered as follows:

1. Oven
2. Oven cavity
3. Sensor
4. Control unit
5. Heat generation means
6. Air circulation means
7. Movement mechanism

[0025] The oven (1) comprises at least one heat generation means (5) and/or an air circulation means (6). The oven (1) performs cooking in the cooking modes (M1, M2, M3....,M_n) wherein the above mentioned heat generation means (5) and/or the air circulation means (6) are operated at different operation combinations. The oven (1) comprises an oven cavity (2) wherein the cooking process is performed, at least one sensor (3) that detects the surface hardness of the foods situated in the oven cavity (2) and at least one control unit (4) that controls the cooking process. In the ovens (1), hybrid cooking is performed by using at least two of the different cooking modes like static (M1), microwave (M2) or turbo (M3). In each cooking mode (M1, M2, M3), the different operation combinations of the heat generation means (5) and/or the air circulation means (6) comprised by the oven (1) are predetermined. The control unit (4) activates one or more than one cooking modes during cooking depending on the type of food selected from the program menu by the user and starts the cooking process (Figure 1, Figure 2).

[0026] The oven (1) of the present invention comprises a control unit (4) that decides on the cooking mode depending on the hardness level (H) detected by the sensor

(3). The user selects type of the food from the program menu after placing the food to be cooked into the oven cavity (2). The control unit (4) activates one or more than one cooking mode depending on the type of food selected and starts the cooking process. During the cooking process, the surface hardness of the food is detected by means of the sensor (3). The control unit (4) regulates the operation power and/or the duration of the cooking mode/modes depending on the data transmitted from the sensor (3) and provides the food to be cooked gradually.

[0027] Consequently, the inner surface of the food is provided to be cooked homogeneously by performing gradual cooking and the outer surface of the food is prevented from burning.

[0028] In an embodiment of the present invention, the oven (1) comprises the sensor (3) that detects the surface hardness of the food by contacting the food located in the oven cavity (2) and the control unit (4) that compares the value (H) detected by the sensor (3) with the limit hardness value (H) limit predetermined by the producer and regulates the cooking mode depending on the value of difference between the detected hardness value (H) and the limit hardness value $(H)_{limit}$. Hybrid cooking can be performed by using at least two of the various cooking modes (M1, M2, M3) like static, turbo or microwave and by operating different combinations of the heat generation means (5) and/or the air circulation means (6). The difference between the hardness value (H) detected by the sensor (3) and the limit hardness value $(H)_{limit}$ predetermined by the producer is calculated by the control unit (4) The control unit (4) decides on the operating powers and/or operating durations of the cooking modes depending on this calculated value of difference. Consequently, not only the outer surface of the food is prevented from burning but also the inner surface of the food is provided to be cooked homogeneously.

[0029] In an embodiment of the present invention, the control unit (4) changes the cooking mode if the detected hardness value (H) is equal to the limit hardness value $(H)_{limit}$ predetermined by the producer when the sensor (3) contacts the food situated inside the oven cavity (2). If the hardness value (H) detected by the sensor (3) is equal to the limit hardness value $(H)_{limit}$ predetermined by the producer, the control unit (4) determines the operation powers and/or durations of the heat generation means (5) and/or the air circulation means (6) again by changing the current cooking mode. The cooking process is ended if the hardness value (H) detected by the sensor (3) reaches the limit hardness value $(H)_{limit}$ which means that the food is cooked. Consequently, the outer surface of the food is prevented from burning and the inner surface is provided to be cooked homogeneously.

[0030] In an embodiment of the present invention, the control unit (4) decides on the cooking mode according to more than one limit hardness value $(H)_{limit}$ predetermined by the producer depending on the type of food to be cooked inside the oven cavity (2). The hardness value determined before the surface of each food gets blackened is different. This value varies depending on the type of the food. Furthermore, the desired surface hardness at the end of the cooking is different depending on the type of food that is cooked (for example if we compare meat and pastry). Therefore, different hardness values for different types of foods are entered in the memory by the producer. When the type of food to be cooked is selected by the user from the program menu, the control unit (4) controls the cooking process depending on the limit hardness values $(H)_{limit}$ of the selected food and regulates the operation power and/or the duration of the heat generation means (5) and/or the air circulation means (6) during cooking. Furthermore, the hardness values relating to each food that is contained in the memory enable the user to choose the consistency depending on the type of food that is cooked.

[0031] In an embodiment of the present invention, the heat generation means (5) is a heater. The heat generation means (5) is disposed inside the oven cavity (2) and provides the heating of the oven cavity (2). The operation of the heat generation means (5) is regulated by the control unit (4) depending on the hardness value (H) detected by the sensor (3). For example, while cooking is performed in the static cooking mode (M1) wherein the heat generation means (5) disposed at the upper and lower sides are operated together, if the hardness value (H) detected by the sensor (3) reaches the limit hardness value $(H)_{limit}$, the static cooking mode (M1) is ended by the heat generation means (5) being closed by the control unit (4) (Figure 1).

[0032] In an embodiment of the present invention, the air circulation means (6) is a fan. The air circulation means (6) provides the air of the oven cavity (2) to be moved. The operation of the air circulation means (6) is regulated by the control unit (4) depending on the hardness value (H) detected by the sensor (3). During cooking, the value (H) detected by the sensor (3) is compared with the limit hardness value $(H)_{limit}$ recorded in the memory and the operation power and duration of the air circulation means (6) is regulated by the control unit (4) according to this comparison (Figure 2).

[0033] In an embodiment of the present invention, the heat generation means (5) is a microwave generator. The heat generation means (5) provides the microwaves to be dispersed into the oven cavity (2). The operation of the heat generation means (5) is regulated by the control unit (4) depending on the hardness value (H) detected by the sensor (3). When the heat generation means (5) is activated, cooking in the microwave mode (M2) is provided to be performed. The control unit (4) decides on operation duration and operation power of the microwave cooking mode (M2) depending on the crust hardness of the food being cooked.

[0034] In an embodiment of the present invention, the control unit (4) provides the shifting from the static cooking mode (M1) to the microwave cooking mode (M2) or from the microwave cooking mode (M2) to the static cooking mode (M1) depending on the hardness value (H) de-

tected by the sensor (3). In the oven (1), two different heat generation means (5) are used. While one of the heat generation means (5) is the heater, the other is the microwave generator. In the static cooking mode (M1), the heater is used as the heat generation means (5) while in the microwave cooking mode (M2) the microwave generator is used. The cooking process is started depending on the type of food selected by the user. When the control unit (4) activates the static cooking mode (M1) and the microwave cooking mode (M2) together for cooking according to the food type, the microwave generator and the heater start operating at the same time. The control unit (4) controls the working order of the cooking modes depending on the data received from the sensor (3).

[0035] In a version of this embodiment, the cooking process is started in the static cooking mode (M1). The control unit (4) prevents the operation of the heat generation means (5) which is the microwave generator while activating the heat generation means (5) which are the heater, disposed at the upper and lower sides. When the hardness value (H) detected by the sensor (3) reaches the limit hardness value $(H)_{limit}$ predetermined according to the type of food, the control unit (4) ends the operation of the heat generation means (5) which is the heater and activates the heat generation means (5) which is the microwave generator. In addition, the control unit (4) decides on the time to shift from one cooking mode to the other. Consequently, the food is provided to be cooked homogeneously.

[0036] In another version of this embodiment, the cooking process is started by operating the static cooking mode (M1) and the microwave cooking mode (M2) together. When the hardness value (H) detected by the sensor (3) reaches the limit hardness value $(H)_{limit}$ predetermined by the producer, the control unit (4) decreases the power of the heat generation means (5) which is the microwave generator and increases the operation power of the heat generation means (5) which is the heater. Consequently, the inner and outer surfaces of the food are provided to be cooked homogeneously by performing gradual cooking and the inner surface of the food is prevented from burning.

[0037] In an embodiment of the present invention, the control unit (4) increases the frequency of hardness measurements when the detected hardness value (H) approaches the limit hardness value $(H)_{limit}$ predetermined by the producer. Thus, the outer surface of the food is prevented from burning.

[0038] In an embodiment of the present invention, the oven (1) comprises a movement mechanism (7) that provides the sensor (3) to extend into the oven cavity and to contact the food(2) by being moved and the control unit (4) that provides the movement mechanism (7) to be moved at intervals determined for hardness measurement. The sensor (3) is mounted detachably to the movement mechanism (7). The control unit (4) moves the movement mechanism (7) at intervals predetermined by the producer. The sensor (3) moves by being actuated of the movement mechanism (7) and moves towards the food to be cooked in the oven cavity (2). The movement of the sensor (3) is ended by the control unit (4) as the result of the encountered force upon contacting the food to be cooked. The sensor (3) detects the hardness of the food surface contacted and transmits the data to the control unit (4). The sensor (3) is moved by means of the movement mechanism (7) and takes measurements from different points on the surface of the food at determined intervals.

[0039] In an embodiment of the present invention, the sensor (3) is a texture probe. The texture probe detects the hardness and/or the flexibility of the food by contacting the outer surface of the food. The texture probe measures the surface hardness of the food by contacting the food and/or by at least partially puncturing the food.

[0040] By means of the present invention an oven (1) is realized wherein the foodstuffs on the outer surface of which a crust is formed during cooking are cooked with the desired quality. The control unit (4) decides on which cooking mode (M1, M2, M3....,M_n) stays active for how long and with how much power depending on the data delivered by the sensor (3) that detects the surface hardness of the food. Thus, while the surface of the food contained in the oven cavity (2) is prevented from burning, the inner surface is provided to be cooked homogeneously.

Claims

1. An oven (1) having at least one heat generation means (5) and/or an air circulation means (6), performing the cooking process at the cooking modes (M1, M2, M3....,Mn) wherein the heat generation means (5) and/or the air circulation means (6) are operated at different operation combinations, **comprising**

   - an oven cavity (2) wherein the cooking process is performed,
   - at least one sensor (3) that detects the surface hardness of the foods contained in the oven cavity (2), and
   - at least one control unit (4) that is configured to control the cooking process and to decide on the cooking mode depending on the hardness value (H) detected by the sensor (3),

   wherein the sensor (3) is configured to detect the surface hardness of the food by contacting the food located in the oven cavity (2), **characterized in that** the control unit (4) is configured to compare the value (H) detected by the sensor (3) with the limit hardness value $(H)_{limit}$ predetermined by the producer and to regulate the cooking mode depending on the value of difference between the detected hardness value (H) and the limit hardness value $(H)_{limit}$, and that the

control unit (4) is further configured to increase the frequency of hardness measurements when the detected hardness value (H) approaches the limit hardness value $(H)_{limil}$ predetermined by the producer.

2. The oven (1) as in Claim 1, **characterized in that** the control unit (4) is configured to change the cooking mode if the hardness value (H) detected when the sensor (3) contacts the food contained in the oven cavity (2) is equal to the limit hardness limit value $(H)_{limit}$ predetermined by the producer.

3. The oven (1) as in any one of the Claims 1 to 2, **characterized in that** the control unit (4) is configured to decide on the cooking mode according to more than one limit hardness value $(H)_{limit}$ predetermined by the producer depending on the type of food to be cooked in the oven cavity (2).

4. The oven (1) as in any one of the above Claims, **characterized in that** the heat generation means (5) is a heater.

5. The oven (1) as in any one of the above Claims, **characterized in that** the air circulation means (6) is a fan.

6. The oven (1) as in any one of the above Claims, **characterized in that** the heat generation means (5) is a microwave generator.

7. The oven (1) as in any one of the Claims 1 to 6, **characterized in that** the control unit (4) is configured to provide the shifting from the static cooking mode (M1) to the microwave cooking mode (M2) or from the microwave cooking mode (M2) to the static cooking mode (M1) depending on the hardness value (H) detected by the sensor (3).

8. The oven (1) as in any one of the above Claims, **characterized in that** a movement mechanism (7) provides the sensor (3) to extend into the oven cavity (2) and contact the food by being moved and the control unit (4) provides the movement mechanism (7) to be moved at intervals determined for hardness measurement.

9. The oven (1) as in any one of the above claims, **characterized in that** the sensor (3) is a texture probe.

Patentansprüche

1. Ofen (1) mit wenigstens einem Wärmeerzeugungsmittel (5) und/oder einem Luftzirkulationsmittel (6), der den Garungsvorgang in Garungsmodi (M1, M2, M3..., Mn) durchführt, wobei das Wärmeerzeugungsmittel (5) und/oder das Luftzirkulationsmittel (6) in unterschiedlichen Betriebskombinationen betrieben werden, **umfassend**

- einen Ofenhohlraum (2), in dem der Garungsvorgang durchgeführt wird,
- wenigstens einen Sensor (3), der die Oberflächenhärte von Speisen im Ofenhohlraum (2) erkennt, und
- wenigstens eine Steuereinheit (4), die dazu konfiguriert ist, den Garungsvorgang zu steuern und den Garungsmodus abhängig von dem durch den Sensor (3) erkannten Härtewert (H) zu bestimmen,

wobei der Sensor (3) dazu konfiguriert ist, die Oberflächenhärte der Speisen zu erkennen, indem er in Kontakt mit den Speisen im Ofenhohlraum (2) tritt,
dadurch gekennzeichnet, dass die Steuereinheit (4) dazu konfiguriert ist, den Wert (H), der vom Sensor (3) erkannt wird, mit dem Härtegrenzwert $(H)_{limit}$ zu vergleichen, der vom Hersteller vorgegeben wird, und den Garungsmodus abhängig von dem Differenzwert zwischen dem erkannten Härtewert (H) und dem Härtegrenzwert $(H)_{limit}$ zu regulieren,
und dass die Steuereinheit (4) ferner dazu konfiguriert ist, die Häufigkeit von Härtemessungen zu erhöhen, wenn der erkannte Härtewert (H) sich dem vom Hersteller vorgegebenen Härtegrenzwert $(H)_{limit}$ nähert.

2. Ofen (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit (4) dazu konfiguriert ist, den Garungsmodus zu wechseln, wenn der Härtewert (H), der bei Kontakt des Sensors (3) mit den Speisen im Ofenhohlraum (2) erkannt wird, gleich dem vom Hersteller vorgegebenen Härtegrenzwert $(H)_{limit}$ ist.

3. Ofen (1) nach einem der Ansprüche 1 bis 2, **dadurch gekennzeichnet, dass** die Steuereinheit (4) dazu konfiguriert ist, abhängig von der Art von Speisen, die im Ofenhohlraum (2) gegart werden sollen, den Garungsmodus entsprechend mehr als einem vom Hersteller vorgegebenen Härtegrenzwert $(H)_{limit}$ zu bestimmen.

4. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Wärmeerzeugungsmittel (5) eine Heizeinrichtung ist.

5. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Luftzirkulationsmittel (6) ein Gebläse ist.

6. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** das Wär-

meerzeugungsmittel (5) ein Mikrowellengenerator ist.

7. Ofen (1) nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Steuereinheit (4) dazu konfiguriert ist, den Wechsel aus dem statischen Garungsmodus (M1) in den Mikrowellengarungsmodus (M2) oder aus dem Mikrowellengarungsmodus (M2) in den statischen Garungsmodus (M1) abhängig von dem durch den Sensor (3) erkannten Härtewert (H) zu ermöglichen.

8. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** ein Bewegungsmechanismus (7) dafür sorgt, dass sich der Sensor (3) in den Ofenhohlraum (2) erstreckt und in Kontakt mit den Speisen gelangt, indem er bewegt wird, und die Steuereinheit (4) dafür sorgt, dass der Bewegungsmechanismus (7) in Intervallen zur Härtemessung bewegt wird.

9. Ofen (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Sensor (3) eine Struktursonde ist.

Revendications

1. Un four (1) présentant au moins un moyen de génération de chaleur (5) et/ou un moyen de circulation d'air (6) effectuant le processus de cuisson aux modes de cuisson (M1, M2, M3..., Mn) où le moyen de génération de chaleur (5) et/ou le moyen de circulation d'air (6) sont mis en marche à différentes combinaisons opérationnelles, **comprenant**

   - une chambre de cuisson (2) dans laquelle le processus de cuisson est effectué,
   - au moins un capteur (3) qui détecte la dureté superficielle des aliments dans la chambre de cuisson (2), et
   - au moins une unité de commande (4) qui contrôle le processus de cuisson et choisit le mode de cuisson en fonction de la valeur de dureté (H) détectée par le capteur (3),

   où le capteur (3) détecte la dureté superficielle des aliments en touchant les aliments dans la chambre de cuisson (2),
   caractérisé en ce que l'unité de commande (4) compare la valeur (H) détectée par le capteur (3) avec la valeur de dureté limite $(H)_{limit}$ prédéterminée par le fabricant et régule le mode de cuisson en fonction de la valeur de différence entre la valeur de dureté détectée (H) et la valeur de dureté limite $(H)_{limit}$, et que l'unité de commande (4) augmente la fréquence des mesures de dureté lorsque la valeur de dureté détectée (H) se rapproche de la valeur de dureté limite $(H)_{limit}$ prédéterminée par le fabricant.

2. Un four (1) selon la Revendication 1, **caractérisé en ce que** l'unité de commande (4) change le mode de cuisson si la valeur de dureté (H) détectée lorsque le capteur (3) touche l'aliment dans la chambre de cuisson (2) est égale à la valeur de dureté limite $(H)_{limit}$ prédéterminée par le fabricant.

3. Un four (1) selon l'une quelconque des revendications de 1 à 2, **caractérisé en ce que** l'unité de commande (4) choisit le mode de cuisson selon plus d'une valeur de dureté limite $(H)_{limit}$ prédéterminée par le fabricant en fonction du type de l'aliment à cuire dans la chambre de cuisson (2).

4. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le moyen de génération de chaleur (5) est un dispositif de chauffage.

5. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le moyen de circulation d'air (6) est un ventilateur.

6. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le moyen de génération de chaleur (5) est un générateur de micro-ondes.

7. Un four (1) selon l'une quelconque des revendications de 1 à 6, **caractérisé en ce que** l'unité de commande (4) assure le changement du mode de cuisson statique (M1) au mode de cuisson à micro-ondes (M2) ou du mode de cuisson à micro-ondes (M2) au mode de cuisson statique (M1) en fonction de la valeur de dureté (H) détectée par le capteur (3).

8. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu**'un mécanisme de mouvement (7) permet au capteur (3) de s'étendre dans la chambre de cuisson (2) et de toucher l'aliment en étant déplacé et l'unité de commande (4) permet au mécanisme de mouvement (7) d'être déplacé à des intervalles déterminés pour la mesure de la dureté.

9. Un four (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le capteur (3) est une sonde de texture.

Figure 1

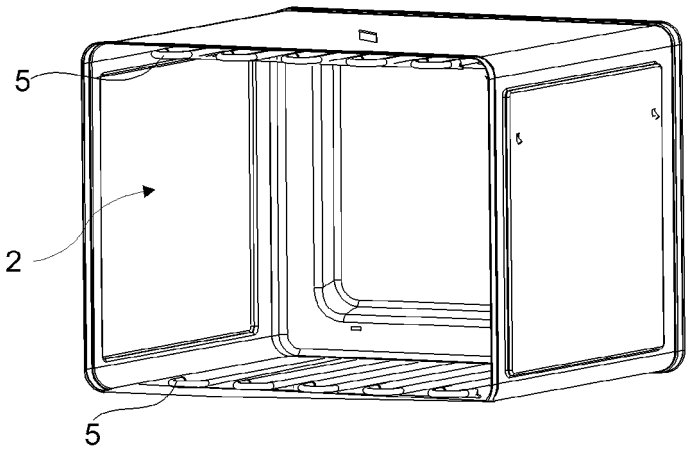


Figure 2

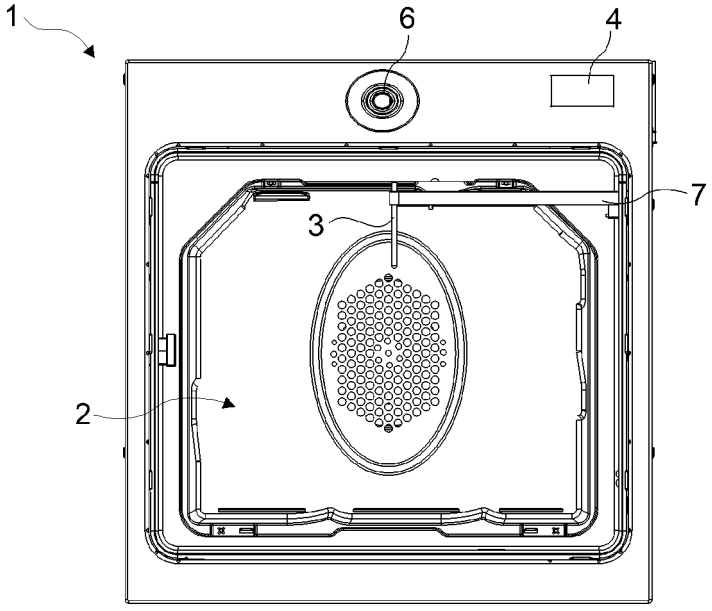
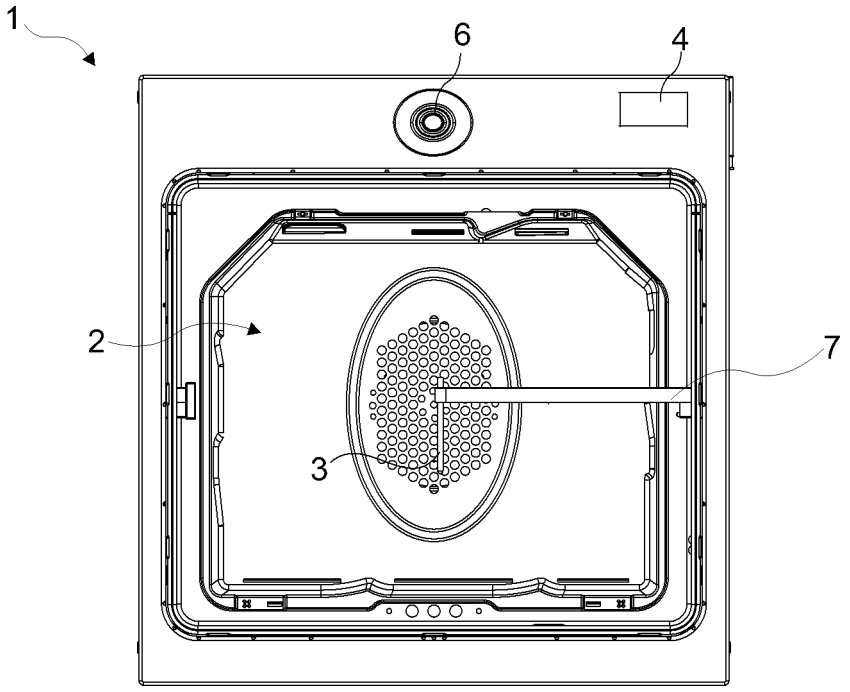


Figure 3



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 6113714 B **[0003]**
- JP 60232430 B **[0004]**
- EP 2188572 A **[0005]**
- JP 2004239455 B **[0006]**
- JP H11223344 B **[0007]**
- EP 1685781 A1 **[0008]**