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

(11) EP 2 511 614 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.10.2012 Bulletin 2012/42

(51) Int Cl.:
F24C 14/02 *(2006.01)* ***F24C 15/32*** *(2006.01)*

(21) Application number: **11003145.7**

(22) Date of filing: **14.04.2011**

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

(71) Applicant: **Electrolux Home Products Corporation N.V.**
1130 Brussel (BE)

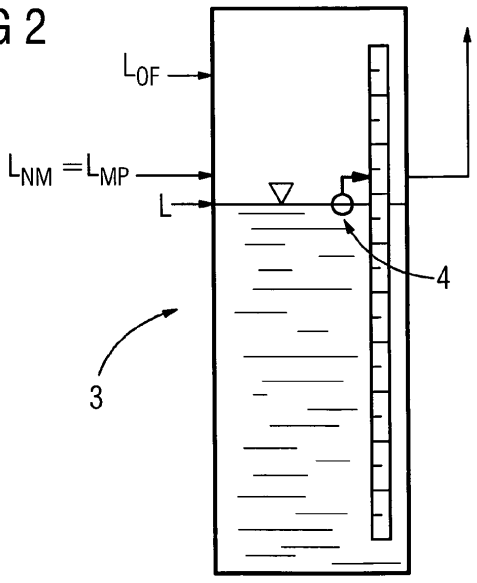
(72) Inventors:
- **Häuslein, Bianca**
  74523 Schwäbisch Hall (DE)
- **Reul, Kurt**
  91438 Bad Windsheim (DE)
- **Hauck, Alexander**
  74594 Bergertshofen (DE)
- **Morosini, Marcel**
  81520-900 Curitiba-PR (BR)
- **Jeanneteau, Laurent**
  60200 Compiègne (FR)

(74) Representative: **Baumgartl, Gerhard Willi et al**
Electrolux Dienstleistungs GmbH
Group Intellectual Property
90327 Nürnberg (DE)

(54) Method for operating a steam oven and steam oven

(57) The invention relates to a method for operating a steam oven (1), especially a domestic steam oven, wherein the steam oven (1) has a control unit (2) and a water reservoir (3) and wherein the steam oven (1) is equipped with a pyrolytic cleaning function. To better protect the electronics and sensors of the oven, the invention is characterized in that the operation of the pyrolytic cleaning comprises the following steps after the pyrolytic cleaning function is activated by the user: a) detecting of the actual water level (L) in the water reservoir (3) by the control unit (2); b) comparing of the detected actual water level (L) with a defined minimum pyrolytic water level (L_{MP}) by the control unit (2); c) starting the pyrolytic cleaning function by the control unit (2) if the actual water level (L) is equal or above the minimum pyrolytic water level (L_{MP}) or d) not starting the pyrolytic cleaning function but issuing of an alarm to the user by the control unit (2) if the actual water level (L) is below the minimum pyrolytic water level (L_{MP}) to alert the user to fill up water into the water reservoir (3). Furthermore, the invention relates to a steam oven.

FIG 2



EP 2 511 614 A1

Description

[0001] The invention relates to a method for operating a steam oven, especially a domestic steam oven, wherein the steam oven has a control unit and a water reservoir and wherein the steam oven is equipped with a pyrolytic cleaning function. Furthermore, the invention relates to a steam oven.

[0002] Steam ovens of this kind are well known in the art. It is also known that a certain amount of water is necessary in the water reservoir for properly carrying out the steam cooking process. Thus, water level detection in the water reservoir (water tank) is used at least in those cases in which a water reservoir is employed which is manually filled with water by the user. As an alternative the steam oven can directly be connected to a water pipe.

[0003] In JP 2005273991 A a steam oven is disclosed. Here the start of the cooking process is enabled only if enough water is present in the water reservoir.

[0004] DE 100 38 136 A1 discloses a steam oven comprising an emergency overflow system.

[0005] In DE 10 2008 014 040 A1 a steam oven is shown which comprises an air bubble detection equipment in the water supply.

[0006] It has been found that the pyrolytic process - which is often used in steam ovens for cleaning - is a quite high thermal load to the whole oven system. Problematic elements are especially the electronic components and the sensor element especially for detecting the water level in the water reservoir.

[0007] Therefore, it is an object of the invention to propose a method for operating a steam oven of the kind mentioned above which guarantees a better protection of the electronics and sensors of the oven. Thus, it should be made sure that especially the pyrolytic cleaning process does not harm the oven system.

[0008] The solution of this object is achieved by the proposed method in that the operation of the pyrolytic cleaning comprises the following steps after the pyrolytic cleaning function is activated by the user:

a) detecting of the actual water level in the water reservoir by the control unit;

b) comparing of the detected actual water level with a defined minimum pyrolytic water level by the control unit;

c) starting the pyrolytic cleaning function by the control unit if the actual water level is equal or above the minimum pyrolytic water level or

d) not starting the pyrolytic cleaning function but issuing of an alarm to the user by the control unit if the actual water level is below the minimum pyrolytic water level to alert the user to fill up water into the water reservoir.

[0009] Thus, the water level in the water reservoir is detected by suitable sensor elements; this is managed by the control unit. Only if a certain and special water level is given in the water reservoir (the defined minimum pyrolytic water level) the pyrolytic cleaning process is carried out; otherwise the user is alerted to fill up water into the water reservoir before the pyrolytic process is done. By doing so enough water is in the reservoir so that the thermal load to the components is reduced due to an insulating property of the water.

[0010] The operation of the pyrolytic cleaning can furthermore comprises the steps after the pyrolytic cleaning function is activated by the user and before carrying out above mentioned step c) :

b') after detecting of the actual water level in the water reservoir according to step a): comparing of the detected actual water level with a defined overfilled water level by the control unit;

c') starting the pyrolytic cleaning function by the control unit if the actual water level is below the overfilled water level or

d') not starting the pyrolytic cleaning function but issuing of an alarm to the user by the control unit if the actual water level is above the overfilled water level to alert the user to drain water from the water reservoir.

[0011] By doing so it is made sure that - on the other hand - not too much water is in the water reservoir before the pyrolytic cleaning process is carried out.

[0012] The minimum pyrolytic water level can be a maximum water level for normal steam cooking operation.

[0013] The minimum pyrolytic water level can also be a water level which is between a maximum water level for normal steam cooking operation and a defined overfilled water level.

[0014] An overfilling of the water reservoir can also be detected as such. Therefore, a version of the proposed method proposes that an alarm is issued to the user by the control unit if the actual water level is above a defined overfilled water level to alert the user to drain water from the water reservoir.

[0015] When it comes to the issuance of an alarm signal this signal can be an optical signal (e. g. a respective message on a display of the oven) or an acoustic signal.

[0016] The proposed steam oven with the pyrolytic cleaning function is characterized by the invention in that the steam oven comprises at least one sensor element to detect the actual water level in the reservoir, wherein the control unit comprises means for comparing the detected actual water level with a defined minimum pyrolytic water level and wherein the control unit comprises alarm means for issuing of an alarm to the user if the actual water level is below the minimum pyrolytic water level

and if a pyrolytic cleaning operation is activated.

[0017] The at least one sensor element can be designed to detect an overfilled water level, wherein the control unit comprises means for comparing the detected actual water level with the overfilled water level and wherein the control unit comprises alarm means for issuing of an alarm to the user if the actual water level is above the overfilled water level.

[0018] The sensor element can comprise at least one floating magnet and relay reeds. Also, it can be a capacitive element. Of course, also other detection elements to measure the water level in the water reservoir can be employed.

[0019] The control unit can be designed to calculate and output the water volume necessary to reach a defined water level in accordance with a detected water level by the sensor element. This means that the invention does not only supplies the signal "too less water in the water reservoir" or "too much water in the reservoir" but can also inform the user how much water has to be filled or drained into or from the tank.

[0020] Furthermore, the steam oven can comprise optical and/or acoustic alarm signal means.

[0021] So, the invention allows to detect the exact level of water reservoir of the steam oven which adds the functionality of overfill detection. Furthermore, the proposed concept tells the user in an accurate manner how much water is missing in the water reservoir or exactly how much water is too much in the reservoir.

[0022] By the concept according to the invention electronic and sensor elements which are employed to run the oven and to detect the water level in a precise way are specifically protected against overheating during the pyrolytic process; the pyrolytic cleaning function of the oven is only enabled, if enough water is in the water reservoir.

[0023] The present invention can be employed in the case that a removable water tank is used within the steam oven. It can also be the case that a build-in water reservoir is used which cannot be removed. Especially if this water reservoir is not visible for the user and thus that the water level cannot easily be monitored by the user the present invention develops its full benefits.

[0024] A removable water tank normally reduces the available space of the cavity or of the front panel of the oven. An invisible reservoir is sometimes better in this respect.

[0025] So, the concept according to the invention also defines at least two water levels, i. e. a maximum water level for normal steam cooking and an overfilled water level. By the proposed solution it becomes redundant to equip the system with a drain pipe for the case the too much water is in the water reservoir. Draining of water via a drain pipe of course has significant disadvantages which can be avoided by the invention.

[0026] A draining pipe can be arranged which is manually activated by the user to remove water from the reservoir.

[0027] Due to the sufficient water level in the water reservoir during the pyrolytic cleaning process it is made sure that the electronics and sensor element cannot be damaged due to too high temperatures.

[0028] The sensors for detecting the water level can thus easier be designed to detect a big range of filling degrees of the reservoir.

[0029] Due to a visual and/or acoustical alert the user can be easily informed concerning the filling or overfilling status of the reservoir.

[0030] Via the display the user can also be specifically informed how much water (i. e. how many millilitre) has to be refilled or drained into or from the reservoir. This can be done in a quite accurate manner due to the design of the sensor.

[0031] Consequently, the water reservoir does not need an automatic draining pipe system for the case of overfilling.

[0032] In the case of gas cavity, where internal overfilling is not recommended, the proposed oven avoids the leak of water in an undesirable way.

[0033] Thus, the user of the oven is better guided to ensure the right degree of filling of the water reservoir according to the actual process which is running in the steam oven (normal cooking operation or pyrolytic cleaning).

[0034] In the drawings an embodiment of the invention is depicted.

FIG 1 shows a schematic illustration of a steam oven in a sectional side view and

FIG 2 shows an enlarged view of the water reservoir of the steam oven according to the depiction of FIG 1.

[0035] In FIG 1 a steam oven 1 is shown schematically which has a cooking cavity 5 closable by a door 6. The steam oven is equipped with a well known arrangement to supply water steam into the cavity 5. For doing so, the steam oven 1 comprises a water reservoir 3 (water tank) in which water can be filled. Thus, the water which is filled into the water reservoir 3 reaches up to an actual water level L.

[0036] In the water reservoir 3 a sensor element 4 is arranged which is able to detect the actual water level L. The detected value for the actual water level is forwarded to a control unit 2 of the steam oven 1.

[0037] As can be seen in more detail in FIG 2 the water level L can reach a maximum water level L_{MN} for normal steam cooking. I. e. this water level L_{MN} is the maximum water level for the water in the reservoir 3 when normal cooking operation is required.

[0038] Furthermore, the water level can reach an overfilled water level L_{OF} which is a bit above the level L_{MN}, e. g. this level is reached when 10% to 20% more water is filled in the reservoir as in the case of the filling degree up to the level L_{MN}.

[0039] Also the steam oven 1 is equipped with - not depicted - means for carrying out a pyrolytic cleaning operation of the cavity 5. When pyrolytic cleaning is carried out a minimum pyrolytic water level L_{MP} must be maintained.

[0040] In the present case the minimum pyrolytic water level L_{MP} is equal to the maximum water level L_{MN} for normal steam cooking; but this needs not to be necessarily the case.

[0041] When a pyrolytic cleaning operation has to be carried out the user selects the respective pyrolytic cleaning program by means of an Input-Output-Device (not shown but connected with the control unit 2), i. e. the user activates the pyrolytic cleaning program.

[0042] The pyrolytic cleaning program does not start immediately. At first the actual water level L in the water reservoir 3 is detected by the sensor element 4 and registered by the control unit 2. Then a comparison takes place in the control unit 2 between the detected actual water level L and a stored value for the minimum pyrolytic water level L_{MP}.

[0043] The pyrolytic cleaning function is started then by the control unit 2 if the actual water level L is equal or above the minimum pyrolytic water level L_{MP}.

[0044] If this is not the case the pyrolytic cleaning function is not started by the control unit 2 but an alarm is issued to the user by the control unit 2 to alert him that water must be filled into the water reservoir 3.

[0045] It is possible that a message is outputted to the user saying how much water has to be filled into the reservoir 3.

[0046] Reference Numerals

1	Steam oven
2	Control unit
3	Water reservoir
4	Sensor element
5	Cooking cavity
6	Door
L	Actual water level
L_{MP}	Minimum pyrolytic water level
L_{OF}	Overfilled water level
L_{MN}	Maximum water level for normal steam cooking

Claims

1. Method for operating a steam oven (1), especially a domestic steam oven, wherein the steam oven (1) has a control unit (2) and a water reservoir (3) and wherein the steam oven (1) is equipped with a pyrolytic cleaning function,
characterized in that
the operation of the pyrolytic cleaning comprises the following steps after the pyrolytic cleaning function is activated by the user:

a) detecting of the actual water level (L) in the water reservoir (3) by the control unit (2);
b) comparing of the detected actual water level (L) with a defined minimum pyrolytic water level (L_{MP}) by the control unit (2);
c) starting the pyrolytic cleaning function by the control unit (2) if the actual water level (L) is equal or above the minimum pyrolytic water level (L_{MP}) or
d) not starting the pyrolytic cleaning function but issuing of an alarm to the user by the control unit (2) if the actual water level (L) is below the minimum pyrolytic water level (L_{MP}) to alert the user to fill up water into the water reservoir (3).

2. Method according to claim 1, **characterized in that** the operation of the pyrolytic cleaning furthermore comprises the steps after the pyrolytic cleaning function is activated by the user and before carrying out step c) of claim 1:

b') after detecting of the actual water level (L) in the water reservoir (3) according to step a) of claim 1: comparing of the detected actual water level (L) with a defined overfilled water level (L_{OF}) by the control unit (2);
c') starting the pyrolytic cleaning function by the control unit (2) if the actual water level (L) is below the overfilled water level (L_{OF}) or
d') not starting the pyrolytic cleaning function but issuing of an alarm to the user by the control unit (2) if the actual water level (L) is above the overfilled water level (L_{OF}) to alert the user to drain water from the water reservoir (3).

3. Method according to claim 1 or 2, **characterized in that** the minimum pyrolytic water level (L_{MP}) is a maximum water level (L_{MN}) for normal steam cooking operation.

4. Method according to claim 1 or 2, **characterized in that** the minimum pyrolytic water level (L_{MP}) is a water level which is between a maximum water level (L_{MN}) for normal steam cooking operation and a defined overfilled water level (L_{OF}).

5. Method according to claim 1, **characterized in that** an alarm is issued to the user by the control unit (2) if the actual water level (L) is above a defined overfilled water level (L_{OF}) to alert the user to drain water

from the water reservoir (3).

6. Method according to one of claims 1 to 5, **characterized in that** the alarm signal is an optical signal.

7. Method according to one of claims 1 to 5, **characterized in that** the alarm signal is an acoustic signal.

8. Steam oven (1), especially domestic steam oven, which has a control unit (2) and a water reservoir (3) and elements to carry out a pyrolytic cleaning function, for carrying out the method according to one of claims 1 to 7,
characterized in that
the steam oven (1) comprises at least one sensor element (4) to detect the actual water level (L) in the reservoir (3), wherein the control unit (2) comprises means for comparing the detected actual water level (L) with a defined minimum pyrolytic water level (L_{MP}) and wherein the control unit (2) comprises alarm means for issuing of an alarm to the user if the actual water level (L) is below the minimum pyrolytic water level (L_{MP}) and if a pyrolytic cleaning operation is activated.

9. Steam oven according to claim 8, **characterized in that** the at least one sensor element (4) is designed to detect an overfilled water level (L_{OF}), wherein the control unit (2) comprises means for comparing the detected actual water level (L) with the overfilled water level (L_{OF}) and wherein the control unit (2) comprises alarm means for issuing of an alarm to the user if the actual water level (L) is above the overfilled water level (L_{OF}).

10. Steam oven according to claims 8 or 9, **characterized in that** the sensor element (4) comprises at least one floating magnet and relay reeds.

11. Steam oven according to claims 8 or 9, **characterized in that** the sensor element (4) is a capacitive element.

12. Steam oven according to one of claims 8 to 11, **characterized in that** the control unit (3) is designed to calculate and output the water volume necessary to reach a defined water level in accordance with a detected water level by the sensor element (4).

13. Steam oven according to claim 12, **characterized in that** the water level is the minimum pyrolytic water level (L_{MP}).

14. Steam oven according to claim 12, **characterized in that** the water level is the maximum water level (L_{MN}) for normal steam cooking operation.

15. Steam oven according to one of claims 8 to 14, **characterized in that** it comprises optical and/or acoustic alarm signal means.

FIG 1

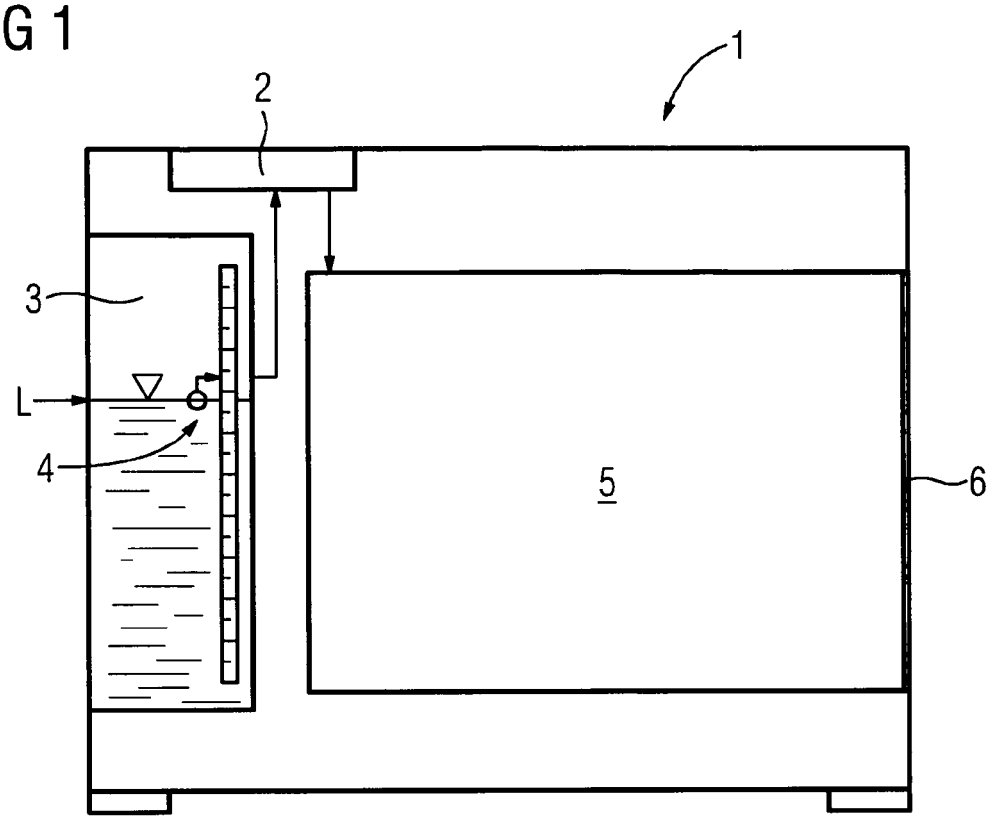
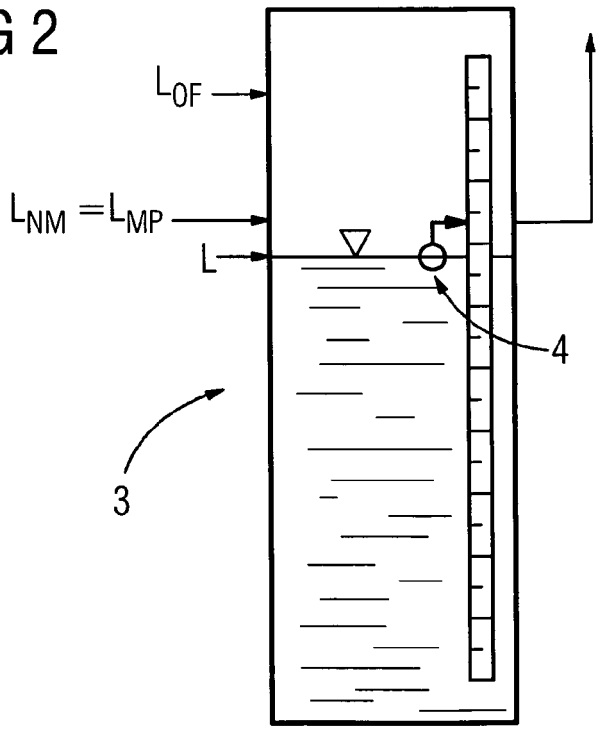


FIG 2



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 00 3145

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2007/204853 A1 (CHENG JASON [US] ET AL) 6 September 2007 (2007-09-06) * abstract * * paragraphs [0020], [0021] *	1-15	INV. F24C14/02 F24C15/32
Y	US 4 601 279 A (GUERIN JACKY [FR]) 22 July 1986 (1986-07-22) * abstract; figure 1 * * page 2, lines 5-19 *	1-15	
A	US 2006/000821 A1 (GEROLA DAVIDE [IT] ET AL) 5 January 2006 (2006-01-05) * abstract; figure 4 * * paragraph [0031] *	1-15	
A	DE 10 2006 050367 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 30 April 2008 (2008-04-30) * paragraph [0021] *	1	
A	WO 2010/128471 A2 (FILIPPI SRL [IT]; FILIPPI FILIPPO [IT]) 11 November 2010 (2010-11-11) * column 3, lines 41-65 *	1	TECHNICAL FIELDS SEARCHED (IPC) F24C A21B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 September 2011	Moreno Rey, Marcos

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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 00 3145

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.

15-09-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007204853 A1	06-09-2007	US 2007204855 A1	06-09-2007
US 4601279 A	22-07-1986	NONE	
US 2006000821 A1	05-01-2006	IT MI20040319 U1	30-09-2004
DE 102006050367 A1	30-04-2008	NONE	
WO 2010128471 A2	11-11-2010	NONE	

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

- JP 2005273991 A **[0003]**
- DE 10038136 A1 **[0004]**
- DE 102008014040 A1 **[0005]**