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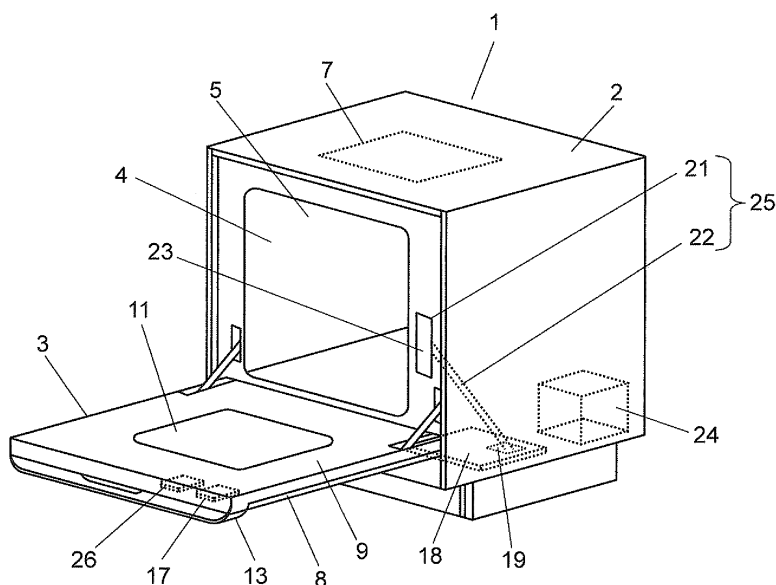
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(54) **COOKING DEVICE**

(57) Device body (2) with heating chamber (4), and door (3) that opens and closes opening (5) of heating chamber (4). A door wireless communication unit (17) transmits a control signal from an operation unit provided

on door 3 in the form of a wireless signal to main wireless communication unit (19). This configuration eliminates the need of wiring between the operation unit and device body (2). No wiring improves noise resistance and productivity.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to cooking devices in which an operation unit is provided on a door.

BACKGROUND ART

[0002] A cooking device such as a microwave oven and cooking range has an operation unit where cooking switches are provided. A floor-standing cooking device disclosed in PTL 1 has an operation unit on a door for opening and closing a heating chamber.

[0003] Fig. 4 is a perspective view of the cooking device of PTL 1. Cooking device 100 includes device body 102 with heating chamber 101, and door 103 that opens and closes an opening of heating chamber 101. Handle 104 is provided at an upper part of door 103 in the state door 103 is closed. Handle 104 has operation unit 105. Fig. 5 is a sectional view of handle 104. Cooking switch 106 is provided on operation unit 105.

[0004] This conventional cooking device 100 does not have operation unit 105 on device body 102. This allows an increase of the capacity of heating chamber 101. In addition, this conventional cooking device 100 is placed on a floor. Accordingly, a user can operate from above operation unit 105 on handle 104 provided at the upper part of device body 102. This improves user friendliness of cooking switch 106.

[0005] However, operation unit 105 is provided on an upper part of door 103 in this conventional cooking device 100. Signal line 107 connecting operation unit 105 and a controller (not illustrated) provided in device body 102 is wired from the upper part of door 103 to the controller through hinge 108 at a lower part of door 103. In other words, a wiring distance of signal line 107 is long. Signal line 107 is thus easily affected by noise due to a long wiring distance of signal line 107. In addition, the long wiring distance of signal line 107 results in low productivity at manufacturing cooking device 100.

[Citation List]

[Patent Literature]

[0006] [PTL 1] Japanese Patent Unexamined Publication No. H2-230026

SUMMARY OF THE INVENTION

[0007] The present invention solves aforementioned disadvantage of the prior art, and offers a cooking device with good noise resistance and productivity.

[0008] The cooking device of the present invention includes a device body with a heating chamber, a heating unit for heating an object to be heated placed in the heating chamber, a door that opens and closes an opening

of the heating chamber, and an operation unit that is provided on the door and outputs a control signal corresponding to a designated cooking menu. The cooking device of the present invention further includes a door wireless communication unit that is provided on the door and transmits a control signal in the form of wireless signal from the operation unit, and a main wireless communication unit that receives the wireless signal from the door wireless communication unit and transmits the wireless signal in the form of a control signal to a controller for controlling the heating unit.

[0009] This configuration enables two-way wireless communication between the operation unit and the device body, and eliminates wiring. No wiring improves noise resistance and productivity.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

Fig. 1 is a perspective view of a cooking device in accordance with a first exemplary embodiment of the present invention.

Fig. 2 is a front view of the cooking device in the first exemplary embodiment of the present invention.

Fig. 3 is a block diagram of the cooking device in the first exemplary embodiment of the present invention.

Fig. 4 is a perspective view of a conventional cooking device.

Fig. 5 is a sectional view of a handle of the conventional cooking device.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0011] Exemplary embodiments of the present invention are described below with reference to drawings.

(FIRST EXEMPLARY EMBODIMENT)

[0012] Fig. 1 is a perspective view of a cooking device in the first exemplary embodiment of the present invention. Fig. 2 is a front view of the cooking device in this exemplary embodiment.

[0013] As shown in Fig. 1, cooking device 1 includes device body 2 whose exterior is covered with a metal plate, and door 3. Heating chamber 4 with opening 5 at the front is provided inside device body 2. Opening 5 of heating chamber 4 is opened and closed by door 3. Door 3 is axially supported at its bottom end, and opens and closes in the vertical direction. Door 3 also covers the entire front face of device body 2.

[0014] Magnetron 24 that generates microwaves of 2450 MHz, which are high-frequency waves, is provided as a heating unit at a lower part of heating chamber 4. Heater 7 is provided on a ceiling of heating unit 4 as another heating unit. An object to be heated inside heating chamber 4 is heated by high-frequency waves of mag-

magnetron 24 and radiation heat of heater 7. The object to be heated is cooked by this heating.

[0015] Next, a structure of door 3 is described. Door 3 includes door outer wall 8 that becomes an outer face of cooking device 1 when door 3 is closed, and door inner wall 9 that faces heating chamber 4 when door 3 is closed. Door 3 has a double-walled structure with space between door outer wall 8 and door inner wall 9. Glass window 11 with an area slightly smaller than opening 5 of heating chamber 4 and a resin frame (not illustrated) surrounding glass window 11 are provided on door inner wall 9. A porous plate (not illustrated) for shielding high-frequency waves is provided on glass window 11. When door 3 is closed, the outer periphery of door inner wall 9 blocks the entire periphery of opening 5 of heating chamber 4.

[0016] As shown in Fig. 2, transparent window 12 for looking inside heating chamber 4 from outside cooking device 1 is provided on door outer wall 8. In Fig. 2, transparent window 12 is configured with a glass sheet covering the entire front face of door 3. Handle 13 that is held by the user for opening and closing door 3 is provided at an upper part of door outer wall 8, which is an upper part of door 3. Handle 13 protrudes to the front from door 3. Operation unit 14 with multiple cooking switches 14A is provided at the right side of handle 13. Cooking switches 14A are used for executing or stopping a range of cooking menus. Operation unit 14 further includes display 14B for displaying time required until completion of cooking, temperature inside heating chamber, and so on.

[0017] Cooking switches 14A are provided on substrate 16 embedded inside door outer wall 8. Cooking switches 14A are operated by pressing door outer wall 8 from outside. Door wireless communication unit 17 with antenna (not illustrated) is provided on substrate 16. In other words, door wireless communication unit 17 is provided on handle 13. Door wireless communication unit 17 outputs a control signal from cooking switches 14A in the form of a wireless signal of radio wave. Door wireless communication unit 17 has a structure of outputting the wireless signal toward device body 2.

[0018] Controller 18 is provided inside device body 2. Controller 18 receives a control signal from cooking switch 14A, and gives a command to door wireless communication unit 17 to output a wireless signal corresponding to cooking switch 14A.

[0019] Main wireless communication unit 19 outputs the wireless signal received from door wireless communication unit 17 to controller 18. Controller 18 outputs a control signal for driving magnetron 24, heater 7, cooling fan (not illustrated) of magnetron, and so on.

[0020] Hole 21 is provided on a rim around opening 5 of device body 2 so as to pass through radio waves transmitted from door wireless communication unit 17 and main wireless communication unit 19. Radio transmission path 22 for connecting hole 21 and the upper part of controller 18 is provided inside device body 2. Radio transmission path 22 has a duct shape formed by a metal plate forming an outer wall of device body 2 and a metal

partition wall different from this metal plate. The partition wall typically has a U-shaped cross section, and radio transmission path 22 is formed in the duct shape by closing an opening that has the U-shaped cross section with the metal plate.

[0021] Hole 21 is covered with plastic dielectric cover 23. This hole 21 and radio transmission path 22 form radio transfer section 25.

[0022] Next, the operation of cooking device 1 is described. To cook food, which is an object to be heated, the user holds handle 13 provided at the upper part of door 3, and opens opening 5 by pulling door 3. The user then places food inside heating chamber 4 through opening 5, and closes opening 5 of heating chamber 4 by closing door 3.

[0023] Then, the user operates one cooking switch 14A for required cooking menu from multiple cooking switches 14A provided on operation unit 14 on handle 13. This outputs a control signal corresponding to cooking switch 14A in the form of wireless signal from door wireless communication unit 17. Output wireless signal passes through a resin frame (not illustrated) provided on door inner wall 9 of door 3, reaches main wireless communication unit 19 through cover 23, hole 21, and radio transmission path 22 in this sequence. Then, main wireless communication unit 19 receives this wireless signal. Main wireless communication unit 19 sends a control signal, which is received wireless signal, to controller 18. Controller 18 outputs a drive signal corresponding to this control signal for controlling driving of the units required for the cooking menu, such as magnetron. As a result, the units required for cooking are driven.

[0024] Controller 18 also outputs a range of pieces of information including the time required until completion of cooking or temperature inside heating chamber 4 in the form of a wireless signal. The wireless signal output passes through radio transmission path 22, hole 21, and cover 23 in this sequence, and reaches door wireless communication unit 17. Door wireless communication unit 17 then receives this output wireless signal. A range of pieces of information is extracted from the received wireless signal, and is displayed on display 14B on operation unit 14.

[0025] Cooking device 1 as configured above in this exemplary embodiment employs wireless signals for transmission and reception of signals between operation unit 14 with cooking switches 14A and display 14B and controller 18. In other words, no wiring is used for transmitting and receiving signals. Accordingly, signals between operation unit 14 and controller 18 are not affected by noise. This means noise resistance of cooking device 1 improves. In addition, no wiring improves productivity at manufacturing cooking device 1.

[0026] If optical communication is used for transmitting and receiving signals, transmission and reception may become difficult by stain on a transmission and reception face of an optical signal coupler. Since signals are transmitted and received using radio waves in cooking device

1 in this exemplary embodiment, there is no influence of stain.

[0027] Cooking device 1 in this exemplary embodiment has operation unit 14 at the upper part. Accordingly, operation is easy for desk-top cooking devices in addition to floor-model cooking devices. Still more, operation unit 14 is provided on handle 13 protruding from door 3. This reduces the influence of heat compared to the case of providing operation unit 14 on door 3. In other words, heat resistance of cooking device 1 improves.

[0028] Frequency of radio waves used for wireless signals is frequency permitted in each country of use. Cooking device 1 corresponding to a country of use can be manufactured by replacing door 3 to the one with door wireless communication unit 1 that transmits and receives radio waves of permitted frequency.

[0029] Still more, operation unit 14 includes object to be heated identification (ID) reader 26. The object to be heated ID reader is, for example, an IC tag in which information including object to be heated type is written in advance. Cooking device 1 that cooks an object to be heated with IC tag as an object to be heated ID is equipped with an IC tag reader as object to be heated ID reader 26. This enables reading of information in the object to be heated ID. Based on this information, the type of object to be heated is automatically identified. This enables appropriate cooking corresponding to each object to be heated.

[0030] In addition, a cooking menu can be downloaded from a menu website by linking cooking device 1 and a mobile phone, for example, to access to the Internet. In other words, the use of cooking menu by downloading as required can reduce a memory capacity for cooking menu in cooking device 1. Accordingly, cost of cooking device 1 can be reduced.

[0031] Still more, if operation unit 14 is configured with a detachable remote control, and a QR code reader is provided as object to be heated ID reader 26, QR codes listed in an operating manual for cooking device 1 can be read. This can be used for reading the cooking information that is a cooking condition of an object to be heated such as food, and transmitting this information to controller 18. The same operation can be achieved by a combination of bar code and bar code reader, instead of QR code.

[0032] Another example of using IC tag, QR code, or bar code as an object to be heated ID is a service for delivering cooked or semi-cooked food to house. More specifically, delivered food can be appropriately cooked without reading instructions by including cooking information required for the delivered food in IC tag, QR code, or bar code in advance.

[0033] Furthermore, a remote control with less cooking menus can be used as the remote control where operation unit 14 is provided. This remote control is useful for those who do not use many functions of cooking device 1 (e.g., elders). In other words, this allows the use of cooking device 1 by simple operation, and thus user-

friendliness of cooking device 1 improves. In addition, if a cooking menu that each individual often uses, such as warming of milk, is stored in the remote control, user-friendliness of cooking device 1 further improves.

[0034] In Fig. 3, operation of cooking device 1 and a range of pieces of information are input using operation unit 14. An operation state of cooking device 1 and a response to input are also output and displayed on operation unit 14.

[0035] Operation unit 14 includes input unit 35, alarm 36, operation microcomputer 34, operation resonance circuit 31, power circuit 32, rechargeable battery 33, and operation communication circuit 37. The user uses input unit 35 for giving instructions to cooking device 1. Alarm 36 notifies the operation state of cooking device 1 and information such as on any abnormality. Operation microcomputer 34 controls the entire operation unit 14. Operation microcomputer 34 controls, for example, an input signal received from input unit 35, output information output to alarm 36, and operation communication circuit 37. Operation resonance circuit 31 includes an inductor and capacitor. Operation resonance circuit 31 receives power from device body 2 through power supply circuit 43, which is described later. Power circuit 32 receives power supply via operation resonance circuit 31, and supplies power to operation unit 14, more particularly to operation microcomputer 34, input unit 35, alarm 36, and operation communication circuit 37. Rechargeable battery 33 is, for example, a secondary battery, and power is input and output via power circuit 32. In other words, power stored in rechargeable battery 33 is supplied to operation microcomputer 34 and so on. Operation communication circuit 37 transmits and receives signals to and from main communication circuit 45, which is described later. Operation communication circuit 37 typically includes door wireless communication unit 17.

[0036] Device body 2 includes main microcomputer 41, main function unit 42, main communication circuit 45, power supply circuit 43, and main resonance circuit 44. Main function unit 42 includes magnetron 24, heater 7 and so on. Main microcomputer 41 controls main function unit 42, main communication circuit 45, and power supply circuit 43. Main communication circuit 45 transmits and receives signals to and from operation communication circuit 37. This enables transmission and reception of information between device body 2 and operation unit 14. Main communication circuit 45 is typically equipped with main wireless communication unit 19. Power supply circuit 43 supplies power to main resonance circuit 44. Main resonance circuit 44 includes an inductor and a capacitor. Main resonance circuit 44 is provided at a position facing operation unit 14. More specifically, main resonance circuit 44 is provided at a position facing operation resonance circuit 31. This configuration enables supply of power from main resonance circuit 44 to operation resonance circuit 31. Accordingly, power supplied from power supply circuit 43 reaches power circuit 32.

[0037] Next is given specific configurations for input

unit 35. Cooking switch 14A is an example of input unit 35. Input unit 35 is, for example, configured with a mechanical switch such as a push switch and tact switch.

[0038] Input unit 35 is, for example, configured with a touch panel. If a touch panel with liquid crystal display (hereafter referred to as LCD) is used, input unit 35 is also used as alarm 36.

[0039] Input unit 35 is, for example, configured with a voice input unit. If the voice input unit is used as input unit 35, the user can operate cooking device 1 by voice even if the user is in a state not accessible to operation unit 14.

[0040] Input unit 35 is, for example, configured with a sensor. A sensor is a temperature sensor, humidity sensor, illumination sensor, acceleration sensor, magnetic sensor, human-presence sensor, and so on. If aforementioned mechanical switch, touch panel, or voice input unit is used as input unit 35, the user gives an instruction to cooking device 1. On the other hand, if a sensor is used as input unit 35, cooking device 1 operates by itself after detecting information required for cooking from the sensor. Aforementioned input unit 35 may be configured as required with consideration to functions, use environment, use state, and cost of cooking device 1.

[0041] Next is given specific configurations for alarm 36. Display 14B is an example of alarm 36. Alarm 36 is, for example, configured with an LCD using cholesteric liquid crystal. Since the LCD can display textual information, content of alarm can be easily recognized. In other words, alarm 36 lets the user know by a sense of sight.

[0042] Alarm 36 is, for example, configured with a sound generator such as a speaker. The sound generator outputs beeping sound, melody, linguistic sound in the form of audio signal. In other words, alarm 36 lets the user know by a sense of hearing.

[0043] Alarm 36 is, for example, configured with a vibrator such as vibration motor. In other words, alarm 36 lets the user know by a sense of touch. Aforementioned alarm 36 may be configured as required with consideration to functions, use environment, use state, and cost of cooking device 1.

[0044] Operation resonance circuit 31 is provided in operation unit 14. Operation resonance circuit 31 and main resonance circuit 44 are disposed facing each other or deviated from each other at an angle. This makes operation resonance circuit 31 and main resonance circuit 33 coupled by electromagnetic induction, and power is supplied from main resonance circuit 44 to operation resonance circuit 31. Inductance and capacitance values of operation resonance circuit 31 are set to values that causes resonance of operation resonance circuit 31 in response to frequency of current that power supply circuit 43 feeds to the inductor of main resonance circuit 44.

[0045] Power circuit 32 rectifies and smoothes AC power obtained from operation resonance circuit 31 so as to convert to DC power. Power circuit 32 outputs power converted to DC current to rechargeable battery 33. This makes rechargeable battery 33 charged. Charged DC

power is output from rechargeable battery 33 to power circuit 32 as required. DC power from rechargeable battery 33 is converted to a predetermined voltage typically by a regulator, and supplied to operation unit 14 including operation microcomputer 34 as power source.

[0046] As described above, main resonance circuit 44 and operation resonance circuit 31 supply power from device body 2 to operation unit 14. Main communication circuit 45 and operation communication circuit 37 transmits and receives communication signals. In other words, Fig. 3 shows configuration in which a resonance circuit for power supply and a resonance circuit for communication (i.e., communication circuit) are separately provided.

[0047] Other than the configuration shown in Fig. 3, a resonance circuit for power supply and a resonance circuit for communication may be shared. As described above, main resonance circuit 44 and operation resonance circuit 31 are used for supplying power from main resonance circuit 44 to operation resonance circuit 31. Main communication circuit 45 modulates a communication signal, which is information from main microcomputer 41, and transmits it from main resonance circuit 44 to operation resonance circuit 31 by electromagnetic induction. Operation communication circuit 37 demodulates the communication signal received by operation resonance circuit 31, and transmits it to operation microcomputer 34. In this way, the communication signal is sent from device body 2 to operation unit 14. To send the communication signal from operation unit 14 to device body 2, the above operation is executed in a reverse direction. A modulation system applied to the communication signal is, for example, the amplitude shift keying (ASK) system, phase shift keying (PSK) system, frequency shift keying (FSK) system, and quadrature amplitude modulation (QAM) system.

[0048] If main microcomputer 41 determines that operation unit 14 is not at a position facing main resonance circuit 44 at supplying power from power supply circuit 43 to main resonance circuit 44, main microcomputer 41 stops supplying power. Main microcomputer 41 determines that operation unit 14 is not at a position facing main resonance circuit 44 if a predetermined voltage and current values are not obtained at supplying power from power supply circuit 43 to main resonance circuit 44. After stopping power supply, main microcomputer 41 detects the presence of operation unit 14 again at predetermined time intervals. If the presence of operation unit 14 is detected, main microcomputer 41 restarts power supply.

[0049] The above configuration enables non-contact communication and power supply without using electrical wiring between operation unit 14 and device body 2. Accordingly, operation unit 14 can be separated from cooking device 1. In this case, operation unit 14 is detachably attached at the upper part of door 3. Operation unit 14 can thus be removed from door 3 for use.

[0050] Still more, a battery does not need to be replaced because power is supplied to operation unit 14

from device body 2, and also power is stored in the rechargeable battery. This allows a sealed structure for operation unit 14. The sealed structure is, for example, a structure sealed by resin. Operation unit 14 separated from cooking device 1 can thus achieve a water-proof structure. In addition, if operation unit is configured with resin with high heat conductivity, heat generated from internal circuits can be released using the entire operation unit. Radiation performance of operation unit 14 thus improves.

[0051] As described above, operation unit 14 achieves non-contact communication and power supply without using electrical wiring. This enables the use of operation unit 14 separately from cooking device 1 as a remote control. In this case, operation unit 14 used as the remote control uses rechargeable battery 33 for power source.

[0052] When operation unit 14 is mounted at a predetermined position of door 3 on cooking device 1, terminal voltage of rechargeable battery 3 is measured. If measured terminal voltage is less than a standard value, rechargeable battery 33 is charged. Noncontact charging is used for charging rechargeable battery 33, which is same as that in the second exemplary embodiment.

[0053] Communication takes place between operation unit 14 and device body 2, and device body 2 executes authentication for permitting power supply to operation unit 14. Operation unit 14 executes authentication for permitting power supply from device body 2. In other words, if any abnormality occurs in rechargeable battery 33, authentication fails, and thus no charging takes place. This suppresses unrequired power supply, and reduces power consumption. In addition, if a safety device is provided so as to supply power only to an authenticated remote control, power supply due to any close foreign substance, for example, can be prevented.

[0054] Furthermore, a display for confirming authentication, such as a light-emitting diode (LED) may be provided on the remote control, which is operation unit 14, or device body 2. This enables display of stoppage of power supply if, for example, door 3 of cooking device 1 is opened after power supply starts. In addition, the display may be used for displaying completion of charging.

INDUSTRIAL APPLICABILITY

[0055] The cooking device of the present invention achieves wireless signal transmission and reception between the operation unit and device body. This eliminates wiring, and improves noise resistance and productivity.

REFERENCE MARKS IN THE DRAWINGS

[0056]

- 1 Cooking device
- 2 Device body
- 3 Door
- 4 Heating chamber

- 5 Opening
- 7 Heater (heating unit)
- 8 Door outer wall
- 9 Door inner wall
- 5 13 Handle
- 14 Operation unit
- 14A Cooking switch
- 14B Display
- 17 Door wireless communication unit
- 10 18 Controller
- 19 Main wireless communication unit
- 21 Hole
- 22 Radio transmission path
- 23 Cover
- 15 24 Magnetron (heating unit)
- 25 Radio wave transmitter
- 26 Object to be heated identification (ID) reader
- 31 Operation resonance circuit
- 32 Power circuit
- 20 33 Rechargeable battery
- 37 Operation communication circuit
- 43 Power supply circuit
- 44 Main resonance circuit
- 45 Main communication circuit

Claims

1. A cooking device comprising:

a device body with a heating chamber;
 a heating unit for heating an object to be heated placed in the heating chamber;
 a door for opening and closing an opening of the heating chamber;
 an operation unit provided on the door, the operation unit outputting a control signal corresponding to a designated cooking menu;
 a door wireless communication unit provided on the door, the door wireless communication unit transmitting the control signal from the operation unit in a form of a wireless signal; and
 a main wireless communication unit for receiving the wireless signal from the door wireless communication unit, and transmitting the wireless signal in a form of the control signal to a controller for controlling the heating unit.

2. The cooking device of claim 1, wherein the operation unit has a display, and the main wireless communication unit transmits the control signal from the controller to the door wireless communication unit in a form of a wireless signal.

3. The cooking device of claim 1, wherein the door has a handle, and the operation unit and the door wireless communication unit are provided on the handle.

4. The cooking device of claim 2,
wherein the device body is covered with a metal, and
includes a radio transmission section inside for pass-
ing a radio wave therethrough. 5
5. The cooking device of claim 1,
wherein the operation unit includes an object to be
heated identification reader for reading an object to
be heated identification of the object to be heated. 10
6. The cooking device of claim 1,
wherein the operation unit is detachably attached to
the door.
7. The cooking device of claim 1, 15
wherein the operation unit uses a rechargeable bat-
tery for a power source, and a non-contact power
supply is established from the device body to the
rechargeable battery. 20
8. The cooking device of claim 7,
wherein the device body includes a main resonance
circuit,
the operation unit includes an operation resonance
circuit, and 25
the non-contact power supply is established from the
main resonance circuit to the operation resonance
circuit using electromagnetic induction.
9. The cooking device of claim 8, 30
wherein a control signal is transmitted and received
between the main resonance circuit and the opera-
tion resonance circuit.

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FIG. 1

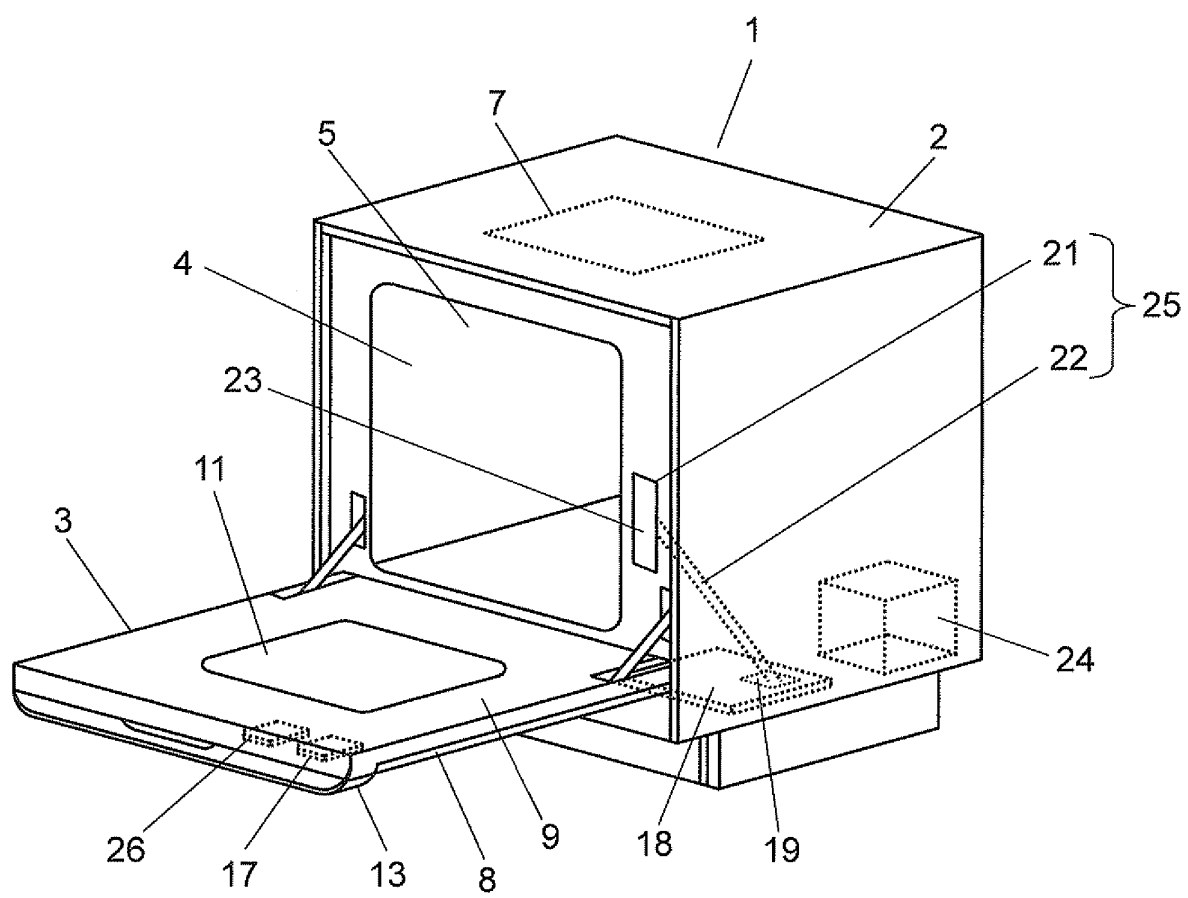


FIG. 2

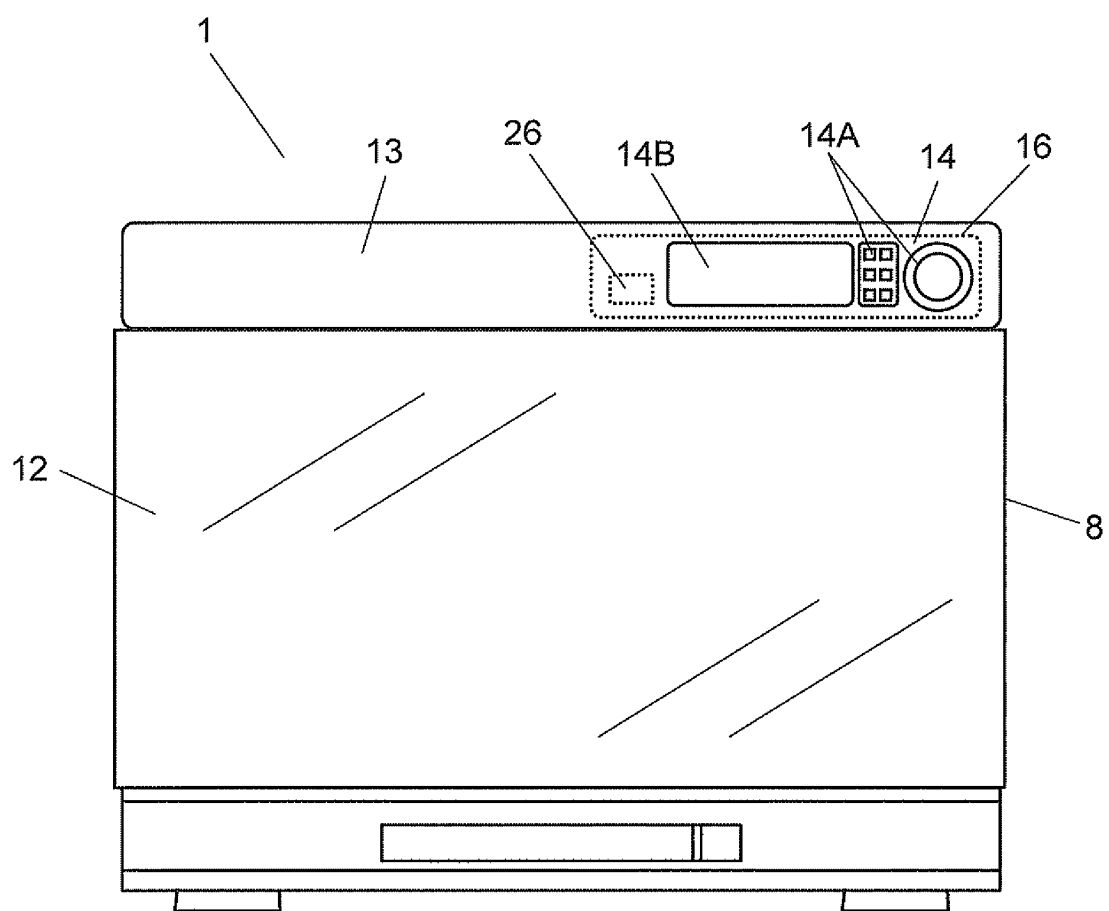


FIG. 3

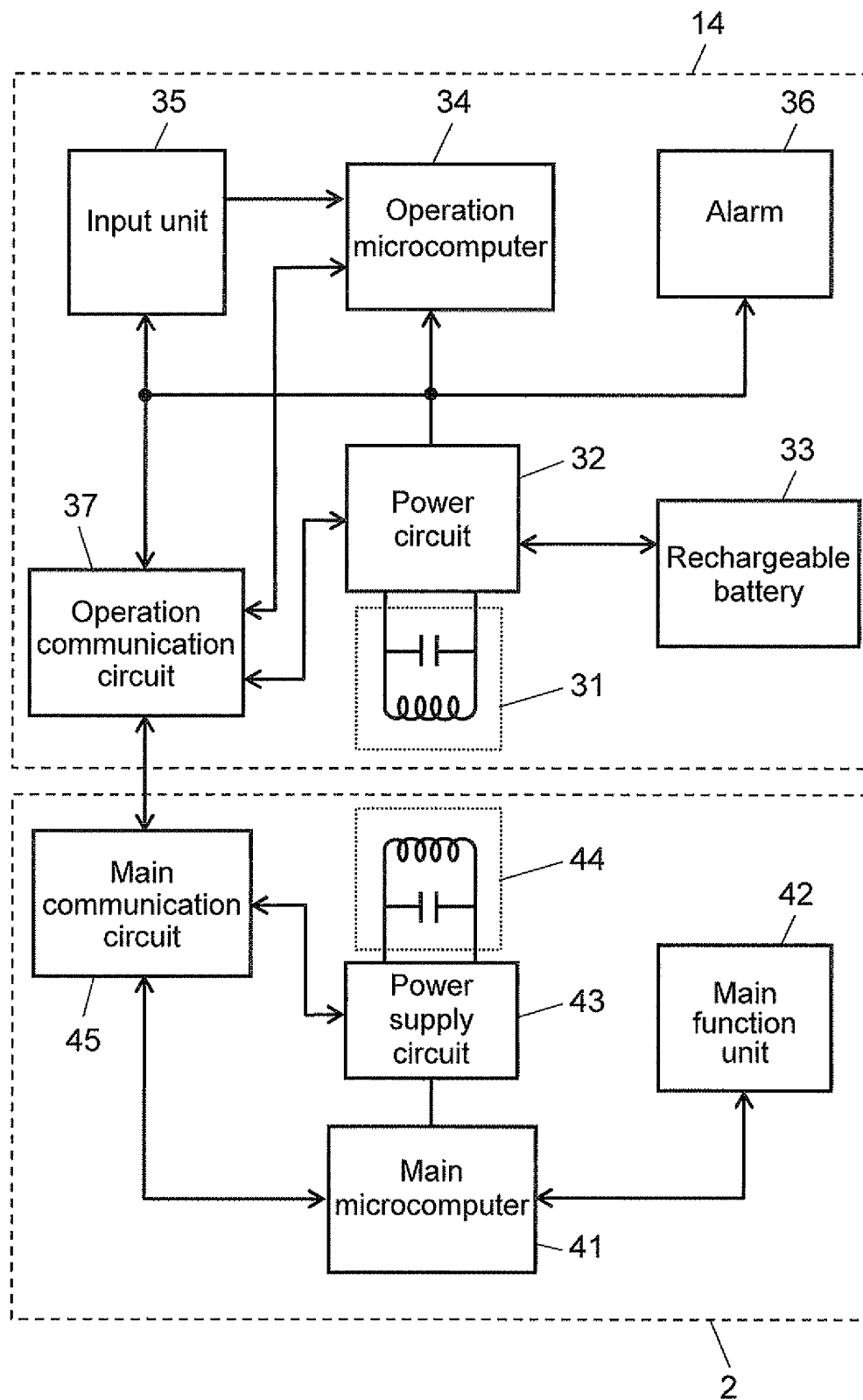


FIG. 4

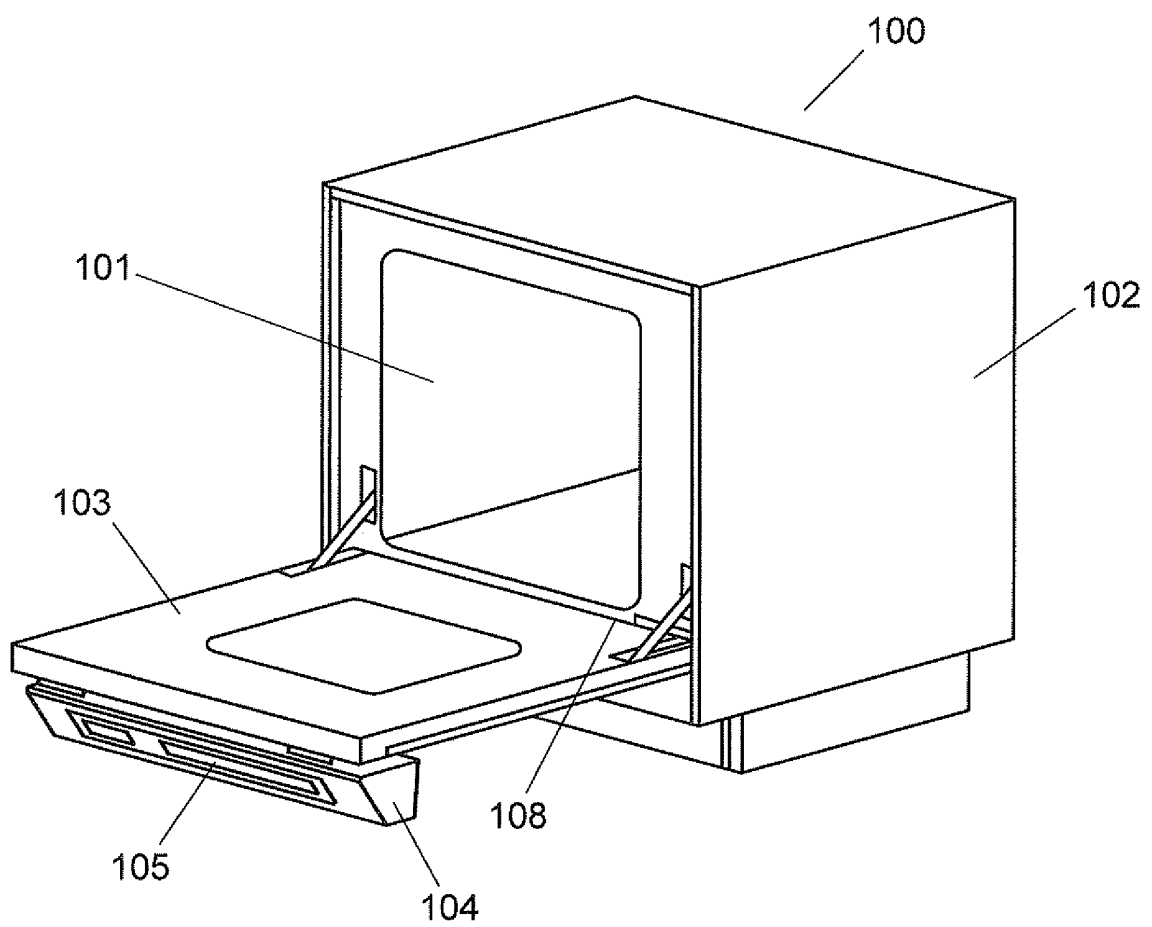
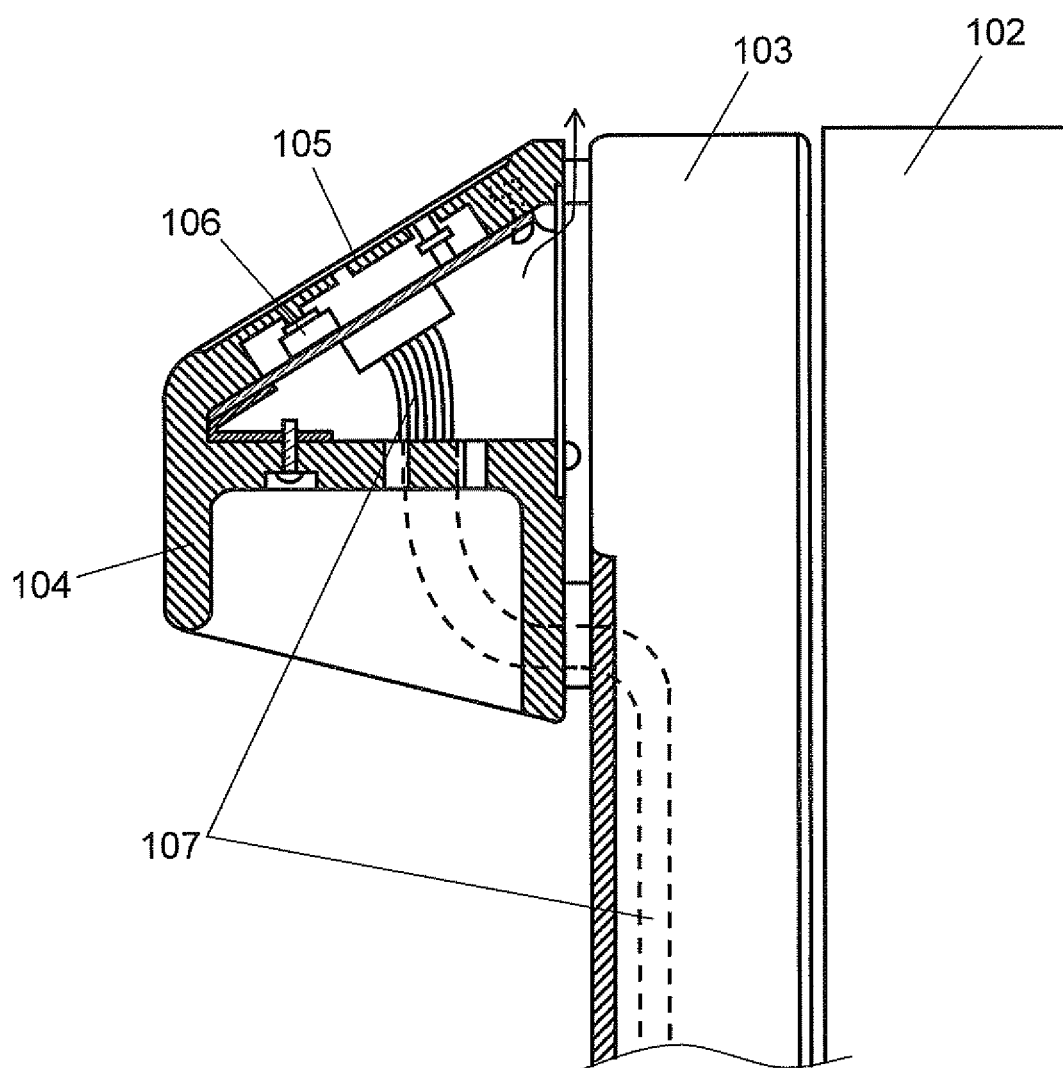


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/002970

A. CLASSIFICATION OF SUBJECT MATTER F24C7/02(2006.01)i, F24C15/00(2006.01)i, H02J17/00(2006.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) F24C7/02, F24C15/00, H02J17/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 4-121520 A (Mitsubishi Electric Home Appliance Co., Ltd.), 22 April 1992 (22.04.1992), entire text; fig. 1 (Family: none)	1, 2, 4
P, X	JP 2009-124895 A (Mitsubishi Electric Corp.), 04 June 2009 (04.06.2009), paragraphs [0149] to [0154]; fig. 14 (Family: none)	1, 2, 4
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* 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		
Date of the actual completion of the international search 02 July, 2010 (02.07.10)		Date of mailing of the international search report 13 July, 2010 (13.07.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/002970

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
(See extra sheets.)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Claims 1, 2 and 4.

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

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Continuation of Box No.III of continuation of first sheet(2)

The matter common to the inventions of claims 1-9 is a "heating cooker comprising a cooker body having a heating chamber, a heating device for heating an object to be heated contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted in the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted in the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device". However, the search has revealed that the common matter is not novel, since it was disclosed in the entire text, fig. 1, of JP 4-121520 A (Mitsubishi Electric Home Appliance Co., Ltd.), (22.04.1992). As a result, the common matter is not the special technical feature within the meaning of PCT Rule 13.2, second sentence, since it makes no contribution over the prior art.

Hence, there is no matter common to all the inventions of claims 1-9.

No technical relationship within the meaning of PCT Rule 13 can be seen between those different inventions, since there exists no other common matter which can be considered as a special technical feature within the meaning of PCT Rule 13.2, second sentence.

Hence, it is apparent that the inventions of claims 1-9 do not comply with the requirement of unity of invention.

This international Searching Authority has admitted that the invention of this patent application is as follows.

First Invention: the invention of claims 1, 2 and 4

A heating cooker "comprising a cooker body having a heating chamber, a heating device for heating an object contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted on the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted in the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device", "wherein the aforementioned operation unit includes a display unit, wherein the aforementioned body-side communication unit sends the control signal from the aforementioned control unit as the radio signal to the aforementioned door-side radio communication unit", and "wherein the aforementioned cooker body is covered with a metal and includes a radio-wave transmission unit therein for passing the radio wave".

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Second Invention: the invention of claims 1 and 3

A heating cooker "comprising a cooker body having a heating chamber, a heating device for heating an object contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted on the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted on the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device", "wherein the aforementioned door includes a handle, and wherein the aforementioned handle is provided with the aforementioned operation unit and the aforementioned door-side radio communication unit".

Third Invention: the invention of claims 1 and 5

A heating cooker "comprising a cooker body having a heating chamber, a heating device for heating an object contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted on the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted on the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device", "wherein the aforementioned operation unit includes an object discriminator reading unit for reading an object discriminator owned by the aforementioned object".

Fourth Invention: the invention of claims 1 and 6

A heating cooker "comprising a cooker body having a heating chamber, a heating device for heating an object contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted on the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted on the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device", "wherein the aforementioned operation unit is removably mounted on the aforementioned door".

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Fifth Invention: the invention of claims 1 and 7-9

A heating cooker "comprising a cooker body having a heating chamber, a heating device for heating an object contained in the aforementioned heating chamber, a door for opening/closing the opening of the aforementioned heating chamber, an operation unit mounted on the aforementioned door for outputting a control signal corresponding to a cooking menu indicated, a door-side radio communication unit mounted on the aforementioned door for sending the control signal coming from the aforementioned operation unit, as a radio signal, and a body-side radio communication unit for receiving the radio signal from the aforementioned door-side radio communication unit, to send the aforementioned radio signal as the aforementioned control signal to a control unit for controlling the aforementioned heating device", "wherein the aforementioned operation unit is electrically energized by a chargeable battery, to which the electric power is contactlessly supplied from the aforementioned cooker body, wherein the aforementioned cooker body includes a body resonance circuit whereas the aforementioned operation unit has an operation-unit resonance circuit so that the electric power is contactlessly fed by an electromagnetic induction from the aforementioned body resonance circuit to the aforementioned operation-unit resonance circuit", and wherein the control signal is sent and received by the aforementioned body resonance circuit and the aforementioned operation-unit resonance circuit".

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H2230026 B [0006]