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(54) **ATOMIZING CORE, ATOMIZER, AEROSOL GENERATING DEVICE AND METHOD FOR MACHINING ATOMIZING CORE**

(57) The present invention provides an atomizing core, an atomizer, an aerosol generating device and a method for machining an atomizing core. The atomizing core comprises a porous substrate, a heating layer and an electrode; at least one side surface of the porous substrate is provided with an atomizing surface; and by forming an electrode on the porous substrate by using a thick film means, the heating layer is covered on the atomizing surface of the porous substrate, and an electrode does not need to be provided on the heating layer. Therefore, the electrode may be firmly bonded to the porous substrate, and the electrode will also not be impacted by a matrix fluid formed by a high-temperature and high-speed aerosol, so that the electrode does not easily fall off. The method for machining an atomizing core provided in the present invention comprises : first forming an electrode on a porous substrate by using a thick film means; then plating a layer of titanium film on an atomizing surface of the porous substrate by means of a magnetron sputtering process; and then plating a heating layer on the titanium film by means of the magnetron sputtering process, so that the electrode may be firmly bonded to the porous substrate, preventing the electrode from

falling off due to the impact of a matrix fluid formed by a high-temperature and high-speed aerosol.

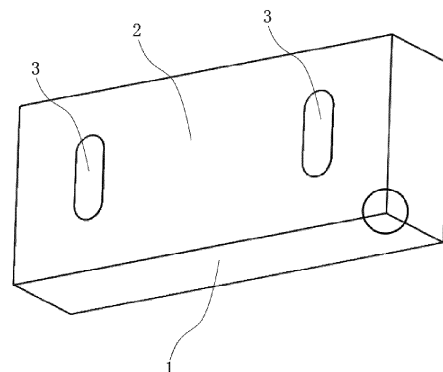


FIG. 1

Description

BACKGROUND OF THE APPLICATION

Field of the Application

[0001] The present disclosure relates to the technical field of atomizing core manufacturing and simulated smoking, in particular to an atomizing core, an atomizing core, an atomizer, an aerosol generating device and a method for manufacturing an atomizing core.

Description of Related Art

[0002] For the thin-film heating-type atomizing core used in the aerosol generating device, a heating film is usually attached to an atomizing surface of a porous substrate. The aerosol-forming substrate on the atomizing surface is heated by the heating film, so that the aerosol-forming substrate is atomized into smoke. In the current thin-film heating-type atomizing core, electrodes used for connecting the power supply device and the heating film are generally arranged on the surface of the heating film away from the porous substrate. In this way, when the thin-film heating-type atomizing core is working, the electrodes are easy to fall off from the heating film due to the impact of the high-temperature and high-speed fluid of the aerosol-forming substrate. After the electrode falls off from the heating film, the resistance at the place where the electrode falls off will increase, resulting in poor stability and reliability of the overall working performance of the heating film, which not only reduces the service life of the thin-film heating-type atomizing core, but also causes uneven heating of the aerosol-forming substrate, thus affecting the taste of the user.

BRIEF SUMMARY OF THE APPLICATION

[0003] Based on the above-mentioned problems in the prior art, a first object of the present disclosure is to provide an atomizing core that forms electrodes on the surface of one side of a porous substrate with an atomizing surface through a thick film process, and then deposits a heating layer on the atomizing surface of the porous substrate, so that the electrodes can be firmly connected to the porous substrate.

[0004] In order to achieve the above object, the technical solution adopted by the present disclosure is: an atomizing core is provided, including:

a porous substrate having an atomizing surface for heating and atomizing an aerosol-forming substrate provided on the surface of at least one side of the porous substrate, wherein the porous substrate is a microporous structure for absorbing the aerosol-forming substrate and infiltrating the absorbed aerosol-forming substrate into the atomizing surface; a heating layer covered on the atomizing surface,

wherein the heating layer is a porous film layer with a microporous structure, the heating layer is configured for heating the aerosol-forming substrate on the atomizing surface to atomize the aerosol-forming substrate into smoke; and

electrodes at least provided on the surface of one side of the porous substrate having the atomizing surface and configured for electrically connecting the heating layer to a power supply device, wherein the electrodes are formed on the porous substrate through a thick film process, the heating layer is electrically connected to the electrodes.

[0005] Further, the porous substrate is a porous ceramic member.

[0006] Further, the heating layer is a platinum layer deposited on the atomizing surface.

[0007] Further, a metal adhesion layer configured for combining the heating layer to the atomizing surface is provided between the atomizing surface and the heating layer, the metal adhesion layer is a porous film layer with a microporous structure.

[0008] Further, the metal adhesion layer is a titanium layer deposited on the atomizing surface, the metal adhesion layer is deposited on the atomizing surface through a magnetron sputtering process.

[0009] Further, the heating layer comprises a right angle on the atomizing surface, and one side of the right angle coincides with the electrode.

[0010] Further, the heating layer is deposited on one surface of the metal adhesion layer away from the atomizing surface through a magnetron sputtering process.

[0011] Further, the electrodes include two electrodes respectively located at two opposite ends of the heating layer, the electrodes are formed on the surface of one side of the porous substrate having the atomizing surface.

[0012] Further, the electrodes are arranged in a pair and spaced apart, and the two electrodes respectively protrude from the surface of one side of the porous substrate, so that a recess is formed between the two electrodes, wherein the bottom surface of the recess forms the atomizing surface, and the atomizing surface is rectangular.

[0013] Based on the above-mentioned problems in the prior art, a second object of the present disclosure is to provide an atomizer having an atomizing core that forms electrodes on the surface of one side of a porous substrate with an atomizing surface through a thick film process, and then deposits a heating layer on the atomizing surface of the porous substrate, so that the electrodes can be firmly connected to the porous substrate.

[0014] In order to achieve the above object, the technical solution adopted by the present disclosure is to provide an atomizer including the atomizing core.

[0015] Based on the above-mentioned problems in the prior art, a third object of the present disclosure is to provide an aerosol generating device that forms electrodes

on the surface of one side of a porous substrate with an atomizing surface through a thick film process, and then deposits a heating layer on the atomizing surface of the porous substrate, so that the electrodes can be firmly connected to the porous substrate.

[0016] In order to achieve the above object, the technical solution adopted by the present disclosure is to provide an aerosol generating device including the atomizing core or the atomizer.

[0017] Compared with the prior art, the above one or more technical solutions provided in the embodiments of the present disclosure have at least one of the following beneficial effects:

[0018] In the atomizing core, atomizer and aerosol generating device provided in the embodiments of the present disclosure, the atomizing core forms the electrodes on the porous substrate through a thick film process, and the heating layer is covered on the atomizing surface of the porous substrate. It is not necessary to form the electrodes on the heating layer. Therefore, the electrodes can be firmly connected to the porous substrate, and the electrodes will not be impacted by the high-temperature and high-speed fluid of the aerosol-forming substrate, so that the electrodes are not easy to fall off. In this way, not only the stability and reliability of the working performance of the heating layer can be improved and the service life of the atomizing core can be extended, but also the heating area of the aerosol-forming substrate can be increased, so that the aerosol-forming substrate is heated more quickly and uniformly, the atomizing core has a good atomizing effect, and the taste of the user is improved.

[0019] Based on the above-mentioned problems in the prior art, a fourth object of the present disclosure is to provide a method for manufacturing an atomizing core.

[0020] In order to achieve the above object, the technical solution adopted by the present disclosure is: a method for manufacturing an atomizing core is provided, including the following steps:

electrode production: a conductive slurry is enabled to flow into the microporous structure of a porous substrate through a thick film process, and the porous substrate screen-printed with the conductive slurry is sintered at high temperature to form electrodes on the surface of one side of the porous substrate having an atomizing surface;

metal adhesion layer production: a first metal film is deposited on the atomizing surface of the porous substrate through a thick film process to form a metal adhesion layer on the atomizing surface of the porous substrate; and

heating layer production: a second metal film is deposited on the first metal film through a thick film process to form a heating layer that can be energized and generate heat on the atomizing surface of the porous substrate, the heating layer is electrically connected to the electrodes.

[0021] Further, in the step of electrode production, an inflow depth of the conductive slurry is 10 μm to 100 μm .

[0022] Further, in the step of electrode production, the porous substrate screen-printed with the conductive slurry is sintered at a temperature of 450°C to 850°C, the sintering time is controlled in the range of 5 minutes to 50 minutes.

[0023] Further, in the step of metal adhesion layer production, the thickness of the first metal film is 0.005 μm to 0.1 μm .

[0024] Further, in the step of heating layer production, the thickness of the second metal film is 0.2 μm to 1 μm .

[0025] Compared with the prior art, the above one or more technical solutions in the embodiments of the present disclosure have at least one of the following beneficial effects:

[0026] The method of manufacturing the atomizing core provided in the embodiment of the present disclosure firstly forms the electrodes on the porous substrate through a thick film process; then, a metal adhesion layer is deposited on the atomizing surface of the porous substrate through a thin film process; and thereafter, a heating layer is deposited on the metal adhesion layer through a thin film process, so as to cover a heating layer on the atomizing surface of the porous substrate. In this way, there is no need to form the electrodes on the heating layer. Therefore, the electrodes can be firmly connected to the porous substrate, and the electrodes will not be impacted by the high-temperature and high-speed fluid of the aerosol-forming substrate, so that the electrodes are not easy to fall off. In this way, not only the stability and reliability of the working performance of the heating layer can be improved and the service life of the atomizing core can be extended, but also the heating area of the aerosol-forming substrate can be increased, so that the aerosol-forming substrate is heated more quickly and uniformly, the atomizing core has a good atomizing effect, and the taste of the user is improved.

40 BRIEF DESCRIPTION OF THE DRAWINGS

[0027] In order to more clearly illustrate the technical solutions in the embodiments of the present disclosure, the accompanying drawings that need to be used in the description of the embodiments or the prior art will be briefly introduced below. Obviously, the accompanying drawings in the following description are only some embodiments of the present disclosure, and for those skilled in the art, other drawings can also be obtained based on these drawings without creative effort.

FIG. 1 is a schematic diagram of the structure of the atomizing core provided in the first embodiment of the present disclosure;

FIG. 2 is a partially enlarged schematic diagram of the structure in FIG. 1;

FIG. 3 is a top schematic view of the structure of the atomizing core provided in the second embodiment

of the present disclosure;

FIG. 4 is a front schematic view of the structure of the atomizing core provided in the second embodiment of the present disclosure;

FIG. 5 is a partially enlarged schematic diagram of the structure in FIG. 4;

FIG. 6 is a perspective schematic diagram of the structure of the porous substrate provided in the second embodiment of the present disclosure;

FIG. 7 is a schematic diagram of four kinds of electrode structures provided in the second embodiment of the present disclosure.

[0028] The part names and reference signs shown in the figures are as follows:

1-porous substrate; 2-heating layer; 3-electrode; 4-atomizing surface; 5-metal adhesion layer.

DETAILED DESCRIPTION OF THE APPLICATION

[0029] In order to make the technical problems to be solved, technical solutions and beneficial effects of the present disclosure clearer, the present disclosure will be further described in detail below in conjunction with the accompanying drawings and embodiments. It should be understood that the specific embodiments described here are only configured to explain the present disclosure, not to limit the present disclosure.

[0030] It should be noted that when an element is referred to as being "connected to" or "disposed on" another element, it may be directly on the other element or be indirectly on the other element. When an element is referred to as being "connected to" another element, it can be directly connected to the other element or indirectly connected to the other element.

[0031] In the description of the present disclosure, it should be noted that unless otherwise specified and defined, the terms "installed", "connected" and "fixed" should be understood in a broad sense, which may, for example, refer to fixed connection, detachable connection or integral connection; may refer to mechanical connection or electrical connection; and may refer to direct connection or indirect connection through an intermediate medium. A person of ordinary skill in the art can understand the specific meaning of the terms in the present disclosure according to specific situations.

[0032] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present application. Thus, the phrases "in one embodiment," "in some embodiments," or "in some of the embodiments" appear in various places throughout the specification, not all referring to the same embodiments. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0033] Please refer to FIGs. 1 to 6 together, now the

atomizing core provided in the embodiments of the present disclosure will be described. The atomizing core provided in the embodiments of the present disclosure is used in an atomizer of an aerosol generating device and can generate heat under the action of electric drive, and heat and atomize the aerosol-forming substrate in a liquid storage chamber of the atomizer to form smoke for the user to inhale, so as to achieve the effect of simulating smoking. Please refer to FIG. 4 and FIG. 6, the atomizing core includes a porous substrate 1, a heating layer 2, and electrodes 3. The surface of at least one side of the porous substrate 1 has an atomizing surface 4. The porous substrate 1 is a microporous structure that can absorb the aerosol-forming substrate and infiltrate the absorbed aerosol-forming substrate into the atomizing surface 4. The heating layer 2 is covered on the atomizing surface 4, and the aerosol-forming substrate infiltrated into the atomizing surface 4 can be heated and atomized by the heating layer 2 into smoke.

[0034] It can be understood that the heating layer 2 is a thin film, further, the heating layer 2 is a porous film layer with a microporous structure, and the smoke formed by heating and atomizing the aerosol-forming substrate can pass through the porous film layer. The heating layer 2 can be, but not limited to, a platinum film deposited on the atomizing surface 4 through a magnetron sputtering process. However, the heating layer 2 may also be a palladium film, or a gold-platinum alloy film, or a gold-silver-platinum alloy film.

[0035] Referring to FIG. 4 and FIG. 6, the electrodes 3 are arranged on the surface of one side of the porous substrate 1 having the atomizing surface 4. The heating layer 2 is electrically connected to the electrodes 3, and the electrodes 3 can be electrically connected to metal spring contacts, so as to electrically connect the heating layer 2 to a power supply device. In this way, when the atomizing core is working, power is supplied to the heating layer 2 through the power supply device. When the heating layer 2 is electrified, it will generate Joule heat, which can heat the aerosol-forming substrate on the atomizing surface 4, so as to atomize the aerosol-forming substrate into smoke. Further, the electrodes 3 are formed on the porous substrate 1 through a thick film process, and the heating layer 2 is covered on the atomizing surface 4 of the porous substrate 1. The electrodes 3 are firmly connected to the porous substrate 1, and the electrodes 3 will not be impacted by the high-temperature and high-speed fluid of the aerosol-forming substrate. Therefore, the electrodes 3 are not easy to fall off, which can not only improve the stability and reliability of the overall working performance of the heating layer 2 and prolong the service life of the atomizing core, but also increase the heating area of the aerosol-forming substrate, so that the aerosol-forming substrate is evenly heated, and the atomizing core has a good atomizing effect, thus improving the taste of the user.

[0036] Compared with the prior art, for the atomizing core provided in the embodiment of the present disclosure

sure, the electrodes 3 are formed on the porous substrate 1 through a thick film process, and the heating layer 2 is covered on the atomizing surface 4 of the porous substrate 1. It is not necessary to form the electrodes 3 on the heating layer 2. Therefore, the electrodes 3 can be firmly connected to the porous substrate 1, and the electrodes 3 will not be impacted by the high-temperature and high-speed fluid of the aerosol-forming substrate, so that the electrodes 3 are not easy to fall off. In this way, not only the stability and reliability of the working performance of the heating layer 2 can be improved and the service life of the atomizing core can be extended, but also the heating area of the aerosol-forming substrate can be increased, so that the aerosol-forming substrate is heated more quickly and uniformly, the atomizing core has a good atomizing effect, and the taste of the user is improved.

[0037] In some embodiments, the porous substrate 1 is a porous ceramic member. The porous ceramic member has excellent characteristics such as stable chemical properties, high temperature resistance, and good insulation, and will not chemically react with the aerosol-forming substrate. Thus, porous ceramics are used to produce the porous substrate 1. Specifically, the static density of the porous ceramic member is 1.5833g/cm^3 , the porosity is 52.08%, the specific pore volume is 0.3289ml/g , the specific surface area is $0.0433\text{m}^2/\text{g}$, and the median pore diameter is $31.33\mu\text{m}$. It can be understood that the above physical parameters of the porous ceramic member can be reasonably adjusted according to the ingredients of the aerosol-forming substrate or specific application requirements. It is only necessary to cover the thin-film heating layer 2 on the atomizing surface 4 of the porous ceramic member, so that the aerosol-forming substrate infiltrated into the atomizing surface 4 can be heated and atomized through the heating layer 2. In this way, the heating area of the aerosol-forming substrate can be increased, so that the aerosol-forming substrate is evenly heated, and the particles in the aerosol-forming substrate can also be prevented from clogging the pores of the porous substrate 1, reducing the carbon deposition of the atomizing core during the atomization process. It can be understood that in other embodiments, the porous substrate 1 can also be made of porous glass material with a microporous structure.

[0038] In some embodiments, the heating layer 2 is a platinum film deposited on the atomizing surface 4, which can not only increase the heating area of the aerosol-forming substrate, so that the aerosol-forming substrate is evenly heated, but also prevent the particles in the aerosol-forming substrate from clogging the pores of the porous substrate 1 and reduce the carbon deposition of the atomizing core during the atomization process. It can be understood that the heating layer 2 can be a porous platinum film, or a gold-platinum alloy film, or a gold-silver-platinum alloy film, etc. The heating layer 2 can be reasonably selected and set according to actual heating needs.

[0039] Please refer to FIG. 2 and FIG. 5, in some embodiments, a metal adhesion layer 5 configured for combining the heating layer 2 to the atomizing surface 4 is provided between the atomizing surface 4 and the heating layer 2. The metal adhesion layer 5 is a porous film layer with a microporous structure. In this embodiment, the metal adhesion layer 5 is firstly covered on the atomizing surface 4 of the porous substrate 1 to increase the adhesion strength between the heating layer 2 and the porous substrate 1, so that the heating layer 2 is firmly connected to the surface of the porous substrate 1 and is not easy to fall off, thereby enhancing the stability and reliability of the atomizing core and prolonging the lifespan of the atomizing core.

[0040] In some embodiments, the metal adhesion layer 5 is a titanium film deposited on the atomizing surface 4. When the porous substrate 1 is a porous ceramic member made of ceramic material, since titanium and ceramics can react at the interface between them to form a relatively strong chemical bond, after a layer of titanium film is deposited on the atomizing surface 4 of the porous ceramic member, the titanium film is firmly adhered to the atomizing surface 4 of the porous ceramic member. Then, the heating layer 2 made of metal is covered on the titanium film to increase the adhesion strength between the heating layer 2 and the atomizing surface 4 of the porous ceramic member, so that the heating layer 2 is firmly connected to the surface of the porous substrate 1 and is not easy to fall off, thereby enhancing the stability and reliability of the atomizing core and prolonging the service life of the atomizing core.

[0041] Please refer to FIG. 5, in some embodiments, the metal adhesion layer 5 is deposited on the atomizing surface 4 through a magnetron sputtering process to enhance the firmness of the metal adhesion layer 5 attached to the atomizing surface 4 of the porous substrate 1. It can be understood that the metal adhesion layer 5 can also be formed on the atomizing surface 4 of the porous substrate 1 by means of physical vapor deposition such as evaporation.

[0042] Please refer to FIG. 4 and FIG. 6, in some embodiments, the heating layer 2 includes a right angle on the atomizing surface, and one side of the right angle coincides with the electrode 3. In the stage of heating up and starting atomization, the temperature near the electrode is relatively slightly higher. This is mainly due to the small atomization area, which makes the heat more concentrated and the heat loss is small. A right angle is formed on the atomizing surface, and there will be local hot spots, so that the temperature of the atomizing core rises faster, and at the same time, the amount of smoke atomized is large.

[0043] Please refer to FIG. 5, in some embodiments, the heating layer 2 is deposited on one surface of the metal adhesion layer 5 away from the atomizing surface 4 through a magnetron sputtering process to increase the adhesion strength between the heating layer 2 and the atomizing surface 4 of the porous substrate 1, so that

the heating layer 2 is firmly connected to the surface of the porous substrate 1 and is not easy to fall off. It can be understood that the heating layer 2 can also be formed on the metal adhesion layer 5 by means of physical vapor deposition such as evaporation.

[0044] Please refer to FIG. 1, in some embodiments, the electrodes 3 include two electrodes respectively located at two opposite ends of the heating layer 2. Optionally, the electrodes 3 are made of silver material, and the electrodes 3 are formed on the surface of one side of the porous substrate 1 having the atomizing surface 4. In this embodiment, the electrodes 3 include two electrodes 3 formed on the porous substrate 1 through a thick film process, the two electrodes 3 are arranged on two opposite ends of the heating layer 2, and the two opposite ends of the heating layer 2 are bordered by the electrodes 3, which not only increases the heating area of the aerosol-forming substrate, but also makes the heating power of the heating layer 2 more evenly distributed, so that the aerosol-forming substrate on the atomizing surface 4 can be heated and atomized relatively quickly and uniformly, and the atomizing core has better atomization efficiency and atomization effect.

[0045] Please refer to FIG. 4 and FIG. 6, in some embodiments, the electrodes 3 are arranged in a pair and spaced apart, and two electrodes 3 respectively protrude from the surface of one side of the porous substrate 1, so that a recess is formed between the two electrodes 3, wherein the bottom surface of the recess forms the atomizing surface 4, and the atomizing surface 4 is rectangular. In this embodiment, the two electrodes 3 forming a pair and arranged at intervals protrude from the surface of one side of the porous substrate 1, so that a recess is formed between the two electrodes 3, wherein the bottom surface of the recess forms the atomizing surface 4, the atomizing surface 4 is rectangular, and two ends of the atomizing surface 4 are bordered by the electrodes 3. In this way, not only the heating area of the aerosol-forming substrate is increased, but also the heating power of the heating layer 2 is more evenly distributed. As a result, the aerosol-forming substrate on the atomizing surface 4 can be heated and atomized relatively quickly and uniformly, so that the atomizing core has better atomization efficiency and atomization effect. It can be understood that the electrode 3 can be a silver electrode 3, but is not limited to a silver electrode, for example, the electrode 3 can be a gold electrode or a gold-silver alloy electrode. The specific material of the electrode 3 can be reasonably selected and set according to the needs of actual use, and there is no limitation here.

[0046] An embodiment of the present disclosure also provides an atomizer, and the atomizer includes the atomizing core provided in any one of the above embodiments. Since the atomizer has all the technical features of the atomizing core provided in any of the above embodiments, it has the same technical effects as the atomizing core.

[0047] An embodiment of the present disclosure also

provides an aerosol generating device, and the aerosol generating device includes the atomizing core provided in any of the above embodiments or the atomizer provided in any one of the above embodiments. Since the aerosol generating device has all the technical features of the atomizing core or atomizer provided in any of the above embodiments, it has the same technical effects as the atomizing core.

[0048] An embodiment of the present disclosure also provides a method for manufacturing an atomizing core, including the following steps:

Electrode production: a conductive slurry is enabled to flow into the microporous structure of the porous substrate 1 through a thick film process, and the porous substrate 1 screen-printed with the conductive slurry is sintered at high temperature to form the electrodes 3 on the surface of one side of the porous substrate 1 having the atomizing surface 4. It can be understood that in this step, a thick film process such as a screen printing process can be used to enable the conductive slurry to flow into the microporous structure of the porous substrate 1. In some embodiments, the conductive slurry may be a silver-containing slurry, and the conductive slurry is a high-viscosity fluid at normal temperature. Certainly, in other embodiments, the conductive slurry may also be a slurry containing gold or a slurry containing a mixture of gold and silver.

[0049] It can be understood that in this step, the porous substrate 1 adopts a porous ceramic member with a microporous structure, and the conductive slurry is infiltrated into the porous ceramic member using a screen printing process. The inflow depth of the conductive slurry is 10 μm to 100 μm . Then, the porous substrate 1 screen-printed with the conductive slurry is sintered at a temperature of 450°C to 850°C, the sintering time is controlled in the range of 5 minutes to 50 minutes, the electrodes 3 can be produced on the surface of the porous ceramic member. Since the electrodes 3 are formed on the surface of one side of the porous ceramic member having the atomizing surface 4 through a thick film process such as a screen printing process, it is convenient to realize electrical connection with the power supply device through the metal spring contacts, so as to facilitate the input of external voltage. Of course, in other embodiments, the porous substrate 1 can also be made of porous glass material with a microporous structure.

[0050] Metal adhesion layer production: a first metal film is deposited on the atomizing surface 4 of the porous substrate 1 through a thick film process to form a metal adhesion layer 5 on the atomizing surface 4 of the porous substrate 1. It can be understood that in this step, a thin film process such as a magnetron sputtering process can be used to deposit the first metal film on the atomizing surface 4 of the porous substrate 1. Specifically, the first metal film may be a titanium film, a zirconium film, a titanium-aluminum alloy film, a titanium-zirconium alloy film, a titanium-molybdenum alloy film, a titanium-niobium alloy film, an iron-aluminum alloy film, or a tantalum-alu-

minum alloy film, etc. The thickness of the first metal film is 0.005 μm to 0.1 μm . Optionally, the first metal film may be a porous titanium film, the thickness of the porous titanium film is 0.005 μm to 0.1 μm , and the porous titanium film can be used as a seed layer to increase the adhesion strength between the heating layer 2 and the porous ceramic member. The film deposition conditions of the porous titanium film include normal temperature, 2E-5 Torr vacuum, and 300W power.

[0051] Heating layer production: a second metal film is deposited on the metal adhesion layer 5 (i.e., the first metal film) through a thin film process to form a heating layer 2 that can be energized and generate heat on the atomizing surface 4 of the porous substrate 1. It can be understood that in this step, a thick film process such as a magnetron sputtering process can be used to deposit the second metal film on the metal adhesion layer 5 (i.e., the first metal film). The second metal film may be a platinum film, a palladium film, a palladium-copper alloy film, a gold-silver-platinum alloy film, a gold-silver alloy film, a palladium-silver alloy film, or a gold-platinum alloy film, etc. Specifically, the thickness of the second metal film is 0.2 μm to 1 μm , and the heating layer 2 is electrically connected with the electrodes 3 to obtain an atomizing core.

[0052] Compared with the prior art, the method of manufacturing the atomizing core provided in the embodiment of the present disclosure firstly forms the electrodes 3 on the porous substrate 1 through a thick film process; then, on the atomizing surface 4 of the porous substrate 1, a metal adhesion layer 5 is deposited on the atomizing surface 4 of the porous substrate 1 through a thick film process; and thereafter, a heating layer 2 is deposited on the metal adhesion layer 5 through a thick film process, so as to form a heating layer 2 that can be energized and generate heat on the atomizing surface 4 of the porous substrate 1. In this way, the heating layer 2 is covered on the atomizing surface 4 of the porous substrate 1, without the need to form the electrodes 3 on the heating layer 2. Therefore, the electrodes 3 can be firmly connected to the porous substrate 1, and the electrodes 3 will not be impacted by the high-temperature and high-speed fluid of the aerosol-forming substrate, so that the electrodes 3 are not easy to fall off. In this way, not only the stability and reliability of the working performance of the heating layer 2 can be improved and the service life of the atomizing core can be extended, but also the heating area of the aerosol-forming substrate can be increased, so that the aerosol-forming substrate is heated more quickly and uniformly, the atomizing core has a good atomizing effect, and the taste of the user is improved.

[0053] During the heating up and starting atomization stage of the atomizing core, there are differences in the temperature field of the atomization surface 4 between different electrodes 3 and different ceramic cores, and the temperature near the electrodes 3 is relatively slightly higher. In a small atomization area, the heat is more con-

centrated, and the heat loss is small. Also, a right angle should be formed on the atomizing surface 4, which will result in local hot spots, faster heating, and a large amount of smoke formed after atomization. Moreover, the heating and atomization effect of the atomizing core is closely related to the uneven power distribution due to the uneven current-carrying field caused by the shape of the electrodes 3. That is, if the atomizing surface 4 of the porous substrate 1 forms a part around the electrode 3, it will lead to uneven power distribution and poor heating atomization effect. However, if the boundary of the atomizing surface 4 is relatively regular, the amount of smoke formed after atomization will be relatively large. Taking into account the above two points, please refer to FIG. 6, the best solution is that the atomizing surface 4 is rectangular, and two ends of the atomizing surface 4 are bordered by the electrodes 3. The comparative experiment is shown in FIG. 7, and in the smoke volume experiment of four electrodes 3 of A, B, C and D, the experimental conditions are:

Suction mode: suction for 3 seconds, stop for 30 seconds, cycle 20 puffs, test 5 groups of total 100 puffs;
Suction rate: suction capacity 55ml, suction rate 18.3ml/s;
Heating power: constant power 7W;

[0054] The final experimental result shows that the amount of smoke of A and B is basically the same, but the amount of smoke of A and B is much higher than that of C and D.

[0055] The above are only preferred embodiments of the present disclosure, and are not intended to limit the present disclosure. Any modifications, equivalent replacements and improvements made within the spirit and principles of the present disclosure shall be included within the protection scope of the present disclosure.

Claims

1. An atomizing core comprising:

a porous substrate having an atomizing surface for heating and atomizing an aerosol-forming substrate provided on the surface of at least one side of the porous substrate, wherein the porous substrate is a microporous structure for absorbing the aerosol-forming substrate and infiltrating the absorbed aerosol-forming substrate into the atomizing surface;
a heating layer covered on the atomizing surface, wherein the heating layer is a porous film layer with a microporous structure, the heating layer is configured for heating the aerosol-forming substrate on the atomizing surface to atomize the aerosol-forming substrate into smoke; and

- electrodes at least provided on the surface of one side of the porous substrate having the atomizing surface and configured for electrically connecting the heating layer to a power supply device, wherein the electrodes are formed on the porous substrate through a thick film process, the heating layer is electrically connected to the electrodes.
2. The atomizing core as claimed in claim 1, wherein the porous substrate is a porous ceramic member.
 3. The atomizing core as claimed in claim 1, wherein the heating layer is a platinum layer deposited on the atomizing surface.
 4. The atomizing core as claimed in claim 1, wherein a metal adhesion layer configured for combining the heating layer to the atomizing surface is provided between the atomizing surface and the heating layer, the metal adhesion layer is a porous film layer with a microporous structure.
 5. The atomizing core as claimed in claim 4, wherein the metal adhesion layer is a titanium layer deposited on the atomizing surface, the metal adhesion layer is deposited on the atomizing surface through a magnetron sputtering process.
 6. The atomizing core as claimed in claim 5, wherein the heating layer is deposited on one surface of the metal adhesion layer away from the atomizing surface through a magnetron sputtering process.
 7. The atomizing core as claimed in claim 1, wherein the heating layer comprises a right angle on the atomizing surface, and one side of the right angle coincides with the electrode.
 8. The atomizing core as claimed in any one of claims 1 to 7, wherein the electrodes include two electrodes respectively located at two opposite ends of the heating layer, the electrodes are formed on the surface of one side of the porous substrate having the atomizing surface.
 9. The atomizing core as claimed in any one of claims 1 to 7, wherein the electrodes are arranged in a pair and spaced apart, and the two electrodes respectively protrude from the surface of one side of the porous substrate, so that a recess is formed between the two electrodes, wherein the bottom surface of the recess forms the atomizing surface, and the atomizing surface is rectangular.
 10. An atomizer comprising the atomizing core as claimed in any one of claims 1 to 9.
 11. An aerosol generating device comprising the atomizing core as claimed in any one of claims 1 to 9 or the atomizer as claimed in claim 10.
 12. A method for manufacturing an atomizing core, comprising the following steps:

electrode production: a conductive slurry is enabled to flow into the microporous structure of a porous substrate through a thick film process, and the porous substrate screen-printed with the conductive slurry is sintered at high temperature to form electrodes on the surface of one side of the porous substrate having an atomizing surface;

metal adhesion layer production: a first metal film is deposited on the atomizing surface of the porous substrate through a thin film process to form a metal adhesion layer on the atomizing surface of the porous substrate; and

heating layer production: a second metal film is deposited on the first metal film through a thin film process to form a heating layer that can be energized and generate heat on the atomizing surface of the porous substrate, the heating layer is electrically connected to the electrodes.
 13. The method for manufacturing an atomizing core as claimed in claim 12, wherein in the step of electrode production, an inflow depth of the conductive slurry is 10 μm to 100 μm .
 14. The method for manufacturing an atomizing core as claimed in claim 12, wherein in the step of electrode production, the porous substrate screen-printed with the conductive slurry is sintered at a temperature of 450°C to 850°C, the sintering time is controlled in the range of 5 minutes to 50 minutes.
 15. The method for manufacturing an atomizing core as claimed in claim 12, wherein in the step of metal adhesion layer production, the thickness of the first metal film is 0.005 μm to 0.1 μm .
 16. The method for manufacturing an atomizing core as claimed in claim 12, wherein in the step of heating layer production, the thickness of the second metal film is 0.2 μm to 1 μm .

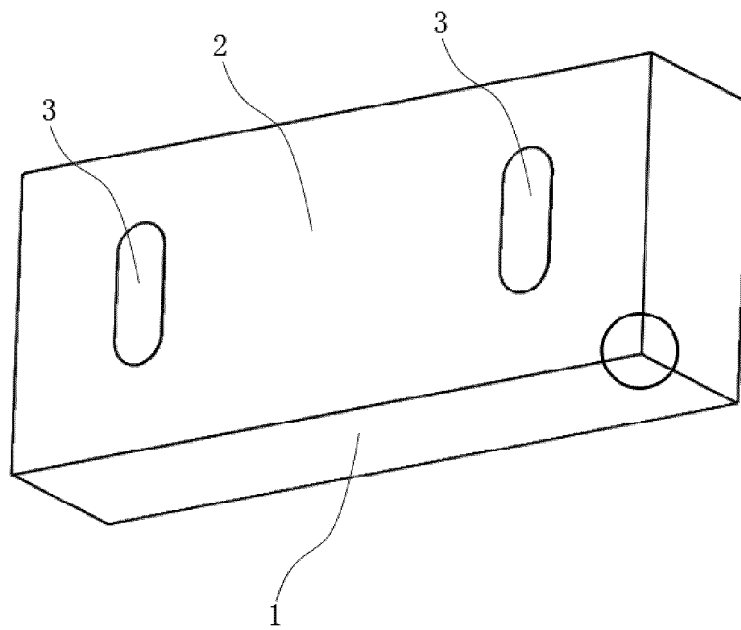


FIG. 1

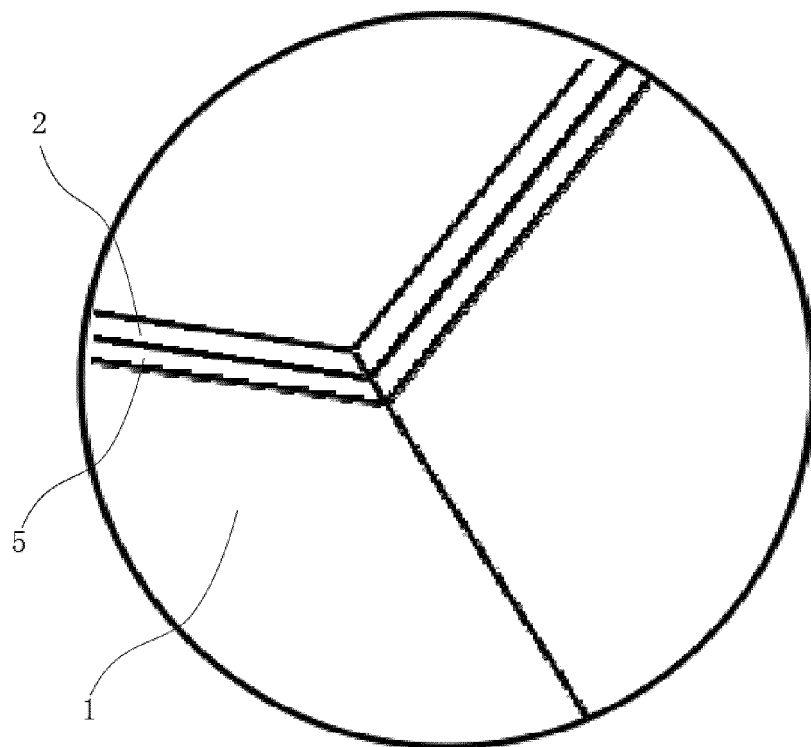


FIG. 2

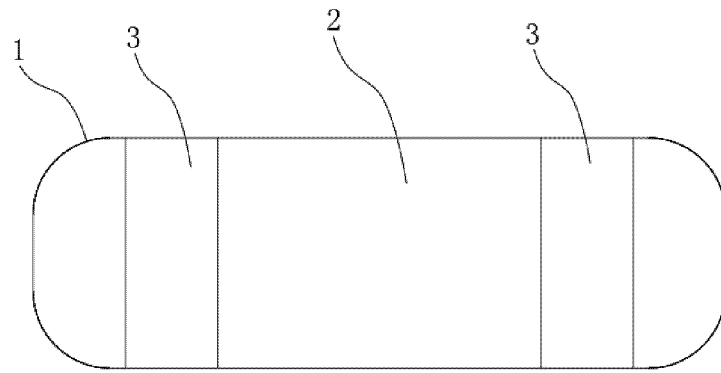


FIG. 3

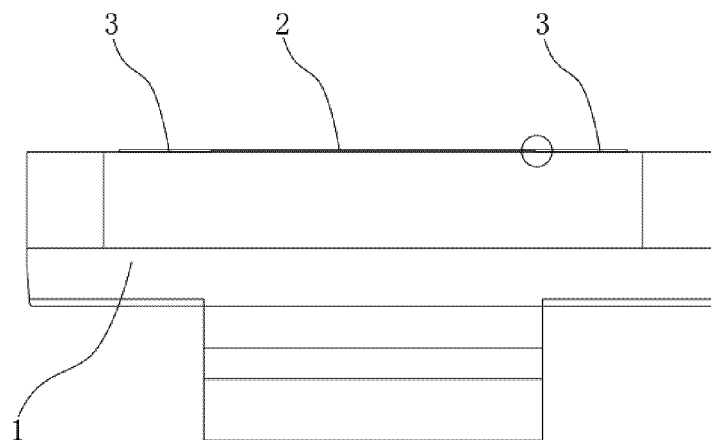


FIG. 4

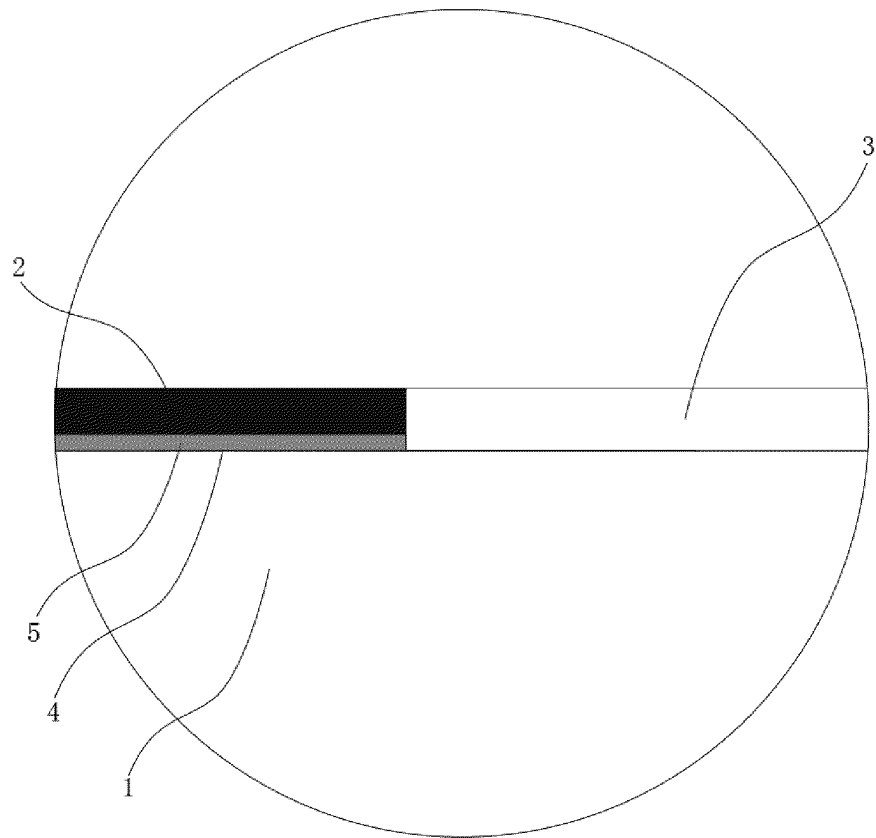


FIG. 5

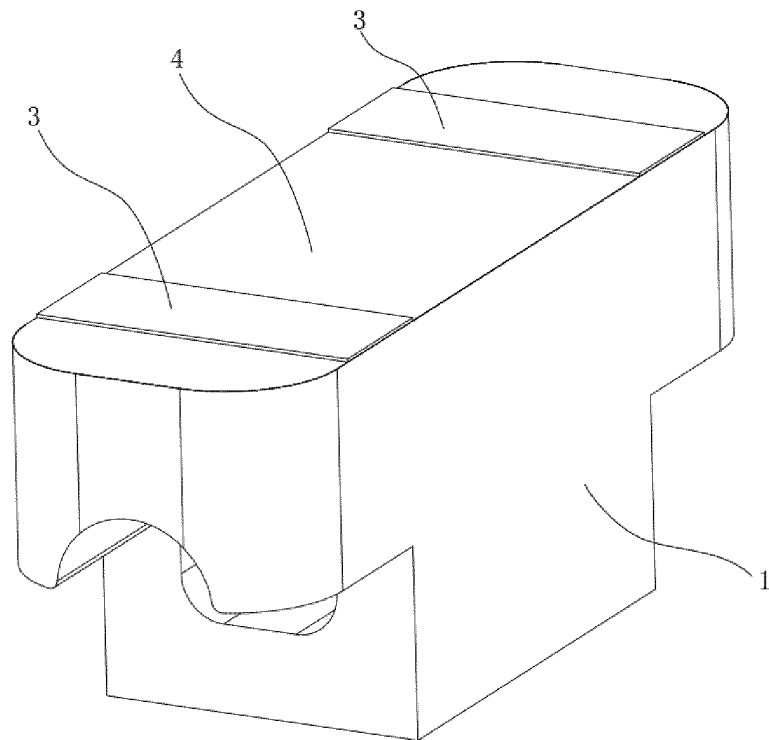


FIG. 6

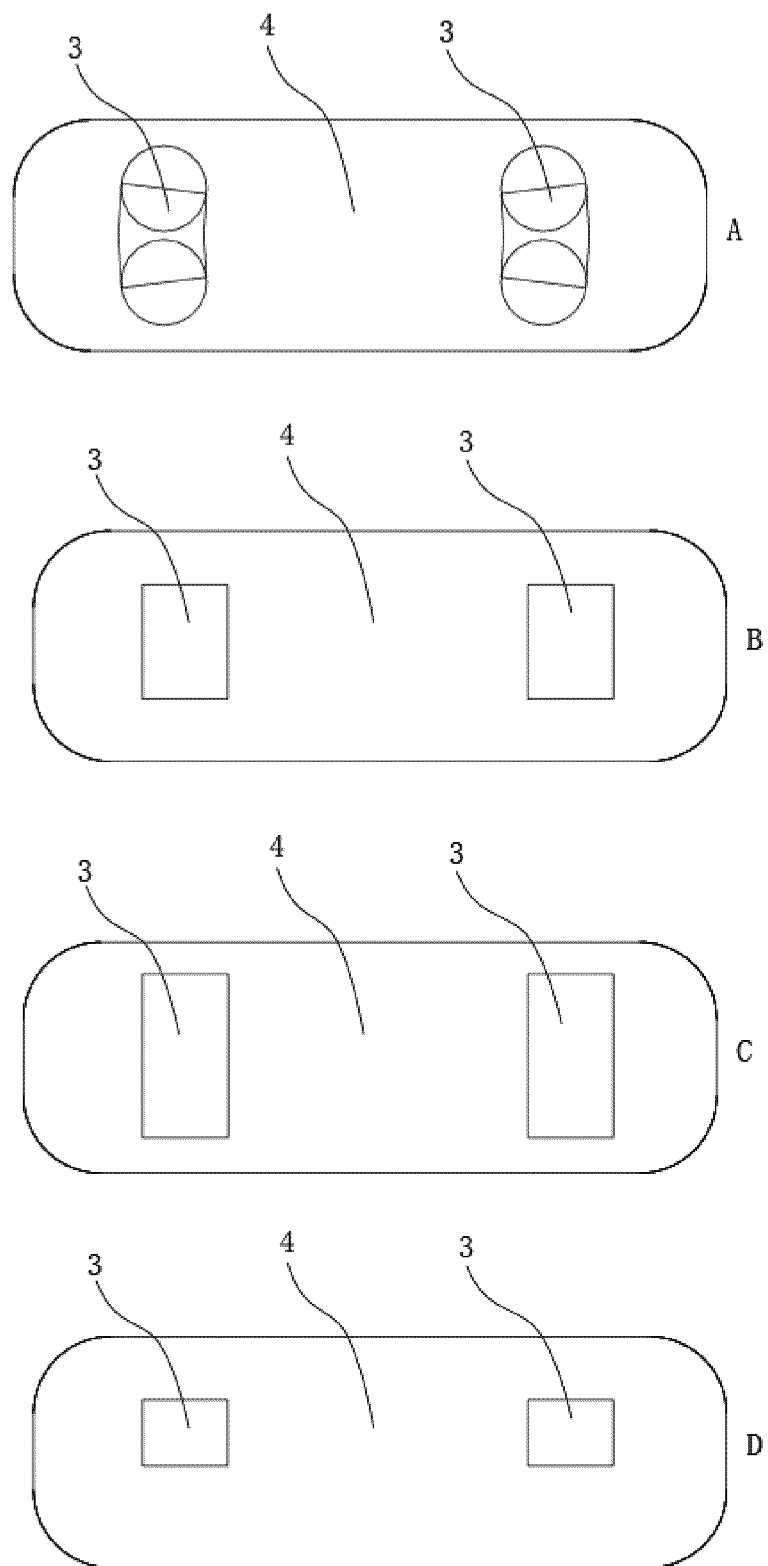


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/128851

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/10(2020.01)i; A24F 40/40(2020.01)i; A24F 40/46(2020.01)i; A24F 40/70(2020.01)i; A24F 47/00(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F40/-,A24F47/-

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; WPABSC; WPABS; ENTXTC; VEN; EPTXT; WOTXT; USTXT: 常州市派腾, 邱伟华, 烧结, 黏附, 加热, 厚膜, 雾化, 印刷, 电热, 电极, 粘附, 粘着, 过渡, 微孔, 附着, 多孔, 发热, 粘合, electro+ , pulveriz+ , print+ , cribellate, heat+ , atomiz+ , +porous, sinter+ , film+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 214509370 U (CHANGZHOU PAITENG ELECTRONIC TECHNOLOGY SERVICE CO., LTD.) 29 October 2021 (2021-10-29) claims 1-11, description, paragraphs 49-53, and figures 1-7	1-16
X	CN 111109666 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 08 May 2020 (2020-05-08) description, paragraphs 39-66, and figures 1-4	1-3, 7-11
X	CN 211794318 U (GUANGDONG GUOYAN NEW MATERIAL CO., LTD.) 30 October 2020 (2020-10-30) description, paragraphs 37-54, and figures 1-4	1-3, 7-11
X	CN 110074463 A (DONGGUAN TPS ELECTRONICS TECHNOLOGY CO., LTD.) 02 August 2019 (2019-08-02) description, paragraphs 55-11, and figures 1-8	1-3, 7-11
Y	CN 111109666 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 08 May 2020 (2020-05-08) description, paragraphs 39-66, and figures 1-4	4-6, 12-16

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

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

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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

10 December 2021

Date of mailing of the international search report

27 December 2021

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

Authorized officer

Facsimile No. (86-10)62019451

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/128851

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 211794318 U (GUANGDONG GUOYAN NEW MATERIAL CO., LTD.) 30 October 2020 (2020-10-30) description, paragraphs 37-54, and figures 1-4	4-6, 12-16
Y	CN 110074463 A (DONGGUAN TPS ELECTRONICS TECHNOLOGY CO., LTD.) 02 August 2019 (2019-08-02) description, paragraphs 55-11, and figures 1-8	4-6, 12-16
Y	CN 110680023 A (O-NET AUTOMATION TECHNOLOGY (SHENZHEN) LTD.) 14 January 2020 (2020-01-14) description, paragraphs 34-81, and figures 1-3	4-6, 12-16
Y	CN 109875123 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 14 June 2019 (2019-06-14) description, paragraphs 32-54, and figures 1-7	4-6, 12-16
A	CN 209749814 U (KEY MATERIAL CO., LTD.) 10 December 2019 (2019-12-10) entire document	1-12
A	CN 209498585 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 18 October 2019 (2019-10-18) entire document	1-16
A	CN 112006329 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 01 December 2020 (2020-12-01) entire document	1-16
A	CN 110627519 A (HUNAN JIASHENG DIANTAO NEW MATERIAL CO., LTD.) 31 December 2019 (2019-12-31) entire document	1-16
A	CN 109549255 A (ZHUIZHOU LEED-INK ELECTRONIC TECHNOLOGY CO., LTD.) 02 April 2019 (2019-04-02) entire document	1-16
A	CN 111920104 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 13 November 2020 (2020-11-13) entire document	1-16
A	CN 210275912 U (ALD GROUP LIMITED) 10 April 2020 (2020-04-10) entire document	1-16
A	CN 110946335 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 03 April 2020 (2020-04-03) entire document	1-16
A	WO 2019127811 A1 (ALD GROUP LTD.) 04 July 2019 (2019-07-04) entire document	1-16
A	CN 111820471 A (SHENZHEN SUNLORD ELECTRONICS CO., LTD.) 27 October 2020 (2020-10-27) entire document	1-16

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

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/128851

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

- [1] Claims 1-11, relating to an atomization core, an atomizer, and an aerosol generating apparatus;
 [2] Claims 12-16, relating to a machining method for an atomization core.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/128851

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 214509370 U	27 October 2020	None	
CN 111109666 A	08 May 2020	WO 2021143472 A1	22 July 2021
CN 211794318 U	30 October 2020	None	
CN 110074463 A	02 August 2019	US 2020359704 A1	19 November 2020
CN 110680023 A	14 January 2020	None	
CN 109875123 A	14 June 2019	None	
CN 209749814 U	10 December 2019	None	
CN 209498585 U	18 October 2019	None	
CN 112006329 A	01 December 2020	None	
CN 110627519 A	31 December 2019	None	
CN 109549255 A	02 April 2019	None	
CN 111920104 A	13 November 2020	None	
CN 210275912 U	10 April 2020	WO 2020244682 A1	10 December 2020
CN 110946335 A	03 April 2020	CN 211746932 U	27 October 2020
		WO 2020228330 A1	19 November 2020
		CN 110301674 A	08 October 2019
		CN 110881694 A	17 March 2020
		CN 110973708 A	10 April 2020
WO 2019127811 A1	04 July 2019	US 2020315251 A1	08 October 2020
		CN 108208938 A	29 June 2018

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