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(54) METHOD OF OPERATING AN OVEN THROUGH THE IMAGE OF ITS LOAD

VERFAHREN ZUM BETRIEB EINES OFENS DURCH DAS BILD SEINER BESCHICKUNG

PROCÉDÉ DE FONCTIONNEMENT D'UN FOUR GRÂCE À L'IMAGE DE SA CHARGE

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Description

[0001] This invention relates to a method for operating an oven, a device for operating an oven and an oven, and more particularly a method and a device for operating an oven through the image of its load. This relates here to a food product cooking oven and more specifically, but not exclusively, for « grande cuisine ».

[0002] The state of the art includes DE 100 63 694 A1 and EP 2192351 A2.

[0003] An oven comprises walls and a door delimiting a cooking cavity. Such a cavity is adapted for receiving removable cooking supports, including metallic ones. Such removable cooking supports could be a carriage or kitchen tools such as for instance, a grid, a container or cooking plates. Such removable cooking supports are adapted for receiving food products to be cooked or for supporting other removable cooking supports.

[0004] The operation of an oven could comprise starting, modifying or stopping different operating cycles of the oven, such as a cleaning cycle, a ventilation cycle, or heating cycles, such as for instance a preheating cycle, different cooking cycles or a vapour producing cycle.

[0005] Some of these operating cycles of an oven could require the presence of some cooking supports in the cooking cavity of the oven or even the closure of the door of the oven or still, the obstruction, through an obturator, of an opening provided in the walls of the oven.

[0006] From application DE102008022227, a method for operating an oven is known, based on the use of capacitive sensors for detecting the presence or the absence of a cooking support for each sensor, at each stage. The sensors to be used in such a solution, positioned in the cooking cavity of the oven, result, more specifically, in oven jamming, clamping, cleaning, thermal behaviour and detection inaccuracy problems. Moreover, such sensors, arranged at different stages of the cooking cavity, do not allow the nature of the cooking supports to be detected in the kitchen tool elements.

[0007] However, in an energy saving context, it could be of interest to want to known whether there are or not, within the enclosure of the oven, cooking supports, such as kitchen tool elements. The invention of the present application aims at detecting the possible presence of supports in the oven and, if necessary, the nature of such supports, on the one hand, and at adapting the operation of an oven accordingly, on the other hand.

[0008] This invention thus relates to, first of all, a method of operating an oven with a cooking cavity adapted for receiving removable cooking supports, wherein food products are cooked on said cooking supports according to determined cooking parameters, as defined in the appended claims.

[0009] The phrase "adaptation of the cooking parameters" both means the ability, in the absence of cooking supports, to adapt the parameters for operating the oven, for example stopping the oven, that is stopping the operation thereof, or forbidding an operating cycle of the oven.

[0010] According to a feature of the invention, the step of detection of the possible presence of removable cooking supports in the cavity of the oven comprises the following steps:

- at least one signal is emitted in the cooking cavity of the oven,
- said reflected signal is received,
- a value of a characteristic of the received reflected signal is determined,
- the presence of removable cooking supports in the cooking cavity is determined from the determined value.

[0011] Thus, with the method according to the invention, it is no longer necessary to arrange a sensor inside the cooking cavity of the oven and the use of a given characteristic of the signal allows the possible presence, and optionally the nature, of any cooking supports to be determined in the cavity of the oven. As recited in the appended claims, the characteristic of the signal is its power. In addition to the power, one or more values of one or several characteristics of one or more signals could also be used for determining the possible presence, and optionally the nature and/or the number of any cooking supports being present in the cooking cavity of the oven. Different characteristics of the signal may be used, such as, for example, the amplitude of the signal, the phase of the signal, the variation of the amplitude of the signal as a function of time, the phase variation of the signal as a function of time, etc. and this, at one or more given frequencies of the signal.

[0012] In the method according to the invention, the number of removable supports in the cooking cavity is preferably determined. Thus, a cooking cycle of the oven may be selected or adapted when a number of removable cooking supports has been determined. For example, the detection of the number of cooking plates being present in the cooking cavity of the oven may allow to select or to adapt a cooking cycle of the

[0013] According to the invention, if there is no cooking support in the cavity of the oven, operation parameters of the oven are adapted.

[0014] According to a feature of this invention, the possible presence of at least one removable wall element of the cavity of the oven is detected before adapting the cooking parameters. Thus, starting a vapour production cycle in the cavity of the oven might be interrupted or forbidden when the absence of a removable wall element of the oven has been determined. For example, it could be useful to detect the absence of a wall obturating element or a wall portion of the oven in order to forbid, for example, the production of vapour.

[0015] Preferably, the method further comprises a step wherein the determined value is compared with at least one reference value so as to determine the presence of cooking supports in the cooking cavity of the oven. Such

a comparison allows a reliable detection of the presence of cooking supports or removable wall elements in the cooking cavity of the oven.

[0016] The method may further comprise a preliminary step wherein a reference value is determined corresponding to the presence of at least one removable cooking support identified in the cavity of the oven.

[0017] Advantageously, the determination of the nature of the removable cooking supports being present in the cavity of the oven occurs through comparing the determined value with at least one reference value associated with the nature of at least one removable cooking support being identified. The nature of the cooking supports being present in the cooking cavity of the oven is thus reliably determined through comparing with references of cooking supports being identified, thereby making the determination of the nature of supports reliable.

[0018] The method may further comprise a preliminary step wherein a reference value is determined corresponding to the presence of at least one removable cooking support identified in the cavity of the oven.

[0019] According to the invention, a signal being emitted at a given frequency, a plurality of signals is emitted at different frequencies in the cooking cavity of the oven, a value of a characteristic is determined for each received reflected signal, at least one remarkable value is determined amongst the plurality of determined values so as to detect the possible presence, and optionally the nature, of any cooking supports in the cavity of the oven. The analysis of the determined values allows at least one remarkable value to be determined. This or these remarkable values are specific of the present cooking support(s) or the removable wall elements absent in the oven.

[0020] According to the invention, the characteristic of the signal is its power and the remarkable value is the maximum power so as to determine a resonant frequency, associated with an image of the oven, of the cooking cavity amongst the plurality of frequencies of the signals being emitted. The power of a signal being easy to determine, this simplifies both the processing of the signal, the determination of the value of a characteristic of the received reflected signal and the determination of the presence, and optionally of the nature, of the removable cooking supports in the cooking cavity from the determined value.

[0021] According to an embodiment outside the scope of the appended claims, the characteristic of the signal can be its phase.

[0022] According to a feature of the invention, the signal is an electromagnetic or a sound signal. An electromagnetic signal may be emitted and received from outside the cooking cavity of the oven, allowing to prevent having to arrange one or more sensors inside the cooking cavity and thus to overcome oven jamming, clamping, cleaning, and thermal behaviour problems. An electromagnetic signal, as a result of its characteristics, including its power, further ensures the accurate determination of a characteristic of the received reflected signal and thus a good reliability of the determination of the presence, and optionally of the nature or the number of cooking supports in the cooking cavity.

[0023] According to an aspect of the invention, the emission of the signal occurs during a time interval and the reception occurs during a distinct subsequent time interval.

[0024] The invention also relates to a device for operating an oven, configured for implementing a method, such as defined hereabove, for operating an oven with a cooking cavity adapted for receiving removable cooking supports, wherein food products are cooked on said cooking supports according to determined cooking parameters, characterized in that said device comprises:

- one detection module operable to detect the possible presence of cooking supports in the cavity of the oven,
- one determination module operable, in the case of the presence of supports, to determine their nature, then,
- one adaptation module operable to adapt the cooking parameters to the absence or to the nature of the supports.

[0025] The invention also relates to an oven comprising the device of the invention such as defined above.

[0026] The features and the advantages of the present invention will become more evident from the following description of an embodiment of this invention, given as a non limitative example, with reference to the corresponding appended drawing (identical references relating to similar elements) in which:

- Fig. 1 is a perspective view of a cooking oven with a cooking cavity comprising cooking supports, having the door opened,
- Fig. 2 is a perspective view of the oven of Fig. 1 further comprising cooking plates,
- Fig. 3 is a perspective view of a grande cuisine cooking oven wherein a cooking support carriage is arranged,
- Fig. 4 is a perspective and partially sectional view of the oven of Fig. 3,
- Fig. 5 is a perspective and partially sectional view of the oven of Fig. 3 having the cooking support carriage thereof being removed,
- Fig. 6 is a perspective and partially sectional view of the oven of Fig. 3, with the cooking support carriage being removed and onto which a removable wall element has been arranged,
- Fig. 7 schematically shows the system according to the invention,
- Fig. 8 schematically shows the device according to the invention,
- Fig. 9 is a schematic flowchart disclosing the method according to the invention, and
- Figs. 10a to 10d show examples of curves of various

loads in the cavity of the oven.

[0027] Figs. 1 and 2 show an oven 10a and Figs. 3 to 6 an oven 10b, each comprising walls defining a cavity 12 and the front side of which is provided with a door 14. A manual setting module 16 for the cooking parameters allows to manually operate the oven while selecting an operating cycle of the oven or manually setting the parameters. The cavity 12 of the oven 10 is adapted for receiving cooking supports 20 for food products.

[0028] Fig. 1 illustrates a first type of cooking oven 10a the door of which is opened. The oven comprises supporting elements 22 arranged for receiving cooking supports 20a.

[0029] Fig. 2 illustrates the oven 10a of Fig. 1 some of the supporting elements 22 of which each receives a cooking plate 20a, here shown in a number of three.

[0030] A second type of oven 10b, shown on Figs. 3 to 6, can receive a cooking support of the carriage type 20b.

[0031] Figs. 3 and 4 thus illustrate such an oven 10b and such a carriage 20b being installed in the cavity 12 of the oven 10b, the door 14 being closed. As illustrated on the partial sectional view of Fig. 4, such a carriage 20b comprises a frame 24 arranged for receiving a plurality of cooking supports 20c, such as cooking plates or trays, on a plurality of different levels.

[0032] When the carriage 20b is out of the cavity 12 of the oven 10b, as shown on Fig. 5, the oven 10b has an opening 26 arranged under its door and through which a liquid or gas stream 27, such as for example vapour, may circulate. A removable wall element 28 of the oven, having the shape of an anti-leakage plate, may thereby be mounted on said opening 26 so as to prevent such a stream from circulating, as illustrated on Fig. 6.

[0033] Fig. 7 illustrates the system according to the invention. This system comprises a device 30 operationally coupled to a cooking oven 10. The device may thus be part of the oven, be mounted in the oven or connected to the oven, for example with a wire. The cavity 12 of the oven 10 is adapted for receiving cooking supports 20 for food products.

[0034] The device comprises, as shown on Fig. 8, a detection module 40, a determination module 50 and a parameter adaptation module 60.

[0035] The detection module 40 comprises an emission module 42, a reception module 44 and an analysis module 46.

[0036] The emission module 42 comprises an antenna 43 arranged for emitting one or more signals in the cavity 12 of the oven 10.

[0037] The receiving module 44 comprises an antenna 45 arranged so as to receive one or more signals being reflected in the cavity 12 of the oven 10 by the walls of the oven and/or by the cooking supports 20 present in the cavity 12 of the oven 10. The antenna 43 of the emission module 42 and the antenna 45 of the reception module 44 may be different or the same.

[0038] In an alternative embodiment of the system according to the invention, the emission module 40 and the reception module 44 may each comprise several antennas respectively for emission and reception of signals. Such antennas may be different or identical.

[0039] The analysis module 46 allows to analyze the received reflected signals by the antenna 45 of the reception module. The analysis may comprise determining a value of a characteristic of the received reflected signal (s). For example, the power of each received reflected signal could be analyzed so as to determine the possible presence of any cooking support in the cavity of the oven as described hereinafter with reference to Fig. 9.

[0040] The determination module 50 allows to determine the nature and optionally the number of cooking supports 20 being present in the cavity 12 of the oven 10.

[0041] The parameter adaptation module 60 allows the oven to be operated while adapting the operation thereof to the absence or the presence, even to the nature or to the number, of the cooking supports 20 being detected in the cavity 12 of the oven 10 through the adaptation of the cooking parameters of the oven 10.

[0042] The method according to the invention is a method of operating an oven 10 with a cooking cavity 12 being intended for receiving removable cooking supports 20, wherein food products are cooked on said cooking supports 20 according to determined cooking parameters.

[0043] In a first step E1, the detection module 40 of the device 30 allows to detect the possible presence of cooking supports 20 in the cavity 12 of the oven 10.

[0044] In an embodiment of the method according to the invention, such a detection step E1 comprises a first step E1a consisting of emitting, by the emission module 42, one or more signals in the cavity 12 of the oven 10. Such signals may be, for example, electromagnetic or sound. Such signals may be emitted in a frequency band ranging between, for example, 430 MHz and 450 MHz. For example, a plurality of signals may be emitted starting at 430 MHz and progressively increasing the frequency step by step up to 450 MHz, for example using 400 measurements.

[0045] The signals emitted in the cavity 12 of the oven 10 will be reflected on the walls of the oven 10 and, if present in the cavity 12, on the cooking supports 20.

[0046] The reception module 44 then received such reflected signals in a second step E1b. Otherwise stated, the received signal is measured in the emitted frequency.

[0047] The emission and the reception of signals may be alternated in time. For example, the emission may occur during 30μs, followed by the reception during 1μs.

[0048] The analysis module 46, in a step E1c, analyzes the received reflected signals and detects the possible presence of any cooking supports 20 in the cavity 12 of the oven 10.

[0049] According to the invention, the emission module 42 sends a plurality of electromagnetic signals, each signal having a frequency different from the others. The re-

ceived reflected signals corresponding to the signals sent in the cavity 12 of the oven 10 will have different powers therebetween. The value of the power of each received signal may be stored. To this end, the device 30 may comprise a memory. The signal(s) with the highest powers has or have frequencies corresponding to the resonant frequencies of the cavity of the oven. This or these values is or are a characteristic of the cavity and varies or vary in the presence of cooking supports 20 and as a function of the nature of said cooking supports 20 or in the absence of a removable wall element 28. When the oven 10 is empty, that is when it does not comprise any cooking supports 20 in its cavity 12, this corresponds to a certain resonant frequency, or a certain image of the load of the (empty) oven 10 referred to as the initial image. Similarly, when the cavity 12 of the oven 10 comprises one or more cooking supports 20, this corresponds to one or more different resonant frequencies. Thus, to each different load of the oven 10, one or more values of resonant frequency correspond, and therefore an image specific to the load of the oven 10. The presence of cooking supports 20 is then established when the current image of the load of the oven 10 does not correspond to the image of the empty oven 10, as illustrated on Fig. 10. Similarly, the absence of cooking support 20 is established when the current image of the load of the oven 10 corresponds to the initial image of the empty oven 10.

[0050] In the case of the presence of cooking supports 20 in the cavity 12 of the oven 10 (step S1), their nature may be determined in a step E2. The nature of the cooking supports 20 is determined by the determination module 50. The value of the analyzed characteristic of the signal giving an image of the load of the oven 10, from the resonant frequency(ies), may be compared to one or more reference images, thereby allowing to identify the load of the oven 10 and thus to determine the nature of the cooking supports 20 present in the cavity 12 of the oven 10, as illustrated on Fig. 11. Such reference images could be achieved, for example, in the plant upon the manufacture of the device 30 and stored in a memory that the device 30 (or the oven 10) may include to this end. Similarly, the determination module may determine, by comparison with reference images, at a step E2', the number of cooking supports 20 being present in the cavity 12 of the oven 10.

[0051] Finally, at a step E3, the cooking parameters are adapted to the absence or the nature of the cooking supports 20. Such an adaptation is implemented by the adaptation module of the cooking parameters 60 and may allow the operation of the oven 10 to be modified according to the presence, and optionally the nature and/or the number, of cooking supports 20 in the cavity 12 of the oven 10.

[0052] With the method and the device according to the invention, the cooking parameters of the oven 10 may thus be adapted automatically as a function of the absence or the presence, and optionally of the nature, of cooking supports 20 in the cavity 12 of the oven 10 or removable wall elements 28.

[0053] The adaptation of the cooking parameters of the oven 10 may comprise, for example, forbidding, starting, stopping or adapting an operation cycle of the oven 10.

[0054] An operation cycle of the oven 10 may be a cleaning cycle, a ventilation cycle, a preheating cycle, a cooking cycle or a vapour producing cycle in the cavity of the oven.

[0055] Thus, a cleaning cycle may be started, for example, when the absence of removable cooking supports 20 has been determined in the cavity 12 of the oven 10, or even adapted or forbidden when the presence of removable cooking supports 20 has been determined in the cavity 12. Thus, the detection of the presence of kitchen tools in the cooking cavity 12 of the oven 10 may allow to adapt or to forbid a cleaning cycle of the oven 10.

[0056] A ventilation cycle or a pre-heating cycle may be stopped when the absence of removable cooking supports 20 has been determined in the cavity. Thus, for example, the detection of the absence of containers or cooking plates in the cavity 12 of the oven 10 allows to interrupt heating or ventilating the oven 10, for example at the end of a pre-heating cycle of the oven 10.

[0057] Starting a cooking cycle of the oven 10 may be forbidden when the absence of some of the removable cooking supports 20 has been determined in the cavity 12. Thus, the detection of the absence of containers or cooking plates in the cavity of the oven may allow a cooking cycle to prevent from starting as there is no product to be cooked in the cooking cavity 12 of the oven 10.

[0058] A cooking cycle of the oven 10 could be, for example, started or adapted when the presence, and optionally the nature, of some removable cooking supports has been determined.

[0059] Starting a vapour production cycle in the cavity 12 of the oven 10 could be interrupted or forbidden when, for example, the presence, and optionally the nature, have been determined of one or more given removable cooking supports 20 in the cavity 12. For example, it may be useful to detect the absence of a carriage 20b or a removable wall element 28 of the oven in order to forbid the production of vapour.

[0060] Figs. 10a to 10d illustrate test curves carried out with different loads of the oven, that is in the cavity of the oven, with an emission/reception antenna and for two different positions of said antenna.

[0061] Fig. 10a shows a first load of the oven, for example a cooking plate. With such a load, the frequency response of the cavity between 395 and 465 MHz shows a peak around 404 MHz being characteristic of said first load.

[0062] Fig. 10a shows a first load of the oven, for example a cooking plate. With such a load, the frequency response of the cavity between 395 and 465 MHz shows a minimum peak of about -34 dB around 404 MHz being characteristic of said first load.

[0063] Fig. 10b shows a second load of the oven, for

example a cooking container. With such a load, the frequency response of the cavity between 395 and 465 MHz shows two minimum peaks of about -24 and - 17 dB around respectively 428 and 435 MHz, being characteristic of said second load.

[0064] Fig. 10c shows a third load of the oven, for example two cooking plates. With such a load, the frequency response of the cavity between 395 and 465 MHz shows two minimum peaks, of about -33 dB around respectively 404 and 434 MHz, being characteristic of said third load.

[0065] Fig. 10d shows a fourth load of the oven, for example when it is empty. With such a load (or absence of a load), the frequency response of the cavity between 395 and 465 MHz shows a minimum peak of about -34 dB around 418 MHz being characteristic of said fourth load.

[0066] Thus, depending on the presence of a support or not, the curve representing the image of the oven varies and one or more peaks occur at different frequencies and with different intensities, that may be associated with the absence or the presence of support and, in the case of the presence, to the nature and/or the number of supports, for example comparing them with predetermined reference curves, for example in the plant.

Claims

1. A method of operating an oven (10, 10a, 10b) with a cooking cavity (12) adapted for receiving removable cooking supports (20), wherein food products are cooked on said cooking supports according to determined cooking parameters, wherein:

   - at least one signal is emitted (E1a) from the oven (10, 10a, 10b) in its cooking cavity (12),
   - at least one reflected signal is received (E1b) by the oven (10, 10, 10b) in its cooking cavity (12),

   characterized in that

   - a value of a characteristic of said received reflected signal is determined (E1c),
   - the presence or absence of removable cooking supports (2) in the cooking cavity (12) is determined (S1) from the determined value,
   - in the case of the presence of supports (20), their nature is determined and the cooking parameters are adapted to the nature of the supports (20),
   - in the case if the absence of supports (20), the cooking parameters are adapted to the absence of the supports (20), and
   - in the step of emission (E1a), one signal being emitted at a given frequency, a plurality of signals is emitted at different frequencies in the cooking cavity (12) of the oven (10, 10a, 10b), a value of a characteristic is determined (E1c) for each received reflected signal (E1b), at least one remarkable value is determined in the plurality of determined values so as to detect the possible presence, and optionally the nature, of any cooking supports (20) in the cavity of the oven (10, 10a, 10b), and
   - the characteristic of the signal is its power and the remarkable value is the maximum power so as to determine a resonant frequency, associated with an image of the oven, of the cooking cavity (12) amongst the plurality of frequencies of the emitted signals.

2. The method according to claim 1, wherein, in the case of the presence of supports (20), the number of removable cooking supports (20) in the cooking cavity (12) is further determined.

3. The method according to any of preceding claims, wherein the possible presence of at least one removable wall element (28) of the cavity (12) of the oven (10, 10a, 10b) is further detected before adapting the cooking parameters.

4. The method according to any of preceding claims, wherein the determined value is compared with at least one reference value so as to determine the presence of any cooking support (20) in the cooking cavity (12) of the oven (10, 10a, 10b).

5. The method according to any of preceding claims, wherein the determination (E2) of the nature of removable cooking supports (20) being present in the cavity (12) of the oven (10, 10a, 10b) occurs by comparing the determined value with at least one reference value associated with the nature of at least one identified removable cooking support (20).

6. A device (30) for operating an oven, configured for implementing a method, according to any of claims 1 to 5, for operating an oven (10, 10a, 10b) with a cooking cavity adapted for receiving removable cooking supports (20), wherein food products are cooked on said cooking supports (20) according to determined cooking parameters, **characterized in that** it comprises:

   - one detection module (40) operable to emit at least one signal in the cooking cavity (12) of the oven (10, 10a, 10b), to receive a reflected signal reflected in the cooking cavity (12) of the oven (10, 10a, 10b), to determine a value of a characteristic of the received reflected signal, and to determine from the determined value the presence of removable cooking supports (2) in the cooking cavity (12), one determination module

(50) operable, in the case of the presence of supports (20), to determine their nature, and
- one adaptation module (60) operable to adapt the cooking parameters to the absence or to the nature of the supports (20).

7. An oven (10, 10a, 10b) comprising a device (30) according to claim 6.

Patentansprüche

1. Verfahren zum Betreiben eines Ofens (10, 10a, 10b) mit einem Garraum (12), der zur Aufnahme von abnehmbaren Garträgern (20) angepasst ist, wobei Lebensmittel auf den Garträgern gemäß bestimmten Garparametern gegart werden, wobei:

- mindestens ein Signal vom Ofen (10, 10a, 10b) in seinem Garraum (12) abgegeben wird (E1a),
- mindestens ein reflektiertes Signal vom Ofen (10, 10, 10b) in seinem Garraum (12) empfangen wird (E1b),

dadurch gekennzeichnet, dass

- ein Wert einer Eigenschaft des reflektierten Signals bestimmt wird (E1c),
- das Vorhandensein oder Fehlen von abnehmbaren Garträgern (2) im Garraum (12) anhand des bestimmten Werts bestimmt wird (S1),
- bei Vorhandensein von Trägern (20) deren Art bestimmt wird und die Garparameter auf die Art der Träger (20) angepasst werden,
- bei Fehlen von Trägern (20) die Garparameter auf das Fehlen der Träger (20) angepasst werden, und
- im Schritt der Abgabe (E1a) ein Signal mit einer gegebenen Frequenz abgegeben wird, eine Vielzahl von Signalen mit unterschiedlichen Frequenzen im Garraum (12) des Ofens (10, 10a, 10b) abgegeben werden, ein Wert einer Eigenschaft für jedes empfangene reflektierte Signal (E1b) bestimmt wird (E1c), mindestens ein bemerkenswerter Wert aus der Vielzahl von bestimmten Werten bestimmt wird, um das mögliche Vorhandensein und optional die Art von etwaigen Garträgern (20) im Hohlraum des Ofens (10, 10a, 10b) zu bestimmen, und
- die Eigenschaft des Signals seine Leistung ist und der bemerkenswerte Wert die maximale Leistung ist, um eine Resonanzfrequenz, die einem Bild des Ofens zugeordnet ist, des Garraums (12) aus der Vielzahl von Frequenzen der abgegebenen Signale zu bestimmen.

2. Verfahren nach Anspruch 1, wobei bei Vorhandensein von Trägern (20) ferner die Anzahl der abnehmbaren Garträger (20) im Garraum (12) bestimmt wird.

3. Verfahren nach einem der vorhergehenden Ansprüche, wobei das mögliche Vorhandensein von mindestens einem abnehmbaren Wandelement (28) des Hohlraums (12) des Ofens (10, 10a, 10b) ferner erfasst wird, bevor die Garparameter angepasst werden.

4. Verfahren nach einem der vorhergehenden Ansprüche, wobei der bestimmte Wert mit mindestens einem Referenzwert verglichen wird, um das Vorhandensein eines Garträgers (20) im Garraum (12) des Ofens (10, 10a, 10b) zu bestimmen.

5. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Bestimmen (E2) der Art der abnehmbaren Garträger (20), die im Hohlraum (12) des Ofens (10, 10a, 10b) vorhanden sind, durch Vergleichen des bestimmten Werts mit mindestens einem Referenzwert erfolgt, der der Art von mindestens einem identifizierten abnehmbaren Garträger (20) zugeordnet ist.

6. Vorrichtung (30) zum Betreiben eines Ofens, die zum Implementieren eines Verfahrens nach einem der Ansprüche 1 bis 5 zum Betreiben eines Ofens (10, 10a, 10b) mit einem Garraum ausgelegt ist, der zur Aufnahme von abnehmbaren Garträgern (20) angepasst ist, wobei Lebensmittel auf den Garträgern (20) gemäß bestimmten Garparametern gegart werden,
dadurch gekennzeichnet, dass sie umfasst:

- ein Erfassungsmodul (40), das betriebsfähig ist, mindestens ein Signal in dem Garraum (12) des Ofens (10, 10a, 10b) abzugeben, um ein reflektiertes Signal zu empfangen, das in dem Garraum (12) des Ofens (10, 10a, 10b) reflektiert wird, um einen Wert einer Eigenschaft des empfangenen reflektierten Signals zu bestimmen, und um anhand des bestimmten Werts das Vorhandensein von abnehmbaren Garträgern (2) im Garraum (12) zu bestimmen, ein Bestimmungsmodul (50), das im Falle des Vorhandenseins von Trägern (20) betriebsfähig ist, deren Art zu bestimmen, und
- ein Anpassungsmodul (60), das betriebsfähig ist, die Garparameter an das Fehlen oder die Art der Träger (20) anzupassen.

7. Ofen (10, 10a, 10b), umfassend eine Vorrichtung (30) nach Anspruch 6.

Revendications

1. Procédé de fonctionnement d'un four (10, 10a, 10b) avec une cavité de cuisson (12) adaptée pour la réception de supports de cuisson amovibles (20), dans lequel des produits alimentaires sont cuits sur lesdits supports de cuisson selon des paramètres de cuisson déterminés, dans lequel :

- au moins un signal est émis (E1a) à partir du four (10, 10a, 10b) dans sa cavité de cuisson (12),
- au moins un signal réfléchi est reçu (E1b) par le four (10, 10, 10b) dans sa cavité de cuisson (12),

caractérisé en ce que

- une valeur d'une caractéristique dudit signal réfléchi reçu est déterminée (E1c),
- la présence ou l'absence de supports de cuisson amovibles (2) dans la cavité de cuisson (12) est déterminée (S1) à partir de la valeur déterminée,
- en cas de présence de supports (20), leur nature est déterminée et les paramètres de cuisson sont adaptés à la nature des supports (20),
- en cas d'absence de supports (20), les paramètres de cuisson sont adaptés à l'absence des supports (20), et
- dans l'étape d'émission (E1a), un signal étant émis à une fréquence donnée, une pluralité de signaux est émise à différentes fréquences dans la cavité de cuisson (12) du four (10, 10a, 10b), une valeur d'une caractéristique est déterminée (E1c) pour chaque signal réfléchi reçu (E1b), au moins une valeur remarquable est déterminée dans la pluralité de valeurs déterminées afin de détecter la présence possible, et éventuellement la nature, d'un quelconque support de cuisson (20) dans la cavité du four (10, 10a, 10b), et
- la caractéristique du signal est sa puissance et la valeur remarquable est la puissance maximale afin de déterminer une fréquence de résonance, associée avec une image du four, de la cavité de cuisson (12) parmi la pluralité de fréquences des signaux émis.

2. Procédé selon la revendication 1, dans lequel, en cas de présence de supports (20), le nombre de supports de cuisson amovibles (20) dans la cavité de cuisson (12) est en outre déterminé.

3. Procédé selon l'une quelconque des revendications précédentes, dans lequel la présence possible d'au moins un élément de paroi amovible (28) de la cavité (12) du four (10, 10a, 10b) est en outre détectée avant l'adaptation des paramètres de cuisson.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel la valeur déterminée est comparée avec au moins une valeur de référence afin de déterminer la présence d'un quelconque support de cuisson (20) dans la cavité de cuisson (12) du four (10, 10a, 10b).

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel la détermination (E2) de la nature des supports de cuisson amovibles (20) étant présents dans la cavité (12) du four (10, 10a, 10b) a lieu par la comparaison de la valeur déterminée avec au moins une valeur de référence associée avec la nature d'au moins un support de cuisson amovible identifié (20).

6. Dispositif (30) pour le fonctionnement d'un four, configuré pour la mise en œuvre d'un procédé, selon l'une quelconque des revendications 1 à 5, pour le fonctionnement d'un four (10, 10a, 10b) avec une cavité de cuisson adaptée pour la réception de supports de cuisson amovibles (20), dans lequel des produits alimentaires sont cuits sur lesdits supports de cuisson (20) selon des paramètres de cuisson déterminés,
caractérisé en ce qu'il comprend :

- un module de détection (40) utilisable pour émettre au moins un signal dans la cavité de cuisson (12) du four (10, 10a, 10b), pour recevoir un signal réfléchi dans la cavité de cuisson (12) du four (10, 10a, 10b), pour déterminer une valeur d'une caractéristique du signal réfléchi reçu, et pour déterminer à partir de la valeur déterminée la présence de supports de cuisson amovibles (2) dans la cavité de cuisson (12), un module de détermination (50) utilisable, en cas de présence de supports (20), pour déterminer leur nature, et
- un module d'adaptation (60) utilisable pour adapter les paramètres de cuisson à l'absence ou à la nature des supports (20) .

7. Four (10, 10a, 10b) comprenant un dispositif (30) selon la revendication 6.

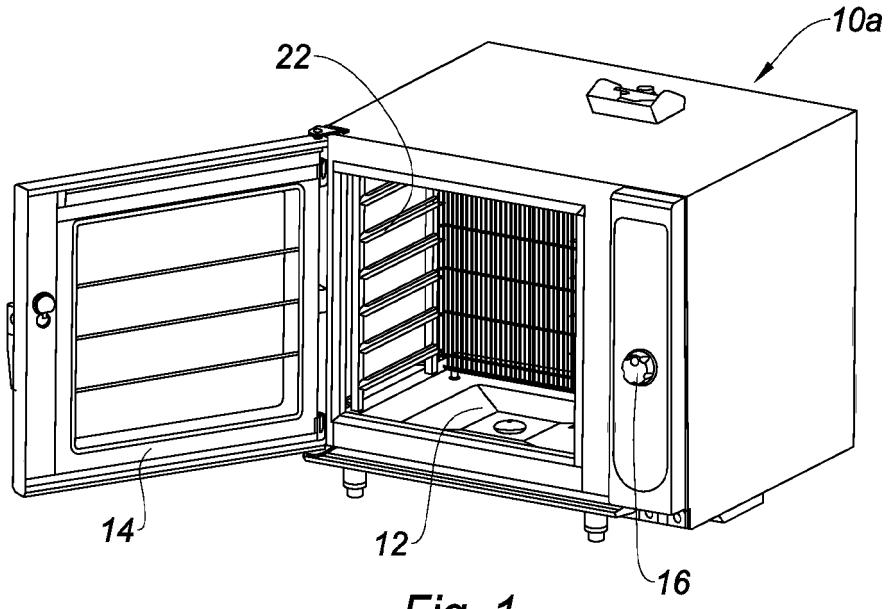

Fig. 1

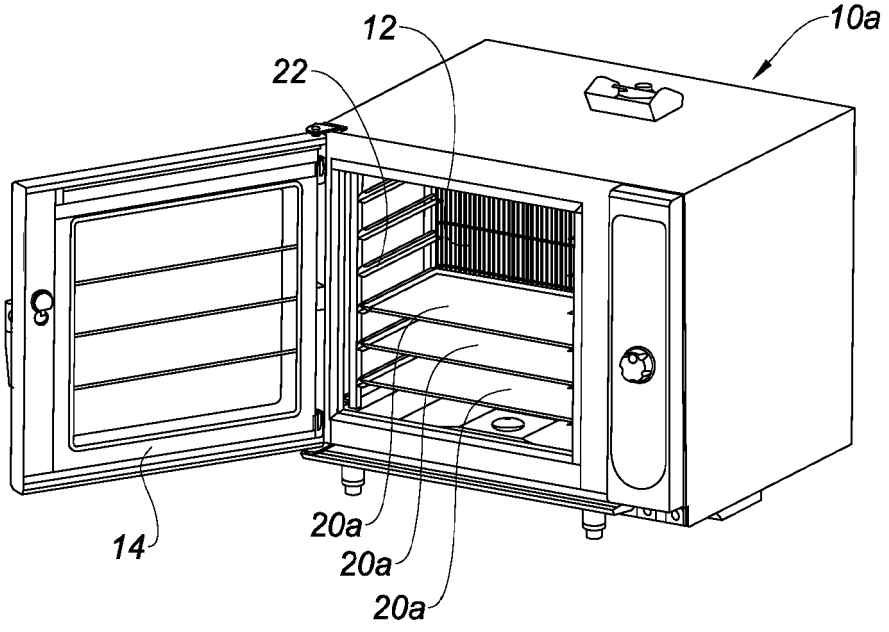

Fig. 2

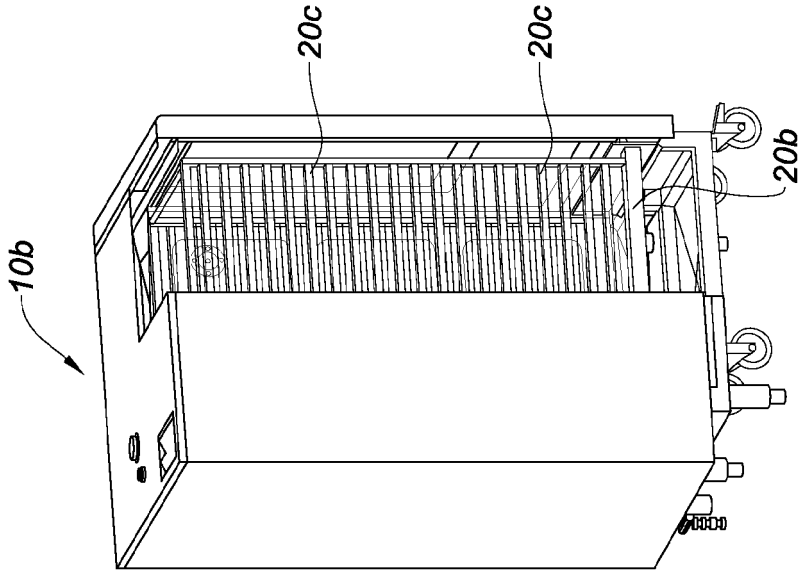

Fig. 4

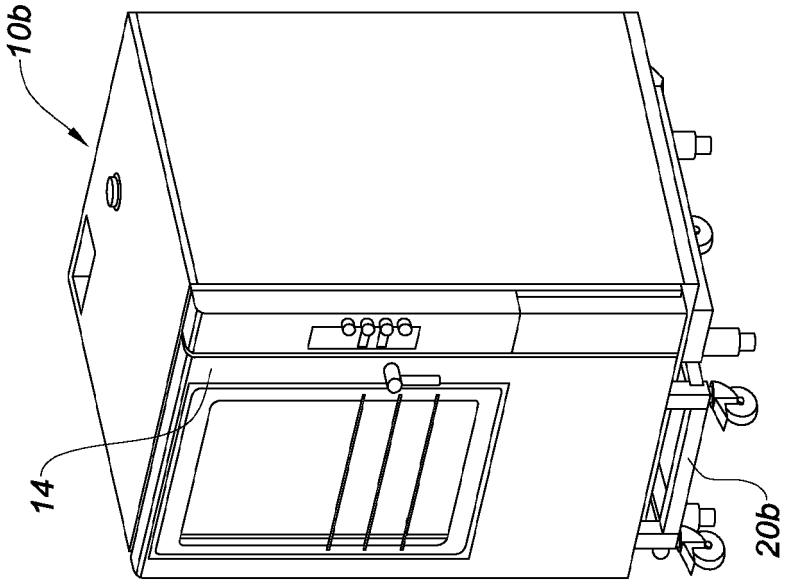

Fig. 3

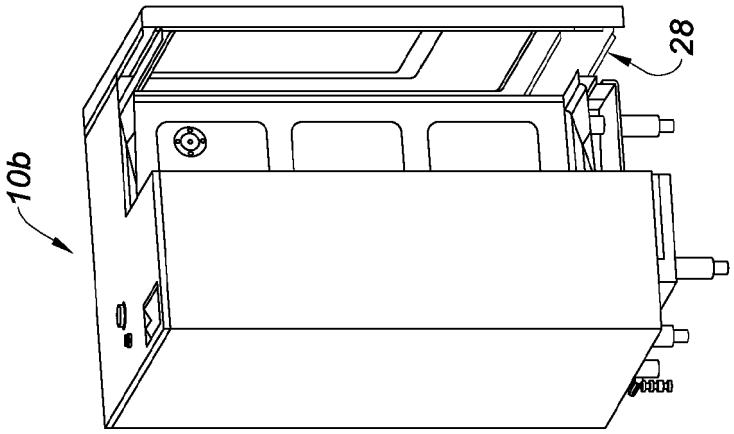

Fig. 6

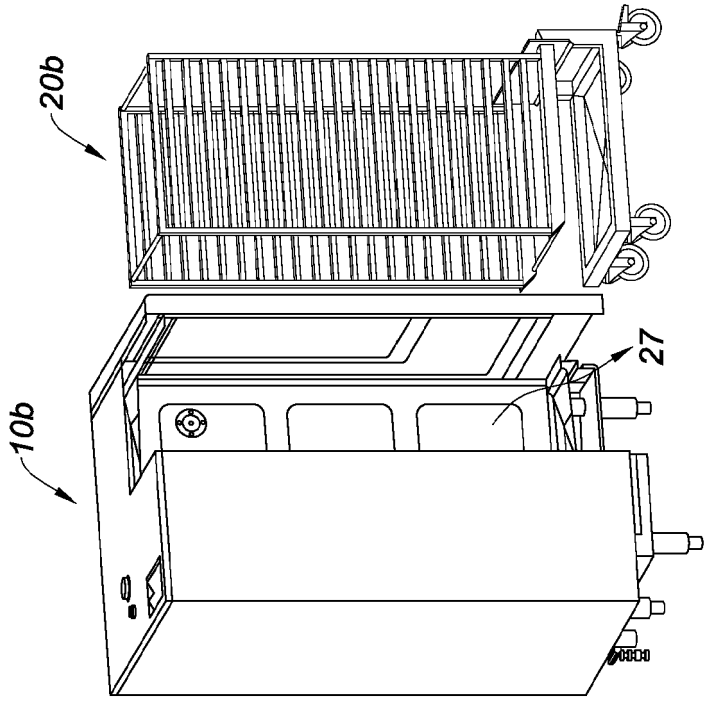

Fig. 5

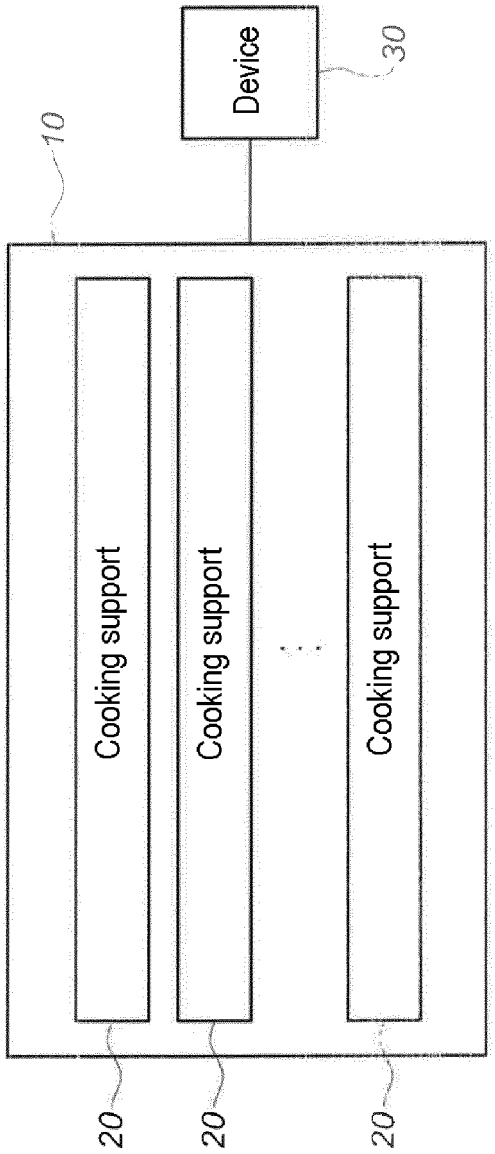
10
Device
30
Cooking support
Cooking support
Cooking support
20
20
20

Fig. 7

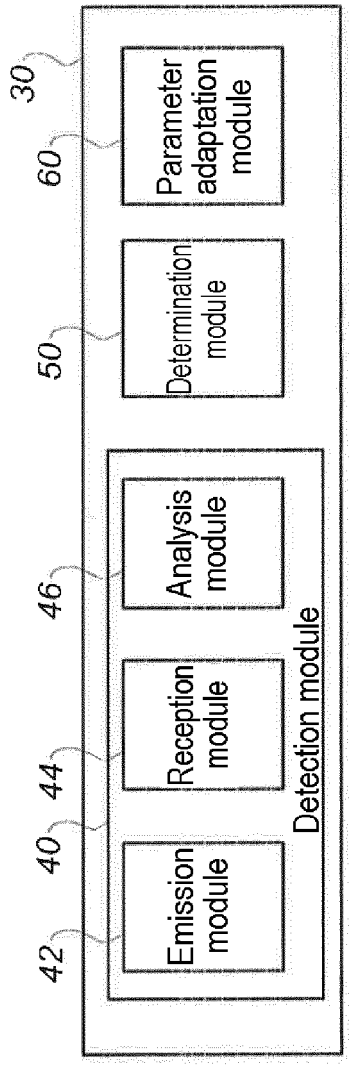
30
60
Parameter adaptation module
50
Determination module
46
Analysis module
44
Reception module
40
Emission module
42
Detection module

Fig. 8

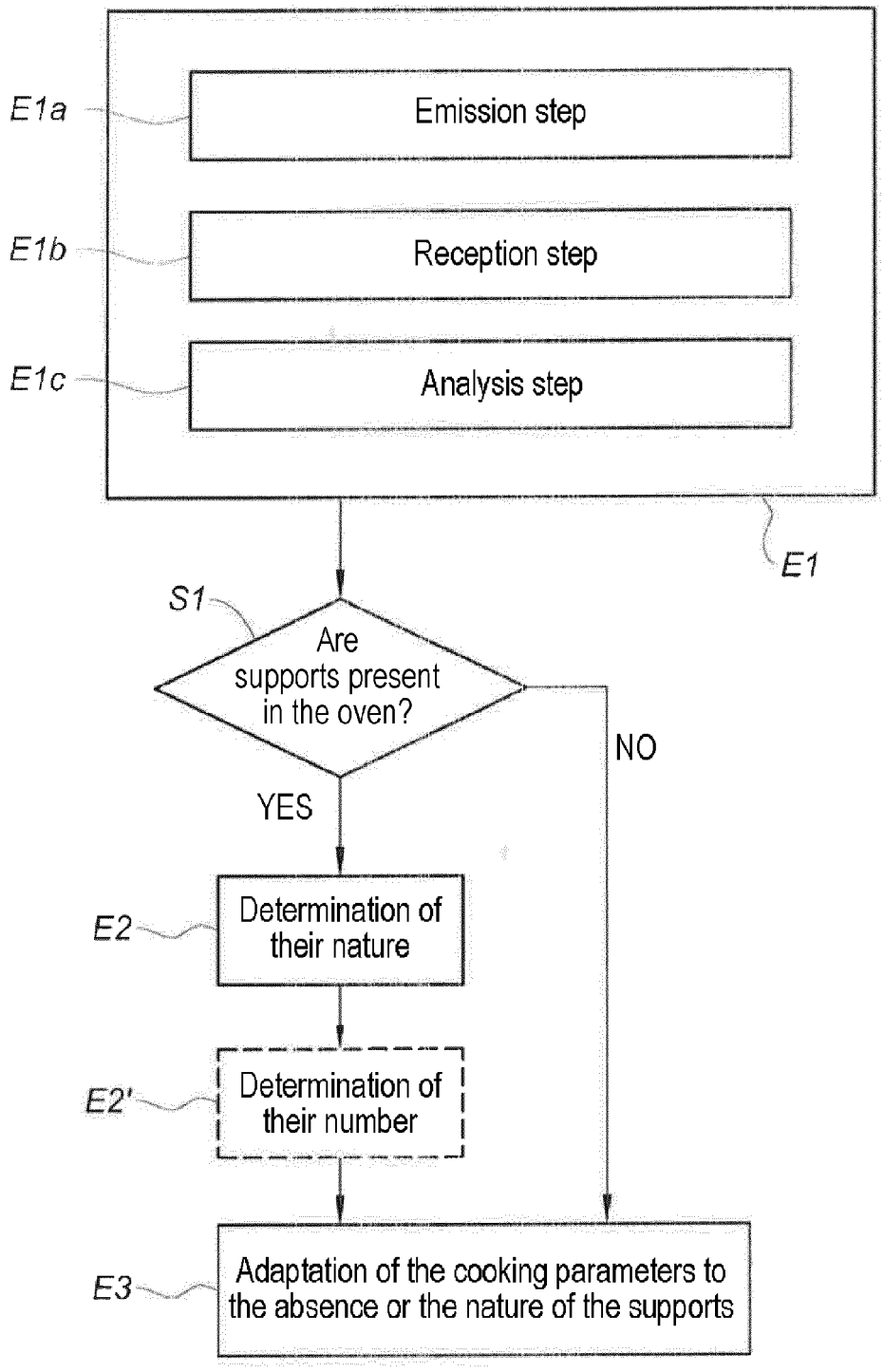
E1a
Emission step
E1b
Reception step
E1c
Analysis step
E1
S1
Are supports present in the oven?
NO
YES
E2
Determination of their nature
E2'
Determination of their number
E3
Adaptation of the cooking parameters to the absence or the nature of the supports

Fig. 9

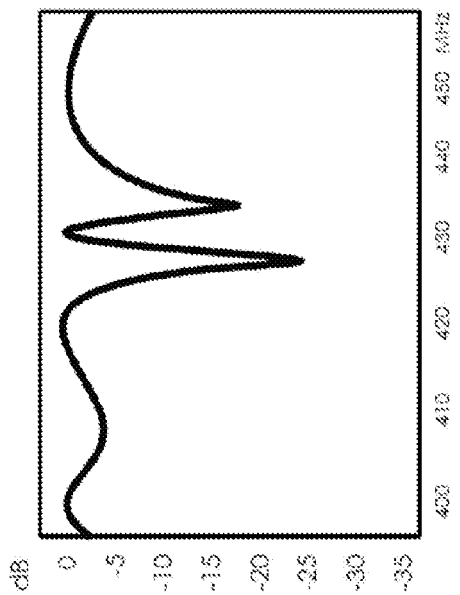

Fig. 10b

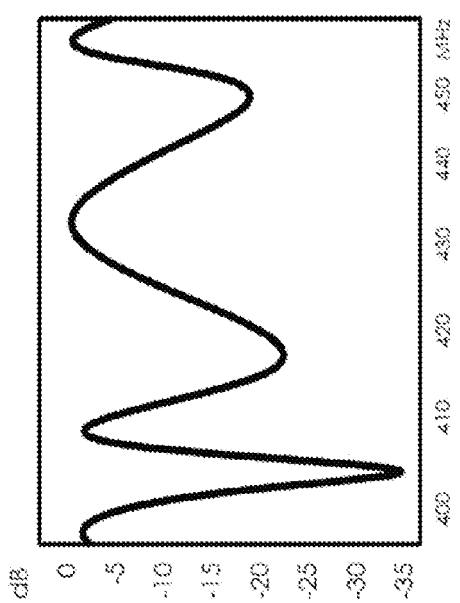

Fig. 10a

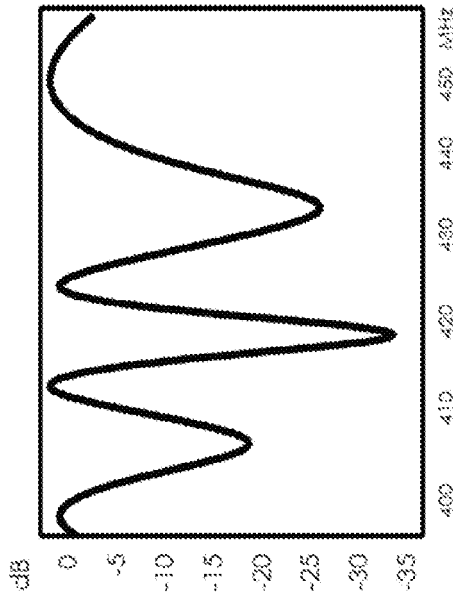

Fig. 10d

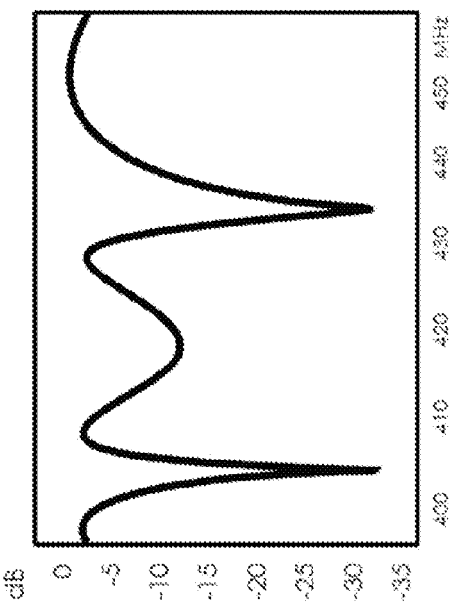

Fig. 10c

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- DE 102008022227 **[0006]**