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

(11) **EP 4 357 681 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.04.2024 Bulletin 2024/17

(21) Application number: **23204011.3**

(22) Date of filing: **17.10.2023**

(51) International Patent Classification (IPC):
F24C 15/32 *(2006.01)* ***F22B 1/28*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F24C 15/327; F22B 1/284; F22B 37/48

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

(30) Priority: **19.10.2022 IT 202200021585**

(71) Applicant: **SMEG S.p.A.**
42016 Guastalla (RE) (IT)

(72) Inventor: **FORNACCIARI, Matteo**
42016 Guastalla (RE) (IT)

(74) Representative: **Studio Torta S.p.A.**
Corso Magenta, 56
20123 Milano (IT)

(54) STEAM OVEN AND METHOD FOR MONITORING THE LIMESCALE LEVEL IN A STEAM OVEN

(57) A steam oven comprises a cooking chamber (3), a steam generation device (5) and a monitoring system (6); wherein the steam generation device (5) is configured to generate steam to be fed into the cooking chamber (3) and comprises a boiler (8) and at least one auxiliary tank (10), which is in communication with the boiler (8) to feed, in use, water to the boiler (8); the monitoring system (6) being configured to monitor the level of limescale in the steam generation device (5) and comprising a temperature sensor (22) coupled to the boiler (8) and a monitoring device (24) configured to store at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) each time the steam function of the oven (1) is activated, to compare the at least one stored temperature value with a limescale threshold value (TCal) and to signal the need for descaling when the at least one stored temperature value ($Temp_{max}$) detected by the temperature sensor (22) is greater than or equal to the limescale threshold value (TCal).

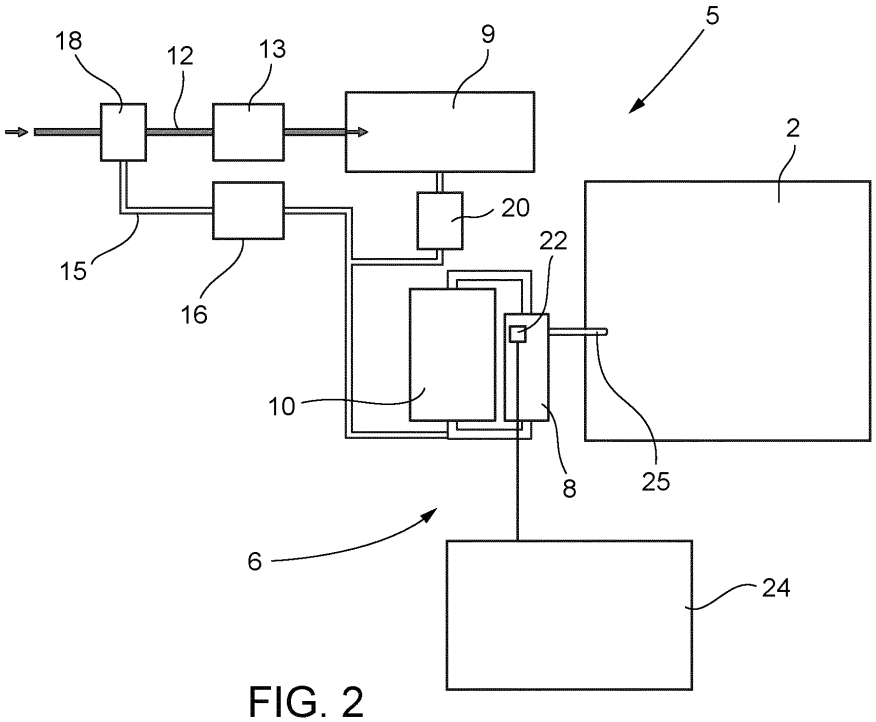

FIG. 2

EP 4 357 681 A1

Description

Cross-reference to related applications

[0001] This patent application claims priority from Italian patent application no. 102022000021585 filed on October 19, 2022, the entire disclosure of which is incorporated herein by reference.

Technical field

[0002] The present invention relates to a steam oven for cooking food and a method for controlling the level of limescale in a steam oven for cooking food.

[0003] The technical field of reference of the present invention thus pertains to (domestic and professional) ovens for cooking or heating food.

[0004] Ovens for cooking food have gradually evolved over the years by integrating new functions and cooking modes.

[0005] For several years now, some ovens supplement so-called traditional cooking processes with steam cooking processes. Such ovens comprise a steam generation device comprising a boiler to generate steam, and a water/steam circuit comprising ducts to feed water to the boiler and additional ducts to feed the steam to the cooking chamber.

[0006] Steam generation devices, however, are subject to malfunctions due to limescale encrustations which accumulate in the water/steam circuit of the steam generation devices and/or in the boiler. Such encrustations prevent the boiler from functioning properly and/or the steam and/or water from being fed properly.

State of the art

[0007] Currently, in order to prevent this problem, upon completion of the steam cooking process, the steam generation device is emptied and, after a predefined number of cycles of use, a signal of the need for descaling is emitted.

[0008] This solution, however, does not guarantee that the descaling is actually carried out when necessary. Indeed, many factors influence the deposition of limescale such as, for example, the hardness of the water fed to the boiler (which can be variable), the number of operating cycles, the amount of time the water is in the boiler, etc.

Description of the invention

[0009] It is thus an object of the present invention to provide a steam oven for cooking food that is reliable independently of how the steam function is used and of the hardness parameters of the water used for the production of steam.

[0010] In accordance with these objects, the present invention relates to a steam oven comprising a cooking chamber, a steam generation device and a monitoring system; wherein the steam generation device is configured to generate steam to be fed into the cooking chamber and comprises a boiler and at least one auxiliary tank, which is in communication with the boiler to feed, in use, water to the boiler; the monitoring system being configured to monitor the level of limescale in the steam generation device and comprising a temperature sensor coupled to the boiler and a monitoring device configured to store at least one temperature value detected by the temperature sensor each time the steam function of the oven is activated, to compare the at least one acquired temperature value with a limescale threshold value, and to signal the need for descaling when the at least one temperature value detected by the temperature sensor is greater than the limescale threshold value.

[0011] It is a further object of the invention to provide a control method that is able to monitor the level of limescale accumulated in the steam generation device in a steam oven in a reliable and cost-effective manner.

[0012] In accordance with these objects, the present invention relates to a method for controlling the level of limescale in a steam oven as claimed in claim 14.

List of the figures

[0013] Further characteristics and advantages of the present invention will become clear from the following description of a non-limiting example embodiment of the same, with reference to the figures of the accompanying drawings, wherein:

- Figure 1 is a schematic representation of a steam oven according to the present invention;
- Figure 2 is a schematic representation of a first detail of the steam oven according to the present invention in a first operating configuration;
- Figure 3 is a schematic representation of a first detail of the steam oven according to the present invention in a second operating configuration;
- Figure 4 is a schematic representation of a first detail of the steam oven according to the present invention in a third

operating configuration;

- Figure 5 is a simplified diagram illustrating the evolution of the temperature detected in the boiler of a steam oven during a cooking process cycle of the oven when the steam function is activated;
- Figure 6 is a simplified diagram illustrating the evolution of the temperature detected in the boiler of a steam oven during successive cooking process cycles of the oven when the steam function is activated.

Description of an embodiment of the invention

[0014] In Figure 1, the reference number 1 indicates a steam oven comprising a muffle 2 that defines a cooking chamber 3 (partially visible), a door 4, a steam generation device 5 (schematically represented) and a monitoring system 6 (visible in Figures 2-4).

[0015] With reference to Figure 2, the steam generation device 5 comprises a boiler 8, a main tank 9 for water storage, an auxiliary tank 10 communicating with the boiler 8, a supply line 12 provided with a supply pump 13 and configured to feed water to the main tank 9 from a water inlet (not illustrated for simplicity), a discharge line 15 provided with a discharge pump 16 and configured to empty the main tank 9 and/or the auxiliary tank 10 and discharge the withdrawn water towards the water inlet, a supply/discharge regulating device 18 (preferably defined by a three-way valve arranged along the supply line 12 and connected to the discharge line 15), and a connecting valve 20, which regulates the connection between the main tank 9 and the auxiliary tank 10.

[0016] The monitoring system 6 comprises a temperature sensor 22 and a monitoring device 24. Preferably, the temperature sensor 22 is an NTC probe made of a sintered semiconductor material that exhibits a large resistive variation in response to a small temperature variation. The temperature sensor 22 is coupled to the boiler 8. Preferably, the temperature sensor 22 is coupled externally to the boiler 8.

[0017] The main tank 9 is provided with a level sensor (not illustrated for simplicity) able to measure the water level.

[0018] The temperature sensor 22 and the level sensor of the main tank 9 are configured to detect data and feed it to the monitoring device 24.

[0019] When the user selects the steam function, the monitoring device 24 calculates, based on the measurement of the level of water present in the main tank 9, the amount of water necessary to complete the steam cooking process based on the parameters set by the user (e.g., function, temperature, time). In other words, if there is already water in the main tank 9, the monitoring device 24 calculates the amount of water to be fed to the main tank 9 in addition to the water already present.

[0020] If the water present in the main tank 9 is insufficient, the monitoring device 24 activates the regulating device 18 in "supply" mode and activates the supply pump 13 until the level of water supplied into the main tank 9 reaches the calculated value (see the supply configuration in Figure 2).

[0021] During the steam cooking process, the boiler 8 generates steam and discharges it into the cooking chamber 2 by means of an injection duct 25. Preferably, the boiler 8 is regulated by the monitoring system 6 and performs, in sequence, switch-on and switch-off cycles controlled by the monitoring device 24.

[0022] When the temperature detected on the boiler 8 by the temperature sensor 22 exceeds a first temperature threshold, called "dry boiler threshold" $Temp_s$, the monitoring device 24 adjusts the connecting valve 20 to perform a refilling of the auxiliary tank 10 by making a part of the water flow from the main tank 9 to the auxiliary tank 10 (see the refilling configuration of Figure 3).

[0023] The connecting value 20 is preferably a regulating solenoid valve, whose opening/closing and adjustment is controlled by the monitoring device 24.

[0024] Once the refilling/filling of the auxiliary tank 10 has been carried out, the boiler 8 is reactivated and continues to carry out switch-on and switch-off cycles until the temperature detected by the temperature sensor 22 again exceeds the dry boiler threshold $Temp_s$, which causes a new refilling operation to start. In other words, reaching a temperature value equal to the "dry boiler threshold $Temp_s$" is indicative of a complete consumption of the water in the auxiliary tank 10.

[0025] If the level of water in the main tank 9 is lower than that required for the cooking process set by the user, the monitoring device 24 activates the regulating device 18 in "supply" mode and activates the supply pump 13 until the level of water supplied in the main tank 9 reaches the calculated value (see the supply configuration of Figure 2).

[0026] These operations (sequential switching-on/switching-off and refilling as required) are repeated until the cooking process is complete.

[0027] When the cooking process is complete, the user can perform a new steam cooking process, using the water left over from the previous cooking process, or empty the main tank 9 and the auxiliary tank 10 through activation of the discharge pump 16 and activation of the regulating device 18 in "discharge" mode (see configuration of Figure 4).

[0028] The monitoring device 24 is also configured to determine, based on at least one temperature value detected by the temperature sensor 22 in the boiler 8, the need to descale the boiler 8 and/or the entire steam generation device 5.

[0029] In particular, the monitoring device 24 is configured to capture the temperature values detected by the temperature sensor 22 with a certain sampling frequency.

[0030] In particular, the monitoring device 24 is configured to store the maximum temperature $Temp_{max}$ reached in the boiler 8 during a switch-on-switch-off cycle of a "water consumption period" TC.

[0031] A switch-on-switch-off cycle is to be understood as the time that elapses between one switch-on event of the boiler 8 and the next. In other words, the switch-on-switch-off cycle comprises the period in which the boiler is switched on (ON time) and the period in which the boiler is switched off between two consecutive switch-on events (OFF time). In Figure 5, the switch-on-switch-off cycle is visible as a temperature oscillation from a minimum to a maximum. "Water consumption period" TC, on the other hand, is to be understood as the time of complete consumption of the water in the auxiliary tank 10 (by reaching the dry boiler threshold temperature Temps). In other words, the water consumption period TC is the time that elapses between the conclusion of the operations of refilling/filling the auxiliary tank 10 and the reaching of the dry boiler threshold temperature Temps.

[0032] With reference to Figure 5, the steam cooking process thus consists of a number of water consumption periods TC interspersed by tank filling periods TR. In particular the diagram in Figure 5 shows the evolution of the temperature detected by the sensor 22 and the activation signal of the connecting valve 20 (variable between 0 and 1).

[0033] In the water consumption period TC, the activation signal of the regulating valve 20 is at zero, and there is an oscillation of the temperature due to the succession of switch-on and switch-off cycles of the boiler 8.

[0034] In the tank filling period TR, the temperature drops conspicuously while the activation signal is at 1.

[0035] The evaluation of the temperature for the purpose of determining the limescale level is preferably carried out as of the third switch-on-switch-off cycle of the boiler 8 while taking into account the maximum temperature reached during said cycle.

[0036] The first cycles (at least the first two and preferably the first three) have a substantially similar duration. After the third cycle, the duration of the switch-on and switch-off cycles can vary according to the steam intensity required by the user. As of the third cycle, however, there is a stabilization of the oscillation values of the temperature.

[0037] For the above reasons, there is a tendency to prefer a detection of the maximum temperature at the third switch-on and switch-off cycle, so as to reach a compromise between the duration of the cycle and the oscillation of the temperature. In this manner, the detection at each water consumption period TC is carried out under the substantially same boundary conditions and can be considered comparable and reliable. In order to reliably detect the state of limescaling of the boiler, it is thus necessary to detect a temperature value that is always comparable with all other detected values, regardless of the cooking-process type and intensity in progress.

[0038] In particular, the steam intensity related to the cooking requirements of the user can have a significant impact on the evolution of the temperature. To remedy this, the control algorithm, after the boiler 8 has been refilled and until the detection of the temperature useful for the purposes of the evaluation, carries out similar switch-on and switch-off cycles of substantially the same duration; only after the detection of the maximum temperature does the steam generation continue, adapting itself to the cooking process required by the user (by prolonging or reducing the duration of the switch-on and switch-off cycles).
This setting causes limited deviations relative to the standard approach and does not compromise the final result of the cooking process.

[0039] According to a variation not illustrated, the maximum temperature is detected in a switch-on and switch-off cycle comprised between the 4th and 6th cycles.

[0040] If the maximum temperature $Temp_{max}$ reached in the boiler 8 at the third cycle of a "water consumption period" TC is greater than or equal to a limescale threshold value Tcal, the monitoring device 24 detects an abnormal condition and signals the need for descaling (condition reached at the 4^{th} water consumption period TC4 in the example shown in Figure 5) .

[0041] If the maximum temperature $Temp_{max}$ reached in the boiler 8 at a defined instant of a "water consumption period" TC is lower than the limescale threshold value Tcal (condition reached in the first three water consumption periods TC1, TC2, TC3 in the example shown in Figure 5), the monitoring device 24 does not generate any signals and the switch-on and switch-off cycles continue normally.

[0042] The maximum temperature $Temp_{max}$ is influenced by the presence of limescale deposits.

[0043] Studies carried out by the Applicant have shown that a new or newly descaled boiler has a relatively low maximum temperature $Temp_{max}$; a boiler that is accumulating limescale on its walls reaches a higher maximum temperature $Temp_{max}$ under the same heating conditions and boundary conditions.

[0044] The limescale threshold value Teal is defined a *priori* taking into account the desired performance and functional aspects of the product, which must be guaranteed.

[0045] In particular, the limescale threshold value Tcal must be lower than the dry boiler threshold value $Temp_s$; otherwise, the functional aspect of the system is compromised.

[0046] In addition, the limescale threshold value Tcal must be sufficiently lower than the dry boiler threshold value $Temp_s$ so that the monitoring system 6 can take advantage of a sufficient space of time to alert the user of the need for descaling before the steam generation device 5 is no longer usable.

[0047] However, the limescale threshold value Teal cannot be too much lower than the dry boiler threshold value

$Temp_s$ either, because that would mean excessively reducing the operating hours of the system before descaling.

[0048] For example, the difference between the dry boiler threshold $Temp_s$ and the limescale threshold Teal is comprised between 8°C and 12°C and is preferably 10°C.

[0049] Preferably, as already partially disclosed, the monitoring device 24 is configured to signal the need for descaling when the maximum temperature $Temp_{max}$ reached in the boiler 8 in a defined cycle of a "water consumption period" TC is greater than or equal to a limescale threshold value Teal.

[0050] When the condition $Temp_{max} \geq Tcal$ occurs at the predefined instant of the water consumption period TC, the monitoring device 24 and the steam generation device 5 are functionally still operational. In other words, the monitoring device 24 provides a "soft" signal to the user, alerting him or her that the time to descale the steam generation device 5 is approaching, but potentially allowing him or her to carry out further steam cooking processes.

[0051] If the monitoring device 24 detects that the dry boiler threshold temperature $Temp_s$ is reached in a very short period of time (indicatively less than 30% of the expected time of duration of the water consumption period TC), the overheating of the boiler 8 is not due to the absence of water, but to a massive presence of limescale. In this case, the monitoring device 24 generates an alarm signal that imposes the descaling of the steam generation device 5 by preventing further steam cooking processes from being carried out. In such a case, the signal is thus of a "hard" type and prevents the use of the steam generation device 5.

[0052] According to a variation not illustrated, the monitoring system 6 is configured to determine an indication of the limescaling status as well and to provide, in real time, limescaling data to the user as an information parameter.

[0053] In particular, the monitoring device 24 is configured to calculate the degree of limescaling of the steam generation device 5 according to the following relation:

$$\%\ Limescaling\ \ (TCn) = \frac{Temp_{max}(TCn) - Temp_{max}D}{TCal - Temp_{max}D}\ 100$$

[0054] Where:

- TCn is the n-th period of water consumption in a cooking process;
- $Temp_{max}$ (TCn) is the maximum temperature detected in the boiler 8 in a switch-on-switch-off cycle within the respective n-th water consumption period TCn; as already mentioned in the foregoing, the acquisition of the temperature is carried out in a switch-on-switch-off cycle comprised between the 3rd and 6th;
- $Temp_{max}$ D is the maximum temperature expected in the selected switch-on-switch-off cycle (between the 3rd and the 6th) and in the specific water consumption period TCn when the boiler is new or newly descaled.
- TCal is the limescale threshold temperature.

[0055] For example, if $Temp_{max}$ D is 130°C, TCal is 150°C and the maximum temperature detected in the third cycle of the respective water consumption period TCn is 140°C, the calculated level of limescaling for that TCn is 50%.

[0056] The formula highlighted above has its basis in the fact that the maximum temperature reached by the boiler 8 in the presence of water and during the various heating steps tends to increase in proportion to the presence of limescale deposited on the walls of the boiler 8 and in the fact that the time of consumption of a certain fixed amount of water tends to remain independent of the amount of limescale deposited inside the boiler 8.

[0057] This is clearly evident in Figure 6, which illustrates a diagram of the evolution of the temperature in a succession of cooking process cycles. Each cooking cycle comprises n water consumption periods TC, and each water consumption period TCn comprises a plurality of switch-on-switch-off cycles. The maximum temperature detected at the nth cycle $Temp_{max}$ (TCn) is the maximum temperature detected in the boiler 8 in the third switch-on-switch-off cycle comprised in a respective n-th water consumption period TCn. In the non-limiting example in Figure 6, the limescale threshold Teal is reached at the water consumption period TC1, TC2, TC3, TC4 of the 6th cooking process.

[0058] Finally, it is evident that modifications and variations can be made to the oven and the method described herein without departing from the scope of the appended claims.

Claims

1. Steam oven comprising a cooking chamber (3), a steam generation device (5) and a monitoring system (6); wherein the steam generation device (5) is configured to generate steam to be fed into the cooking chamber (3) and comprises a boiler (8) and at least one auxiliary tank (10), which is in communication with the boiler (8) to feed, in use, water to the boiler (8); the monitoring system (6) being configured to monitor the level of limescale in the steam generation device (5) and comprising a temperature sensor (22) coupled to the boiler (8) and a monitoring device (24) configured

to store at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) each time the steam function of the oven (1) is activated, to compare the at least one stored temperature value ($Temp_{max}$) with a limescale threshold value (TCal) and to signal the need for descaling when the at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) is greater than or equal to the limescale threshold value (TCal).

2. Oven according to claim 1, wherein the activation of the steam function involves a succession of switch-on and switch-off cycles of the boiler (8); the monitoring device (24) being configured to store the maximum temperature value ($Temp_{max}$) measured during at least one switch-on-switch-off cycle.

3. Oven according to claim 2, wherein the switch-on and switch-off cycles follow each other in a water consumption period (TC); wherein the water consumption period (TC) corresponds to the period of time between the time of completion of filling of the auxiliary tank (10) and the time when the boiler (8) has consumed all the water in the auxiliary tank (10).

4. Oven according to claim 3, wherein the time when the boiler (8) has consumed all the water in the auxiliary tank (10) is identified by the monitoring device (24) when the temperature detected by the sensor (22) is at least equal to a dry boiler threshold temperature (Temps).

5. Oven according to claim 4, wherein the limescale threshold temperature (Tcal) is lower than the dry boiler threshold temperature (Temps).

6. Oven according to any of claims 3 to 5, wherein the monitoring device (24) is configured to stop the steam function when the dry boiler threshold temperature (Temps) is reached in a time less than 30% of the expected water consumption time (TC).

7. Oven according to any of claims 3 to 6, wherein the maximum temperature value ($Temp_{max}$) stored by the monitoring device (24) is the measurement of the maximum temperature detected by the temperature sensor (22) in one switch-on-switch-off cycle comprised between the 3rd and 6th from the time of completion of filling of the auxiliary tank (10) .

8. Oven according to claim 7, wherein the maximum temperature ($Temp_{max}$) stored is the measurement of the maximum temperature detected by the temperature sensor (22) in the 3rd switch-on-switch-off cycle from the time of completion of filling of the auxiliary tank (10).

9. Oven according to any of the preceding claims, wherein the monitoring device (24) is configured to generate no signal when the at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) is below the limescale threshold value (TCal).

10. Oven according to any of claims from 2 to 9, wherein the monitoring device (24) is also configured to determine an indication of the limescaling status and to provide, in real time, the limescaling data to the user as an information parameter.

11. Oven according to claim 10, wherein the monitoring device (24) is configured to calculate the degree of limescaling of the steam generation device (5) in real time according to the following relation:

$$Limescaling\ (TCn) = \frac{Temp_{max}(TCn) - Temp_{max}D}{TCal - Temp_{max}D}\ 100$$

Where:

- TCn is the n-th period of water consumption in a steam cooking process;
- $Temp_{max}$ (TCn) is the maximum temperature detected in a given switch-on-switch-off cycle within a respective n-th water consumption period (TCn) in the boiler (8);
- $Temp_{max}D$ is the maximum temperature expected in the selected switch-on-switch-off cycle and in the specific n-th water consumption period (TCn) when the boiler is new or newly descaled;
- TCal is the limescale threshold temperature.

12. Oven according to any of claims 3 to 11, wherein at least the first two switch-on and switch-off cycles within each

water consumption period (TC) have substantially similar durations.

13. Oven according to any of claims 3 to 12, wherein at least the first three switch-on and switch-off cycles within each water consumption period (TC) have substantially similar durations.

14. Method for monitoring the limescale level in a steam oven (1); the steam oven (1) comprising a cooking chamber (3), a steam generation device (5) and a monitoring system (6); wherein the steam generation device (5) is configured to generate steam to be fed into the cooking chamber (3) and comprises a boiler (8) and at least one auxiliary tank (10), which is in communication with the boiler (8) to feed, in use, water to the boiler (8); the monitoring system (6) comprising a temperature sensor (22) coupled to the boiler (8); the method comprising:

- storing at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) each time the steam function of the oven (1) is activated;
- comparing the at least one acquired temperature value with a limescale threshold value (TCal); and
- signalling the need for descaling when the at least one temperature value ($Temp_{max}$) detected by the temperature sensor (22) is greater than or equal to the limescale threshold value (TCal).

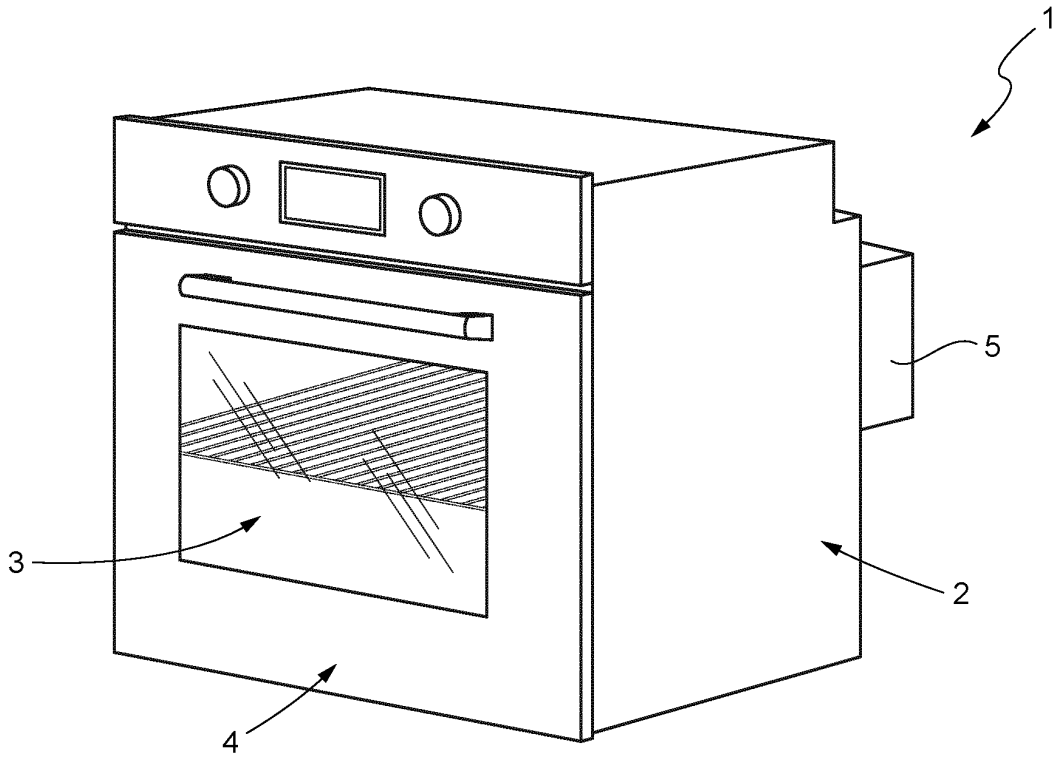

FIG. 1

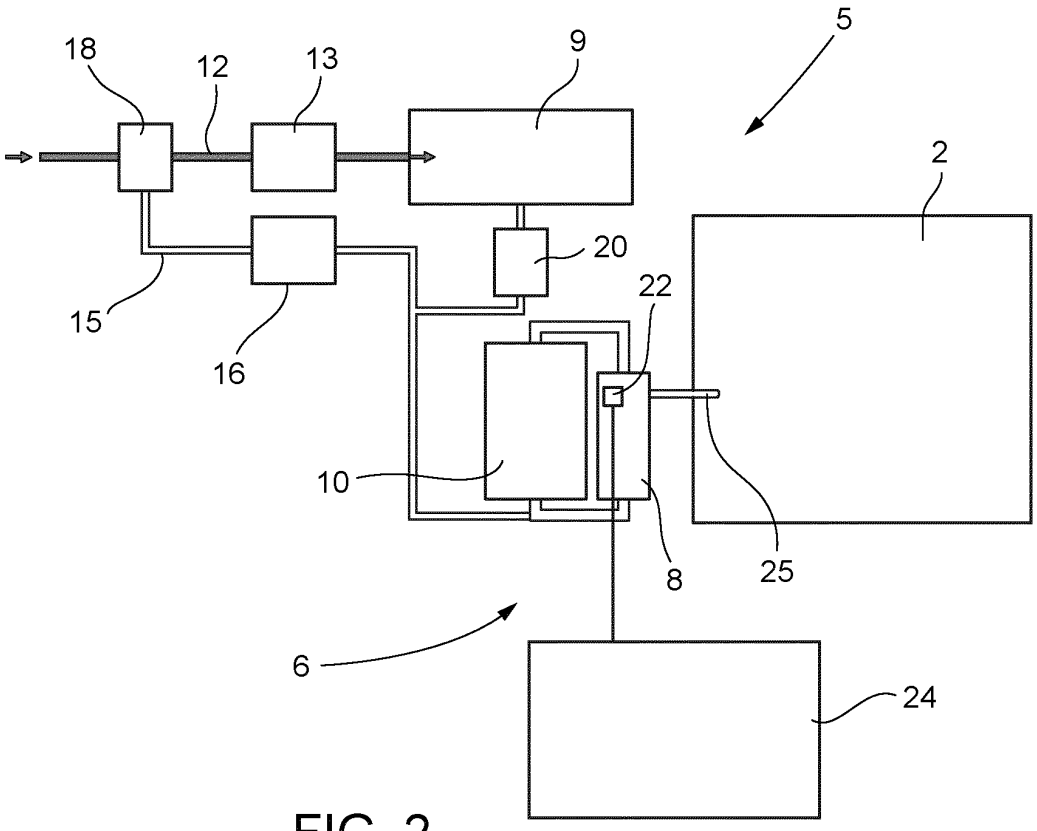

FIG. 2

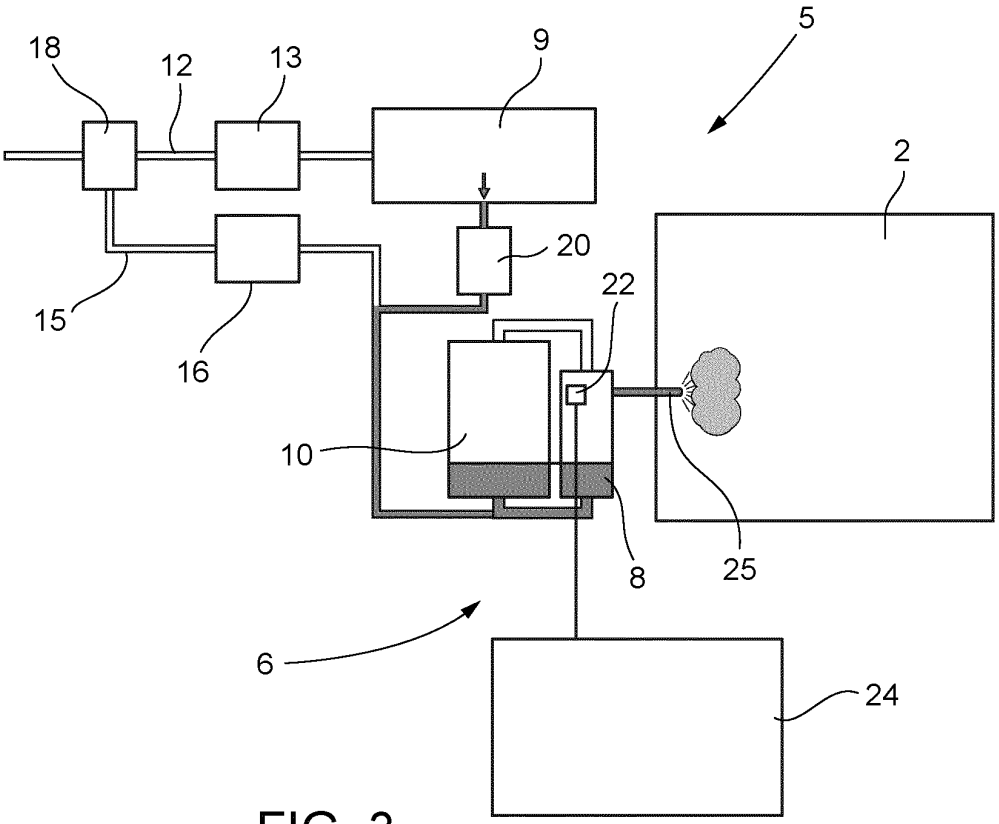
18
12
13
9
5
2
20
22
15
16
10
8
25
6
24

FIG. 3

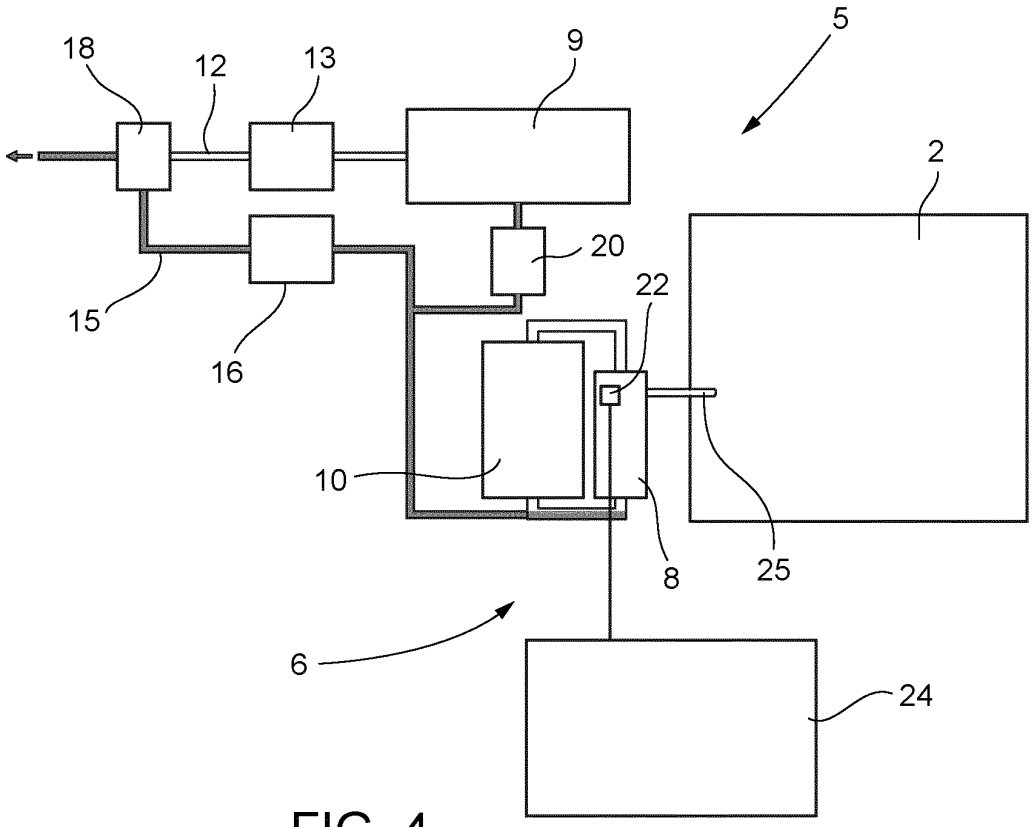
18
12
13
9
5
2
20
22
15
16
10
8
25
6
24

FIG. 4

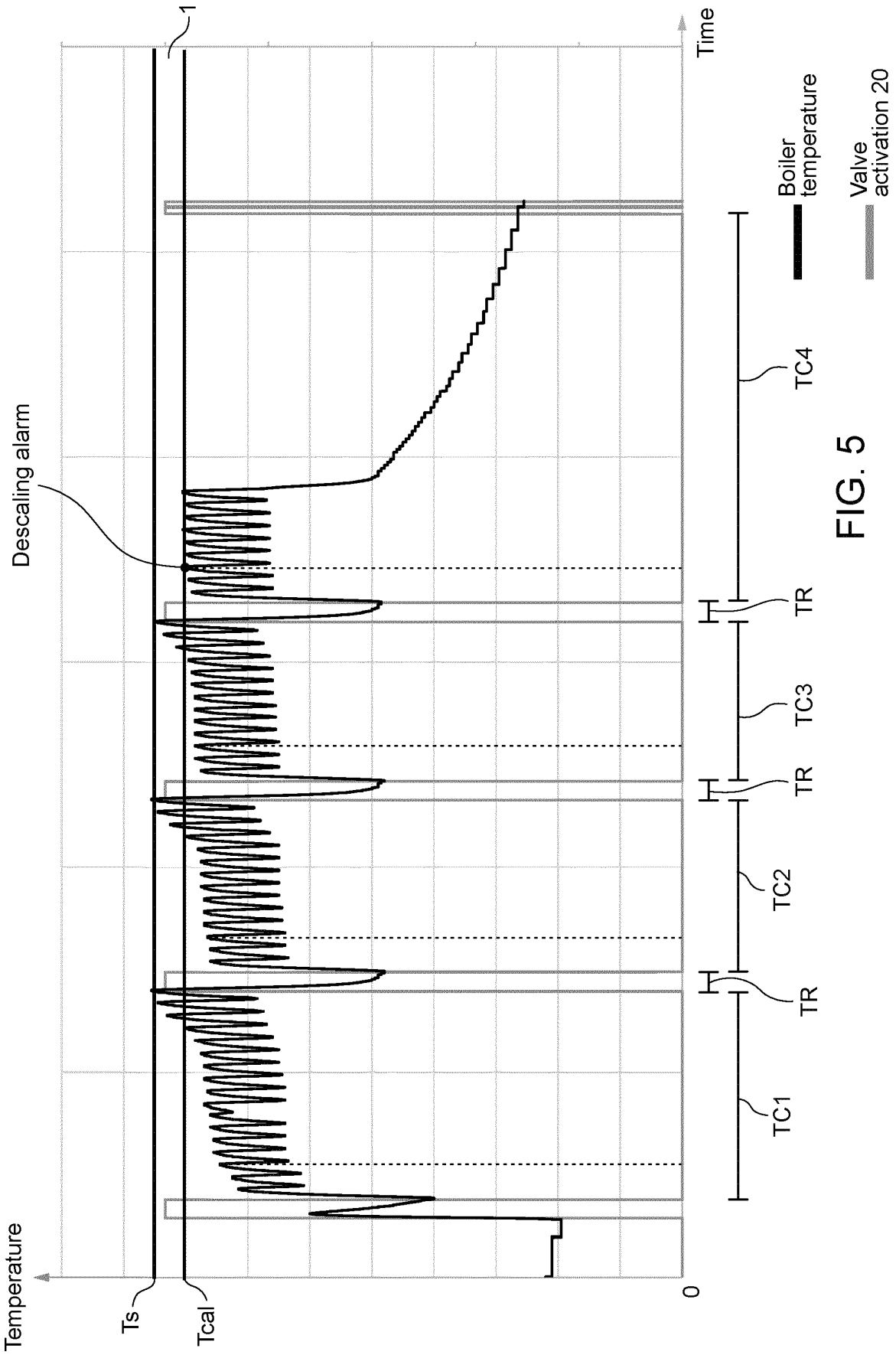
Temperature
Time
Descaling alarm
1
Ts
Tcal
0
TC1
TR
TC2
TR
TC3
TR
TC4
Boiler temperature
Valve activation 20

FIG. 5

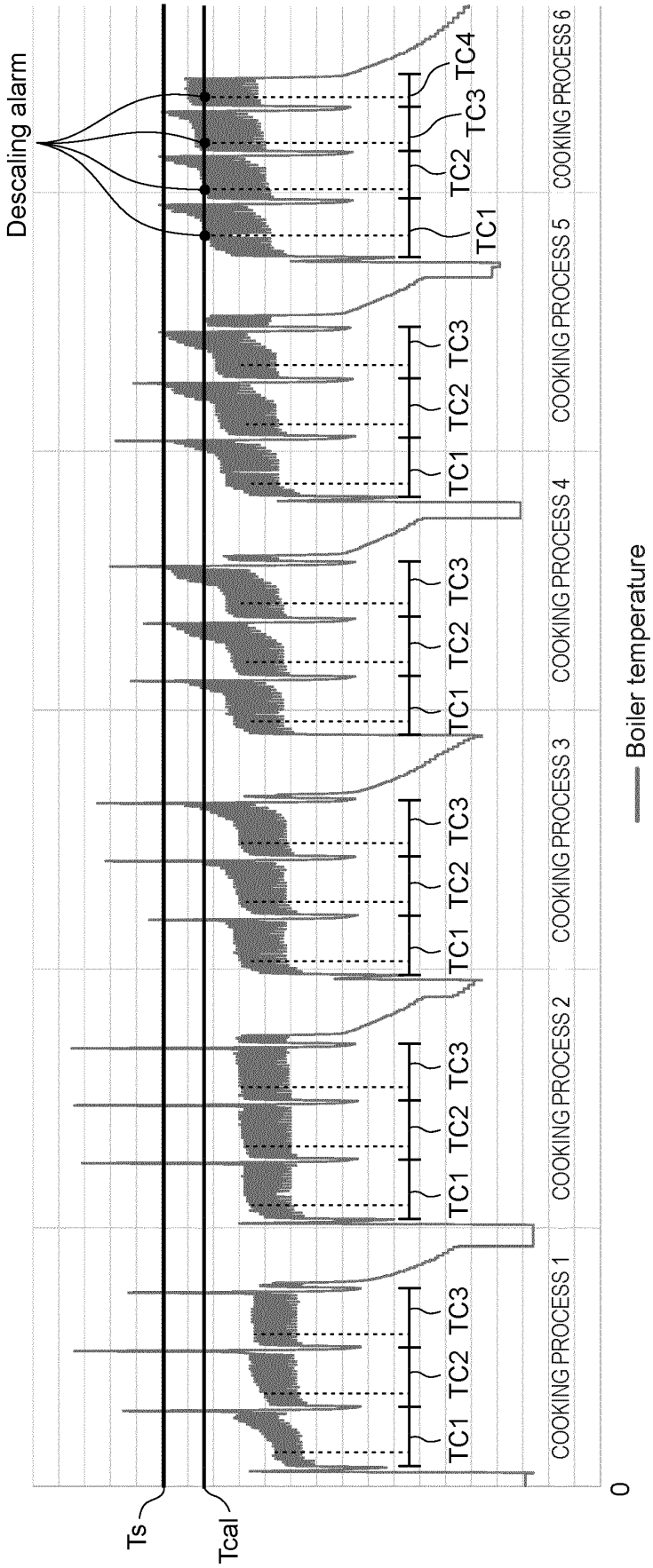
Descaling alarm
Ts
Tcal
0
Boiler temperature
COOKING PROCESS 1
COOKING PROCESS 2
COOKING PROCESS 3
COOKING PROCESS 4
COOKING PROCESS 5
COOKING PROCESS 6
TC1 TC2 TC3
TC1 TC2 TC3
TC1 TC2 TC3
TC1 TC2 TC3
TC1 TC2 TC3
TC1 TC2 TC3 TC4

FIG. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 20 4011

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 2 461 107 B1 (MIELE & CIE [DE]) 14 September 2016 (2016-09-14) * Parag. 40, lines 3-4; parag. 48; figures 1-4 *	1,5-9, 11,14 2-4,10, 12,13	INV. F24C15/32 F22B1/28
Y	US 4 281 636 A (VEGH ELMER S ET AL) 4 August 1981 (1981-08-04) * column 3, lines 28-30 *	2,3,12, 13	
Y	CN 217 274 087 U (NINGBO FOTILE KITCHEN WARE CO) 23 August 2022 (2022-08-23) * paragraph [0010] *	4	
Y	WO 2019/185321 A1 (BSH HAUSGERAETE GMBH [DE]) 3 October 2019 (2019-10-03) * claim 1 *	10	
A	EP 1 166 698 B1 (V ZUG AG [CH]) 23 April 2003 (2003-04-23) * paragraph [0036] *	1-12	
A	US 2016/316516 A1 (KOEBRICH HOLGER [DE] ET AL) 27 October 2016 (2016-10-27) * paragraph [0048] *	1-12	TECHNICAL FIELDS SEARCHED (IPC) F24C A47J F22B
A	EP 2 048 444 B1 (MIELE & CIE [DE]) 24 February 2016 (2016-02-24) * paragraph [0028] *	1-12	H05B A21B F22G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 January 2024	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 23 20 4011

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-01-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2461107 B1	14-09-2016	NONE	
US 4281636 A	04-08-1981	AU 538530 B2	16-08-1984
		CA 1147788 A	07-06-1983
		DE 3021418 A1	18-12-1980
		FR 2458260 A1	02-01-1981
		GB 2057253 A	01-04-1981
		JP S56927 A	08-01-1981
		US 4281636 A	04-08-1981
CN 217274087 U	23-08-2022	NONE	
WO 2019185321 A1	03-10-2019	EP 3775701 A1	17-02-2021
		WO 2019185321 A1	03-10-2019
EP 1166698 B1	23-04-2003	CH 691948 A5	14-12-2001
		EP 1166698 A1	02-01-2002
US 2016316516 A1	27-10-2016	CN 106063679 A	02-11-2016
		DE 102015207253 A1	27-10-2016
		EP 3088800 A1	02-11-2016
		ES 2857575 T3	29-09-2021
		PL 3088800 T3	17-05-2021
		US 2016316516 A1	27-10-2016
EP 2048444 B1	24-02-2016	DE 102007048567 A1	16-04-2009
		EP 2048444 A2	15-04-2009

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- IT 102022000021585 **[0001]**