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(54) OVEN FOR COOKING FOOD PRODUCTS AND METHOD FOR COOKING FOOD PRODUCTS WITH SAID OVEN

(57) Oven for cooking food products, which comprises a support structure (2) internally delimiting a cooking chamber (3), a cooking surface (4) placed within the cooking chamber (3) and heating means (5), mechanically connected to the support structure (2) and placed to heat at least the cooking surface (4).

The oven comprises, moreover, a fixed first temperature sensor (6), mounted on the support structure (2), pointed towards the cooking surface (4) and configured for detecting at least one surface temperature value (Ts) of a first measurement area (A1) on the cooking surface (4).

In addition the oven is provided with a logic control unit (7), mechanically connected to the support structure (2) and comprising a first comparison module (C1) configured for comparing at least the surface temperature value (Ts) with a threshold surface temperature value (Tss1), and at least one user interface (8), configured for receiving a comparison signal from the first comparison module (C1) and emitting a warning signal based on the comparison signal.

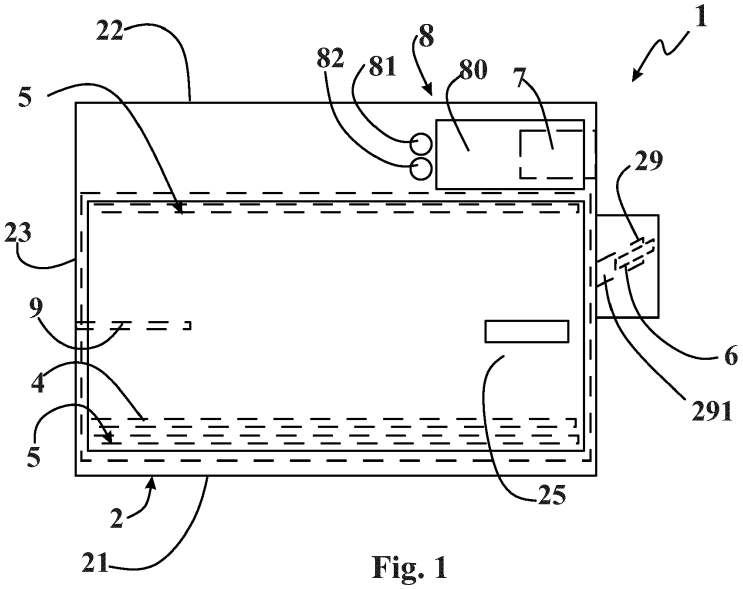

Fig. 1

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Description

Field of application

[0001] The present invention regards an oven for cooking food products and a method for cooking food products with the aforesaid oven according to the preamble of the independent claims.

[0002] The present oven is advantageously employable for cooking food products at its interior, preferably baked, and is intended to be employed in a professional setting, for example in the bakery field, gastronomy field, pastry field and in the restaurant field in general, as well as in the home.

[0003] Therefore, the present invention is inserted in the industrial field of production of apparatuses for cooking food products, in particular ovens, both of professional and home type.

State of the art

[0004] Known on the market are ovens for cooking food products provided with a support structure defining, at its interior, a cooking chamber. Such ovens comprise at least one cooking surface, made of steel or alternatively of refractory material and placed in proximity to a base wall of the support structure, and one or more electrical heating elements placed within the cooking chamber, usually on the upper wall and on the base wall delimiting the cooking chamber, in order to allow the cooking of the food products placed at the interior.

[0005] In addition, the aforesaid ovens comprise an ambient temperature sensor, usually a thermocouple, placed within the cooking chamber and arranged for measuring the temperature inside the oven, also known as chamber temperature.

[0006] More in detail, the ovens of known type, in an entirely conventional manner, allow the user to select a specific cooking program, which corresponds to a specific power of the electrical heating elements, and such ovens comprise a selector of the internal temperature of the chamber, by means of which the user can set the objective temperature that the cooking chamber must reach before putting the food in the oven. The conventional ovens also comprise at least one signaling LED, operatively connected to the temperature sensor and arranged for communicating - for example by means of the turning off or turning on thereof - to the user when the cooking chamber reaches the temperature set by the user or the temperature corresponding to the preset program.

[0007] The ovens for cooking food products of known type have in practice shown that they do not lack drawbacks.

[0008] A first drawback of the ovens of known is given by the fact that they do not allow obtaining a cooking of the foods that is always optimal and reproducible, in particular during multiple continuous cooking cycles.

[0009] Indeed, such ovens provide the user with a visual feedback, given by the signaling LED, indicative of the temperature inside the cooking chamber, which however is not a sufficient condition for attaining an optimal cooking that is reproducible over time.

[0010] It can in fact happen, in particular in the event in which the cooking surface is made of refractory material and hence provided with a high thermal inertia, that the internal temperature of the cooking chamber is very different from the temperature of the cooking surface, for example in the first starting steps of the oven (with the cooking surface that is situated at a temperature much lower than the temperature of the chamber).

[0011] In addition, a further drawback lies in the fact that such ovens do not allow an optimal cooking if it is necessary to cook products that require temperatures that are very different from each other. For example, in the event in which following the cooking of a first food for which high temperatures within the chamber are required, it is necessary to change cooking program in order to cook a second food at low temperatures, the user will tend to put the aforesaid second food in the oven as soon as he/she receives the visual feedback that the objective chamber temperature has been reached, without considering if also the cooking surface has reached or not reached such objective temperature.

[0012] In such situation, the cooking quality of the various food products to be baked and the reproducibility thereof will depend on the experience of the user and his/her capability in understanding the actual situation of the cooking chamber and the cooking surface before cooking the food products.

[0013] Therefore, a further drawback lies in the fact that the ovens of known type have proven poorly adapted for home use, in which therefore the experience and the ability of the average user is certainly lower and not sufficient for reaching a high quality of cooking and a good reproducibility over time.

[0014] Also known from the document US 2021/404745 is an oven provided with a thermocouple embedded in the cooking surface in order to detect the internal temperature of the latter.

[0015] Also known from the document US 2017/332841 is a grill for cooking foods which comprises a thermal camera, grippable and manually actuatable by a user, which is configured in order to detect the temperature of the foods placed on the grill and automatically recognize the shape of such foods such to be able to recognize which are the different foods that have been placed on the grill.

Presentation of the invention

[0016] In this situation, the problem underlying the present invention is therefore that of eliminating the problems of the abovementioned prior art, by providing an oven for cooking food products which allows obtaining an optimal cooking for the different food products to be

cooked.

[0017] A further object of the present invention is to provide an oven for cooking food products which allows obtaining a cooking which can be reproduced over time with precision.

[0018] A further object of the present invention is to provide an oven for cooking food products which is simple to use.

[0019] A further object of the present invention is to provide an oven for cooking food products which is adapted for the aforesaid objects even in a home environment for users without professional experience.

[0020] A further object of the present invention is to provide an oven for cooking food products which allows guiding the user during the different cooking operations.

[0021] A further object of the present invention is to provide an oven for cooking food products which is capable of operating in a highly automated manner.

Brief description of the drawings

[0022] The technical characteristics of the invention, according to the aforesaid objects, can be clearly found in the contents of the below-reported claims and the advantages thereof are more evident in the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows a front schematic view of the oven for cooking food products, object of the present invention;
- figure 2 shows a front schematic view of the oven of figure 1 with several components removed in order to better show other components;
- figure 3 shows a detail of a cooking surface with a food product placed on such cooking surface of the oven of figure 1, in which a first measurement area and a second measurement area are highlighted;
- figure 4 shows a schematic view of a logic control unit of the oven for cooking food products of figure 1.

Detailed description of a preferred embodiment

[0023] With reference to the enclosed figures, reference number 1 overall indicates an oven for cooking food products 100 according to the present invention.

[0024] The present oven 1 is advantageously employable both in the home environment and in professional settings, e.g. in restaurants, pizzerias, bakeries or in other business enterprises that require the use of an oven 1 for cooking food products 100.

[0025] In a non-limiting manner, moreover, the oven 1, object of the invention, is particularly advantageous if employed for cooking baked products, such as for example pizza and focaccia, though it can also be used for cooking different food products 100.

[0026] The present oven 1 comprises a support structure 2, preferably made of metal, which internally delimits a cooking chamber 3.

[0027] More in detail, the support structure 2 is provided in a per se known manner with at least one lower wall 21, with an opposite upper wall 22, and a perimeter wall 23, which is extended projectingly from the aforesaid lower wall 21 up to the upper wall 22 and at least partially encloses, together with the lower and upper walls 21, 22, the cooking chamber 3.

[0028] Advantageously, the support structure 2 comprises an access opening to the cooking chamber 3, preferably made on the perimeter wall 23, which allows the insertion and the extraction of the food products 100 into/from the cooking chamber 3. In addition, the oven 1 also advantageously comprises a door 25, which is hinged to the support structure 2 and is movable for selectively opening and closing the aforesaid access opening.

[0029] The oven 1 comprises, in addition, at least one cooking surface 4, placed within the cooking chamber 3 and on which at least one food product 100 is susceptible of being set.

[0030] In particular, the cooking surface 4 is placed preferably suspended within the cooking chamber 3, in particular connected to the perimeter wall 23 of the support structure 2. Advantageously, the cooking surface 4 is made of a refractory material, e.g. clay or cordierite bisque, in order to allow the attainment of high temperatures, ensuring a cooking flexibility for a vast range of food products 100.

[0031] The oven 1 also comprises heating means 5, placed at least partially within the cooking chamber 3 in order to heat at least the cooking surface 4 and preferably also the air present in the cooking chamber 3.

[0032] Advantageously the heating means 5 comprise a first electrical heating element 51, which is mounted on the support structure 2, in particular on the upper wall 22, and at least one second electrical heating element 52, which is mounted on the support structure 2, in particular on the lower wall 21.

[0033] In accordance with the idea underlying the present invention the oven 1 comprises a fixed first temperature sensor 6, mounted on the support structure 2, pointed towards the cooking surface 4 (spaced from the latter) and configured for detecting at least one surface temperature value Ts of a first measurement area A1 of the aforesaid cooking surface 4.

[0034] The aforesaid first temperature sensor 6, in a per se known manner, defines a measurement cone CM, which is extended along a corresponding pointing axis X. More in detail, the pointing axis X is fixed with respect to the first temperature sensor 6 and defines the direction along which the latter is pointed.

[0035] Advantageously, the first measurement area A1 is defined by the intersection between the measurement cone CM of the first temperature sensor 6 and the cooking surface 4. In this manner, since the first temperature sensor 6 is operatively fixed with respect to the support struc-

ture 2, and consequently with respect to the cooking surface 4, the first measurement area A1 has a fixed size.

[0036] In this manner, the detection of the surface temperature value (Ts) of the first measurement area A1 of the cooking surface 4 is stable and repeatable over time. Preferably, the first temperature sensor 6 is arranged for measuring the average surface temperature of the first measurement area A1 of the cooking surface 4.

[0037] The oven 1 also comprises a logic control unit 7, mechanically connected to the support structure 2 and comprising at least one first comparison module C1 configured for comparing at least the surface temperature value Ts with a preset first threshold surface temperature value Tss1 and generating a corresponding comparison signal based on the aforesaid comparison.

[0038] The oven 1 also comprises at least one user interface 8, configured for receiving the comparison signal from the first comparison module C1 and emitting a warning signal based on the aforesaid comparison signal.

[0039] Advantageously, with the oven 1 and the method, object of the present invention, the user inserts the food product 100 within the cooking chamber 3, in particular placing it on the cooking surface 4, when the latter has reached a surface temperature value Ts ideal for cooking a specific food product 100. In this manner, it is possible to cook a wide range of food products 100 in a simple, precise and repeatable manner, in particular standardizing the cooking of the food products 100 themselves.

[0040] In accordance with the preferred embodiment, the first temperature sensor 6 is a remote temperature sensor, i.e. adapted to measure the temperature without direct contact between itself and the cooking surface 4.

[0041] Preferably, the first temperature sensor 6 is a sensor arranged for measuring the temperature by detecting the electromagnetic radiation emitted in particular by the surface of the object regarding which it is desired to measure the surface temperature. For example, the first temperature sensor 6 is selected between an infrared pyrometer, a laser pyrometer, an optical pyrometer, or a multi-technology instrument. Advantageously, the first temperature sensor (6) is capable of detecting the temperature within an interval preferably comprised between -50°C and 1030°C, and operates in a spectrum range comprised between 8 and 14 μm.

[0042] Advantageously in addition, the first temperature sensor (6) is provided with an average accuracy of 1.0 °C.

[0043] More in detail, according to the preferred embodiment of the present invention, the first temperature sensor (6) employed is the sensor CSmicro LT/LTH sold by Optris®.

[0044] Advantageously, the oven 1 comprises an auxiliary support body 29, of substantially box-like shape, fixed to the support structure 2 and defining a housing seat 291, which is positioned preferably outside the cooking chamber 3 and, still more preferably, outside the support structure 2. More in detail, the first temperature sensor 6 is mechanically connected to the auxiliary support body 29 and is placed at least partially within the aforesaid housing seat 291.

[0045] According to the embodiment represented in the enclosed figures, the perimeter wall 23 of the support structure 2 comprises two planar lateral walls 27 placed facing each other, each of which extended along a corresponding lying plane substantially perpendicular to the lower wall 21.

[0046] Preferably, the auxiliary support body 29 is fixed to the support structure 2 at its perimeter wall 23. More in detail, the auxiliary support body 29 is fixed to a lateral wall 27 of the perimeter wall 23.

[0047] As is evident from the image 2, the first temperature sensor 6 is mechanically connected to the auxiliary support body 29 with the pointing axis X thereof incident with respect to the cooking surface 4. In this manner, as stated above, the intersection between the measurement cone CM of the first temperature sensor 6 with the cooking surface 4 defines the aforesaid first measurement area A1 on the cooking surface 4 itself. According to the embodiment represented in the enclosed figures, the pointing axis X of the first temperature sensor 6 is tilted with respect to the cooking surface 4 with an angle smaller than 90° with respect to the cooking surface 4 itself.

[0048] According to an embodiment not represented in the enclosed figures, the auxiliary support body 29 is fixed at the upper wall 22 of the support structure 2. In such configuration, preferably the first temperature sensor 6 is fixed to the auxiliary support body 29 with the pointing axis X substantially perpendicular to the cooking surface 4. In this manner, the measurement area A has substantially circular shape.

[0049] Advantageously, the support structure 2 comprises a dividing wall 26 placed as a separation between the cooking chamber 3 and the housing seat 291, through which the first temperature sensor 6 detects the surface temperature value Ts.

[0050] In this manner, the dividing wall 26 thermally isolates, at least partially, the housing seat 291 from the cooking chamber 3, and in particular from the high temperature which the latter can reach, allowing a regular operations of the first temperature sensor 6 and consequently lengthening the useful operating life thereof.

[0051] In this case, by 'through' it must not be intended 'by means of , but rather it must be intended that the first temperature sensor 6 is capable of detecting the surface temperature value Ts of a surface placed beyond the dividing wall 26.

[0052] Advantageously, such dividing wall 26 is placed to intercept the pointing axis X of the first temperature sensor 6.

[0053] Advantageously, the dividing wall 26 is made of a material transparent to the electromagnetic radiation detected by the first temperature sensor 6.

[0054] According to the embodiment represented in the enclosed figures, the dividing wall 26 is placed at a

lateral wall 27 of the support structure 2, in particular adjacent to the aforesaid auxiliary support body 29.

[0055] More in detail, the first temperature sensor 6 is configured for sending a first measurement signal, indicative of the detected first surface temperature value Ts and the logic control unit 7 is advantageously provided with a reception module, configured for receiving the aforesaid measurement signal and operatively connected to the first comparison module C1.

[0056] Advantageously, the user interface 8 comprises an actuation module, operatively connected to the first comparison module C1, and a light source, electrically connected to the actuation module and arranged for being driven based on the aforesaid comparison signal. For example, in a non-limiting manner, the light source is preferably turned on when the comparison signal satisfies the requirement set by the corresponding comparison logic, in order to warn the user that the surface temperature value Ts detected by the first temperature sensor 6 meets the aforesaid requirement and that therefore the user can proceed to bake the desired food product 100.

[0057] Of course it is also possible that the user interface 8 comprise an acoustic emitter, in alternative to or in combination with the aforesaid light source, electrically connected to the actuation module and arranged for being driven based on the aforesaid comparison signal. For example, in a non-limiting manner, the acoustic emitter is preferably actuated when the comparison signal meets the requirement set by the corresponding comparison logic, in order to warn the user that the surface temperature value Ts detected by the first temperature sensor 6 meets the aforesaid requirement and hence that the user can proceed to bake the desired food product 100.

[0058] Advantageously, the logic control unit 7 comprises a memory unit M, containing at least one cooking program stored therein, which is associated with at least one corresponding first threshold surface temperature value Tss1, and the user interface 8 is actuatable by a user in order to set, by the memory unit M, one of the cooking programs.

[0059] Preferably, the user interface 8 comprises a control panel 80, which can be of physical type or alternatively of touch screen type, mechanically associated with the support structure 2, in particular on the perimeter wall 23 in proximity to the door 25. The aforesaid control panel 80 is preferably a screen, intended to signal to a user the cooking program that is currently set. In addition, the user interface 8 advantageously comprises at least one first button 81, which if pressed, sends a drive signal to the logic control unit 7 in order to actuate a new cooking program.

[0060] Of course, the first button 81 can be integrated in the control panel 80 if the latter is a touch screen.

[0061] Advantageously, the first comparison module C1 is configured for comparing at least the surface temperature value Ts with the first threshold surface temperature value Tss1 corresponding to the set cooking program and sending a corresponding comparison signal to the user interface 8.

[0062] Advantageously, the logic control unit 7 is configurable for operating in a heating control mode, in which the first comparison module C1 is configured for comparing at least the surface temperature value Ts of the cooking surface 4 with the first threshold surface temperature value Tss1 and sending a corresponding first comparison signal to the user interface 8 in order to signal to the user when the cooking surface 4 reaches a surface temperature value Ts substantially equal to the first threshold surface temperature value Tss1.

[0063] Advantageously, in accordance with a first programmed logic in which the heating means 5 operate for heating the cooking surface 4 of the oven 1, the user interface 8 emits the aforesaid warning signal when the surface temperature value Ts is for example equal to or greater than 90% of the first threshold surface temperature value Tss1 of the cooking surface 4.

[0064] Otherwise, in accordance with a second programmed logic in which the heating means 5 are turned off or operate at a reduced power in order to allow reducing the surface temperature of the cooking surface 4 of the oven 1, the user interface 8 emits the aforesaid warning signal when the surface temperature value Ts is for example equal to or lower than the 110% of the first threshold surface temperature value Tss1 of the cooking surface 4.

[0065] In this manner, it is therefore possible to employ the first temperature sensor 6 both for deciding when to bake a food product 100 during the step of heating the oven 1 (e.g. during a first turning on) and during the step of "cooling" the oven 1 (e.g. following a change of the objective temperature at which baking will take place), allowing a quick and precise reading of the surface temperature value Ts of the cooking surface 4 in every situation.

[0066] Advantageously, the cooking chamber 3 is susceptible of receiving at least one food product 100, which is placed in abutment against the cooking surface 4 and is interposed between the first temperature sensor 6 and the cooking surface 4.

[0067] More in detail, the food product 100 is positioned on the cooking surface 4 at the first measurement area A1 defined by the intersection of the measurement cone CM of the first temperature sensor 6 and the cooking surface 4 itself.

[0068] As seen in figure 3, with a food product 100 placed on the cooking surface 4 at the first measurement area A1, the measurement cone CM intersects the food product 100 itself. Preferably, the first temperature sensor 6 is configured for detecting at least one surface temperature value Ts of a second measurement area A2 on the food product 100 substantially opposite the first measurement area A1 on the cooking surface 4.

[0069] In this manner, with the first temperature sensor 6 of the oven 1, object of the present invention, it is possible to selectively measure the surface temperature of

the cooking surface 4, in particular of a first measurement area A1 thereof, for example during a step of heating the oven 1, or the surface temperature of a food product 100, in particular of a second measurement area A2 thereof, placed on the cooking surface 4 itself, e.g. during a cooking step, so as to determine its optimal cooking level.

[0070] More in detail, the food product 100 comprises a lower surface, in contact with the cooking surface 4, and an opposite upper surface. The second measurement area A2 is preferably defined by the intersection between the measurement cone CM of the first temperature sensor 6 and the upper surface of the food product 100.

[0071] Advantageously, in the event in which the food product 100 is in particular a baked product with substantially flat form, such for example a pizza or focaccia, the second measurement area A2 defined on its upper surface by the measurement cone CM of the first temperature sensor 6 is placed substantially superimposed on the first measurement area A1 of the cooking surface 4.

[0072] More in detail, as is seen in figure 3, due to the geometric placement of the first measurement sensor 6, and consequently of its measurement cone CM, of the cooking surface 4 and of the food product 100, the second measurement area A2 is being slightly non-centered with respect to the first measurement area A1. In particular, the second measurement area A2 is more non-centered with respect to the first measurement area A1 the smaller the angle between the pointing axis X of the first temperature sensor 6 and the cooking surface 4.

[0073] In addition, since the external surface of the food product 100 is placed at a distance, measured in particular along the pointing axis X, from the first temperature sensor 6 smaller than the cooking surface 4, the second measurement area A2 has a size smaller than the first area A1. In particular, the size difference between the first A1 and the second measurement area A2 depends on the thickness of the food product 100. Preferably, each cooking program set by a user, by actuating the user interface 8, is associated with a corresponding second threshold surface temperature value Tss2 of the food product 100 placed on the cooking surface 4.

[0074] Advantageously, the logic control unit 7 is configurable for operating in a cooking control mode, in which the first comparison module C1 is configured for comparing at least the surface temperature value Ts of the food product 100 with the second threshold surface temperature value Tss2 and sending a corresponding second comparison signal to the user interface 8 in order to signal to the user when the food product 100 reaches a surface temperature value Ts substantially equal to the second threshold surface temperature value Tss2.

[0075] Advantageously, in accordance with a third programmed logic in which the heating means 5 operate for heating the food product 100 placed on the cooking surface 4 of the oven 1, the user interface 8 emits the aforesaid warning signal when the surface temperature value Ts is for example equal to or greater than 90% of the second threshold surface temperature value Tss2 of the food product 100.

[0076] In this manner, it is therefore possible to employ the first temperature sensor 6 in order to decide when to remove a food product 100 from the cooking chamber 3 during a cooking step, allowing a cooking level of the food products that is precise, repeatable and standardized.

[0077] Advantageously, the user interface 8 is actuatable by a user in order to configure the logic control unit 7 to operate according to one between the aforesaid heating control mode or the aforesaid cooking control mode.

[0078] Preferably, the user interface 8 comprises at least one second button 82, which, if pressed, sends to the logic control unit 7 a drive signal in order to configure it to operate according to the heating control mode or according to the cooking control mode.

[0079] Of course, the second button 82 can be integrated in the control panel 80 if the latter is a touch screen.

[0080] Advantageously, the logic control unit 7 is operatively connected to the heating means 5 and is configured for driving the heating means 5 based on at least the comparison signal.

[0081] In such a manner it is possible therefore to immediately limit the power of the heating means 5 if the surface temperature of the cooking surface 4 has already reached the desired value, preventing the based food products 100 from being burnt.

[0082] Preferably, the electrical heating elements 51, 52 of the heating means 5 are composed of multiple sectors actuatable in a manner independent each other and the control unit 7 comprises a power adjustment module, electrically connected to the aforesaid sectors, and arranged for selectively actuating the latter based on the selected program and based on the programmed logic. For example, in the heating step, the power adjustment module will activate all the sectors of the electrical heating elements 51, 52, and in the step of turning off or reducing the temperature, it can deactivate all or some of the aforesaid sectors.

[0083] Preferably the adjustment module is a control of PID type, whose operating logic is well known to the man skilled in the art and therefore will not be described hereinbelow.

[0084] Advantageously, the adjustment module is capable of repeatedly modifying the power of the electrical heating elements 51, 52 each time the first temperature sensor 6 detects a surface temperature value Ts and the first comparison module C1 compares the latter with the threshold surface temperature value Tss1, Tss2 relative to the cooking program and to the mode for operating the oven 1 selected by the user through the user interface 8.

[0085] Advantageously, the first temperature sensor 6 and the logic control unit 7 can be configured so that the acquisition of the surface temperature value Ts by the first temperature sensor 6 occurs automatically at regular time intervals. For example, it is possible to acquire the

surface temperature value Ts each second, in a manner such to emit the warning signal in a reliable manner.

[0086] Preferably, the power adjustment module is in data communication with the user interface 8, in order to provide a time estimate based on the calculation of the PID controller.

[0087] Advantageously, in addition, the power adjustment module is capable of adjusting the power of the electrical heating elements 51, 52 by means of the PID controller in a manner so as to, with the oven 1 configured for operating according to the cooking control mode, heat the cooking surface 4 in a pre-established time set by a user by means of the user interface 8.

[0088] Advantageously, the oven 1 comprises a second temperature sensor 9, fixed to the support structure 2 and placed within the cooking chamber 3, which is configured for detecting at least one ambient temperature value Ta of the cooking chamber 3 and sending, to the logic control unit 7, the detected ambient temperature value Ta. Advantageously, the logic control unit 7 comprises a second comparison module C2, which is configured for comparing at least the ambient temperature value Ta detected by the second temperature sensor 9 with a threshold ambient temperature value Tas and is configured for sending a corresponding confirmation signal;

[0089] In addition, the user interface 8 is preferably configured for receiving the confirmation signal and emitting the warning signal based on the comparison signal and on the confirmation signal.

[0090] For example, in a non-limiting manner, the second temperature sensor 9 is a Pt100 probe, which is arranged for sending a measured ambient temperature value Ta, at regular intervals, to the logic control unit 7. Preferably the second temperature sensor 9 is configured for carrying out and sending an ambient temperature measurement Ta per second, in a manner such to emit the warning signal in a reliable manner.

[0091] More in detail, in accordance with the first programmed logic described above, the user interface 8 emits the aforesaid confirmation signal when the ambient temperature value Ta is for example equal to or greater than 90% of the threshold ambient temperature value Tas.

[0092] Otherwise, in accordance with the second programmed logic, the user interface 8 emits the aforesaid confirmation signal when the ambient temperature value Ta is for example equal to or lower than the 110% of the threshold ambient temperature value Tas. Advantageously, the actuation module of the user interface 8 is operatively connected to the second comparison module C2, and is arranged for being driven based on the comparison signal and on the confirmation signal. For example, still in a non-limiting manner, the light source of the actuation module is preferably turned on when both the comparison signal and the confirmation signal meet the requirement set by the corresponding comparison logic, in order to warn the user that the surface temperature value Ts and the ambient temperature value Ta detected are in the desired range, and that therefore the user can proceed with baking the food product 100.

[0093] Advantageously, each of the cooking programs is associated with at least one corresponding threshold ambient temperature value Tas, and the second comparison module C2 is configured for comparing the ambient temperature value Ta with the aforesaid threshold ambient temperature value Tas corresponding to the preset cooking program and sending a corresponding confirmation signal to the user interface 8. Advantageously, the adjustment module of the logic control unit 7 receives the signal of the ambient temperature value Ta and calculates, by means of the PID controller, a division of power to be provided respectively to the first electrical heating element 51 and to the second electrical heating element 52, such to be able to reach - in the least possible time (or within a time preset by the user as long as greater than a minimum calculated time) - the threshold ambient temperature value Tas and the first threshold surface temperature value Tss1.

[0094] For example, when a specific cooking program is associated with a first threshold surface temperature value Tss1 of 450°C and a threshold ambient temperature value Tas of 300°C, the aforesaid adjustment module will provide more energy to the first electrical heating element 51, which is closer to the cooking surface 4 and must meet a greater thermal gradient, or it can slow the activation of the second electrical heating element 52, in order to delay the heating of the cooking chamber 3 with respect to the heating of the cooking surface 4.

[0095] Advantageously, the first temperature sensor 6 comprises a first data communication port 60 and the logic control unit 7 comprises a second data communication port 760. Preferably, the first and the second data communication port 60,760 are ports of USB type, and still more preferably ports of USB-C or USB-A type.

[0096] According to a first embodiment of the present invention, the oven 1 comprises a first data connection cable 10, connected to the first data communication port 60 and to the second data communication port 760 in order to transmit a signal containing information relative to the detected surface temperature value Ts.

[0097] Preferably, the first data connection cable 10 is a cable capable of electrically power supplying the first temperature sensor 6, and is electrically connected to the electrical power supply of the oven 1.

[0098] According to a different embodiment, the first temperature sensor 6 advantageously comprises a first wireless data communication module and the logic control unit 7 comprises a second wireless data communication module, which are operatively and remotely connected in order to transmit a signal containing information relative to the detected first surface temperature value Ts.

[0099] Preferably, the first data communication module and the second data communication module are based on a communication technology selected from among: radio waves, Bluetooth, Wi-Fi, NFC.

[0100] Advantageously, the second temperature sensor 9 comprises a third data communication port 90 and the logic control unit 7 comprises a fourth data communication port 790.

[0101] Preferably, the oven 1 comprises a second data connection cable 11, connected to the third data communication port 90 and to the fourth data communication port 790 in order to transmit a signal containing information relative to the detected ambient temperature value Ta.

[0102] Preferably, the second data connection cable 11 is a cable capable of electrically power supplying the second temperature sensor 9, and is electrically connected to the electrical power supply of the oven 1.

[0103] Advantageously, the logic control unit 7 comprises a printed circuit board, on which the memory unit M, the second data communication port 760, the fourth data communication port 790 and a processor are connected.

[0104] More in detail, the aforesaid processor comprises preferably a program for managing the comparison modules C1, C2, of the reception module, of the timer module, of the actuation module, of the adjustment module and of the data communication modules 61, 761.

[0105] Advantageously the printed circuit board of the logic control unit 7 is electrically connected to at least the control panel 80 of the user interface 8 and is at least partially placed within a seat made in a depression on the perimeter wall 23 of the support structure 2

[0106] Advantageously in addition, the oven 1 can comprise ventilation means (not represented in the enclosed figures) mechanically associated with the support structure 2 and intended to move an air flow within the cooking chamber 3.

[0107] Such ventilation means allow uniformly distributing the heat generated by the heating elements 51, 52, allowing the cooking of the food products 100 at lower temperatures and with reduced cooking times.

[0108] Also forming the object of the present invention is a method for cooking food products 100 with an oven 1, preferably of the above-described type, regarding which the same reference numbers will be maintained for the same of greater descriptive clarity. Advantageously, such method comprises a heating step in which, at least before inserting a food to be cooked in the cooking chamber 3, the heating means 5 heat at least the cooking surface 4, and preferably also the cooking chamber 3. Advantageously, the method also comprises a measurement step, in which the first temperature sensor 6 measures at least one first surface temperature value Ts of the cooking surface 4. Advantageously, the measurement step is executed during the cooking step, hence when the heating means 5 are heating the cooking surface 4, in a manner such to identify the state of the surface of the cooking surface 4 on which the food product is intended to be set. Such method advantageously comprises, in addition, a comparison step, preferably executed during the heating step, in which the first comparison module C1 compares the surface temperature value Ts of the cooking surface 4 detected by the first temperature sensor 6 with the first threshold surface temperature value Tss1 of the cooking surface 4 and sends a corresponding comparison signal to the user interface 8, which emits a warning signal based on the aforesaid comparison signal.

[0109] Advantageously, in accordance with a first programmed logic in which the heating means 5 operate for heating the cooking surface 4 of the oven 1, the user interface 8 emits the aforesaid warning signal when the first surface temperature Ts is preferably equal to or greater than 90% of the of the threshold surface temperature Tss. Otherwise, in accordance with a second programmed logic in which the heating means 5 are turned off or operate at a reduced power in order to allow reducing the surface temperature of the cooking surface 4 of the oven 1, the user interface 8 emits the aforesaid warning signal when the first surface temperature Ts is preferably equal to or lower than the 110% of the value of the threshold surface temperature Tss.

[0110] The method also advantageously comprises an insertion step executed based on the warning signal, and in such insertion step at least one food product 100 is placed on the cooking surface 4 within the cooking chamber 3, in a manner such to allow inserting the food product 100 with the right timing, when the surface temperature Ts is in an optimal interval (e.g. between 90% and 110% of the threshold surface temperature Tss) for the subsequent cooking of such food product.

[0111] The method according to the invention advantageously comprises a first selection step, in which a user actuates the aforesaid user interface 8 in order to set, by the memory unit M, one of the cooking programs and in order to configure the logic control unit 7 to operate according to the heating control mode.

[0112] Advantageously, since, as stated above, each cooking program is associated with a second threshold surface temperature value Tss2 relative to the surface temperature of a food product 100 that has reached an optimal cooking level, each aforesaid cooking program is specific for one food product 100 in particular. For example, a user sets, by the user interface 8, the cooking program for cooking a simple focaccia, a margherita pizza, a four seasons pizza, etc.

[0113] Advantageously, the food product 100 is placed on the cooking surface 4 at the first measurement area A1, so as to allow the first temperature sensor 6 to detect the surface temperature value Ts of the second measurement area A2 on the upper surface of the food product 100 itself.

[0114] The method in addition provides for a second selection step, in which the user actuates the user interface 8 in order to configure the logic control unit 7 to operate according to the cooking control mode.

[0115] Following the second selection step, the present method comprises a cooking step, in which the first comparison module C1 compares the surface tem-

perature value Ts detected by the first temperature sensor 6 and the second threshold surface temperature value Tss2 of the food product 100 placed on the cooking surface 4 and sends a corresponding second comparison signal to the user interface 8 in order to signal to the user when the food product 100 has reached the surface temperature associated with an optimal cooking level.

[0116] At the end of the cooking step, a step is preferably provided for extracting the food product 100 from the cooking chamber 3. More in detail, the user removes the food products 100 from the cooking chamber 3 of the oven 1 when the user interface 8 emits the aforesaid warning signal.

[0117] Hence, with the oven 1 and the method, object of the present invention, the user inserts the food product 100 within the cooking chamber 3, in particular placed on the cooking surface 4, when the latter has reached the ideal temperature for cooking the specific food product 100. In addition, the user removes the food product 100 from the cooking chamber 3 when the latter has reached a surface temperature associated with an ideal cooking level for the specific food product 100.

[0118] In this manner, it is possible to cook a wide range of food products 100 in a simple, precise and repeatable manner, in particular by standardizing the cooking of the food products 100 themselves.

[0119] The invention thus conceived therefore attains the pre-established objects.

Claims

1. Oven for cooking food products, which comprises:

- a support structure (2) internally delimiting a cooking chamber (3);
- at least one cooking surface (4), placed within said cooking chamber (3) and on which at least one food product (100) is susceptible of being abutted;
- heating means (5), mechanically connected to said support structure (2) and placed to heat at least said cooking surface (4);

said oven being **characterized in that it comprises:**

- a fixed first temperature sensor (6), mounted on said support structure (2), pointed towards said cooking surface (4) and configured for detecting at least one surface temperature value (Ts) of a first measurement area (A1) of the cooking surface (4);
- a logic control unit (7), mechanically connected to said support structure (2) and comprising at least one first comparison module (C1) configured for comparing said at least one surface temperature value (Ts) with at least one preset first threshold surface temperature value (Tss1) and generating a corresponding comparison signal based on said comparison;
- at least one user interface (8), configured for receiving said comparison signal from said first comparison module (C1) and emitting a warning signal based on said comparison signal.

2. Oven for cooking food products according to claim 1, **characterized in that** said logic control unit (7) comprises a memory unit (M), containing at least one cooking program stored therein, with which at least one corresponding first threshold surface temperature value (Tss1) of said cooking surface (4) is associated;

said user interface (8) being actuatable by a user in order to set, by said memory unit (M), one said cooking program;
said first comparison module (C1) being configured for comparing at least said surface temperature value (Ts) with said first threshold surface temperature value (Tss1) of said cooking surface (4) corresponding to said set cooking program and sending a corresponding comparison signal to said user interface (8).

3. Oven for cooking food products according to claim 1 and 2, **characterized in that** said logic control unit (7) is configurable for operating in a heating control mode, in which said first comparison module (C1) is configured for comparing at least said surface temperature value (Ts) of said cooking surface (4) with said first threshold surface temperature value (Tss1) of said cooking surface (4) itself and sending a corresponding first comparison signal to said user interface (8) in order to signal to user when said cooking surface (4) reaches a surface temperature value (Ts) substantially equal to said first threshold surface temperature value (Tss1).

4. Oven for cooking food products according to claim 1 and 2, **characterized in that** said cooking chamber (3) is susceptible of receiving at least one said food product (100) in abutment against said cooking surface (4) and interposed between said first temperature sensor (6) and said cooking surface (4);

said first temperature sensor (6) being configured for detecting at least one surface temperature value (Ts) of a second measurement area (A2) on said food product (100) substantially opposite said first measurement area (A1) on said cooking surface (4); each said cooking program being associated with a corresponding second threshold surface temperature value (Tss2) of said food product (100);
said logic control unit (7) being configurable in order to operate in a cooking control mode, in

which said first comparison module (C1) is configured for comparing at least said surface temperature value (Ts) of said food product (100) with said second threshold surface temperature value (Tss2) of said food product (100) itself and sending a corresponding second comparison signal to said user interface (8) in order to signal to the user when said food product (100) reaches a surface temperature value (Ts) substantially equal to the second threshold surface temperature value (Tss2).

5. Oven for cooking food products according to claims 3 and 4, **characterized in that** said user interface (8) is actuatable by a user in order to configure said logic control unit (7) to operate according to one between said heating control mode or said cooking control mode.

6. Oven for cooking food products according to any one of the preceding claims **characterized in that** it comprises an auxiliary support body (29) fixed to said support structure (2) and defining a housing seat (291);
said first temperature sensor (6) being mechanically connected to said auxiliary support body (29) and placed at least partially within said housing seat (291).

7. Oven for cooking food products according to claim 6, **characterized in that** said first temperature sensor (6) is a sensor arranged for measuring the temperature by detecting the electromagnetic radiation;
said support structure (2) comprising a dividing wall (26) placed to separate said cooking chamber (3) and said housing seat (291) made of a material transparent to the electromagnetic radiation detected by said first temperature sensor (6).

8. Oven for cooking food products according to any one of the preceding claims **characterized in that** it comprises a second temperature sensor (9), fixed to said support structure (2) and placed within said cooking chamber (3), which is configured for detecting at least one ambient temperature value (Ta) of said cooking chamber (3) and sending, to said logic control unit (7), said detected ambient temperature value (Ta); said logic control unit (7) comprising a second comparison module (C2), configured for comparing at least the ambient temperature value (Ta) detected by said second temperature sensor (9) with a threshold ambient temperature value (Tas) and configured for sending a corresponding confirmation signal;
said user interface (8) being configured for receiving said confirmation signal and emitting said warning signal based on said comparison signal and on said confirmation signal.

9. Oven for cooking food products according to any one of the preceding claims, **characterized in that** said logic control unit (7) is operatively connected to said heating means (5) and is configured for driving said heating means (5) based on at least said comparison signal.

10. Method for cooking a food product (100) with an oven according to claim 5, said method being **characterized in that it comprises** the following steps:

- a first selection step in which a user actuates said user interface (8) in order to set, by said memory unit (M), one said cooking program and in order to configure said logic control unit (7) to operate according to said heating control mode;
- a heating step in which said heating means (5) heat at least said cooking surface (4); in said heating step, said first comparison module (C1) compares the surface temperature value (Ts) of said cooking surface (4) detected by said first temperature sensor (6) and said first threshold surface temperature value (Tss1) of said cooking surface (4) and sends a corresponding first comparison signal to said user interface (8), in order to signal to the user when said cooking surface (4) has reached the optimal surface temperature for cooking said food product (100);
- an insertion step in which at least one said food product (100) is placed on said cooking surface (4) within said cooking chamber (3);
- a second selection step, in which a user actuates said user interface (8) in order to configure said logic control unit (7) to operate according to said cooking control mode;
- a cooking step, in which said first comparison module (C1) compares the surface temperature value (Ts) of said food product (100) detected by said first temperature sensor (6) and said second threshold surface temperature value (Tss2) of said food product (100) and sends a corresponding second comparison signal to said user interface (8) in order to signal to the user when said food product (100) has reached the surface temperature associated with an optimal cooking level;
- a step of extracting said at least one food product (100) from said cooking chamber (3).

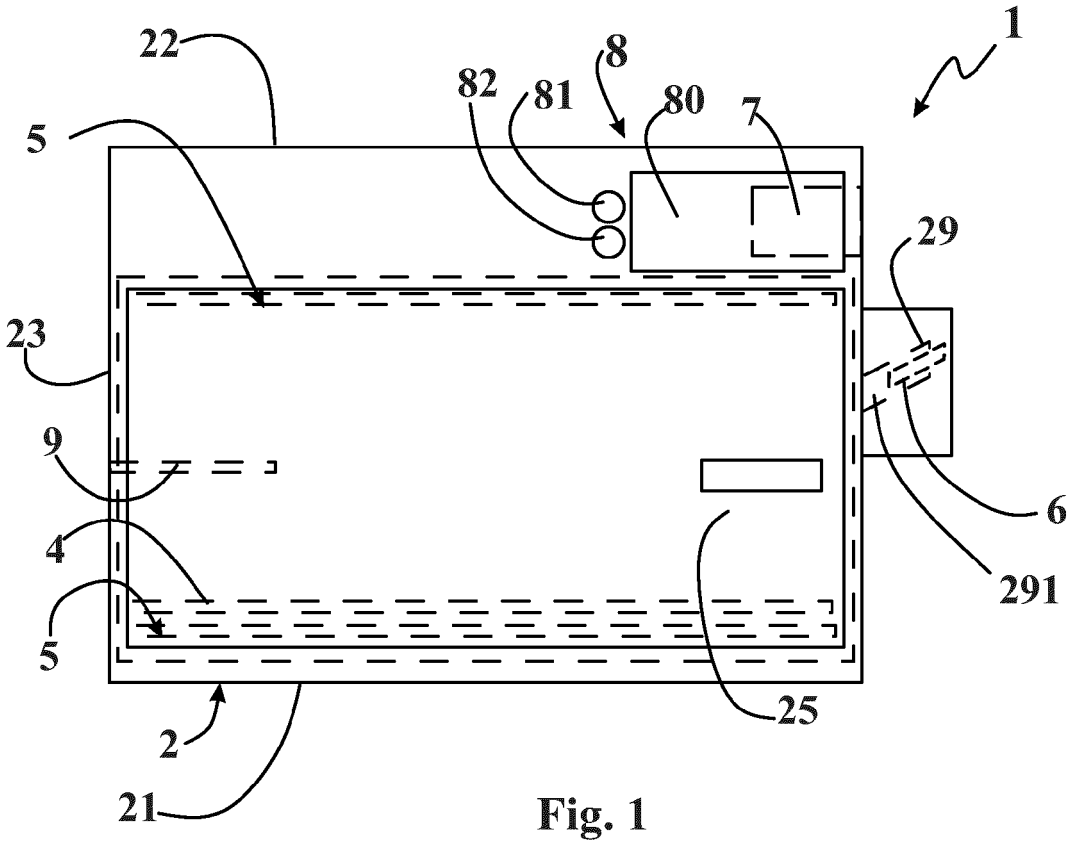
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Fig. 1

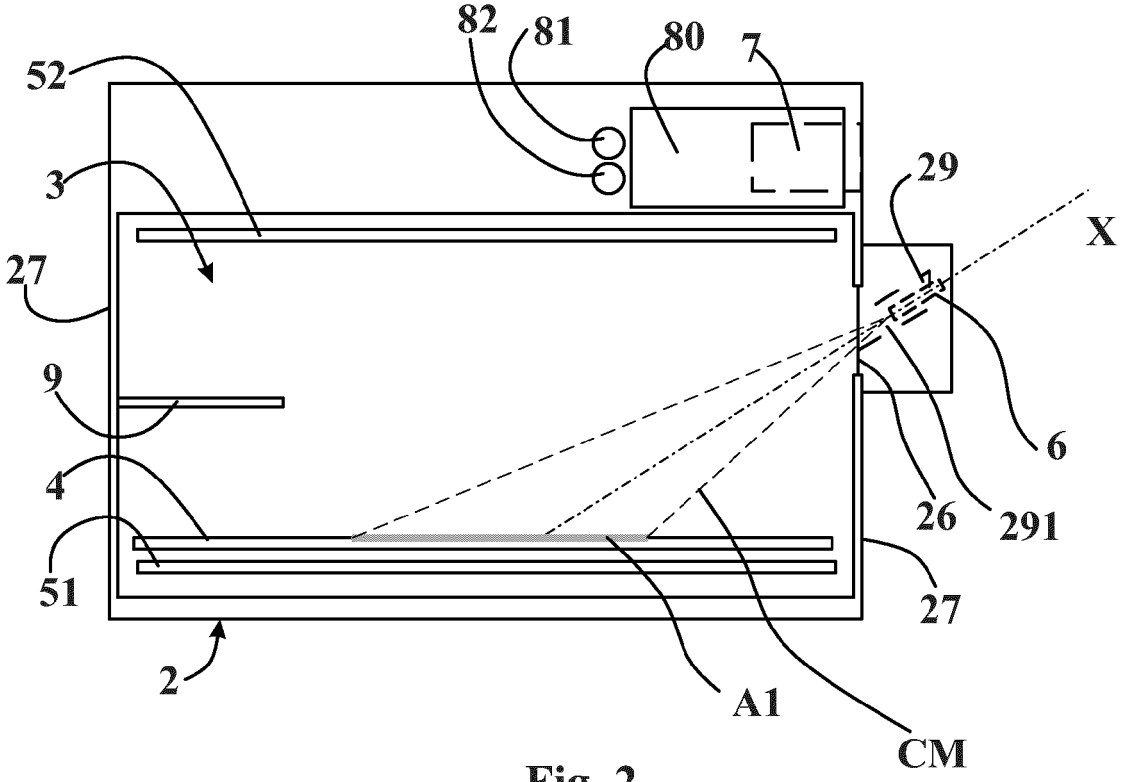
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Fig. 2

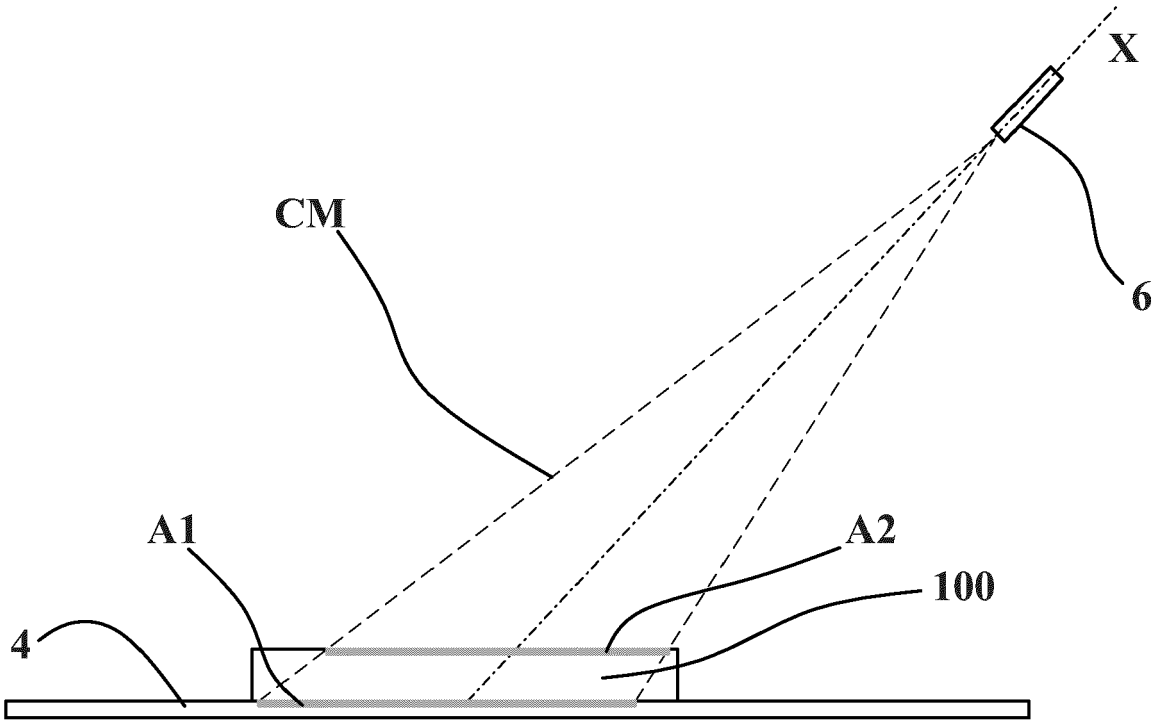

Fig. 3

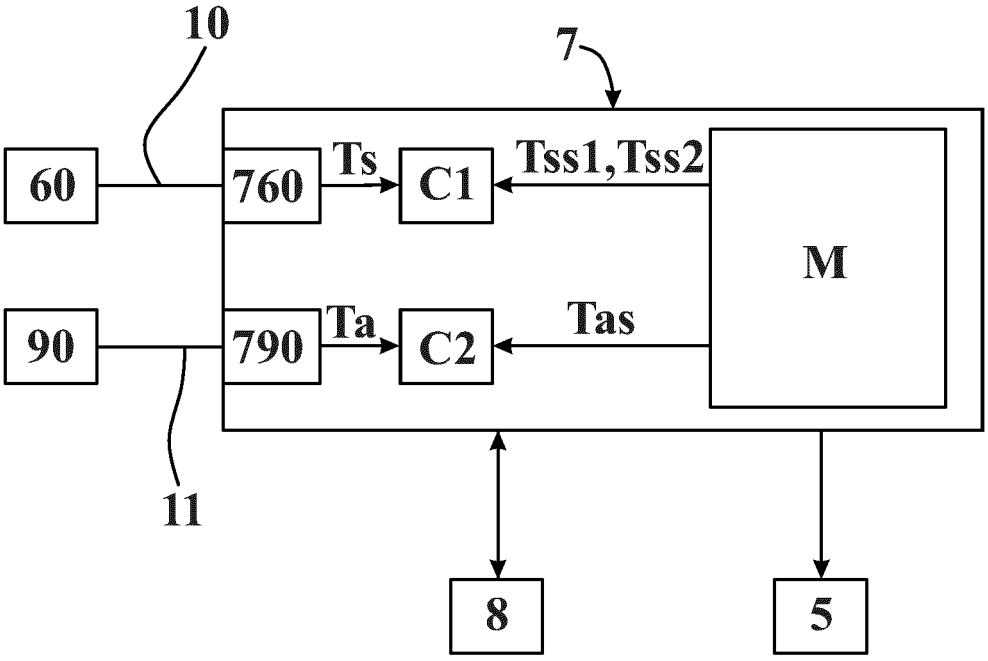

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	14 August 2023	Jalal, Rashwan

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