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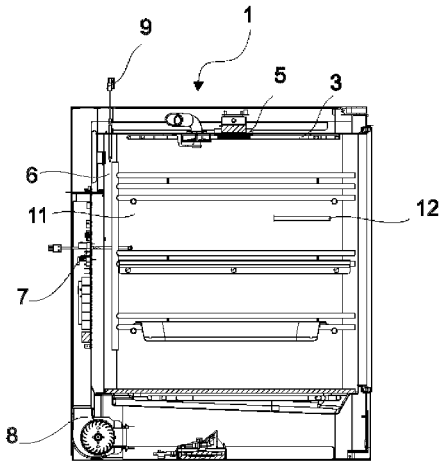
(71) Applicant: **Arçelik Anonim Sirketi**
34445 Istanbul (TR)

(72) Inventors:
- **ALTUNTAS, Hakan**
  34445 ISTANBUL (TR)
- **KANTAS, Murat**
  34445 ISTANBUL (TR)
- **KOC, Yusuf**
  34445 ISTANBUL (TR)
- **YAYLA, Sonat**
  34445 ISTANBUL (TR)

(54) A COOKING APPLIANCE HAVING AN IMPROVED DRYING ALGORITHM

(57) The present invention relates to a cooking appliance (1) comprising; a cavity (2) into which the articles to be cooked are placed, a heater (3) to heat the cavity (2), a door (4) providing access inside the said cavity (2), a liquid inlet (5) to transfer liquid into the cavity (2), an air exhaust tube (6) interconnecting the cavity (2) to the outer environment, a first sensor assembly (7) to detect the relative humidity inside the cavity (2), a blower (8) to force the circulation of the air between the cavity (2) and the outer environment.

Figure 2



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Description

[0001] The present invention relates to a cooking appliance, in particular to a cooking appliance having improved drying algorithm

[0002] The cooking appliances are commonly used to cook a wide range of food products such as sea products, vegetables, poultry and other types of meat products. In order to achieve the perfect taste and aroma, it is vital to clean the cooking appliances after each use so as to remove the odor and remains of the previously cooked item inside the cooking appliance. The cleaning of the cooking appliances are automated and comprises the steps of injection of cleaning fluids, discharging the said cleaning fluids followed by the drying of the cavity of the cooking appliance. Drying procedure is based on drying the cavity by the heaters followed by removal of humid air, resulting in drying of the cavity. The humidity of the air inside the cavity is measured by a humidity sensor and the drying procedure is terminated should a predetermined humidity level is reached. A problem faced with such a method is that the relative humidity of the ambient air is not taken into consideration; ergo, resulting the heater to operate more than required, especially in regions having high relative humidity.

[0003] A prior art publication in the technical field of the present invention may be referred to as US4547642A among others, the document disclosing a cooking appliance having self-cleaning properties and drying means.

[0004] An objective of the present invention is to minimize the energy consumption of the cooking appliance during drying and to optimize the drying according to current relative humidity.

[0005] Another objective of the present invention is to provide the users with a cooking appliance having an environment responsive drying procedure, therefore minimizing the need for the users to intervene.

[0006] The method realized to achieve the aim of the present invention and disclosed in the first claim and the dependent claims comprises a cooking appliance. The cooking appliance comprises a cavity wherein the articles are cooked. The cavity is separated from the outer environment via a door, the outer environment meaning the volume and space outside the cooking appliance. As the user closes the door and activates the cooking appliance, a heater inside or in close vicinity of the cavity turns on and cooking of the articles inside the cavity starts. The cooking appliance further comprises a blower, forcing the air inside the cavity to circulate and transfer the air to the outer environment via an air exhaust tube if necessary. During the cleaning operation of the cooking appliance, water or washing liquid is sprayed inside the cavity via a liquid inlet. The cooking appliance further comprises a first sensor assembly, wherein the said sensor assembly comprises means to detect the relative humidity of the air inside the cavity. The cooking appliance further comprises a second sensor assembly to detect and measure the relative humidity of the air outside the cooking appliance meaning that the relative humidity of the outer environment. A control unit is provided inside the cooking appliance wherein the control unit controls the operational function of the cooking appliance including but not limited to timing, cooking, cleaning and drying. The control unit is configured to energize the blower and the heater by a predetermined amount wherein the predetermined amount depends on the relative humidity readings' difference of the first sensor assembly and the second sensor assembly. By means of this, energy consumption of the cooking appliance is reduced. Particularly in high relative humidity environments, the relative humidity of the air inside the cavity remains relatively high, even during drying. By means of the second sensor assembly, measuring the relative humidity of the outer environment and transferring the said measurement to the control unit, the relative humidity of the air inside the cavity is normalized which in turn helps the control unit to turn of the blower and the heater sooner.

[0007] In an embodiment of the invention, the first sensor assembly is in communication with the air exhaust tube via which the temperature of the air passing through said air exhaust tube is measured.

[0008] In an embodiment of the invention, the first sensor assembly contact a surface of the cavity via which the temperature of the surface is measured.

[0009] In an embodiment of the invention, a temperature sensor measures the temperature of the air inside the cavity.

[0010] In an embodiment of the invention, the control unit, according to the temperature measurements, forms a decision matrix and energizes the blower and the heater by a predetermined amount. The control unit is connected to the first sensor assembly and the second sensor assembly and the temperature sensor. The control unit decides, according to the decision matrix and the relative humidity readings provided by the said sensor assemblies will turn off the heater and or the blower or energizes the heater and or the blower by a predetermined amount. By means of this, the energy consumption of the cooking appliance is further improved.

[0011] In the cooking appliance of the present invention, drying of the cooking appliance is optimized, reducing the energy consumption.

[0012] Another advantageous effect provided by means of this invention is that the cavity is completely dried, removing humidity completely which in turn eliminates the possibility of microbiological infestation.

[0013] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

Figure 1 - is a front view of the cooking appliance
Figure 2 - is a side view of cooking appliance along the dashed line in Fig -1

[0014] The following numerals are assigned to different parts demonstrated in the drawings and referred to in the present detailed description of the invention:

1. Cooking appliance
2. Cavity
3. Heater
4. Door
5. Liquid inlet
6. Air exhaust tube
7. First sensor assembly
8. Blower
9. Second sensor assembly
10. Control unit
11. Surface
12. Temperature sensor

[0015] The present invention relates to a cooking appliance (1) comprising; a cavity (2) into which the articles to be cooked are placed, a heater (3) to heat the cavity (2), a door (4) providing access inside the said cavity (2), a liquid inlet (5) to transfer liquid into the cavity (2), an air exhaust tube (6) interconnecting the cavity (2) to the outer environment, a first sensor assembly (7) to detect the relative humidity inside the cavity (2), a blower (8) to force the circulation of the air between the cavity (2) and the outer environment.

[0016] The present invention relates to a cooking appliance (1) further comprising a second sensor assembly (9) to detect the relative humidity of the outer environment and by a control unit (10) configured to control the drying of the cavity (2) by energizing the blower (8) and the heater (3) by a predetermined amount depending on the relative humidity differences between the two said sensor assemblies (7,9). The cooking appliance (1) comprises the cavity (2). The cavity (2) houses the articles to be cooked. The heater (3) is provided inside or in close vicinity of the cavity (2) and heats the cavity (2), therefore, cooking articles inside the cavity (2). The door (4) is pivotably attached to the front of the cooking appliance (1) and provides access or blocks access inside the cavity (2). The air exhaust tube (6) connects the cavity (2) to the outer environment. The air exhaust tube (6) allows air to be transferred between the cavity (2) and the outer environment. The first sensor assembly (7) is provided on the cooking appliance (1) and at least partly extends inside the cavity (2) measuring the relative humidity of the air inside the cavity (2). The blower (8) circulates the air inside the cavity (2) and transfers the air to the outer environment via the air exhaust tube (7). The cooking appliance (1) further comprises the second sensor assembly (9) wherein the second sensor assembly (9) is at least partly faces the outer environment and measures the relative humidity of the air of the outer environment. The cooking appliance (1) further comprises the control unit (10). The control unit (10) controls the functioning parts of the cooking appliance (1), the said functioning parts comprising but not limited to the blower (8), heater (3) the first and the second sensor assemblies (7,9). The control unit (10) is in communication with the first and the second sensor assemblies (7,9) and according to the relative humidity data provided by the said sensor assemblies (7,9), the control unit (10) energizes the blower (8) and the heater (3) by a predetermined amount. The control unit (10) energizes the blower (8) and the heater (3) with maximum capacity if the relative humidity difference between the outer environment and the cavity (2) is higher than a first value (ΔX_1). The control unit (10) energizes the blower (8) and the heater (3) with a capacity almost linearly dependent on the relative humidity difference between the outer environment and the cavity (2) if the humidity difference is lower than the first value (ΔX_1) but bigger than a second value (ΔX_2). The control unit (10) deenergizes the blower (8) and the heater (3) if the relative humidity difference between the outer environment and the cavity (2) is lower than the second value (ΔX_2). By means of this invention, the control unit (10) is able to response to the relative humidity of the air of the outer environment, therefore, decreasing the energy consumption of the cooking appliance (1). Another advantageous effect of the present invention is that the cavity (2) is completely dried in regions where the relative humidity of the air is higher. This helps to effectively dry the cavity (2), removing the odors and particles completely, therefore, achieving a successful cleaning. This both provides customer satisfaction and eliminates the possibility of microbiological growth inside the cooking appliance (1).

[0017] In an embodiment of the present invention, the first sensor assembly (7) is in communication with the air exhaust tube (6) via which the temperature of the air (T_1) passing through said air exhaust tube (6) is measured. The first sensor assembly (7) extends between the cavity (2) and the air exhaust tube (6). Therefore, measuring temperature of the air passing through said air exhaust tube (6) and measuring the relative humidity of the air inside the cavity (2) is achieved with a single sensor assembly and therefore, with a single assembly step, helping decrease the manufacturing costs.

[0018] In an embodiment of the present invention, the first sensor assembly (7) contacts a surface (11) of the cavity (2) via which the temperature of the surface (11) (T_2) is measured.

[0019] In an embodiment of the present invention, a temperature sensor (12) is provided to measure the temperature of the air inside the cavity (2) (T_3). By means of the temperature sensor (12), the temperature of the air inside the cavity (2) (T_3) is measured. This measurement (T_3) along with the previous measurements (T_1, T_2) helps calculate the drop of temperature through out the cooking appliance (1).

[0020] In an embodiment of the present invention, the control unit (10) according to the temperature measurements (T_1, T_2, T_3) forms a decision matrix and energizes the blower (8) and the heater (3) by a predetermined amount. The control unit (10) creates a decision matrix according to the said temperature measurements (T_1,

T_2, T_3). The relative humidity levels along with the said temperature measurements (T_1, T_2, T_3) helps the control unit (10) to decide for how long the blower (8) and the heater (3) is needed to be operated. This helps further decrease the energy consumption of the cooking appliance (1).

[0021] In the cooking appliance (1) of the present invention, energy consumption of the cooking appliance (1) is optimized by means of the first sensor assembly (7) and the second sensor assembly (9) which measure the relative humidity of the air inside the cavity (2) and that of the outer environment respectively. By means of the said measurements, the control unit (10) optimizes the operation of the blower (8) and the heater (3) which in turn helps to reduce the energy consumption of the cooking appliance (1).

Claims

1. A cooking appliance (1) comprising;
   a cavity (2) into which the articles to be cooked are placed,
   a heater (3) to heat the cavity (2),
   a door (4) providing access inside the said cavity (2),
   a liquid inlet (5) to transfer liquid into the cavity (2),an air exhaust tube (6) interconnecting the cavity (2) to the outer environment,
   a first sensor assembly (7) to detect the relative humidity inside the cavity (2), a blower (8) to force the circulation of the air between the cavity (2) and the outer environment,
   characterized by
   a second sensor assembly (9) to detect the relative humidity of the outer environment and by a control unit (10) configured to control the drying of the cavity (2) by energizing the blower (8) and the heater (3) by a predetermined amount depending on the relative humidity differences between the two said sensor assemblies (7,9).

2. A cooking appliance (1) according to claim 1, **characterized in that** the first sensor assembly (7) is in communication with the air exhaust tube (6) via which the temperature of the air (T_1) passing through said air exhaust tube (6) is measured.

3. A cooking appliance (1) according to claim 2, **characterized in that** the first sensor assembly (7) contact a surface (11) of the cavity (2) via which the temperature of the surface (11) (T_2) is measured.

4. A cooking appliance (1) according to claim 3, **characterized by** a temperature sensor (12) measuring the temperature of the air inside the cavity (2) (T_3).

5. A cooking appliance (1) according to claim 4, **characterized in that** the control unit (10) according to the temperature measurement s (T_1, T_2, T_3) forms a decision matrix and energizes the blower (8) and the heater (3) by a predetermined amount.

Figure 1

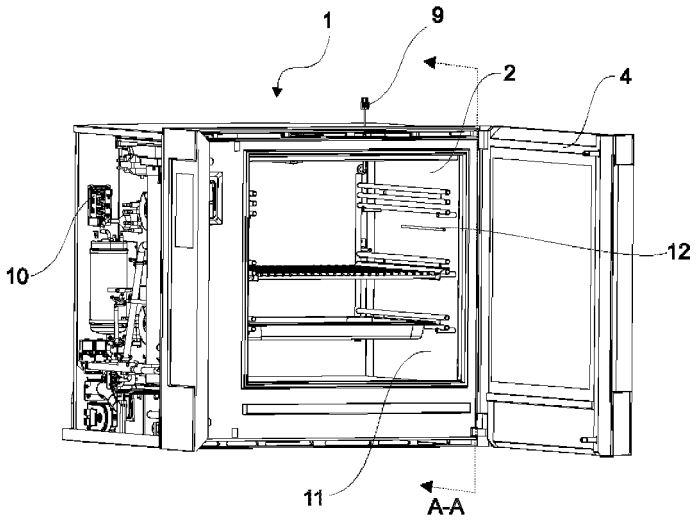
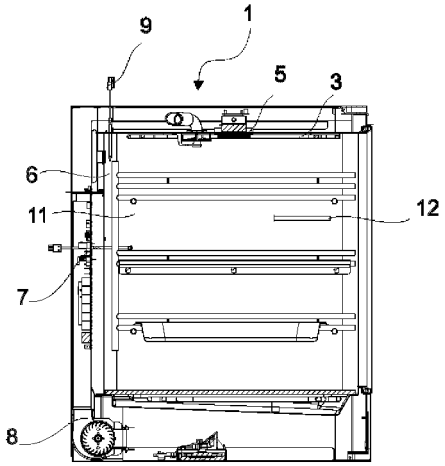


Figure 2



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EUROPEAN SEARCH REPORT

Application Number
EP 20 18 8020

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 2017/292713 A1 (BOEDICKER STEPHEN CHRISTOPHER [US] ET AL) 12 October 2017 (2017-10-12) * paragraph [0043]; figure 2 * -----	1-5	INV. F24C7/08 F24C15/20
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			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	24 November 2020	Adant, Vincent

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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24-11-2020

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

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