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(54) **ELECTRONIC ATOMIZING DEVICE, POWER SUPPLY MECHANISM, AND RECOGNITION METHOD FOR ATOMIZER**

(57) This application provides an electronic vaporization device, a power supply mechanism, and a method for identifying a vaporizer. The electronic vaporization device includes a vaporizer configured to vaporize a liquid substrate to generate an aerosol, and a power supply mechanism configured to supply power to the vaporizer. The vaporizer includes a heating element configured to heat and vaporize the liquid substrate. The power supply mechanism includes: a core, configured to supply power to the heating element; and a controller, configured to identify the vaporizer based on electric power provided by the core to the heating element and a resistance change generated by the heating element. Through the electronic vaporization device, the vaporizer can be automatically identified by detecting the resistance change of the heating element under electric power.

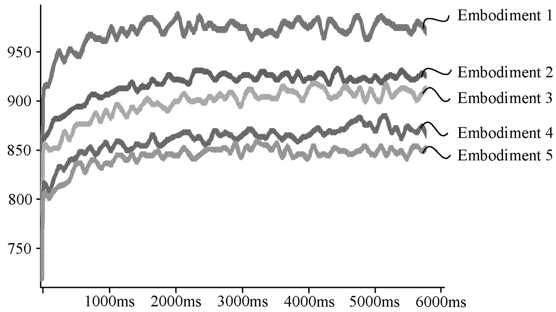

FIG. 8

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202110284535.6, filed with the China National Intellectual Property Administration on March 16, 2021 and entitled "ELECTRONIC VAPORIZATION DEVICE, POWER SUPPLY MECHANISM, AND METHOD FOR IDENTIFYING VAPORIZER", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this application relate to the field of electronic vaporization technologies, and in particular, to an electronic vaporization device, a power supply mechanism, and a method for identifying a vaporizer.

BACKGROUND

[0003] Tobacco products (such as cigarettes, cigars, and the like) burn tobacco during use to produce tobacco smoke. Attempts are made to replace these tobacco-burning products by manufacturing products that release compounds without burning tobacco.

[0004] An example of this type of products is an electronic vaporization product, which vaporize a liquid substrate by heating to produce an inhalable vapor or aerosol. The liquid substrate may contain nicotine, and/or aromatics, and/or aerosol-generation substances (such as glycerin). Such frequently used electronic vaporization product is a modular construction and usually includes a replaceable vaporizer. The replaceable vaporizer has a storage component configured to accommodate the liquid substrate. The liquid substrate stored in the vaporizer may vary significantly in composition, taste, concentration, or another property, and consumers may wish to interchange the vaporizer at will. However, an optimal vaporization condition may depend on composition of the liquid substrate stored in the vaporizer. Therefore, it is desirable to include an automatic identification device in the vaporizer that can identify the replaceable vaporizer or the liquid substrate stored therein, to automatically change control settings for a vaporization device accordingly.

SUMMARY

[0005] An embodiment of this application provides an electronic vaporization device, including a vaporizer configured to vaporize a liquid substrate to generate an aerosol, and a power supply mechanism configured to supply power to the vaporizer. The vaporizer includes a heating element configured to heat and vaporize the liquid substrate. The power supply mechanism includes:

a core, configured to supply power to the heating element; and
a controller, configured to identify the vaporizer based on electric power provided by the core to the heating element and a resistance change generated by the heating element.

[0006] In a preferred embodiment, the controller is configured to:

determine a TCR value of the heating element based on electric power provided by the core to the heating element and a resistance change generated by the heating element; and identify the vaporizer based on the TCR value of the heating element.

[0007] In a preferred embodiment, the resistance change includes a change curve of a resistance of the heating element with time.

[0008] In a preferred implementation, the resistance change includes a resistance change rate of the heating element.

[0009] In a preferred implementation, the resistance change includes a resistance value when the resistance of the heating element rises to be substantially constant, or a difference between the resistance value and an initial resistance value.

[0010] In a preferred embodiment, the controller is configured to:
compare the resistance change of the heating element with a threshold range and change the electric power provided by the core to the heating element based on a comparison result.

[0011] In a preferred embodiment, the controller is configured to:
compare a resistance change rate of the heating element or a resistance variation within a preset time with a threshold range, and prevent the core from supplying power to the heating element when the resistance change rate or the

resistance variation is greater than a maximum value of the threshold range or less than a minimum value of the preset threshold range.

[0012] In a preferred embodiment, the controller is configured to:

raise a resistance of the heating element to a substantially constant resistance value or compare a difference between the resistance value and an initial resistance value with a threshold range, and prevent the core from supplying power to the heating element when the resistance value or the difference is greater than a maximum value of the threshold range or less than a minimum value of the preset threshold range.

[0013] In a preferred embodiment, the core is configured to provide predetermined electric power to the heating element.

[0014] In a preferred embodiment, the core is configured to supply power to the heating element in a manner of constant power output.

[0015] Another embodiment of this application further provides a power supply mechanism, configured to supply power to a vaporizer of an electronic vaporization device, where the vaporizer includes a heating element configured to heat and vaporize a liquid substrate to generate an aerosol; the power supply mechanism includes:

a core, configured to supply power to the heating element; and
a controller, configured to identify the vaporizer based on electric power provided by the core to the heating element and a resistance change generated by the heating element.

[0016] Another embodiment of this application further provides a method for identifying a vaporizer, where the vaporizer includes a heating element configured to heat and vaporize a liquid substrate to generate an aerosol; and the method includes following steps of:

supplying power to the heating element, and identifying the vaporizer based on an electric power provided to the heating element and a resistance change generated by the heating element.

[0017] Through the electronic vaporization device, the vaporizer can be automatically identified by detecting the resistance change of the heating element under electric power.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] One or more embodiments are exemplarily described with reference to the corresponding figures in the accompanying drawings, and the descriptions are not to be construed as limiting the embodiments. Elements in the accompanying drawings that have same reference numerals are represented as similar elements, and unless otherwise particularly stated, the figures in the accompanying drawings are not drawn to scale.

FIG. 1 is a schematic structural diagram of an electronic vaporization device according to an embodiment of this application.
FIG. 2 is a schematic cross-sectional view of an embodiment of a vaporizer in FIG. 1.
FIG. 3 is a schematic structural diagram of a porous body in FIG. 2 from a perspective.
FIG. 4 is a schematic structural diagram of a porous body in FIG. 2 from another perspective;
FIG. 5 is a schematic cross-sectional view of another embodiment of a vaporizer in FIG. 1.
FIG. 6 is a schematic diagram of a resistance detection circuit according to an embodiment.
FIG. 7 is a curve showing a resistance change of a heating element of a vaporizer during continuous inhalation representing that a user inhales once according to an embodiment.
FIG. 8 is a curve showing a resistance change of heating elements of a plurality of vaporizers during continuous inhalation representing that a user inhales once according to an embodiment.
FIG. 9 is a schematic diagram of a resistance change rate of heating elements within a predetermined time of a plurality of vaporizers in FIG. 8.

DETAILED DESCRIPTION

[0019] For ease of understanding of this application, this application is described below in more detail with reference to the accompanying drawings and specific implementations.

[0020] This application provides an electronic vaporization device. Referring to FIG. 1, the electronic vaporization device includes: a vaporizer 100, configured to store a liquid substrate and vaporize the liquid substrate to generate an aerosol; and a power supply mechanism 200, configured to supply power to the vaporizer 100.

[0021] In an optional implementation, for example, as shown in FIG. 1, the power supply mechanism 200 includes a receiving cavity 270, arranged at an end in a length direction and configured to receive and accommodate at least a part of the vaporizer 100; and a first electrical contact 230, at least partially exposed on a surface of the receiving cavity 270, and configured to be electrically connected to the vaporizer 100 to supply power to the vaporizer 100 when at least a part of the vaporizer 100 is received and accommodated in the power supply mechanism 200.

[0022] According to a preferred implementation shown in FIG. 1, a second electrical contact 21 is arranged on an end portion of the vaporizer 100 opposite to the power supply mechanism 200 in the length direction, so that when the at least a part of the vaporizer 100 is received in the receiving cavity 270, the second electrical contact 21 is in contact with and abuts against the first electrical contact 230 to form an electrical connection.

[0023] A seal member 260 is arranged in the power supply mechanism 200, and at least a part of an internal space of the power supply mechanism 200 is separated by the seal member 260 to form the receiving cavity 270. In the preferred implementation shown in FIG. 1, the seal member 260 is configured to extend along a cross section direction of the power supply mechanism 200, and is preferably prepared by a flexible material such as silica gel, so as to prevent the liquid substrate seeping from the vaporizer 100 to the receiving cavity 270 from flowing to a controller 220, a sensor 250, and another component inside the power supply mechanism 200.

[0024] In the preferred implementation shown in FIG. 1, the power supply mechanism 200 further includes a core 210, configured to supply power and facing away from the receiving cavity 270 along a length direction; and a controller 220, arranged between the core 210 and an accommodating cavity, where the controller 220 operably guiding a current between the core 210 and the first electrical contact 230.

[0025] The power supply mechanism 200 includes the sensor 250, which is configured to sense an inhalation flow generated by the vaporizer 100 during inhalation, so that the controller 220 controls the core 210 to output the current to the vaporizer 100 based on a detection signal of the sensor 250.

[0026] Further, in the preferred implementation shown in FIG. 1, a charging interface 240 is arranged on another end of the power supply mechanism 200 facing away from the receiving cavity 270, and is configured to supply power to the core 210.

[0027] Embodiments in FIG. 2 to FIG. 4 are schematic structural diagrams of an embodiment of the vaporizer 100 in FIG. 1, which includes a main housing 10, a porous body 30, and a heating element 40.

[0028] As shown in FIG. 2, the main housing 10 is substantially in a flat cylindrical shape, and certainly, a hollow interior of the main housing is a necessary functional device configured to store and vaporize the liquid substrate. A suction nozzle A configured to inhale an aerosol is arranged on an upper end of the main housing 10.

[0029] A liquid storage cavity 12 configured to store the liquid substrate is arranged on an interior of the main housing 10. In a specific embodiment, a vapor-gas transmission pipe 11 in an axial direction is arranged inside the main housing 10, and the liquid storage cavity 12 configured to store the liquid substrate is formed in a space between an outer wall of the vapor-gas transmission pipe 11 and an inner wall of the main housing 10. An upper end of the vapor-gas transmission pipe 11 opposite a proximal end 110 is in communication with the suction nozzle port A.

[0030] The porous body 30 is configured to obtain the liquid substrate in the liquid storage cavity 12 through a liquid channel 13, and the liquid substrate is transmitted as indicated by arrow R1 in FIG. 2. The porous body 30 includes a flat vaporization surface 310. The vaporization surface 310 is formed with the heating element 40 that heats at least part of the liquid substrate absorbed by the porous body 30 to generate the aerosol.

[0031] Specifically, referring to FIG. 3 and FIG. 4, a side of the porous body 30 facing away from the vaporization surface 310 is in fluid communication with the liquid channel 13 to absorb the liquid substrate, and then transfer the liquid substrate to the vaporization surface 310 to heat and vaporize.

[0032] After assembly, two ends of the heating element 40 abut against the second electrical contact 21 to conduct electricity, and the heating element 40 heats at least part of the liquid substrate of the porous body 30 to generate the aerosol during electrification. In an optional implementation, the porous body 30 includes flexible fibers, such as cotton fibers, non-woven fabrics, glass fiber ropes, or includes porous ceramics with a microporous structure, such as porous ceramics in shapes shown in FIG. 3 and FIG. 4, and the specific structures can be found in patent CNCN212590248U.

[0033] The heating element 40 may be combined onto the vaporization surface 310 of the porous body 30 through printing, deposition, sintering, physical assembly, or the like. In some other variant embodiments, the porous body 30 may have a flat or curved surface for supporting the heating element 40, and the heating element 40 is formed on the flat or curved surface of the porous body 30 through mounting, printing, deposition, and the like.

[0034] The heating element 40 is made of a metal material with an appropriate impedance, a metal alloy, graphite, carbon, conductive ceramic, or another composite material of a ceramic material and a metal material. A suitable metal or alloy material includes at least one of nickel, cobalt, zirconium, titanium, nickel alloy, cobalt alloy, zirconium alloy, titanium alloy, nickel-chromium alloy, nickel-iron alloy, iron-chromium alloy, iron-chromium-aluminum alloy, titanium alloy, iron-manganese-aluminum based alloy, or stainless steel. The resistive material of the heating element 40 can select a metal or alloy material having a suitable resistance temperature coefficient, such as a positive temperature coefficient or a negative temperature coefficient, so that a heating circuit can be configured to generate heat and can be configured as a sensor for sensing real-time temperature of a vaporization component.

[0035] FIG. 5 shows a schematic structural diagram of a vaporizer 100a according to another embodiment. The porous body 30a is configured in a shape of a hollow columnar extending in a longitudinal direction of the vaporizer 100a, and the heating element 40a is formed in a columnar hollow of the porous body 30a. In use, as represented by arrow R1, the liquid substrate of the liquid storage cavity 20a is absorbed along an outer surface of the porous body 30a in a radial direction, and then transmitted to the heating element 40a on an inner surface to heat and vaporize to generate an aerosol; and the generated aerosol is outputted from the columnar hollow of the porous body 30a along a longitudinal direction of the vaporizer 100a.

[0036] In order to distinguish whether the replaced vaporizer 100/100a is an adaptive type, the resistance change of the heating element 40/40a in operation is detected by the controller 220 in an embodiment of this application, to identify and determine the vaporizer 100/100a.

[0037] Generally, different vaporizers 100/100a have heating elements 40/40a with different materials or models. Therefore, during heating, due to different initial resistance values and the respective material TCR (temperature coefficient of resistance), the resistance changes during heating are significantly different. In this way, the vaporizer 100/100a can be identified and determined based on the resistance change.

[0038] Further, in order to enable the power supply mechanism 200 to detect the resistance change of the heating element 40/40a in real time, the power supply mechanism 200 further includes a resistance detection circuit for detecting the resistance value of the heating element 40/40a. A structure of the resistance detection circuit in a conventional embodiment is shown in FIG. 6, including:
a standard resistor R1, configured to construct a voltage dividing circuit connected in series with the connected heating element 40/40a, where the voltage dividing circuit connected in series is turned on and grounded by a switch tube Q1 to form a circuit. In this case, the controller 220 may calculate the resistance value of the heating element 40/40a by sampling a voltage to ground Vabc of the standard resistor R1 and then through a formula of a partial pressure.

[0039] Certainly, other resistors R2, R3, and R4 in the circuit shown in FIG. 6 are normal basic conventional functions such as voltage reduction and current limiting.

[0040] In another variant embodiment, the resistance detection circuit may further use a constant current source. When the vaporizer 100/100a is coupled to the power supply mechanism 200 to couple the heating element 40/40a to the circuit, the constant current source provides a constant current detection current to the heating elements 40/40a. The controller 220 samples the voltage of the heating element 40/40a at the constant current through a sampling pin, and then obtains the resistance value of the heating element 40/40a after calculation.

[0041] For example, FIG. 7 shows a curve showing a resistance change of a heating element 40 of a vaporizer 100 during continuous inhalation representing that a user inhales once according to an embodiment. According to the test curve, each unit of the time axis is 60 ms, and the total detected data sampling time is 60×60 = 3600 ms = 3.6 s. During the test, an initial resistance value of the heating element 40 is 1.1 ohms, and the power output of the power supply mechanism 200 to the heating element 40 is constant at 10 W (generally, the output voltage of the core 210 in the electronic vaporization device in the art is 3.5 V after being fully charged. Combined with an actual output effective voltage of about 3.2 V and a heat loss, setting the output power to be constant at 10 W is the most commonly used constant power output value). In the curve of FIG. 7, the resistance value change of the heating element 40 includes three stages.

[0042] S1 first stage: It is an initial heating stage. The heating element 40 starts to heat up rapidly from a room temperature, and at the same time, the temperature has not been raised above a boiling point of the liquid substrate; and most of the heat at this stage is absorbed by the heating element 40, and correspondingly, the resistance value of the heating element 40 also increases rapidly due to the TCR.

[0043] S2 second stage: During this stage, the heating element 40 continues to heat up, and part of the heat of the heating element 40 is absorbed by a low-boiling component (such as propylene glycol, and a flavor component) in the liquid substrate to form the aerosol. In this stage, a resistance raising efficiency of the heating element 40 gradually decreases.

[0044] S3 third stage: In this stage, since the temperature of the heating element 40 rises to the temperature at which the liquid substrate is vaporized in large quantities, the heating efficiency of the heating element 40 is balanced with a vaporization efficiency of the liquid substrate; and in this stage, the resistance value of the heating element 40 is substantially constant and fluctuates in a generally small range until an end of the inhalation.

[0045] In the above changes in the actual resistance detected in conjunction with specific embodiments, a significant increase in resistance can be expressed as the resistance variation per unit time (that is, a slope of a tangent of the curve) or the increase in the resistance value beyond a certain reference threshold, that is, the resistance is considered to have risen significantly.

[0046] In order to identify and distinguish different vaporizers 100, the following show the sampling results of the resistance value of the heating element 40 in the power supply test performed by the power supply mechanism 200 to five different vaporizers 100 at a constant power of 7 W, respectively. Certainly, to eliminate an error of a single sampling of the sampling detection result of the vaporizer 100 of each embodiment, the sampling of the vaporizer 100 in each embodiment is performed in two repetitions, which are denoted as "sample 1" and "sample 2" respectively. The specific sampling results are as follows, and the sampling results of each embodiment in the following table are averaged, and the resistance change curve with time is obtained by fitting as shown in FIG. 8.

Table 1

Sampling time/ms	Sampling resistance value/mΩ									
	Embodiment 1		Embodiment 2		Embodiment 3		Embodiment 4		Embodiment 5	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
0	752	758	757	760	750	754	717	724	710	713
20	916	911	860	859	856	851	814	830	801	810
80	912	919	870	869	852	859	806	821	798	816
140	913	929	884	882	853	868	821	839	806	824
200	915	928	885	889	855	867	834	848	810	827
260	933	933	888	889	872	872	831	844	813	836
320	923	933	893	895	863	872	841	849	817	836
380	938	942	897	897	877	880	842	858	832	831
440	942	945	898	895	880	883	850	852	836	842
500	941	941	900	912	879	879	849	846	826	843
560	943	956	910	907	881	893	855	853	837	839
620	954	950	911	914	892	888	847	848	838	844
680	945	945	907	907	883	883	854	865	830	847
740	957	950	911	917	894	888	860	863	836	847
800	949	959	912	915	887	896	852	860	834	848
860	964	964	916	918	901	901	861	864	843	844
920	959	954	918	918	896	892	860	870	844	845
980	950	956	917	916	888	893	852	860	838	855
1040	961	963	924	920	898	900	853	869	845	842
1100	956	957	915	929	893	894	859	868	837	842
1160	963	962	920	929	900	899	856	877	846	843
1220	970	967	919	921	907	904	858	864	843	852
1280	964	972	927	931	901	908	869	869	844	846

(continued)

Sampling time/ms	Sampling resistance value/mΩ									
	Embodiment 1		Embodiment 2		Embodiment 3		Embodiment 4		Embodiment 5	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
1340	965	970	922	923	902	907	858	869	848	852
1400	961	974	923	927	898	910	859	868	841	858
1460	958	961	932	925	895	898	864	876	846	857
1520	966	969	928	924	903	906	866	871	844	858
1580	968	974	928	924	905	910	869	881	844	852
1640	977	979	926	932	913	915	871	877	852	855
1700	969	976	923	923	906	912	872	880	845	852
1760	968	972	936	934	905	908	864	872	840	850
1820	969	974	938	923	906	910	867	883	844	852
1880	966	980	936	929	903	916	859	884	848	854
1940	974	975	934	927	910	911	862	873	851	849
2000	969	967	927	927	906	904	874	876	850	846
2060	976	968	933	931	912	905	868	866	850	844
2120	972	979	934	930	908	915	871	877	852	848
2180	979	968	931	931	915	905	869	868	847	850
2240	972	978	926	923	908	914	864	872	857	853
2300	962	984	930	925	899	920	867	878	842	858
2360	978	984	933	935	914	920	872	864	853	846
2420	981	973	930	929	917	909	875	874	850	851
2480	973	977	927	925	909	913	868	873	858	846
2540	973	980	936	929	909	916	867	873	856	847
2600	974	970	933	937	910	907	866	867	855	849
2660	972	980	932	935	908	916	874	874	850	845

(continued)

Sampling time/ms	Sampling resistance value/mΩ									
	Embodiment 1		Embodiment 2		Embodiment 3		Embodiment 4		Embodiment 5	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
2720	972	973	927	929	908	909	869	871	857	843
2780	985	975	932	929	921	911	864	876	842	852
2840	980	969	934	933	916	906	869	871	853	855
2900	980	979	926	932	916	915	866	879	842	843
2960	976	976	935	935	912	912	862	877	845	846
3020	969	977	926	931	906	913	866	873	845	852
3080	982	977	929	926	918	913	868	877	841	841
3140	989	966	928	934	924	903	873	868	854	850
3200	987	980	934	926	922	916	876	870	844	849
3260	984	968	932	934	920	905	869	869	845	853
3320	973	972	922	926	909	908	873	879	844	850
3380	973	976	935	929	909	912	871	879	852	855
3440	976	967	938	931	912	904	874	865	849	849
3500	985	979	924	933	921	915	875	877	848	841
3560	980	975	929	936	916	911	882	873	845	850
3620	975	978	925	928	911	914	884	871	847	844
3680	983	970	928	925	919	907	888	872	849	848
3740	968	980	929	930	905	916	880	869	854	848
3800	982	978	925	929	918	914	881	878	846	844
3860	970	970	931	932	907	907	873	870	845	845
3920	969	980	924	926	906	916	887	880	854	853
3980	988	982	929	927	923	918	889	873	844	848
4040	974	974	932	928	910	910	872	878	852	844

(continued)

Sampling time/ms	Sampling resistance value/mΩ									
	Embodiment 1		Embodiment 2		Embodiment 3		Embodiment 4		Embodiment 5	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
4100	978	985	929	933	914	921	877	867	846	847
4160	983	973	937	930	919	909	865	878	848	849
4220	981	972	931	924	917	908	878	868	841	847
4280	979	979	927	932	915	915	874	869	852	846
4340	969	972	929	936	906	908	872	874	854	843
4400	978	980	934	928	914	916	878	875	848	856
4460	983	980	930	928	919	916	867	872	852	844
4520	975	972	924	934	911	908	874	869	842	843
4580	968	976	937	934	905	912	871	878	845	847
4640	976	970	938	936	912	907	874	871	853	847
4700	982	980	937	923	918	916	864	875	843	855
4760	978	973	925	932	914	909	878	875	853	848
4820	975	973	927	929	911	909	869	874	851	841
4880	970	978	937	929	907	914	877	871	847	855
4940	967	970	924	928	904	907	871	869	852	849
5000	972	966	927	921	908	903	869	875	849	846
5060	972	981	931	925	908	917	866	868	848	848
5120	979	972	927	930	915	908	878	867	845	851
5180	976	979	931	930	912	915	869	863	854	860
5240	967	969	930	925	904	906	871	865	842	856
5300	974	979	935	934	910	915	872	875	845	851
5360	980	972	929	924	916	908	880	876	851	856
5420	984	972	933	933	920	908	873	879	849	846

(continued)

Sampling time/ms	Sampling resistance value/mΩ									
	Embodiment 1		Embodiment 2		Embodiment 3		Embodiment 4		Embodiment 5	
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2
5480	972	985	936	936	908	921	881	879	851	857
5540	972	973	927	935	908	909	871	871	851	856
5600	972	984	936	931	908	920	877	878	847	849

[0047] As can be seen from Table 1 and FIG. 8 above, the difference between the two replicates of the vaporizer 100 and the "sample 1" and "sample 2" in each embodiment is less than 1% of the sampled data, and the sampling error can be considered to meet the requirements. If the data is required to have high accuracy, more sampling times can be added, and then it is desirable to combine the above "sample 1" and "sample 2" data to take the average value as the detection result.

[0048] Further, according to Table 1 above, an average initial resistance value of the heating element 40 of the vaporizer 100 of Embodiment 1 is 0.75 mQ, an average initial resistance value of the heating element 40 of the vaporizer 100 of Embodiment 2 is 0.75 mQ, an average initial resistance value of the heating element 40 of the vaporizer 100 in Embodiment 3 is 0.75 mΩ, an average initial resistance value of the heating element 40 of the vaporizer 100 in Embodiment 4 is 0.71 mQ, and an average initial resistance value of the heating element 40 of the vaporizer 100 in Embodiment 5 is 0.71 mQ. The initial values of the heating element 40 in Embodiment 1 to Embodiment 3 are basically the same; and the initial values of the heating elements 40 of Embodiment 4 and Embodiment 5 are basically the same.

[0049] Further, the material of the heating element 40 of the vaporizer 100 in Embodiment 1 is prepared by FeSi15 (FeSi alloy containing Si15%) with the TCR value of 1443 ppm; the material of the heating element 40 of the vaporizer 100 in Embodiment 2 is prepared by FeSi 10 with the TCR value of 1245 ppm; the material of the heating element 40 of the vaporizer 100 in Embodiment 3 is prepared by a stainless steel 304 with the TCR value of 1038 ppm; the material of the heating element 40 of the vaporizer 100 in Embodiment 4 is prepared by a stainless steel 317L with the TCR value of 956 ppm; and the material of the heating element 40 of the vaporizer 100 in Embodiment 5 is prepared by NiCr30Si1.45 alloy with a TCR value of 890 ppm.

[0050] FIG. 8 shows the resistance value-time curve of the samples from Embodiment 1 to Embodiment 5. As can be clearly seen from FIG. 8, the vaporizer 100 in each embodiment has different TCR values for the heating elements 40 in the inhalation test, so that in the process of vaporizing the liquid substrate to generate the aerosol in the constant power output mode normally used in the art, the resistance varies differentially. As a result, the above resistance value-time curve or the rate of the resistance value can be used for identifying and distinguishing different vaporizers 100.

[0051] Further, during testing the vaporizer 100 in each embodiment, the electric power supplied to the electric power by the core 210 is predetermined; and at the same time, in order to ensure that the detection results are not affected due to the different electric power supplied, the predetermined electric power supplied to the vaporizers is the same.

[0052] Further, the controller 220 stores a threshold range that is most adaptive for the resistance change of the heating element 40 in the vaporizer 100; and the sampled value of the resistance change obtained by sampling is compared with the stored threshold range based on the detection process, and it can be identified and determined whether the currently replaced vaporizer 100 is the most suitable vaporizer 100 by the comparison result. At the same time, when the above comparison results are inconsistent, the controller 220 prevents the core 210 from providing power to the vaporizer 100.

[0053] Further, in a preferred embodiment, the controller 220 can further calculate and obtain the TCR value of the heating element 40 based on the resistance change of the heating element 40 during operation, and then identify and determine whether the currently replaced vaporizer 100 is a suitable or adaptive vaporizer 100 based on the TCR value.

[0054] Further, according to the sampling data of FIG. 8 and the table above, it can be seen that for different vaporizers 100 at constant power, the resistance value of the heating element 40 is raised to be substantially constant, and/or the difference between the resistance value and the initial resistance value when the heating element 40 is raised to be substantially constant is different, which is caused by different TCRs. Further, in another embodiment, the controller 220 may identify and distinguish different vaporizers 100 based on the resistance value and/or the rise amplitude or difference when the heating element 40 is raised to substantially constant.

[0055] Further, as can be seen from the sampling data in FIG. 8 and the table above, at constant power for different vaporizers 100, the resistance change rate is also different due to the different TCRs, and the resistance change rate of the heating element 40 within a predetermined time is different. As a result, the controller 220 can identify and distinguish different vaporizers 100 according to the resistance change rate of the heating element 40 during a predetermined time. For example, FIG. 9 shows a schematic diagram of identifying a vaporizer 100 by a period of time from 0 ms to 2000 ms at a predetermined time. According to FIG. 9, the resistance change curves corresponding to the vaporizer 100 of different embodiments during this time period correspond to those shown in L1 to L5, respectively. In addition, slopes of the resistance change curve L1 to L5 of the vaporizer 100 in different embodiments when being raised from the initial value to basically stable are significantly different, and then different vaporizers 100 can be identified and distinguished by calculating the slopes.

[0056] In another optional embodiment, the above predetermined time may also select another time period such as 500 ms to 1600 ms, 300 ms to 1200 ms, and the like.

[0057] Based on the above, another embodiment of this application further a method for identifying and distinguishing different vaporizers 100, which includes the following steps.

[0058] S 10: Determine, based on a relationship between the power supplied to the heating element 40 of the vaporizer 100 and a resulting change in the resistance value of the heating element 40, information of the vaporizer 100.

[0059] In the process of providing the above power, according to the conventional embodiments of the products in the art, in a more preferred embodiment, the power is supplied to the heating element 40 in a constant power output manner. In a more preferred embodiment, the power provided to the vaporizer 100 in the process of identifying and distinguishing different vaporizers 100 above is the same as the output power set by the power supply mechanism 200 during the inhalation process, such as a constant power of 7 W or 10 W as described above.

[0060] Further, in a preferred embodiment, the detection method and step as described above are performed during a first puff after the user connects the vaporizer 100 to the power supply mechanism 200, which avoids a case in which the step as described above is automatically performed during a non-puffing process to supply power to the vaporizer 100 so that smoke generated is not inhaled by the user.

[0061] Further, the resistance temperature coefficient of the heating element 40 is determined based on the relationship between the power supplied to the heating element 40 of the vaporizer 100 and the resulting change in the resistance value of the heating element 40, the temperature coefficient of the resistance value is compared with the stored threshold range, and the vaporizer 100 is determined based on the comparison result.

[0062] The content of Identifying and distinguishing the vaporizer 100 includes: a liquid substrate type, a heating mode, an anti-counterfeiting information, and the like. Further, the power supply mechanism 200 may prevent the core 210 from outputting power when the content identified above does not match the vaporizer 100 acceptable to the power supply mechanism 200.

[0063] Further, based on comparing the change in the resistance value generated by the heating element 40 within a predetermined time with the preset threshold, the power provided by the core 210 to the heating element 40 is changed or adjusted based on the comparison result. In an optional embodiment, changing or adjusting the power provided by the core 210 to the heating element 40 may prevent power to the vaporizer 100 when the comparison result exceeds a maximum or minimum value of a preset threshold. Alternatively, in a further optional embodiment, a plurality of preset thresholds are included, and each preset threshold corresponds to a different optimal heating curve or power; and According to the comparison results, the core 210 can be further changed or adjusted accordingly to supply power to the vaporizer 100 with an optimal heating curve or power, respectively.

[0064] It should be noted that the specification and the accompanying drawings of this application provide preferred embodiments of this application, but is not limited to the embodiments described in this specification. Further, a person of ordinary skill in the art may make improvements or modifications according to the foregoing descriptions, and all the improvements and modifications shall fall within the protection scope of the appended claims of this application.

Claims

1. An electronic vaporization device, comprising a vaporizer configured to vaporize a liquid substrate to generate an aerosol, and a power supply mechanism configured to supply power to the vaporizer, wherein the vaporizer comprises a heating element configured to heat and vaporize the liquid substrate, and the power supply mechanism comprises:

    a core, configured to supply power to the heating element; and
    a controller, configured to identify the vaporizer based on electric power provided by the core to the heating element and a resistance change generated by the heating element.

2. The electronic vaporization device according to claim 1, wherein the resistance change comprises a change curve of a resistance of the heating element with time.

3. The electronic vaporization device according to claim 1, wherein the resistance change comprises a resistance change rate of the heating element.

4. The electronic vaporization device according to claim 1, wherein the resistance change comprises a resistance value when the resistance of the heating element rises to be substantially constant, or a difference between the resistance value and an initial resistance value.

5. The electronic vaporization device according to claim 1, wherein the controller is configured to:
compare the resistance change of the heating element with a threshold range and change the electric power provided by the core to the heating element based on a comparison result.

6. The electronic vaporization device according to claim 5, wherein the controller is configured to:
compare a resistance change rate of the heating element or a resistance variation within a preset time with a threshold range, and prevent the core from supplying power to the heating element when the resistance change

rate or the resistance variation is greater than a maximum value of the threshold range or less than a minimum value of the preset threshold range.

7. The electronic vaporization device according to claim 5, wherein the controller is configured to:
raise a resistance of the heating element to a substantially constant resistance value or compare a difference between the resistance value and an initial resistance value with a threshold range, and prevent the core from supplying power to the heating element when the resistance value or the difference is greater than a maximum value of the threshold range or less than a minimum value of the preset threshold range.

8. The electronic vaporization device according to any of claims 1 to 7, wherein the core is configured to provide predetermined electric power to the heating element.

9. The electronic vaporization device according to claim 8, wherein the core is configured to supply power to the heating element in a manner of constant power output.

10. A power supply mechanism, configured to supply power to a vaporizer of an electronic vaporization device, wherein the vaporizer comprises a heating element configured to heat and vaporize a liquid substrate to generate an aerosol, and the power supply mechanism comprises:

a core, configured to supply power to the heating element; and
a controller, configured to identify the vaporizer based on electric power provided by the core to the heating element and a resistance change generated by the heating element.

11. A method for identifying a vaporizer, wherein the vaporizer comprises a heating element configured to heat and vaporize a liquid substrate to generate an aerosol, and the method comprises following steps of:
supplying power to the heating element, and identifying the vaporizer based on an electric power provided to the heating element and a resistance change generated by the heating element.

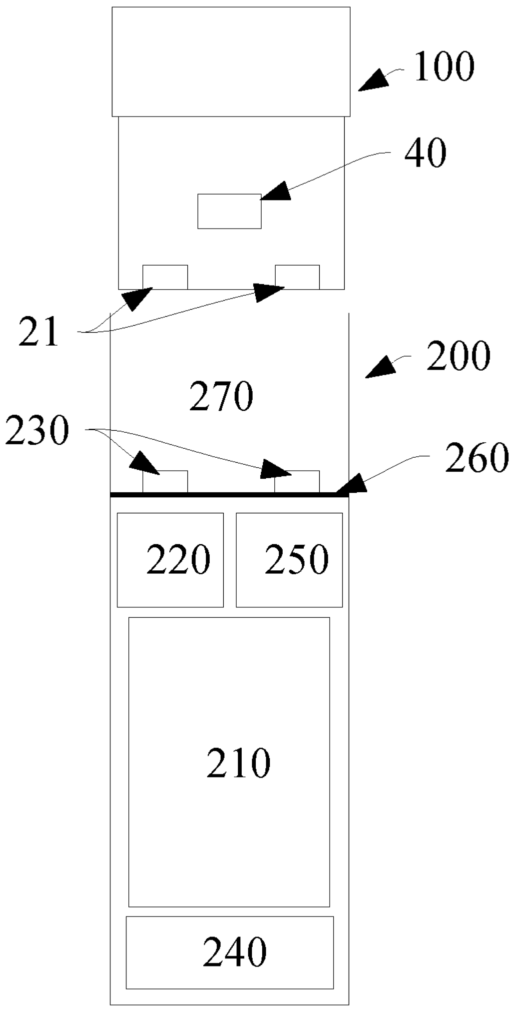


FIG. 1

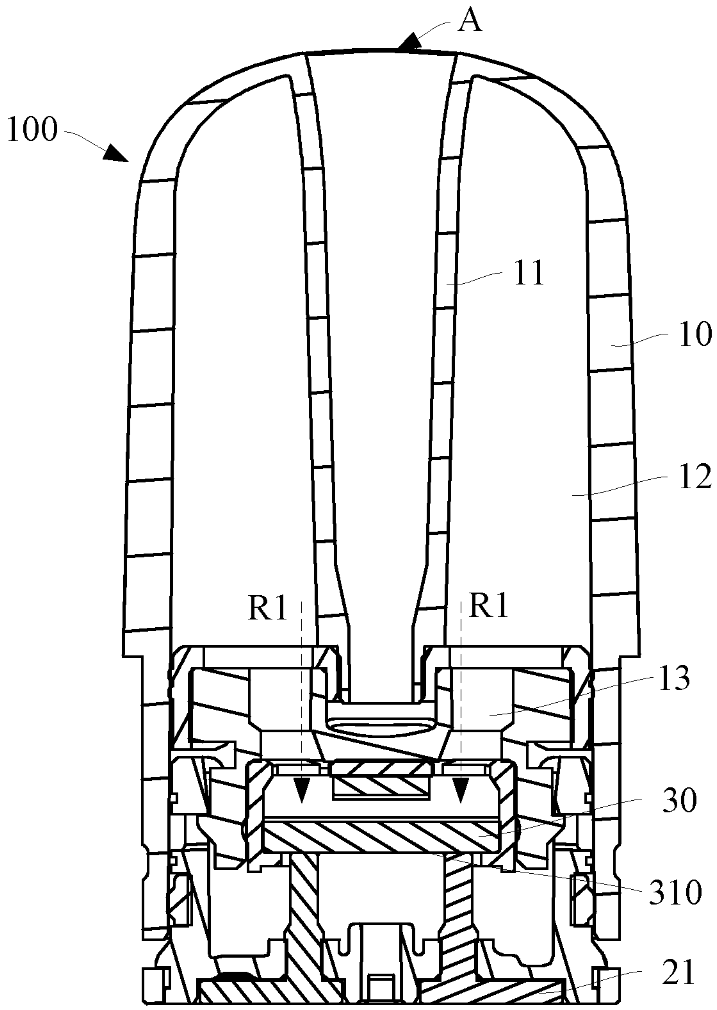


FIG. 2

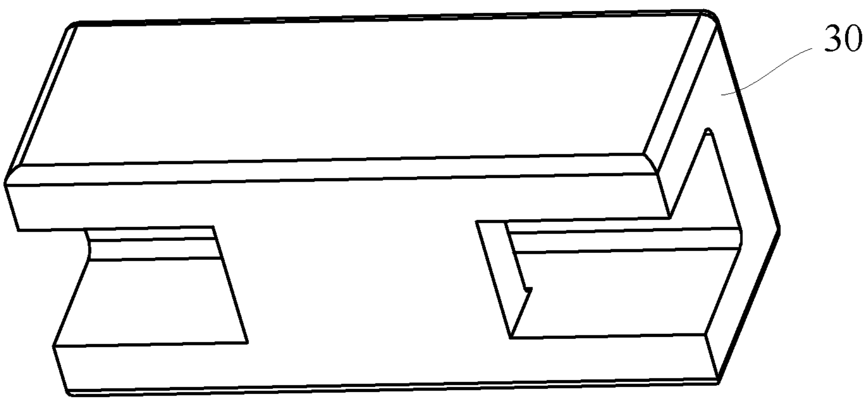


FIG. 3

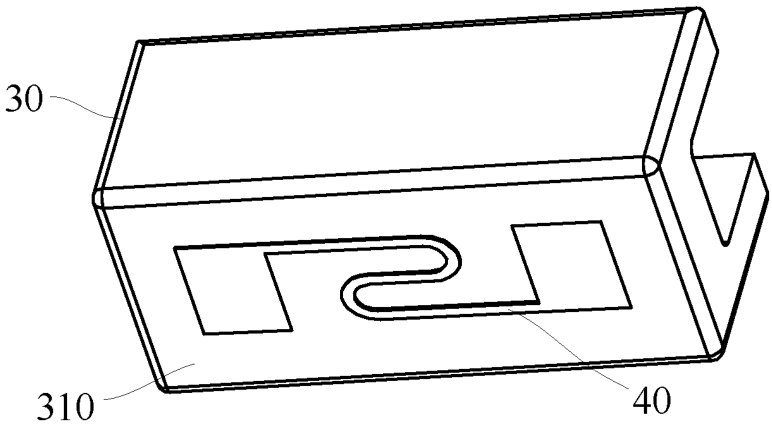


FIG. 4

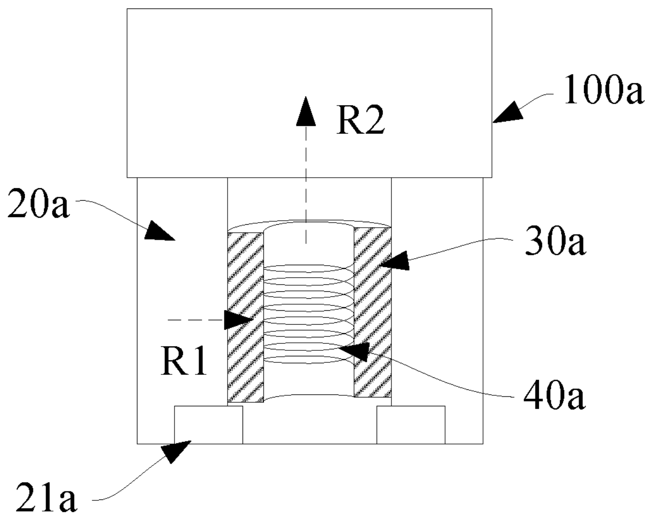


FIG. 5

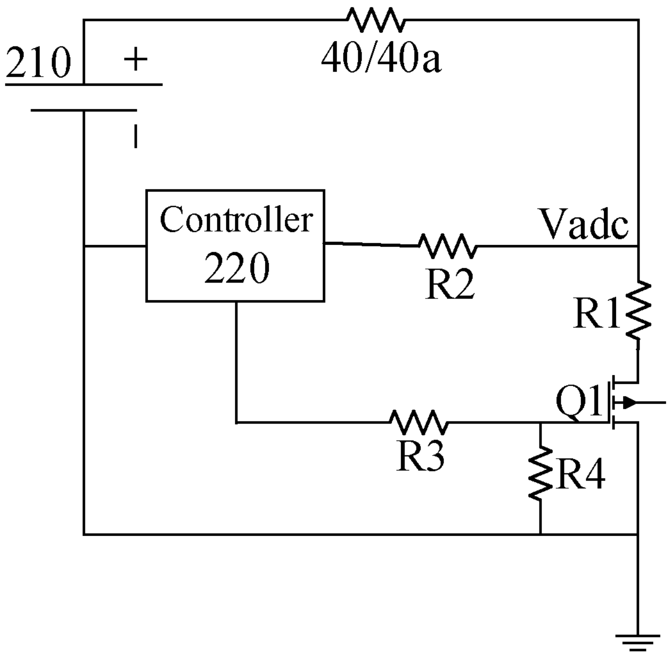


FIG. 6

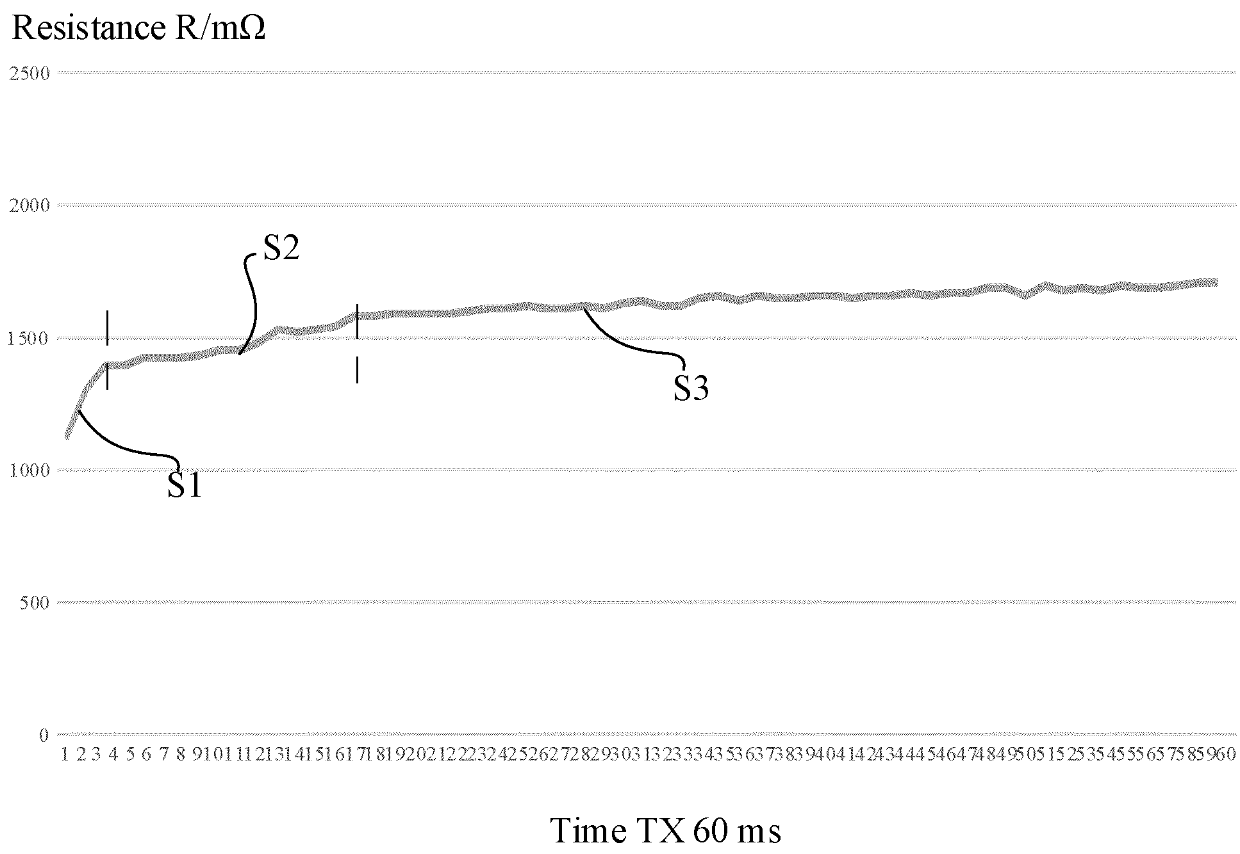
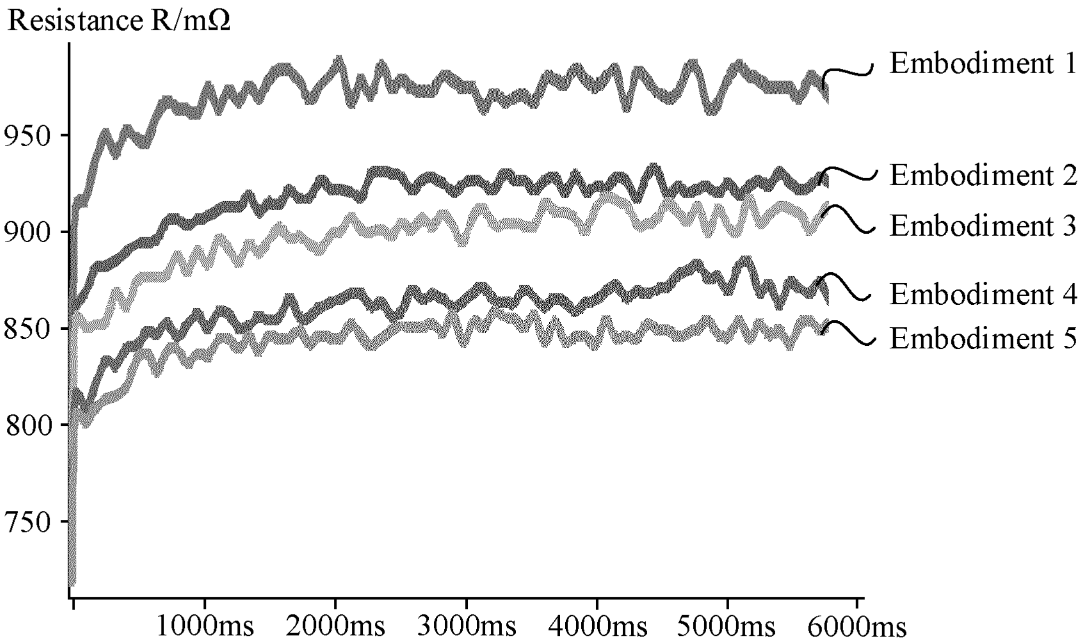


FIG. 7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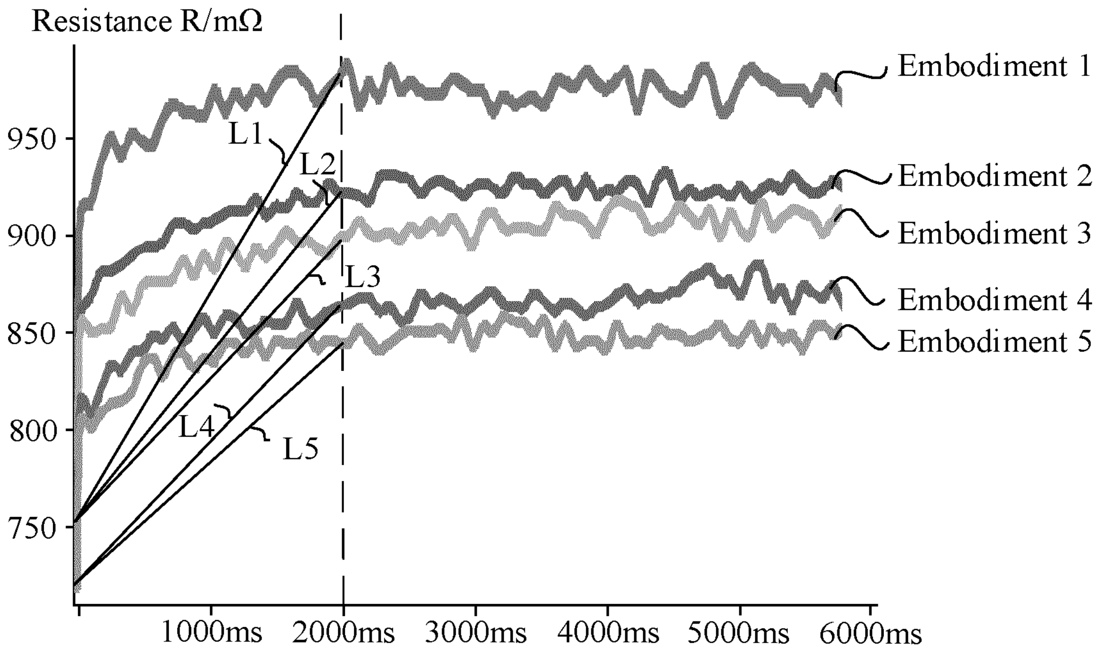
900
850
800
750
1000ms
2000ms
3000ms
4000ms
5000ms
6000ms
Embodiment 1
Embodiment 2
Embodiment 3
Embodiment 4
Embodiment 5

FIG. 8


Resistance R/mΩ
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900
850
800
750
1000ms
2000ms
3000ms
4000ms
5000ms
6000ms
L1
L2
L3
L4
L5
Embodiment 1
Embodiment 2
Embodiment 3
Embodiment 4
Embodiment 5

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/080990

A. CLASSIFICATION OF SUBJECT MATTER

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

CNTXT, ENTXTC, DWPI: 电子烟, 雾化, 识别, 辨别, 适配, 匹配, 电阻, 阻值, 变化, 时间, 温度, electronic, cigarette, atomiz+, recogni+, discriminat+, resistance, match+, adapt+, chang+, time, temperature, TCR

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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X	CN 106820275 A (ETSONG (QINGDAO) INDUSTRIAL CO., LTD.) 13 June 2017 (2017-06-13) description, paragraphs 0021-0031, and figures 1-3	1-11
X	CN 206714080 U (ETSONG (QINGDAO) INDUSTRIAL CO., LTD.) 08 December 2017 (2017-12-08) description, paragraphs 0021-0031, and figures 1-3	1-11
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X	CN 106604654 A (NICOVENTURES HOLDINGS LIMITED) 26 April 2017 (2017-04-26) description, paragraphs 0024-0054, figure 5	1-11
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☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"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
16 May 2022	**21 June 2022**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China**	
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/080990

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/080990

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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REFERENCES CITED IN THE DESCRIPTION

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