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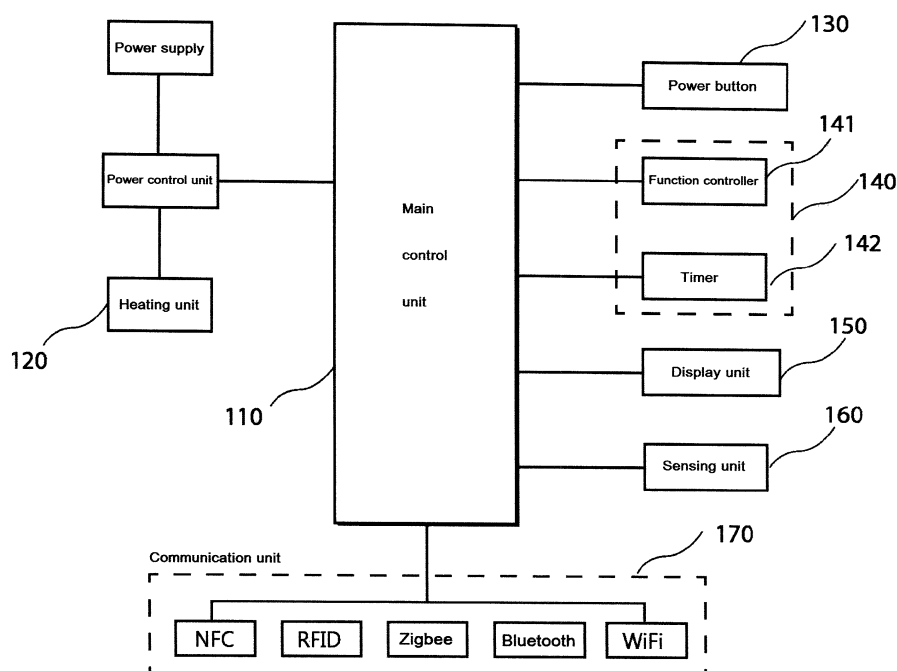
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(54) **INTELLIGENT ELECTRIC RANGE**

(57) There is provided an intelligent electric stove comprising: a controller including a hardware interface for communication with hardware, wherein the controller has a memory to store therein a pre-set cooking solution as an application program; a user interface coupled to the controller and configured to allow a user to control an operation of the stove; a timer coupled to the controller

and configured to set operation timing of the stove; a display unit coupled to the controller and configured to output operation states of the stove; a sensing unit coupled to the controller and configured to detect operation state; and a wireless communication unit coupled to the controller and configured to allow the stove to communicate wirelessly with external devices.



Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Korean patent application No. 10-2014-0095148 filed on July 26, 2014, the entire content of which is incorporated herein by reference for all purposes as if fully set forth herein.

BACKGROUND

Field of the Present Disclosure

[0002] The present disclosure relates to an electric stove, and, more particularly, to an intelligent electric stove wherein a cooking utensil and the electric stove communicate with each other via a machine-to-machine communication or the person and the electric stove communicate with each other via a person-to-machine communication.

Discussion of Related Art

[0003] Electric stove is excellent in terms of control of output and safety in comparison with gas stove.

[0004] Further, since it does not burn gas to generate a heat source, it is attracting attention as a clean kitchen appliance which does not generate carbon dioxide and harmful gas during cooking and does not pollute indoor air.

[0005] Such an electric stove is divided into a halogen lamp type, a heating coil type and an induction type depending on a method of generating a heat source. The halogen and heating coil types are used in combination to complement each other's disadvantages.

[0006] FIG. 1 shows a configuration of a function control unit or user interface generally used in the conventional electric stove described above. The function control unit or user interface includes a power button 10, a thermal power control button 20, and a reserved time setting button (timer) 30 having a time switch function. The buttons may be displayed using LEDs.

[0007] These control buttons are arranged variously depending on the stove designer. They focus on the functional arrangement rather than user's convenience. Thus, position variations of the control interfaces may not be feasible or additional functions may not be added.

[0008] The conventional electric stoves may not provide a functional merit or user convenience other than the safety, the firepower output control in a step by step manner, and the timer function.

SUMMARY

[0009] In order to solve the problems, the present disclosure is intended to improve the user's convenience by configuring the electric stove such that a cooking utensil and the electric stove communicate with each other

via a machine-to-machine communication or the person and the electric stove communicate with each other via a person-to-machine communication.

[0010] Another object of the present disclosure is to enable an audio input function, a remote control function, and an output function of an operation state of the stove or a cooking utensil placed on the stove.

[0011] In one aspect, there is provided an intelligent electric stove comprising: a controller including a hardware interface for communication with hardware, wherein the controller has a memory to store therein a pre-set cooking solution as an application program; a user interface coupled to the controller and configured to allow a user to control an operation of the stove; a timer coupled to the controller and configured to set operation timing of the stove; a display unit coupled to the controller and configured to output operation states of the stove; a sensing unit coupled to the controller and configured to detect operation state; and a wireless communication unit coupled to the controller and configured to allow the stove to communicate wirelessly with external devices.

[0012] In one implementation, the memory stores therein an operating system, and application programs operatively associated with the operation system, wherein the application programs includes the cooking solution.

[0013] In one implementation, the user interface includes a heating region selection menu, a heating power adjustment menu, and/or a timing menu.

[0014] In one implementation, the display unit is operatively associated with the user interface.

[0015] In one implementation, the communication unit communicates with a cooking utensil and/or mobile device using at least one of RFID, NFC, Bluetooth, Zigbee, and WiFi protocols.

[0016] In one implementation, the communication unit communicates with a stove hood using at least one of RFID, NFC, Bluetooth, Zigbee, and WiFi protocols.

[0017] In one implementation, the controller is configured to download and/or update the cooking solution from a web server or a mobile device using the communication unit.

[0018] In one implementation, the intelligent electric stove further includes an audio interface configured to output operation states of the electric stove to the user using a voice and/or to input a user voice input to the controller.

[0019] In one implementation, the audio interface includes a sound output unit, a sound input unit and a voice recognition engine.

[0020] In one implementation, the intelligent electric stove further includes a weight sensor configured to detect a weight of a cooking utensil placed on a heating region, wherein the weight sensor is positioned nearby or in the heating region.

[0021] In one implementation, the intelligent electric stove further includes a DC (direct current) wireless power transmitter configured to wirelessly supply a power to a cooking utensil placed on the stove, wherein the cook-

ing utensil has a communication unit or sensor unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 shows a view of control buttons for a conventional electric stove.

FIG. 2 show a view of a system in which a smart electric stove in accordance with the present disclosure is implemented.

FIG. 3 is a block diagram of an intelligent electric stove in accordance with a first embodiment of the present disclosure.

FIG. 4 is a block diagram of an intelligent electric stove in accordance with a second embodiment of the present disclosure.

FIG. 5 is a block diagram of an intelligent electric stove in accordance with a third embodiment of the present disclosure.

FIG. 6 is a block diagram of an intelligent electric stove in accordance with a fourth embodiment of the present disclosure.

FIG. 7 is a flow chart for illustrating a first example of an operation of the intelligent electric stove in accordance with the present disclosure.

FIG. 8 is a flow chart for illustrating a second example of an operation of the intelligent electric stove in accordance with the present disclosure.

FIG. 9 is a flow chart for illustrating a third example of an operation of the intelligent electric stove in accordance with the present disclosure.

DETAILED DESCRIPTIONS

[0023] Examples of various embodiments are illustrated and described further below. It will be understood that the description herein is not intended to limit the claims to the specific embodiments described. On the contrary, it is intended to cover alternatives, modifications, and equivalents as may be included within the spirit and scope of the present disclosure as defined by the appended claims.

[0024] It will be understood that when an element or layer is referred to as being "connected to", or "coupled to" another element or layer, it can be directly on, connected to, or coupled to the other element or layer, or one or more intervening elements or layers may be present. In addition, it will also be understood that when an element or layer is referred to as being "between" two elements or layers, it can be the only element or layer between the two elements or layers, or one or more intervening elements or layers may also be present.

[0025] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present disclosure. As used herein, the singular forms "a" and "an" are intended to include the plural forms as well, unless the context clearly

indicates otherwise. It will be further understood that the terms "comprises", "comprising", "includes", and "including" when used in this specification, specify the presence of the stated features, integers, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, operations, elements, components, and/or portions thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. Expression such as "at least one of" when preceding a list of elements may modify the entire list of elements and may not modify the individual elements of the list.

[0026] FIG. 2 show a view of a system in which a smart electric stove in accordance with the present disclosure is implemented. In the system, the electric stove 100 may be communicatively connected to a cooking utensil 200, a stove hood 300, and a mobile device 400 in a M2M (Machine to Machine) manner and may be communicatively connected to a person in a M2P (Machine to People) manner. This may be achieved using IoT (Internet of Things).

[0027] Further, to act as a communication hub between devices, the intelligent electric stove 100 collects and stores operation data in the stove, and finally transmits the data to the cloud server so that the data is integrated and managed.

[0028] FIG. 3 is a block diagram of an intelligent electric stove in accordance with a first embodiment of the present disclosure. The intelligent electric stove may include a main control unit 110, a display unit 140, a communication unit 170, and a heating unit 120.

[0029] The main control unit 110 has a configuration in which a hardware (H/W) having an interface for connecting various devices and software (S/W) installed for the operations of the hardware are integrated. Further, the software includes an operating platform OS and a service or application platform.

[0030] The operating platform uses an open source OS such as Linux and Android, and may be used with an application Tizen in the future. The service platform creates a cooking solution that allows all functions of the stove to be controlled.

[0031] The operation and function selection of a function controller 131 and a timer 132 used for controlling the thermal power, and selecting a heating region, etc. are integrated into a touch screen 140. The function controller 131 may include the user interface to allow the user to select operation of the stove.

[0032] The display unit 140 displays an operation state of the electric stove or an array of menus that are supported by the cooking solution and may include a liquid crystal panel. The display unit 140 may be designed to realize User Interface (UI) and User Experience (UX). Further, the designed menus and buttons may be associated with the touch screen 130 attached to the liquid crystal panel.

[0033] The communication unit 170 supports NFC, RFID, ZigBee, Bluetooth and WiFi for wireless commu-

nication with external devices such as the cooking utensil 200, stove hood 300 and mobile device 400. Via the communication unit 170, firmware or service platform or a software can be added to the main control unit 110 or may be updated. The firmware or service platform or a software may be downloaded via Internet directly or via a mobile device through the communication unit 170.

[0034] Reference numeral 120 denotes a heating unit which is a heat source connected to a power source through a power control unit. Reference numeral 130 denotes a power button. Reference numeral 160 denotes a sensor unit for sensing operational conditions and installed inside the electric stove for safety.

[0035] FIG. 4 is a block diagram of an intelligent electric stove in accordance with a second embodiment of the present disclosure, wherein an audio interface 180 is added to the configuration of the first embodiment of the intelligent electric stove.

[0036] The audio interface 180 is used to inform the status of the electric stove using a voice form and/or to control the function of the stove directly by voice when the user can not directly touch the function button during cooking.

[0037] To this end, the audio interface 180 includes a microphone 181 connected to the main control unit 110 for input/output, a loudspeaker 182, and a voice recognition engine 183 installed as a middleware of the main platform.

[0038] In one example, when the user voices words "turn off", "heat up", "heat down", "turn on a hood", or "turn off a hood", the audio interface 180 senses and recognize the words to form signals and send the signals to the main control unit 110 to control the operations of the stove correspondingly.

[0039] FIG. 5 is a block diagram of an intelligent electric stove in accordance with a third embodiment of the present disclosure. In this embodiment, the configuration of the second embodiment further includes a weight sensor 161 as a sensing unit 160. The weight sensor 161 is located adjacent to a heating region of the electric stove so as to protrude from a surface of the heating region. The weight sensor 161 is used to measure the weight of the contents in the container when the cooking utensil is put on the heating region to load on the weight sensor 161.

[0040] This may be used to predict the cooking time of the food contained in the cooking utensil, or to prevent the cooking utensil from being heated without food being filled.

[0041] FIG. 6 is a block diagram of an intelligent electric stove in accordance with a fourth embodiment of the present disclosure. In this embodiment, the configuration of the third embodiment further includes a wireless power supply unit 190. The wireless power supply unit or transmitter unit 190 may be configured to supply wireless DC power to the cooking utensil in order that the status of the cooking utensil 200 may be sent to the electric stove wirelessly. In this connection, the cooking utensil 200 has

a sensing unit to sense the state thereof. For example, the cooking utensil 200 has a temperature sensor.

[0042] Hereinafter, various examples of operations of the intelligent electric stove in accordance with the above embodiments will be described.

First example (automatic control function for pot)

[0043] First, the example may begin by registering dedicated cooking utensils the user wants to use on the electric stove. Registration method is as follow: when the dedicated cooking utensil is placed on the stove, the stove is synchronized with the cooking utensil, such that information such as model name, container floor area, capacity and weight of the cooking utensil is registered into the cooking solution via RFID, NFC, Zigbee and Bluetooth. In this connection, the cooking utensil may have a transmitter or RFID transmitter to transmit the information thereof to the stove.

[0044] FIG. 7 is a flow chart for illustrating a first example of an operation of the intelligent electric stove in accordance with the present disclosure. Referring to FIG. 7, when the water filled pot is placed on one heating region of the electric stove 100, the electric stove is synchronized with the pot to prepare for the operation. When the start button is pressed, the firepower will start heating and adjust the level of the heating power based on the sensed floor area of the pot and the sensed amount of water (S1, S2).

[0045] At this time, the stove estimates the cooking time by measuring the amount of water contained in the pot through the weight sensor 161.

[0046] When the internal temperature of the pot reaches 100° C, the sensor in the pot may detect this and sends it to the electric stove (S3).

[0047] When the electric stove receives the detection, the electric stove adjusts the level of the fire power to zero and notifies the completion of the cooking process through a beep or a mobile device application and finishes the cooking process (S4, S5, S6)

[0048] When the cooking time that is expected in this process exceeds a predetermined time, the stove adjusts the firepower to 0 level and sends warning alarm.

[0049] The above example can be applied to any cooking utensil that is used to boil water in the registered cooking utensil rather than limited to the pot. The above operation of the first example may be programmed in the cooking solution stored in the memory in the main control unit 110.

Second example (control function based on recipe)

[0050] FIG. 8 is a flow chart for illustrating a second example of an operation of the intelligent electric stove in accordance with the present disclosure. FIG. 8 shows an example of registering and executing a recipe such as ramen cooking in a cooking solution.

[0051] Referring to FIG. 8, when the water filled pot is

placed on one heating region of the electric stove 100, the electric stove is synchronized with the pot to prepare for the operation. When the start button is pressed, the firepower will start heating and adjust the level of the heating power based on the sensed floor area of the pot and the sensed amount of water (S1, S2).

[0052] At this time, the stove estimates the cooking time by measuring the amount of water contained in the pot through the weight sensor 161.

[0053] When the water starts to boil, the sensed information in the vessel is sent to the electric stove and informs the user that the water has boiled and noodle and seasoning agents should be put in (S3, S4). At this time, sound can be informed directly. Alternatively, the display of the electric stove may display the image of the food to be injected into the pot. Alternatively, the mobile device can may display the image of the food to be injected into the pot. This procedure may be set into the cooking solution.

[0054] Thereafter, in operation S6, it is recognized by the timer whether the indicated proper cooking time on the ramen package, for example, 4 minutes and 30 seconds has lapsed. If so, the electric stove adjusts the heating power level to 0 level (S7). Then, the stove informs the user of the cooking completion of the ramen (S8). In this way, the cooking process may end (S9).

[0055] In this example, the recipe of simple ramen cooking is given as an example. However, in the case of complicated cooking process, time for food injection into the pot and/or the thermal power control may be pre-set in the cooking solution.

Third example (programmed control for pressurized cooking container)

[0056] FIG. 9 is a flow chart for illustrating a third example of an operation of the intelligent electric stove in accordance with the present disclosure. FIG. 9 describes the process of cooking rice using pressurized cooking container merely by selecting the menu preprogrammed in the cooking solution until the completion of rice cooking.

[0057] A dedicated pressurized cooking container used here has a solenoid valve which is operated by an electrical signal in addition to the temperature sensor.

[0058] First, when the water and raw rice is injected into the pressurized cooking container registered onto the present electric stove and is placed on the heating region of the stove, the user may press the rice cooking button in the user interface corresponding to the menu of the cooking solution. In this embodiment, the heating power level may be adjusted automatically according to the timing schedule preset into the cooking solution.

[0059] The operation A in the figure is to maintain the proper cooking condition of 1.2 atmospheric pressure and 122 °C in the cooking process using the pressurized cooking container. The operation A may be incorporated at least one time during the entire cooking process.

[0060] In operation (S7), the firepower level of the stove is adjusted to 0 and the zero level lasts for a predetermined time while the cooking completion is not notified to the user. This is for complete softening of the raw rice by uniform transfer of the heat to the inner portion of the rice. Thereafter, in order to open the lid of the container safely after the lapse of the cooking time, the user may remove the operating pressure on the solenoid valve to relieve pressure.

[0061] The heating powers and cooking times presented here are for explanation purposes only. Thus, the present disclosure is not limited thereto.

[0062] Combining these series of cooking factors, various kinds of foods for example, rice, potato, beef, chicken, etc. can be cooked using the combination of the present stove and the pressurized cooking utensil.

[0063] Further, regarding the operation of the stove hood 300, which is missing from the examples, when the cooking temperature of the cooking utensil 200 during cooking by electric stove 200 react a predetermined temperature, the electric stove confirms the operation status of the stove hood by inter-communication between the hood and the stove. When the hood is not in operation, the stove sends an operation signal so that the stove hood 300 operates.

[0064] At a predetermined time after the cooking process of the electric stove is completed, the operation of the stove hood 300 is checked again. When the stove hood 300 is still operating, the stop signal is transmitted to stop the operation.

[0065] Further, when the stove hood is continuously operated for a certain period of time when the electric stove is not in operation, the user is notified of the stove hood abnormality to the user.

Industrial application

[0066] In addition, although the above-described examples only describe general containers such as pots, general cooking utensils and pressurized cooking containers, the present disclosure is not limited thereto. For example, the present stove may be combined with the steamer container or boiler container, etc.

Claims

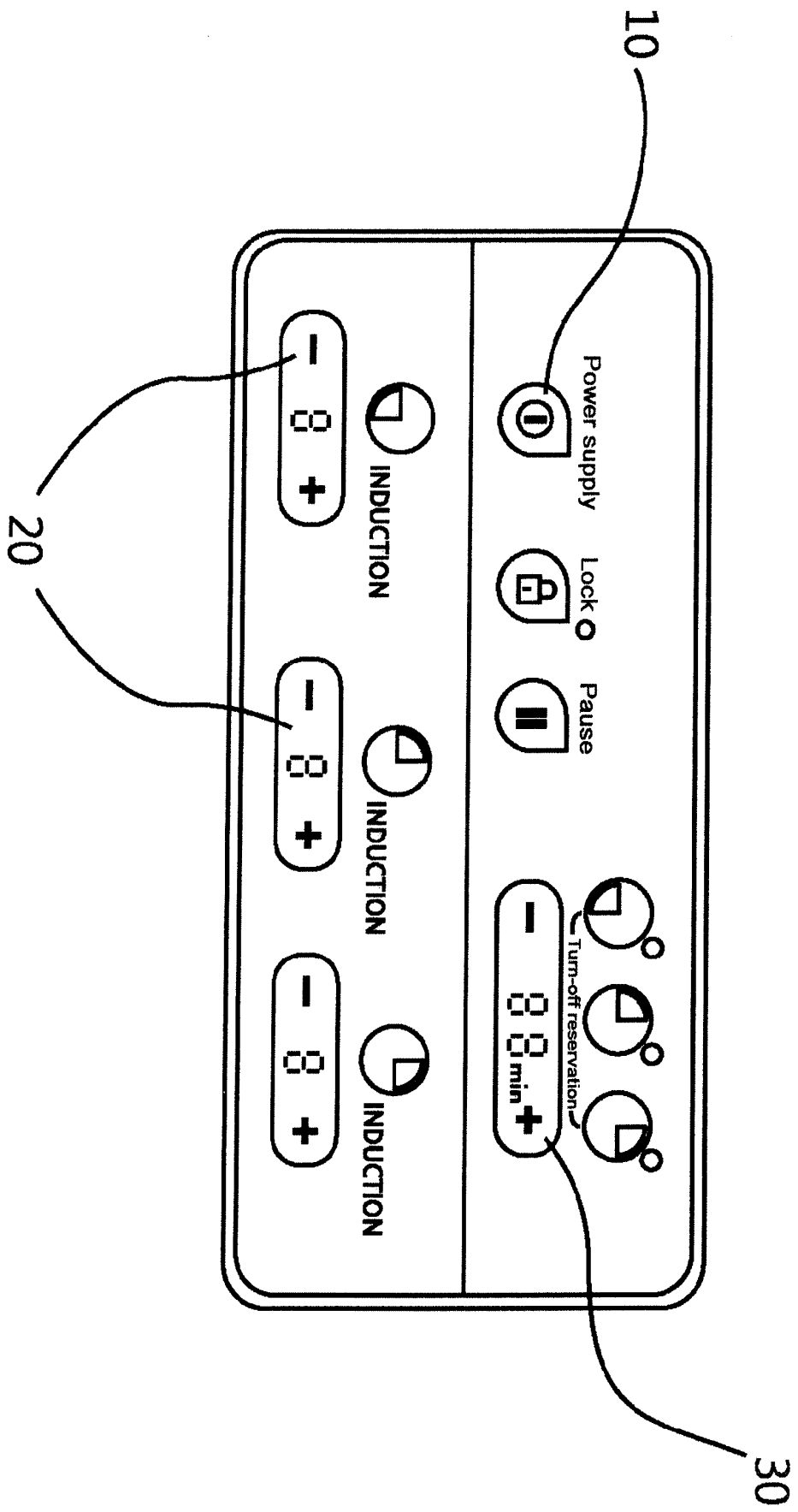
1. An intelligent electric stove comprising:

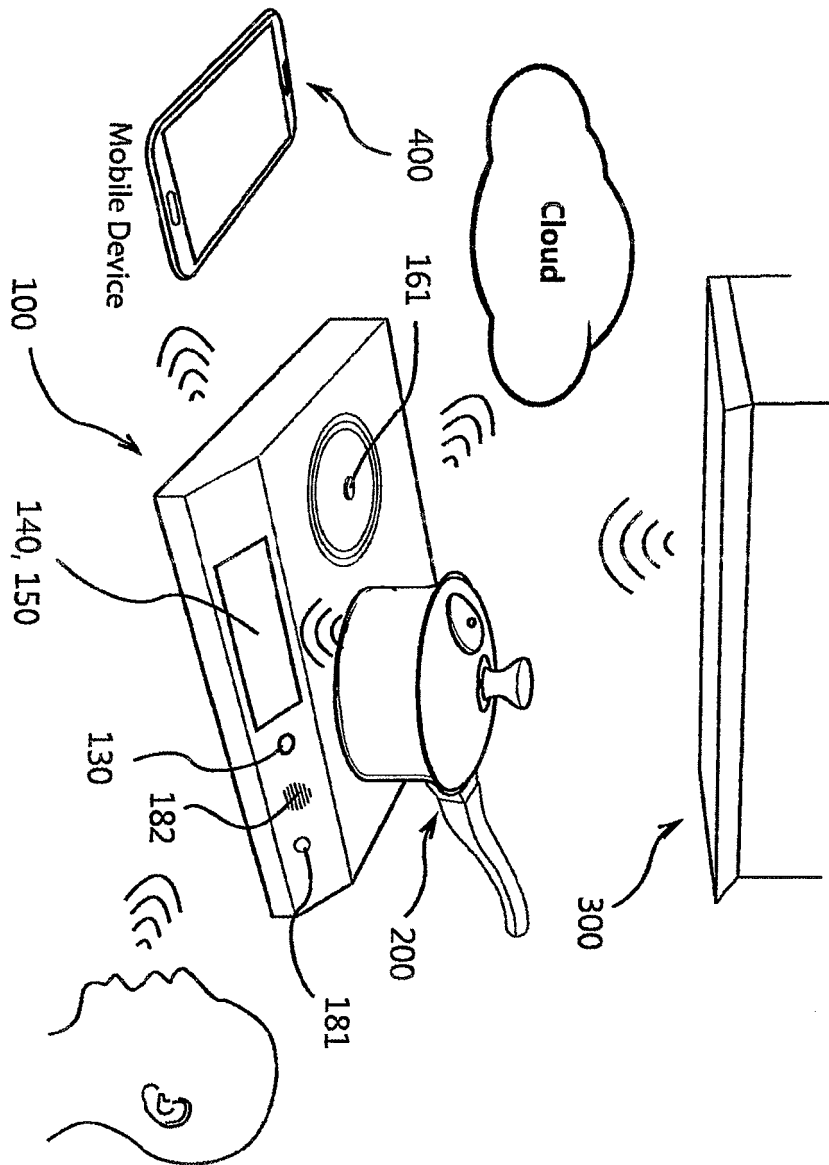
a controller including a hardware interface for communication with hardware, wherein the controller has a memory to store therein a pre-set cooking solution as an application program;
a user interface coupled to the controller and configured to allow a user to control an operation of the stove;
a timer coupled to the controller and configured to set operation timing of the stove;

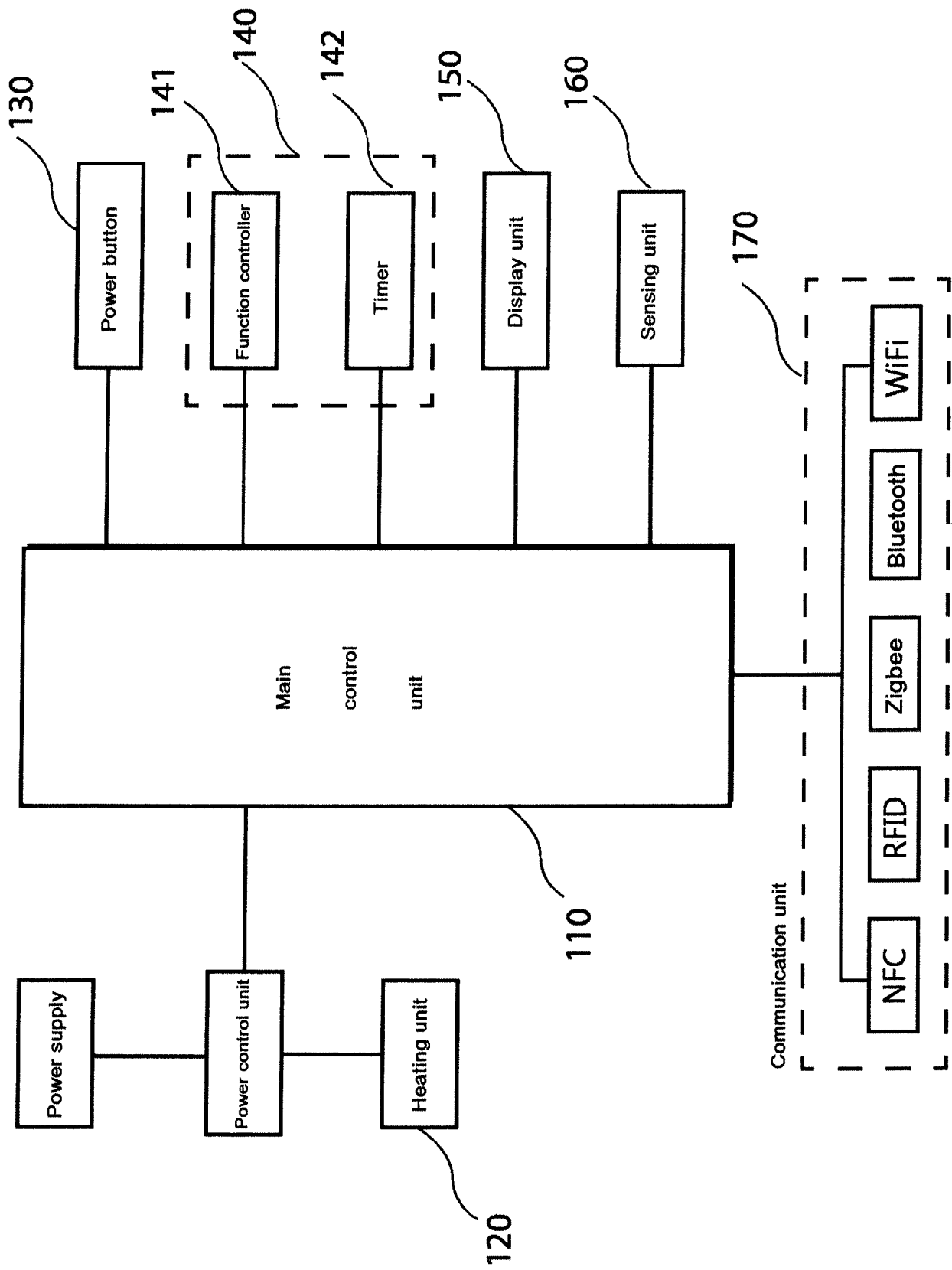
a display unit coupled to the controller and configured to output operation states of the stove;
 a sensing unit coupled to the controller and configured to detect operation state; and
 a wireless communication unit coupled to the controller and configured to allow the stove to communicate wirelessly with external devices.

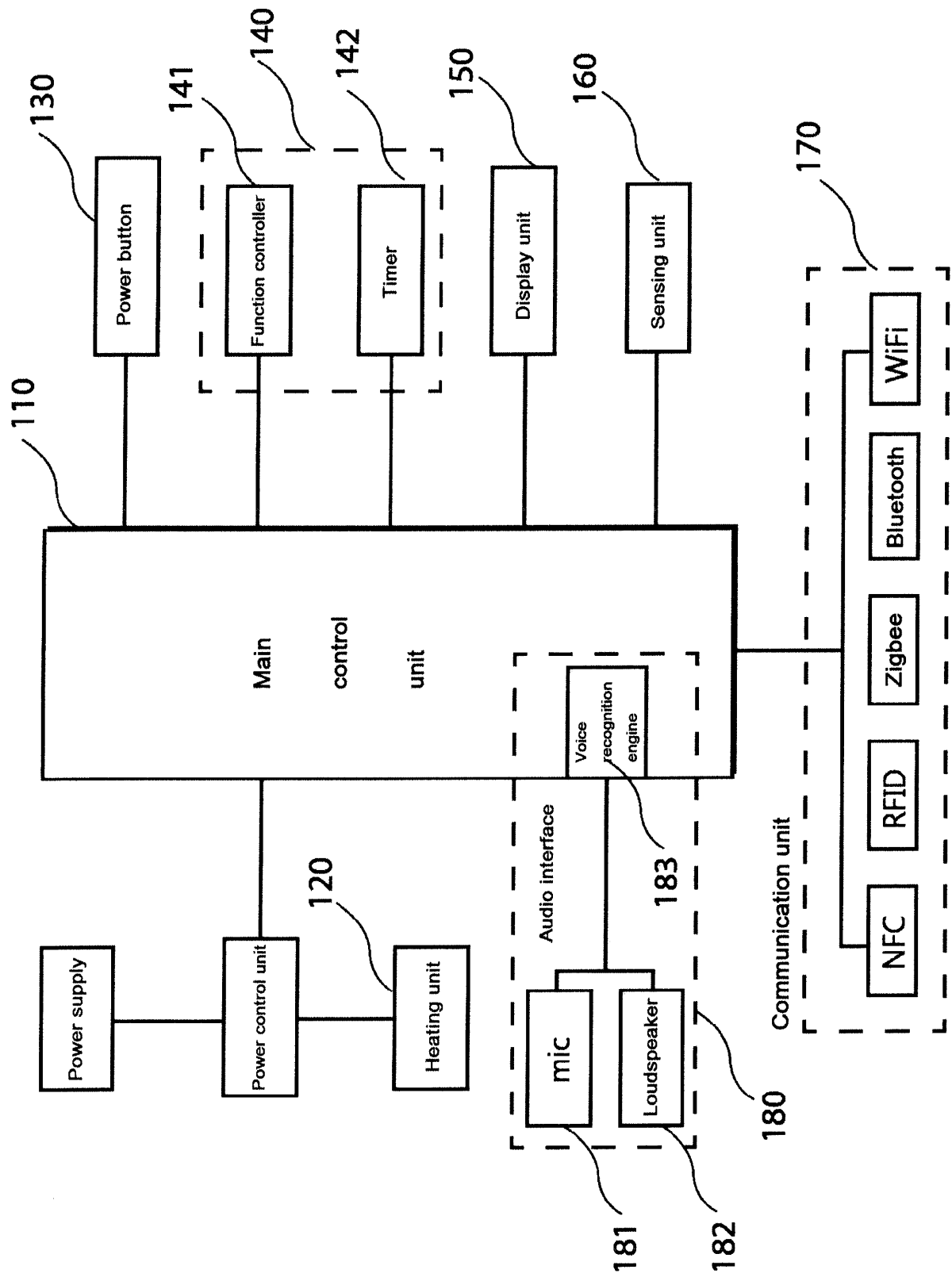
cooking utensil has a communication unit or sensor unit.

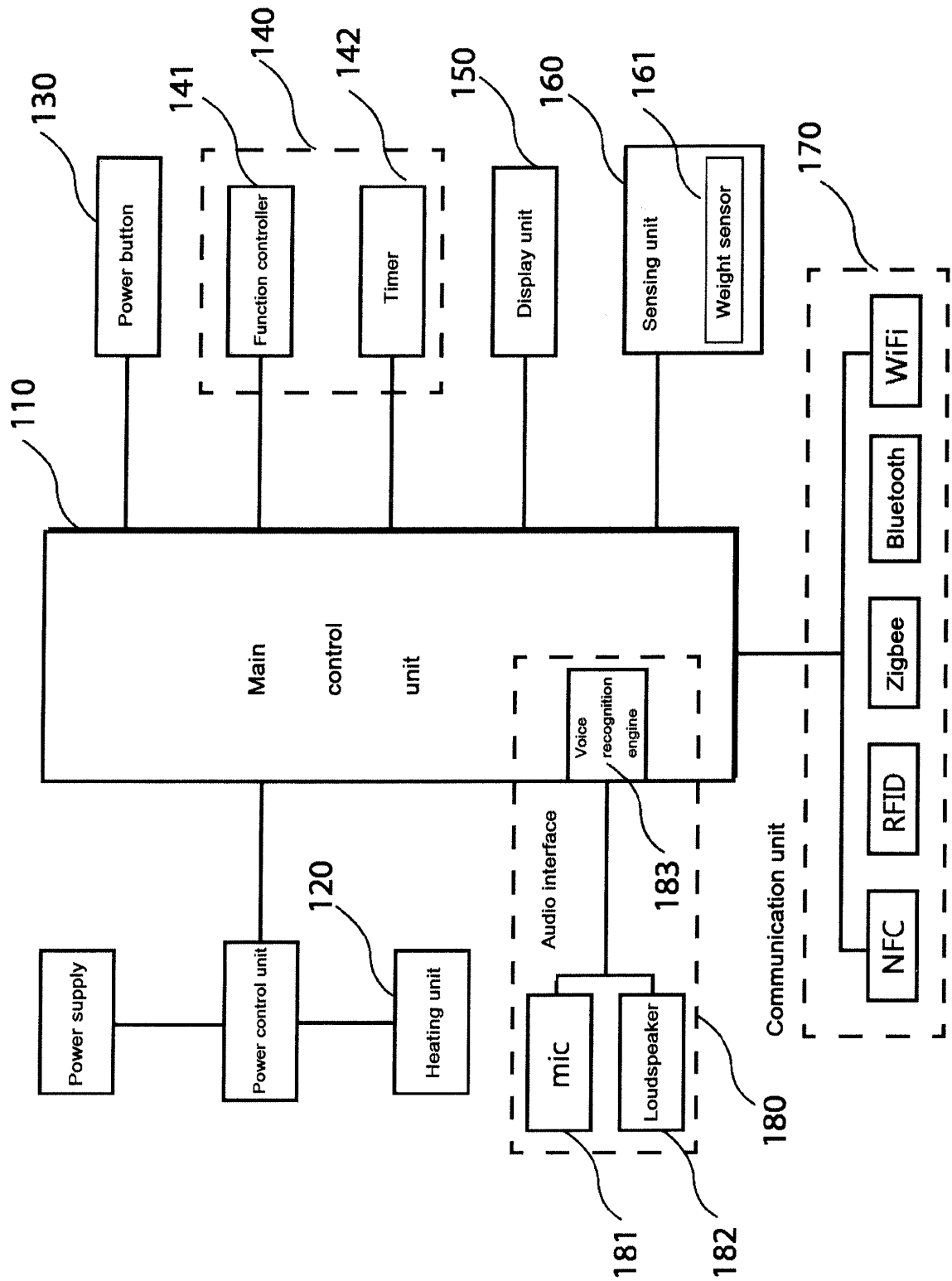
2. The intelligent electric stove of claim 1, wherein the memory stores therein an operating system, and application programs operatively associated with the operation system, wherein the application programs includes the cooking solution. 5
3. The intelligent electric stove of claim 1, wherein the user interface includes a heating region selection menu, a heating power adjustment menu, and/or a timing menu. 10
4. The intelligent electric stove of claim 1, wherein the display unit is operatively associated with the user interface. 15
5. The intelligent electric stove of claim 1, wherein the communication unit communicates with a cooking utensil and/or mobile device using at least one of RFID, NFC, Bluetooth, Zigbee, and WiFi protocols. 20
6. The intelligent electric stove of claim 1, wherein the communication unit communicates with a stove hood using at least one of RFID, NFC, Bluetooth, Zigbee, and WiFi protocols. 25
7. The intelligent electric stove of claim 1, wherein the controller is configured to download and/or update the cooking solution from a web server or a mobile device using the communication unit. 30
8. The intelligent electric stove of claim 1, further including an audio interface configured to output operation states of the electric stove to the user using a voice and/or to input a user voice input to the controller. 35
9. The intelligent electric stove of claim 8, wherein the audio interface includes a sound output unit, a sound input unit and a voice recognition engine. 40
10. The intelligent electric stove of claim 1, further including a weight sensor configured to detect a weight of a cooking utensil placed on a heating region, wherein the weight sensor is positioned nearby or in the heating region. 45
11. The intelligent electric stove of claim 1, further including a DC (direct current) wireless power transmitter configured to wirelessly supply a power to a cooking utensil placed on the stove, wherein the 50

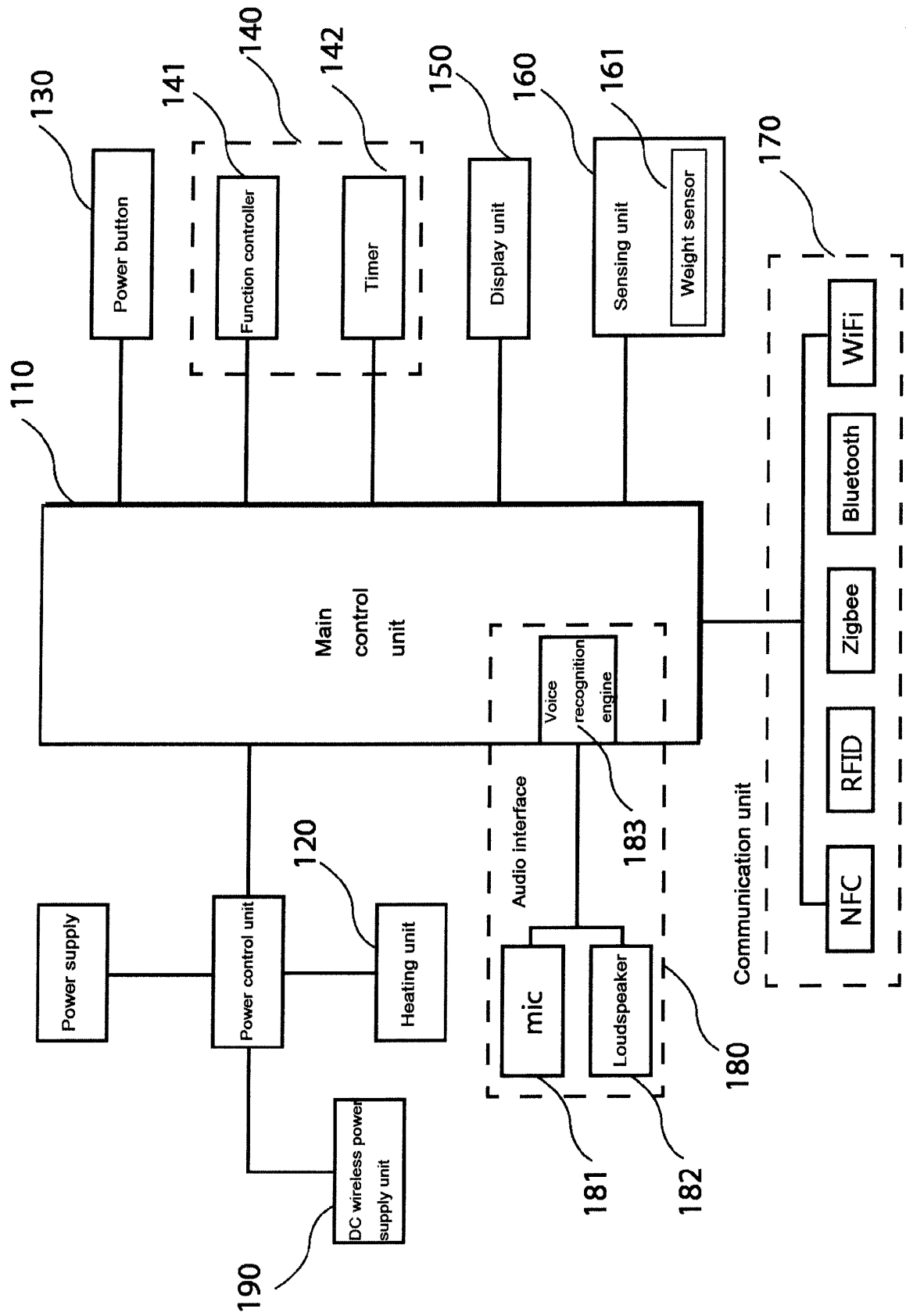


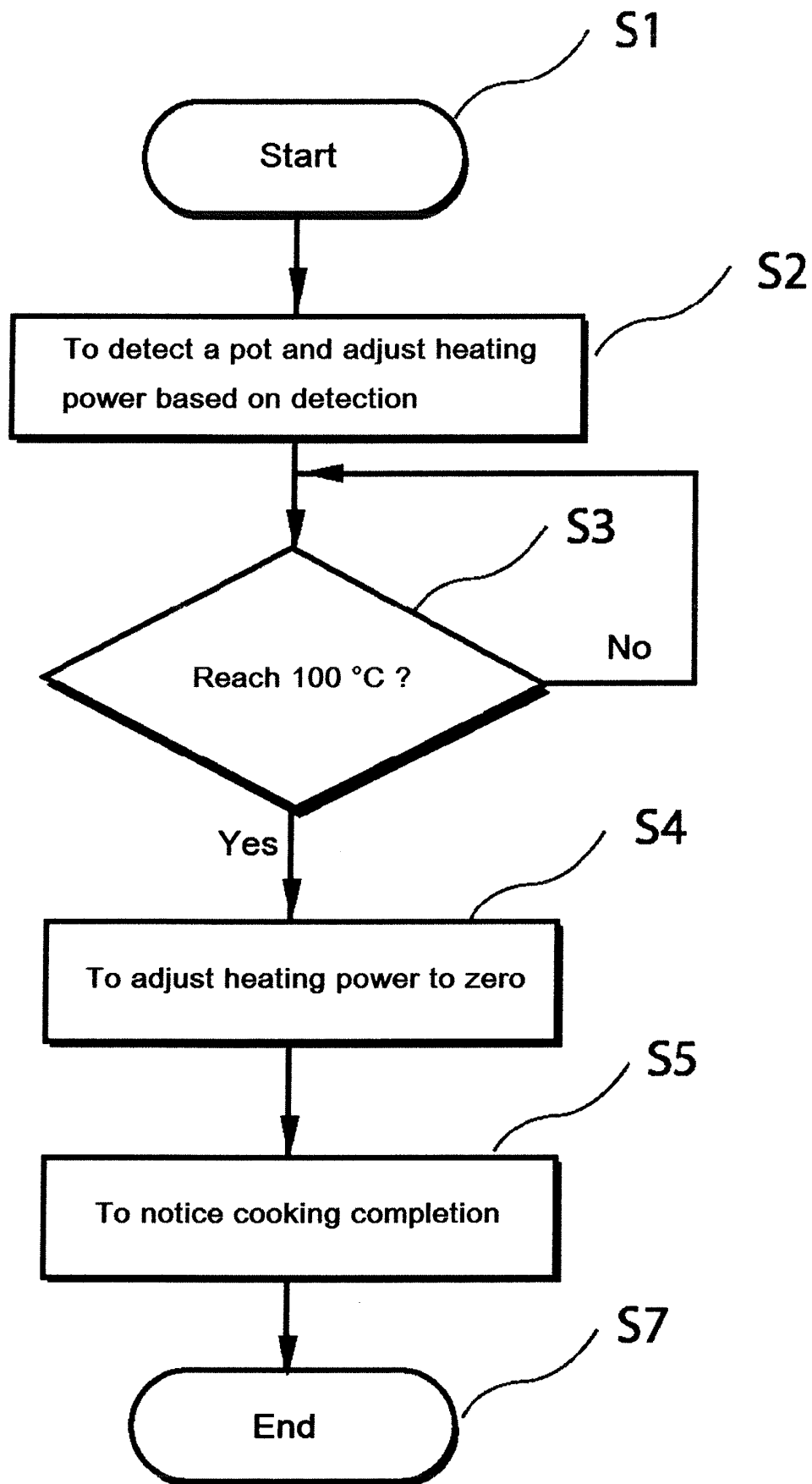


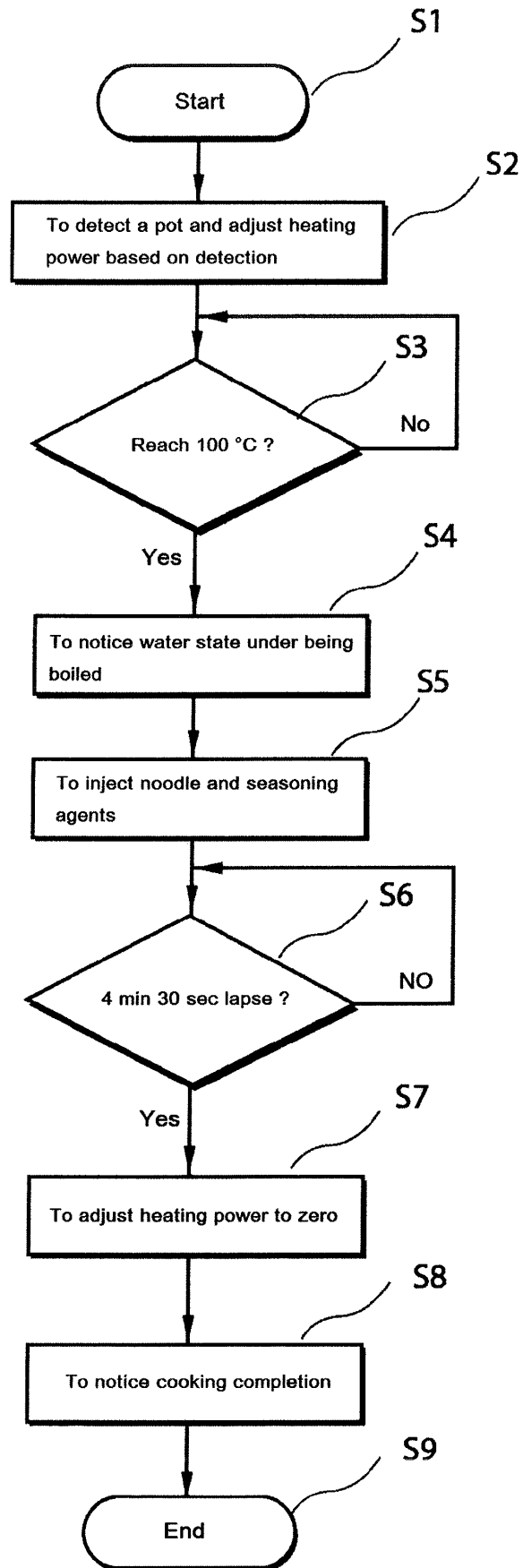


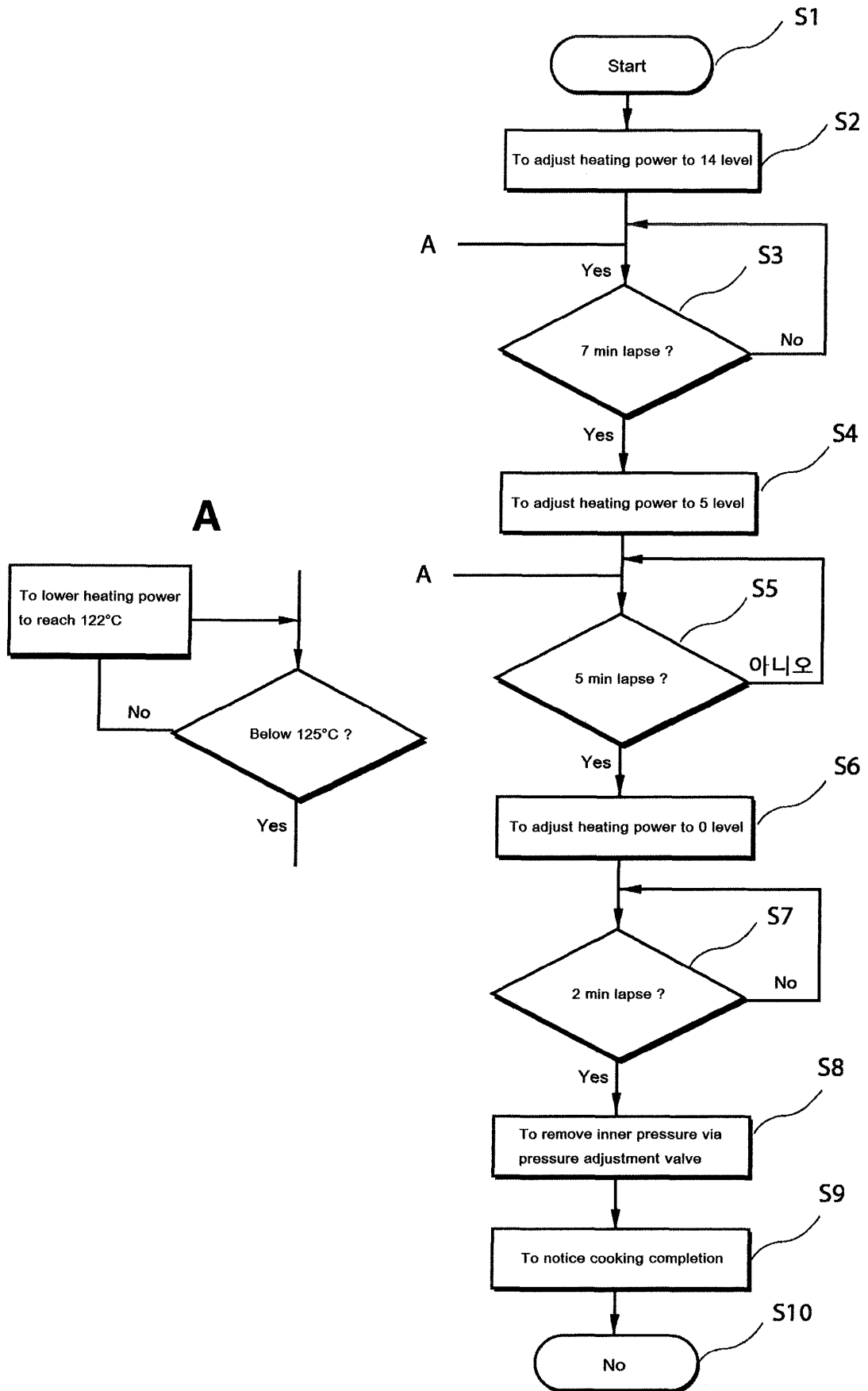












INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2015/007712

5	A. CLASSIFICATION OF SUBJECT MATTER		
	<i>F24C 7/08(2006.01)i, F24C 15/00(2006.01)i</i>		
	According to International Patent Classification (IPC) or to both national classification and IPC		
	B. FIELDS SEARCHED		
10	Minimum documentation searched (classification system followed by classification symbols) F24C 7/08; F24C 15/20; A47J 27/00; G101 15/00; F24C 7/04; F24C 7/02; H05B 6/12; F24C 15/00		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Utility models and applications for Utility models: IPC as above Japanese Utility models and applications for Utility models: IPC as above		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS (KIPO internal) & Keywords: electric range, operation unit, timer, display unit, detection part, communication unit, cooking vessel, range hood		
	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Y	KR 10-2012-0097585 A (YEO, Heung Gyu et al.) 05 September 2012 See paragraphs [0038], [0049], [0096], [0115]-[0119] and figure 1.	1-11
25	Y	KR 10-2001-0000431 A (CHUNG, Hae Jo et al.) 05 January 2001 See page 3, line 24 and claims 3, 6.	1-11
	Y	JP 2007-205669 A (MATSUSHITA ELECTRIC IND. CO., LTD. et al.) 16 August 2007 See paragraph [0087] and claim 1.	6
30	A	JP 2003-108183 A (TOSHIBA CORP.) 11 April 2003 See paragraph [0017] and claim 1.	1-11
	A	JP 2005-093122 A (TOSHIBA CORP.) 07 April 2005 See paragraph [0017] and figure 1.	1-11
35			
40	☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
50	Date of the actual completion of the international search 22 DECEMBER 2015 (22.12.2015)		Date of mailing of the international search report 23 DECEMBER 2015 (23.12.2015)
55	Name and mailing address of the ISA/KR  Korean Intellectual Property Office Government Complex-Daejeon, 189 Soonsa-ro, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2015/007712

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Patent document cited in search report	Publication date	Patent family member	Publication date
KR 10-2012-0097585 A	05/09/2012	NONE	
KR 10-2001-0000431 A	05/01/2001	KR 10-0398960 B1	19/09/2003
JP 2007-205669 A	16/08/2007	JP 04745846 B2	10/08/2011
JP 2003-108183 A	11/04/2003	NONE	
JP 2005-093122 A	07/04/2005	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020140095148 [0001]