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

(11) EP 3 124 872 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.02.2017 Bulletin 2017/05

(51) Int Cl.:
F24C 7/08 *(2006.01)* ***H05B 6/68*** *(2006.01)*

(21) Application number: **15178509.4**

(22) Date of filing: **27.07.2015**

(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
Designated Extension States:
BA ME
Designated Validation States:
MA

(71) Applicant: **Indesit Company S.p.A.**
60044 Fabriano (AN) (IT)

(72) Inventors:
- **VITALONI, Valentina**
  I-60126 Ancona (IT)
- **MARCONI, Michele**
  I-60131 Ancona (IT)

(74) Representative: **Gallarotti, Franco**
Buzzi, Notaro & Antonielli d'Oulx
Via Maria Vittoria, 18
10123 Torino (IT)

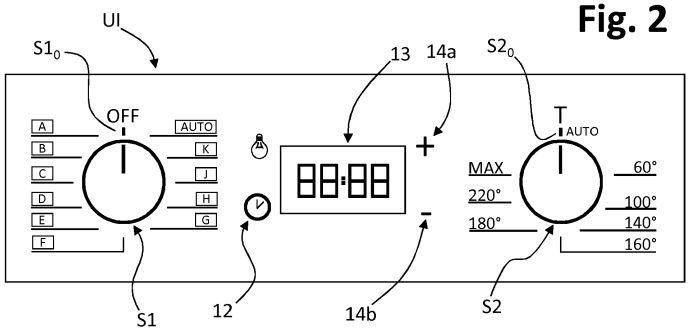
(54) HOUSEHOLD COOKING OVEN

(57) A household cooking oven comprises a load-bearing structure, housed in which is a muffle defining a cooking cavity. The cooking oven further comprises a control system that includes a user interface (UI) having:
a first device (S1) for manual selection of an operating program from a plurality of selectable operating programs (A-K, AUTO); and
a second device (S2) for manual selection of a cooking temperature from a plurality of selectable cooking temperatures.

Associated to the muffle is a plurality of heating elements that can be controlled by the control system, and the control system is configured for controlling execution of an operating program (A-K, AUTO) at least according to a selection made via the first selection device (S1) and a selection made via the second selection device (S2). The operating programs (A-K, AUTO) comprise first programs (A-K), during which the control system is able to control one or more of the heating elements in order to manage a temperature profile in the cooking cavity as a function of a temperature selected via the second selection device.

The plurality of the cooking programs (A-K, AUTO) that can be selected via the first selection device (S1) further comprises an automatic operating program (AUTO), and the control system is provided for:
- enabling start of the automatic operating program (AUTO) when the first selection device (S1) is in the corresponding selection position and the second selection device (S1) is in a pre-set selection position ($S2_0$);
- automatically controlling one or more of the heating elements in the course of the automatic operating program (AUTO) in order to manage a pre-set temperature profile in the cooking cavity (CC) that is characteristic of the automatic operating program (AUTO); and
- rendering ineffective a temperature selection via the second selection device (S1) after start of the automatic operating program (AUTO).

Fig. 2



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Description

Field of the invention

[0001] The present invention relates to household cooking apparatuses in general, and has been developed with particular reference to cooking ovens.

Background art

[0002] Ovens of the type referred to typically include a load-bearing structure, associated to which is a muffle defining a cooking cavity. Associated to the muffle is a plurality of heating elements, variously arranged, frequently constituted by electrical resistances. The control system of the oven typically includes a control panel with a first selector, which can be operated by a user for selecting a cooking program from a plurality of possible programs, as well as a second selector, for manual setting of a desired cooking temperature from a plurality of possible temperatures. Frequently, the control panel of the oven also includes a timer device, via which the user can set a desired cooking duration.

[0003] The programs that can be selected by the user are in general programs substantially dedicated to the cooking of classes of foods, where the user can set the desired temperature. In general, then, the user is required to set both the desired program and a corresponding temperature: when the program is being executed, the control system of the oven controls one or more of its heating elements so as to manage a temperature profile in the cooking cavity that is variable as a function of the temperature selected by the user.

[0004] The user must hence make a selection from among the programs available, identifying the one he or she deems the most suitable for the type of food that is to be cooked, as well as a selection of a corresponding temperature. This practice can complicate the activity of programming of the oven by the user, as regards selection of the program and of the temperature, likewise involving the risk of corresponding improper selections. Not infrequent, then, is the case where the user starts the cooking program inadvertently leaving the temperature selector in the position used for a different program executed previously, with evident adverse consequences on the cooking process. Similar problems also apply in relation to setting of the duration of the cooking program.

[0005] Finally, it may happen that the user starts a program not suited for the food to be cooked, this problem being among the most frequent.

Summary of the invention

[0006] In its general terms, the aim of the present invention is basically to limit the aforesaid drawbacks. This aim is achieved, according to the present invention, by a household cooking oven and by a cooking program for a household oven having the characteristics specified in the claims. The claims form an integral part of the technical teaching provided herein in relation to the invention.

Brief description of the drawings

[0007] Further objects, characteristics, and advantages of the invention will emerge clearly from the ensuing detailed description, with reference to the annexed drawings, which are provided purely by way of explanatory and non-limiting example and in which:

- Figure 1 is a schematic cross-sectional view of a household cooking oven according to a possible embodiment of the invention;
- Figure 2 is a schematic view in front elevation of a user interface of an oven according to an embodiment of the invention;
- Figure 3 is a simplified flowchart, aimed at exemplifying a possible mode of selection of a cooking program of an oven according to an embodiment of the invention;
- Figure 4 is a diagram in tabular form aimed at exemplifying execution of a cooking program of an oven according to an embodiment of the invention; and
- Figure 5 is a graph aimed at exemplifying a pre-set temperature profile of a cooking program of an oven according to an embodiment of the invention.

Description of preferred embodiments of the invention

[0008] Reference to "an embodiment" or "one embodiment" in the framework of the present description indicates that a particular configuration, structure, or characteristic described in relation to the embodiment is comprised in at least one embodiment. Hence, phrases such as "in an embodiment" or "in one embodiment" and the like that may be present in various points in the framework of the present description do not necessarily all refer to one and the same embodiment. Furthermore, the particular configurations, structures, or characteristics may be combined in any adequate way in one or more embodiments. The references used in what follows are provided merely for convenience and do not define the sphere of protection or the scope of the embodiments.

[0009] It is likewise pointed out that in the ensuing description the oven according to the invention will be described limitedly to the parts of interest for an understanding of the invention, without going into the details of its characteristics that go beyond the invention.

[0010] With initial reference to Figure 1, designated as a whole by 1 is a household cooking oven according to an embodiment of the present invention. The oven 1 has a load-bearing structure 2, located within which is a muffle 3, built in a way in itself known, which delimits part of a cooking cavity, designated by CC. A front door 4 is hinged to the structure 2, in particular in a lower region thereof, designed to delimit the cooking cavity CC at the front and enable access to the inside thereof. Associated to the

front part of the load-bearing structure 2, in particular above the door 4, is a control panel 5, which integrates a user interface described hereinafter, which forms part of a control system of the oven 1.

[0011] The above control system comprises an electronic board, represented only schematically in Figure 1, where it is designated by CS, preferably comprising a microprocessor control unit. According to a technique in itself known, the electronic control board CS is connected in signal communication to the aforesaid user interface, as well as to sensor means necessary for controlling operation of the oven, amongst which at least one sensor TS for detecting the temperature within the cooking cavity CC. Once again according to a technique in itself known, the electronic board CS is configured for driving - preferably using suitable power actuators - various electrical loads of the oven, amongst which at least one fan and a plurality of heating elements.

[0012] In various embodiments, the oven according to the invention comprises at least one of a fan for circulation of air within the muffle 3 and an extraction fan, in particular for expelling cooking fumes/vapours from the muffle. In the example of embodiment represented in Figure 1, the oven 1 comprises both of the aforesaid fans, designated, respectively, by 6 and 7. Each fan 6, 7 has a respective electric motor 6a, 7a, connected to the output shaft of which is a respective impeller 6b, 7b.

[0013] In various embodiments, the muffle 3 has an intermediate partition wall 3a, which divides the cavity CC of the muffle 3 into a front, cooking, chamber, which extends between the door 4 and the partition wall 3a, and a rear, air-distribution, chamber S, which extends between the partition wall 3a and the rear wall of the muffle 3. In the cooking chamber there may be preferably positioned one or more shelves at different heights, on which the containers of the foods to be cooked can be set. Housed in the air-distribution chamber S is the impeller 6b of the fan 6, preferably of a centrifugal type with axis of rotation substantially horizontal. Preferably housed in the chamber S is also at least one heating element 8, in particular an electrical resistance. Preferably, the impeller 6b is positioned within a region circumscribed by the resistance 8, which preferably has a circular shape.

[0014] According to a technique in itself known, the distribution chamber S has an outlet section, for delivery of air to the cooking chamber, as well as an inlet section, for suction of air from the cooking chamber. The aforesaid outlet section may comprise a plurality of passages in generally peripheral positions of the distribution chamber S, for example defined between the partition wall 3a and the rear wall or the side walls of the muffle 3, whereas the aforesaid inlet section is defined in a central area of the partition wall 3a, which is configured substantially in the form of a grill and is located in front of the impeller 6b. With such an arrangement, the air is heated by the resistance 8 and pushed towards the peripheral outlet passages of the distribution chamber S so that it tends to flow along the side walls of the muffle 3 towards the front of the cooking chamber. Thanks to the action of the fan 6, the same air is drawn towards the central grill-shaped area of the partition wall 3a in order to heat by convection the foods that are located on the shelf or shelves arranged within the cooking chamber. This "exhausted" air, which has yielded heat to the foods, then returns into the distribution chamber S so as to be heated again and re-introduced into the cooking chamber.

[0015] In various embodiments, the muffle 3 has a fume/vapour outlet 3b at its upper wall, as well as a channelling 9 that extends above the upper wall of the muffle 3. Preferably, the channelling 9 has an outlet 9a that is located substantially at the front of the oven 1, above an upper portion of the door 4, at least one upper air intake 9b and a lower fume/vapour inlet 9c, in fluid communication with the outlet 3b of the muffle 3. The fan 7 is preferably associated to the channelling 9 so as to take in air from the air intake 9b and fumes/vapours from the outlet 3b of the muffle 3 in order to expel a resulting mixture from the outlet 9a.

[0016] The fan 7 is preferably a radial fan, mounted in such a way that its impeller 7b - of a centrifugal type - is located within the channelling 9. Once again preferentially, the centrifugal impeller 7b has an upper impeller section and a lower impeller section, which are pre-arranged for taking in air from the inlet 9b and fumes/vapours from the inlet 9c, respectively, with the aforesaid lower section that is positioned above the inlet 9c, substantially coaxial thereto and to the outlet 3b of the muffle. In this way, at least the cooking fumes/vapours are drawn substantially in the direction of the axis of the impeller 7b and forced in a radial direction in the channelling 9 so as to be expelled from the corresponding outlet 9a. As has been said, via the upper inlet 9b the impeller 7b also enables air intake, in particular from the area that overlies the muffle 3 so as to reduce the temperature in this area, where some functional components of the oven 1 are mounted, amongst which for example the electronic control board CS.

[0017] Once again in Figure 1, designated by 10 and 11 are two further heating elements, preferably constituted by electrical resistances, arranged inside and outside the cooking cavity CC, respectively. Preferably, the heating element 10 is positioned in the upper part of the cooking cavity CC to provide a so-called grill resistance, whereas the heating element 11 is positioned underneath the cooking cavity CC, in particular underneath the lower wall of the muffle 3, to provide a so-called "sole resistance".

[0018] Figure 2 is a schematic illustration of a possible embodiment of the aforesaid user interface, belonging to the control system of the oven and connected in signal communication to the electronic control board CS.

[0019] The interface, designated as a whole by UI, comprises a first device S1, for manual selection of a cooking program from a plurality of selectable cooking programs, as well as a second device S2 for manual selection of a cooking temperature from a plurality of se-

lectable cooking temperatures. The devices S1 and S2 preferably comprise electrical selectors, very preferably with rotatable control knob. In the example represented, the selector S1 enables manual selection of eleven programs, identified by the letters A to K and by the wording AUTO.

[0020] The control system, and in particular the control unit of the board CS, is able to control execution of programs that can be executed by the oven 1 at least according to a selection made via the selector S1 and a selection made via the selector S2. In general terms, these programs differ from one another as regards the modes and times of activation of the electrical loads that contribute to cooking, and specifically the heating elements 8, 10, 11 and the fans 6, 7. The logic that supervises the above modes and times for the various programs is, as has been said, implemented in the control system, in particular in the control unit of the board CS.

[0021] The programs that can be selected via the selector S1 comprise first programs A-K, during which the control system is able to control one or more of the heating elements 8, 10, 11 in order to manage a temperature profile in the cooking cavity CC that is variable as a function of a temperature selected via the selector S2. According to a technique in itself known, the control system is in any case configured also for enabling, during execution of one of the programs A-K, modification of the selection made via the selector S2, i.e., modification of the desired temperature for the cooking cavity. The programs A-K, of a generally known conception, may comprise for example a traditional oven program, a multilevel cooking program, a grill cooking program, a baking program for cakes and the like.

[0022] Preferably, also the duration of the first programs A-K may be varied according to a choice made by the user. For this purpose, in preferred embodiments, the user interface UI comprises means for setting a duration of the cooking program, and the control system of the oven is configured for controlling execution of the program also as a function of the duration set. In one embodiment, such as the one exemplified, the user interface UI includes a control means 12, which can be operated for selecting a timing function, a display device 13, and control means 14a, 14b, which can be operated for setting a duration. Via the control means 12, for example a key of a "touch" type, the user can activate programming of the duration, which corresponds to a corresponding graphic representation on the display 13. Next, via the means 14a, 14b, which are also, for example, keys of a "touch" type for increment (+) and decrement (-) of a value, the user can set the desired duration for the cooking program and then confirm his or her choice, for example by pressing again the key 12. Obviously, the means described can be configured also for programming a delayed start of the desired program ("delay timer" function).

[0023] In the case exemplified, the selector S2 is prearranged for enabling discrete selection of a certain number of temperature levels, but not excluded from the scope of the invention is the case of a selection of a continuous type. In the example seven temperature levels are envisaged, designated by 60°C, 100°C, 140°C, 160°C, 180°C, 220°C and MAX, the latter temperature being the maximum cooking temperature allowed for the oven.

[0024] According to the invention, the plurality of programs that can be selected via the selector S1 further comprises an automatic-cooking program, designated by AUTO, which constitutes a sort of "universal" or "multipurpose" cooking program, in the sense that it is suited for cooking various types of foods, even very different from one another, such as for example a roast, lasagne, doughnuts, a food containing filling, stuffed vegetables, buns.

[0025] Once again according to the invention, the control system of the oven 1 is pre-arranged for:

- enabling start of the automatic-cooking program AUTO only and exclusively when the selector S1 is in the corresponding selection position and the selector S2 is in a pre-set selection position;
- automatically controlling one or more of the heating elements 8, 10, 11 in the course of the program AUTO in order to manage a pre-set temperature profile in the cooking cavity CC, which is characteristic of the program AUTO; and
- rendering ineffective a temperature selection via the selector S1 after start of the program AUTO.

[0026] For the purposes of execution of the program AUTO the control system of the oven 1 manages in a completely automatic way the necessary electrical loads of the oven, without the need for the user to make any further settings, for example of temperature and/or times. In a preferred embodiment of the invention, in fact, the automatic-cooking program AUTO has a substantially pre-set duration. Furthermore, in any case, following upon start of the program AUTO, the user of the oven 1 is prevented from the possibility of varying the pre-set temperature profile for that program.

[0027] In various embodiments, the selector S2 defines an inoperative selection position and a plurality of operative selection positions. Corresponding to the operative selection positions are the temperatures that can be selected via the selector S2 (i.e., 60°C, 100°C, 140°C, 160°C, 180°C, 220°C, MAX), whereas corresponding to the inoperative selection position, designated by $S2_0$ in Figure 2, is the predefined position that starts the program AUTO, when the selector S1 is in the corresponding position. The inoperative selection position $S2_0$ is a zero position of the selector S2, i.e., a position to which there does not correspond any of the temperatures that can be selected by the user.

[0028] For practical reasons and compliance to the relevant standards, it is also preferable for the selector S1 to have an inoperative position, i.e., a zero position to

which there does not correspond any of the programs that can be selected by the user, preferably corresponding to an OFF condition of the oven: in the example, this position is designated by $S1_0$.

[0029] Figure 3 illustrates, via a simplified flowchart, the process of setting of the program AUTO. The block 100 is the starting block, via which the control system checks whether the selector S1 is in the position AUTO. Control then passes to block 110, which is a test block, via which the system checks whether the selector S2 is in the position $S2_0$. If it is (output YES), control passes to block 120, whereas, if it is not (output NO), control passes to block 130, with the control system that waits for programming, i.e., waits for the selector S2 to be brought into the position $S2_0$: only after this selection does control pass to block 120.

[0030] Block 120 hence enables execution of the program AUTO. Start of execution preferably occurs automatically, when the selector S1 is in the position AUTO and the selector S2 is in the position $S2_0$. On the other hand, not excluded from the scope of the invention is the case where the user interface UI is provided with a specific start key, pressing of which, after the selection made via the selectors S1, S2, starts the program chosen, or again the case where it is possible to set via the means 12, 13, 14a-14b, a delayed start of the program ("delay timer" function). Selection and/or start of the program AUTO is preferably highlighted graphically also on the display 13.

[0031] Control then passes to block 140, which represents the end of the program AUTO, which may possibly be notified via a visual indication (for example, on the display 13) and/or an acoustic warning. The control system then sets itself in an END or quiescence state. Control then passes to block 150, of end-of-program, i.e., of end-of-cooking.

[0032] As explained previously, after start of the program AUTO (block 120), any temperature selection made via the selector S2 is rendered ineffective. Consequently, also in the case where the user turns the selector S2 into one of its operative selection positions, this action will have no effect on the pre-set temperature profile for the program AUTO. On the other hand, the user is free to make other selections or actions that do not affect in any case the modes of management of the electrical loads envisaged for the program AUTO, such as for example turning-off of the oven, bringing the selector S1 into the corresponding inoperative or zero position, or selection of a different cooking program, by bringing the selector S1 into any one of the positions A-K.

[0033] In a preferred embodiment, when the program AUTO is being executed, the control system manages operation of at least one heating element internal to the oven and at least one heating element external to the oven, in particular the element 10 and the element 11. According to the various steps envisaged by the program AUTO, the heating elements 10 and 11 can be activated continuously, or else cyclically, i.e., with activation steps separated by de-activation pauses. In general terms, the total duration of the de-activation pauses of the upper heating element 10 is longer than the total duration of the de-activation pauses of the external heating element 11.

[0034] Once again preferentially, when the program AUTO is being executed, the control system manages operation of at least one of the fans 6 and 7, very preferably of both of the fans. In this way, there is guaranteed an effective circulation of air on the foods being cooked, even though the air is not necessarily heated via the element 8, as well as an efficient evacuation of the moisture released by the foods being cooked. Preferably, the control system is pre-arranged for enabling operation at constant r.p.m. of both of the fans 6 and 7 during execution of the program AUTO.

[0035] Figure 4 illustrates schematically, in tabular form, the possible development of the program AUTO according to a possible embodiment of the invention. In this embodiment, the program AUTO comprises:

- a pre-heating step, during which the inside of the cooking cavity CC is heated up to a substantially pre-set heating temperature;
- a first cooking step, during which the inside of the cooking cavity CC is for a first substantially fixed time brought to and/or kept at a first substantially pre-set cooking temperature; and
- a second cooking step, during which the inside of the cooking cavity CC is brought to a second substantially pre-set cooking temperature and kept at said temperature for a second substantially fixed time.

[0036] Preferably, the second fixed time is longer than the first fixed time, and the second cooking temperature is higher than the first cooking temperature. On the other hand, the time necessary for execution of the pre-heating step is not exactly predetermined, in so far as its execution terminates when a given temperature is reached, which can be detected via the temperature sensor TS. Even though the characteristics of the oven and of the heating elements (muffle volume, thermal insulation, power of the heating elements, r.p.m. of the fans, etc.) are substantially known parameters, the time necessary for reaching the heating temperature envisaged for the pre-heating step is slightly variable as a function of external factors, such as for example the ambient temperature, the amount of foods being cooked, the type of containers for the foods (metal, ceramic, glass, etc.). For this reason, the total duration of the program AUTO is defined herein as being "substantially pre-set". Indicatively, in any case, the pre-heating step may have a duration comprised between 3 and 6 minutes, in particular 4-5 minutes.

[0037] Preferably, the heating temperature that must be reached at the end of the pre-heating step is comprised between 130°C and 160°C, very preferably between 135°C and 150°C, the first cooking temperature,

for execution of the first cooking step, is preferably comprised between 140°C and 170°C, very preferably between 145°C and 165°C, and the second cooking temperature, for execution of the second cooking step, is preferably comprised between 160°C and 200°C, very preferably between 165°C and 190°C. In the example represented in Figure 4, the aforesaid substantially preset three temperatures are 140°C, 150°C, and 180°C, respectively.

[0038] Once again preferentially, the first cooking step has a duration comprised between 5 and 15 minutes, whereas the second cooking step has a duration comprised between 30 and 50 minutes. In the example represented in Figure 4, these durations are 10 and 40 minutes, respectively.

[0039] As emerges from Figure 4, in a preferred embodiment, in the course of the pre-heating step the heating elements 10 and 11 are both activated continuously, whereas during the first and second cooking steps the elements 10 and 11 are activated cyclically. On the other hand, preferably, the resistance 8 (referred to as "circular" in Figure 4) is always inactive when the program AUTO is being executed.

[0040] It should be noted that, in the example represented in the table of Figure 4, the squares appearing in the section "ACTIVATIONS CYCLE" each correspond to a time of 12 seconds, with a total duty cycle of 2 minutes (10 squares x 12 seconds). As may be noted, within the 2 minutes, the total duration of the pauses of inactivity or non-supply of the element 10 (84 seconds) is longer than the total duration of the pauses of inactivity or non-supply of the element 11 (24 seconds). In the cooking steps the heating action performed by the sole resistance 11 is hence privileged.

[0041] Preferably, the fans 6 and 7 are both active in the pre-heating step, in the first cooking step and in the second cooking step. Very preferably, the fans 6 and 7 are driven at their maximum r.p.m., or in any case at an r.p.m. that is indicatively comprised between 1150 and 1350 r.p.m. for the fan 6 and 1200 and 1350 r.p.m. for the fan 7.

[0042] As may be seen in Figure 4, according to a preferred embodiment, the program AUTO may further comprise a final heat-recovery step, which is also of substantially pre-set duration, during which the residual heating action provided by the elements 10 and 11 is exploited, even though these are not active or supplied in this step, to the advantage of energy saving. Also in the recovery step, which may have a duration comprised between 2 and 6 minutes, for example 4 minutes, both of the fans 6 and 7 are in any case active, preferably at the same r.p.m. as the one kept during the previous steps.

[0043] Figure 5 highlights graphically the time plot of the temperature within the cooking cavity CC. There may hence be noted an increase in temperature up to 140°C (lasting slightly longer than 4 minutes) that determines the end of the pre-heating step, which is followed by a further increase to approximately 150°C, i.e., the temperature necessary for execution of the first cooking step; the increase to 150°C and maintenance of this temperature altogether last approximately 10 minutes. There then follows an increase to approximately 180°C, i.e., to the temperature necessary for execution of the second cooking step; in the example, the increase to 180°C and maintenance of this temperature last as a whole approximately 40 minutes. This is finally followed by the recovery step, in which the heating elements are inactive and the fans are active. The recovery step here has a duration of approximately 5 minutes, after which the program AUTO is terminated. In the example appearing in Figures 4 and 5, then, the program AUTO has an total duration of approximately 60 minutes.

[0044] From the above description, the characteristics of the present invention, as likewise its advantages, emerge clearly. Practical tests conducted by the present Applicant have made it possible to ascertain that the automatic program provided according to the present invention makes it possible to achieve efficient cooking results over a wide range of foods, such as for example a roast, lasagne, doughnuts, a food containing filling, stuffed vegetables, buns. The modes of selection of the automatic program are simple and intuitive, virtually eliminating any risk of errors of setting of the program AUTO, at the same time preventing the possibility of the user inadvertently modifying the pre-set temperature profile for that program and/or its duration.

[0045] It is clear that numerous variations may be made by the person skilled in the art to the oven and to the cooking program described by way of example, without thereby departing from the scope of the invention as defined in the ensuing claims.

Claims

1. A household cooking oven comprising a load-bearing structure (2), housed in which is a muffle (3) defining a cooking cavity (CC), the oven (1) further comprising a control system (CS, TS, UI) that includes a user interface (UI) having:

   a first device (S1) for manual selection of an operating program from a plurality of operating programs (A-K, AUTO); and
   a second device (S2) for manual selection of a cooking temperature from a plurality of selectable cooking temperatures,
   wherein associated to the muffle (3) is a plurality of heating elements (8, 10, 11) that can be controlled by the control system (CS, TS, UI) and wherein the control system (CS, TS, UI) is able to control execution of one said operating program (A-K, AUTO) at least according to a selection made via the first selection device (S1) and a selection made via the second selection device (S2), the operating programs (A-K, AUTO)

comprising first programs (A-K), during which the control system (CS, TS, UI) is able to control one or more of the heating elements (8, 10, 11) in order to manage a temperature profile in the cooking cavity (CC) that is variable as a function of a temperature selected via the second selection device (S2),
wherein the plurality of operating programs (A-K, AUTO) that can be selected via the first selection device (S1) further comprises an automatic operating program (AUTO),
and wherein the control system (CS, TS, UI) is pre-arranged for:

- enabling start of the automatic operating program (AUTO) only when the first selection device (S1) is in the corresponding selection position and the second selection device (S2) is in a pre-set selection position ($S2_0$);
- automatically controlling one or more of the heating elements (8, 9, 10) in the course of the automatic operating program (AUTO) in order to manage a pre-set temperature profile in the cooking cavity (CC) that is characteristic of the automatic operating program (AUTO); and
- rendering ineffective a temperature selection via the second selection device (S2) after start of the automatic operating program (AUTO).

2. The cooking oven according to Claim 1, wherein the second selection device (S2) defines an inoperative selection position and a plurality of operative selection positions (60°C, 100°C, 140°C, 160°C, 180°C, 220°C, MAX), there corresponding to the operative selection positions (60°C, 100°C, 140°C, 160°C, 180°C, 220°C, MAX) the selectable temperatures, and there corresponding to the inoperative selection position the aforesaid predefined position ($S2_0$), the inoperative selection position being in particular a zero position of the second selection device (S2).

3. The cooking oven according to Claim 1 or Claim 2, wherein:

- the user interface (UI) further comprises means for setting a duration (12, 13, 14a-14b) of one said first program (A-K);
- the control system (CS, TS, UI) is configured for controlling execution of one said first program (A-K) also according to a selection made via the means for setting a duration (12,13,14a-14b); and
- the automatic operating program (AUTO) has a substantially pre-set duration.

4. The cooking oven according to any one of Claims 1 to 3, further comprising at least one of a fan (6) for circulation of air within the muffle (3) and an extraction fan (7) for expelling fumes/vapours from the muffle (3), wherein the control system (CS, TS, UI) is pre-arranged for controlling operation of the at least one fan (6, 7) during execution of the automatic operating program (AUTO).

5. The cooking oven according to Claim 4, wherein the control system (CS, TS, UI) is pre-arranged for enabling operation at constant r.p.m. of the at least one fan (6, 7) during execution of the automatic operating program (AUTO).

6. The cooking oven according to Claim 4 or Claim 5, wherein the control system (CS, TS, UI) is pre-arranged for enabling operation of the fan (6) for circulation of air within the muffle (3) and of the extraction fan (7) during execution of the automatic operating program (AUTO).

7. The cooking oven according to any one of Claims 1 to 6, wherein the heating elements (8, 10, 11) comprise at least one first heating element (8, 10) inside the cooking cavity (CC) and at least one second heating element (11) outside the cooking cavity (CC).

8. The cooking oven according to Claim 7, wherein the first heating element (10) is a heating element positioned in the upper part of the cooking cavity (CC) and the second heating element (11) is a heating element set underneath the cooking cavity (CC).

9. The cooking oven according to any one of Claims 1 to 8, wherein the automatic operating program (AUTO) comprises:

- a pre-heating step, during which the inside of the cooking cavity (CC) is heated up to a substantially pre-set heating temperature;
- a first cooking step, during which the inside of the cooking cavity (CC) is kept for a first substantially fixed time at a first substantially pre-set cooking temperature; and
- a second cooking step, during which the inside of the cooking cavity (CC) is brought to a second substantially pre-set cooking temperature and kept at said temperature for a second substantially fixed time,

wherein the second fixed time is longer than the first fixed time and the second cooking temperature is higher than the first cooking temperature.

10. The cooking oven according to Claim 9, wherein:

- the heating temperature is comprised between

130°C and 160°C, preferably between 135°C and 150°C;
- the first cooking temperature is comprised between 140°C and 170°C, preferably between 145°C and 165°C; and
- the second cooking temperature is comprised between 160°C and 200°C, preferably between 165°C and 190°C.

11. The cooking oven according to Claim 9 or Claim 10, wherein:

- the first cooking step has a duration comprised between 5 and 15 minutes; and
- the second cooking step has a duration comprised between 30 and 50 minutes.

12. The cooking oven according to Claims 8 and 9, wherein:

- in the course of the pre-heating step the first heating element (10) and the second heating element (11) are active continuously; and
- in the course of the first and second cooking steps, the first heating element (10) and the second heating element (11) are active cyclically, the total duration of the pauses of de-activation of the first heating element (10) being longer than the total duration of the pauses of de-activation of the second heating element (11).

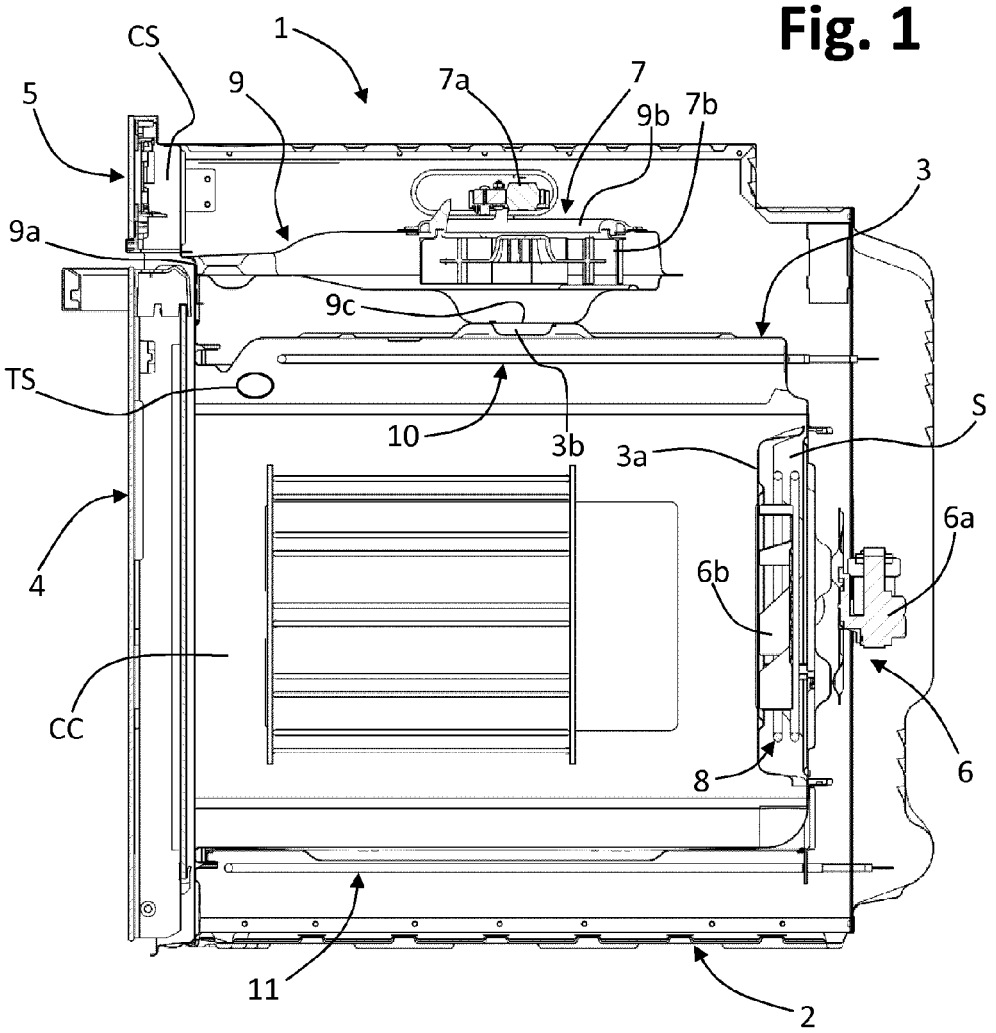
13. The cooking oven according to Claims 7 and 9, wherein the automatic operating program (AUTO) further comprises a final heat-recovery step, of substantially pre-set duration, during which the first and second heating elements (10, 11) are inactive, the final step preferably having a duration comprised between 2 and 6 minutes.

14. An automatic-cooking program for a household oven, in particular an oven according to one or more of Claims 1-13, having a first heating element (10) positioned in the upper part of a corresponding cooking cavity (CC) and a second heating element (11) set underneath the cooking cavity (CC), the oven moreover having a first fan (6) for circulation of air within the cooking cavity (CC) and a second, extraction, fan (7) for expelling fumes/vapours from the cooking cavity, wherein the program comprises:

- a pre-heating step, during which the inside of the cooking cavity (CC) is heated up to a substantially pre-set heating temperature, the heating temperature being comprised between 130°C and 160°C, preferably between 135°C and 150°C;
- a first cooking step, during which the inside of the cooking cavity (CC) is kept for a first substantially fixed time at a first substantially pre-set cooking temperature, the first temperature being comprised between 140°C and 170°C, preferably between 145°C and 165°C; and
- a second cooking step, during which the inside of the cooking cavity (CC) is brought to a second substantially pre-set cooking temperature and kept at said temperature for a second substantially fixed time, the second temperature being comprised between 160°C and 200°C, preferably between 165°C and 190°C,

wherein the second fixed time is longer than the first fixed time and the second cooking temperature is higher than the first cooking temperature;
wherein the first cooking step has a duration comprised between 5 and 15 minutes and the second cooking step has a duration comprised between 30 and 50 minutes;
wherein in the course of the pre-heating step the first heating element (10) and the second heating element (11) are active continuously, and in the course of the cooking steps the first heating element (10) and the second heating element (11) are activated cyclically, the total duration of the pauses of de-activation of the first heating element (10) being longer than the total duration of the pauses of de-activation of the second heating element (11);
and wherein in the course of the pre-heating step and of the cooking steps the first and second fans (6, 7) are both active.

Fig. 1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9b
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3b
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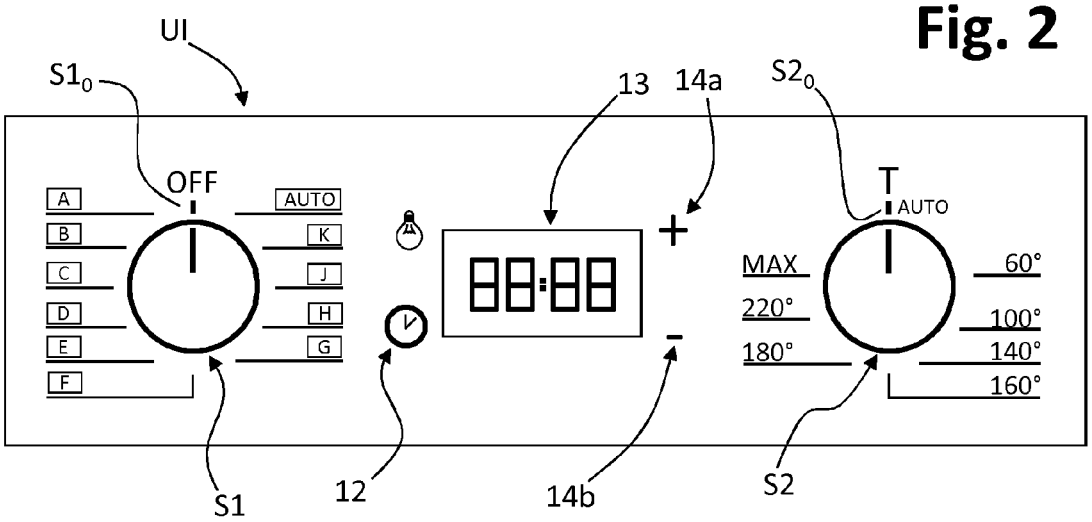
S
6a
4
6b
CC
8
6
11
2

Fig. 2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S1
12
14b
S2

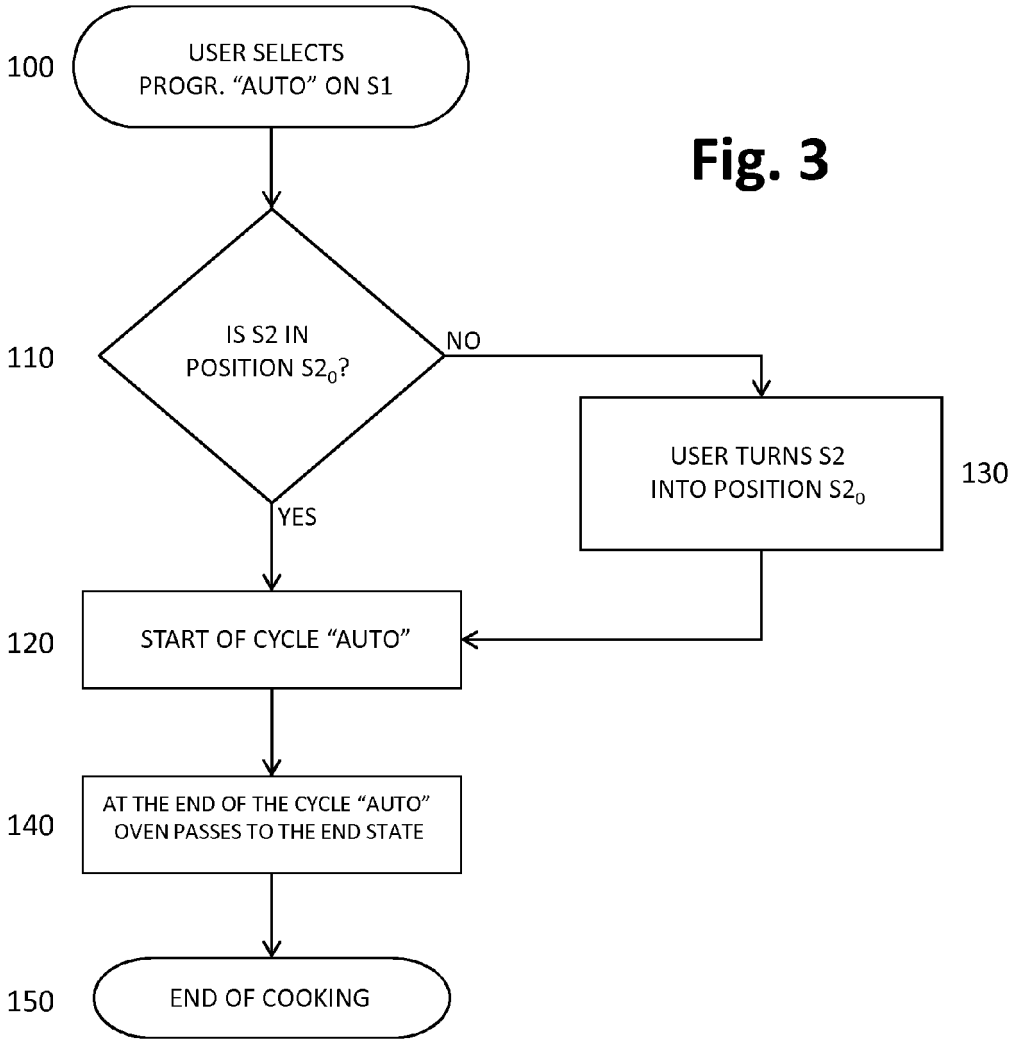
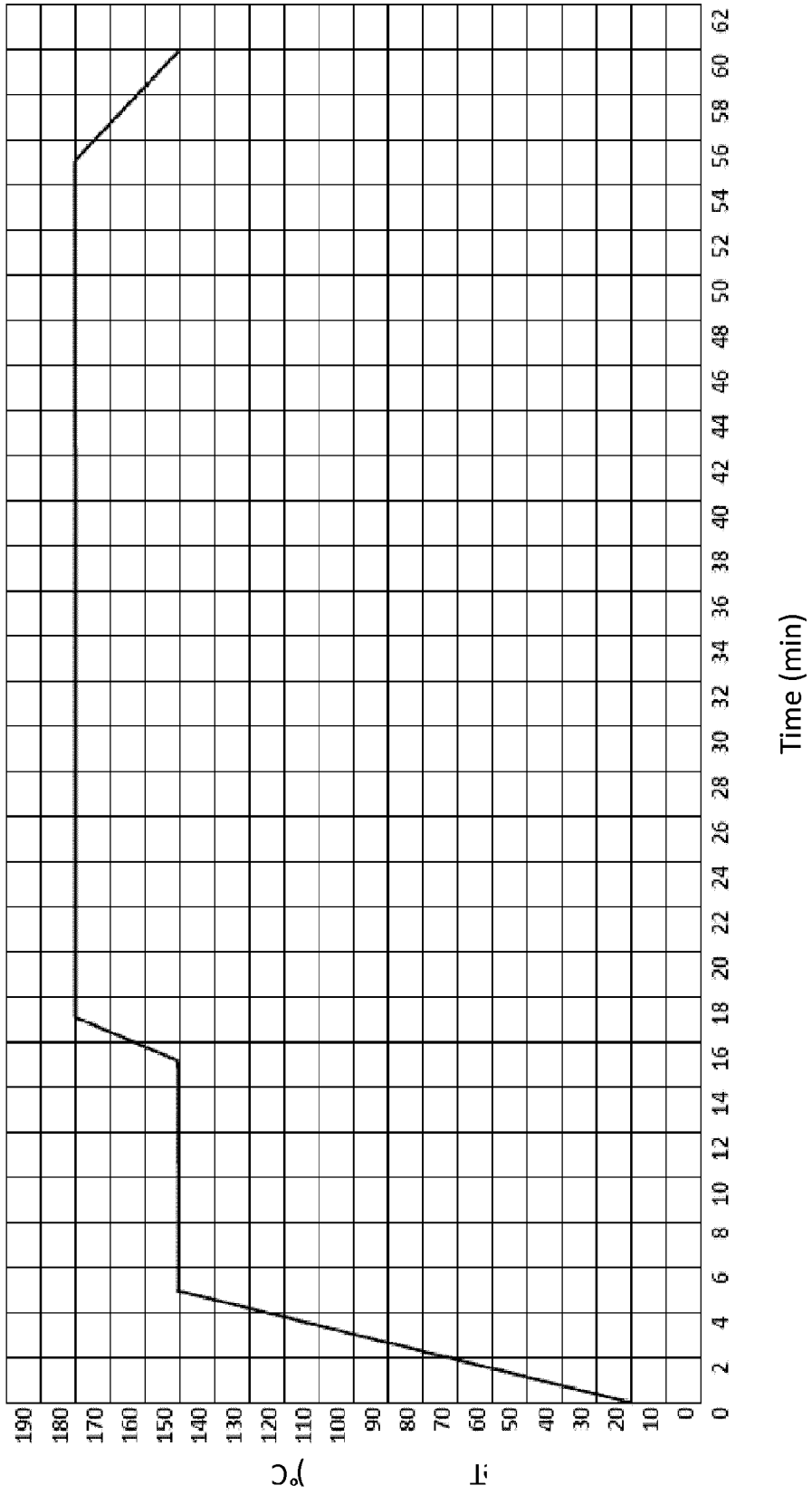


Fig. 3

Fig. 4

	TEMP.	TIME	TYPE OF HEATER	ACTIVATIONS CYCLE	RADIAL FAN	CAVITY FAN
			SOLE			
PRE-HEAT.	140 °C		GRILL		MAX	MAX
			CIRCULAR			
			SOLE			
COOKING	150 °C	10 min	GRILL		MAX	MAX
			CIRCULAR			
			SOLE			
COOKING	180 °C	40 min	GRILL		MAX	MAX
			CIRCULAR			
			SOLE			
RECOVERY	OFF	5 min	GRILL		MAX	MAX
			CIRCULAR			

Fig. 5


°C)
°F
190
180
170
160
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130
120
110
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Time (min)

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EUROPEAN SEARCH REPORT

Application Number
EP 15 17 8509

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 758 000 A1 (WHIRLPOOL CO [US]) 28 February 2007 (2007-02-28) * the whole document *	1-13	INV. F24C7/08 H05B6/68
Y	US 3 808 402 A (REA W) 30 April 1974 (1974-04-30) * column 6, lines 26-44; figure 13 *	1,2,4-13	
A	DE 101 38 062 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 13 February 2003 (2003-02-13) * paragraph [0019]; figure 3 *	1	
Y	DE 103 42 531 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 21 April 2005 (2005-04-21) * paragraph [0024] *	3	

TECHNICAL FIELDS SEARCHED (IPC)

F24C
H05B
A47J

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	17 November 2015	Rodriguez, Alexander

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

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Application Number
EP 15 17 8509

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-13

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 15 17 8509

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13

the start of the automatic operating program (AUTO) occurs only when the first selection device (S1) is in the corresponding selection position and the second selection device (S2) is in a pre-set selection position (S2o)

---

2. claim: 14

an automatic-cooking program for a household oven, in particular an oven according to one or more of Claims 1-13, having a first heating element (10) positioned in the upper part of a corresponding cooking cavity (CC) and a second heating element (11) set underneath the cooking cavity (CC), the oven moreover having a first fan (6) for circulation of air within the cooking cavity (CC) and a second, extraction, fan (7) for expelling fumes/vapours from the cooking cavity, wherein the program comprises:
- a pre-heating step, during which the inside of the cooking cavity (CC) is heated up to a substantially pre-set heating temperature, the heating temperature being comprised between 130°C and 160°C, preferably between 135°C and 150°C;
- a first cooking step, during which the inside of the cooking cavity (CC) is kept for a first substantially fixed time at a first substantially pre-set cooking temperature, the first temperature being comprised between 140°C and 170°C, preferably between 145°C and 165°C; and
- a second cooking step, during which the inside of the cooking cavity (CC) is brought to a second substantially pre-set cooking temperature and kept at said temperature for a second substantially fixed time, the second temperature being comprised between 160°C and 200°C, preferably between 165°C and 190°C,
wherein the second fixed time is longer than the first fixed time and the second cooking temperature is higher than the first cooking temperature;
wherein the first cooking step has a duration comprised between 5 and 15 minutes and the second cooking step has a duration comprised between 30 and 50 minutes;
wherein in the course of the pre-heating step the first heating element (10) and the second heating element (11) are active continuously, and in the course of the cooking steps the first heating element (10) and the second heating element (11) are activated cyclically, the total duration of the pauses of de-activation of the first heating element (10) being longer than the total duration of the pauses of de-activation of the second heating element (11);
and wherein in the course of the pre-heating step and of the cooking steps the first and second fans (6, 7) are both active

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 15 17 8509

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 17 8509

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
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17-11-2015

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		GB 1455794 A	17-11-1976
		US 3808402 A	30-04-1974
DE 10138062 A1	13-02-2003	NONE	
DE 10342531 A1	21-04-2005	NONE	

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