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(54) **OVEN AND CONTROL METHOD THEREOF**

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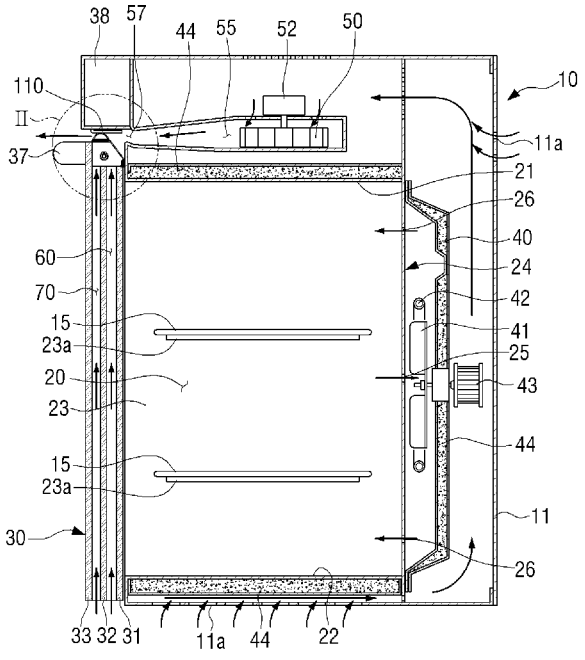
(57) **ABSTRACT**

An oven and a control method thereof are provided. The oven includes a case including a cooking chamber in an inside thereof, a door hinge-coupled to the case and configured to open and close the cooking chamber, a cooling fan disposed in an upper portion of the inside of the case and configured to discharge air toward a front of the cooking chamber, and a heat blocking unit configured to form a wind shield which blocks high-temperature heat and water vapor discharged from an inside of the cooking chamber by changing a direction of the air discharged through the cooling fan to a lower side of the cooking chamber. In response to the door being closed, a portion of the heat blocking unit is pressed through an upper portion of the door and non-interferes the air discharged toward the front of the cooking chamber and in response to the door being opened, the portion of the heat blocking unit pressed by the upper portion of the door is released and interferes the air discharged toward the front of the cooking chamber to form the wind shield.



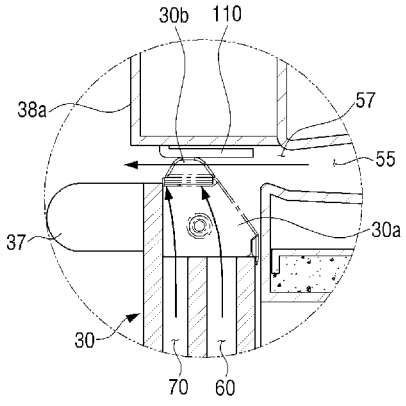


FIG. 1

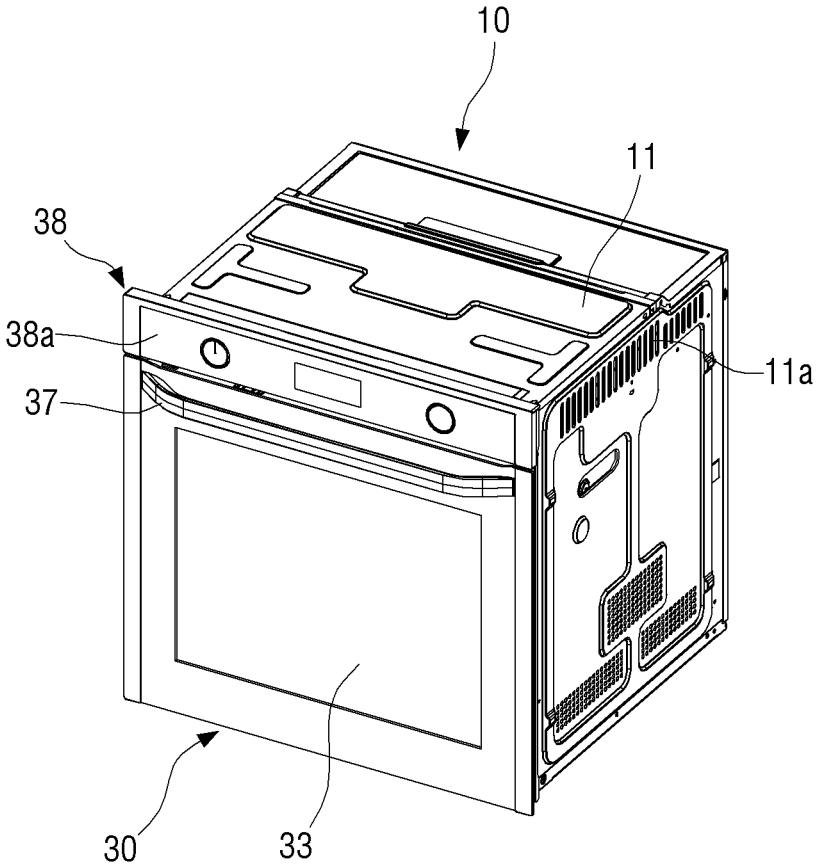


FIG. 2A

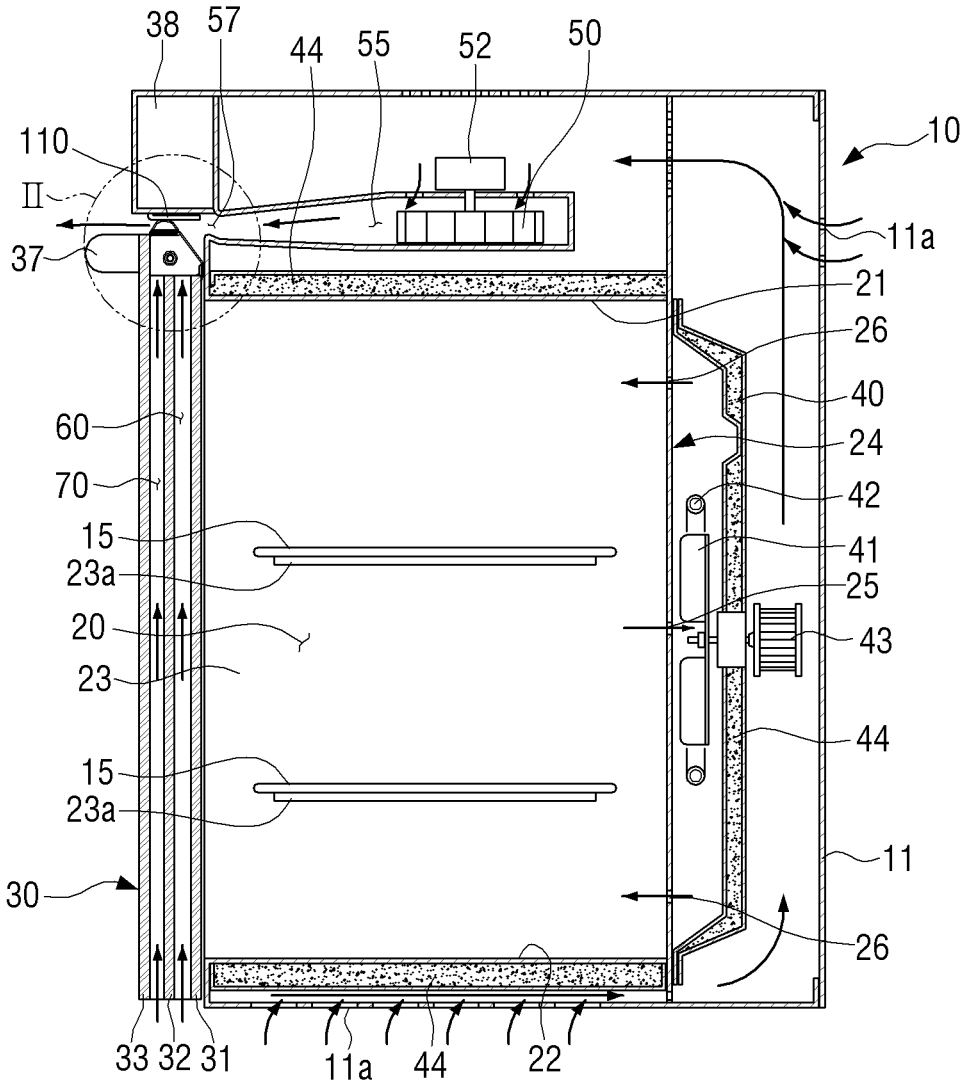

38
57
44
55
52
50
10
110
II
37
11a
21
26
40
60
24
70
42
15
41
23a
25
20
43
23
44
15
23a
11
30
26
33
32
31
11a
44
22

FIG. 2B

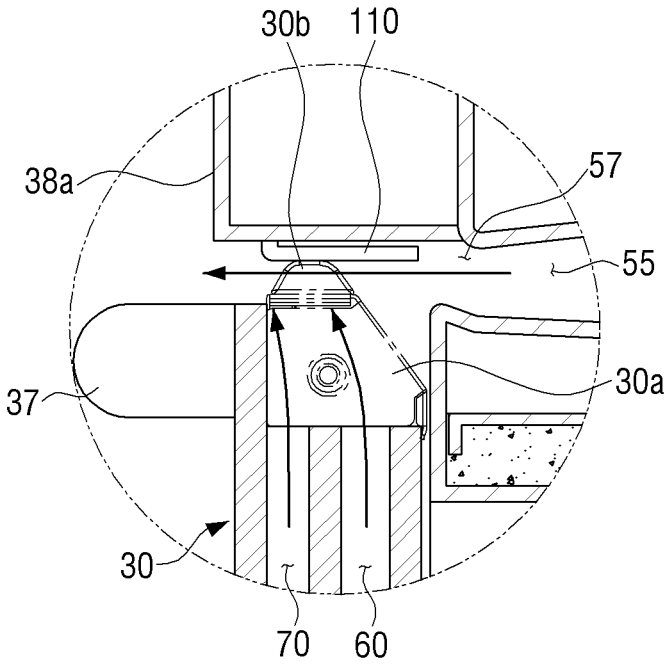


FIG. 3

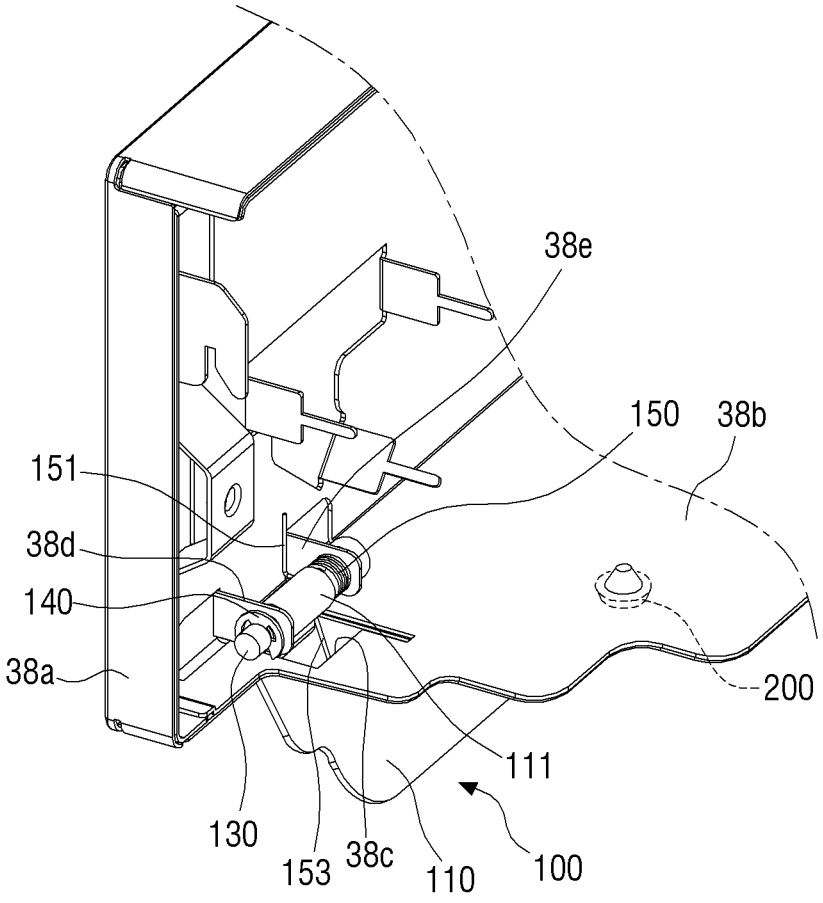


FIG. 4

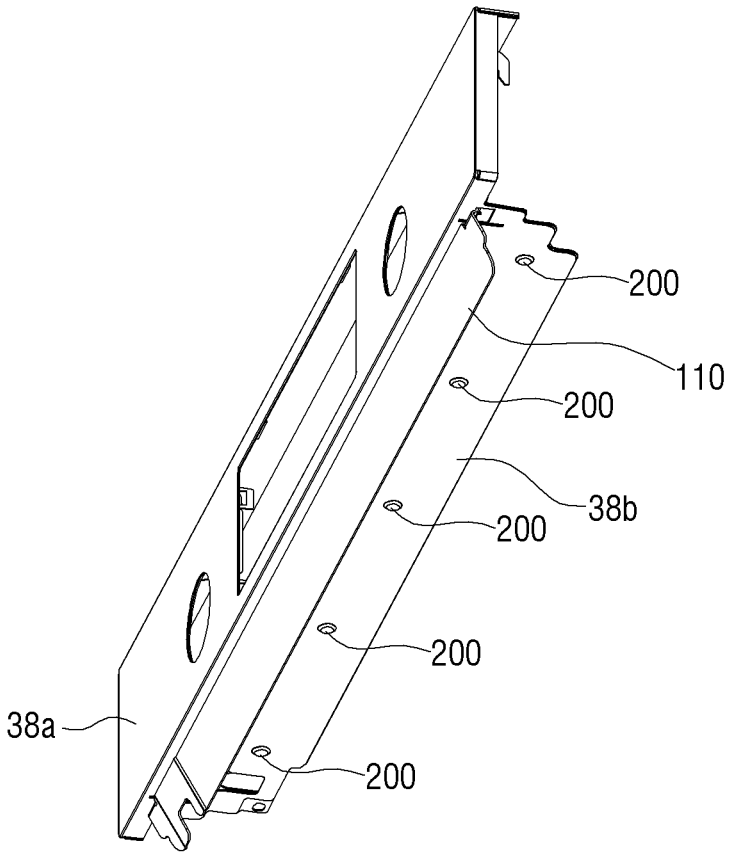


FIG. 5

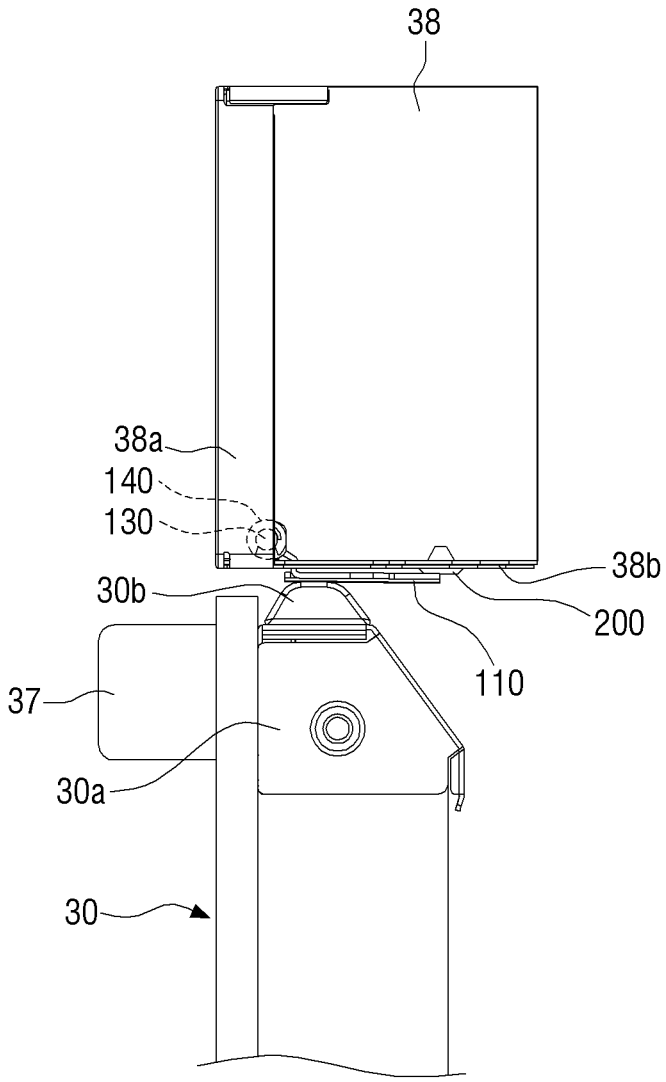


FIG. 6

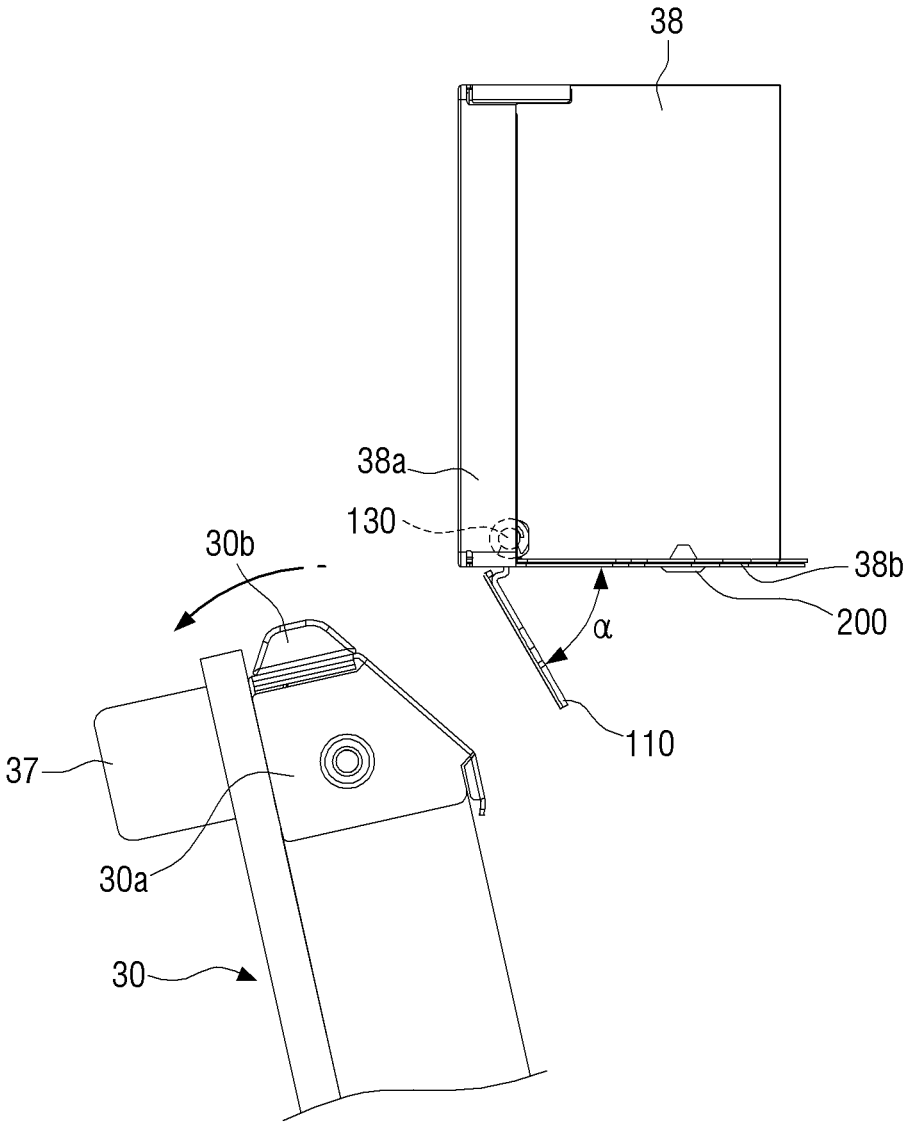


FIG. 7

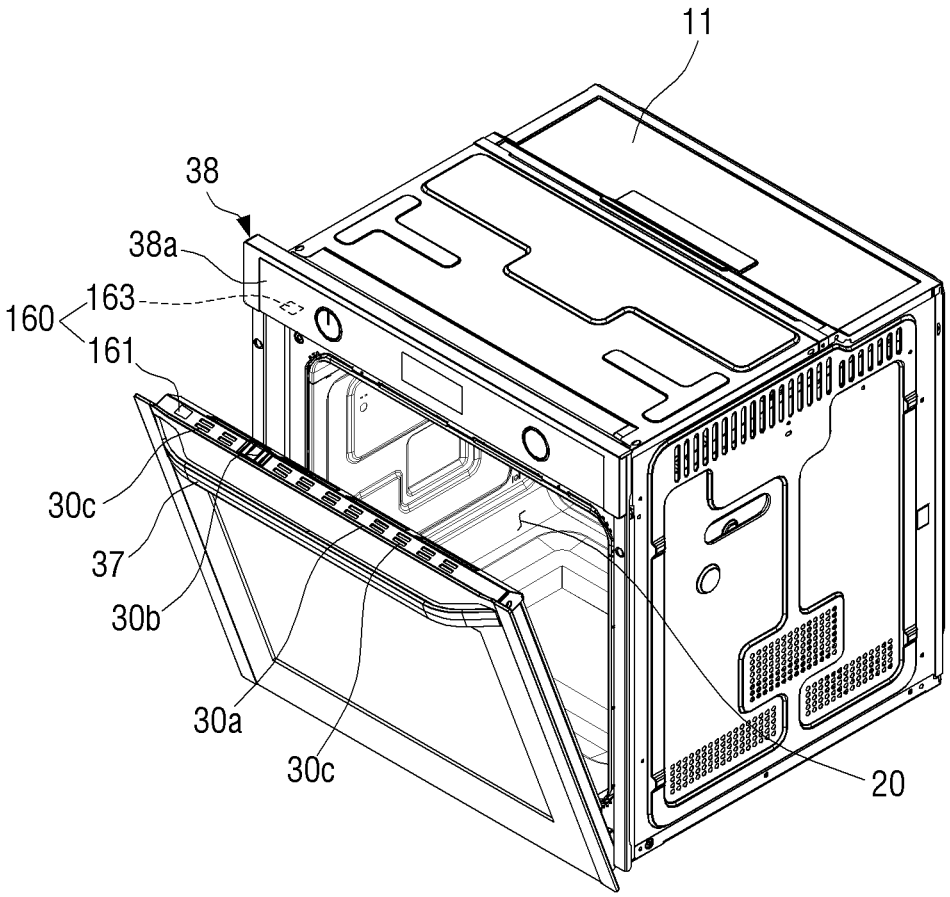


FIG. 8

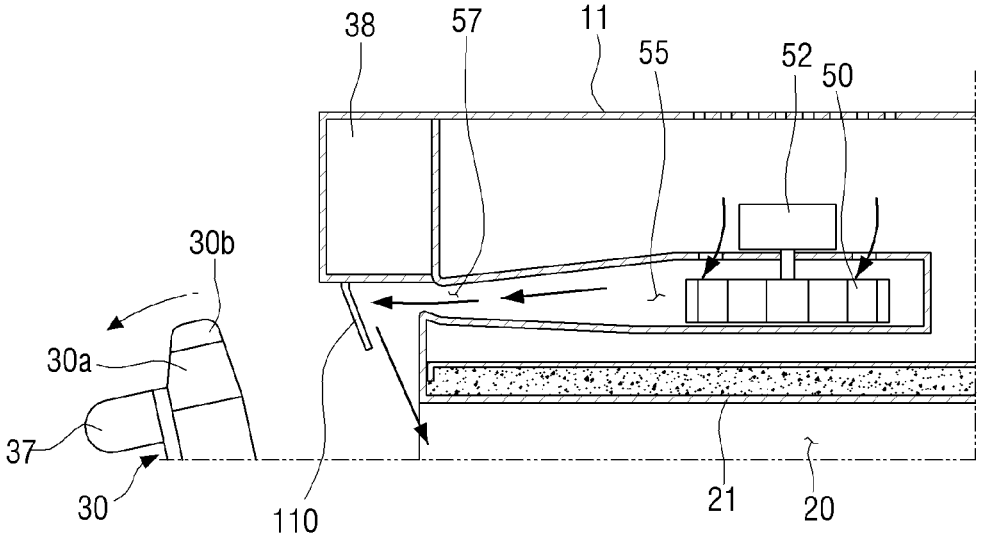
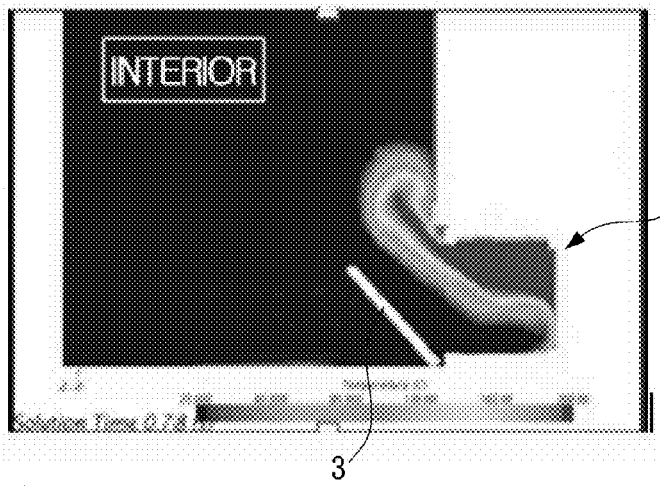
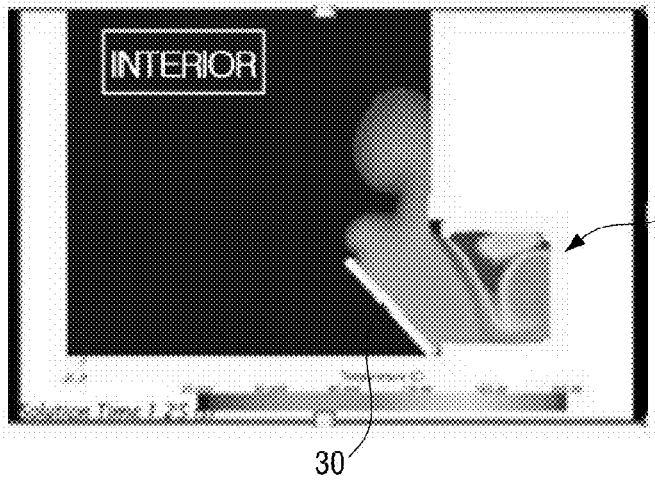


FIG. 9

(a)



(b)



(c)

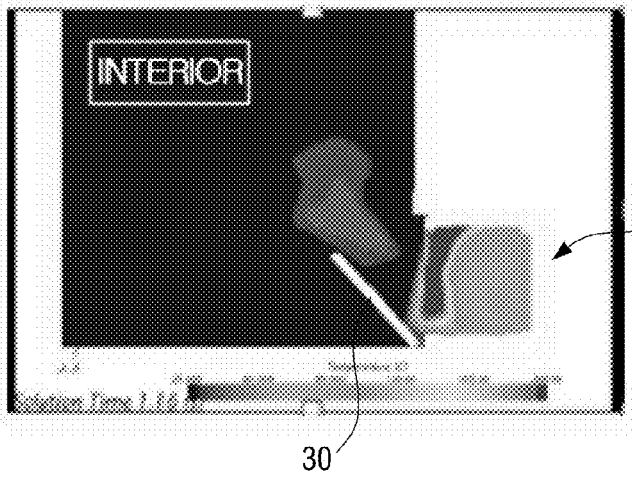


FIG. 10

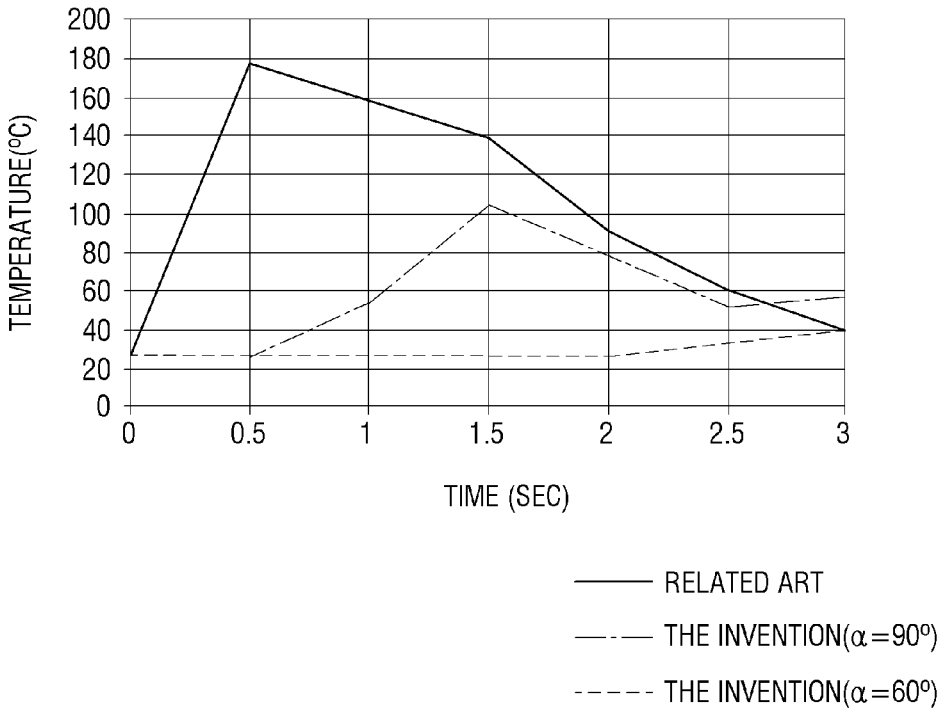
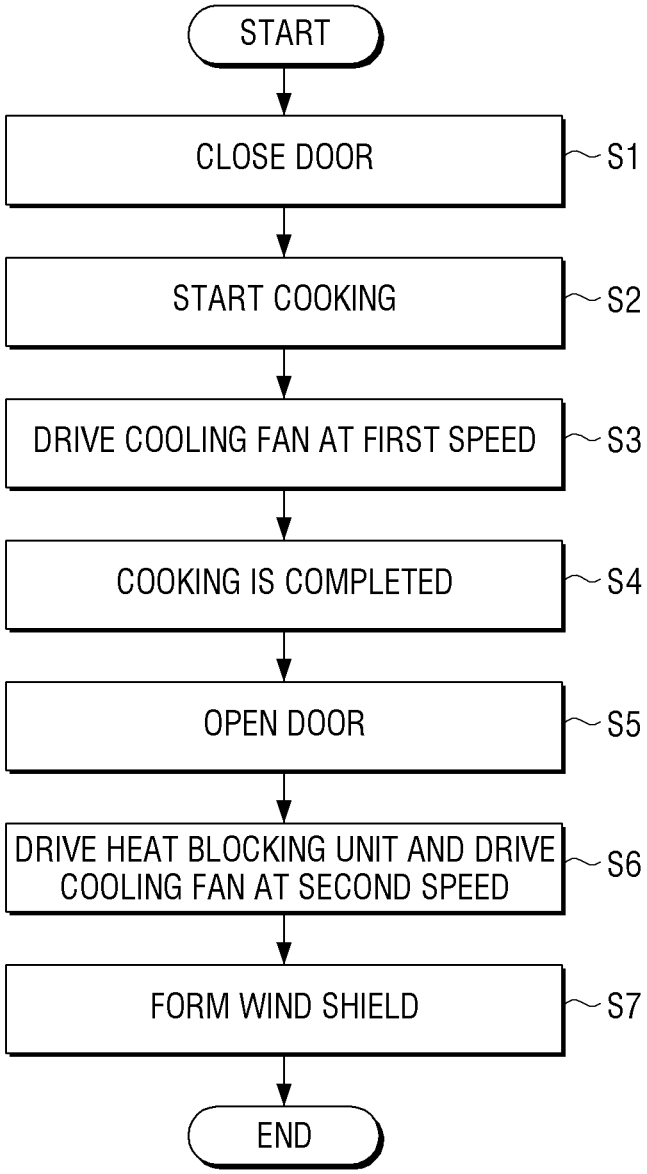

200
180
160
140
120
100
80
60
40
20
0
TEMPERATURE(°C)
0
0.5
1
1.5
2
2.5
3
TIME (SEC)
RELATED ART
THE INVENTION(α=90°)
THE INVENTION(α=60°)

FIG. 11


START
CLOSE DOOR
S1
START COOKING
S2
DRIVE COOLING FAN AT FIRST SPEED
S3
COOKING IS COMPLETED
S4
OPEN DOOR
S5
DRIVE HEAT BLOCKING UNIT AND DRIVE COOLING FAN AT SECOND SPEED
S6
FORM WIND SHIELD
S7
END

OVEN AND CONTROL METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from Korean Patent Application No. 10-2015-0134288, filed on Sep. 23, 2015, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] Field of the Invention

[0003] Apparatuses and methods consistent with exemplary embodiments relate to an oven and a control method thereof, and more particularly, to an oven capable of blocking high-temperature heat and water vapor which are discharged upwardly from a cooking chamber through a wind shield formed in door opening and a control method thereof.

[0004] Description of the Related Art

[0005] Ovens may be apparatuses which cook cooking materials by sealing and heating the cooking materials and may be typically divided into electrical ovens, gas ovens, and electronic ovens according to a heat source. The electrical ovens may use an electrical heater as the heat source, the gas ovens may use heat by gas as the heat source, and the electronic ovens as microwave ovens may use frictional heat of water molecules due to high frequency as the heat source.

[0006] In cooking using the oven in the related art, the temperature in the inside of the cooking chamber may be increased to about 300° C. Accordingly, in response to the door being opened to withdraw the cooking materials to the outside of the cooking chamber from the cooking chamber after the cooking being completed, the heat-temperature heat and water vapor may be discharged upwardly. Since the user who opens the door in front of the oven is directly exposed to the high-temperature heat and water vapor discharged upwardly from a cooking chamber, the user may suffer burns.

[0007] To overcome the problem, an oven, which blocks high-temperature heat and water vapor through an air curtain formed by discharging the cooling air to a direction substantially perpendicular to a plurality of air discharge holes formed over a front of a cooking chamber, has been developed. However, the air curtain has limits in blocking the high-temperature heat and water vapor which are rapidly discharged from the cooking chamber at the same time that the door is opened.

SUMMARY OF THE INVENTION

[0008] Exemplary embodiments may overcome the above disadvantages and other disadvantages not described above. Also, an exemplary embodiment is not required to overcome the disadvantages described above, and an exemplary embodiment may not overcome any of the problems described above.

[0009] One or more exemplary embodiments relate to an oven capable of efficiently blocking high-temperature heat or water vapor emitted toward a front of the cooking chamber from the cooking chamber through a wind shield formed through simultaneous operations of a blocking plate and a cooling fan in door opening and a control method thereof

[0010] One or more exemplary embodiments relate to an oven capable of removing noise generated by a blocking plate in door closing.

[0011] According to an aspect of an exemplary embodiment, there is provided an oven including a case including a cooking chamber in an inside thereof; a door hinge-coupled to the case and configured to open and close the cooking chamber; a cooling fan disposed in an upper portion of the inside of the case and configured to discharge air toward a front of the cooking chamber; and a heat blocking unit configured to form a wind shield which blocks high-temperature heat and water vapor discharged from an inside of the cooking chamber by changing a direction of the air discharged through the cooling fan to a lower side of the cooking chamber. In response to the door being closed, a portion of the heat blocking unit may be pressed through an upper portion of the door and may non-interfere the air discharged toward the front of the cooking chamber and in response to the door being opened, the portion of the heat blocking unit pressed by the upper portion of the door may be released and may interfere the air discharged toward the front of the cooking chamber to form the wind shield.

[0012] The cooling fan may rotate at a first speed in cooking and may rotate at a second speed faster than the first speed in response to the door being opened after the cooking.

[0013] The heat blocking unit may include a blocking plate hinge-coupled to a portion of the case close to an upper end of an opening of the cooking chamber and an elastic member configured to operate the blocking plate according to opening and closing of the door.

[0014] The blocking plate may be pressed through the door and set to a first position which non-interferes the air discharged toward the front of the cooking chamber in response to the door being closed and the blocking plate pressed through the door may be released and set to a second position which interferes the air discharged toward the front of the cooking chamber in response to the door being opened.

[0015] The blocking plate may be obliquely disposed downward toward the inside of the cooking chamber in the second position.

[0016] The second position may be located at an angle rotated by 50 to 90 degrees from the first position.

[0017] The oven may further include at least one buffer member provided in the portion of the case to absorb a shock of the blocking plate which moves from the second position to the first position.

[0018] The oven may further include a door open/close detector configured to detect the opening/closing of the door. The cooling fan may rotate at a first speed in response to the closing of the door being detected through the door open/close detector and may rotate at a second speed faster than the first speed in response to the opening of the door being detected through the door open/close detector.

[0019] According to an aspect of an exemplary embodiment, there is provided an oven including a case including a cooking chamber in an inside thereof; a door configured to open and close the cooking chamber; a cooling fan configured to change speed of air discharged toward a front of the cooking chamber by changing rotation speed; and a heat blocking unit configured to form a wind shield by changing a moving direction of the air through interference of the air discharged through the cooling fan according to opening of

the door. In response to the door being closed, a portion of the heat blocking unit may be pressed through an upper portion of the door and may non-interfere the air discharged toward the front of the cooking chamber and in response to the door being opened, the portion of the heat blocking unit pressed by the upper portion of the door may be released and may interfere the air discharged toward the front of the cooking chamber to form the wind shield.

[0020] The wind shield may be obliquely formed directed to a lower portion of the inside of the cooking chamber from an upper portion of an opening of the cooking chamber.

[0021] The portion of the blocking plate may be set to a position which non-interferes the air discharged by the cooling fan in response to the door being closed. The oven may further include at least one buffer member configured to absorb a shock generated by an operation according to a movement of the portion of the heat blocking unit to the position which non-interferes the air from a position which interferes the air.

[0022] According to an aspect of an exemplary embodiment, there is provided a method of controlling an oven, the method including setting a blocking plate disposed in an upper portion of an opening of a cooking chamber to a first position by closing a door; setting the blocking plate to a second position by opening the door after cooking is completed; and forming a wind shield from the upper portion of the opening of the cooking chamber to a lower portion of the opening through collision of air continuously discharged toward the blocking plate with the blocking plate.

[0023] Discharging speed of the air discharged toward the blocking plate set to the second position may be larger than that of air discharged in response to the blocking plate being set to the first position.

[0024] The discharged air may be provided through a cooling fan, and rotation speed of the cooling fan in the first position may be larger than that of the cooling fan in the second position.

[0025] The discharged air may be provided through a cooling fan, and the method may further include rotating the cooling fan at a first speed in response to closing of the door being detected and rotating the cooling fan at a second speed faster than the first speed in response to opening of the door being detected.

[0026] Additional aspects and advantages of the exemplary embodiments are set forth in the detailed description, and will be obvious from the detailed description, or may be learned by practicing the exemplary embodiments.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0027] The above and/or other aspects of the present invention will be more apparent by describing certain exemplary embodiments of the present invention with reference to the accompanying drawings, in which:

[0028] FIG. **1** is a perspective view illustrating an oven according to an exemplary embodiment;

[0029] FIG. **2**A is a cross-sectional diagram illustrating an oven according to an exemplary embodiment;

[0030] FIG. **2**B is an enlarged diagram illustrating a portion II indicated in FIG. **2**A;

[0031] FIG. **3** is a partially enlarged perspective view illustrating a heat blocking unit provided in an oven according to an exemplary embodiment;

[0032] FIG. **4** is a perspective view illustrating a blocking plate of a heat blocking unit and a buffer member provided in the blocking plate according to an exemplary embodiment;

[0033] FIG. **5** is a partially enlarged cross-sectional diagram illustrating a first position of a blocking plate of a heat blocking plate in door closing according to an exemplary embodiment;

[0034] FIG. **6** is a partially enlarged cross-sectional diagram illustrating a second position of a blocking plate of a heat blocking plate in door opening according to an exemplary embodiment;

[0035] FIG. **7** is a schematic perspective view illustrating a door open/close detector disposed in an upper end portion of a door and a lower end portion of a control panel according to an exemplary embodiment;

[0036] FIG. **8** is a partial cross-sectional diagram illustrating a state that a wind shield is formed through a heat blocking unit and a cooling fan according to door opening according to an exemplary embodiment;

[0037] FIGS. **9** to **10** are a diagram and a graph illustrating CAE air flow data which compares discharge degree of heat and water vapor in an oven which has no blocking plate in the related art and an oven according to an exemplary embodiment in response to a door of the oven being opened after cooking is completed; and

[0038] FIG. **11** is a flowchart sequentially illustrating a control process of an oven according to an exemplary embodiment.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0039] Various embodiments will now be described more fully with reference to the accompanying drawings in which some embodiments are shown. The techniques described herein are exemplary, and should not be construed as implying any particular limitation on the present disclosure. It should be understood that various alternatives, combinations and modifications could be devised by those skilled in the art. In the following description, unless otherwise described, the same reference numerals are used for the same elements when they are depicted in different drawings.

[0040] It will be understood that the terms first, second, third, etc. may be used herein to describe various elements and/or components regardless of the order and/or importance, and these elements and/or components should not be limited by these terms. These terms are only used to distinguish one element or component. For example, a first user apparatus and a second user apparatus may refer to user apparatuses different from each other regardless of the order or importance. Thus, without departing from the scope in the document, a first element and/or component discussed below could be termed a second element and/or component, and vice versa.

[0041] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present inventive concept. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this inventive concept belongs. It will be further understood that terms, such as those defined in

commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein. In some cases, the terms defined in the document should not be interpreted to exclude embodiments herein.

[0042] Hereinafter, a configuration of an oven according to an exemplary embodiment will be described in detail with the accompanying drawings.

[0043] FIG. **1** is a perspective view illustrating an oven according to an exemplary embodiment, FIG. **2**A is a cross-sectional diagram illustrating an oven according to an exemplary embodiment, and FIG. **2**B is an enlarged diagram illustrating a portion II indicated in FIG. **2**A.

[0044] Referring to FIGS. **1** and **2**A, an oven **10** according to an exemplary embodiment may include a case **11**, a cooking chamber **20**, a door **30**, a control unit **38**, a convection fan **41**, a cooling fan **50**, a heat blocking unit **100**, and a door open/close detector (see **160** of FIG. **7**).

[0045] The cooking chamber **20** may be provided in the inside of the case **11** and a plurality of inhalation holes **11***a* may be formed to inhale the air in the outside of the case **11** to the inside of the case **11** according to driving of the cooling fan **50**. The inhalation holes **11***a* may be formed in both sides, a bottom, and a rear of the case **11**. The case **11** may form an outer appearance of the oven **10** together with the door **30** rotatably coupled to a lower end of the case **11**.

[0046] The cooking chamber **20** may be a cooking space formed by a top plate **21**, a bottom plate **22**, both side plates **23**, and a rear plate **24**, and various parts constituting the oven **10** may be built in a space between the outside of the cooking chamber **20** and the case **11**. Heat-insulating members **44** configured to heat-insulate the cooking chamber **20** from the outside may be disposed in outer sides of the top plate **21**, the bottom plate **22**, and the side plates **23** constituting the cooking chamber **20** and a fan cover **40**. A control panel **38***a* configured to control an operation of the oven **10** may be installed in an upper end portion of the case **11**. The convection fan **41** which the fan cover **40** is coupled thereto and is configure to circulate the air through the cooking chamber **20** may be built in an outer side of the rear plate **24**. A plurality of inlet holes **25** may be formed around the center of the rear plate **24** facing the convection fan **41** to allow the air inside the cooking chamber to flow in, and a plurality of outlet holes **26** may be formed to supply the heat to the cooking chamber in an edge of the rear plate **24**.

[0047] At least one rack **15** configured to allow food to be placed thereon may be disposed in the inside of the cooking chamber **20**. Rails **23***a* which the rack **15** is attachable/detachable thereto/therefrom may be installed in inner side of the side plates **23**. The user may move the rack **15** through the rails **23***a* and may take out the food or place the food on the rack **15**.

[0048] The door **30** may be hinge-coupled to the lower end portion of the case **11** and may be installed to open/close the cooking chamber **20** by the user. A handle **27** configured to easily rotate the door **30** by the user may be attached to an upper portion of the door **30**.

[0049] The user may place the food on the rack **15** supported by the rails **23***a* and close the cooking chamber **20** by closing the door **30**. The user may operate the control panel **38***a* to allow an electrical heater **42** to generate heat and the convection fan **41** may be rotated through a driving motor **43**. Accordingly, the air in the inside of the cooking chamber **20** may flow in through the inlet holes **25**, heated through the electrical heater **42**, and then supplied to the cooking chamber **20** through the outlet holes **26**. The heated air supplied through the outlet holes **26** may be circulated in the inside of the cooking chamber **20** to cook the food.

[0050] Temperature in the inside of the cooking chamber **20** in the cooking process may be largely increased and the heat of the cooking chamber **20** may be transfer to the door **30** located in a front of the cooking chamber **20**. Since the door **30** is a part which is frequently touched by the user, it is important for the user not to suffer burns by the door **30** heated by the heat of the cooking chamber **20**. Accordingly, the oven **10** may include the cooling fan **50** configured to cool the door **30**.

[0051] The cooling fan **50** may be disposed to an outer side of the top plate **21** of the cooking chamber **20**. The cooling fan **50** may allow the external air to flow in the inside of the case **11** through the plurality of inhalation holes **11***a* of the case **11** and allow the air to be discharged to the front of the oven **10** again. For the operation of the cooling fan **50**, a cooling motor **52** may be coupled to one side of the cooling fan **50**. As the air is circulated through the cooling fan **50**, the door **30** and the whole inside of the case **11** may be cooled.

[0052] A cooling channel **55** may be installed in an upper side of the top plate **21** to discharge the air inhaled through the cooling fan **50** toward the front of the oven **10**. The cooling channel **55** may include an air discharge hole **57** in one end thereof close to the door **30** so as to discharge the inhaled air.

[0053] The air discharge hole **57** may be located in rear of the door **30** so that the air passing through the cooling channel **55** is discharged to the upper portion of the door **30**. The cooling channel **55** may be formed to be gradually narrowed toward a side of the air discharge hole **57** from a side of the fooling fan **50**. Accordingly, the speed of the air discharged from the narrowed air discharge hole **57** may be increased. As the speed of the air is increased, the pressure of the air may be reduced, and a venturi effect that inhales the air of atmospheric pressure may be generated in a place which the air passes through. Accordingly, the pressure in the upper portion of the door **30** which the discharged air passes through may be reduced, and thus the surrounding air may be collected to the upper portion of the door **30**.

[0054] The door **30** may be cooled using the force that the surrounding air is collected to the upper portion of the door **30**. For example, at least one door channel **60** and **70** may be provided in the inside of the door **30**. The door channels **60** and **70** may be installed so that the air inhaled in a lower end of the door **30** may flow toward the upper end of the door **30** close to the cooling channel **55** via the inside of the door **30**.

[0055] To form the at least one door channel **60** and **70**, the door **30** may include a plurality of piece of glasses **31**, **32**, and **33** provided to be spaced from each other. The plurality of piece of glasses **31**, **32**, and **33** may include an outer side glass **33**, a middle glass **32**, and an inner side glass **31** sequentially arranged at intervals. The outer side glass **33** may be exposed to the outside, and a handle **37** provided to easily rotate the door **30** by the user may be attached to the outer glass **33**. The inner glass **31** may be installed to seal the cooking chamber **20** and may be exposed to the outside in a state that the door **30** is opened. The middle glass **32** may

be located between the inner glass **31** and the outer glass **33** and form the plurality of door channels **60** and **70**.

[0056] In the oven **10** according to the exemplary embodiment, only one piece of middle glass **32** may be installed, and the door **30** may include one piece of outer glass **33**, one piece of middle glass **32**, and one piece of inner glass **31**. Accordingly, the door channels **60** and **70** may include a first door channel **70** formed between the outer glass **33** and the middle glass **32** and a second door channel **60** formed between the middle glass **32** and the inner glass **31**.

[0057] The door channels **60** and **70** may be formed to have a width of 5 mm or more sufficient to move the air. For example, the plurality of piece of glasses **31**, **32**, and **33** may be installed to be spaced at an interval of 5 mm or more.

[0058] A cooling operation of the door **30** will be described below. The door **30** may include the door channels which are coupled to the front of the oven **10** and allow the air to flow in the inside of the door, and the cooling fan **50** provided in an upper portion of the inside of the oven **10** may inhale the external air and discharge the air again. The air circulated through the cooling fan **50** may flow from the rear to the front of the oven **10** along the cooling channel **55** and may be discharged at fast speed to the upper portion of the door **30** through the air discharge hole **57** by the cooling channel **55** which is gradually narrowed toward the air discharge hole **57**. Accordingly, the external air which the pressure thereof is lowered and is discharged to the upper portion of the door **30** may move from the lower end of the door **30** to the upper end of the door **30** through the door channels **60** and **70** and may cool the door **30**. After the door **30** is cooled, the air moved to the upper end of the door **30** may pass through a plurality of exhaust holes (see **30***c* of FIG. **7**) formed in a heat **30***a* of the door **30** and then exhaust toward the front of the oven **10** as illustrated in FIG. **2**B.

[0059] The control unit **38** which is separated from the door **30** by a space that the air passing through the cooling channel **55** and the door channels **60** and **70** can escape to the front of the door **30** may be located over the door **30**. For example, the control unit **38** may be located in rear of the control panel **38***a* exposed to the outside. The control unit **38** may perform a cleaning mode which removes foreign materials through thermal decomposition by increasing the temperature of the inside of the cooking chamber **20**.

[0060] After the cooking through the heating of the food in the cooking chamber **20**, oil and the like derived from the food may be attached and then stiffed to an inner wall of the cooking chamber **20**, and thus the pyrolytic cleaning function may be used in response to the cleaning being difficult. The pyrolytic cleaning may be a method of burning and removing contaminants by keeping an internal temperature of the cooking chamber **20** to high temperature for a long time using the electrical heater **42**. Since a temperature larger than a cooking temperature is necessary for the pyrolytic cleaning, it may prevent the door **30** from being heated using two pieces of middle glass. Since the temperature of the cooking chamber **20** in the cooking keeps higher than the temperature in the pyrolytic cleaning, the cooling fan **50** may rotate at higher speed in the pyrolytic cleaning than in the cooking so that the door **30** is substantially maintained to the cooling state in the cooking.

[0061] A configuration of the heat blocking unit **100** will be described in detail with reference to FIGS. **3** to **6**. FIG. **3** is a partially enlarged perspective view illustrating a heat blocking unit provided in an oven according to an exemplary embodiment, FIG. **4** is a perspective view illustrating a blocking plate of a heat blocking unit and a buffer member provided in the blocking plate according to an exemplary embodiment, FIG. **5** is a partially enlarged cross-sectional diagram illustrating a first position of a blocking plate of a heat blocking plate in door closing according to an exemplary embodiment, and FIG. **6** is a partially enlarged cross-sectional diagram illustrating a second position of a blocking plate of a heat blocking plate in door opening according to an exemplary embodiment.

[0062] Referring to FIG. **3**, the heat blocking unit **100** may block high-temperature heat and water vapor discharged upwardly from the cooking chamber **20** in response to the door **30** being opened after the cooking so that the high-temperature heat and water vapor are not directed to the user. The heat blocking unit **100** may include a blocking plate **110**, a hinge pin **130**, and an elastic member **150**.

[0063] The blocking plate **110** may be elastically hinge-coupled to a portion of a rear of the control panel **38***a*. In response to the door **30** being closed, the blocking plate **110** may be pressed through a pressing projection **30***b* disposed over the heated **30***a* of the door **30** and may be disposed in a first position (see FIG. **5**) close to an extension plate **386**. The pressed state of the blocking plate **110** by the door **30** may be released in response to the door being opened, and thus the blocking plate **110** may be disposed in a second position (see FIG. **6**) away from the extension plate **38***b*.

[0064] The blocking plate **110** located in the second position may be rotated by a fixed angle α and may block the high-temperature heat and water vapor discharged from the cooking chamber **20**. For example, the angle α of the blocking plate **110** in the second position may be set in a range of 50 to 90 degrees toward the front of the cooking chamber **20** from the first position. In this example, the angle α of the blocking plate **110** in the second position may be set in a range of 50 to 70 degrees from the extension plate **38***b*. The direction of the wind shield may be changed according to the set angle α of the blocking plate **110**.

[0065] CAE air flow data with respect to the discharge degree of the heat and water vapor in response to the door being opened after the cooking is completed in an oven having no blocking plate in the related art and the oven in the exemplary embodiment will be compared with reference to FIGS. **9** and **10**.

[0066] Referring to **9**(*a*), in the oven having no blocking plate in the related art, as the heat and water vapor are obliquely discharged upwardly toward an upper end of an opening of the oven **1**, the surrounding temperature of the upper end of the opening of the oven **1** is increased to about 175° C. or more due to the discharged heat and water vapor at the same time that the door **3** is opened. The surrounding temperature distribution in the upper end of the opening of the oven **1** is represented in red in FIG. **9**(*a*). The colors represented in FIG. **9**(*a*) represent the temperature lowered in order of red, yellow, and cyan.

[0067] Accordingly, in response to the heat and water vapor discharged from the oven **1** in the related art being directed to a face of the user, the user may suffer burns.

[0068] In the exemplary embodiment, in response to the door **30** being opened, both in response to the set angle α of the blocking plate **110** being 90 degrees as illustrated in FIG. **9**(*b*) and in response to the set angle α of the blocking plate **110** being 60 degrees as illustrated in FIG. **9**(*c*), red is represented in the inner side of the oven **10** and is not

represented in the outer side of the oven **10**. In FIG. **9**(*c*), a portion represented by cyan is less distributed than a portion represented by cyan in FIG. **9**(*b*). It can be seen from the data that the set angle a of the blocking plate **110** is preferably set to 60 degrees rather than 90 degrees. In response to the set angle α of the blocking plate **110** in front of the opening of the oven **10** being 60 degrees, the surrounding temperature of the upper end of the opening of the oven **10** is about 45° C., and thus the temperature more lowered by 130° C. than the related art may be maintained.

[0069] The temperature over time after the door is opened will be described with reference to FIG. **10**. In the oven in the related art, the temperature is increased close to about 180° C. until 0.5 second after the door is opened, and the temperature is about 140° C. at 1.5 seconds and then gradually reduced.

[0070] In the oven according to an exemplary embodiment, in response to the set angle α of the blocking plate **110** being 90 degrees, the temperature is about 25° C. at 0.5 second after the door is opened, and the temperature is about 100° C. even at 1.5 seconds and then gradually reduced. Further, in response to the set angle α of the blocking plate **110** being 60 degrees, the temperature is increased close to about 25° C. at 0.5 second after the door is opened, and the temperature is maintained to about 25° C. even about 1.5 seconds and the temperature is maintained to about 40° C. at about 3 seconds.

[0071] The blocking plate **110** may be disposed in a lower end portion of the control panel **38***a*, for example, a bottom surface of the extension plate **38***b* formed to extend toward the inner side of the oven **10** from the lower end of the control panel **38***a* as illustrated in FIG. **4**. The blocking plate **110** may substantially have a length larger than or equal to a width of the cooking chamber **20**.

[0072] Hinge units **111** may be formed to extend in both end portions of the blocking plate **110**, and the hinge units **111** may be hinge-coupled to the rear of the control panel **38***a* through the hinge pins **130**. The hinge unit **111** may be coupled to the hinge pin **130** by passing through through holes **38***c* formed in the extension plate **38***b* of the control panel **38***a*.

[0073] The hinge pin **130** may be coupled to a pair of brackets **38***d* and **38***e* formed in the rear of the control panel **38***a*. For example, a fixing ring, for example, an E-ring may be coupled to the hinge pin **130** to prevent the hinge pin **130** from being separated from the brackets **38***d* and **38***e*.

[0074] The elastic member **150** may elastically support the blocking plate **110** so that the blocking plate **110** rotates from the first position (see FIG. **5**) to the second position (see FIG. **6**) in the response to the door **30** being opened. For example, the elastic member **150** may be configured of a torsion spring and may be coupled to the hinge pin **130**. In this example, one end **151** of the elastic member **150** may be supported by the rear of the control panel **38***a*, and the other end **153** of the elastic member **150** may be supported by the blocking plate **110**. Accordingly, the blocking plate **110** may receive elastic force to a direction away from the extension plate **38***b* by the elastic member **150**, and in response to the pressed state of the blocking plate **110** by the pressing projection **30***b* being released according to the opening of the door **30**, the blocking plate **110** may rotate to the second position.

[0075] The operation of the heat blocking unit **100** will be described with reference to FIGS. **5** and **6**.

[0076] As illustrated in FIG. **5**, in a state that to the cooking chamber **20** is being closed through the door **30**, the portion of the blocking plate **110** may be pressed through the pressing projection **30***b* provided in the heat **30***a* of the door **30** and thus the blocking plate **110** may be disposed to the first position close to the bottom surface of the extension plate **38***b*. The intensity of the elastic force applied to the blocking plate **110** through the elastic member **150** may be maximized.

[0077] In response to the cooking chamber **20** being opened through opening of the door **30** to withdraw the cooking material from the cooking chamber **20** after the cooking is performed in the state that the door **30** is closed as illustrated in FIG. **6**, the pressed state of the blocking plate **110** through the pressing projection **30***b* may be released and thus the blocking plate **110** may rotate to a direction away from the extension plate **38***b* step by step through the elastic member **150** and move to the second position. The portion of the blocking plate **110** may be interfered to a portion of the lower end of the control panel **38***a* and thus the blocking plate **110** may not move any longer and stop.

[0078] A plurality of buffer members **200** may be disposed at intervals along a length direction of the blocking plate **110** as illustrated in FIG. **4**. The buffer member **200** may prevent the blocking plate **110** from directly colliding with the bottom surface of the extension plate **38***b* in advance as illustrated in FIG. **5** in response to the blocking plate **110** being moved from the second position to the first position. For example, the buffer member **200** may be configured of a rubber material having elasticity to prevent the blocking plate **110** from being broken in colliding with the blocking plate **110** and to prevent noise from being generated according to the collision.

[0079] A configuration of the door open/close detector **160** provided in the oven **10** according to an exemplary embodiment will be described with reference to FIG. **7**. FIG. **7** is a schematic perspective view illustrating a door open/close detector disposed in an upper end portion of a door and a lower end portion of a control panel according to an exemplary embodiment.

[0080] The door open/close detector **160** may include a magnetic sensor **161** and a magnet **163** as a non-detection material detectable through the magnetic sensor **161**.

[0081] The magnetic sensor **161** may be disposed in an upper end portion of the door **30**, for example, the head **30***a* of the door **30** and the magnetic sensor **161** may be electrically coupled to the control unit **38** and may transfer a door open/close signal to the control unit **38**.

[0082] The magnet **163** may be disposed in a portion of the lower end of the control panel **38***a* so that the magnet **163** may be disposed in a position corresponding to the magnetic sensor **161** in a state that the door is closed.

[0083] The magnetic sensor **161** may be disposed in a position close and corresponding to the magnet **163** in a state that the door **30** is closed and may transfer a first voltage value to the control unit **38**. In response to the first voltage value being received from the magnetic sensor **161**, the control unit **38** may determine that the door **30** is closed.

[0084] In response to the door **30** being opened in a state that the door is closed, the magnet sensor **161** may be away from the magnet **163** and may transfer a second voltage value smaller than the first voltage value to the control unit **38**. Accordingly, the control unit **38** may determine that the door **30** is opened. In response to being determined that the

door **30** is opened after the cooking is completed, the control unit **38** may rotate the cooling fan **50** at faster speed than speed in the cooking, for example, at the same speed as speed that the cooling fan **50** is rotated in the pyrolytic cleaning and may discharge the cooling air to the air discharge hole **57**.

[0085] It has been described in the exemplary embodiment that the door open/close detector **160** includes the magnet sensor **161** and the magnet **163**, but this is not limited thereto. For example, the door open/close detector **160** may include a switch such as a plunger switch or a tactile switch. In this example, the magnet **163** as the non-detection material which is detected through the magnet sensor **161** may be omitted. The switch may be disposed in the upper end portion of the door **30** or the lower end portion of the control panel **38***a*. The switch may be disposed in any position that the switch is turned on/off by a neighboring structure in response to the door **30** being opened and closed. For example, in response to the switch being installed in the upper end portion of the door **30**, the neighboring structure may be installed in the lower end of the control panel **38***a* that the portion of the switch may be pressed to operate in response to the door being closed.

[0086] The oven **10** according to the exemplary embodiment may include a locking device (not shown) configured to prevent the door from being opened by an arbitrary behavior of the user during the cooking. The locking device may be locked and unlocked through the control unit **38**.

[0087] Hereinafter, the operation of the oven **10** having the above-described configuration according to an exemplary embodiment will be described with reference to FIGS. **2**, **8**, and **11**.

[0088] FIG. **8** is a partial cross-sectional diagram illustrating a state that a wind shield is formed through a heat blocking unit and a cooling fan according to door opening according to an exemplary embodiment, and FIG. **11** is a flowchart sequentially illustrating a control process of an oven according to an exemplary embodiment.

[0089] First, the user may place the cooking material in the cooking chamber **20** of the oven **10** to cook and close the door **30** (S**1**). While the door **30** is closed, the blocking plate **110** of the heat blocking unit **100** may be pushed through the pressing projection **30***b* of the door **30**, may be elastically supported through the elastic member **150**, and may be rotated to the first position (see FIG. **5**). The blocking plate **110** may be rotated close to the extension plate **38***b*, and one surface of the blocking plate **110** may be supported through the plurality of buffer members **200**. Accordingly, the collision of the blocking plate with the extension plate **38***b* may be prevented and thus the noise generation may be basically blocked.

[0090] In response to the door **30** being closed, the door open/close detector **160** may transmit the first voltage value to the control unit **38**. In response to the first voltage value being received from the door open/close detector **160**, the control unit **38** may determine that the door **30** is closed and lock the door **30** through the locking device.

[0091] In response to the setup for desired cooking time and temperature being completed through the operation of the control panel **38***a* by the user, the cooking may start through the control unit **38** (S**2**). For example, in response to the starting of the cooking, the control unit **38** may supply high-temperature air heated through the electrical heat **42** to the cooking chamber **20** by controlling the electrical heater **42** to generate heat and driving the convection fan **41**. Accordingly, the door **30** may also be heated through the temperature of the cooking chamber **20** gradually heated, and simultaneously the control unit **38** may rotate the cooling fan **50** at the first speed to cool the door **30** (S**3**).

[0092] As the cooling fan **50** is rotated at the first speed, the external air may flow in the inside of the case **11**, may be collected to the cooling fan **50**, and may be discharged to the air discharge hole **57** through the cooling channel **55** via the cooling fan **50**. The negative pressure may be formed in the upper end of the door **30** through the air discharged at the fast speed from the air discharge hole **57**. Accordingly, the external air may flow in the door channels **60** and **70** from the lower end of the door **30** and move to the upper end of the door, and thus the door **30** may be cooled.

[0093] In response to the cooking being completed (S**4**), the control unit **38** may release the locking of the door **30** by operating the locking device so that the cooking chamber **20** is opened by opening the door **30**.

[0094] In response to the door **30** being opened (S**5**), the door open/close detector **160** may transmit the second voltage value to the control unit **38**. The control unit **38** may determine that the door **30** is opened through the second voltage value received from the door open/close detector **160**.

[0095] While the pressed state of the blocking plate **110** by the pressing projection **30***b* of the door **30** is released through the opening of the door **30**, as illustrated in FIG. **8**, the blocking plate **110** of the heat blocking unit **100** may be rotated to the second position from the first position (as a position in a state that the door **30** is closed) through the elastic force of the elastic member **150**. Simultaneously, the control unit **38** may rotate the cooling fan **50** at the second speed faster than the first speed (S**6**).

[0096] The air discharged at the fast speed through the air discharge hole **57** from the cooling channel **55** may collide with the blocking plate **110** and form the wind shield to a downwardly inclined direction to a direction toward the cooking chamber **20** (S**7**).

[0097] Accordingly, the high-temperature heat and water vapor discharged upwardly from the cooking chamber **20** while the door is opened may be blocked through the wind shield so as not to be discharged toward the user in front of the door **30**. The user may be secured against a burn accident due to the high-temperature heat and water vapor discharged from the cooking chamber **20**.

[0098] The foregoing exemplary embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. Also, the description of the exemplary embodiments of the present invention is intended to be illustrative, and not to limit the scope of the claims, and many alternatives, modifications, and variations will be apparent to those skilled in the art.

What is claimed is:

1. An oven comprising:

a case including a cooking chamber in an inside thereof;

a door hinge-coupled to the case and configured to open and close the cooking chamber;

a cooling fan disposed in an upper portion of the inside of the case and configured to discharge air toward a front of the cooking chamber; and

a heat blocking unit configured to form a wind shield which blocks high-temperature heat and water vapor

discharged from an inside of the cooking chamber by changing a direction of the air discharged through the cooling fan to a lower side of the cooking chamber,

wherein in response to the door being closed, a portion of the heat blocking unit is pressed through an upper portion of the door and non-interferes the air discharged toward the front of the cooking chamber and in response to the door being opened, the portion of the heat blocking unit pressed by the upper portion of the door is released and interferes the air discharged toward the front of the cooking chamber to form the wind shield.

2. The oven as claimed in claim **1**, wherein the cooling fan rotates at a first speed in cooking and rotates at a second speed faster than the first speed in response to door being opened after the cooking.

3. The oven as claimed in claim **1**, wherein the heat blocking unit includes:

a blocking plate hinge-coupled to a portion of the case close to an upper end of an opening of the cooking chamber; and

an elastic member configured to operate the blocking plate according to opening and closing of the door.

4. The oven as claimed in claim **3**, wherein the blocking plate is pressed through the door and set to a first position which non-interferes the air discharged toward the front of the cooking chamber in response to the door being closed and the blocking plate pressed through the door is released and set to a second position which interferes the air discharged toward the front of the cooking chamber in response to the door being opened.

5. The oven as claimed in claim **4**, wherein the blocking plate is obliquely disposed downward toward the inside of the cooking chamber in the second position.

6. The oven as claimed in claim **4**, wherein the second position is located at an angle rotated by 50 to 90 degrees from the first position.

7. The oven as claimed in claim **3**, further comprising at least one buffer member provided in the portion of the case to absorb a shock of the blocking plate which moves from the second position to the first position.

8. The oven as claimed in claim **1**, further comprising a door open/close detector configured to detect the opening and closing of the door,

wherein the cooling fan rotates at a first speed in response to the closing of the door being detected through the door open/close detector and rotates at a second speed faster than the first speed in response to the opening of the door being detected through the door open/close detector.

9. An oven comprising:

a case including a cooking chamber in an inside thereof;

a door configured to open and close the cooking chamber;

a cooling fan configured to change speed of air discharged toward a front of the cooking chamber by changing rotation speed; and

a heat blocking unit configured to form a wind shield by changing a moving direction of the air through interference of the air discharged through the cooling fan according to opening of the door,

wherein in response to the door being closed, a portion of the heat blocking unit is pressed through an upper portion of the door and non-interferes the air discharged toward the front of the cooking chamber and in response to the door being opened, the portion of the heat blocking unit pressed by the upper portion of the door is released and interferes the air discharged toward the front of the cooking chamber to form the wind shield.

10. The oven as claimed in claim **9**, wherein the wind shield is obliquely formed directed to a lower portion of the inside of a cooking chamber from an upper portion of an opening of the cooking chamber.

11. The oven as claimed in claim **9**, wherein the portion of the blocking plate is set to a position which non-interferes the air discharged by the cooling fan in response to the door being closed,

the oven further comprising at least one buffer member configured to absorb a shock generated by an operation according to a movement of the portion of the heat blocking unit to the position which non-interferes the air from a position which interferes the air.

12. A method of controlling an oven, the method comprising:

setting a blocking plate disposed in an upper portion of an opening of a cooking chamber to a first position by closing a door;

setting the blocking plate to a second position by opening the door after cooking is completed; and

forming a wind shield from the upper portion of the opening of the cooking chamber to a lower portion of the opening through collision of air continuously discharged toward the blocking plate with the blocking plate.

13. The method as claimed in claim **12**, wherein discharging speed of the air discharged toward the blocking plate set to the second position is larger than that of air discharged in response to the blocking plate being set to the first position.

14. The method as claimed in claim **12**, wherein the discharged air is provided through a cooling fan, and

rotation speed of the cooling fan in the first position is larger than that of the cooling fan in the second position.

15. The method as claimed in claim **12**, wherein the discharged air is provided through a cooling fan,

the method further comprising:

rotating the cooling fan at a first speed in response to closing of the door being detected; and

rotating the cooling fan at a second speed faster than the first speed in response to opening of the door being detected.

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