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(54) **AN OVEN AND METHOD OF OPERATING**

(57) An oven (1) comprising: a plurality of walls (3, 4, 5, 6, 7, 8) defining a heating chamber (2) for receiving items to be heated. A heating element (9) is located inside the heating chamber (2). The heating element (9) is movable within the heating chamber (2). The oven (1) includes a sensor for obtaining a determination of the type of material adjacent the exterior of at least one wall of the oven (1); and a controller (16). The controller (16) is configured to: estimate the type of material adjacent the exterior of the at least one wall of the oven (1) based on the determination of the type of material obtained by the sensor; and cause the heating element (9) to move towards or away from the at least one wall depending on the type of material adjacent the exterior of the at least one wall.

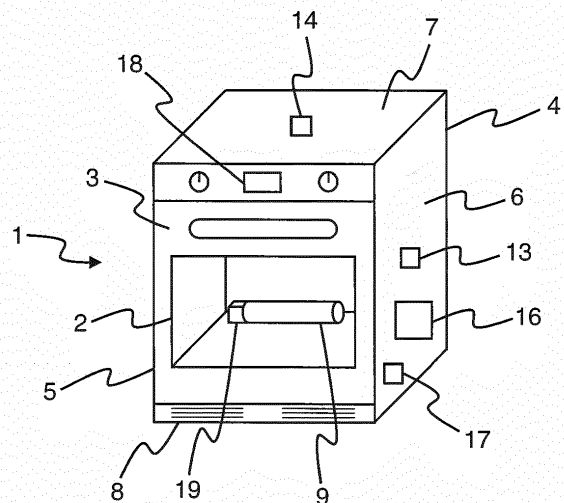


Figure 1

Description

Technical Field

[0001] The present disclosure relates to an oven and a method of operating an oven.

Background

[0002] An oven is an apparatus for heating and cooking items such as foodstuffs. A traditional oven comprises a heating chamber contained within a housing into which the items to be heated are placed. A heating element is located in the heating chamber. The heating element controllably generates heat within the heating chamber such that any items placed inside the heating chamber will be heated. Thus, a foodstuff can be heated by placing it in the heating chamber.

Summary

[0003] According to a first aspect disclosed herein, there is provided an oven comprising: a plurality of walls defining a heating chamber for receiving items to be heated; a heating element located inside the heating chamber, the heating element being movable within the heating chamber; a sensor for obtaining a determination of the type of material adjacent the exterior of at least one wall of the oven; and a controller configured to: estimate the type of material adjacent the exterior of the at least one wall of the oven based on the determination of the type of material obtained by the sensor; and cause the heating element to move towards or away from the at least one wall depending on the type of material adjacent the exterior of the at least one wall.

[0004] This allow the controller to cause the heating element to move away from a wall that is adjacent a type of material through which heat is easily lost from the heating chamber, and to move towards a wall that is adjacent a type of material through which heat is not easily lost from the heating chamber. This increases the efficiency of heating the heating chamber and reduces the amount of energy required for the heating element to heat the heating chamber, which consequently reduces the operating costs of the oven and the environmental impact caused by operating the oven.

[0005] In an example, the sensor is an acoustic sensor for obtaining a determination of the type of material adjacent the exterior of the at least one wall of the oven based on the acoustic properties of the material.

[0006] In an example, the oven comprises a sound emitter for outputting a sound towards material that is adjacent the exterior of the at least one wall of the oven, and wherein the sensor is configured to obtain a determination of the type of material adjacent the exterior of the wall based on a measure of one or more properties of the sound that is reflected back from the material.

[0007] In an example, the controller is configured to

estimate the type of material adjacent the exterior of the at least one wall of the oven by searching a look-up table which contains data for types of material and corresponding acoustic properties.

[0008] In an example, the controller is configured to obtain a measure of the thermal conductivity of the estimated type of material and cause the heating element to move towards or away from the at least one wall depending on the thermal conductivity of the type of material.

[0009] In an example, the controller is configured to obtain a measure of the thermal conductivity of the type of material by searching a look-up table which contains data for types of material and corresponding thermal conductivity.

[0010] In an example, the oven comprises data storage which stores the look-up table.

[0011] In an example, the oven comprises a plurality of sensors, each sensor being arranged to obtain a determination of the type of material adjacent the exterior of a respective wall of the oven.

[0012] In an example, the oven comprises a motor for moving the heating element within the heating chamber, and wherein the controller is configured to cause the heating element to move by operating the motor.

[0013] According to a second aspect disclosed herein, there is provided a method of operating an oven, the method comprising: obtaining a determination of the type of material adjacent the exterior of at least one wall of the oven; estimating the type of material adjacent the exterior of the at least one wall of the oven based on the obtained determination of the type of material; and moving a heating element located inside a heating chamber of the oven towards or away from the at least one wall depending on the type of material adjacent the exterior of the at least one wall.

[0014] In an example, the method comprises: obtaining a determination of the type of material adjacent the exterior of the at least one wall of the oven based on the acoustic properties of the material.

[0015] In an example, the method comprises: outputting a sound towards material that is adjacent the exterior of the at least one wall of the oven; and obtaining a determination of the type of material adjacent the exterior of the wall based on a measure of one or more properties of the sound that is reflected back from the material.

[0016] In an example, the method comprises: estimating the type of material adjacent the exterior of the at least one wall of the oven by searching a look-up table which contains data for types of material and corresponding acoustic properties.

[0017] In an example, the method comprises: obtaining a measure of the thermal conductivity of the estimated type of material and causing the heating element to move towards or away from the at least one wall depending on the thermal conductivity of the type of material.

[0018] In an example, the method comprises operating a motor to move the heating element within the heating chamber.

Brief Description of the Drawings

[0019] To assist understanding of the present disclosure and to show how embodiments may be put into effect, reference is made by way of example to the accompanying drawings in which:

Figure 1 shows schematically a perspective view of an example of a free standing oven according to an aspect described herein;

Figure 2 shows schematically a horizontal cross sectional view of the oven shown in Figure 1;

Figure 3 shows schematically a vertical cross sectional view of the oven shown in Figure 1;

Figure 4 shows schematically shows schematically a perspective view of an example of an integrated oven according to an aspect described herein;

Figure 5 shows schematically an example of a method of operating an oven according to an aspect described herein.

Detailed Description

[0020] An oven is an apparatus for heating and cooking items such as foodstuffs. A traditional oven comprises a heating chamber contained within a housing into which the items to be heated are placed. A heating element is located in the heating chamber. The heating element controllably generates heat within the heating chamber such that any items placed inside the heating chamber will be heated. Thus, a foodstuff can be heated by placing it in the heating chamber. The heating chamber may be surrounded by thermal insulation, which reduces heat loss from the heating chamber to the surrounding environment.

[0021] An oven in a modern kitchen is often integrated into a fitted kitchen. In this arrangement, the oven may be located between two other units, which are usually cabinets. Heat from the oven can be lost from the oven, through the various walls of the housing and to the surrounding environment. The heat loss through the different walls of the oven occurs at different heat loss rates depending on the structure and the properties of the material that is adjacent the wall. For example, if a top wall of the oven is adjacent a marble worktop and a side wall of the oven is adjacent a wooden cabinet then the heat loss from the top wall will be different from the heat loss from the side wall.

[0022] Figures 1, 2 and 3 show schematically an oven 1. In one example, the oven 1 is provided as a standalone oven. In another example, the oven 1 is provided as part of, or integrated into, a more complex cooking apparatus, such as a cooker having one or more cooking rings. In this example, the oven 1 has a housing formed from a

plurality of walls. The plurality of walls define a heating chamber 2 for receiving items to be heated, such as foodstuffs. In this example, the oven 1 comprises a front wall 3 and a back wall 4, a left side wall 5 and a right side wall 6, and a top wall 7 and a bottom wall 8. In this example, the front wall 3 is or includes a door. The door can be opened to permit access to the heating chamber 2, and closed to prevent access to the heating chamber 2.

[0023] A heating element 9 is located inside the heating chamber 2. In one example, a plurality of heating elements 9 are located inside the heating chamber 2. The heating element 9 is operated to increase the temperature inside of the heating chamber 2. In one example, the heating element 9 is an electric coil, which converts electricity into heat using for example resistive or inductive heating. In another example, the heating element 9 may be another type of heating element such as a gas burner, which converts gas fuel into heat. The heating element 9 is movable within the heating chamber 2, such that the heating element 9 can be moved towards or away from at least one of the walls of the oven 1. In an example, the heating element 9 is movable between a plurality of predetermined positions located within the heating chamber 2.

[0024] The oven 1 has a sensor for obtaining a determination of the type of material adjacent the exterior of at least one of the plurality of walls. There may be a single sensor, which may generally be located centrally of the heating chamber 2 or towards one of the walls 3-8, and which is arranged to obtain a determination of the type of material adjacent the exterior of one or more walls 3-8 of the oven 1.

[0025] In this example, the oven 1 includes a plurality of sensors. Each sensor in this example is arranged to obtain a determination of the type of material adjacent the exterior of a respective wall 3-8 of the oven 1. Each sensor may be located adjacent a respective wall 3-8 of the oven 1. In one example, each sensor is attached to a respective wall 3-8 of the oven 1.

[0026] In this example, the oven 1 has a front wall sensor 10 attached to the front wall 3 (the door in this example); a back wall sensor 11 attached to the back wall 4; a left side wall sensor 12 attached to the left side wall 5; a right side wall sensor 13 attached to the right side wall 6; a top wall sensor 14 attached to the top wall 7; and a bottom wall sensor 15 attached to the bottom wall 8. Each of the sensors 10-15 is arranged to obtain a determination of the type of material adjacent the exterior of its respective wall 3-8.

[0027] The oven 1 includes a controller 16 (such as a processor, a micro-processor, or the like). The controller 16 is configured to estimate the type of material adjacent the exterior of at least one of the walls of the oven 1 based on a measurement obtained by the one or more sensors 10-15. The controller 16 is also configured to cause the heating element 9 to move towards or away from at least one wall of the oven 1 depending on the type of material that is adjacent the exterior of the wall. The controller 16

is configured to move the heating element 9 to a position that minimises heat loss from the heating chamber 2. This heat loss depends, at least partially, on the physical properties (such as thermal conductivity) of the materials exterior to the walls of the oven 1. The type of material that is to the exterior of each wall of the oven 1 is dependent on the location that the oven 1 is situated within a kitchen. Since an oven 1 can be placed in many different locations within a kitchen, it is important to be able to identify the particular type of material so that heat loss can be minimised.

[0028] For example, the controller 16 may be configured to move the heating element 9 away from a wall that is adjacent a material having a relatively high thermal conductivity (e.g. a metal or concrete) because heat is lost easily from the heating chamber 2 through this wall. In another example, the controller 16 may be configured to move the heating element 9 towards a wall that is adjacent a material having a relatively low thermal conductivity (e.g. polystyrene foam or an insulated building wall) because heat is not easily lost from the heating chamber 2 through this wall. This helps to reduce heat loss from the heating chamber 2.

[0029] In this example, each sensor 10-15 is an acoustic sensor for obtaining a determination of the type of material adjacent the exterior of a wall based on the acoustic properties of the material. By obtaining a measure of the acoustic properties of a material exterior to a wall, the controller 16 can estimate the particular type of material because different types of material exhibit different acoustic properties. In another example, each sensor 10-15 is a different type of sensor that can obtain a determination of the type of a material.

[0030] In this example, the oven 1 includes a sound emitter 18 for outputting a sound towards material that is adjacent the exterior of a wall of the oven 1. In one example, the sound emitter 18 may emit sound at a specific frequency. In this example, the or each sensor is configured to obtain a determination of the type of material adjacent the wall based on a measure of one or more properties of the sound that is reflected back from the material. In an example, the or each sensor is configured to obtain a determination of the type of material adjacent the wall based on a measure of the speed of the sound reflected back from the material to the sensor. Alternatively, or additionally, in one example the or each sensor is configured to obtain a determination of the type of material adjacent the wall based on a measure of the time taken for the sound to reflect back from the material to the sensor. The sound emitter 18 may be configured so that it can output sound omnidirectionally. In another example, the oven 1 includes a plurality of sound emitters 18. In one example where there are plural sensors 10-15, a sound emitter 18 may be located adjacent each sensor 10-15 such that there is a dedicated sound emitter 18 for each wall 3-8 for outputting sound towards material adjacent the exterior of the wall 3-8.

[0031] The controller 16 may be configured to estimate

the type of material adjacent the exterior of a wall of the oven by searching a look-up table which contains data for different types of material and their corresponding acoustic properties. In this example, the oven 1 includes a data storage 17 which stores the look-up table.

[0032] In an example, the controller 16 is configured to obtain a measure of the thermal conductivity of a type of material adjacent the exterior of a wall of the oven 1. The controller 16 may obtain a measure of the thermal conductivity of a material by searching a look-up table which contains data for different types of material and their corresponding thermal conductivity. The data storage 17 may store the look-up table. In this respect, once the controller 16 has estimated the type of the material based on the acoustic properties, the controller 16 can then use this information to obtain a measure of the thermal conductivity of the material. The measure of the thermal conductivity of the material can be used by the controller 16 when determining whether to cause the heating element 9 to move towards or away from a particular wall.

[0033] In an example in which the oven 1 comprises a plurality of heating elements 9, the controller 16 is configured to cause each of the plurality of heating elements 9 to move towards or away from at least one wall of the oven 1 as necessary depending on the type of material that is adjacent the exterior of the wall. The controller 16 therefore causes each of the plurality of heating elements 9 to move location within the heating chamber 2 as necessary in order to minimise heat loss from the heating chamber 2. Nevertheless, in other examples where there are plural heating elements 9, one or more of the heating elements 9 may be movable and one or more of the heating elements 9 may be fixed.

[0034] In one example, the controller 16 is configured to estimate the type of material adjacent the exterior of multiple walls at the same time. For example, the controller 16 may be configured to estimate the type of material adjacent the exterior of left side wall 5 and the right side wall 6 at the same time.

[0035] In one example, the controller 16 is configured to estimate the type of material adjacent the exterior of one or more walls more frequently than other walls. That is, the controller 16 may effectively test or poll the thermal properties of one or more walls more frequently than other walls. This may be useful if the controller 16 estimates that the exterior of that wall is adjacent a type of material having a high thermal conductivity.

[0036] In this example, the oven 1 comprises a motor 19 for moving the heating element 9 within the heating chamber 2. In this example, the controller 16 is configured to cause the heating element 9 to move by operating the motor 19. The motor 19 may be, for example, an electric motor. In an example, the motor 19 is attached the heating element 9 so that it moves within the heating chamber 2 as the heating element 9 moves. In the case that there are plural movable heating elements 9, there may be a corresponding number of motors 19, one for each movable heating element 9.

[0037] Figure 4 shows schematically the oven 1 of Figures 1, 2 and 3 when integrated into a fitted kitchen. In this example, the oven 1 is positioned between a first cabinet 20 and a second cabinet 21. The first cabinet 20 is located adjacent the exterior of the left side wall 5 of the oven 1, and the second cabinet 21 is located adjacent the exterior of the right side wall 6 of the oven 1. In this example, a worktop 22 sits on top of the oven 1 and on top of the first and second cabinets 20, 21. Therefore, the worktop 22 is located adjacent the exterior of the top wall 7 of the oven 1. The oven 1 and the first and second cabinets 20, 21 are resting on a floor 23 such that the floor 23 is located adjacent the exterior of the bottom wall 8 of the oven 1. The oven 1 and the first and second cabinets 20, 21 back on to a wall 24 such that the wall 24 is located adjacent the exterior of the back wall 4 of the oven 1.

[0038] The materials that are adjacent the exterior of the different walls 3-8 of the oven 1 (e.g. the materials forming the cabinets 20, 21, the worktop 22, the floor 23 and the wall 24) in general have different heat loss properties, including in particular their thermal conductivity.

[0039] To illustrate the different thermal conductivities of examples of different materials commonly found in a kitchen, reference may be made to the following table of thermal conductivities for a number of materials. In one example, this table is stored as information on the data storage 17.

Table A

Type of Material	Thermal Conductivity W/(m K)
Wood (Oak)	0.14
Air	0.26
Brick	0.70
Concrete	1.40
Marble	2.08

[0040] An example of operation of the controller 16 of the oven 1 shown in Figures 1-4 causing the heating element(s) 9 to move towards or away from one or more walls depending on the type of material located adjacent the exterior of the walls will now be described, with reference to Figure 5.

[0041] At S1, the controller 16 begins the process of estimating the type of material adjacent the exterior of each wall of the oven 1 by instructing the or each sound emitter 18 to output sound towards the material that is adjacent a respective wall 3-8 of the oven 1.

[0042] At S2, the sound output from the sound emitter 18 reflects back from the materials and towards the one or more sensors 10-15. The or each sensor 10-15 then senses the sound that is reflected back from the material adjacent the exterior of its respective wall 3-8.

[0043] At S3, the controller 16 analyses the reflected

sound that is detected by the or each sensor 10-15. The controller 16 then estimates the type of material that is adjacent the exterior of each wall 3-8 based on the acoustic properties of the material. In this example, the controller 16 estimates the type of material by searching information in a look-up table stored in the data storage 17 to find a type of material having the same acoustic properties as that sensed by the or each sensor 10-15.

[0044] At S4, the controller 16 determines whether to cause the heating element 9 (or in one example the plurality of heating elements 9) to move towards or away from one or more walls 3-8 of the oven 1, based on the estimated type of material that is adjacent the exterior of the one or more walls 3-8. The controller 16 seeks to cause the heating element 9 to move to a position inside the heating chamber 2 that will minimise, or at least reduce, heat loss from the heating chamber 2. In an example, the controller 16 determines that it should cause the heating element 9 to move towards a wall 3-8 having an exterior that is adjacent a material having a lower thermal conductivity because heat is not easily lost from the heating element 9 through this wall. In another example, the controller 16 determines that it should cause the heating element 9 to move away from a wall 3-8 having an exterior that is adjacent a material having a higher thermal conductivity in order to reduce the heat loss through this wall. To this end, the controller 16 can cross reference each estimated type of material with the thermal conductivities stored in the data storage 17 (e.g. as shown in Table A) to obtain a measure of the thermal conductivity of the material adjacent the exterior of the one or more walls 3-8.

[0045] At S5, the controller 16 causes the heating element 9 to move towards or away from one or more walls 3-8 of the oven 1, depending on the type of material that is adjacent the exterior of the one or more walls 3-8, by operating the motor 19. In one example, the controller 16 causes the heating element 9 to move towards a wall 3-8 having an exterior that is adjacent oak because oak has a relatively low thermal conductivity. In another example, the controller 16 causes the heating element 9 to move away from a wall 3-8 having an exterior that is adjacent marble because marble has a relatively high thermal conductivity.

[0046] An advantage of the described arrangement is that the controller 16 can move the heating element 9 (or the plurality of heating elements 9) to a location within the heating chamber 2 of the oven 1 where heat loss from the heating chamber 2 can be reduced. This increases the efficiency of heating the heating chamber 2 and reduces the amount of energy required to heat the heating chamber 2, which consequently reduces the operating costs of the oven 1 and the environmental impact caused by operating the oven 1.

[0047] It will be understood that the processor or processing system or circuitry referred to herein may in practice be provided by a single chip or integrated circuit or plural chips or integrated circuits, optionally provided

as a chipset, an application-specific integrated circuit (ASIC), field-programmable gate array (FPGA), digital signal processor (DSP), graphics processing units (GPUs), etc. The chip or chips may comprise circuitry (as well as possibly firmware) for embodying at least one or more of a data processor or processors, a digital signal processor or processors, baseband circuitry and radio frequency circuitry, which are configurable so as to operate in accordance with the exemplary embodiments. In this regard, the exemplary embodiments may be implemented at least in part by computer software stored in (non-transitory) memory and executable by the processor, or by hardware, or by a combination of tangibly stored software and hardware (and tangibly stored firmware).

[0048] Reference is made herein to data storage for storing data. This may be provided by a single device or by plural devices. Suitable devices include for example a hard disk and non-volatile semiconductor memory (e.g. a solid-state drive or SSD).

[0049] Although at least some aspects of the embodiments described herein with reference to the drawings comprise computer processes performed in processing systems or processors, the invention also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of non-transitory source code, object code, a code intermediate source and object code such as in partially compiled form, or in any other non-transitory form suitable for use in the implementation of processes according to the invention. The carrier may be any entity or device capable of carrying the program. For example, the carrier may comprise a storage medium, such as a solid-state drive (SSD) or other semiconductor-based RAM; a ROM, for example a CD ROM or a semiconductor ROM; a magnetic recording medium, for example a floppy disk or hard disk; optical memory devices in general; etc.

[0050] The examples described herein are to be understood as illustrative examples of embodiments of the invention. Further embodiments and examples are envisaged. Any feature described in relation to any one example or embodiment may be used alone or in combination with other features. In addition, any feature described in relation to any one example or embodiment may also be used in combination with one or more features of any other of the examples or embodiments, or any combination of any other of the examples or embodiments. Furthermore, equivalents and modifications not described herein may also be employed within the scope of the invention, which is defined in the claims.

Claims

1. An oven comprising:

a plurality of walls defining a heating chamber

for receiving items to be heated;

a heating element located inside the heating chamber, the heating element being movable within the heating chamber;

a sensor for obtaining a determination of the type of material adjacent the exterior of at least one wall of the oven; and

a controller configured to: estimate the type of material adjacent the exterior of the at least one wall of the oven based on the determination of the type of material obtained by the sensor; and cause the heating element to move towards or away from the at least one wall depending on the type of material adjacent the exterior of the at least one wall.

2. An oven according to claim 1, wherein the sensor is an acoustic sensor for obtaining a determination of the type of material adjacent the exterior of the at least one wall of the oven based on the acoustic properties of the material.

3. An oven according to claim 2, comprising a sound emitter for outputting a sound towards material that is adjacent the exterior of the at least one wall of the oven, and wherein the sensor is configured to obtain a determination of the type of material adjacent the exterior of the wall based on a measure of one or more properties of the sound that is reflected back from the material.

4. An oven according to claim 2 or claim 3, wherein the controller is configured to estimate the type of material adjacent the exterior of the at least one wall of the oven by searching a look-up table which contains data for types of material and corresponding acoustic properties.

5. An oven according to any one of claims 1 to 4, wherein the controller is configured to obtain a measure of the thermal conductivity of the estimated type of material and cause the heating element to move towards or away from the at least one wall depending on the thermal conductivity of the type of material.

6. An oven according to claim 5, wherein the controller is configured to obtain a measure of the thermal conductivity of the type of material by searching by searching a look-up table which contains data for types of material and corresponding thermal conductivity.

7. An oven according to claim 4 or claim 6, comprising data storage which stores the look-up table.

8. An oven according to any one of claims 1 to 7, comprising a plurality of sensors, each sensor being arranged to obtain a determination of the type of ma-

terial adjacent the exterior of a respective wall of the oven.

9. An oven according to any one of claims 1 to 8, comprising a motor for moving the heating element within the heating chamber, and wherein the controller is configured to cause the heating element to move by operating the motor. 5
10. A method of operating an oven, the method comprising: 10
- obtaining a determination of the type of material adjacent the exterior of at least one wall of the oven; 15
- estimating the type of material adjacent the exterior of the at least one wall of the oven based on the obtained determination of the type of material; and
- moving a heating element located inside a heating chamber of the oven towards or away from the at least one wall depending on the type of material adjacent the exterior of the at least one wall. 20
- 25
11. A method according to claim 10, comprising:
- obtaining a determination of the type of material adjacent the exterior of the at least one wall of the oven based on the acoustic properties of the material. 30
12. A method according to claim 11, comprising:
- outputting a sound towards material that is adjacent the exterior of the at least one wall of the oven; 35
- and obtaining a determination of the type of material adjacent the exterior of the wall based on a measure of one or more properties of the sound that is reflected back from the material. 40
13. A method according to any one of claims 10 to 12, comprising: 45
- estimating the type of material adjacent the exterior of the at least one wall of the oven by searching a look-up table which contains data for types of material and corresponding acoustic properties. 50
14. A method according to any one of claims 10 to 13, comprising:
- obtaining a measure of the thermal conductivity of the estimated type of material and causing the heating element to move towards or away from the at least one wall depending on the ther- 55

mal conductivity of the type of material.

15. A method according to any one of claims 10 to 14, comprising:
- operating a motor to move the heating element within the heating chamber.

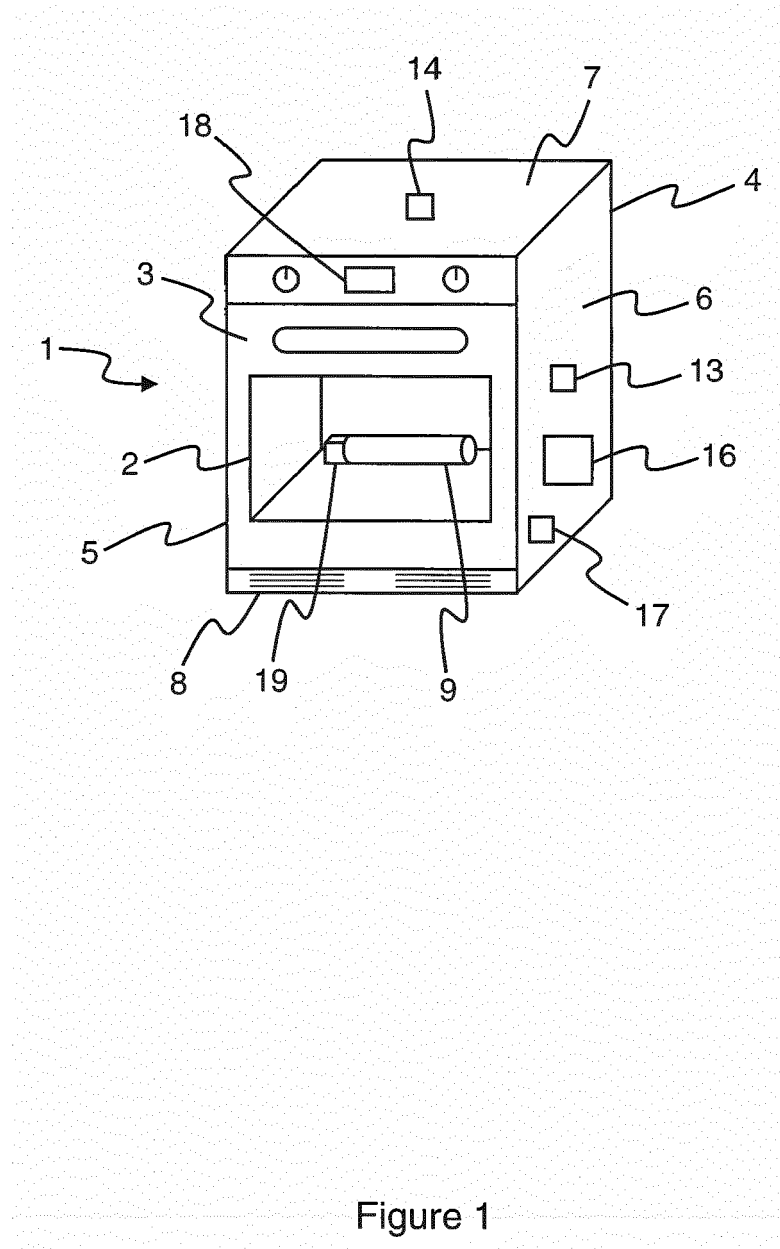


Figure 1

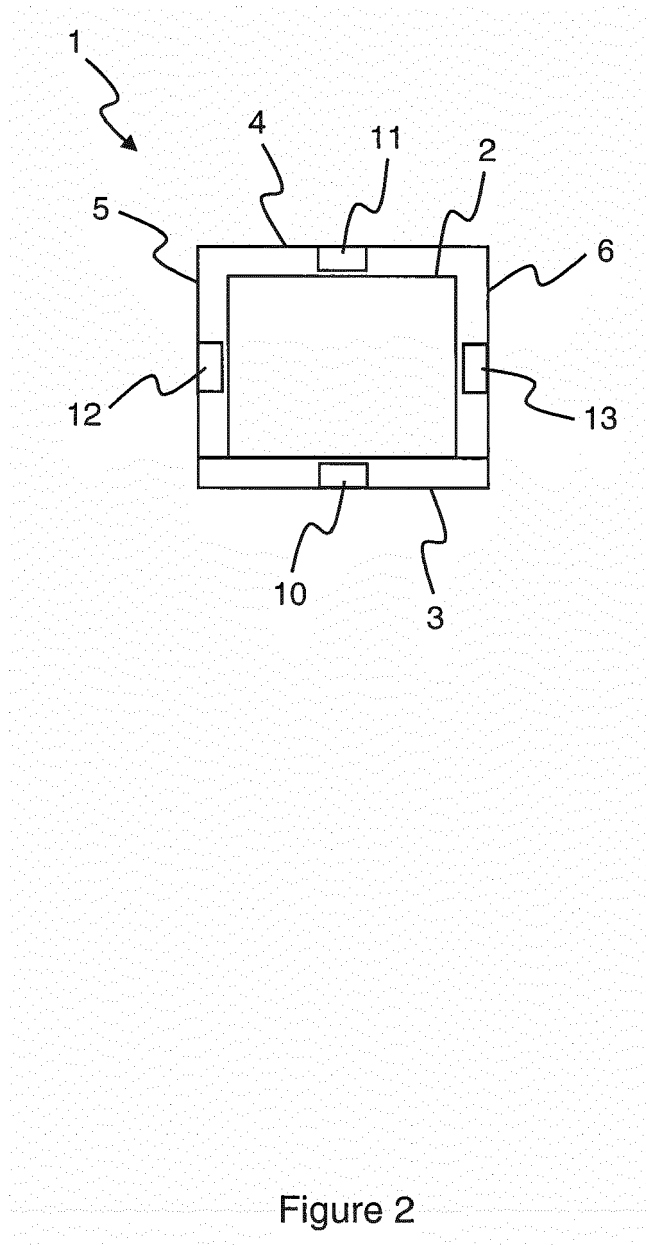


Figure 2

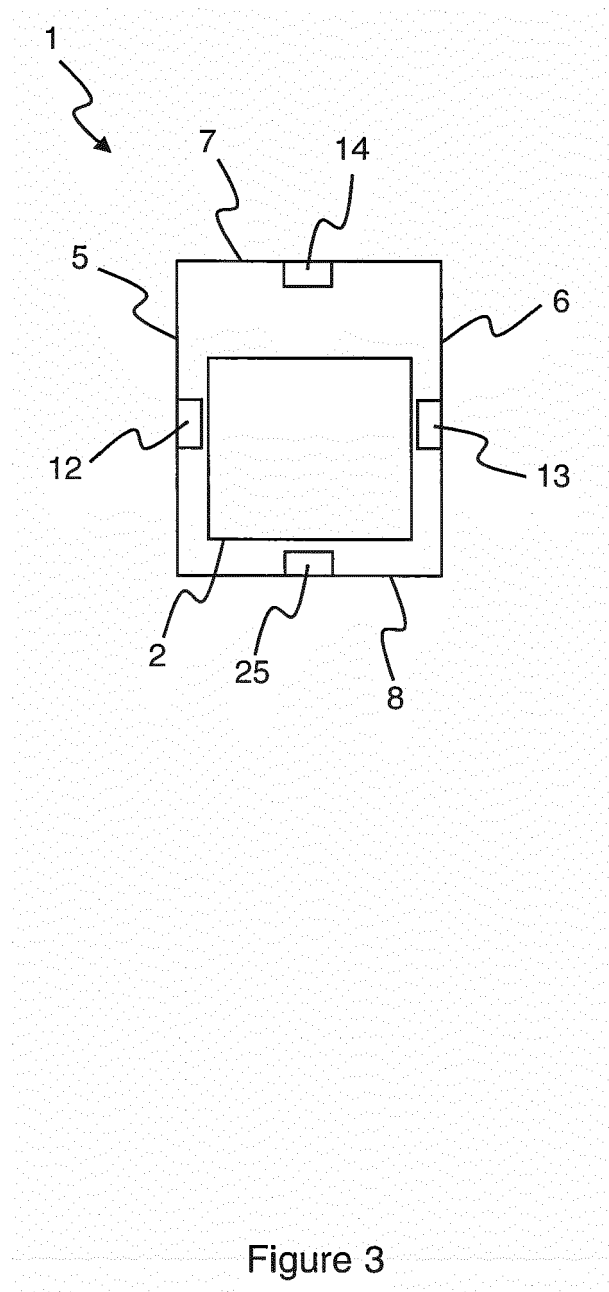


Figure 3

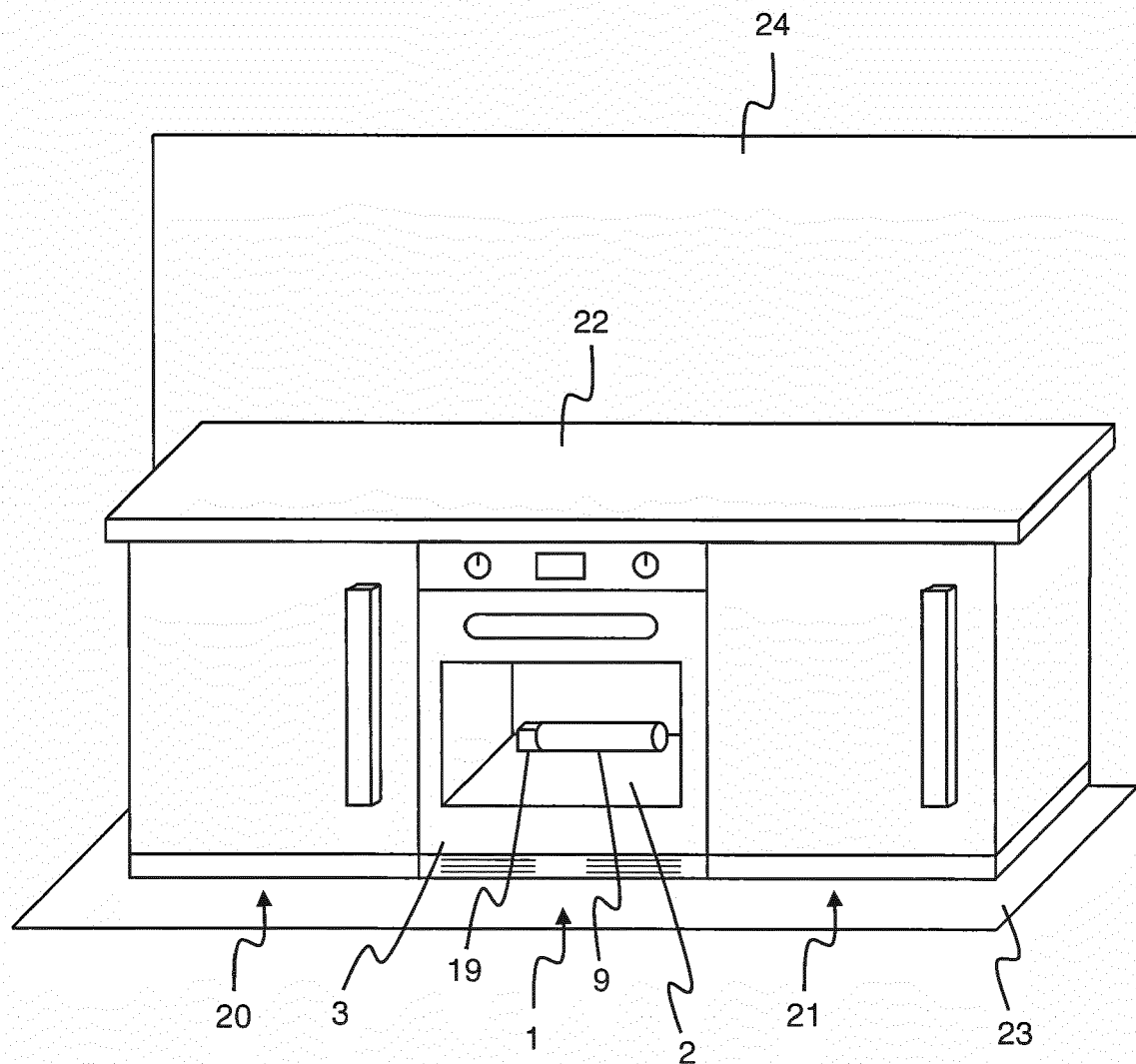


Figure 4

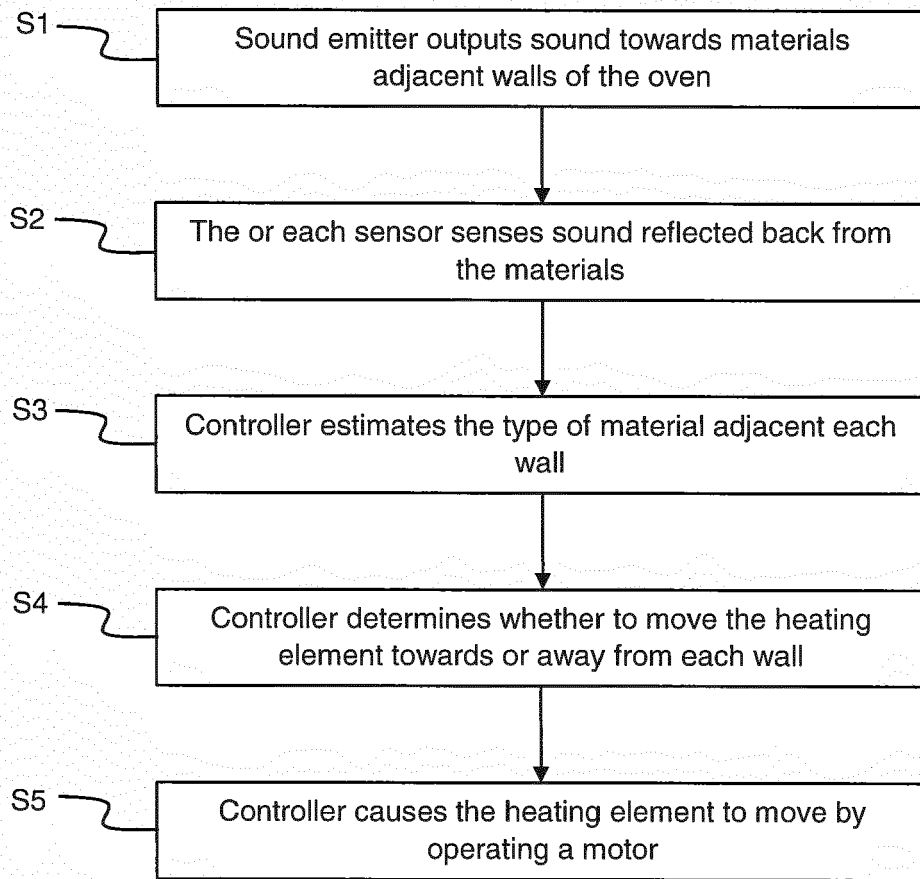


Figure 5



EUROPEAN SEARCH REPORT

Application Number
EP 18 20 6818

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 6 723 962 B1 (SIT ANTONY [HK]) 20 April 2004 (2004-04-20) * figures 1-2 *	1-15	INV. F24C7/06
A	EP 0 966 180 A2 (SHARP KK [JP]) 22 December 1999 (1999-12-22) * figure 2 *	1-15	
A	FR 2 721 695 A3 (WHIRLPOOL EUROP [NL]) 29 December 1995 (1995-12-29) * figure 3 *	1-15	
A	DE 198 28 641 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 30 December 1999 (1999-12-30) * figure 1 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 April 2019	Examiner Adant, Vincent
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 20 6818

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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18-04-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6723962	B1	20-04-2004	NONE
EP 0966180	A2	22-12-1999	AU 718835 B2 20-04-2000
		DE 69916175 T2 17-03-2005	
		EP 0966180 A2 22-12-1999	
		JP 3649591 B2 18-05-2005	
		JP 2000002435 A 07-01-2000	
		KR 20000006197 A 25-01-2000	
		US 6091057 A 18-07-2000	
FR 2721695	A3	29-12-1995	NONE
DE 19828641	A1	30-12-1999	NONE