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(54) ELECTRONIC ATOMIZER AND LIQUID SUPPLY METHOD THEREFOR

(57) Disclosed are an electronic atomizer and a liquid supply method therefor. The liquid supply method includes: obtaining an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit; calculating a real-time power of the atomizing unit according to the atomization parameter; determining an operating time ratio of an air supply unit to the atomizing unit according to the real-time power; determining a duty cycle of the air supply unit according to the operating time ratio; and controlling the air supply unit to supply air to a liquid storage unit according to the duty cycle; or, obtaining an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit; calculating a real-time power of the atomizing unit according to the atomization parameter; determining an output power of an air supply unit according to the real-time power; and controlling the air supply unit to supply air to a liquid storage unit according to the output power. The electronic atomizer supplies liquid using the liquid supply method. The invention solves the problem that it is difficult to keep a balance between atomizing liquid consumption and atomizing liquid supply of the atomizing unit, thus solving the problems of liquid leaking and dry burning, and improving the mouth feeling of the user.

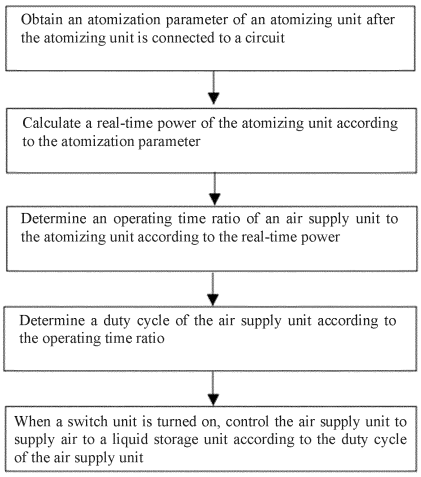

FIG. 1

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Description

FIELD

[0001] The invention belongs to the technical field of atomization, and particularly relates to an electronic atomizer and a liquid supply method therefor.

BACKGROUND

[0002] In the technical field of atomization, there are many types of electronic atomizers, which are different in power and liquid consumption in actual use. For example, when the power of an atomizing core is high, a large amount of atomizing liquid will be consumed at a high rate, and if the liquid supply rate fails to match the liquid consumption rate, the atomizing core will be dry-burned. When the power of the atomizing core is low, a small amount of liquid will be consumed, and if too much liquid is supplied in this case, redundant liquid on the atomizing core will leak out of the electronic atomizer. How to keep a balance between liquid consumption and liquid supply during atomization is a technical difficulty to be overcome.

SUMMARY

[0003] The technical issue to be settled by the invention is to provide an electronic atomizer and a liquid supply method therefor to overcome the defects in the prior art.

[0004] The technical solution that the present invention adopts to resolve the technical problems is to develop a liquid supply method for an electronic atomizer. The electronic atomizer comprises a liquid storage unit configured for storing atomizing liquid, an atomizing unit disposed below the liquid storage unit, an air supply unit configured for supplying air to the liquid storage unit so as to supply liquid to the atomizing unit, a switch unit configured for controlling the atomizing unit, and a control unit configured for controlling the air supply unit to operate. The liquid supply method comprises the following steps:

S1: obtaining an atomization parameter of the atomizing unit after the atomizing unit is connected to a circuit;

S2: calculating a real-time power of the atomizing unit according to the atomization parameter;

S3: determining an operating time ratio of the air supply unit to the atomizing unit according to the real-time power;

S4: determining a duty cycle of the air supply unit according to the operating time ratio; and

S5: when the switch unit is turned on, controlling the air supply unit to supply air to the liquid storage unit according to the duty cycle of the air supply unit.

[0005] Preferably, the atomization parameter comprises a resistance of the atomizing unit. S2 comprises the following steps:
calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit.

[0006] Preferably, calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit comprises:

obtaining a relation of resistance, voltage and power; and

calculating the real-time power of the atomizing unit according to the relation of resistance, voltage and power, as well as the resistance of the atomizing unit.

[0007] Preferably, S3 comprises:

obtaining a corresponding relation between the operating time ratio and power, wherein the corresponding relation between the operating time ratio and power is a relation between the operating time ratio of the air supply unit to the atomizing unit and the power of the atomizing unit; and

determining the operating time ratio of the air supply unit to the atomizing unit according to the corresponding relation between the operating time ratio and power and the real-time power.

[0008] Preferably, S4 comprises:

the operating time ratio of the air supply unit to the atomizing unit is less than or equal to 1.

the switch unit is connected to the control unit and is configured for controlling on/off of the atomizing unit.

[0009] Preferably, the switch unit comprise an airflow induction switch or a push switch.

[0010] An electronic atomizer is provided. The electronic atomizer supplies liquid using the liquid supply method described above.

[0011] A liquid supply method for an electronic atomize which comprises a liquid storage unit configured for storing atomizing liquid, an atomizing unit disposed below the liquid storage unit, an air supply unit configured for supplying air to the liquid storage unit so as to supply liquid to the atomizing unit, a switch unit configured for controlling the atomizing unit, and a control unit configured for controlling the air supply unit to operate, the liquid supply method comprising:

S1: obtaining an atomization parameter of the atomizing unit after the atomizing unit is connected to a circuit;

S2: calculating a real-time power of the atomizing unit according to the atomization parameter;

S3: determining an output power of the air supply unit according to the real-time power; and

S4: when the switch unit is turned on, controlling the air supply unit to supply air to the liquid storage unit according to the output power.

[0012] Preferably, the atomization parameter comprises a resistance of the atomizing unit; S2 comprising:

calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit.

calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit comprising:

obtaining a relation of resistance, voltage and power; and

calculating the real-time power of the atomizing unit according to the relation of resistance, voltage and power, as well as the resistance of the atomizing unit.

[0013] Preferably, S3 comprises:

obtaining a power threshold;

comparing the real-time power of the atomizing unit with the power threshold; and

if the real-time power is less than the power threshold, setting the output power of the air supply unit as half-power; or

if the real-time power is equal to or greater than the power threshold, setting the output power of the air supply unit as full-power.

[0014] Preferably, the power threshold of the atomizing unit is 20W.

[0015] Preferably, the switch unit is connected to the control unit and is configured for controlling on/off of the atomizing unit.
the switch unit comprises an airflow induction switch or a push switch.

[0016] An electronic atomizer is provided. The electronic atomizer supplies liquid using the liquid supply method described above.

[0017] The invention has the following beneficial effects: the liquid supply method for an electronic atomizer provided by the invention comprises: obtaining an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit; calculating a real-time power of the atomizing unit according to the atomization parameter; determining an operating time ratio of an air supply unit to the atomizing unit according to the real-time power; determining a duty cycle of the air supply unit according to the operating time ratio; and controlling the air supply unit to supply air to a liquid storage unit according to the duty cycle; or, obtaining an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit; calculating a real-time power of the atomizing unit according to the atomization parameter;

determining an output power of an air supply unit according to the real-time power; and controlling the air supply unit to supply air to a liquid storage unit according to the output power. In this way, the invention solves the problem that it is difficult to keep a balance between atomizing liquid consumption and atomizing liquid supply of the atomizing unit in actual use of the electronic atomizer, thus solving the problems of liquid leaking and dry burning, and improving the mouth feeling of the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention will be further described below in conjunction with accompanying drawings and embodiments. In the drawings:

FIG. 1 is a flow diagram of a liquid supply method according to Embodiment 1 of the invention;

FIG. 2 is a structural view of an electronic atomizer according to Embodiment 1 and Embodiment 2 of the invention;

FIG. 3 is a relation graph of the power of an atomizing unit and atomizing liquid consumption according to one specific implementation of Embodiment 1 and Embodiment 2 of the invention;

FIG. 4 is a relation graph of the operating time ratio of an air supply unit to an atomizing unit and the power of the atomizing unit according to a first implementation of Embodiment 1 of the invention;

FIG. 5 is a relation graph of the operating time ratio of the air supply unit to the atomizing unit and the power of the atomizing unit according to a second implementation of Embodiment 1 of the invention;

FIG. 6 is a flow diagram of a liquid supply method according to Embodiment 2 of the invention.

DESCRIPTION OF THE EMBODIMENTS

[0019] To gain a better understanding of the technical features, purposes and effects of the invention, specific implementations of the invention will be described in detail here with reference to the accompanying drawings.

Embodiment 1

[0020] An electronic atomizer, as shown in FIG. 2, comprises a liquid storage unit 1 configured for storing atomizing liquid, an atomizing unit 2 disposed below the liquid storage unit 1, an air supply unit 3 configured for supplying air to the liquid storage unit 1 to change the air pressure in the liquid storage unit so as to supply liquid to the atomizing unit 2, a switch unit 5 configured for controlling the atomizing unit 2, and a control unit 4 configured for controlling the air supply unit 3 to operate, wherein the switch unit 5 comprises an airflow induction switch or a push switch, and is connected to the control unit 4 and configured for controlling on/off of the atomizing unit 2.

[0021] The operating principle of the electronic atomizer is as follows: when a change of the air pressure in the atomizing unit 2 is sensed (i.e., when a user inhales), the circuit of the atomizing unit 2 is controlled to be closed by means of the push switch or airflow induction switch of the switch unit 5. When the atomizing unit 2 operates, the atomizing liquid will be consumed, the air supply unit 3 supplies and delivers air to the liquid storage unit 1, and with the increase of the air pressure in the liquid storage unit 1, the atomizing liquid in the liquid storage unit 1 will be squeezed out and supplied to the atomizing unit 2. It can be understood that the amount of air supplied by the air supply unit 3 to the liquid storage unit 1 is equivalent to the amount of atomizing liquid supplied by the liquid storage unit 1 to the atomizing unit 2, the supplied atomizing liquid will be consumed by the atomizing unit 2 for atomization, and it is necessary to keep a balance between the amount of atomizing liquid consumption and the amount of atomizing liquid supply of the atomizing unit 2. The amount of air supplied by the air supply unit 3 is related to the air supply rate and operating time (i.e., air supply time) of the air supply unit 3, so the amount of liquid supplied by the liquid storage unit 1 can be determined according to the air supply rate and operating time of the air supply unit 3. The amount of atomizing liquid consumed by the atomizing unit 2 is related to the output power and operating time (i.e., atomizing time) of the atomizing unit 2, the heat generation rate can be determined according to the output power of the atomizing unit 2, and the consumption rate of atomizing liquid can be determined according to the heat generation rate, so the amount of atomizing liquid consumed by the atomizing unit 2 can be converted into the amount of air supplied by the air supply unit 3 under a certain output power; then, a corresponding relation between the operating time ratio of the air supply unit 3 to the atomizing unit 2 and the power of the atomizing unit 2 can be obtained, and the amount of atomizing liquid supplied to the atomizing unit 2 can be controlled by controlling the duty cycle of the air supply unit 3 to keep a balance between the amount of atomizing

liquid consumption and the amount of atomizing liquid supply of the atomizing unit 2, thus avoiding liquid leaking and dry burning of an atomizing core.

[0022] Specifically, as shown in FIG. 1, a liquid supply method comprises the following steps:

S1, the atomizing unit 2 is connected to a circuit, and then an atomization parameter of the atomizing unit 2 is recognized and obtained, wherein the atomization parameter comprises a resistance of the atomizing unit 2.

S2, a real-time power of the atomizing unit 2 is calculated according to the atomization parameter: the real-time power of the atomizing unit 2 is calculated according to the resistance of the atomizing unit 2 detected in real time. Specifically, calculating the real-time power comprises: obtaining the real-time resistance and output voltage of the atomizing unit 2; and calculating the real-time power of the atomizing unit 2 according to a relation of resistance, voltage and power, as well as the resistance of the atomizing unit 2, wherein the relation of resistance, voltage and power of the atomizing unit 2 is $P=U^2/R$ (P is power, U is voltage, and R is resistance). In this way, after the atomizing unit 2 is connected to the circuit, the real-time power of the atomizing unit 2 can be calculated according to the detected resistance and voltage of the atomizing unit 2.

S3, an operating time ratio of the power supply unit 3 to the atomizing unit 2 is determined according to the real-time power calculated in S2.

[0023] Specifically, S3 comprises obtaining a corresponding relation between operating time ratio and power, wherein the corresponding relation between operating time ratio and power is a relation between the operating time ratio of the air supply unit 3 to the atomizing unit 2 and the power of the atomizing unit 2.

[0024] The operating time ratio of the air supply unit 3 to the atomizing unit 2 is determined according to the corresponding relation between operating time ratio and power and the real-time power, wherein the operating time ratio of the air supply unit 3 to the atomizing unit 2 is less than or equal to 1.

[0025] S4, a duty cycle of the air supply unit 3 is determined according to the operating time ratio.

[0026] Specifically, the atomizing time (operating time) of the atomizing unit 2 is obtained, and the duty cycle of the air supply unit 3 is calculated according to the operating time ratio.

[0027] S5, when the switch unit 5 is turned on, the air supply unit 3 is controlled to supply air to the liquid storage unit 1 according to the duty cycle.

[0028] The relation between the operating time ratio of the air supply unit 3 to the atomizing unit 2 and the power of the atomizing unit 2 can be obtained by testing through the following steps: atomizing unit standard samples with different powers are tested to detect atomizing liquid consumption of the atomizing unit 2 within a fixed atomizing time under different powers and is converted into the atomizing liquid consumption rate of the atomizing unit 2; the amount of atomizing liquid squeezed out of the liquid storage unit 1 (i.e., the amount of atomizing liquid supplied to the atomizing unit 2) when the air supply unit supplies air to the liquid storage unit 1 within the fixed operating time is detected by testing, and is converted into the rate of liquid supply to the atomizing unit 2, and the amount of air supplied by the air supply unit 3 (i.e., the amount of atomizing liquid supplied by the liquid storage unit 1) within the fixed time is obtained. The corresponding relation between the power of the atomizing unit 2 and the amount of atomizing liquid consumption can be obtained by testing, the corresponding relation between atomizing liquid supply and atomizing liquid consumption of the air supply unit 3 and the atomizing unit 2 within the same operating time is obtained, and the corresponding relation between the liquid supply rate and the liquid consumption rate of the atomizing unit 2 is also obtained; and finally, the operating time ratio of the air supply unit 3 to the atomizing unit 2 under different powers of the atomizing unit 2 can be determined according to the requirement for keeping a balance between atomizing liquid supply and consumption of the atomizing unit 2 in actual use.

[0029] A data list is drawn according to data obtained by testing, and is prestored in the control unit 4; in practical work, the control unit 4 finds a corresponding operating time ratio from the data list according to the recognized real-time power of the atomizing unit 2 and obtains a desired duty cycle of the air supply unit 3 according to the operating time ratio and the actual operating time of the atomizing unit 2; and when the switch unit 5 is turned on, the air supply unit 3 is controlled to supply air to the liquid storage unit 1 according to the duty cycle. Or, a relation graph of the operating time ratio of the air supply unit 3 to the atomizing unit 2 and the power of the atomizing unit 2 is drawn according to data obtained by testing, wherein the relation graph may be a fitted curve which is pre-stored in the control unit; in practical work, the control unit 4 finds a corresponding operating time ratio from the fitted curve according to the recognized real-time power of the atomizing unit 2 and obtains a desired duty cycle of the air supply unit 3 according to the operating time ratio and the actual operating time of the atomizing unit 2 (the actual vaping time of the user); and when the switch unit 5 is turned on, the air supply unit 3 is controlled to supply air to the liquid storage unit 1 according to the duty cycle. Or, a relation graph of the operating time ratio of the air supply unit 3 to the atomizing unit 2 and corresponding power of the atomizing unit 2 is drawn according to data obtained by testing, wherein the relation graph may be a straight-line

graph or broken-line graph, the straight-line graph may be progressive or stepped, as shown in FIG. 3-FIG. 4, and the straight-line graph or broken-line graph is prestored in the control unit 4; in practical work, the control unit 4 finds a corresponding operating time ratio from the straight-line graph according to the recognized real-time power of the atomizing unit 2 and obtains a desired duty cycle of the air supply unit 3 according to the operating time ratio and the actual operating time of the atomizing unit 2 (the actual vaping time of the user); and when the switch unit 5 is turned on, the air supply unit 3 is controlled to supply air to the liquid storage unit 1 according to the duty cycle. In this way, a balance between atomizing liquid consumption and supply of the atomizing unit 2 is kept, thus solving the problems of liquid leaking and dry burning, and improving the mouth feeling of the user.

[0030] In one specific implementation, 11 atomizing unit standard samples with different resistances were tested under an output voltage of 4.2V, powers of the atomizing unit 2 standard samples were calculated according to the formula $P=U^2/R$, and the atomizing unit 2 standard samples with different powers were installed on electronic atomizers to form multiple electronic atomizers, which were tested as follows: a user took each puff for 2 seconds and then stopped for 8 seconds, the amount of air inhaled by the user in each puff was 35 ml, and the vaping speed was 17.5ml/s; the electronic atomizers were weighed before atomizing liquid consumption (before vaping) and after atomizing liquid consumption (after 100 puffs) to obtain the weight of atomizing liquid consumed by each puff, and by testing, the density of cigarette liquid was 1.14 g/ml, so the volume of liquid consumed by each puff (the amount of atomizing liquid consumption of each puff) was obtained. Specific test data is shown in Table 1:

Table 1 Test data of 11 atomizing unit standard samples with different resistances

Serial number	Resistance of atomizing unit standard samples (Ω)	Power of atomizing unit standard samples (W)	Weight reduction after 100 puffs (g)	Atomizing liquid consumption of each puff (mg)
1	0.45	39.2	1.55	15.5
2	0.5	35.2	1.35	13.5
3	0.6	29.4	1.05	10.5
4	0.8	22	0.88	8.8
5	0.9	19.6	0.81	8.1
6	1.0	17.6	0.77	7.7
7	1.1	16	0.73	7.3
8	1.2	14.7	0.71	7.1
9	1.3	13.5	0.67	6.7
10	1.4	12.6	0.6	6
11	1.5	11.7	0.56	5.6

[0031] A relation graph of the atomizing liquid consumption of the atomizing unit 2 (atomizing liquid consumption of each puff) and the power of the atomizing unit 2 (the atomizing unit 2 standard samples) is drawn according to the above data, as shown in FIG. 3; it can be known by testing that with the increase of the power of the atomizing unit 2, the atomizing liquid consumption will become larger, and the amount of air needing to be supplied to the liquid storage unit 1 by the air supply unit 3 will become larger, so the air supply time of the air supply unit 3 will be longer, and the duty cycle of the air supply unit 3 will be greater.

[0032] By testing, relevant data of the air supply unit 3 was detected, wherein the data included the amount of air supplied by the air supply unit 3 (the amount of supplied atomizing liquid) within a fixed time; a corresponding relation between atomizing liquid supply and atomizing liquid consumption within the same operating time of the air supply unit 3 and the atomizing unit 2 was obtained, and a corresponding relation between the liquid supply rate and the liquid consumption rate of the atomizing unit 2 was also obtained; a relation graph of the operating time ratio of the air supply unit 3 to the atomizing unit 2 and the power of the atomizing unit 2 was drawn according to data obtained by testing, wherein in one specific implementation, the obtained relation graph is shown in FIG. 4; the relation graph was prestored in the control unit 4; after the atomizing unit 2 was connected to a 4.2V circuit, the resistance of the atomizing unit 2 was automatically recognized and was 1.0Ω, the voltage of the atomizing unit 2 was 4.2V, the real-time power of the atomizing unit 2 was 17.6W by recognition and calculation, and the control unit 4 figured out that the operating time ratio corresponding to the real-time power 17.6W was 0.36 according to the relation graph prestored therein; the actual vaping time of a user was 1S, so the duty cycle of the air supply unit 3 was 36%; and when the switch unit 5 was turned on, the

air supply unit 3 was controlled to supply air to the liquid storage unit 1 according to the air duty cycle, that is, the air supply unit 3 was started and stopped highly frequently according to the duty cycle of 36% within the vaping time of 1S of the user, and the proportion of the on-time of a circuit of the air supply unit 3 was 36%.

[0033] In another specific embodiment, the obtained relation graph is shown in FIG. 5; the relation graph was prestored in the control unit 4; after the atomizing unit 2 was connected to a 4.2V circuit, the resistance of the atomizing unit 2 was automatically recognized and was 0.45Ω, the voltage of the atomizing unit 2 was 4.2V, the real-time power of the atomizing unit 2 was 39.2W by recognition and calculation, and the control unit 4 figured out that the operating time ratio corresponding to the real-time power 39.2W was 0.8 according to the relation graph prestored therein; the actual vaping time of a user was 1S, so the duty cycle of the air supply unit 3 was 80%; and when the switch unit 5 was turned on, the air supply unit 3 was controlled to supply air to the liquid storage unit 1 according to the air duty cycle, that is, the air supply unit 3 was started and stopped highly frequently according to the duty cycle of 80% within the vaping time of 1S of the user, and the proportion of the on-time of a circuit of the air supply unit 3 was 80%.

Embodiment 2

[0034] An electronic atomizer, as shown in FIG. 2, comprises a liquid storage unit 1 configured for storing atomizing liquid, an atomizing unit 2 disposed below the liquid storage unit 1, an air supply unit 3 configured for supplying air to the liquid storage unit 1 to change the air pressure in the liquid storage unit so as to supply liquid to the atomizing unit 2, a switch unit 5 configured for controlling the atomizing unit 2, and a control unit 4 configured for controlling the air supply unit 3 to operate, wherein the switch unit 5 comprises an airflow induction switch or a push switch, and is connected to the control unit 4 and configured for controlling on/off of the atomizing unit 2.

[0035] The operating principle of the electronic atomizer is as follows: when a change of the air pressure in the atomizing unit 2 is sensed (when a user smokes), the atomizing unit 2 is controlled to be connected to a circuit by means of the push switch or airflow induction switch of the switch unit 5; when the atomizing unit 2 operates, the atomizing liquid will be consumed, the air supply unit 3 supplies and delivers air to the liquid storage unit 1, and with the increase of the air pressure in the liquid storage unit 1, the atomizing liquid in the liquid storage unit 1 will be squeezed out and supplied to the atomizing unit 2; it can be understood that the amount of air supplied by the air supply unit 3 to the liquid storage unit 1 is equivalent to the amount of atomizing liquid supplied by the liquid storage unit 1 to the atomizing unit 2, the supplied atomizing liquid will be consumed by the atomizing unit 2 for atomization, and it is necessary to keep a balance between atomizing liquid consumption and atomizing liquid supply of the atomizing unit 2; the amount of air supplied by the air supply unit 3 is related to the output power and operating time (air supply time) of the air supply unit 3, so the air generation rate (air supply rate) can be determined according to the output power of the air supply unit 3; the amount of atomizing liquid consumed by the atomizing unit 2 is related to the output power and operating time (atomizing time) of the atomizing unit 2, the heat generation rate can be determined according to the output power of the atomizing unit 2, and the consumption rate of atomizing liquid can be determined according to the heat generation rate, so the amount of atomizing liquid consumed by the atomizing unit 2 can be converted into the amount of air supplied by the air supply unit 3 under the same operating time (the air supply time is equal to the atomizing time); the output power desired by the air supply unit 3 is calculated according to the air supply required, and the amount of atomizing liquid supplied to the atomizing unit 2 can be controlled by controlling the output power of the air supply unit 3 to keep a balance between atomizing liquid consumption and atomizing liquid supply of the atomizing unit 2, thus avoiding liquid leaking and dry burning of an atomizing core.

[0036] Specifically, as shown in FIG. 6, a liquid supply method comprises the following steps:

S 1, the atomizing unit 2 is connected to a circuit, and then an atomization parameter of the atomizing unit 2 is recognized and obtained, wherein the atomization parameter comprises a resistance of the atomizing unit 2.

S2, a real-time power of the atomizing unit 2 is calculated according to the atomization parameter: the real-time power of the atomizing unit 2 is calculated according to the resistance of the atomizing unit 2 detected in real time. Specifically, a relation of real-time resistance, voltage and power of the atomizing unit 2 is obtained; and the real-time power of the atomizing unit 2 is calculated according to the relation of resistance, voltage and power, as well as the resistance of the atomizing unit 2, wherein the relation of resistance, voltage and power of the atomizing unit 2 is $P=U^2/R$ (P is power, U is voltage, and R is resistance). In this way, after the atomizing unit 2 is connected to the circuit, the real-time power of the atomizing unit 2 can be calculated according to the detected resistance and voltage of the atomizing unit 2.

S3, an output power of the air supply unit 3 is determined according to the real-time power calculated in S2.

S4, when the switch unit 5 is turned on, the air supply unit 3 is controlled to supply air to the liquid storage unit 1

according to the output power.

[0037] Further, in S3, a power threshold is obtained; the real-time power of the atomizing unit 2 is compared with the power threshold; and if the real-time power is less than the power threshold, the output power of the air supply unit 3 is set as half-power; or if the real-time power is equal to or greater than the power threshold, the output power of the air supply unit 3 is set as full-power.

[0038] The power threshold can be obtained by testing through the following steps: atomizing standard samples with different powers are tested to detect atomizing liquid consumption of the atomizing unit 2 within a fixed atomizing time under different powers, a corresponding relation between atomizing liquid consumption of the atomizing unit 2 and the power of the atomizing unit 2 is obtained, and the atomizing liquid consumption is in positive relation with the power of the atomizing unit, that is, the atomizing liquid consumption will increase with the increase of the power of the atomizing unit 2 and will decrease with the decrease of the power of the atomizing unit 2; a power threshold can be set according to the corresponding relation, and atomizing liquid consumption corresponding to the power threshold can be found on a curve; the real-time power of the atomizing unit 2 is compared with the power threshold; if the real-time power is less than the power threshold, the output power of the air supply unit 3 is low; or, if the real-time power is greater than the power threshold, the output power of the air supply unit 3 is high.

[0039] The power threshold of the atomizing unit 2 is set as 20W. When the real-time power of the atomizing unit 2 reaches the power threshold, that is, the real-time power of the atomizing unit 2 is greater than or equal to 20W, a small amount of atomizing liquid will be consumed by the atomizing unit 2, and in order to keep a balance between atomizing liquid supply and consumption of the atomizing unit 2, a large amount of atomizing liquid should to be supplied, the output power of the air supply unit 3 should be high to ensure that a large amount of air is supplied by the air supply unit 3 to allow a large amount of liquid to be squeezed out of the liquid storage unit 1; and in this case, the air supply unit 3 needs to operate under full-power to keep a balance between the atomizing liquid supply and consumption of the atomizing unit 2. When the real-time power of the atomizing unit 2 does not reach the power threshold, that is, the real-time power of the atomizing unit 2 is less than 20W, a small amount of atomizing liquid will be consumed by the atomizing unit 2, and in order to keep a balance between atomizing liquid supply and consumption of the atomizing unit 2, a small amount of atomizing liquid should to be supplied, the output power of the air supply unit 3 should be low to ensure that a small amount of air is supplied by the air supply unit 3 to allow a small amount of liquid to be squeezed out of the liquid storage unit 1; and in this case, the air supply unit 3 just needs to operate under half-power to keep a balance between the atomizing liquid supply and consumption of the atomizing unit 2. In this way, the problems of liquid leaking and dry burning are solved, and the mouth feeling of the user is improved.

[0040] In one specific implementation, 11 atomizing unit 2 standard samples with different resistances were tested under an output voltage of 4.2V, powers of the atomizing unit 2 standard samples were calculated according to the formula $P=U^2/R$, and the atomizing unit 2 standard samples with different powers were installed on electronic atomizers to form multiple electronic atomizers, which were tested as follows: a user took each puff for 2 seconds and then stopped for 8 seconds, the amount of air inhaled by the user in each puff was 35 ml, and the vaping speed was 17.5ml/s; the electronic atomizers were weighed before atomizing liquid consumption (before vaping) and after atomizing liquid consumption (after 100 puffs) to obtain the weight of atomizing liquid consumed by each puff, and by testing, the density of cigarette liquid was 1.14 g/ml, so the volume of liquid consumed by each puff (atomizing liquid consumption of each puff) was obtained. Specific test data is shown in Table 2:

Table 2 Test data of 11 atomizing unit standard samples with different resistances

Serial number	Resistance of atomizing unit standard samples (Ω)	Power of atomizing unit standard samples (W)	Weight reduction after 100 puffs (g)	Atomizing liquid consumption of each puff (mg)
1	0.45	39.2	1.55	15.5
2	0.5	35.2	1.35	13.5
3	0.6	29.4	1.05	10.5
4	0.8	22	0.88	8.8
5	0.9	19.6	0.81	8.1
6	1.0	17.6	0.77	7.7
7	1.1	16	0.73	7.3
8	1.2	14.7	0.71	7.1

(continued)

Serial number	Resistance of atomizing unit standard samples (Ω)	Power of atomizing unit standard samples (W)	Weight reduction after 100 puffs (g)	Atomizing liquid consumption of each puff (mg)
9	1.3	13.5	0.67	6.7
10	1.4	12.6	0.6	6
11	1.5	11.7	0.56	5.6

[0041] A relation graph of the atomizing liquid consumption of the atomizing unit 2 (atomizing liquid consumption of each puff) and the power of the atomizing unit 2 (the atomizing unit 2 standard samples) is drawn according to the above data, as shown in FIG. 3. It can be known, from the test results, that with the increase of the power of the atomizing unit 2, the atomizing liquid consumption will become larger and the required output power of the air supply unit 3 will become larger, and that with the decrease of the power of the atomizing unit 2, the atomizing liquid consumption will become smaller and the required output power of the air supply unit 3 will become smaller; and the power threshold is set as 20W according to the relation graph, and is prestored in the control unit 4.

[0042] In one specific implementation, the power threshold was set as 20W and prestored in the control unit 4; after the atomizing unit 2 was connected to a circuit with an output voltage of 4.2V, the resistance of the atomizing unit 2 was automatically recognized and was 1.0Ω, the voltage of the atomizing unit 2 was 4.2V, and by recognition and calculation, the real-time power of the atomizing unit 2 was 17.6W, which was less than 20W, so the control unit 4 determined that the output power of the air supply unit 3 was half-power; and when the switch unit 5 was turned on, the control unit 4 controlled the air supply unit 3 to supply air to the liquid storage unit 1 under half-power.

[0043] In another specific implementation, the power threshold was set as 20W and prestored in the control unit 4; after the atomizing unit 2 was connected to a circuit with an output voltage of 4.2V, the resistance of the atomizing unit 2 was automatically recognized and was 0.45Ω, the voltage of the atomizing unit 2 was 4.2V, and by recognition and calculation, the real-time power of the atomizing unit 2 was39.2W, which was greater than 20W, so the control unit 4 determined that the output power of the air supply unit 3 was full-power; and when the switch unit 5 was turned on, the control unit 4 controlled the air supply unit 3 to supply air to the liquid storage unit 1 under full-power.

Claims

1. A liquid supply method for an electronic atomizer, **characterized in that** the electronic atomizer comprises a liquid storage unit configured for storing atomizing liquid, an atomizing unit disposed below the liquid storage unit, an air supply unit configured for supplying air to the liquid storage unit so as to supply liquid to the atomizing unit, a switch unit configured for controlling the atomizing unit, and a control unit configured for controlling the air supply unit to operate, the liquid supply method comprising:

   S1: obtaining an atomization parameter of the atomizing unit after the atomizing unit is connected to a circuit;
   S2: calculating a real-time power of the atomizing unit according to the atomization parameter;
   S3: determining an operating time ratio of the air supply unit to the atomizing unit according to the real-time power;
   S4: determining a duty cycle of the air supply unit according to the operating time ratio; and
   S5: when the switch unit is turned on, controlling the air supply unit to supply air to the liquid storage unit according to the duty cycle of the air supply unit.

2. The liquid supply method for an electronic atomizer according to Claim 1, **characterized in that** the atomization parameter comprises a resistance of the atomizing unit;
   S2 comprising the following steps:
   calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit.

3. The liquid supply method for an electronic atomizer according to Claim 2, **characterized in that** calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit comprises:

   obtaining a relation of resistance, voltage and power; and
   calculating the real-time power of the atomizing unit according to the relation of resistance, voltage and power, as well as the resistance of the atomizing unit.

4. The liquid supply method for an electronic atomizer according to Claim 1, **characterized in that** S3 comprises:

obtaining a corresponding relation between the operating time ratio and power, wherein the corresponding relation between the operating time ratio and power is a relation between the operating time ratio of the air supply unit to the atomizing unit and the power of the atomizing unit; and
determining the operating time ratio of the air supply unit to the atomizing unit according to the corresponding relation between the operating time ratio and power and the real-time power.

5. The liquid supply method for an electronic atomizer according to Claim 1, **characterized in that** the operating time ratio of the air supply unit to the atomizing unit is less than or equal to 1.

6. The liquid supply method for an electronic atomizer according to any one of Claims 1-5, **characterized in that** the switch unit is connected to the control unit and is configured for controlling on/off of the atomizing unit.

7. The liquid supply method for an electronic atomizer according to Claim 1, **characterized in that** the switch unit comprise an airflow induction switch or a push switch.

8. An electronic atomizer, **characterized in that** the electronic atomizer supplies liquid using the liquid supply method according to any one of Claims 1-7.

9. A liquid supply method for an electronic atomizer, **characterized in that** the electronic atomizer comprises a liquid storage unit configured for storing atomizing liquid, an atomizing unit disposed below the liquid storage unit, an air supply unit configured for supplying air to the liquid storage unit so as to supply liquid to the atomizing unit, a switch unit configured for controlling the atomizing unit, and a control unit configured for controlling the air supply unit to operate, the liquid supply method comprising:

S1: obtaining an atomization parameter of the atomizing unit after the atomizing unit is connected to a circuit;
S2: calculating a real-time power of the atomizing unit according to the atomization parameter;
S3: determining an output power of the air supply unit according to the real-time power; and
S4: when the switch unit is turned on, controlling the air supply unit to supply air to the liquid storage unit according to the output power.

10. The liquid supply method for an electronic atomizer according to Claim 9, **characterized in that** the atomization parameter comprises a resistance of the atomizing unit;
S2 comprising:
calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit.

11. The liquid supply method for an electronic atomizer according to Claim 10, **characterized in that** calculating the real-time power of the atomizing unit according to the resistance of the atomizing unit comprising:

obtaining a relation of resistance, voltage and power; and
calculating the real-time power of the atomizing unit according to the relation of resistance, voltage and power, as well as the resistance of the atomizing unit.

12. The liquid supply method for an electronic atomizer according to Claim 9, **characterized in that** S3 comprises:

obtaining a power threshold;
comparing the real-time power of the atomizing unit with the power threshold; and
if the real-time power is less than the power threshold, setting the output power of the air supply unit as half-power; or
if the real-time power is equal to or greater than the power threshold, setting the output power of the air supply unit as full-power.

13. The liquid supply method for an electronic atomizer according to Claim 12, **characterized in that** the power threshold of the atomizing unit is 20W.

14. The liquid supply method for an electronic atomizer according to any one of Claims 9-13, **characterized in that** the switch unit is connected to the control unit and is configured for controlling on/off of the atomizing unit.

15. The liquid supply method for an electronic atomizer according to Claim 9, **characterized in that** the switch unit comprises an airflow induction switch or a push switch.

16. An electronic atomizer, **characterized in that** the electronic atomizer supplies liquid using the liquid supply method according to any one of Claims 9-15.

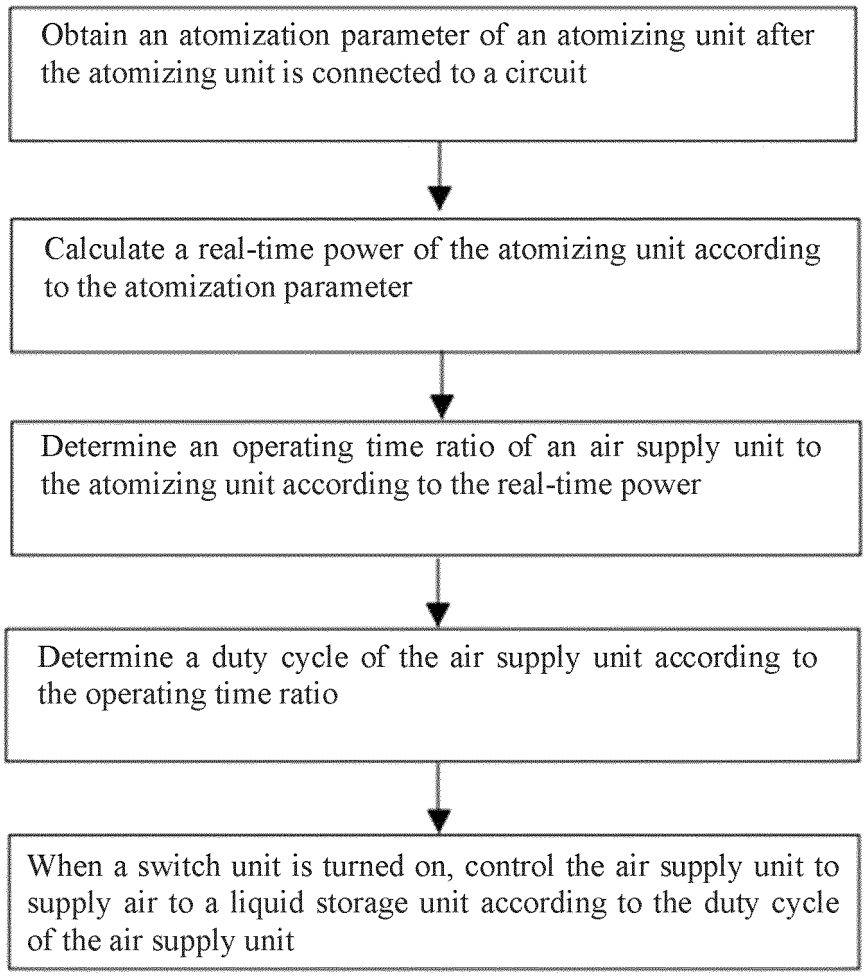
Obtain an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit
Calculate a real-time power of the atomizing unit according to the atomization parameter
Determine an operating time ratio of an air supply unit to the atomizing unit according to the real-time power
Determine a duty cycle of the air supply unit according to the operating time ratio
When a switch unit is turned on, control the air supply unit to supply air to a liquid storage unit according to the duty cycle of the air supply unit

FIG. 1

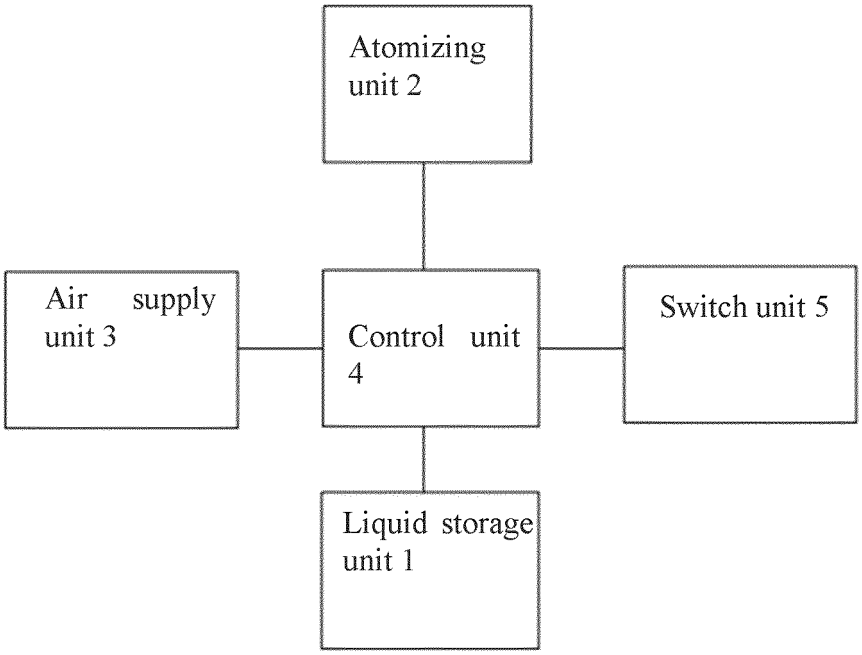
Atomizing unit 2
Air supply unit 3
Control unit 4
Switch unit 5
Liquid storage unit 1

FIG. 2

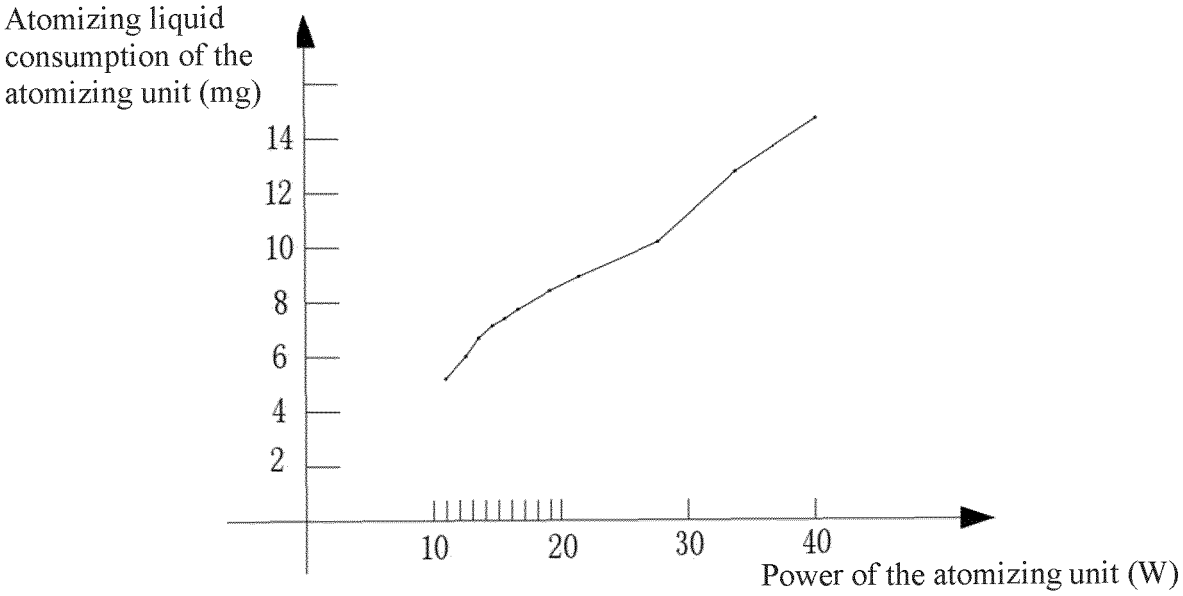
Atomizing liquid consumption of the atomizing unit (mg)
14
12
10
8
6
4
2
10
20
30
40
Power of the atomizing unit (W)

FIG. 3

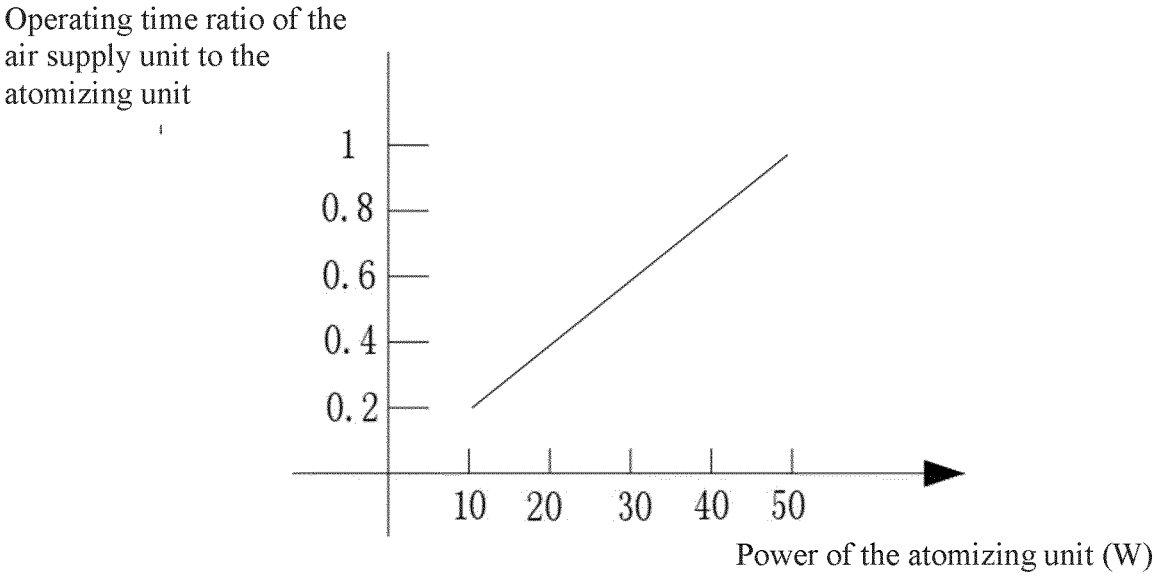
Operating time ratio of the air supply unit to the atomizing unit
1
0.8
0.6
0.4
0.2
10
20
30
40
50
Power of the atomizing unit (W)

FIG. 4

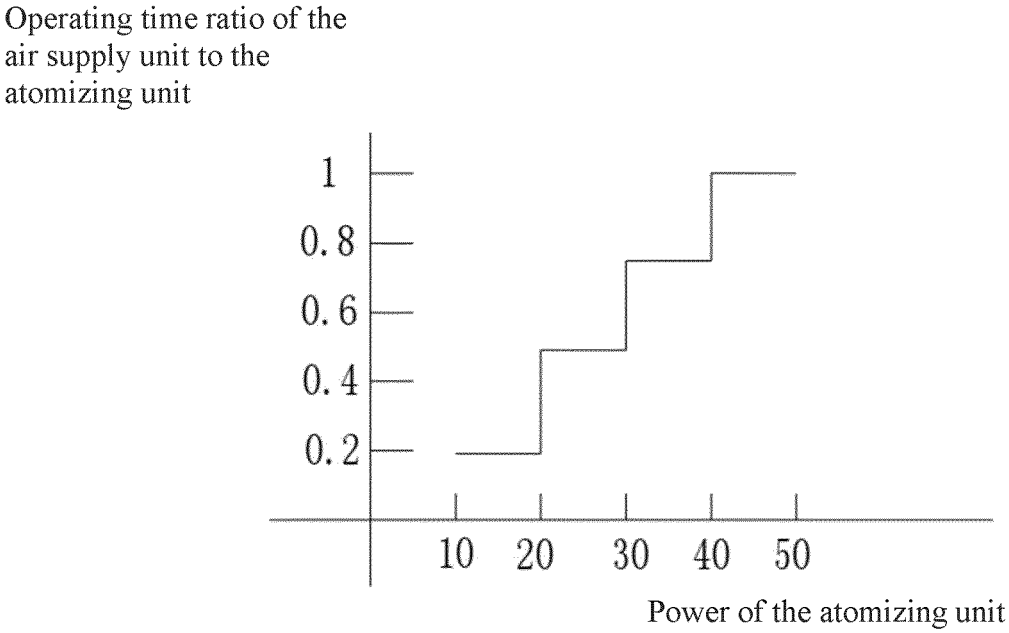
Operating time ratio of the air supply unit to the atomizing unit
1
0.8
0.6
0.4
0.2
10
20
30
40
50
Power of the atomizing unit

FIG. 5

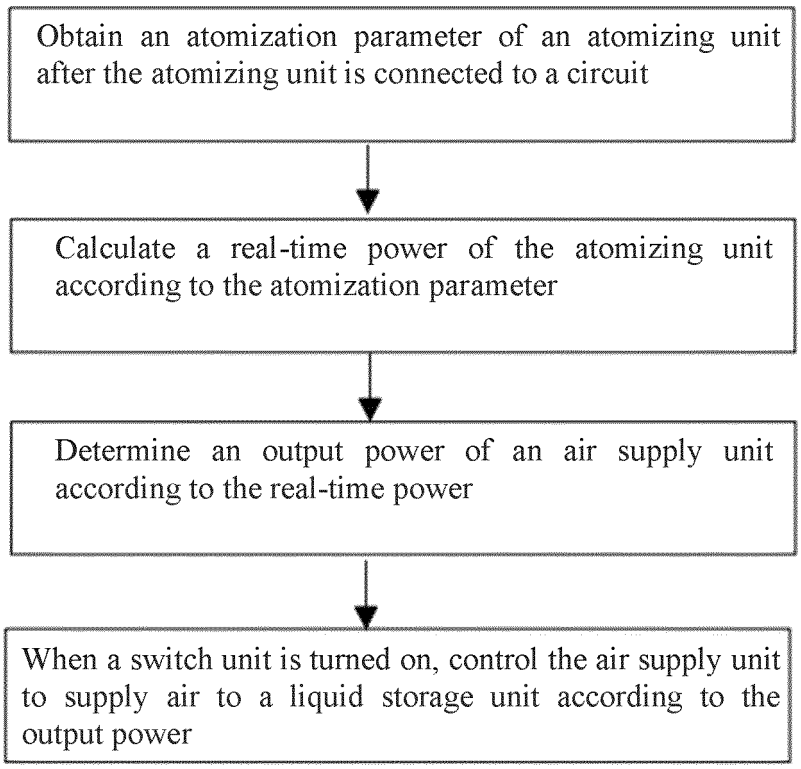
Obtain an atomization parameter of an atomizing unit after the atomizing unit is connected to a circuit
Calculate a real-time power of the atomizing unit according to the atomization parameter
Determine an output power of an air supply unit according to the real-time power
When a switch unit is turned on, control the air supply unit to supply air to a liquid storage unit according to the output power

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/090711

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/10(2020.01)i; A24F 40/40(2020.01)i; A24F 40/50(2020.01)i; A24F 40/51(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 40/-; A24F 47/-;

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

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

CNKI, CNTXT, ENTXTC, VEN, 电子烟, 雾化, 加热, 供液, 供气, 储液, 控制, 时长, 功率, 电阻, electronic, electrical, cigar+, smoking, tobacco, atomiz+, heat+, liquid supply, gas supply, liquid storage, reservoir, control+, time, power, resistance

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 113841928 A (SHENZHEN XUEWU TECHNOLOGY CO., LTD.) 28 December 2021 (2021-12-28) entire document	1-16
A	CN 112120291 A (SHENZHEN SMOORE TECHNOLOGY LTD.) 25 December 2020 (2020-12-25) entire document	1-16
A	CN 110326820 A (SHENZHEN WOODY VAPES TECHNOLOGY CO., LTD.) 15 October 2019 (2019-10-15) entire document	1-16
A	CN 110839966 A (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 28 February 2020 (2020-02-28) entire document	1-16
A	CN 107898008 A (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 13 April 2018 (2018-04-13) entire document	1-16

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

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 December 2022	**03 January 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/090711

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 113439873 A (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 28 September 2021 (2021-09-28) entire document	1-16
A	WO 2019218893 A1 (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 21 November 2019 (2019-11-21) entire document	1-16
A	WO 2021170148 A1 (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 02 September 2021 (2021-09-02) entire document	1-16

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/090711

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	113841928	A	28 December 2021	None			
CN	112120291	A	25 December 2020	CN	214431787	U	22 October 2021
CN	110326820	A	15 October 2019	CN	110326820	B	21 April 2020
CN	110839966	A	28 February 2020	CN	110839966	B	05 April 2022
				WO	2021109609	A1	10 June 2021
CN	107898008	A	13 April 2018	CN	107898008	A	13 April 2018
CN	113439873	A	28 September 2021	WO	2021190318	A1	30 September 2021
WO	2019218893	A1	21 November 2019	CN	110495638	A	26 November 2019
				CN	110495638	B	28 September 2021
WO	2021170148	A1	02 September 2021	CN	113367389	A	10 September 2021

Form PCT/ISA/210 (patent family annex) (January 2015)