



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.11.2017 Bulletin 2017/44

(51) Int Cl.:
H05B 6/06 (2006.01)

(21) Application number: **17156479.2**

(22) Date of filing: **16.02.2017**

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

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(30) Priority: **25.04.2016 JP 2016086786**

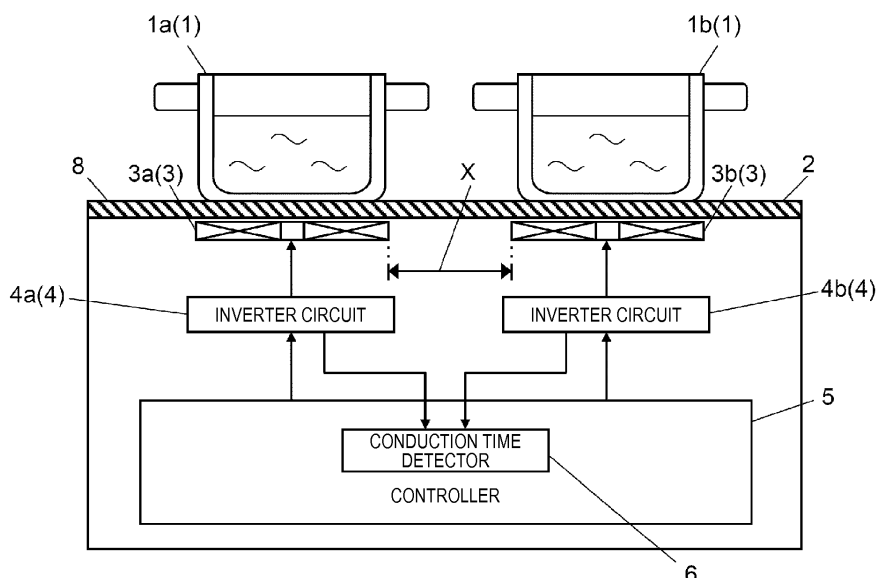
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(54) **INDUCTION HEATING COOKER**

(57) A controller drives an inverter circuit at the same frequency in a case where a plurality of heating target objects are simultaneously heated by heating coils which are adjacent with each other. In addition, the controller includes a conduction time detector for detecting a conduction period of time of a switching element of the inverter circuit. In a case where the conduction period of

time is equal to or less than a predetermined value, the controller does not switch a driving frequency of the switching element, and in a case where the conduction period of time becomes longer than the predetermined value, the controller makes the driving frequency of the inverter circuit be decreased and drives the inverter circuit to heat the heating target object.

FIG. 1



Description

BACKGROUND

1. Technical Field

[0001] The present disclosure relates to an induction heating cooker used in kitchens for general households.

2. Description of the Related Art

[0002] In the related art, an induction heating cooker of this type is disclosed in, for example, Japanese Patent Unexamined Publication No. 2005-267996. This induction heating cooker includes a plurality of heating coils for induction heating of a heating target object, a plurality of inverter circuits, input current detection means, switching voltage detection means, and control means. The control means controls the inverter circuits. In a case where a plurality of heating target objects are simultaneously heated, the control means suppresses an interference sound of the heating target object by driving the corresponding inverter circuits at the same frequency.

[0003] In this induction heating cooker, for the heating coil which is operated first, in an area in which switching voltage with respect to input current is equal to or less than a predetermined value, rated input power is obtained without switching a driving frequency of the inverter circuit and induction heating is operated.

[0004] Meanwhile, for the heating coil which is operated first, in a case where the switching voltage with respect to the input current is larger than the predetermined value, if induction heating is performed at the driving frequency as it is by the heating coil, there is a possibility that voltage applied to the switching means becomes excessive and the switching element may be destroyed.

[0005] In this case, the control means reduces (switches) the driving frequency of the inverter circuit corresponding to the heating coil operated first until an optimum driving frequency to obtain the rated input power. As a result, induction heating is performed with respect to the heating target object.

[0006] Then, in a case where the plurality of heating target objects are simultaneously heated, for the heating coil operated after the second, the driving frequency of the heating coil operated after the second is matched to the optimum driving frequency of the heating coil operated first. As a result, it is possible to obtain maximum input power by optimizing the driving frequency of the inverter circuit with respect to the heating target object. Accordingly, it is possible to prevent a user from feeling that thermal power is reduced.

[0007] In addition, by reducing the driving frequency of the inverter circuit, it is possible to reduce electrical loading of the switching means or electrical loading of an inverter circuit component and to suppress pot noise caused by a difference between the driving frequencies of the inverter circuits respectively corresponding to the

plurality of heating coils.

[0008] However, in a configuration of the related art, if once the driving frequency is reduced to the optimum driving frequency, the driving frequency of the inverter circuit is always fixed to a driving frequency approaching to an audible range during heating. Therefore, there is a possibility that the user may hear a sound of the driving frequency of the inverter circuit, so that the user feels discomfort.

SUMMARY

[0009] To solve the above problem, the present disclosure provides the induction heating cooker which can suppress the pot noise caused by a difference between the driving frequencies of the inverter circuits corresponding to the plurality of heating coils and enables the user to have friendly usability while reducing a concern that the user hears the sound of the driving frequency of the inverter circuit.

[0010] Specifically, there is provided an induction heating cooker according to one example of embodiment of the present disclosure including: a top plate in which a heating target object is placed; a plurality of heating coils which are disposed under the top plate and heat the heating target object; an inverter circuit which is provided corresponding to each of the plurality of heating coils and supplies high-frequency current to each of the heating coils; a controller which controls an operation of the inverter circuit; and an operation display which is operated by a user, in which the inverter circuit includes a switching unit which switches current of a resonance circuit, and the controller includes a conduction time detector which detects a conduction period of time of the switching unit.

[0011] In a case where a first heating coil and a second heating coil among the plurality of heating coils are simultaneously operated, and a distance between the first heating coil and the second heating coil is equal to or more than a first predetermined distance, the controller is configured to; in a case where the conduction periods of time of the switching units of a first inverter circuit corresponding to the first heating coil and a second inverter circuit corresponding to the second heating coil are equal to or less than a predetermined value, make driving frequencies of the switching unit of the first inverter circuit and the second inverter circuit be a predetermined driving frequency; in a case where the conduction period of time of the switching unit is longer than the predetermined value, make the driving frequency of the first inverter circuit or the second inverter circuit which has been detected as having the conduction period of time longer than the predetermined value be smaller than the predetermined driving frequency; and inductively heat the heating target object by the first heating coil and the second heating coil.

[0012] By this configuration, it is possible to suppress the pot noise which is caused by a difference between the driving frequencies of the inverter circuits respectively

corresponding to the plurality of heating coils while reducing a concern that the user hears the sound of the driving frequency of inverter circuit. Accordingly, it is possible to improve usability of the induction heating cooker.

[0013] In the induction heating cooker according to one example of the embodiment of the present disclosure, in a case where the distance between the first heating coil and the second heating coil is smaller than the first predetermined distance, the controller may be configured to drive the first inverter circuit and the second inverter circuit at the same frequency.

[0014] By this configuration, even in a case where a distance between the plurality of heating coils is short, it is possible to suppress the pot noise which is caused by a difference between the driving frequencies of the inverter circuits respectively corresponding to the plurality of heating coils while reducing a concern that the user hears the sound of the driving frequency of inverter circuit. Accordingly, it is possible to improve usability of the induction heating cooker.

[0015] In the induction heating cooker according to one example of the embodiment of the present disclosure, the top plate includes a first heating area and a second heating area on which the heating target object is placed, in the first heating area, three or more of the plurality of heating coils are arranged in parallel in a front-back direction or a right-left direction of the induction heating cooker and the heating coil operated is switched according to the heating target object, the second heating area is formed to have a heating coil having a larger diameter than a diameter or a minor axis of one of the plurality of the heating coils constituting the first heating area, the controller may be configured to, in a case where the plurality of heating coils of the first heating area and the second heating area are simultaneously operated, respectively drive the inverter circuits corresponding to the heating coils at the same frequency; and in a case where the plurality of heating target objects are simultaneously heated in the first heating area and the second heating area, determine the driving frequencies of the inverter circuits respectively corresponding to the heating coils according to the distance between the heating coils of the first heating area and the heating coil of the second heating area, and inductively heat the heating target objects by the heating coils of the first heating area and the heating coil of the second heating area.

[0016] With this configuration, the user can freely select a position in which the heating target object is placed on the first heating area, so that usability can be improved and a limited space can be effectively used. In addition, it is possible to suppress the pot noise which is caused by the difference between the driving frequencies of the plurality of heating coils in the first heating area or between the first area and the second area. Accordingly, it is possible to improve usability of the induction heating cooker.

[0017] In the induction heating cooker according to one example of the embodiment of the present disclosure,

the second heating area may be provided at least on the right or left of the first heating area.

[0018] With the above configuration, since the user can use the plurality of heating areas at a position close to the front of the induction heating cooker, it is possible to further improve usability of the induction heating cooker.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a diagram illustrating an overall sectional configuration of an induction heating cooker according to EMBODIMENT 1 and EMBODIMENT 2 of the present disclosure;

FIG. 2 is a diagram illustrating a circuit configuration of an induction heating cooker according to EMBODIMENTS 1 to 4 of the present disclosure;

FIG. 3 is a flowchart illustrating heating control of the induction heating cooker according to EMBODIMENT 1 of the present disclosure;

FIG. 4 is a plan view of the induction heating cooker according to EMBODIMENT 3 and EMBODIMENT 4 of the present disclosure; and

FIG. 5 is a circuit diagram of a switching unit for switching connections of heating coils of the induction heating cooker according to EMBODIMENT 3 of the present disclosure.

DETAILED DESCRIPTION

[0020] Hereinafter, embodiments according to the present disclosure will be described with reference to drawings. Furthermore, the present disclosure is not to be limited to the embodiments.

EMBODIMENT 1

[0021] FIG. 1 is a diagram illustrating an overall sectional configuration of an induction heating cooker according to EMBODIMENT 1 of the present disclosure. In addition, FIG. 2 is a diagram illustrating a circuit configuration of the induction heating cooker.

[0022] In FIG. 1, heating target objects 1a and 1b placed on top plate 2 are heated by heating coils 3a and 3b. Inverter circuits 4a and 4b respectively supply high frequency resonance current to heating coils 3a and 3b. Furthermore, heating coil 3 is representative of heating coils 3a and 3b, and inverter circuit 4 is representative of inverter circuits 4a and 4b.

[0023] Above heating coils 3a and 3b, top plate 2 formed of heat-resistant glass which is an insulator is provided. Heating target objects 1a and 1b are placed to respectively face heating coils 3a and 3b with top plate 2 interposed therebetween.

[0024] Next, a circuit configuration of the induction heating cooker including inverter circuits 4a and 4b will be described with reference to FIG. 2. Here, one inverter

circuit 4 and one heating coil 3 corresponding to inverter circuit 4 will be described for simplicity.

[0025] Inverter circuit 4 is connected to an alternating current (AC) power supply through a rectifier circuit and a smoothing circuit connected to the rectifier circuit.

[0026] The rectifier circuit is configured to have a diode bridge for converting AC voltage from the AC power supply into direct current (DC) voltage. In addition, the smoothing circuit is configured to have a choke coil and a smoothing capacitor.

[0027] Further, on an output side of the smoothing circuit, a serial connection body of first switching element (IGBT: Insulated Gate Bipolar Transistor) 20a and second switching element (IGBT) 20b respectively including a reverse conduction diode therein is connected to the smoothing circuit as a switching unit. Then, the resonance circuit is connected between a connection point between first switching element 20a and second switching element 20b and a low potential side or a high potential side of the smoothing capacitor constituting the smoothing circuit (low potential side in FIG. 2). The resonance circuit is formed to have heating coil 3 which inductively heats heating target object 1 and a resonance capacitor which resonates with heating coil 3 being connected with each other in series.

[0028] Then, inverter circuit 4 is configured to have first switching element 20a and second switching element 20b so that the high frequency resonance current is supplied to heating coil 3. Furthermore, first switching element 20a and second switching element 20b are collectively referred to as switching element 20.

[0029] In addition, an input current detector is provided in the induction heating cooker for detecting input current of inverter circuit 4.

[0030] Furthermore, the circuit configuration of the induction heating cooker including inverter circuit 4 is not limited to the above described configuration and can use known ones.

[0031] As illustrated in FIG. 1, heating coil 3a and heating coil 3b are disposed so that distance X between heating coil 3a and heating coil 3b is a first predetermined distance (for example, 4 cm). Here, distance X is a distance between nearest positions between an outer periphery of first heating coil 3a and an outer periphery of second heating coil 3b. Then, the first predetermined distance is set to a distance (for example, 4 cm) so that magnetic flux from a plurality of heating coils 3a and 3b does not enter to one heating target object 1.

[0032] On or near top plate 2, operation display 8 is provided to perform an input by a user.

[0033] Controller 5 exclusively and alternately conducts first switching element 20a and second switching element 20b illustrated in FIG. 2 at a constant frequency and controls output of inverter circuit 4 based on a signal transmitted from operation display 8, so that start or stop of heating is performed.

[0034] In addition, operation display 8 displays information recognized by induction heating cooker based on

a signal transmitted from controller 5. With this, the information is notified to the user, and the user is encouraged to operate the induction heating cooker.

[0035] In addition, controller 5 includes conduction time detector 6 (see FIG. 1) for detecting a conduction period of time of switching element 20. Further, controller 5 includes a resonant voltage detector for detecting resonance voltage of inverter circuit 4 and a heating target object detector for determining whether or not heating target object 1 is placed on top plate 2 based on a detected value of the input current detector and the resonant voltage detector.

[0036] Impedance of heating coil 3 is changed depending on presence or absence, size, and the like of heating target object 1 placed above heating coil 3, and thus the current flowing through inverter circuit 4 and the resonance voltage are changed. Accordingly, it is possible to detect presence or absence of heating target object 1 by detecting the resonance voltage.

[0037] Hereinafter, a method for detecting presence or absence of heating target object 1 will be described.

[0038] First, controller 5 controls a period of time of on-state of switching element 20, that is, the conduction period of time so that detected current in the input current detector is a predetermined value. When the period of time of on-state of switching element 20 is increased, current flowing through heating coil 3 is increased and the resonance voltage becomes higher by heating coil 3 and the resonant capacitor.

[0039] The heating target object detector makes the current for detection flow through heating coil 3 and detects change of the detected value of the resonance voltage accordingly. Then, the heating target object detector determines whether or not there is heating target object 1 above heating coil 3 by comparing the amount of change of the detected value with a threshold which is set in the heating target object detector. Further, when the heating target object detector determines that heating target object 1 is disposed above heating coil 3, the heating target object detector outputs a detection signal to controller 5.

[0040] Furthermore, although a configuration in which heating target object 1 is detected using the resonance voltage has been described in the present embodiment, there is also a detection method using coil current of heating coil 3, and the detection method of heating target object 1 is not limited to thereto.

[0041] Operations and actions of the induction heating cooker configured as described above will be described below.

[0042] FIG. 3 is a flowchart illustrating heating control of the induction heating cooker according to EMBODIMENT 1.

[0043] When a power switch of the induction heating cooker is pressed by the user (Yes in S01), the AC power supply is changed to the DC power supply by the rectifier circuit. In this state, a signal for driving switching element 20 of inverter circuits 4a and 4b illustrated in FIG. 1 and

FIG. 2 does not output from controller 5, and heating coils 3a and 3b do not heat heating target objects 1a and 1b.

[0044] Next, when a heating on / off key of operation display 8 is pressed by the user (Yes in S02), the heating target object detector determines whether or not heating target objects 1a and 1b are placed above heating coils 3a and 3b.

[0045] When the heating target object detector determines that heating target objects 1a and 1b are placed (Yes in S03), controller 5 controls inverter circuits 4a and 4b and performs heating of heating target objects 1a and 1b so that thermal power becomes thermal power displayed on operation display 8 (S04).

[0046] Meanwhile, in a case where the heating target object detector determines that heating target objects 1 is not placed, controller 5 causes operation display 8 to display that heating target object 1 is not placed (for example, "-" is displayed), and does not perform heating (No in S03).

[0047] The heating target object detector determines whether or not there is heating target object 1 at a constant period (for example, a period of two seconds). As a result, even in a case where heating target object 1 is placed halfway, it is possible to immediately determine presence or absence of heating target object 1 and to perform heating. In addition, when a state in which heating target object 1 is not placed continues for a constant period of time (for example, one minute), controller 5 determines that the user is not willing to heat and returns to a state in which the power switch is pressed (that is, a state where inverter circuit 4 is not driven).

[0048] Furthermore, in a case where the plurality of heating coils 3a and 3b respectively heat the plurality of heating target objects 1a and 1b, the user presses the heating on / off key respectively corresponding to heating coils 3a and 3b in operation display 8.

[0049] Next, an operation of controller 5 will be described.

[0050] Controller 5 includes conduction time detector 6 for detecting the conduction period of time of switching element 20(IGBT) as described above. In a case where the conduction period of time detected in conduction time detector 6 is equal to or less than a predetermined value (for example, 32 μ s) (Yes in S05), controller 5 drives inverter circuit 4 at a predetermined driving frequency (for example, 23 kHz, a period is 43.4 μ s) without changing a driving frequency to inductively heat heating target object 1 (S06).

[0051] Meanwhile, in a case where the user selects strong thermal power in operation display 8 and the conduction period of time of inverter circuit 4 corresponding to heating coil 3 is longer than a predetermined value (No in S05), controller 5 reduces the driving frequency (for example, 20.8 kHz, a period is 48 μ s) of inverter circuit 4 to inductively heat heating target object 1 (S07).

[0052] In addition, as described above, since distance X between heating coil 3a and heating coil 3b is equal to or more than the first predetermined distance (for exam-

ple, 4 cm), it is possible to prevent magnetic flux from the plurality of heating coils 3a and 3b from entering into one heating target object 1. Accordingly, even in a case where the driving frequencies of inverter circuits 4a and 4b corresponding to the plurality of heating coils 3a and 3b are different from each other, an occurrence of a pot noise is suppressed.

[0053] Furthermore, although EMBODIMENT 1 has been described using two heating coils 3a and 3b, the present disclosure is not limited to such a configuration.

[0054] For example, the plurality of heating coils 3 may be arranged in a matrix shape in the front-back and the right-left. In this case, heating target object 1 can be disposed at an arbitrary position on top plate 2 by the user. Heating target object 1 is heated by one or more heating coils 3 (heating coil group) disposed under heating target object 1.

[0055] In a case where the plurality of heating target objects 1 are simultaneously heated in the induction heating cooker of such a configuration, the driving frequency of inverter circuit 4 is determined and induction heating is performed according to distance X between the heating coil group and nearest heating coil 3 from the heating coil group which respectively heat heating target object 1.

[0056] By this configuration, it is possible to suppress the pot noise which is caused by a difference between the driving frequencies of the plurality of inverter circuits 4a and 4b while reducing a concern that the user hears a sound of the driving frequency of inverter circuits 4a and 4b. Accordingly, it is possible to improve usability of the induction heating cooker.

EMBODIMENT 2

[0057] Next, an induction heating cooker according to EMBODIMENT 2 of the present disclosure will be described.

[0058] An overall sectional configuration and a circuit configuration of the induction heating cooker according to EMBODIMENT 2 are the same as those in the induction heating cooker according to EMBODIMENT 1 of FIG. 1. Therefore, the same reference numerals are given to components of the same function and the same configuration as those of the induction heating cooker of EMBODIMENT 1, and description thereof is omitted.

[0059] In EMBODIMENT 2, a case where there are heating coils 3a and 3b between which a distance between the heating coils is less than the first predetermined distance and which are close to each other will be described.

[0060] In FIG. 1, in a case where distance X between the plurality of heating coils 3a and 3b is less than the first predetermined distance (for example, 4 cm) and the heating coils are close to each other to be at a second predetermined distance (for example, 2 cm), magnetic flux from the plurality of heating coils 3a and 3b enters into one heating target object 1. Accordingly, in a case where heating is simultaneously performed using the plu-

rality of heating coils 3a and 3b having small distance X between the heating coils, the driving frequencies of all of inverter circuits 4a and 4b corresponding to the plurality of heating coils 3a and 3b are set to same frequency (for example, 23 kHz).

[0061] Furthermore, the induction heating cooker is configured so that total electric power is restricted in order to prevent breaker interruption in a case where the plurality of heating coils 3 are simultaneously operated and the heating target object is heated. Accordingly, in a case where the plurality of heating coils 3 are simultaneously operated, output power from one inverter circuit 4 becomes lower as compared with when single heating coil 3 is operated. Therefore, even in a case where small thermal power is set, it is possible to provide desired power without reducing the driving frequency of inverter circuit 4. Accordingly, a possibility that the user approaching to an audible range of the driving frequency can hear the sound of the driving frequency is reduced.

[0062] In addition, in a case where there is heating coil 3 that distance X between the heating coils is equal to or more than the first predetermined distance, the driving frequency of inverter circuit 4 is controlled in the same manner as EMBODIMENT 1. Specifically, in a case where the conduction period of time of switching element 20 of inverter circuit 4 is larger than the predetermined value, the driving frequency of inverter circuit 4 is reduced (for example, 20.8 kHz).

[0063] An interference sound of heating target object 1 is caused by magnetic flux of different frequency bands from the plurality of heating coils 3 entering into one heating target object 1. Accordingly, in a case where distance X between heating coils 3 is large, and magnetic flux from the plurality of heating coils 3 does not enter into heating target object 1, it is not necessary to make the driving frequencies of the inverter circuits 4 corresponding to heating coils 3 be the same frequency even when the plurality of heating coils 3 are simultaneously operated to heat heating target object 1.

[0064] By this configuration, it is possible to suppress the pot noise which is caused by a difference between the driving frequencies of the plurality of heating coils 3 while reducing a concern that the user hears the sound of the driving frequency of inverter circuit 4. Accordingly, it is possible to improve usability of the induction heating cooker.

EMBODIMENT 3

[0065] Next, an induction heating cooker according to EMBODIMENT 3 of the present disclosure will be described.

[0066] The same reference numerals are given to components of the same function and the same configuration as those of the induction heating cooker of EMBODIMENT 1 and EMBODIMENT 2, and description thereof is omitted.

[0067] FIG. 4 is a plan view of the induction heating

cooker according to EMBODIMENT 3 of the present disclosure. FIG. 5 is a circuit diagram of a switching unit for switching the heating coils of the induction heating cooker according to Embodiment 3 of the present disclosure.

[0068] In EMBODIMENT 3, a specific configuration example of a heating area on top plate 2 and an operation of the induction heating cooker in the configuration will be described.

[0069] As illustrated in FIG. 4, the induction heating cooker of EMBODIMENT 3 includes first heating area 11 and second heating area 12 (12a and 12b) in which heating target object 1 is placed on top plate 2.

[0070] Heating coil 31 (31a to 31d) corresponds to first heating area 11. In heating coil 31, three or more (four in FIG. 4) heating coils of circular or elliptical shape are arranged in parallel in the front-back direction or the right-left direction (right-left direction in FIG. 4).

[0071] In addition, heating coil 32 (32a and 32b) corresponds to second heating area 12 (12a and 12b). Heating coil 32 is configured to have heating coils of which a diameter is larger than a diameter or minor axis of heating coil 31 constituting first heating area 11.

[0072] In addition, it is possible to switch heating coil 31 which heats heating target object 1c according to a size or position of heating target object 1c in first heating area 11.

[0073] As illustrated in FIG. 5, switching unit 7 (7a to 7d) switches a connection of the plurality of heating coils 31 (31a to 31d) corresponding to first heating area 11. Controller 5 controls a contact point (for example, contact point of relay) of switching unit 7 to switch heating coil 31 to be connected according to heating target object 1c placed on top plate 2.

[0074] For example, as illustrated in FIG. 4, when heating target object 1c is placed across two (31c and 31d) of a right side among four oval heating coils 31a to 31d in a line in first heating area 11 and the user operates operation display 8 to start heating, a connection of heating coil 31 is switched by switching unit 7. With this, heating is performed by two heating coils 31c and 31d of the right side, and high-frequency current is not supplied to two remaining heating coils 31a and 31b of a left side.

[0075] In addition, when heating target object 1c is placed across two (31b and 31c) of the center of four oval heating coils 31 in a line in first heating area 11 and the user operates operation display 8 to start heating, the connection of heating coil 31 is switched by switching unit 7 and heating is performed in two heating coils 31b and 31c of the center. The high-frequency current is not supplied to remaining heating coils 31a and 31d.

[0076] When heating target object 1 is placed on two heating coils 31a and 31b of the left side in first heating area 11, the connection of heating coil is switched by switching unit 7 and heating is performed by two heating coils 31a and 31b of the left side in the same manner.

[0077] In addition, when heating target object 1c is placed across all four (31a to 31d) of four oval heating coils 31 in a line and the user operates operation display

8 to start heating, heating is performed by all of four heating coils 31a to 31d. In addition, when heating target object 1c is placed across right three (31b to 31d) of four oval heating coils 31 in a line and operation display 8 is operated to heat, heating is performed by right three heating coils 31b to 31d. When heating target object 1c is placed on left three heating coils 31a and 31c, the connection of heating coil 31 is switched in the same manner.

[0078] In addition, when heating target object 1c is placed on one heating coil 31 among four oval heating coils 31a to 31d in a line and the user operates operation display 8 to start heating, heating is performed by only one heating coil 31.

[0079] With this, since the connection of heating coil 31 is switched by switching unit 7, an arbitrary position such as right and left or middle can be selected for heating in first heating area 11.

[0080] An induction heating cooker built and used in a cabinet of a kitchen or the like has limitations on sizes of an equipment body and a top plate to be provided. However, since the connection of heating coil 31 is switched by switching unit 7 in the induction heating cooker of EMBODIMENT 3, it is possible to freely select a position on which heating target object 1c is placed and to effectively utilize a limited space of top plate 2.

[0081] With the above configuration, since heating target object 1c can be heated even if the position of heating target object 1c is changed within first heating area 11, it is possible to improve usability of the user and to effectively utilize the limited space of top plate 2.

[0082] Furthermore, in a case where the plurality of heating coils 31 of first heating area 11 are simultaneously operated, inverter circuit 4 corresponding to heating coil 31 operated is driven at same frequency in the same manner as EMBODIMENT 2.

[0083] In addition, in a case where heating coil 31 of first heating area 11 and heating coil 32 of second heating area 12 are simultaneously operated, the driving frequency of inverter circuit 4 corresponding to each of heating coils 31 and 32 is determined according to distance X between heating coil 31 group operated in first heating area 11 and heating coil 32 operated in the second heating area in the same manner as EMBODIMENT 1 or EMBODIMENT 2.

[0084] That is, when distance X is equal to or more than the first predetermined distance, the driving frequency, in a case where the conduction period of time of switching element 20 of inverter circuit 4 becomes longer, is decreased. In addition, in a case where distance X is the second predetermined distance which is less than the first predetermined distance, inverter circuit 4 is respectively driven at the same frequency without changing the driving frequency.

[0085] Here, as illustrated in FIG. 4, distance X is a distance between nearest positions between an outer periphery of nearest heating coil 31d from operated heating coil 32 (32b) in operated heating coil 31 group (31c and 31d) and an outer periphery of heating coil 32b.

[0086] By the configuration of EMBODIMENT 3, it is possible to suppress the pot noise which is caused by a difference between the driving frequencies of inverter circuits 4 corresponding to the plurality of heating coils.

EMBODIMENT 4

[0087] Next, an induction heating cooker according to EMBODIMENT 4 of the present disclosure will be described. The same reference numerals are given to components of the same function and the same configuration as those of the induction heating cooker of EMBODIMENTS 1 to 3, and description thereof is omitted.

[0088] A plan view of the induction heating cooker according to EMBODIMENT 4 is the same as that in the induction heating cooker according to EMBODIMENT 3 in FIG. 4.

[0089] In EMBODIMENT 4, second heating area 12 is provided at least on the right or left of first heating area 11. That is, the plurality of heating areas are disposed in the right-left direction in a line in front of the induction heating cooker. FIG. 4 illustrates an example in which second heating areas 12a and 12b are provided on both side of first heating area 11.

[0090] With the above configuration, since the user can use both of first heating area 11 and second heating area 12 at a position close to the front of the induction heating cooker, it is possible to further improve usability.

[0091] As described above, the present disclosure can provide the induction heating cooker which can suppress the pot noise which is caused by a difference between the driving frequencies of the inverter circuits corresponding to the plurality of heating coils while reducing a concern that the user hears the sound of the driving frequency of the inverter circuit. Accordingly, the induction heating cooker can be widely used for cookers or the like used in kitchens for general households or kitchens for business.

Claims

1. An induction heating cooker comprising:

- a top plate in which a heating target object is placed;
- a plurality of heating coils which are disposed under the top plate and heat the heating target object;
- an inverter circuit which is provided corresponding to each of the plurality of heating coils and supplies high-frequency current to each of the heating coils;
- a controller which controls an operation of the inverter circuit; and
- an operation display which is operated by a user, wherein the inverter circuit includes a switching unit which switches current of a resonance cir-

cuit,
 the controller includes a conduction time detector which detects a conduction period of time of the switching unit, and
 the controller is configured to, 5
 in a case where a first heating coil and a second heating coil among the plurality of heating coils are simultaneously operated, and a distance between the first heating coil and the second heating coil is equal to or more than a first predetermined distance, 10

i) in a case where the conduction periods of time of the switching units of a first inverter circuit corresponding to the first heating coil and a second inverter circuit corresponding to the second heating coil are equal to or less than a predetermined value, 15
 make driving frequencies of the first inverter circuit and the second inverter circuit be a predetermined driving frequency; 20
 ii) in a case where the conduction period of time of the switching unit is longer than the predetermined value, 25
 make the driving frequency of the first inverter circuit or the second inverter circuit which has been detected as having the conduction period of time longer than the predetermined value be smaller than the predetermined driving frequency; and 30

inductively heat the heating target object by the first heating coil and the second heating coil.

2. The induction heating cooker of Claim 1, 35
 wherein, in a case where the distance between the first heating coil and the second heating coil is smaller than the first predetermined distance, the controller is configured to drive the first inverter circuit and the second inverter circuit at the same frequency. 40
3. The induction heating cooker of Claim 1 or 2, 45
 wherein the top plate includes a first heating area and a second heating area on which the heating target object is placed,
 in the first heating area, three or more of the plurality of heating coils are arranged in parallel in a front-back direction or a right-left direction of the induction heating cooker and the heating coil operated is switched according to the heating target object, 50
 the second heating area is formed to have a heating coil having a larger diameter than a diameter or a minor axis of one of the plurality of the heating coils constituting the first heating area, and
 the controller is configured to, 55
 in a case where the plurality of heating coils of the first heating area are simultaneously operated, respectively drive the inverter circuits corresponding

to the heating coils at the same frequency, and
 in a case where a plurality of the heating target objects are simultaneously heated in the first heating area and the second heating area, determine the driving frequencies of the inverter circuits respectively corresponding to the heating coils according to the distance between the heating coils of the first heating area and the heating coil of the second heating area, and inductively heat the heating target objects by the heating coils of the first heating area and the heating coil of the second heating area.

4. The induction heating cooker of Claim 3, wherein the second heating area is provided at least on the right or left of the first heating area.

FIG. 1

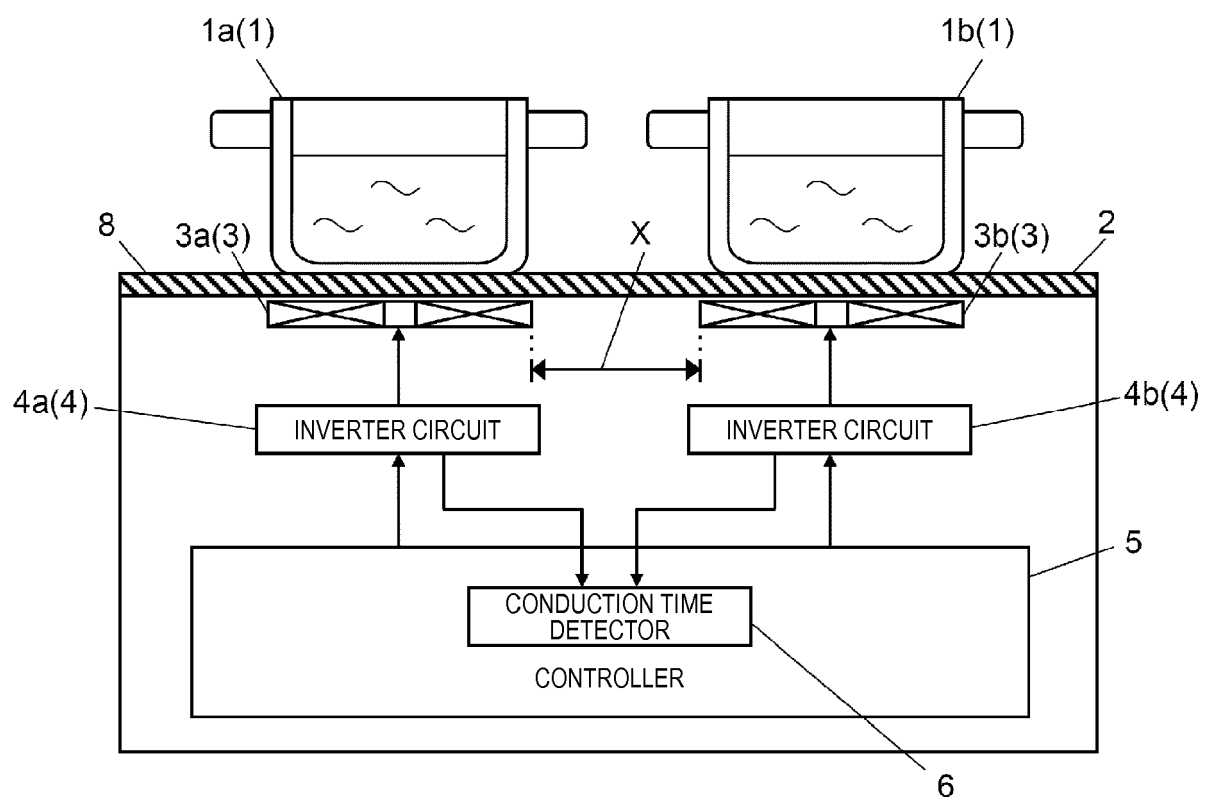


FIG. 2

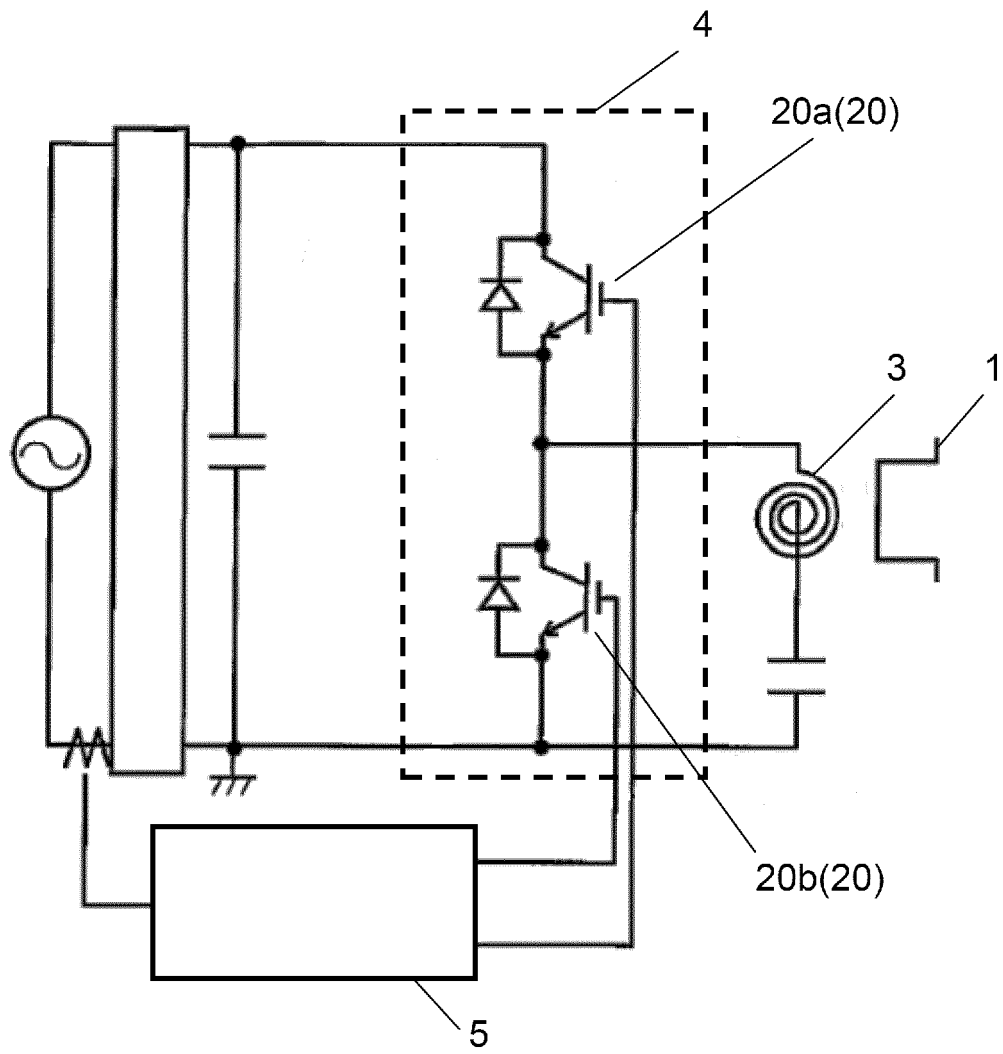


FIG. 3

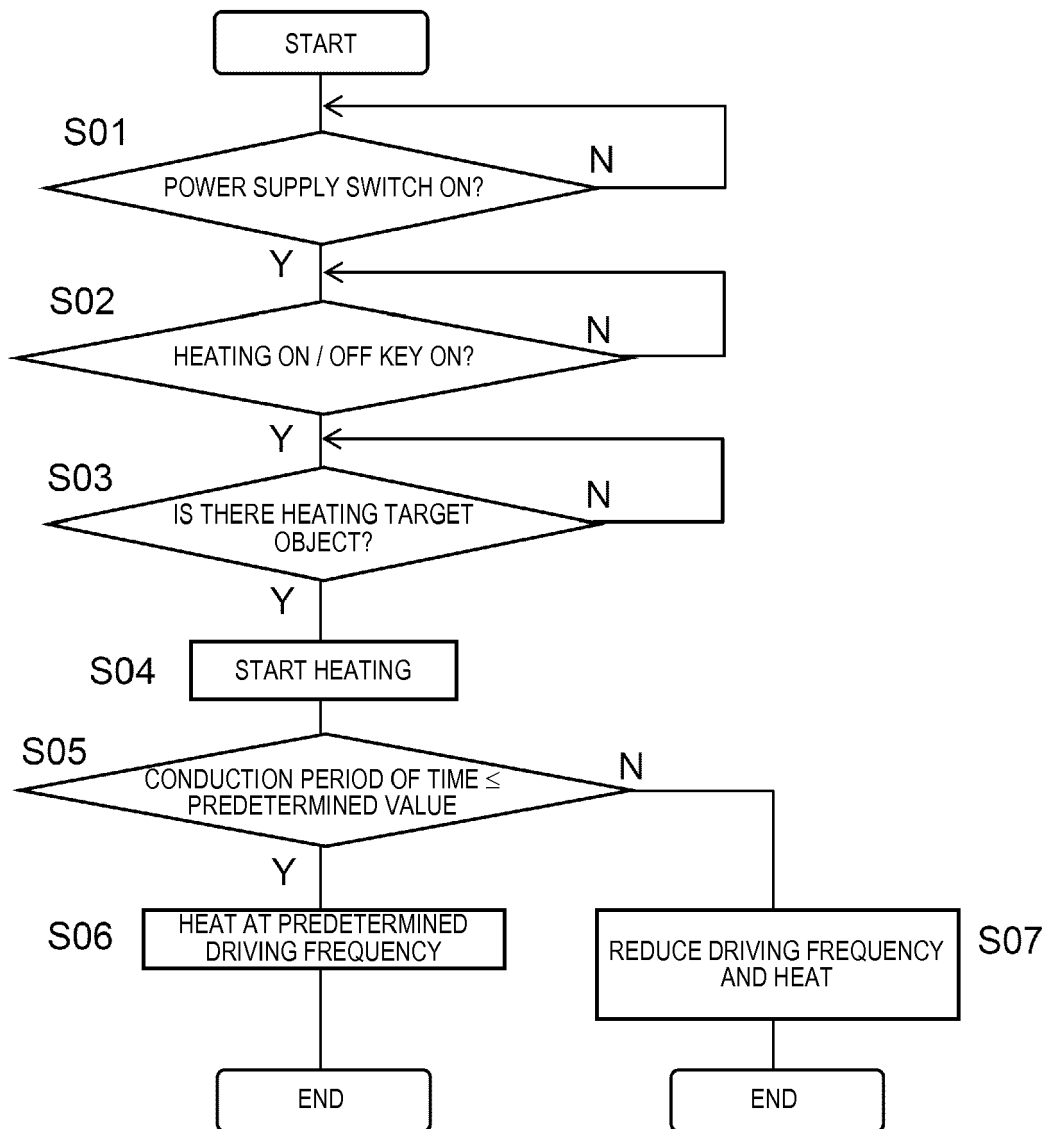


FIG. 4

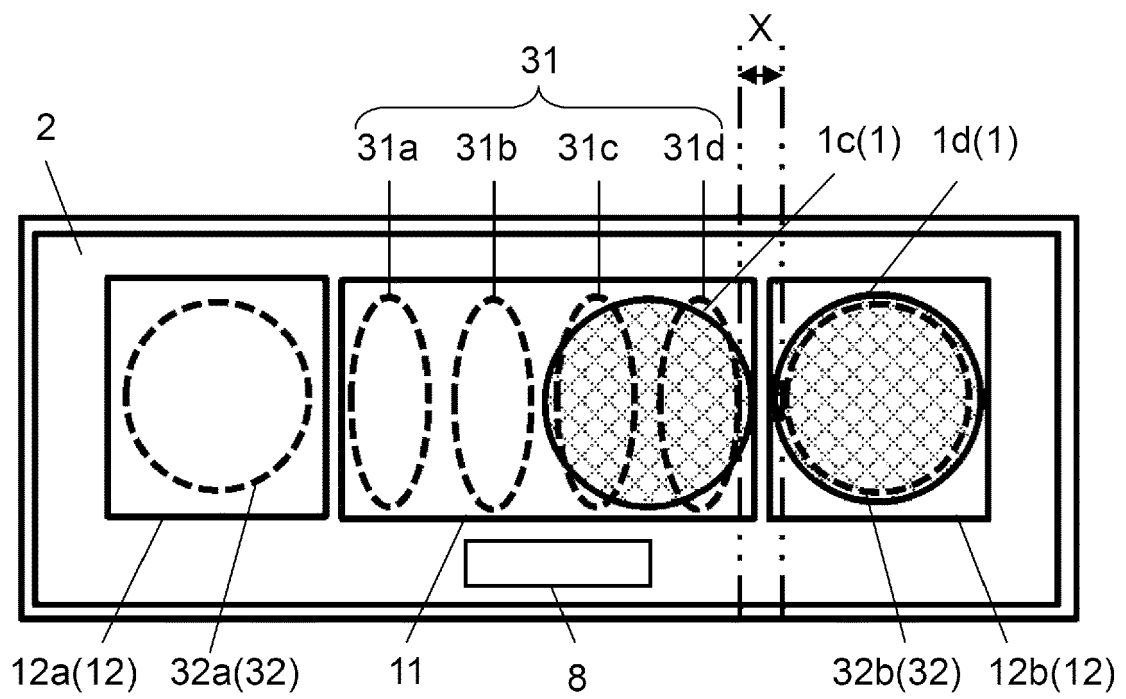
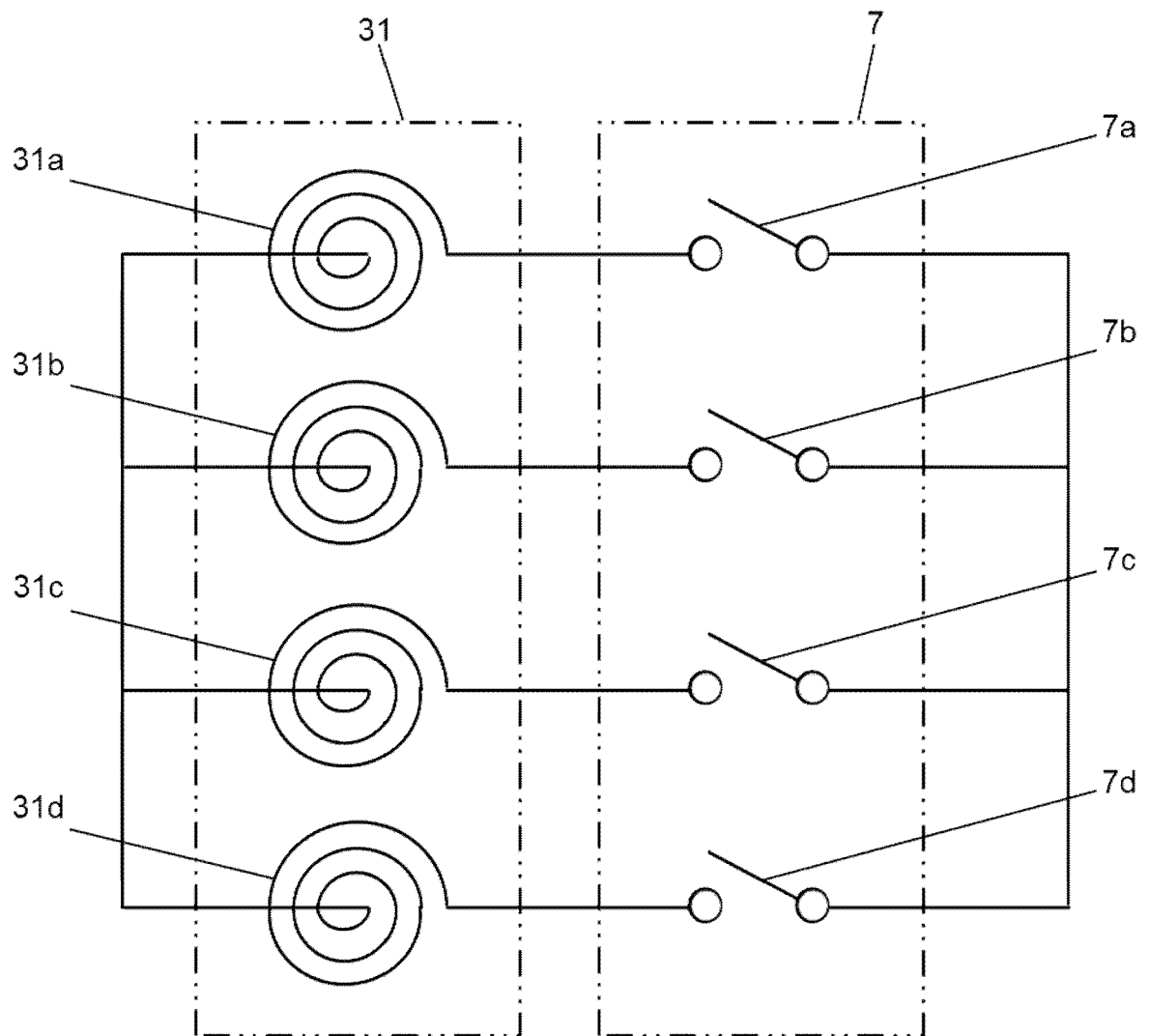


FIG. 5





EUROPEAN SEARCH REPORT

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