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(54) **AEROSOL GENERATION APPARATUS, CONTROL METHOD, CONTROL APPARATUS AND READABLE STORAGE MEDIUM**

(57) An aerosol generating apparatus, a control method, a control apparatus and a readable storage medium. The aerosol generating apparatus includes an atomization chamber, a microwave assembly, and a microwave detector. The microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect standing-wave ratios (SWRs) of the microwave in the atomization chamber. The control method includes: adjusting an operating frequency of the microwave assembly according to a set frequency-adjusting value during an operation of the microwave assembly; determining a target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after an adjustment; and controlling the microwave assembly to operate according to the target operating frequency. By controlling the frequency-hopping operation of the microwave assembly to feed the microwave into the atomization chamber, and by selecting the target operating frequency based on the detected microwave SWRs in the atomization chamber, the microwaves are fed into the atomization chamber with a high efficiency, thereby improving an atomization effect of aerosol-forming substrate in the aerosol generating

apparatus, and avoiding incomplete atomization of the aerosol-forming substrate.

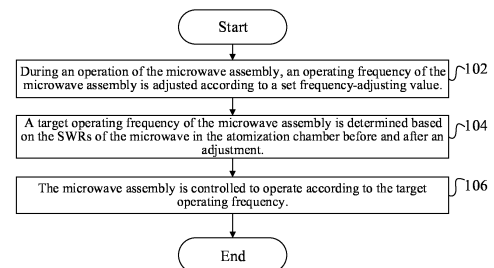


FIG. 1

Description

[0001] This application claims the priority of Chinese patent application No. 202111220283.7, filed on October 20, 2021 and entitled "AEROSOL GENERATING APPARATUS, CONTROL METHOD, CONTROL APPARATUS AND READABLE STORAGE MEDIUM", the entire content of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present application relates to the field of electronic atomization technology, specifically, to an aerosol generating apparatus, a control method, a control apparatus and readable storage medium.

BACKGROUND

[0003] A Heat Not Burning (HNB) device is a combination of heating device and aerosol-forming substrate (processed plant leaf products). The external heating device heats the aerosol-forming substrate to a temperature at which the aerosol-forming substrate can generate aerosol but cannot burn, allowing the aerosol-forming substrate to generate aerosol required by a user under the condition that the aerosol-forming substrate does not burn.

[0004] Currently, the HNB appliances in the market mainly adopt a heating manner of resistance heating, that is, a central heating plate or a heating needle is inserted into the aerosol-forming substrate from the center of the aerosol-forming substrate to heat. This kind of appliance needs to be preheated for a long time before use, and cannot extract and stop freely. The aerosol-forming substrate is unevenly carbonized, resulting in insufficient baking of the aerosol-forming substrate and a low utilization rate. Secondly, the heating plate of the HNB appliance easily generates dirty in the extractor of the aerosol-forming substrate and in the base of the heating plate, which is difficult to be cleaned, and the temperature of a portion of the aerosol-forming substrate that contacts the heating element will become too high, thus causing the aerosol-forming substrate to crack partially and release substances harmful to the human body. Therefore, the microwave heating technology is gradually replacing the resistance heating and has become a new heating method. The microwave heating technology has the characteristics of high efficiency, timeliness, selectivity and no delay in heating, and has a heating effect only on substances with specific dielectric properties. The advantages of atomization using microwave heating are as follows. a. The microwave heating is radiant heating without heat conduction, and can realize a timely extracting or stop; b. No heating plate is needed, thus there are no problems of fragmenting the heating plate and cleaning the heating plate; c. The utilization rate of the aerosol-forming substrate is high, taste consistency is high, and

the taste is approximate to that of cigarette.

[0005] In the existing technology, after the aerosol generated by the aerosol-forming substrate enters the atomization chamber, microwave absorption characteristics in the atomization chamber change, thus resulting in a deterioration of the effect of microwave atomization.

SUMMARY

[0006] The present application aims to solve at least one of the technical problems existing in the prior art or in the related art.

[0007] In view of this, in the first aspect, the embodiment of the present application proposes a control method for an aerosol generating apparatus. The aerosol generating apparatus includes an atomization chamber, a microwave assembly, and a microwave detector. The microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect standing-wave ratios (SWRs) of the microwave in the atomization chamber. The control method includes: adjusting an operating frequency of the microwave assembly according to a set frequency-adjusting value during an operation of the microwave assembly; determining a target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after an adjustment; and controlling the microwave assembly to operate according to the target operating frequency.

[0008] The control method for the aerosol generating apparatus provided in this embodiment is used to control the operation of the aerosol generating apparatus. The aerosol generating apparatus includes the housing, the atomization chamber, the microwave assembly and the microwave detector. The atomization chamber is formed inside the housing, and the aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber. The aerosol-forming substrate releases aerosol under the action of the microwaves. The microwave detector is arranged on the housing, and may detect the SWR of the microwave in the atomization chamber.

[0009] It may be understood that the microwave assembly may output microwaves of multiple frequency bands into the atomization chamber. The atomization chamber is set to be in a bandwidth range from 1M to 20M, and the frequency bands of the microwaves output by the microwave assembly may be selected as 902MHz to 928MHz, 2.400GHz to 2.500GHz, 5.7255GHz to 5.875GHz, and 24GHz to 24.25GHz.

[0010] The control method for the aerosol generating apparatus includes controlling a frequency-hopping operation of the microwave assembly. Specifically, during the frequency-hopping operation of the microwave assembly, the operating frequency of the microwave as-

sembly is adjusted according to a set frequency-adjusting value, so that the microwave assembly feeds microwave of different frequencies into the atomization chamber. During the frequency-hopping operation of the microwave assembly, the microwave detector continuously collects the SWRs of the microwave in the atomization chamber. The collected SWRs of the microwave may reflect the microwave feed efficiency in the atomization chamber. According to the microwave SWRs detected at different operating frequencies, a frequency is selected from the operating frequencies of the microwave assembly to obtain the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwave into the atomization chamber based on the target operating frequency. The present application controls the frequency-hopping operation of the microwave assembly to feed microwaves into the atomization chamber, and may select the target operating frequency based on the detected microwave SWRs in the atomization chamber, thereby feeding the microwaves into the atomization chamber with a high efficiency, improving the atomization effect of the aerosol-forming substrate in the aerosol generating apparatus, and avoiding incomplete atomization of the aerosol-forming substrate.

[0011] It can be understood that the aerosol-forming substrate is atomized under the action of the microwaves in the atomization chamber, and the aerosol generated by atomization will affect the SWR of the microwave in the atomization chamber. By controlling the frequency-hopping operation of the microwave assembly and selecting the target operating frequency according to the detected microwave SWRs, this application realizes the adjustment of the operating frequency of the microwave assembly during the operation of the aerosol generating apparatus, and improves the efficiency of feeding microwaves into the atomization chamber.

[0012] The control method for the aerosol generating apparatus according to the technical solutions of the present application further has technical features as follows.

[0013] In a possible embodiment, adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value during the operation of the microwave assembly, includes: determining a second frequency based on a first frequency and the set frequency-adjusting value when the microwave assembly operates according to the first frequency; and controlling the microwave assembly to operate according to the second frequency.

[0014] In this embodiment, the first frequency is an initial operating frequency of the microwave assembly, that is, when the aerosol atomizing device starts operating, the microwave assembly feeds a microwave of the first frequency into the atomization chamber. Under a condition that the microwave assembly outputs the microwave of the first frequency, the second frequency is calculated based on the first frequency and the set frequency-ad-

justing value, and the microwave assembly is controlled to operate according to the second frequency.

[0015] In the process of controlling the frequency-hopping operation of the microwave assembly, the initial operating frequency and a frequency-hopping step length of the microwave assembly need to be determined. The initial operating frequency of the microwave assembly is the first frequency, and the frequency-hopping step length is the frequency-adjusting value. The first frequency and the frequency-adjusting value are configured in a local storage area before the aerosol atomizing device leaves a factory. After the aerosol atomizing device starts operating, the first frequency and the frequency-adjusting value are directly called to control the frequency-hopping operation of the microwave assembly.

[0016] The present application controls the frequency-hopping operation of the microwave assembly through a fixed frequency-adjusting value, thereby stably adjusting the operating frequency of the microwave assembly and improving the stability of the frequency-hopping operation of the microwave assembly, and avoiding a decrease in the effect of microwave feed of the microwave assembly in the atomization chamber due to inconsistent frequency hopping steps of the frequency-hopping operation of the microwave assembly.

[0017] It can be understood that the frequency-adjusting value ranges from 0.5MHz to 40MHz.

[0018] The present application sets the frequency-adjusting value to be in a range of greater than or equal to 0.5MHz and less than or equal to 40MHz. By setting the frequency-adjusting value to greater than or equal to 0.5MHz, it can be ensured that an adjustment of the microwave frequency is large enough for each frequency hopping, so that the SWR in the atomization chamber can be changed. By setting the frequency-adjusting value to less than or equal to 40MHz, the problem that the target operating frequency cannot be accurately obtained due to an excessive adjustment of the operating frequency of the microwave assembly can be avoided.

[0019] It should be noted that in the process of controlling the frequency-hopping operation of the microwave assembly according to the frequency-adjusting value, the set frequency-adjusting value may be added to the first frequency, or the set frequency-adjusting value may be subtracted from the first frequency.

[0020] In a possible embodiment, before a step of controlling the microwave assembly to operate according to the second frequency, the control method further comprises: controlling the microwave assembly to operate with a second set power under a condition that the microwave assembly is operating with a first set power. The second set power is less than the first set power.

[0021] In this embodiment, before controlling the microwave assembly to perform a frequency hopping, the operating power of the microwave assembly is controlled to be reduced. Specifically, at the initial operation stage, the microwave assembly operates at the initial frequency, that is, when the microwave assembly operates at the

first frequency, the microwave assembly is controlled to operate at the first set power, so as to ensure the effect of the microwave feed. The first set power is a higher operating power. Before a frequency hopping, the operating power of the microwave assembly is lowered, that is, the microwave assembly is controlled to operate with the second set power. In the process of controlling the microwave assembly to adjust the operating frequency, the microwave assembly is controlled to operate at a lowered operating power, thus reducing an energy consumption of the microwave assembly during the frequency-hopping operation.

[0022] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly will output microwaves of different frequency bands at different frequency-hopping stages, and microwaves of different frequency bands have different atomization effects on the aerosol-forming substrate. The present application lowers the operating power during the frequency-hopping operation of the microwave assembly, which can avoid a waste of electric energy.

[0023] In a possible embodiment, controlling the microwave assembly to operate according to the target operating frequency includes: controlling the microwave assembly to operate with a third set power according to the target operating frequency. The third set power is greater than the second set power.

[0024] In this embodiment, the third set power is greater than the second set power, that is, after the target operating frequency is determined, the microwave assembly is controlled to increase the current operating power to operate with a higher power and controlled to output microwaves according to the target operating frequency. The target operating frequency is selected according to the SWRs of the microwave in the atomization chamber during the frequency-hopping operation of the microwave assembly. That is, the efficiency of the microwave feed in the atomization chamber can be ensured when the microwave assembly feeds the microwave into the atomization chamber according to the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwaves into the atomization chamber with the third set power greater than the second set power, thereby further enhancing the efficiency of the microwave assembly feeding microwaves into the atomization chamber, and improving the atomization effect of the aerosol-forming substrate in the atomization chamber.

[0025] In a possible embodiment, determining the target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after the adjustment includes: obtaining a first SWR in the atomization chamber before the adjustment and a second SWR in the atomization chamber after the adjustment; calculating a first difference between the first SWR and a preset SWR and a second difference between the second SWR and the pre-

set SWR; and determining the target operating frequency based on the first difference and the second difference.

[0026] In this embodiment, during the frequency-hopping operation of the microwave assembly, the SWRs in the atomization chamber before and after the frequency hopping of the microwave assembly are detected by the microwave detector. The first SWR before the frequency hopping and the second SWR after the frequency hopping are obtained. The preset SWR is a default SWR, namely a desired SWR in the atomization chamber by the user. By calculating the first difference and the second difference, and by numerically comparing the first difference and the second difference, the effect of adjusting the operating frequency of the microwave assembly can be determined. Specifically, when it is detected that the first difference is greater than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be improved. When it is detected that the first difference is less than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be reduced. During the frequency-hopping operation of the microwave assembly, according to the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly, which makes the effect of the microwave feed better, is determined, thereby obtaining the target operating frequency.

[0027] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly can perform frequency hopping once or more. In the process of performing the frequency hopping each time, the microwave assembly selects a next frequency hopping direction based on the first difference and the second difference.

[0028] In some embodiments, the current operating frequency of the microwave assembly is 2.43GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.5 and the preset SWR is 1. It can be obtained that the first difference is 0.6, and the second difference is 0.5. It is determined that the current adjustment manner of increasing the frequency makes the microwave SWRs in the chamber become increasingly closer to the preset SWR. The next frequency hopping adjustment may be performed in the manner of increasing the frequency to adjust the frequency hopping.

[0029] In some other embodiments, the current frequency of the microwave assembly is adjusted to 2.43 GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.7 and the preset SWR is 1. It

can be obtained that the first difference is 0.6, and the second difference is 0.7. It is determined that the current adjustment manner of increasing the frequency makes the microwave SWRs in the cavity become increasingly farther from the preset SWR. The next frequency hopping adjustment may be performed in the manner of lowering the frequency to adjust the frequency hopping.

[0030] In these embodiments of the present application, during the multiple frequency hopping adjustments, the microwave SWRs in the atomization chamber are detected before and after each frequency hopping adjustment. According to the microwave SWRs in the atomization chamber detected before and after the current adjustment, the direction of the next frequency hopping adjustment is determined to ensure that when the microwave assembly performs frequency hopping adjustment, the effect of microwave feed in the atomization chamber can be improved.

[0031] In some embodiments, the preset SWR may be selected as 1. When the microwave SWR in the atomization chamber is closer to 1, it means that the effect of microwave feed in the atomization chamber is better.

[0032] In a possible embodiment, determining the target operating frequency based on the first difference and the second difference includes: determining an operating frequency corresponding to the second SWR as the target operating frequency, when the first difference is greater than the second difference; and determining the target operating frequency according to an operating frequency corresponding to the first SWR and the set frequency-adjusting value, when the first difference is less than the second difference.

[0033] In this embodiment, under the circumstance that the microwave assembly only needs to perform frequency hopping once, if it is detected that the first difference is greater than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at the operating frequency corresponding to the second SWR, then the operating frequency corresponding to the second SWR will be used as the target operating frequency. If it is detected that the first difference is smaller than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at the operating frequency corresponding to the first SWR, then the operating frequency corresponding to the first SWR will be used as the target operating frequency. During the frequency-hopping operation of the microwave assembly, based on the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly with better effect of microwave feed is determined, thus obtaining the target operating frequency and controlling the microwave assembly to operate according to the target operating frequency, and improving the effect of microwave feed in the atomization chamber.

[0034] In a possible embodiment, before controlling

the microwave assembly to operate according to the target operating frequency, the control method further includes: obtaining the number of times the microwave assembly adjusts the operating frequency according to the set frequency-adjusting value; returning to perform a step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value, when the number of times is less than a set number of times.

[0035] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the number of times the microwave assembly adjusts the operating frequency is detected. When it is detected that the number of times of adjusting reaches the set number of times, the microwave assembly is controlled to start operating according to the target operating frequency. When it is detected that the number of times of adjusting is less than the set number of times, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the number of times of adjusting reaches the set number of times. After multiple frequency hopping adjustments, this present application selects the target operating frequency obtained finally to control the operation of the microwave assembly, thereby improving the effect of microwave feed into the atomization chamber of the microwave assembly.

[0036] In some embodiments, the set number of times ranges from 1 to 8 times.

[0037] In these embodiments, since the microwave assembly lowers the operating power during the frequency-hopping operation, that is, the microwave assembly will operate with a lower operating power. If the set number of times is greater than 8 times, the overall efficiency of microwave feed into the atomization chamber of the microwave assembly will be affected. If the set number of times is less than 1 time, the operating frequency of the microwave assembly cannot be adjusted reasonably.

[0038] In a possible embodiment, before controlling the microwave assembly to operate according to the target operating frequency, the control method further includes: obtaining a third SWR corresponding to the target operating frequency; and returning to perform a step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value, when the third SWR is within a preset SWR range.

[0039] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the current SWR of the microwave in the atomization chamber, namely, the third SWR corresponding to the target operating frequency, is detected. After it is detected that the third SWR is within the preset SWR range, it is determined that the microwave assembly has been adjusted to the optimal operating frequency

range, and the microwave assembly is controlled to start operating according to the target operating frequency. After it is detected that the third SWR is not within the preset SWR range, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the third SWR is in the preset SWR range. The present application controls the number of times the microwave assembly performs the frequency hopping adjustments based on the microwave SWRs in the atomization chamber, which can ensure that the microwave assembly operates based on the target operating frequency to achieve the best effect of microwave feed.

[0040] In a second aspect, the present application proposes a control apparatus for an aerosol generating apparatus. The aerosol generating apparatus includes an atomization chamber, a microwave assembly, and a microwave detector. The microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect standing-wave ratios (SWRs) of the microwave in the atomization chamber. The control apparatus includes: an adjusting module, configured to adjust an operating frequency of the microwave assembly according to a set frequency-adjusting value during an operation of the microwave assembly; a determining module, configured to determine a target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after an adjustment; and a control module, configured to control the microwave assembly to operate according to the target operating frequency.

[0041] The control apparatus for the aerosol generating apparatus provided in this embodiment is used to control the operation of the aerosol generating apparatus. The aerosol generating apparatus includes the housing, the atomization chamber, the microwave assembly and the microwave detector. The atomization chamber is formed inside the housing, and the aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber. The aerosol-forming substrate releases aerosol under the action of the microwaves. The microwave detector is arranged on the housing, and may detect the SWR of the microwave in the atomization chamber.

[0042] It can be understood that the microwave assembly can output microwaves in multiple frequency bands into the atomization chamber. The atomization chamber is set to be in a bandwidth range from 1M to 20M, and the microwave frequency bands output by the microwave assembly can be selected as 902MHz to 928MHz, 2.400GHz to 2.500GHz, 5.7255GHz to 5.875GHz, and 24GHz to 24.25GHz.

[0043] The control method for the aerosol generating apparatus includes controlling a frequency-hopping op-

eration of the microwave assembly. Specifically, during the frequency-hopping operation of the microwave assembly, the operating frequency of the microwave assembly is adjusted according to a set frequency-adjusting value, so that the microwave assembly feeds microwave of different frequencies into the atomization chamber. During the frequency-hopping operation of the microwave assembly, the microwave detector continuously collects the SWRs of the microwave in the atomization chamber. The collected SWRs of the microwave may reflect the microwave feed efficiency in the atomization chamber. According to the microwave SWRs detected at different operating frequencies, a frequency is selected from the operating frequencies of the microwave assembly to obtain the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwave into the atomization chamber based on the target operating frequency. The present application controls the frequency-hopping operation of the microwave assembly to feed microwaves into the atomization chamber, and may select the target operating frequency based on the detected microwave SWRs in the atomization chamber, thereby feeding the microwaves into the atomization chamber with a high efficiency, improving the atomization effect of the aerosol-forming substrate in the aerosol generating apparatus, and avoiding incomplete atomization of the aerosol-forming substrate.

[0044] It can be understood that the aerosol-forming substrate is atomized under the action of the microwaves in the atomization chamber, and the aerosol generated by atomization will affect the SWR of the microwave in the atomization chamber. By controlling the frequency-hopping operation of the microwave assembly and selecting the target operating frequency according to the detected microwave SWRs, this application realizes the adjustment of the operating frequency of the microwave assembly during the operation of the aerosol generating apparatus, and improves the efficiency of feeding microwaves into the atomization chamber.

[0045] In a third aspect, the embodiment of the present application proposes an aerosol generating apparatus, including the control apparatus for the aerosol generating apparatus in the second aspect. Therefore, the aerosol generating apparatus may achieve all the same beneficial effects as the control apparatus for the aerosol generating apparatus in the second aspect, which will not be described in detail herein.

[0046] In a fourth aspect, the embodiment of the present application proposes an aerosol generating apparatus, including: a memory and a processor. The memory has programs or instructions stored thereon. The processor, when executing the programs or the instructions stored on the memory, implements the control method for the aerosol generating apparatus in the first aspect. Therefore, the aerosol generating apparatus may achieve all the same beneficial effects as the control method for the aerosol generating apparatus in the first

aspect, which will not be described in detail herein.

[0047] In addition, the aerosol generating apparatus proposed by the present application includes following technical features.

[0048] In a possible embodiment, the aerosol generating apparatus further includes a housing, having the atomization chamber formed therein for arranging an aerosol-forming substrate; and the microwave assembly, arranged on the housing and connected to the processor, and configured to feed the microwave into the atomization chamber.

[0049] In this embodiment, the aerosol generating apparatus includes the housing, the atomization chamber, and the microwave assembly. The atomization chamber is formed inside the housing. The aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber, and the aerosol-forming substrate releases aerosol under the action of the microwave.

[0050] In a possible embodiment, the aerosol generating apparatus further includes the microwave detector arranged on the housing and configured to collect the microwave SWRs in the atomization chamber.

[0051] In this embodiment, the microwave detector is arranged on the housing, and the microwave detector can detect the SWR of the microwave in the atomization chamber.

[0052] In a possible embodiment, the aerosol generating apparatus further includes a resonant column. A first end of the resonant column is connected to a bottom wall of the atomization chamber, and a second end of the resonant column faces an opening of the atomization chamber.

[0053] In this embodiment, the aerosol generating apparatus includes the resonant column. The resonant column is arranged in the atomization chamber, the first end of the resonant column is connected to the bottom wall of the atomization chamber, and the second end of the resonant column faces the opening of the atomization chamber. Through the resonant column arranged inside the atomization chamber, this application can convey the microwave generated by the microwave assembly in a direction from the first end to the second end of the resonant column. Since the aerosol-forming substrate is arranged in an area close to the second end of the resonant column, it is ensured that the microwave can act on the aerosol-forming substrate, thereby improving the atomization effect of the aerosol-forming substrate under the action of microwaves.

[0054] In a fifth aspect, the embodiment of the present application proposes a readable storage medium, having programs or instructions stored thereon. The programs or the instructions, when executed by a processor, implement steps of the control method for the aerosol generating apparatus of any one of the embodiments. There-

fore, the readable storage medium may achieve all the same beneficial effects as the control method for the aerosol generating apparatus of any one of the embodiments above, which will not be described in detail herein.

[0055] The additional aspects and advantages of the present application will become apparent from the description below, or may be learned by practice of the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0056] The above aspects and/or additional aspects and advantages of the present application will become apparent and better understood from the description of the embodiments in conjunction with the following drawings, where:

FIG. 1 shows a first flowchart of a control method for an aerosol generating apparatus in a first embodiment of the present application;

FIG. 2 shows a second flowchart of the control method for the aerosol generating apparatus in the first embodiment of the present application;

FIG. 3 shows a third flowchart of the control method for the aerosol generating apparatus in the first embodiment of the present application;

FIG. 4 shows a structural block view of a control apparatus for an aerosol generating apparatus in a second embodiment of the present application;

FIG. 5 shows a structural block view of an aerosol generating apparatus in a third embodiment of the present application;

FIG. 6 shows a structural block view of an aerosol generating apparatus in a fourth embodiment of the present application.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0057] To make the purposes, features, and advantages of the present application to be more clearly understood, the present application will be further described in detail hereinafter in conjunction with the accompanying drawings and specific embodiments. It should be noted that, as long as there is no conflict, the embodiments of the present application and the features in the embodiments can be combined with each other.

[0058] Many details are set forth in the following description to make the present application to be fully understood. However, the present application may also be implemented in other ways different from those described hereinafter. Therefore, the protection scope of the present application is not limited to the specific embodiments disclosed below.

[0059] A control method of an aerosol generating apparatus, a control apparatus for an aerosol generating apparatus, an aerosol generating apparatus and a readable storage medium according to some embodiments of the present application will be described referring to

FIGS. 1 to 6.

Embodiment 1

[0060] As shown in FIG. 1, the first embodiment of the present application provides a control method for an aerosol generating apparatus. The aerosol generating apparatus includes: an atomization chamber, a microwave assembly, and a microwave detector. The microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect a standing-wave ratio (SWR) of the microwave in the atomization chamber.

[0061] The control method for the aerosol generating apparatus include following steps.

[0062] At Step 102: During an operation of the microwave assembly, an operating frequency of the microwave assembly is adjusted according to a set frequency-adjusting value.

[0063] At Step 104: A target operating frequency of the microwave assembly is determined based on the SWRs of the microwave in the atomization chamber before and after an adjustment.

[0064] At Step 106: The microwave assembly is controlled to operate according to the target operating frequency.

[0065] The control method for the aerosol generating apparatus provided in this embodiment is used to control the operation of the aerosol generating apparatus. The aerosol generating apparatus includes the housing, the atomization chamber, the microwave assembly and the microwave detector. The atomization chamber is formed inside the housing, and the aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber. The aerosol-forming substrate releases aerosol under the action of the microwaves. The microwave detector is arranged on the housing, and may detect the SWR of the microwave in the atomization chamber.

[0066] It may be understood that the microwave assembly may output microwaves of multiple frequency bands into the atomization chamber. The atomization chamber is set to be in a bandwidth range from 1M to 20M, and the frequency bands of the microwaves output by the microwave assembly may be selected as 902MHz to 928MHz, 2.400GHz to 2.500GHz, 5.7255GHz to 5.875GHz, and 24GHz to 24.25GHz.

[0067] The control method for the aerosol generating apparatus includes controlling a frequency-hopping operation of the microwave assembly. Specifically, during the frequency-hopping operation of the microwave assembly, the operating frequency of the microwave assembly is adjusted according to a set frequency-adjusting value, so that the microwave assembly feeds microwave of different frequencies into the atomization chamber.

During the frequency-hopping operation of the microwave assembly, the microwave detector continuously collects the SWRs of the microwave in the atomization chamber. The collected SWRs of the microwave may reflect the microwave feed efficiency in the atomization chamber. According to the microwave SWRs detected at different operating frequencies, a frequency is selected from the operating frequencies of the microwave assembly to obtain the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwave into the atomization chamber based on the target operating frequency. The present application controls the frequency-hopping operation of the microwave assembly to feed microwaves into the atomization chamber, and may select the target operating frequency based on the detected microwave SWRs in the atomization chamber, thereby feeding the microwaves into the atomization chamber with a high efficiency, improving the atomization effect of the aerosol-forming substrate in the aerosol generating apparatus, and avoiding incomplete atomization of the aerosol-forming substrate.

[0068] It can be understood that the aerosol-forming substrate is atomized under the action of the microwaves in the atomization chamber, and the aerosol generated by atomization will affect the SWR of the microwave in the atomization chamber. By controlling the frequency-hopping operation of the microwave assembly and selecting the target operating frequency according to the detected microwave SWRs, this application realizes the adjustment of the operating frequency of the microwave assembly during the operation of the aerosol generating apparatus, and improves the efficiency of feeding microwaves into the atomization chamber.

[0069] As shown in FIG. 2, in the above embodiment, adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value during the operation of the microwave assembly includes following steps.

[0070] At Step 202, when the microwave assembly operates according to a first frequency, a second frequency is determined based on the first frequency and the set frequency-adjusting value.

[0071] At Step 204, the microwave assembly is controlled to operate according to the second frequency.

[0072] In this embodiment, the first frequency is an initial operating frequency of the microwave assembly, that is, when the aerosol atomizing device starts operating, the microwave assembly feeds a microwave of the first frequency into the atomization chamber. Under a condition that the microwave assembly outputs the microwave of the first frequency, the second frequency is calculated based on the first frequency and the set frequency-adjusting value, and the microwave assembly is controlled to operate according to the second frequency.

[0073] In the process of controlling the frequency-hopping operation of the microwave assembly, the initial operating frequency and a frequency-hopping step length

of the microwave assembly need to be determined. The initial operating frequency of the microwave assembly is the first frequency, and the frequency-hopping step length is the frequency-adjusting value. The first frequency and the frequency-adjusting value are configured in a local storage area before the aerosol atomizing device leaves a factory. After the aerosol atomizing device starts operating, the first frequency and the frequency-adjusting value are directly called to control the frequency-hopping operation of the microwave assembly.

[0074] The present application controls the frequency-hopping operation of the microwave assembly through a fixed frequency-adjusting value, thereby stably adjusting the operating frequency of the microwave assembly and improving the stability of the frequency-hopping operation of the microwave assembly, and avoiding a decrease in the effect of microwave feed of the microwave assembly in the atomization chamber due to inconsistent frequency hopping steps of the frequency-hopping operation of the microwave assembly.

[0075] It can be understood that the frequency-adjusting value ranges from 0.5MHz to 40MHz.

[0076] The present application sets the frequency-adjusting value to be in a range of greater than or equal to 0.5MHz and less than or equal to 40MHz. By setting the frequency-adjusting value to greater than or equal to 0.5MHz, it can be ensured that an adjustment of the microwave frequency is large enough for each frequency hopping, so that the SWR in the atomization chamber can be changed. By setting the frequency-adjusting value to less than or equal to 40MHz, the problem that the target operating frequency cannot be accurately obtained due to an excessive adjustment of the operating frequency of the microwave assembly can be avoided.

[0077] It should be noted that in the process of controlling the frequency-hopping operation of the microwave assembly according to the frequency-adjusting value, the set frequency-adjusting value may be added to the first frequency, or the set frequency-adjusting value may be subtracted from the first frequency.

[0078] In any one of the above embodiments, before the step of controlling the microwave assembly to operate according to the second frequency, following steps are also included.

[0079] Under the condition that the microwave assembly is operating with a first set power, the microwave assembly is controlled to operate with a second set power, where the second set power is less than the first set power.

[0080] In this embodiment, before controlling the microwave assembly to perform a frequency hopping, the operating power of the microwave assembly is controlled to be reduced. Specifically, at the initial operation stage, the microwave assembly operates at the initial frequency, that is, when the microwave assembly operates at the first frequency, the microwave assembly is controlled to operate at the first set power, so as to ensure the effect of the microwave feed. The first set power is a higher

operating power. Before a frequency hopping, the operating power of the microwave assembly is lowered, that is, the microwave assembly is controlled to operate with the second set power. In the process of controlling the microwave assembly to adjust the operating frequency, the microwave assembly is controlled to operate at a lowered operating power, thus reducing an energy consumption of the microwave assembly during the frequency-hopping operation.

[0081] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly will output microwaves of different frequency bands at different frequency-hopping stages, and microwaves of different frequency bands have different atomization effects on the aerosol-forming substrate. The present application lowers the operating power during the frequency-hopping operation of the microwave assembly, which can avoid a waste of electric energy.

[0082] In any of the above embodiments, controlling the microwave assembly to operate according to the target operating frequency includes: controlling the microwave assembly to operate with a third set power according to the target operating frequency, where the third set power is greater than the second set power.

[0083] In this embodiment, the third set power is greater than the second set power, that is, after the target operating frequency is determined, the microwave assembly is controlled to increase the current operating power to operate with a higher power and controlled to output microwaves according to the target operating frequency. The target operating frequency is selected according to the SWRs of the microwave in the atomization chamber during the frequency-hopping operation of the microwave assembly. That is, the efficiency of the microwave feed in the atomization chamber can be ensured when the microwave assembly feeds the microwave into the atomization chamber according to the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwaves into the atomization chamber with the third set power greater than the second set power, thereby further enhancing the efficiency of the microwave assembly feeding microwaves into the atomization chamber, and improving the atomization effect of the aerosol-forming substrate in the atomization chamber.

[0084] As shown in FIG. 3, in any one of the above embodiments, determining the target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after the adjustment includes following steps.

[0085] At Step 302, a first SWR in the atomization chamber is obtained before the adjustment, and a second SWR in the atomization chamber is obtained after the adjustment.

[0086] At Step 304, a first difference between the first SWR and the preset SWR is calculated, and a second difference between the second SWR and the preset SWR

is calculated.

[0087] At Step 306, the target operating frequency is determined based on the first difference and the second difference.

[0088] In this embodiment, during the frequency-hopping operation of the microwave assembly, the SWRs in the atomization chamber before and after the frequency hopping of the microwave assembly are detected by the microwave detector. The first SWR before the frequency hopping and the second SWR after the frequency hopping are obtained. The preset SWR is a default SWR, namely a desired SWR in the atomization chamber by the user. By calculating the first difference and the second difference, and by numerically comparing the first difference and the second difference, the effect of adjusting the operating frequency of the microwave assembly can be determined. Specifically, when it is detected that the first difference is greater than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be improved. When it is detected that the first difference is less than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be reduced. During the frequency-hopping operation of the microwave assembly, according to the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly, which makes the effect of the microwave feed better, is determined, thereby obtaining the target operating frequency.

[0089] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly can perform frequency hopping once or more. In the process of performing the frequency hopping each time, the microwave assembly selects a next frequency hopping direction based on the first difference and the second difference.

[0090] In some embodiments, the current operating frequency of the microwave assembly is 2.43GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.5 and the preset SWR is 1. It can be obtained that the first difference is 0.6, and the second difference is 0.5. It is determined that the current adjustment manner of increasing the frequency makes the microwave SWRs in the chamber become increasingly closer to the preset SWR. The next frequency hopping adjustment may be performed in the manner of increasing the frequency to adjust the frequency hopping.

[0091] In some other embodiments, the current frequency of the microwave assembly is adjusted to 2.43 GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of

the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.7 and the preset SWR is 1. It can be obtained that the first difference is 0.6, and the second difference is 0.7. It is determined that the current adjustment manner of increasing the frequency makes the microwave SWRs in the chamber become increasingly farther from the preset SWR. The next frequency hopping adjustment may be performed in the manner of lowering the frequency to adjust the frequency hopping.

[0092] In these embodiments of the present application, during the multiple frequency hopping adjustments, the microwave SWRs in the atomization chamber are detected before and after each frequency hopping adjustment. According to the microwave SWRs in the atomization chamber detected before and after the current adjustment, the direction of the next frequency hopping adjustment is determined to ensure that when the microwave assembly performs frequency hopping adjustment, the effect of microwave feed in the atomization chamber can be improved.

[0093] In some embodiments, the preset SWR may be selected as 1. When the microwave SWR in the atomization chamber is closer to 1, it means that the effect of microwave feed in the atomization chamber is better.

[0094] In any one of the above embodiments, determining the target operating frequency based on the first difference and the second difference includes: determining an operating frequency corresponding to the second SWR as the target operating frequency, when the first difference is greater than the second difference, and determining the target operating frequency according to an operating frequency corresponding to the first SWR and the set frequency-adjusting value, when the first difference is less than the second difference.

[0095] In this embodiment, under the circumstance that the microwave assembly only needs to perform frequency hopping once, if it is detected that the first difference is greater than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at the operating frequency corresponding to the second SWR, then the operating frequency corresponding to the second SWR will be used as the target operating frequency. If it is detected that the first difference is smaller than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at the operating frequency corresponding to the first SWR, then the operating frequency corresponding to the first SWR will be used as the target operating frequency. During the frequency-hopping operation of the microwave assembly, based on the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly with better effect of microwave feed is determined, thus obtaining the target operating frequency and controlling the microwave assembly to operate according to the target operating frequency, and improving the effect of microwave feed in the atomization

chamber.

[0096] In any one of the above embodiments, before controlling the microwave assembly to operate according to the target operating frequency, the method also includes: obtaining the number of times that the microwave assembly adjusts the operating frequency according to the set frequency-adjusting value; when the number of times is less than the set number of times, returning to perform the step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value.

[0097] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the number of times the microwave assembly adjusts the operating frequency is detected. When it is detected that the number of times of adjusting reaches the set number of times, the microwave assembly is controlled to start operating according to the target operating frequency. When it is detected that the number of times of adjusting is less than the set number of times, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the number of times of adjusting reaches the set number of times. After multiple frequency hopping adjustments, this present application selects the target operating frequency obtained finally to control the operation of the microwave assembly, thereby improving the effect of microwave feed into the atomization chamber of the microwave assembly.

[0098] In some embodiments, the set number of times ranges from 1 to 8 times.

[0099] In these embodiments, since the microwave assembly lowers the operating power during the frequency-hopping operation, that is, the microwave assembly will operate with a lower operating power. If the set number of times is greater than 8 times, the overall efficiency of microwave feed into the atomization chamber of the microwave assembly will be affected. If the set number of times is less than 1 time, the operating frequency of the microwave assembly cannot be adjusted reasonably.

[0100] In any one of the above embodiments, before controlling the microwave assembly to operate according to the target operating frequency, the method further includes: obtaining a third SWR corresponding to the target operating frequency; when the third SWR is within a preset SWR range, returning to perform the step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value.

[0101] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the current SWR of the microwave in the atomization chamber, namely, the third SWR corresponding to the target operating frequency, is detected. After it is detected that the third SWR is within the preset

SWR range, it is determined that the microwave assembly has been adjusted to the optimal operating frequency range, and the microwave assembly is controlled to start operating according to the target operating frequency. After it is detected that the third SWR is not within the preset SWR range, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the third SWR is in the preset SWR range. The present application controls the number of times the microwave assembly performs the frequency hopping adjustments based on the microwave SWRs in the atomization chamber, which can ensure that the microwave assembly operates based on the target operating frequency to achieve the best effect of microwave feed.

Embodiment 2:

[0102] As shown in FIG. 4, the second embodiment of the present application proposes a control apparatus 400 for an aerosol generating apparatus. The aerosol generating apparatus includes: an atomization chamber, a microwave assembly, and a microwave detector. The microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect a standing-wave ratio (SWR) of the microwave in the atomization chamber. The control apparatus includes:

- an adjusting module 402, configured to adjust an operating frequency of the microwave assembly according to a set frequency-adjusting value, during an operation of the microwave assembly;
- a determining module 404, configured to determine a target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after an adjustment;
- a control module 406, configured to control the microwave assembly to operate according to the target operating frequency.

[0103] The control apparatus 400 for the aerosol generating apparatus provided in this embodiment is used to control the operation of the aerosol generating apparatus. The aerosol generating apparatus includes the housing, the atomization chamber, the microwave assembly and the microwave detector. The atomization chamber is formed inside the housing, and the aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber. The aerosol-forming substrate releases aerosol under the action of the microwaves. The microwave detector is arranged on the housing, and may detect the SWR of the microwave in the atomization cham-

ber.

[0104] It can be understood that the microwave assembly can output microwaves in multiple frequency bands into the atomization chamber. The atomization chamber is set to be in a bandwidth range from 1M to 20M, and the microwave frequency bands output by the microwave assembly can be selected as 902MHz to 928MHz, 2.400GHz to 2.500GHz, 5.7255GHz to 5.875GHz, and 24GHz to 24.25GHz.

[0105] The control method for the aerosol generating apparatus includes controlling a frequency-hopping operation of the microwave assembly. Specifically, during the frequency-hopping operation of the microwave assembly, the operating frequency of the microwave assembly is adjusted according to a set frequency-adjusting value, so that the microwave assembly feeds microwave of different frequencies into the atomization chamber. During the frequency-hopping operation of the microwave assembly, the microwave detector continuously collects the SWRs of the microwave in the atomization chamber. The collected SWRs of the microwave may reflect the microwave feed efficiency in the atomization chamber. According to the microwave SWRs detected at different operating frequencies, a frequency is selected from the operating frequencies of the microwave assembly to obtain the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwave into the atomization chamber based on the target operating frequency. The present application controls the frequency-hopping operation of the microwave assembly to feed microwaves into the atomization chamber, and may select the target operating frequency based on the detected microwave SWRs in the atomization chamber, thereby feeding the microwaves into the atomization chamber with a high efficiency, improving the atomization effect of the aerosol-forming substrate in the aerosol generating apparatus, and avoiding incomplete atomization of the aerosol-forming substrate.

[0106] It can be understood that the aerosol-forming substrate is atomized under the action of the microwaves in the atomization chamber, and the aerosol generated by atomization will affect the SWR of the microwave in the atomization chamber. By controlling the frequency-hopping operation of the microwave assembly and selecting the target operating frequency according to the detected microwave SWRs, this application realizes the adjustment of the operating frequency of the microwave assembly during the operation of the aerosol generating apparatus, and improves the efficiency of feeding microwaves into the atomization chamber.

[0107] In any one of the above embodiments, the adjusting module 402 is also configured to determine a second frequency based on the first frequency and the set frequency-adjusting value, when the microwave assembly operates according to a first frequency.

[0108] The control module 406 is further configured to control the microwave assembly to operate according to

the second frequency.

[0109] In this embodiment, the first frequency is an initial operating frequency of the microwave assembly, that is, when the aerosol atomizing device starts operating, the microwave assembly feeds a microwave of the first frequency into the atomization chamber. Under a condition that the microwave assembly outputs the microwave of the first frequency, the second frequency is calculated based on the first frequency and the set frequency-adjusting value, and the microwave assembly is controlled to operate according to the second frequency.

[0110] In the process of controlling the frequency-hopping operation of the microwave assembly, the initial operating frequency and a frequency-hopping step length of the microwave assembly need to be determined. The initial operating frequency of the microwave assembly is the first frequency, and the frequency-hopping step length is the frequency-adjusting value. The first frequency and the frequency-adjusting value are configured in a local storage area before the aerosol atomizing device leaves a factory. After the aerosol atomizing device starts operating, the first frequency and the frequency-adjusting value are directly called to control the frequency-hopping operation of the microwave assembly.

[0111] The present application controls the frequency-hopping operation of the microwave assembly through a fixed frequency-adjusting value, thereby stably adjusting the operating frequency of the microwave assembly and improving the stability of the frequency-hopping operation of the microwave assembly, and avoiding a decrease in the effect of microwave feed of the microwave assembly in the atomization chamber due to inconsistent frequency hopping steps of the frequency-hopping operation of the microwave assembly.

[0112] It can be understood that the frequency-adjusting value ranges from 0.5MHz to 40MHz.

[0113] The present application sets the frequency-adjusting value to be in a range of greater than or equal to 0.5MHz and less than or equal to 40MHz. By setting the frequency-adjusting value to greater than or equal to 0.5MHz, it can be ensured that an adjustment of the microwave frequency is large enough for each frequency hopping, so that the SWR in the atomization chamber can be changed. By setting the frequency-adjusting value to less than or equal to 40MHz, the problem that the target operating frequency cannot be accurately obtained due to an excessive adjustment of the operating frequency of the microwave assembly can be avoided.

[0114] It should be noted that in the process of controlling the frequency-hopping operation of the microwave assembly according to the frequency-adjusting value, the set frequency-adjusting value may be added to the first frequency, or the set frequency-adjusting value may be subtracted from the first frequency.

[0115] In any of the above embodiments, the control module 406 is also configured to control the microwave assembly to operate with a second set power under the condition that the microwave assembly is operating with

a first set power, where the second set power is smaller than the first set power.

[0116] In this embodiment, before controlling the microwave assembly to perform a frequency hopping, the operating power of the microwave assembly is controlled to be reduced. Specifically, at the initial operation stage, the microwave assembly operates at the initial frequency, that is, when the microwave assembly operates at the first frequency, the microwave assembly is controlled to operate at the first set power, so as to ensure the effect of the microwave feed. The first set power is a higher operating power. Before a frequency hopping, the operating power of the microwave assembly is lowered, that is, the microwave assembly is controlled to operate with the second set power. In the process of controlling the microwave assembly to adjust the operating frequency, the microwave assembly is controlled to operate at a lowered operating power, thus reducing an energy consumption of the microwave assembly during the frequency-hopping operation.

[0117] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly will output microwaves of different frequency bands at different frequency-hopping stages, and microwaves of different frequency bands have different atomization effects on the aerosol-forming substrate. The present application lowers the operating power during the frequency-hopping operation of the microwave assembly, which can avoid a waste of electric energy.

[0118] In any one of the above embodiments, the control module 406 is also configured to control the microwave assembly to operate with a third set power according to the target operating frequency, where the third set power is greater than the second set power.

[0119] In this embodiment, the third set power is greater than the second set power, that is, after the target operating frequency is determined, the microwave assembly is controlled to increase the current operating power to operate with a higher power and controlled to output microwaves according to the target operating frequency. The target operating frequency is selected according to the SWRs of the microwave in the atomization chamber during the frequency-hopping operation of the microwave assembly. That is, the efficiency of the microwave feed in the atomization chamber can be ensured when the microwave assembly feeds the microwave into the atomization chamber according to the target operating frequency. After the target operating frequency is determined, the microwave assembly is controlled to feed microwaves into the atomization chamber with the third set power greater than the second set power, thereby further enhancing the efficiency of the microwave assembly feeding microwaves into the atomization chamber, and improving the atomization effect of the aerosol-forming substrate in the atomization chamber.

[0120] In any one of the above embodiments, the obtaining module is also configured to obtain a first SWR

in the atomization chamber before the adjustment and a second SWR in the atomization chamber after the adjustment.

[0121] The control apparatus 400 for the aerosol generating apparatus also includes:

a calculation module, configured to calculate a first difference between the first SWR and the preset SWR, and a second difference between the second SWR and the preset SWR; and
a determining module configured to determine the target operating frequency based on the first difference and the second difference.

[0122] In this embodiment, during the frequency-hopping operation of the microwave assembly, the SWRs in the atomization chamber before and after the frequency hopping of the microwave assembly are detected by the microwave detector. The first SWR before the frequency hopping and the second SWR after the frequency hopping are obtained. The preset SWR is a default SWR, namely a desired SWR in the atomization chamber by the user. By calculating the first difference and the second difference, and by numerically comparing the first difference and the second difference, the effect of adjusting the operating frequency of the microwave assembly can be determined. Specifically, when it is detected that the first difference is greater than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be improved. When it is detected that the first difference is less than the second difference, it is determined that adjusting the operating frequency of the microwave assembly at this time has made the effect of microwave feed in the atomization chamber to be reduced. During the frequency-hopping operation of the microwave assembly, according to the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly, which makes the effect of the microwave feed better, is determined, thereby obtaining the target operating frequency.

[0123] It should be understood that, during the frequency-hopping operation of the microwave assembly, the microwave assembly can perform frequency hopping once or more. In the process of performing the frequency hopping each time, the microwave assembly selects a next frequency hopping direction based on the first difference and the second difference.

[0124] In some embodiments, the current operating frequency of the microwave assembly is 2.43GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.5 and the preset SWR is 1. It can be obtained that the first difference is 0.6, and the second difference is 0.5. It is determined that the current adjustment manner

of increasing the frequency makes the microwave SWRs in the chamber become increasingly closer to the preset SWR. The next frequency hopping adjustment may be performed in the manner of increasing the frequency to adjust the frequency hopping.

[0125] In some other embodiments, the current frequency of the microwave assembly is adjusted to 2.43 GHz, and the detected first SWR is 1.6. The current frequency hopping adjustment is performed by increasing the operating frequency, and the operating frequency of the microwave assembly is adjusted to 2.44GHz. The detected second SWR is 1.7 and the preset SWR is 1. It can be obtained that the first difference is 0.6, and the second difference is 0.7. It is determined that the current adjustment manner of increasing the frequency makes the microwave SWRs in the chamber become increasingly farther from the preset SWR. The next frequency hopping adjustment may be performed in the manner of lowering the frequency to adjust the frequency hopping.

[0126] In these embodiments of the present application, during the multiple frequency hopping adjustments, the microwave SWRs in the atomization chamber are detected before and after each frequency hopping adjustment. According to the microwave SWRs in the atomization chamber detected before and after the current adjustment, the direction of the next frequency hopping adjustment is determined to ensure that when the microwave assembly performs frequency hopping adjustment, the effect of microwave feed in the atomization chamber can be improved.

[0127] In some embodiments, the preset SWR may be selected as 1. When the microwave SWR in the atomization chamber is closer to 1, it means that the effect of microwave feed in the atomization chamber is better.

[0128] In any one of the above embodiments, the determining module is also configured to determine the target operating frequency based on the first difference and the second difference, including: determining an operating frequency corresponding to the second SWR as the target operating frequency, when the first difference is greater than the second difference, and determining the target operating frequency according to an operating frequency corresponding to the first SWR and the set frequency-adjusting value, when the first difference is less than the second difference.

[0129] In this embodiment, under the circumstance that the microwave assembly only needs to perform frequency hopping once, if it is detected that the first difference is greater than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at the operating frequency corresponding to the second SWR, then the operating frequency corresponding to the second SWR will be used as the target operating frequency. If it is detected that the first difference is smaller than the second difference, and it is determined that the effect of microwave feed in the atomization chamber is better when the microwave assembly operates at

the operating frequency corresponding to the first SWR, then the operating frequency corresponding to the first SWR will be used as the target operating frequency. During the frequency-hopping operation of the microwave assembly, based on the collected microwave SWRs in the atomization chamber, the operating frequency of the microwave assembly with better effect of microwave feed is determined, thus obtaining the target operating frequency and controlling the microwave assembly to operate according to the target operating frequency, and improving the effect of microwave feed in the atomization chamber.

[0130] In any one of the above embodiments, the obtaining module is further configured to obtain the number of times that the microwave assembly adjusts the operating frequency according to the set frequency-adjusting value.

[0131] The control module 406 is further configured to return to perform the step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value when the number of times is less than the set number of times.

[0132] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the number of times the microwave assembly adjusts the operating frequency is detected. When it is detected that the number of times of adjusting reaches the set number of times, the microwave assembly is controlled to start operating according to the target operating frequency. When it is detected that the number of times of adjusting is less than the set number of times, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the number of times of adjusting reaches the set number of times. After multiple frequency hopping adjustments, this present application selects the target operating frequency obtained finally to control the operation of the microwave assembly, thereby improving the effect of microwave feed into the atomization chamber of the microwave assembly.

[0133] In some embodiments, the set number of times ranges from 1 to 8 times.

[0134] In these embodiments, since the microwave assembly lowers the operating power during the frequency-hopping operation, that is, the microwave assembly will operate with a lower operating power. If the set number of times is greater than 8 times, the overall efficiency of microwave feed into the atomization chamber of the microwave assembly will be affected. If the set number of times is less than 1 time, the operating frequency of the microwave assembly cannot be adjusted reasonably.

[0135] In any one of the above embodiments, the obtaining module is also configured to obtain a third SWR corresponding to the target operating frequency.

[0136] The control module 406 is also configured to return to perform the step of adjusting the operating fre-

quency of the microwave assembly according to the set frequency-adjusting value when the third SWR is in the preset SWR range.

[0137] In this embodiment, under the circumstance that the microwave assembly needs to perform multiple frequency hopping adjustments, before controlling the microwave assembly to operate according to the target operating frequency, the current SWR of the microwave in the atomization chamber, namely, the third SWR corresponding to the target operating frequency, is detected. After it is detected that the third SWR is within the preset SWR range, it is determined that the microwave assembly has been adjusted to the optimal operating frequency range, and the microwave assembly is controlled to start operating according to the target operating frequency. After it is detected that the third SWR is not within the preset SWR range, the current operating frequency will continue to be adjusted according to the set frequency-adjusting value until the third SWR is in the preset SWR range. The present application controls the number of times the microwave assembly performs the frequency hopping adjustments based on the microwave SWRs in the atomization chamber, which can ensure that the microwave assembly operates based on the target operating frequency to achieve the best effect of microwave feed.

Embodiment 3

[0138] As shown in FIG. 5, a third embodiment of the present application proposes an aerosol generating apparatus 500, which includes the control apparatus 400 for the aerosol generating apparatus in the Embodiment 2. Therefore, the aerosol generating apparatus may achieve all the same beneficial effects as the control apparatus 400 for the aerosol generating apparatus in the above Embodiment 2, which will not be described in detail herein.

[0139] In any one of the above embodiments, the aerosol generating apparatus 500 further includes: a housing, in which an atomization chamber is formed for arranging the aerosol-forming substrate; a microwave assembly, which is arranged on the housing and connected to the processor, and configured to feed a microwave into the atomization chamber.

[0140] In this embodiment, the aerosol generating apparatus 500 includes the housing, the atomization chamber, and the microwave assembly. The atomization chamber is formed inside the housing. The aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the microwave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber, and the aerosol-forming substrate releases aerosol under the action of the microwave.

[0141] In any one of the above embodiments, the aerosol generating apparatus 500 further includes a micro-

wave detector, which is arranged on the housing and configured to collect the SWR of the microwave in the atomization chamber.

[0142] In this embodiment, the microwave detector is arranged on the housing, and the microwave detector can detect the SWR of the microwave in the atomization chamber.

[0143] In any of the above embodiments, the aerosol generating apparatus 500 further includes a resonant column. A first end of the resonant column is connected to a bottom wall of the atomization chamber, and a second end of the resonant column faces an opening of the atomization chamber.

[0144] In this embodiment, the aerosol generating apparatus 500 includes the resonant column. The resonant column is arranged in the atomization chamber, the first end of the resonant column is connected to the bottom wall of the atomization chamber, and the second end of the resonant column faces the opening of the atomization chamber. Through the resonant column arranged inside the atomization chamber, this application can convey the microwave generated by the microwave assembly in a direction from the first end to the second end of the resonant column. Since the aerosol-forming substrate is arranged in an area close to the second end of the resonant column, it is ensured that the microwave can act on the aerosol-forming substrate, thereby improving the atomization effect of the aerosol-forming substrate under the action of microwaves.

Embodiment 4:

[0145] As shown in FIG. 6, a fourth embodiment of the present application proposes an aerosol generating apparatus 600, which includes a memory 602 and a processor 604. The memory 602 stores programs or instructions. The processor 604 executes the programs or instructions stored in the memory 602, to implement the control method for the aerosol generating apparatus 600 in the Embodiment 1, therefore, the aerosol generating apparatus may achieve all the same beneficial effects as the control method for the aerosol generating apparatus 600 in the above Embodiment 1, which will not be described in detail herein.

[0146] In any one of the above embodiments, the aerosol generating apparatus 600 further includes: a housing, in which an atomization chamber is formed for arranging the aerosol-forming substrate; a microwave assembly, which is arranged on the housing and connected to the processor 604, and configured to feed a microwave into the atomization chamber.

[0147] In this embodiment, the aerosol generating apparatus 600 includes the housing, the atomization chamber, and the microwave assembly. The atomization chamber is formed inside the housing. The aerosol-forming substrate may be arranged inside the atomization chamber. The microwave assembly is arranged outside the housing. The microwave assembly may feed the mi-

crowave into the atomization chamber. The microwave acts on the aerosol-forming substrate inside the atomization chamber, and the aerosol-forming substrate releases aerosol under the action of the microwave.

[0148] In any of the above embodiments, the aerosol generating apparatus 600 further includes a microwave detector, which is arranged on the housing and configured to collect the SWR of the microwave in the atomization chamber.

[0149] In this embodiment, the microwave detector is installed on the housing, and the microwave detector can detect the SWR of the microwave in the atomization chamber.

[0150] In any of the above embodiments, the aerosol generating apparatus 600 further includes a resonant column. A first end of the resonant column is connected to a bottom wall of the atomization chamber, and a second end of the resonant column faces an opening of the atomization chamber.

[0151] In this embodiment, the aerosol generating apparatus 600 includes the resonant column. The resonant column is arranged in the atomization chamber, the first end of the resonant column is connected to the bottom wall of the atomization chamber, and the second end of the resonant column faces the opening of the atomization chamber. Through the resonant column arranged inside the atomization chamber, this application can convey the microwave generated by the microwave assembly in a direction from the first end to the second end of the resonant column. Since the aerosol-forming substrate is arranged in an area close to the second end of the resonant column, it is ensured that the microwave can act on the aerosol-forming substrate, thereby improving the atomization effect of the aerosol-forming substrate under the action of microwaves.

Embodiment 5

[0152] A fifth embodiment of the present application proposes a readable storage medium. Programs or instructions are stored on the readable storage medium. When the programs or instructions are executed by a processor, the steps of the control method for the aerosol generating apparatus of any one of the above possible embodiments are implemented. Therefore, the readable storage medium can achieve all the same beneficial effects as the control method for the aerosol generating apparatus of any one of the above possible embodiments, which will not be described in detail herein.

[0153] It should be noted that, in the claims, the description and the drawings of the present application, the term "multiple" refers to two or more than two. Unless otherwise clearly defined, the orientation or positional relationship indicated by the terms "upper", "lower", etc., is based on the orientation or positional relationship shown in the drawings. The orientation or positional relationship is only for the convenience of describing the present application and simplifying the description, but does not in-

dicade or imply that the device or element referred to must have a specific orientation and be constructed and operated in a specific orientation, therefore the orientation or positional relationship cannot be understood as a limitation of the present application. The terms "connection", "installation", "fixing", etc., should be understood in a broad sense. For example, "connection" may be a fixed connection, a detachable connection, or an integral connection, and it may be a direct connection, or it may be an indirectly connection implemented through intermediaries. For those of ordinary skill in the art, the specific meanings of the above terms in the present application may be understood according to specific circumstances.

[0154] In the claims, the description and the drawings of the present application, the terms "one embodiment", "some embodiments", "specific embodiments", etc., mean that the specific features, structures, materials, or characteristics described in connection with the embodiment or example are included in at least one embodiment or example the present application. In this specification, the illustrative description of the above terms does not necessarily refer to the same embodiment or example. Furthermore, the specific features, structures, materials, or characteristics described may be combined in any suitable manner in any one or more embodiments or examples.

[0155] The above embodiments are only preferred embodiments of the present application, and not intended to limit the present application. For those skilled in the art, the present application may have various modifications and changes. Any modifications, equivalent replacements, improvements, etc., made within the spirits and principles of the application shall be included in the protection scope of the application.

Claims

1. A control method for an aerosol generating apparatus, **characterized in that**, the aerosol generating apparatus comprises an atomization chamber, a microwave assembly, and a microwave detector, wherein the microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect standing-wave ratios (SWRs) of the microwave in the atomization chamber; the control method comprises:

adjusting an operating frequency of the microwave assembly according to a set frequency-adjusting value during an operation of the microwave assembly;
determining a target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after an adjustment; and
controlling the microwave assembly to operate

- according to the target operating frequency.
2. The control method for the aerosol generating apparatus according to claim 1, wherein adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value during the operation of the microwave assembly, comprises:
 - determining a second frequency based on a first frequency and the set frequency-adjusting value when the microwave assembly operates according to the first frequency; and
 - controlling the microwave assembly to operate according to the second frequency.
 3. The control method for the aerosol generating apparatus according to claim 2, wherein before a step of controlling the microwave assembly to operate according to the second frequency, the control method further comprises:
 - controlling the microwave assembly to operate with a second set power under a condition that the microwave assembly is operating with a first set power;
 - wherein the second set power is less than the first set power.
 4. The control method for the aerosol generating apparatus according to claim 3, wherein controlling the microwave assembly to operate according to the target operating frequency comprises:
 - controlling the microwave assembly to operate with a third set power according to the target operating frequency;
 - wherein the third set power is greater than the second set power.
 5. The control method for the aerosol generating apparatus according to any one of claims 1 to 4, wherein determining the target operating frequency of the microwave assembly based on the SWRs of the microwave in the atomization chamber before and after the adjustment comprises:
 - obtaining a first SWR in the atomization chamber before the adjustment and a second SWR in the atomization chamber after the adjustment;
 - calculating a first difference between the first SWR and a preset SWR and a second difference between the second SWR and the preset SWR; and
 - determining the target operating frequency based on the first difference and the second difference.
 6. The control method for the aerosol generating apparatus according to claim 5, wherein determining the target operating frequency based on the first difference and the second difference comprises:
 - determining an operating frequency corresponding to the second SWR as the target operating frequency, when the first difference is greater than the second difference; and
 - determining the target operating frequency according to an operating frequency corresponding to the first SWR and the set frequency-adjusting value, when the first difference is less than the second difference.
 7. The control method for the aerosol generating apparatus according to claim 5, wherein before controlling the microwave assembly to operate according to the target operating frequency, the control method further comprises:
 - obtaining the number of times the microwave assembly adjusts the operating frequency according to the set frequency-adjusting value;
 - returning to perform a step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value, when the number of times is less than a set number of times.
 8. The control method for the aerosol generating apparatus according to claim 5, wherein before controlling the microwave assembly to operate according to the target operating frequency, the control method further comprises:
 - obtaining a third SWR corresponding to the target operating frequency; and
 - returning to perform a step of adjusting the operating frequency of the microwave assembly according to the set frequency-adjusting value, when the third SWR is within a preset SWR range.
 9. A control apparatus for an aerosol generating apparatus, **characterized in that**, the aerosol generating apparatus comprises an atomization chamber, a microwave assembly, and a microwave detector, wherein the microwave assembly is configured to feed a microwave into the atomization chamber, and the microwave detector is configured to collect standing-wave ratios (SWRs) of the microwave in the atomization chamber; the control apparatus comprises:
 - an adjusting module, configured to adjust an operating frequency of the microwave assembly according to a set frequency-adjusting value

- during an operation of the microwave assembly;
 a determining module, configured to determine
 a target operating frequency of the microwave
 assembly based on the SWRs of the microwave
 in the atomization chamber before and after an
 adjustment; and 5
 a control module, configured to control the mi-
 crowave assembly to operate according to the
 target operating frequency. 10
10. An aerosol generating apparatus, **characterized by**
 comprising the control apparatus for the aerosol gen-
 erating apparatus according to claim 9.
11. An aerosol generating apparatus, **characterized by** 15
 comprising:
- a memory, having programs or instructions
 stored thereon; and
 a processor, wherein the processor, when exe- 20
 cuting the programs or the instructions stored
 on the memory, implements steps of the control
 method for the aerosol generating apparatus ac-
 cording to any one of claims 1 to 8. 25
12. The aerosol generating apparatus according to claim
 11, further comprising:
- a housing having the atomization chamber
 formed inside the housing for arranging an aer- 30
 osol-forming substrate; and
 the microwave assembly arranged on the hous-
 ing and connected to the processor and config-
 ured to feed the microwave into the atomization
 chamber. 35
13. The aerosol generating apparatus according to claim
 12, further comprising:
 the microwave detector arranged on the housing and
 configured to collect the microwave SWRs in the at- 40
 omization chamber.
14. The aerosol generating apparatus according to claim
 12 or 13, further comprising a resonant column,
 wherein a first end of the resonant column is con- 45
 nected to a bottom wall of the atomization chamber,
 and a second end of the resonant column faces an
 opening of the atomization chamber.
15. A readable storage medium, **characterized by** hav- 50
 ing programs or instructions stored thereon, where-
 in, the programs or the instructions, when executed
 by a processor, implement steps of the control meth-
 od for the aerosol generating apparatus according
 to any one of claims 1 to 8. 55

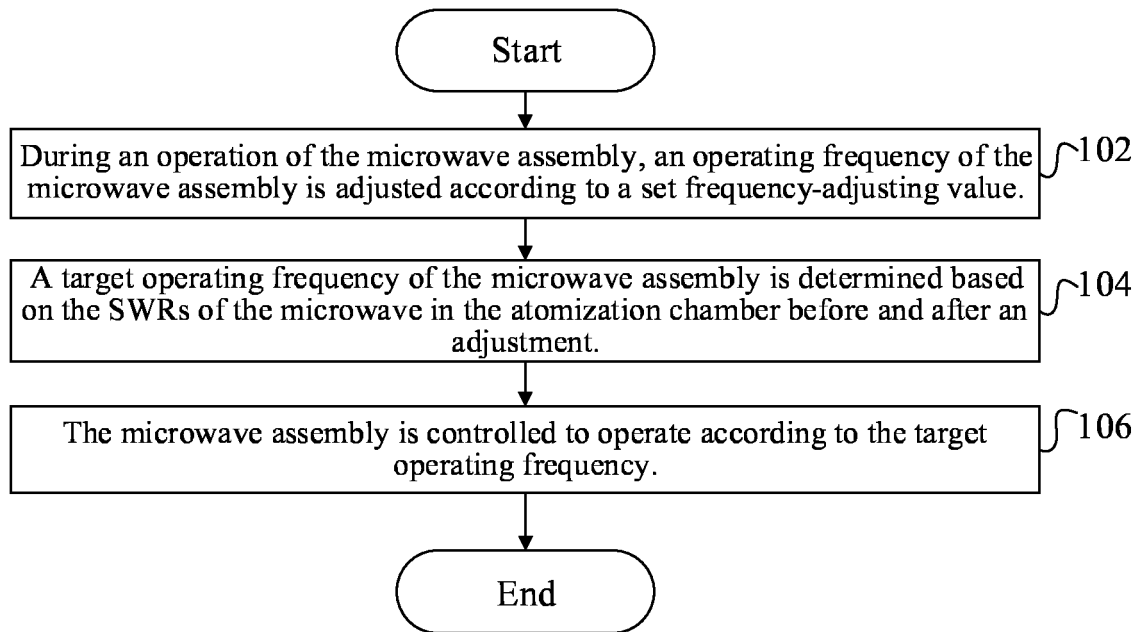


FIG. 1

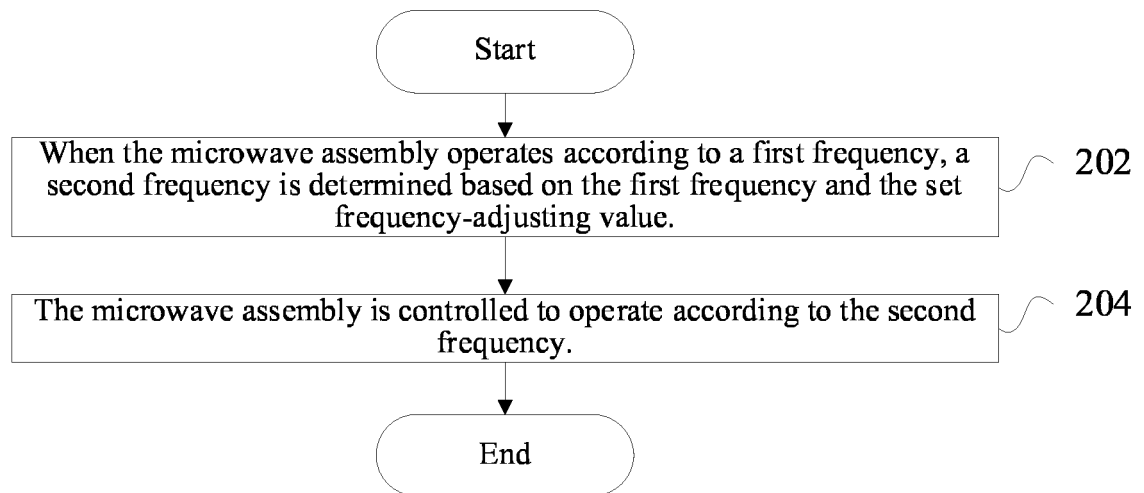


FIG. 2

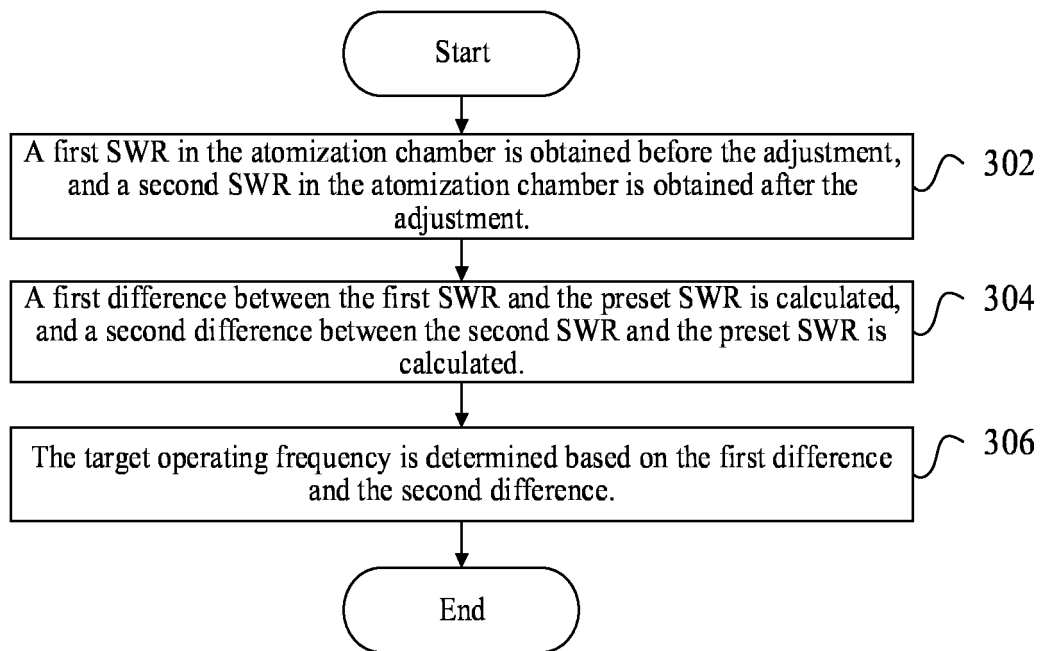


FIG. 3

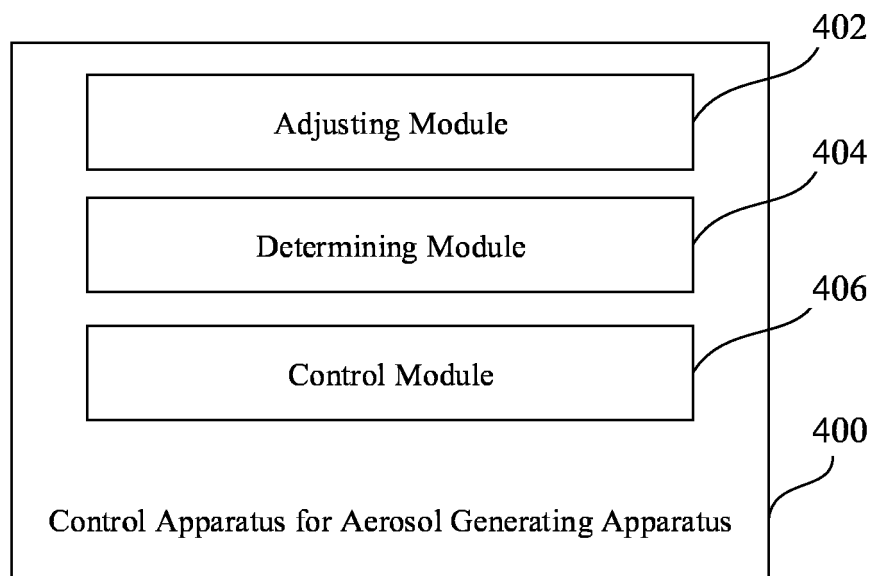


FIG. 4

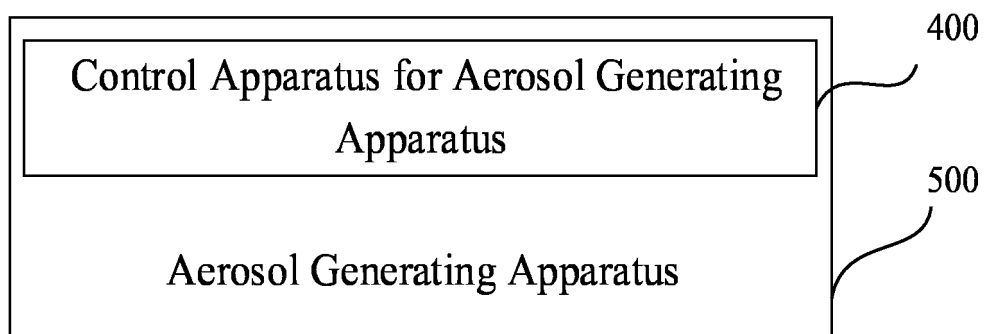


FIG. 5

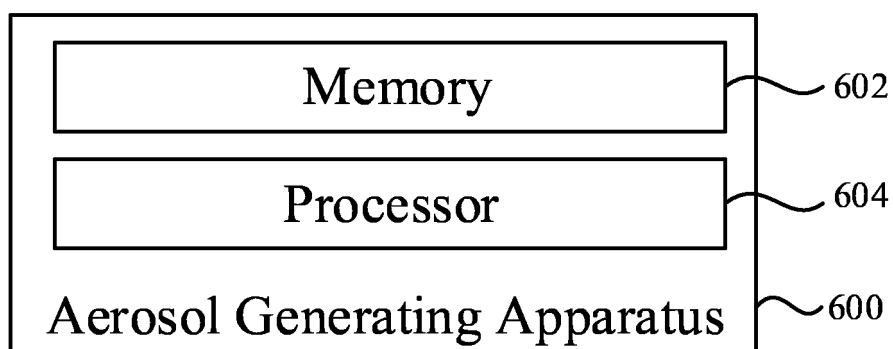


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/120229

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00(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)

A24F

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)

CNTXT, ENTXT, ENTXTC, VEN: 气溶胶, 雾化, 电子烟, 微波, 频率, 驻波比, 驻波系数, 加热, SWR, VSWR, microwave, frequency, wave ratio, heat+

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	CN 106287866 A (GUANGDONG MIDEA KITCHEN APPLIANCES MANUFACTURING CO., LTD. et al.) 04 January 2017 (2017-01-04) entire document	1-15

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

22 November 2022

Date of mailing of the international search report

30 November 2022

Name and mailing address of the ISA/CN

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Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/120229

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Information on patent family members

International application No.

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