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(54) HEAT-NOT-BURN DEVICE AND HEATING CONTROL METHOD THEREFOR, PROGRAM PRODUCT, AND STORAGE MEDIUM

(57) A heat not-burn device and a heating control method therefor, a program product, and a storage medium. The heating control method comprises: when heating a aerosol generating substrate by using a microwave heating mode, measuring the frequency of a microwave signal in real time , and determining, according to the frequency detected in real time, an corresponding initial time point of when the aerosol generating substrate reaches a specific temperature; determining the required energy of the aerosol generating substrate, starting from the initial time point, according to the specific temperature and a preset target temperature; and controlling the output power and/or output time of a microwave source unit according to the required energy, such that the temperature of the aerosol generating substrate reaches the target temperature.

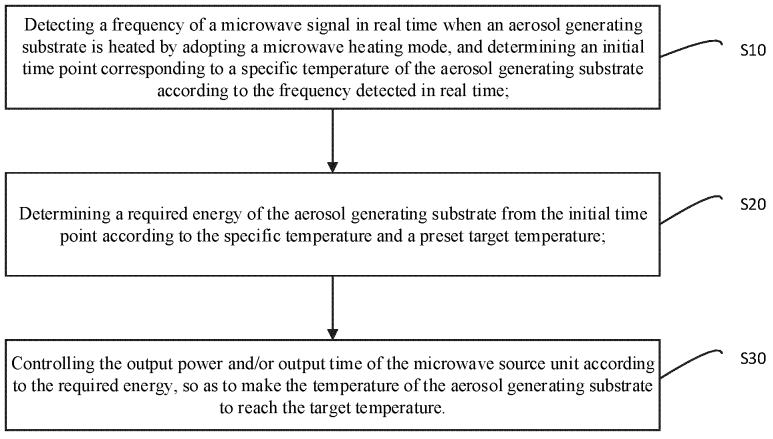

FIG.1

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Description

TECHNICAL FIELD

[0001] The invention relates to the field of atomization equipment, in particular to a heat not-burning device and a heating control method therefor, a program product and a storage medium.

DESCRIPTION OF RELATED ART

[0002] The HNB (Heat Not Burning) device can use microwave to heat an aerosol generating substrate. In order to achieve accurate temperature measurement, a convex part is often formed on the appliance, and a temperature measuring element such as a thermistor is arranged in the convex part. When the HNB appliance works, if a user inserts the aerosol generating substrate, the convex part can be correspondingly inserted into the aerosol generating substrate, so that the temperature of the aerosol generating substrate is measured. However, in the existing scheme, the convex part is polluted in the heating process of the aerosol generating substrate, so that the convex part needs to be cleaned regularly, which causes inconvenience for the user, and the convex part is damaged due to excessive force exerted by the user during cleaning.

BRIEF SUMMARY OF THE INVENTION

Technical issues

[0003] The technical problem to be solved by the invention lies in the defect that the convex part needs to be cleaned regularly in the prior art.

Solution to the problem

[0004] The technical scheme adopted by the invention to solve the technical problem is to construct a heating control method of a heat not-burning device, which comprises the following steps:

[0005] Detecting a frequency of a microwave signal in real time when an aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;

[0006] Determining a required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature;

[0007] And controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.

[0008] Preferably, the method also comprises:

Calculating the output energy of the microwave unit from the initial time point to the current time point according to the real-time output power and output time of the microwave source unit when the temperature of the aerosol generating substrate reaches the target temperature;

Determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature;

Judging whether the calculated temperature of the current time point is consistent with the set temperature of the current time point in a preset temperature curve;

And adjusting the output power and/or output time of the microwave source unit when the calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve.

[0009] Preferably, determining the temperature of the aerosol generating substrate at the current time point comprises:

Determining the temperature of the aerosol generating substrate at the current time point in a formula calculation mode; or

Determining the temperature of the aerosol generating substrate at the current time point in a table look-up manner.

[0010] Preferably, adjusting the output power and/or the output time of the microwave source unit when calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve comprises:

Comparing the calculated temperature of the current time point with the set temperature of the current time point in a preset temperature curve;
Controlling the microwave source unit to reduce the output power and/or reduce the output time if the calculated temperature of the current time point is greater than the set temperature;
Controlling the microwave source unit to increase the output power if the calculated temperature of the current time point is less than the set temperature.

[0011] Preferably, determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time comprises:

Determining an inflection point frequency according to the frequency detected in real time, and taking a time point corresponding to the inflection point frequency as an initial time point;
Determining the temperature of the aerosol generating substrate at the initial time point as the specific temperature.

[0012] Preferably, determining an inflection point frequency according to the frequency detected in real time comprises: Taking the maximum frequency among the frequencies detected in real time as the inflection point frequency.

[0013] The present invention also constitutes a program product comprising a processor which, when executing a stored computer program, implements the steps of the heating control method of a heat not-burning device described above.

[0014] The present invention also provides a storage medium storing a computer program that, when executed by a processor, realizes the steps of the heating control method of a heat not-burning device described above.

[0015] The invention also constructs a heat not-burning device, which comprises a microwave source unit and an aerosol generating substrate.

[0016] A first determining module is used for detecting the frequency of a microwave signal in real time when the aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;

A second determining module is used for determining the required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature;
And a control module is used for controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.

[0017] Preferably, the heat not-burning device also comprises:

A calculation module is used for calculating the output energy of the microwave unit from the initial time point to the current time point according to the real-time output power and output time of the microwave source unit when the temperature of the aerosol generating substrate reaches the target temperature;
A third determining module is used for determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature;
A judging module is used for judging whether the calculated temperature of the current time point is consistent with the set temperature of the current time point in a preset temperature curve;
And an adjusting module is used for adjusting the output power and/or the output time of the microwave source unit in case of inconsistency.

[0018] Preferably, the device further comprises a circulator, a radiation unit, a forward coupler, a reverse coupler, a forward detection unit and a reverse detection unit, wherein the output end of the microwave source unit is connected with the first end of the circulator, the second end of the circulator is connected with the radiation unit, and the aerosol generating substrate is located in the radiation range of the radiation unit. The first ends of the forward coupler and the reverse coupler are respectively connected with the third end of the circulator, the second end of the forward coupler is connected with the input end of the forward detection unit, and the second end of the reverse coupler is connected with the input end of a reverse detection unit; The output end of the forward detection unit and the output end of the reverse detection unit are respectively connected with the first determining module.

Beneficial effect

The beneficial effects of invention

[0019] By implementing the technical scheme of the invention, the initial time point corresponding to the specific temperature of the aerosol generating substrate can be determined according to the real-time detected frequency, namely, the temperature (specific temperature) of the aerosol generating substrate at the initial time point can be detected, so that temperature measuring devices such as a thermistor and the like do not need to be additionally arranged in a heat not-burning device when the temperature of aerosol generating substrate is measured. The heat not-burning device does not need to be provided with a convex part for accommodating a thermal temperature measuring device, so that the work of regularly cleaning the convex part can be omitted for a user, the user experience is improved, and the damage to the convex part caused by cleaning can be avoided.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0020] The present invention will be further described with reference to the accompanying drawings and embodiments, in which:

FIG. 1 is a flow chart of a heating control method of a heat not-burning device according to a first embodiment of the present invention;
FIG. 2 is a schematic diagram of a calculated temperature curve and a measured temperature curve;
FIG. 3 is a logic structure diagram of a first embodiment of the heat not-burning device of the present invention;
FIG. 4 is a logic structure diagram of a second embodiment of the heat not-burning device of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0021] The technical solutions in the embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings in the embodiments of the present invention. Obviously, the described embodiments are only a part of the embodiments, not all of the embodiments. Based on the embodiments of the present invention, all other embodiments obtained by those of ordinary skill in the art without creative work belong to the scope of protection of the present invention.

[0022] FIG. 1 is a flow chart of a first embodiment of a heating control method for a heat not-burning device according to the present invention, and the heating control method of this embodiment comprises the following steps:

Step S10, detecting a frequency of a microwave signal in real time when an aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;
Step S20, determining a required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature (for example, 225°C .);
And step S30, controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.

[0023] **In** this embodiment, the permittivity of the aerosol generating substrate changes as the temperature of the aerosol generating substrate increases (for example, from room temperature) in an environment in which the aerosol generating substrate is heated by the microwave, and the real part of the permittivity is the true permittivity, which further affects the wavelength of the electromagnetic wave. Because the wavelength of electromagnetic wave is inversely proportional to the frequency, the change of the real part of dielectric constant will affect the change of the frequency of microwave signal. For a certain heat not-burning device, the installed aerosol generating substrate is determined and has a unique specific temperature, and the specific temperature corresponds to a unique microwave signal frequency, so that the time point (initial time point) when the aerosol generating substrate reaches the specific temperature can be determined by detecting the frequency of the microwave signal in real time. Once the specific temperature of the aerosol generating substrate has been determined, the amount of energy (required energy) that needs to be supplied to the aerosol generating substrate from an initial time point can be determined in conjunction with the target temperature, and finally the output power and/or output time of the microwave source unit can be controlled in accordance with the required energy so that the temperature of said aerosol generating substrate reaches the target temperature.

[0024] In the embodiment, since the corresponding initial time point when the aerosol generating substrate reaches the specific temperature can be determined according to the frequency detected in real time, that is, the temperature (specific temperature) of the aerosol generating substrate at the initial time point is detected, it is no longer necessary to additionally install a temperature measuring device such as a thermistor in the heat not-burning device when measuring the temperature of the aerosol generating substrate. The heat not-burning device does not need to be provided with a

convex part for accommodating a thermal temperature measuring device, so that the work of regularly cleaning the convex part can be omitted for a user, the user experience is improved, and the damage to the convex part caused by cleaning can be avoided.

[0025] Further, in an alternative embodiment, the heating control method of the present invention further comprises:

Calculating the output energy of the microwave unit from the initial time point to the current time point according to the real-time output power and output time of the microwave source unit when the temperature of the aerosol generating substrate reaches the target temperature;

Determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature;

Judging whether the calculated temperature of the current time point is consistent with the set temperature of the current time point in a preset temperature curve;

And adjusting the output power and/or output time of the microwave source unit when the calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve.

[0026] In this embodiment, in the process from the initial time point (the time point when the aerosol generating substrate reaches the specific temperature) to the time point when the aerosol generating substrate reaches the target temperature, the temperature of the aerosol generating substrate at the current time point can also be calculated periodically or irregularly according to the energy already output (output energy). Specifically, since the output power and the output time in the period from the initial time point to the current time point are determined, the output energy that has been output can be calculated from the output power and the output time. The output energy is related to the temperature difference from the initial time point to the current time point, so the temperature at the current time point can be calculated according to the output energy and the specific temperature. Then, the calculated temperature is compared with the set temperature at the corresponding time point in the temperature curve, and if the calculated temperature and the set temperature are inconsistent, the output of the microwave source unit can be adjusted, so that the actual calculated temperature of the aerosol generating substrate is consistent with the temperature curve, thereby ensuring the smoking taste and the quality of aerosol. In addition, the embodiment realizes the temperature measurement of the aerosol generating substrate through a software calculation method, and the accuracy is high through testing. As shown in FIG. 2, the curve L1 is a temperature curve obtained by using the temperature measurement method of the embodiment, and the curve L2 is a measured temperature curve.

[0027] Further, the temperature of the aerosol generating substrate at the current point in time may be determined by: 1. use the formula calculation method; 2.use the way of looking up the table. In this embodiment, a relational formula of energy and temperature or a relational table of energy and temperature difference (a difference value between the temperature at the current time point and a specific temperature) may be stored in advance, and after the energy that has been output is calculated, the temperature at the current time point may be calculated by the relational formula of energy, or, the temperature at the current time point is obtained by looking up the relationship table between the energy and the temperature difference.

[0028] Further, the step of adjusting the output power and/or the output time of the microwave source unit when calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve may specifically include:

Comparing the calculated temperature at the current time point with the set temperature at the current time point in a preset temperature curve;

Controlling the microwave source unit to reduce the output power and/or reduce the output time if the calculated temperature at the current time point is greater than the set temperature;

Controlling the microwave source unit to increase the output power if the calculated temperature at the current time point is less than the set temperature.

[0029] In this embodiment, when the calculated temperature at the current time point is compared with the set temperature at the current time point in the preset temperature curve, the following three comparison results may occur: 1. the calculated temperature is greater than the set temperature, and it indicates that the actual temperature of the aerosol generating substrate is too high. At this time, the output power of the microwave source unit can be reduced and/or the output time can be reduced; 2. the calculated temperature is less than the set temperature, andit indicates that the actual temperature of the aerosol generating substrate is too low, and the output power of the microwave source unit can be increased at this time; 3.The calculated temperature is equal to the set temperature, and it indicates that the actual temperature of the aerosol generating substrate is just right and no adjustment of the output power and/or output time is required.

[0030] Further, in an optional embodiment, in step S10, determining an initial time point corresponding to a specific

temperature of the aerosol generating substrate according to the frequency detected in real time comprises:

Determining an inflection point frequency according to the frequency detected in real time, and taking a time point corresponding to the inflection point frequency as an initial time point;

Determining the temperature of the aerosol generating substrate at the initial time point as the specific temperature.

[0031] Further, the inflection point frequency may be determined in such a manner that taking the maximum frequency among the frequencies detected in real time as the inflection point frequency. It shall be noted that, after frequency following detection, the detected frequencies can be sorted to find the maximum value, which is the inflection point frequency; the detected frequencies can also be made into a frequency curve by time, which is obviously a parabola with downward opening, and the maximum value of the parabola is the inflection point frequency.

[0032] In this embodiment, in the environment of heating the aerosol generating substrate by microwave, as shown in Table 1, the real part of the dielectric constant of the aerosol generating substrate will increase gradually and then decrease gradually with the increase of the temperature of the aerosol generating substrate, while the real part of the dielectric constant will affect the wavelength of electromagnetic waves, and the wavelength of electromagnetic waves is inversely proportional to the frequency. Therefore, the change of the real part of the dielectric constant will affect the change of the frequency of the microwave signal, and the inflection point of the frequency corresponds to the inflection point of the change in the real part of the dielectric constant of the aerosol generating substrate, that is, 3.85, and then it is determined that the temperature (specific temperature) corresponding to the inflection points of the change in the real parts of dielectric constants is 100°C. Therefore, the temperature at the moment when frequency inflection points appear can be determined as the specific temperature.

Table 1

temperature of the aerosol generating substrate (°C)	the real part of the dielectric constant of the aerosol generating substrate (ε_r)	Substrate loss tangent ($tg\delta$)
normal atmospheric temperature	2.15	0.1
40°C	2.785	0.125
60°C	2.85	0.145
75°C	2.95	0.16
100°C	3.85	0.17
125°C	3.6	0.16
150°C	3.55	0.15
175°C	3	0.14
200°C	2.75	0.135
225°C	2.26	0.11
250°C	2.1	0.095

[0033] FIG. 3 is a logic structure diagram of a first embodiment of the heat not-burning device of the present invention. The heat not-burning device of this embodiment comprises a main control unit 10, a microwave source unit 20, and a aerosol generating substrate 30, wherein the microwave source unit 20 may include a microwave signal source for generating a microwave signal, and a power amplifier for amplifying the power of the generated microwave signal. The aerosol generating substrate 30 may be housed within a heating chamber, and the heating chamber may be within the radiation range of the microwave signal. The main control unit 10 includes a first determining module 11, a second determining module 12, and a control module 13. The first determining module 11 is used for detecting a frequency of a microwave signal in real time when the aerosol generating substrate 30 is heated by microwave, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate 30 according to the detected frequency; The second determining module 12 is used for determining the required energy of the aerosol generating substrate 30 from the initial time point according to the specific temperature and a preset target temperature, and the control module 13 is used for controlling the output power and/or output time of the microwave source unit 20 according to the required energy, so as to make the temperature of the aerosol generating substrate 30 to reach the target temperature.

[0034] Furthermore, the main control unit 10 may further include a calculation module, a third determining module, a judging module and an adjusting module. Moreover, the calculation module is used for calculating of the microwave unit

from the initial time point to the current time point according to the real-time output power and output time of the microwave source unit, when the temperature of the aerosol generating substrate reaches the target temperature. The third determining module is used for determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature. The judging module is used for judging whether the calculated temperature at the current time point is consistent with the set temperature of the current time in a preset temperature curve. The adjusting module is used for adjusting the output power and/or output time of the microwave source unit when the output power and/or output time are not consistent.

[0035] It should be understood that the first determining module 11, the second determining module 12, the control module 13, the calculation module, the third determining module, the judging module and the adjusting module can be integrated into the main control unit 10 or can be implemented by a plurality of independent modules.

[0036] FIG. 4 is a logic structure diagram of a second embodiment of the heat not-burning device according to the present invention. The heat not-burning device of this embodiment comprises a main control unit 10, a microwave source unit 20, and a aerosol generating substrate, and further comprises a circulator 40, a radiation unit 50, a forward coupler 61, a reverse coupler 62, a forward detection unit 71, and a reverse detection unit 72.The output end of the microwave source unit 20 is connected to the first end of the circulator 40, the second end of the circulator 40 is connected to the radiation unit 50, and the aerosol generating substrate is located within the radiation range of the radiation unit 50, the first ends of the forward coupler 61 and the reverse coupler 62 are respectively connected to the third end of the circulator 40, the second end of the forward coupler 61 is connected to the input end of the forward detection unit 71,the second end of the reverse coupler 62 is connected to the input end of the reverse detection unit 72, and the output ends of the forward detection unit 71 and the reverse detection unit 72 are respectively connected to the first determining module in the main control unit 10. In addition, the control module in the main control unit 10 is connected to the input end of the microwave source unit 20.

[0037] In this embodiment, the microwave source unit 20 outputs a corresponding microwave signal under the control of the main control unit 10. The microwave signal is transmitted to the radiation unit 50 through the circulator 40, and the radiation unit 50 begins to radiate the microwave signal. At the same time, the temperature of aerosol generating substrate will cause the change of the real part of the dielectric constant of aerosol generating substrate, and then affect the change of the frequency of microwave signal. During tracking frequency detection, the forward detection unit 71 and the reverse detection unit 72 respectively collect the voltage of the microwave signal through the corresponding forward coupler 61 and the corresponding reverse coupler 62, and send the voltage to the first determining module in the main control unit 10.The first determining module may determine the frequency of the microwave signal by analyzing the collected voltage of the microwave signal, and then determine the inflection point frequency, and then use the time point at which the inflection point frequency occurs as the initial time point, and the temperature at the initial time point is the specific temperature (if the aerosol generating substrate is determined, the corresponding specific temperature is also determined).

[0038] The present invention also provided a program product comprising a processor which, when executing a stored computer program, implements the steps of the heating control method of a heat not-burning device described above.

[0039] As will be appreciate, in that embodiments of the present application, the processor may be a Central Processing Unit (CPU) but may also be other general purpose processors, Digital Signal Processor, (DSP), Application Specific Integrated Circuit, (ASIC), field- Programmable Gate Array (FPGA) or other programmable logic device, discrete gate or transistor logic device, discrete hardware components, etc. The general purpose processor may be a microprocessor, any conventional processor, etc.

[0040] In addition, since the processor can implement the steps of any heating control method of a heat not-burning device provided by the embodiment of the present invention when executing the computer program, the beneficial effects that can be achieved by any heating control method of a heat not-burning device provided by the embodiment of the present invention can be achieved. See the previous embodiments for details, which are not repeated here.

[0041] The present invention also constitutes a storage medium storing a computer program that, when executed by a processor, realizes the steps of the heating control method ofa heat not-burning device described above.

[0042] It should be understood that the storage medium may include various computer storage media capable of storing the program codes, such as a USB flash disk, a mobile hard disk, a Read-Only Memory (ROM), a magnetic disk or an optical disk. Moreover, since the computer program stored in the storage medium can realize the steps of any of the heating control methods for heat not-burning device provided by the embodiments of the present invention when being executed, the advantageous effects that can be realized by any of the heating control methods of a heat not-burning device provided by the embodiments of the present invention can be realized.

[0043] The foregoing is merely a preferred embodiment of the present invention and is not intended to limit the present invention, which is susceptible to various modifications and variations as will occur to those skilled in the art. Any modifications, equivalents, improvements, and the like that come within the spirit and principles of the present invention are intended to be included within the scope of the claims.

Claims

1. A heating control method of a heat not-burning device, comprising:

detecting a frequency of a microwave signal in real time when the aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;
determining a required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature;
and controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.

2. The heating control method of a heat not-burning device according to claim 1, further comprising:

calculating the output energy of the microwave unit from the initial time point to the current time point according to the real-time output power and output time of the microwave source unit when the temperature of the aerosol generating substrate reaches the target temperature;
determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature;
judging whether the calculated temperature of the current time point is consistent with the set temperature of the current time point in a preset temperature curve;
and adjusting the output power and/or output time of the microwave source unit when the calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve.

3. The heating control method of a heat not-burning device according to claim 2, wherein determining the temperature of the aerosol generating substrate at the current time point comprises:

determining the temperature of the aerosol generating substrate at the current time point in a formula calculation mode; or
determining the temperature of the aerosol generating substrate at the current time point in a table look-up manner.

4. The heating control method of a heat not-burning device according to claim 2, wherein the step of adjusting the output power and/or the output time of the microwave source unit when calculated temperature of the current time point is not consistent with the set temperature of the current time point in a preset temperature curve comprises:

comparing the calculated temperature of the current time point with the set temperature of the current time point in a preset temperature curve;
controlling the microwave source unit to reduce the output power and/or reduce the output time if the calculated temperature of the current time point is greater than the set temperature;
controlling the microwave source unit to increase the output power if the calculated temperature of the current time point is less than the set temperature.

5. The heating control method of a heat not-burning device according to claim 1, wherein the step of determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time comprises:

determining an inflection point frequency according to the frequency detected in real time, and taking a time point corresponding to the inflection point frequency as an initial time point;
determining the temperature of the aerosol generating substrate at the initial time point as the specific temperature.

6. The heating control method of a heat not-burning device according to claim 5, wherein determining an inflection point frequency according to the frequency detected in real time comprises:
taking the maximum frequency among the frequencies detected in real time as the inflection point frequency.

7. A program product comprising a processor, wherein the processor, when executing the stored computer program,

realizes the steps of the heating control method of a heat not-burning device according to any one of the claims 1 to 6.

8. A storage medium storing a computer program, wherein the computer program, when executed by a processor, realizes the steps of the heating control method of a heat not-burning device according to any one of the claims 1 to 6.

9. A heat not-burning device, comprising a microwave source unit and a aerosol generating substrate, wherein the heat not-burning device further comprises:

a first determining module is used for detecting the frequency of a microwave signal in real time when the aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;
a second determining module is used for determining the required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature;
and a control module is use for controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.

10. The heat not-burning device according to claim 9, further comprising:

a calculation module is used for calculating the output energy of the microwave source unit from the initial time point to the current time point according to the real-time output power and output time of the microwave unit when the temperature of the aerosol generating substrate reaches the target temperature;
a third determining module is used for determining the temperature of the aerosol generating substrate at the current time point according to the output energy and the specific temperature;
a judging module is used for judging whether the calculated temperature of the current time point is consistent with the set temperature of the current time point in a preset temperature curve;
and an adjusting module is used for adjusting the output power and/or the output time of the microwave source unit in case of inconsistency.

11. The heat not-burning device according to claim 9, further comprising a circulator, a radiation unit, a forward coupler, a reverse coupler, a forward detection unit, and a reverse detection unit, wherein the output end of the microwave source unit is connected to the first end of the circulator, and the second end of the circulator is connected to the radiation unit; and the aerosol generating substrate is located in the radiation range of the radiation unit; the first ends of the forward coupler and the reverse coupler are respectively connected with the third end of the circulator; the second end of the forward coupler is connected with the input end of the forward detection unit; the second end of the reverse coupler is connected with the input end of the reverse detection unit; the output end of the forward detection unit and the output end of the reverse detection unit are respectively connected with the first determining module.

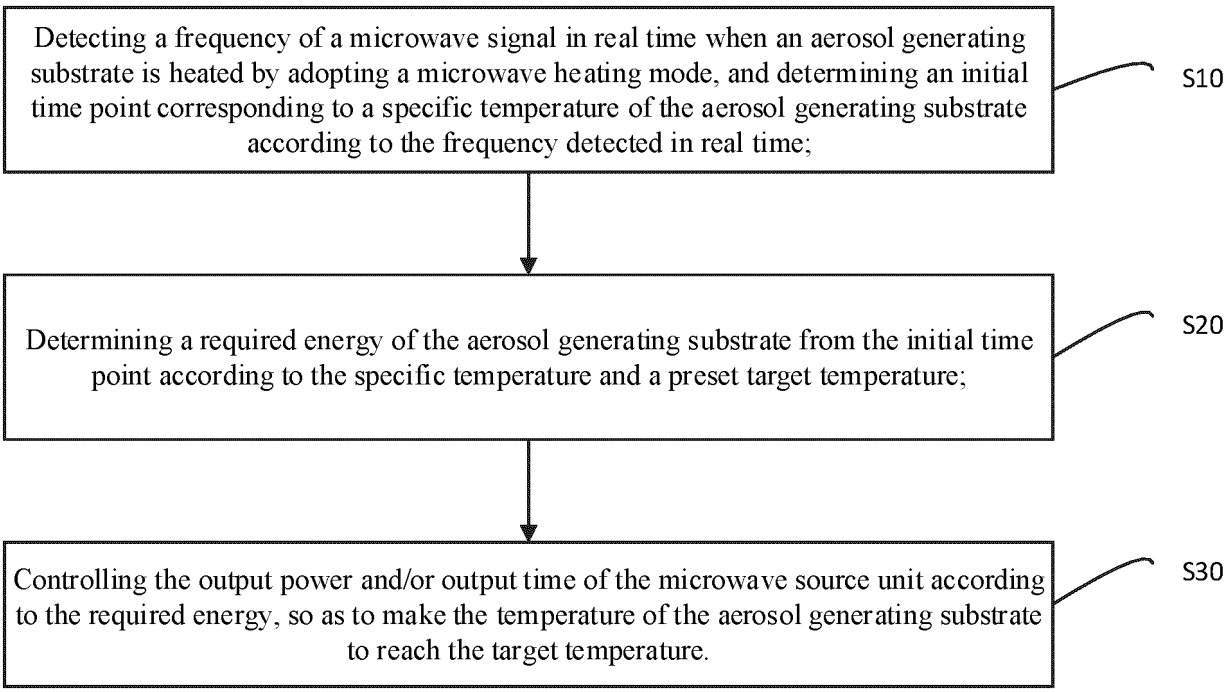
Detecting a frequency of a microwave signal in real time when an aerosol generating substrate is heated by adopting a microwave heating mode, and determining an initial time point corresponding to a specific temperature of the aerosol generating substrate according to the frequency detected in real time;
S10
Determining a required energy of the aerosol generating substrate from the initial time point according to the specific temperature and a preset target temperature;
S20
Controlling the output power and/or output time of the microwave source unit according to the required energy, so as to make the temperature of the aerosol generating substrate to reach the target temperature.
S30

FIG.1

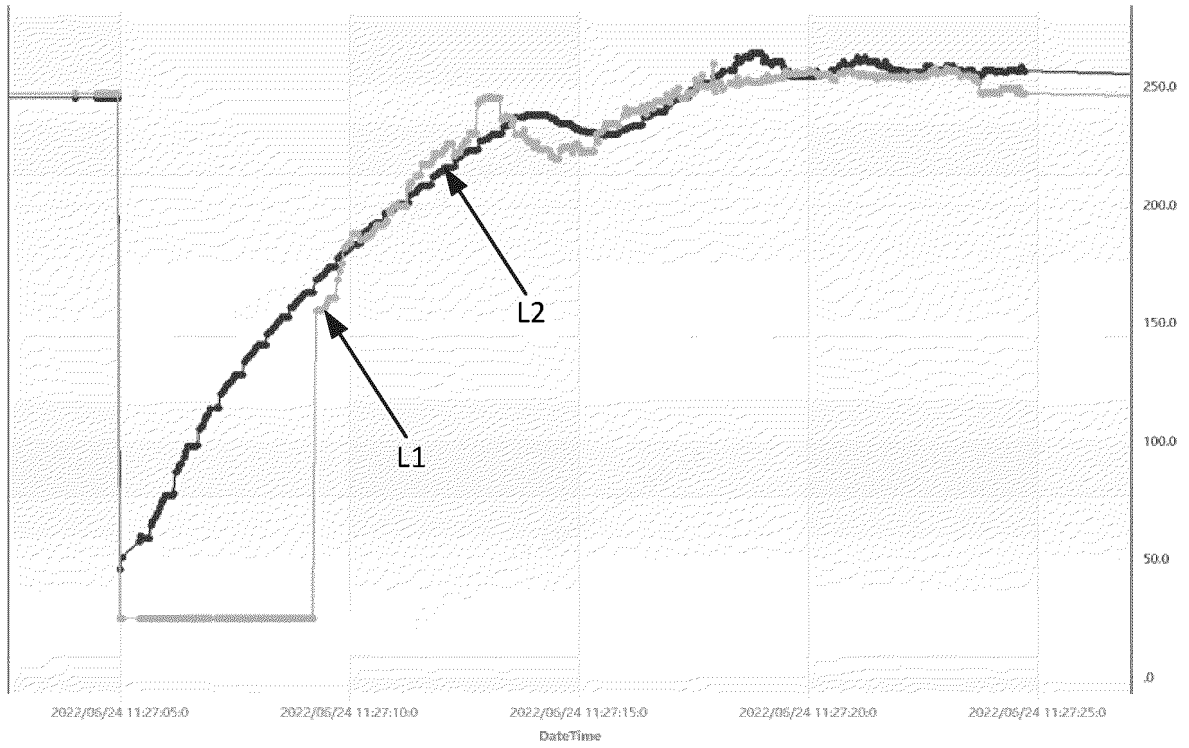
L2
L1
250.0
200.0
150.0
100.0
50.0
.0
2022/06/24 11:27:05:0
2022/06/24 11:27:10:0
2022/06/24 11:27:15:0
2022/06/24 11:27:20:0
2022/06/24 11:27:25:0
DateTime

FIG.2

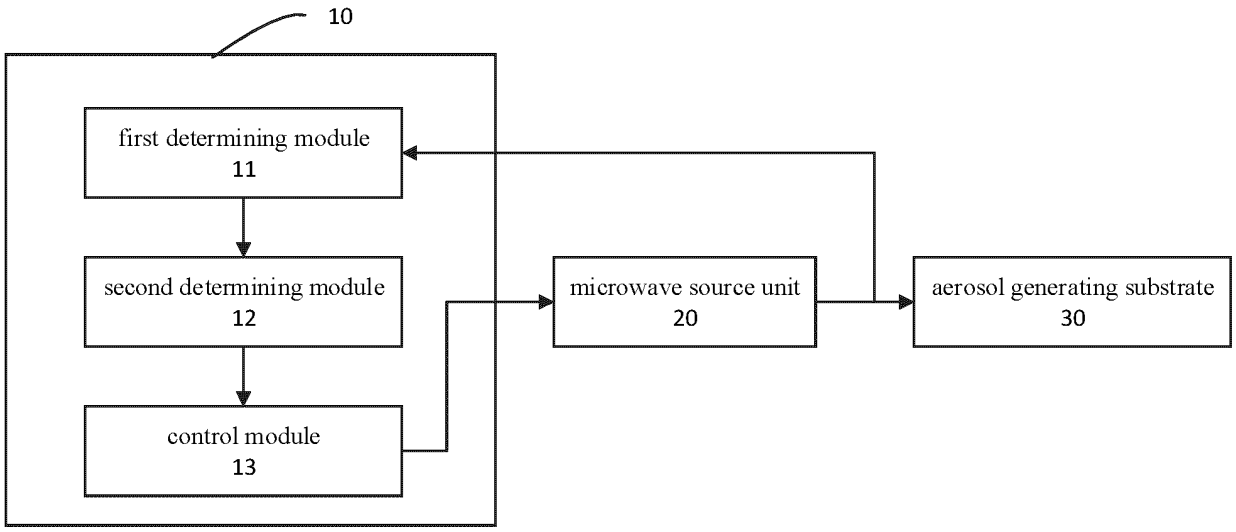
10
first determining module
11
second determining module
12
control module
13
microwave source unit
20
aerosol generating substrate
30

FIG.3

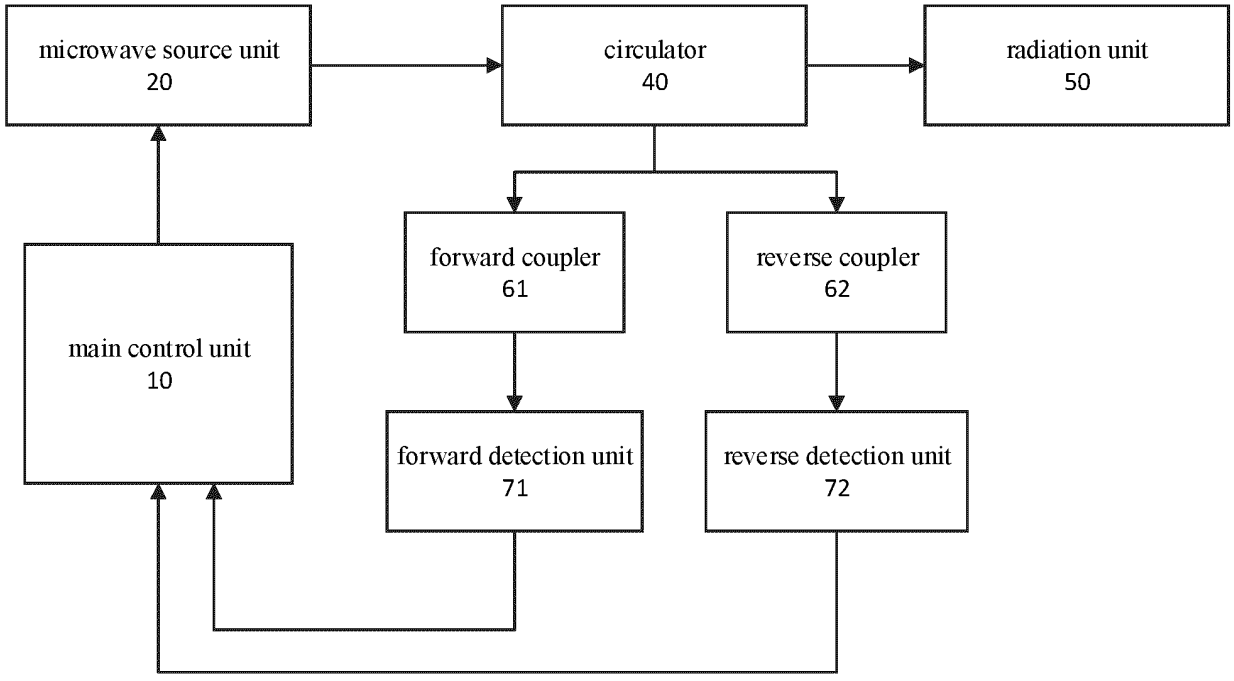
microwave source unit
20
circulator
40
radiation unit
50
forward coupler
61
reverse coupler
62
main control unit
10
forward detection unit
71
reverse detection unit
72

FIG.4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/116231

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00(2020.01)i;A24F 40/46(2020.01)i;A24F 40/50(2020.01)i;A24F 40/40(2020.01)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)

IPC: A24F 47/-; A24F 40/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, CNTXT, ENTXTC, ENTXT, VEN: 微波, 加热, 雾化, 控制, 频率, 温度, 时间, 功率, microwave, heat+, atomiz+, control +, frequency, temperature, time, power

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 110652038 A (CHENGDU YAYAN TECHNOLOGY CO., LTD.) 2020-01-07 (2020-01-07) entire document	1-11
A	CN 114903216 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 2022-08-16 (2022-08-16) entire document	1-11
A	CN 114441059 A (JIANGSU RUIDI MEASUREMENT AND CONTROL CO., LTD.) 2022-05-06 (2022-05-06) entire document	1-11
A	CN 111436665 A (CHINA TOBACCO YUNNAN INDUSTRIAL CO., LTD.) 2020-07-24 (2020-07-24) entire document	1-11
A	CN 114947221 A (HAINAN MOER BROTHERS TECHNOLOGY CO., LTD.) 2022-08-30 (2022-08-30) entire document	1-11

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"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	Date of mailing of the international search report
06 April 2023	**06 April 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/116231

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	WO 2022170465 A1 (SHENZHEN SMOORE TECHNOLOGY LTD.) 2022-08-18 (2022-08-18) entire document	1-11
A	WO 2022170468 A1 (SHENZHEN SMOORE TECHNOLOGY LTD.) 2022-08-18 (2022-08-18) entire document	1-11

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/116231

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CN 114903216 A	16 August 2022	None	
CN 114441059 A	06 May 2022	None	
CN 111436665 A	24 July 2020	None	
CN 114947221 A	30 August 2022	None	
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		JP 2022163151 A	25 October 2022
		EP 3818848 A1	12 May 2021
		EP 3818848 A4	01 December 2021
		KR 20200144403 A	29 December 2020
		KR 102389832 B1	22 April 2022
WO 2022170465 A1	18 August 2022	None	
WO 2022170468 A1	18 August 2022	None	

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