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(54) HEATING ASSEMBLY, ATOMIZER, AND ELECTRONIC ATOMIZATION DEVICE

(57) A heating assembly, an atomizer, and an electronic atomization device. The heating assembly comprises a matrix (10); the matrix (10) has a first surface (10a) and a second surface (10b) arranged opposite to each other; the matrix (10) comprises a heating area (11) and a non-heating area (12); a plurality of first micropores (11a) are formed in the heating area (11); a plurality of second micropores (12a) are formed in the non-heating area (12); the first micropores (11a) and the second micropores (12a) are used for guiding an aerosol generating substrate from the first surface (10a) to the second surface (10b); the second surface (10b) is provided with a plurality of flow channels enabling the first micropores (11a) to be communicated with the second micropores (12a); and aerosol generating substrates in the second micropores (12a) can enter the first micropores (11a) through the flow channels. A large-particle aerosol can be formed on the surface of the heating area (11), thereby improving the sweetness taste.

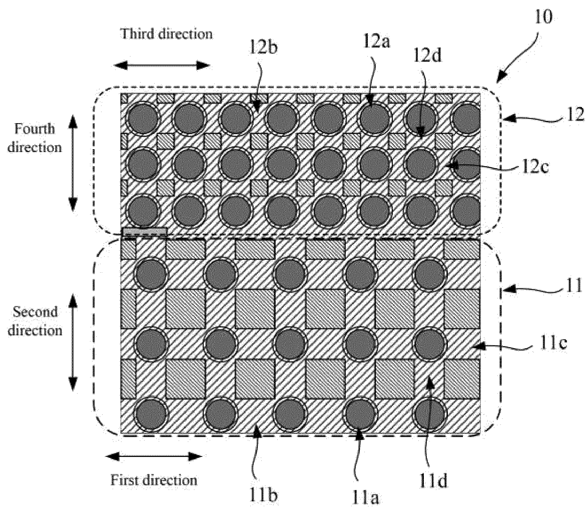

FIG. 1

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Description

TECHNICAL FIELD

[0001] This application relates to the field of electronic atomization technologies, and in particular, to a heating assembly, an atomizer, and an electronic atomization apparatus.

BACKGROUND

[0002] An electronic atomization apparatus includes components such as a heating assembly, a battery, and a control circuit. The heating assembly is a core element of the electronic atomization apparatus, and the characteristic of the heating assembly determines the atomization effect and use experience of the electronic atomization apparatus. Sizes of aerosol particles deposited at different positions of an airway are not the same. PM2.5 can enter the lungs, aerosol particles of about 10 um can be deposited in the mouth and the upper respiratory tract, and aerosol particles of about 5 um can be deposited in the lower respiratory tract. Sweetness taste during inhalation is mainly determined by content of aerosol particles with the size of about 10 um.

[0003] For the heating assembly in the related art, there is an atomized aerosol particle with a small size, and is not an obviously large particle aerosol, and there is a small amount of aerosol particles deposited in the mouth, resulting in subtle sweetness.

SUMMARY

[0004] In view of this, a heating assembly, an atomizer, and electronic atomization apparatus are expected to be provided in embodiments of this application, to solve a problem in the related art that there is an atomized aerosol particle with a small size, and is not an obviously large particle aerosol, and there is a small amount of aerosol particles deposited in the mouth, resulting in subtle sweetness.

[0005] To reach the purpose, an embodiment of this application provides a heating assembly. The heating assembly includes a substrate. The substrate has a first surface and a second surface arranged opposite to each other. The substrate includes a heating region and a non-heating region. The heating region is provided with a plurality of first micro-pores, the non-heating region is provided with a plurality of second micro-pores, and the first micro-pores and the second micro-pores are configured to guide an aerosol-forming material from the first surface to the second surface.

[0006] The second surface is provided with a plurality of flow channels that are communicated with the first micro-pores and the second micro-pores, and the aerosol-forming material in the second micro-pores is movable into the first micro-pores through the flow channels.

[0007] In an embodiment, the flow channels include a plurality of first flow channels located in the heating region and a plurality of second flow channels located in the non-heating region. The first flow channels pass through surfaces of the first micro-pores, and the second flow channels pass through surfaces of the second micro-pores.

[0008] In an embodiment, the heating region is provided with a plurality of first grooves extending along a first direction and a plurality of second grooves extending along a second direction, the first grooves and the second grooves are arranged in an intersecting manner, and each first groove and each second groove form the first flow channel.

[0009] In an embodiment, the non-heating region is provided with a plurality of third grooves extending along a third direction and a plurality of fourth grooves extending along a fourth direction, the third grooves and the fourth grooves are arranged in an intersecting manner, and each third groove and each fourth groove form the second flow channel.

[0010] In an embodiment, the plurality of first micro-pores are distributed in an array, each first groove corresponds to one or more rows of first micro-pores, and each second groove corresponds to one or more columns of first micro-pores.

[0011] In an embodiment, the plurality of second micro-pores are distributed in an array, each third groove corresponds to one or more rows of second micro-pores, and each fourth groove corresponds to one or more columns of second micro-pores.

[0012] In an embodiment, the width of the first flow channel ranges from 1 μm to 100 μm.

[0013] In an embodiment, the width of the second flow channel ranges from 1 μm to 100 μm.

[0014] In an embodiment, the ratio of the width of the first flow channel to the pore size of the first micro-pore is less than or equal to 1.2.

[0015] In an embodiment, the ratio of the width of the second flow channel to the pore size of the second micro-pore is less than or equal to 1.2.

[0016] In an embodiment, the depth of the first flow channel ranges from 1 μm to 200 μm. In an embodiment, the depth of the second flow channel ranges from 1 μm to 200 μm.

[0017] In an embodiment, the depth of the second flow channel is greater than the depth of the first flow channel.

[0018] In an embodiment, the pore size of the first micro-pore ranges from 1 μm to 100 μm.

[0019] In an embodiment, the pore size of the second micro-pore ranges from 1 μm to 100 μm.

[0020] In an embodiment, the first micro-pore is a first elongated hole, the width of the first elongated hole ranges from 1 μm to 100 μm, and the length-width ratio of the first elongated hole is greater than 1.5.

[0021] In an embodiment, the second micro-pore is a second elongated hole, the width of the second elongated hole ranges from 1 μm to 100 μm, and the length-width ratio of the second elongated hole is greater than

1.5.

[0022] In an embodiment, the porosity of the heating region is less than the porosity of the non-heating region.

[0023] In an embodiment, the porosity of the heating region ranges from 15% to 40%.

[0024] In an embodiment, the porosity of the non-heating region ranges from 20% to 80%.

[0025] In an embodiment, the ratio of the porosity of the non-heating region to the porosity of the heating region ranges from 1 to 2.

[0026] In an embodiment, the pore size of the first micro-pore is equal to the pore size of the second micro-pore, and the center-to-center distance between neighboring first micro-pores is greater than the center-to-center distance between neighboring second micro-pores.

[0027] In an embodiment, the center-to-center distance between neighboring first micro-pores is equal to the center-to-center distance between neighboring second micro-pores, and the pore size of the first micro-pore is less than the pore size of the second micro-pore.

[0028] In an embodiment, the heating assembly includes a heating element. The heating element is an independent element disposed in the heating region.

[0029] In an embodiment, the substrate has a conductive function.

[0030] In an embodiment, the substrate is a dense substrate.

[0031] An embodiment of this application provides an atomizer, including:

a liquid storage cavity, configured to store an aerosol-forming material; and
the heating assembly, where the heating assembly is in fluid communication with the liquid storage cavity.

[0032] An embodiment of this application provides an electronic atomization apparatus, including the atomizer according to any one of embodiments of this application.

[0033] Embodiments of this application provide a heating assembly, an atomizer, and an electronic atomization apparatus. The heating assembly includes a substrate. The substrate has a first surface and a second surface arranged opposite to each other. The substrate includes a heating region and a non-heating region. The first surface includes a liquid absorbing surface. The second surface includes an atomization surface. The heating region is provided with a plurality of first micro-pores. The non-heating region is provided with a plurality of second micro-pores. The first micro-pores and the second micro-pores are configured to guide an aerosol-forming material from the first surface to the second surface. In other words, the substrate can implement a liquid guide function and a liquid storage function through the first micro-pores and the second micro-pores. The aerosol-forming material may be guided to the second surface through the first micro-pores and the second micro-pores, and the aerosol-forming material in the heating region is heated and atomized to generate an aerosol. In addition, the second surface is provided with a plurality of flow channels that are communicated with the first micro-pores and the second micro-pores. The aerosol-forming material in the second micro-pores is movable into the first micro-pores through the flow channels. Because the heating region has a specific degree of superheat during atomization, and the second micro-pores in the non-heating region store an aerosol-forming material with the temperature lower than a boiling point, the aerosol-forming material in the second micro-pores near the edge of the heating region enters the heating region through the flow channels, to replenish the aerosol-forming material with the temperature lower than a boiling point for the heating region. In this way, a large particle aerosol can be formed on a surface of the heating region to increase sweetness taste. In addition, when the aerosol-forming material is consumed in the heating region, the aerosol-forming material stored in the second micro-pores in the non-heating region can replenish the aerosol-forming material for the heating region in time, to improve atomization efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

[FIG. 1 is a schematic diagram of a structure of a heating assembly according to an embodiment of this application;
FIG. 2 is a schematic diagram of a structure of a heating assembly according to another embodiment of this application;
FIG. 3 is a schematic diagram of a structure of a heating region shown in FIG. 1; and
FIG. 4 is a sectional view of a heating region shown in FIG. 1.

DETAILED DESCRIPTION

[0035] It should be noted that embodiments of this application and technical features in embodiments may be mutually combined in a case that no conflict occurs. Detailed descriptions in a specific embodiment should be understood as an explanation of an objective of this application and should not be regarded as an improper limitation on this application.

[0036] In the descriptions in embodiments of this application, it should be noted that orientation or position relationships indicated by terms such as "thickness" are based on orientation or position relationships shown in FIG. 4, and are merely intended for ease and brevity of description in embodiments of this application, rather than indicating or implying that the mentioned apparatus or element needs to have a specific orientation or needs to be constructed and operated in a specific orientation. Therefore, such terms should not be construed as a limitation to embodiments of this application. In addition, terms "first", "second", "third", and "fourth" are merely used for description, and cannot be understood as an indication or implication relative importance.

[0037] An embodiment of this application provides an electronic atomization apparatus, including the atomizer provided in any one of embodiments of this application.

[0038] The electronic atomization apparatus is configured to atomize an aerosol-forming material to generate an aerosol for a user to inhale. The aerosol-forming material includes, but is not limited to, a medicine, a nicotine-containing material or a nicotine-free material,and the like.

[0039] The atomizer is configured to store the aerosol-forming material and atomize the aerosol-forming material to form an aerosol that can be inhaled by a user. The atomizer may be specifically used in different fields such as medical care, cosmetology, and recreation inhalation. For example, in one embodiment, the atomizer may be used in an electronic aerosol atomization apparatus to atomize an aerosol-forming material, so as to generate an aerosol for inhalation by an inhaler. The following embodiments use the recreation inhalation as an example for descriptions. Certainly, in some other embodiments, the atomizer may alternatively be used in a hair spray device, to atomize hair spray for hair styling, or used in a device for treating an upper and lower respiratory system disease to atomize medicines.

[0040] For example, the electronic atomization apparatus includes a main unit. The main unit includes a battery and a control circuit. The main unit is configured to power the atomizer and control an operation of the atomizer, so that the atomizer can atomize an aerosol-forming material to form an aerosol.

[0041] It should be noted that the atomizer and the main unit may be of an integrally formed structure or a split structure. For example, the atomizer may be detachably connected to the main unit.

[0042] An embodiment of this application provides an atomizer, including a liquid storage cavity and the heating assembly according to any one of embodiments of this application. The liquid storage cavity is configured to store an aerosol-forming material, and the heating assembly is in fluid communication with the liquid storage cavity. The heating assembly is in fluid communication with the liquid storage cavity. To be specific, the aerosol-forming material may be guided to the heating assembly through the liquid storage cavity, and the heating assembly is configured to absorb, heat, and atomize the aerosol-forming material.

[0043] A specific structure of the atomizer is not limited herein. For example, in one embodiment, the atomizer includes a shell, an atomization base, and a heating assembly. The shell includes a liquid storage cavity and an air outlet channel. The liquid storage cavity is configured to store a liquid aerosol-forming material. For example, the liquid storage cavity may be arranged around the air outlet passage. The end portion of the shell further includes a vape opening. The vape opening is communicated with the air outlet passage. An aerosol generated by the aerosol-forming material is guided to the vape opening through the air outlet passage for the user to inhale. It should be noted that a specific formation method of the vape opening is not limited herein. For example, the vape opening may be formed by a port of the air outlet passage, or a suction nozzle with the vape opening can be provided, and the suction nozzle cooperates with the shell to allow inhalation of the aerosol. Specifically, an accommodating cavity is provided on the side of the liquid storage cavity away from the vape opening of the shell, and the atomization base is disposed in the accommodating cavity. The atomization base includes an atomization top base and an atomization bottom base. The atomization top base and the atomization bottom base jointly form a receiving cavity. In other words, the atomization base includes the receiving cavity. The heating assembly is disposed in the accommodating cavity and is disposed together with the atomization base in the receiving cavity.

[0044] An embodiment of this application provides a heating assembly. Refer to FIG. 1 to FIG. 4. The heating assembly includes a substrate 10. The substrate 10 has a first surface 10a and a second surface 10b arranged opposite to each other. The substrate 10 includes a heating region 11 and a non-heating region 12. The first surface 10a includes a liquid absorbing surface. The second surface 10b includes an atomization surface. The heating region 11 is provided with a plurality of first micro-pores 11a. The non-heating region 12 is provided with a plurality of second micro-pores 12a. The first micro-pores 11a and the second micro-pores 12a are configured to guide an aerosol-forming material from the first surface 10a to the second surface 10b. In other words, the substrate 10 can implement a liquid guide function and a liquid storage function through the first micro-pores 11a and the second micro-pores 12a. The aerosol-forming material may be guided to the second surface 10b through the first micro-pores 11a and the second micro-pores 12a, and the aerosol-forming material in the heating region 11 is heated and atomized to generate an aerosol. In addition, the second surface 10b is provided with a plurality of flow channels that are communicated with the first micro-pores 11a and the second micro-pores 12a. The aerosol-forming material in the second micro-pores 12a is movable into the first micro-pores 11a through the flow channels. Because the heating region 11 has a specific degree of superheat during atomization, and the second micro-pores 12a in the non-heating region 12 store an aerosol-forming material with the temperature lower than a boiling point, the aerosol-forming material in the second micro-pores 12a near the edge of the heating region 11 enters the heating region 11 through the flow channels, to replenish the aerosol-forming material with the temperature lower than a boiling point for the heating region 11. In this way, a large particle aerosol can be formed on a surface of the heating region 11 to increase sweetness taste. In addition, when the aerosol-forming material is consumed in the heating region 11, the aerosol-forming material stored in the second micro-pores 12a in the non-heating region 12 can replenish the aerosol-forming material for the heating region 11 in time, to improve atomization efficiency.

[0045] It should be noted that there are a plurality of ways to provide the flow channels. For example, in one embodiment, refer to FIG. 1 to FIG. 4. The flow channels include a plurality of first flow channels 11b located in the heating region 11 and a plurality of second flow channels 12b located in the non-heating region 12. The first flow channels 11b pass through surfaces of the first micro-pores 11a, and the second flow channels 12b pass through surfaces of the second micro-pores 12a. In other words, the plurality of first flow channels 11b passing through the surfaces of the first micro-pores 11a are provided in the heating region 11, and the plurality of second flow channels 12b passing through the surfaces of the second micro-pores 12a are provided in the non-heating region 12. In this case, neighboring first micro-pores 11a are communicated with each other through the first flow channel 11b, neighboring second micro-pores 12a are communicated with each other through the second flow channel 12b, and neighboring first flow channels 11b are communicated with neighboring second flow channel 12b, so that the neighboring first micro-pores 11a are communicated with the neighboring second micro-pores 12a.

[0046] The first flow channel 11b and the second flow channel 12b have a capillary action, to guide the aerosol-forming material in a transverse direction. After the aerosol-forming material enters the first micro-pores 11a from the first surface 10a, transverse liquid replenishment is implemented under a capillary force of the first flow channel 11b, so that the aerosol-forming material is evenly distributed between the first micro-pores 11a. After the aerosol-forming material enters the second micro-pores 12a from the first surface 10a, transverse liquid replenishment is implemented under a capillary force of the second flow channel 12b, so that the aerosol-forming material is evenly distributed between the second micro-pores 12a. In addition, the neighboring first flow channels 11b are communicated with the neighboring second flow channels 12b, so that the neighboring first micro-pores 11a are communicated with the neighboring second micro-pores 12a. In other words, the aerosol-forming material in each second micro-pores 12a is movable into the first micro-pores 11a through the first flow channels 11b and the second flow channels 12b. Because the heating region 11 has a specific degree of superheat during atomization, and the second micro-pores 12a in the non-heating region 12 store an aerosol-forming material with the temperature lower than a boiling point, the aerosol-forming material in the second micro-pores 12a of the edge of the heating region 11 enters the first micro-pores 11a of the heating region 11 through the flow channels, to replenish the aerosol-forming material with the temperature lower than a boiling point for the heating region 11. In this way, a large particle aerosol can be formed on a surface of the heating region 11 to increase sweetness taste.

[0047] It should be noted that the transverse direction is a direction that is not parallel to an extending direction of the first micro-pores 11a and the second micro-pores 12a, for example, a direction that is perpendicular to a central axis of the first micro-pores 11a and the second micro-pores 12a, or a direction that is parallel to the second surface 10b.

[0048] In one embodiment, the heating assembly includes a heating element (not shown in the figure). The heating element is an independent element disposed in the heating region 11. For example, the heating element may be a heating sheet, a heating film, a heating mesh, or the like that can heat and atomize the aerosol-forming material. The heating element may be disposed on the heating region 11, or may be embedded in the substrate 10, which is specifically designed as required.

[0049] In one embodiment, the heating assembly further includes a positive electrode and a negative electrode, and two ends of the heating element are respectively electrically connected to the positive electrode and the negative electrode. Both the positive electrode and the negative electrode are electrically connected to a main unit.

[0050] In some other embodiments, the substrate 10 has a conductive function and can generate heat by itself, for example, conductive ceramic generating heat by itself or glass with a conductive function. In this case, the heating element does not need to be disposed. In other words, the heating element is of an optional structure.

[0051] In the related art, the substrate 10 may be a porous substrate 10, for example, porous ceramic, cotton, quartz sand core, or a material of a foam structure. However, it is hard for porous ceramic manufactured through high-temperature sintering to accurately control position distribution and size precision of micro-pores.

[0052] To improve consistency of distribution and sizes of micro-pores in the heating assembly, the substrate 10 is a dense substrate 10, and an array through hole and a heating film are formed on the dense substrate 10 by using a micromachining technology. It should be noted that a specific type of the substrate 10 is not limited herein, including but not limited to materials, such as dense ceramic, glass, or silicon. For example, the substrate 10 is a glass substrate 10. In one specific embodiment, the substrate 10 is borosilicate glass. The borosilicate glass has good heat resistance. In another specific embodiment, the substrate 10 is quartz glass.

[0053] There are a plurality of ways to provide the first flow channels 11b. For example, in one embodiment, refer to FIG. 1 and FIG. 3. The heating region 11 is provided with a plurality of first grooves 11c extending along a first direction and a plurality of second grooves 11d extending along a second direction. The first grooves 11c and the second grooves 11d are arranged in an intersecting manner, and each first groove 11c and each second groove 11d form the first flow channel 11b. It may be understood that the first grooves 11c and the second grooves 11d are provided simultaneously. The first groove 11c and the second groove 11d have a capillary action, so that the aerosol-forming material may be guided in the transverse direction, and the aerosol-forming material may be further evenly distributed between the first micro-pores 11a.

[0054] The first grooves 11c and the second grooves 11d are arranged in an intersecting manner. In other words, the first direction is not parallel to the second direction, to be specific, an included angle is formed between the first direction and the second direction. For example, a range of the included angle is from 1 degree to 89 degrees. In this embodiment of this application, the first direction is perpendicular to the second direction.

[0055] In some other embodiments, only the plurality of first grooves 11c extending along the first direction or only the plurality of second grooves 11d extending along the second direction are provided. In other words, the neighboring first micro-pores 11a are only communicated with each other in one direction. The first groove 11c and/or the second groove 11d have a capillary action, so that the aerosol-forming material may be guided in the transverse direction, and the aerosol-forming material is evenly distributed between the first micro-pores 11a, to implement transverse liquid replenishment.

[0056] There are a plurality of ways to provide the second flow channels 12b. For example, in one embodiment, refer to FIG. 1. The non-heating region 12 is provided with a plurality of third grooves 12c extending along a third direction and a plurality of fourth grooves 12d extending along a fourth direction. The third grooves 12c and the fourth grooves 12d are arranged in an intersecting manner, and each third groove 12c and each fourth groove 12d form the second flow channel 12b. It may be understood that the third grooves 12c and the fourth grooves 12d are provided simultaneously. The third groove 12c and the fourth groove 12d have a capillary action, so that the aerosol-forming material may be guided in the transverse direction, and the aerosol-forming material may be further evenly distributed between the second micro-pores 12a.

[0057] The third grooves 12c and the fourth grooves 12d are arranged in an intersecting manner. In other words, the third direction is not parallel to the fourth direction, to be specific, an included angle is formed between the third direction and the fourth direction. A range of the included angle may from 1 degree to 89 degrees, for example, the included angle is 10°, 30°, 45°, 60°, 70°, 80°, or the like. In this embodiment of this application, the third direction is perpendicular to the fourth direction.

[0058] In some other embodiments, only the plurality of third grooves 12c extending along the third direction or only the plurality of fourth grooves 12d extending along the fourth direction are provided. In other words, the neighboring second micro-pores 12a are only communicated with each other in one direction. The third groove 12c and/or the fourth groove 12d have a capillary action, so that the aerosol-forming material may be guided in the transverse direction, and the aerosol-forming material is evenly distributed between the second micro-pores 12a, to implement transverse liquid replenishment.

[0059] In one embodiment, the plurality of first micro-pores 11a are distributed in an array, each first groove 11c corresponds to one or more rows of first micro-pores 11a, and each second groove 11d corresponds to one or more columns of first micro-pores 11a, which is specifically designed as required. In this embodiment, each first groove 11c corresponds to one row of first micro-pores 11a, and each second groove 11d corresponds to one column of first micro-pores 11a (as shown in FIG. 1 and FIG. 3).

[0060] In one embodiment, the plurality of second micro-pores 12a are distributed in an array, each third groove 12c corresponds to one or more rows of second micro-pores 12a, and each fourth groove 12d corresponds to one or more columns of second micro-pores 12a, which is specifically designed as required. In this embodiment, each third groove 12c corresponds to one row of second micro-pores 12a, and each fourth groove 12d corresponds to one column of second micro-pores 12a (as shown in FIG. 1).

[0061] In one embodiment, the width of the first flow channel 11b is 1 μm to 100 μm. When the width of the first flow channel 11b is greater than 100 μm, a capillary force of the first flow channel 11b is not strong, and it is hard to guide the aerosol-forming material in the second micro-pore 12a to the heating region 11. In this way, atomization efficiency is not apparently improved. When the width of the first flow channel 11b is less than 1 μm, flow resistance is excessively large, so that the aerosol-forming material slowly flows. In this case, the aerosol-forming material in the second micro-pores 12a near the edge of the heating region 11 cannot enter the heating region 11 through the first flow channels 11b in time, that is, cannot replenish an aerosol-forming material with the temperature lower than a boiling point for the heating region 11. In this way, it is not conducive to formation of a large particle aerosol on a surface of the heating region 11 and an increase of sweetness taste. In addition, atomization efficiency is reduced. Therefore, the width of the first flow channel 11b is set to 1 μ m to 100 μ m, so that the capillary force of the first flow channel 11b is ensured to meet a requirement and the flow resistance is not excessively large. This is conducive to formation of a large aerosol particle on the surface of the heating region 11 and an increase of sweetness taste. In addition, atomization efficiency is improved.

[0062] In one embodiment, the width of the second flow channel 12b is 1 μm to 100 μm. When the width of the second flow channel 12b is greater than 100 μm, a capillary force of the second flow channel 12b is not strong, it is hard for the aerosol-forming material to flow in the second flow channel 12b, and it is hard to guide the aerosol-forming material in the second micro-pore 12a to the heating region 11. In this way, it is not conducive to atomization of the aerosol-forming material. When the width of the second flow channel 12b is less than 1 μm, flow resistance is excessively large, so that the aerosol-forming material slowly flows, and it is not conducive to atomization of the aerosol-forming material.

[0063] In one embodiment, the ratio of the width of the first flow channel 11b to the pore size of the first micro-pore 11a is less than or equal to 1.2, to ensure that the capillary force of the first flow channel 11b meets a requirement.

[0064] In one embodiment, the ratio of the width of the second flow channel 12b to the pore size of the first micro-pore 11a is less than or equal to 1.2, to ensure that the capillary force of the second flow channel meets a requirement.

[0065] In one embodiment, the depth of the first flow channel 11b ranges from 1 μm to 200 μm. When the depth of the first flow channel 11b is less than 1 μm, the capillary force of the first flow channel 11b is not apparent, and it is hard to guide the aerosol-forming material in the first micro-pore 11a to the first flow channel 11b. Dry heating occurs in the first flow channel 11b, resulting in serious fouling of the heating film. In this way, it is not conducive to atomization of the aerosol-forming material. When the depth of the first flow channel 11b is greater than 200 μm, excessive liquid explosion may easily occur, the heating film may be hardly formed in the first flow channel 11b. If the substrate 10 is quite thin and the depth of the first flow channel 11b is excessively large, strength may be easily affected. Optionally, the depth of the first flow channel 11b ranges from 1 μm to 50 μm, so that excessive liquid explosion may be avoided and the size of an aerosol particle may be prevented from being excessively large.

[0066] In one embodiment, the depth of the second flow channel 12b ranges from 1 μm to 200 μm. When the depth of the second flow channel 12b is less than 1 μm, the capillary force of the second flow channel 12b is not apparent, and it is hard to guide the aerosol-forming material in the second micro-pore 12a to the second flow channel 12b. Dry heating occurs in the second flow channel 12b. In this way, it is not conducive to atomization of the aerosol-forming material. When the depth of the second flow channel 12b is greater than 200 μm, strength may be easily affected.

[0067] In one embodiment, the depth of the second flow channel 12b is greater than the depth of the first flow channel 11b. In this way, when being heated and atomized, the aerosol-forming material in the first flow channel 11b boils and is atomized preferentially, and the aerosol-forming material with the temperature lower than a boiling point in the second flow channel 12b can be replenished into the first flow channel 11b in time, so that a large aerosol particles may be formed on the surface of the heating region 11 to increase sweetness taste. Because the second flow channel 12b is provided in the non-heating region, there is no need to provide a heating film. The depth can be appropriately increased without affecting structural strength, so that the depth of the second flow channel 12b is greater than the depth of the first flow channel 11b. In this way, the aerosol-forming material with the temperature lower than a boiling point in the second flow channel 12b can be replenished into the first flow channel 11b in time.

[0068] It should be noted that a specific shape and size of the first micro-pore 11a are not limited herein. For example, in one embodiment, the first micro-pore 11a is a circular hole, and the pore size of the first micro-pore 11a ranges from 1 μm to 100 μm. When the pore size of the first micro-pore 11a is less than 1 μm, a liquid supply requirement cannot be met, resulting in a decrease in an amount of aerosols. When the pore size of the first micro-pore 11a is greater than 100 μm, the aerosol-forming material easily flows out of the first micro-pore 11a to cause liquid leakage. In this case, the electronic atomization apparatus may be damaged due to the liquid leakage, and user experience is reduced. In addition, insufficient atomization and waste of e-liquid occur. Optionally, the pore size of the first micro-pore 11a ranges from 20 μm to 50 μm. It may be understood that the pore size of the first micro-pore 11a is selected based on an actual requirement.

[0069] It should be noted that a specific shape and size of the second micro-pore 12a are not limited herein. For example, in one embodiment, the second micro-pore 12a is a circular hole, and the pore size of the second micro-pore 12a ranges from 1 μm to 100 μm. When the pore size of the second micro-pore 12a is less than 1 μm, a liquid supply requirement cannot be met, resulting in a decrease in an amount of aerosols. When the pore size of the second micro-pore 12a is greater than 100 μm, the aerosol-forming material easily flows out of a micro-pore to cause liquid leakage. In this case, the electronic atomization apparatus may be damaged due to the liquid leakage, and user experience is reduced. Optionally, the pore size of the second micro-pore 12a ranges from 20 μm to 50 μm. It may be understood that the pore size of the second micro-pore 12a is selected based on an actual requirement.

[0070] In some other embodiments, the first micro-pore 11a is a first elongated hole, the width of the first elongated hole ranges from 1 μm to 100 μm, and the length-width ratio of the first elongated hole is greater than 1.5. When the width of the first elongated hole is less than 1 μm, a liquid supply requirement cannot be met, resulting in a decrease in an amount of aerosols. In other words, if the width of the second elongated hole is excessively small, insufficient liquid supply occurs, resulting in serious fouling of the heating film. When the width of the first elongated hole is greater than 100 μm, the aerosol-forming material easily flows out of a micro-pore to cause liquid leakage. In this case, the electronic atomization apparatus may be damaged due to the liquid leakage, and user experience is reduced. In addition, during atomization, excessive liquid explosion, insufficient atomization, and waste of e-liquid may occur. Optionally, the width of the first elongated hole ranges from 20 μm to 45 μm. It may be understood that the width and the length of the first elongated hole are selected based on an actual requirement.

[0071] In some other embodiments, the second micro-pore 12a is a second elongated hole, the width of the second elongated hole ranges from 1 μm to 100 μm, and the length-width ratio of the second elongated hole is greater than 1.5. When the width of the second elongated hole is less than 1 μm, a liquid supply requirement cannot be met, resulting in a decrease in an amount of aerosols. When the width of the second elongated hole is greater than 100 μm, the aerosol-forming material easily flows out of a micro-pore to cause liquid leakage, and user experience is reduced. Optionally, the width of the second elongated hole ranges from 20 μm to 45 μm. It may be understood that the width and the length of the second elongated hole are selected based on an actual requirement.

[0072] It may be understood that the first micro-pore 11a may be a circular hole, or an elongated hole, or a part of the first micro-pores 11a are circular holes, and a part of the first micro-pores 11a are elongated holes. Certainly, the first micro-pore 11a may alternatively be a hole in another shape.

[0073] The second micro-pore 12a may be a circular hole, or an elongated hole, or a part of the second micro-pores 12a are circular holes, and a part of the second micro-pores 12a are elongated holes. Certainly, the second micro-pore 12a may alternatively be a hole in another shape.

[0074] In one embodiment, the porosity of the heating region 11 is less than the porosity of the non-heating region 12. The porosity is a percentage of the volume of micro-pores in the substrate 10 to the total volume of materials in a natural state, that is, a percentage of the volume of the micro-pores in the substrate 10 to the total volume of the substrate 10. The porosity of the heating region 11 is a percentage of the volume of the first micro-pores 11a in the heating region 11 to the total volume of the heating region 11 of the substrate 10, and the porosity of the non-heating region 12 is a percentage of the volume of the second micro-pores 12a in the non-heating region 12 to the total volume of the non-heating region 12 of the substrate 10. It may be understood that an excessively large porosity affects the strength of the substrate 10. While an excessively small porosity affects liquid supply.

[0075] In addition, the heating assembly includes the heating film provided in the heating region 11 of the substrate 10. Therefore, if the porosity of the heating region 11 of the substrate 10 is excessively large, the quality of the heating film is affected. Therefore, it is necessary to make a balance between the quality of the heating film and the liquid supply performance. To be specific, the porosity may be appropriately reduced, without affecting the liquid supply performance, to improve the quality of the heating film. The non-heating region 12 does not need to be provided with the heating film. Therefore, the porosity may be appropriately increased, while it is ensured that the substrate 10 has sufficient strength, to improve the liquid supply performance.

[0076] In one embodiment, the porosity of the heating region 11 ranges from 15% to 40%. When the porosity of the heating region 11 is lower than 15%, an amount of liquid supply is affected, an amount of smoke is reduced, and the heating film is seriously fouled due to insufficient liquid supply. When the porosity of the heating region 11 is higher than 40%, the quality of the heating film is affected.

[0077] In one embodiment, the porosity of the non-heating region 12 ranges from 20% to 80%. When the porosity of the non-heating region 12 is lower than 20%, an amount of liquid supply is affected. It is not conducive for the aerosol-forming material in the second micro-pores 12a near the edge of the heating region 11 to enter the heating region 11 through the flow channels, and replenish an aerosol-forming material with the temperature lower than a boiling point for the heating region 11, so that atomization efficiency is reduced and it is not conducive to formation of a large particle aerosol on a surface of the heating region 11 and an increase of sweetness taste. When the porosity of the heating region 11 is higher than 80%, the strength of the substrate 10 is affected.

[0078] In one embodiment, the ratio of the porosity of the non-heating region 12 to the porosity of the heating region 11 ranges from 1 to 2. It is ensured that the substrate 10 has the sufficient strength and the liquid supply performance as much as possible without affecting the quality of the heating film.

[0079] It should be noted that there are a plurality of manners to set the porosity of the non-heating region 12 to be greater than the porosity of the heating region 11. For example, in one embodiment, as shown in FIG. 1, the pore size of the first micro-pore 11a is equal to the pore size of the second micro-pore 12a, and the center-to-center distance between neighboring first micro-pores 11a is greater than the center-to-center distance between neighboring second micro-pores 12a. In other words, in this embodiment, the pore size of the first micro-pore 11a is equal to the pore size of the second micro-pore 12a. The center-to-center distance between neighboring first micro-pores 11a is set to be greater than the center-to-center distance between neighboring second micro-pores 12a. In this way, when the area of the heating region 11 is equal to the area of the non-heating region 12, a quantity of the first micro-pores 11a in the heating region 11 is less than a quantity of the second micro-pores 12a in the non-heating region 12, so that the volume of the first micro-pores 11a in the heating region 11 is smaller than the volume of the second micro-pores 12a in the non-heating region 12, thereby enabling the porosity of the non-heating region 12 to be greater than the porosity of the heating region 11.

[0080] In some other embodiments, as shown in FIG. 2, the center-to-center distance between neighboring first micro-pores 11a is equal to the center-to-center distance between neighboring second micro-pores 12a, and the pore size of the first micro-pore 11a is less than the pore size of the second micro-pore 12a. In other words, in this embodiment, the center-to-center distance between neighboring first micro-pores 11a is equal to the center-to-center distance between neighboring second micro-pores 12a. The pore size of the first micro-pore 11a is set to be less than the pore size of the second micro-pore 12a. In this way, when the area of the heating region 11 is equal to the area of the non-heating region 12, a quantity of the first micro-pores 11a in the heating region 11 is equal to a quantity of the second micro-pores 12a in the non-heating region 12, but the volume of the first micro-pores 11a in the heating region 11 is smaller than the volume of the second micro-pores 12a in the non-heating region 12, thereby enabling the porosity of the non-heating region 12 to be greater than the porosity of the heating region 11.

[0081] In some still other embodiments, when other conditions are the same, the first micro-pore 11a is configured as a circular hole, and at least a part of the second micro-pores 12a are configured as elongated holes. In this way, when the area of the heating region 11 is equal to the area of the non-heating region 12, the volume of the first micro-pores 11a in the heating region 11 is smaller than the volume of the second micro-pores 12a in the non-heating region 12, thereby enabling the porosity of the non-heating region 12 to be greater than the porosity of the heating region 11. For example, at least a part of the second micro-pores 12a near the heating region 11 are configured as elongated holes. The porosity of the non-heating region 12 is enabled to be greater than the porosity of the heating region 11, so that a liquid supply capacity is improved. In addition, the elongated holes are provided close to the heating region 11, so that the non-heating region 12 can replenish an aerosol-forming material with the temperature lower than a boiling point for the heating region 11 in time, thereby improving atomization efficiency and the atomization effect.

[0082] Certainly, in another embodiment, the pore size of the first micro-pore 11a may alternatively be set to be less than the pore size of the second micro-pore 12a simultaneously, and the center-to-center distance between neighboring first micro-pores 11a is greater than the center-to-center distance between neighboring second micro-pores 12a. The pore size of the first micro-pore 11a may alternatively be set to be less than the pore size of the second micro-pore 12a, but the center-to-center distance between neighboring first micro-pores 11a is less than the center-to-center distance between neighboring second micro-pores 12a. The pore size of the first micro-pore 11a may alternatively be set to be greater than the pore size of the second micro-pore 12a, and the center-to-center distance between neighboring first micro-pores 11a is greater than the center-to-center distance between neighboring second micro-pores 12a. In addition, the first micro-pore 11a may be selectively configured as an elongated hole and/or the second micro-pore 12a may be selectively configured as an elongated hole according to a situation. A specific configuration manner is determined according to an actual situation, provided that the porosity of the non-heating region 12 can be greater than the porosity of the heating region 11.

[0083] In the descriptions of this application, descriptions of reference terms such as "in one embodiment", "in some embodiments", "in some other embodiments", "in some still other embodiments", or "for example" mean that specific features, structures, materials, or characteristics described with reference to this embodiment or the example are included in at least one embodiment or example of embodiments of this application. In this application, schematic descriptions of the foregoing terms do not necessarily refer to the same embodiment or example. Besides, the specific features, the structures, the materials or the characteristics that are described may be combined in proper manners in any one or more embodiments or examples. In addition, a person skilled in the art may combine different embodiments or examples described in this application and features of the different embodiments or examples without mutual contradiction.

[0084] The descriptions are merely preferred embodiments of this application and are not intended to limit this application. For a person skilled in the art, this application may have various modifications and changes. Any modification, equivalent replacement, or improvement made without departing from the spirit and principle of this application shall fall within the protection scope of this application.

Claims

1. A heating assembly, comprising a substrate, wherein the substrate has a first surface and a second surface arranged opposite to each other; the substrate comprises a heating region and a non-heating region, the heating region is provided with a plurality of first micro-pores, the non-heating region is provided with a plurality of second micro-pores, and the first micro-pores and the second micro-pores are configured to guide an aerosol-forming material from the first surface to the second surface; and
   the second surface is provided with a plurality of flow channels that are communicated with the first micro-pores and the second micro-pores, and the aerosol-forming material in the second micro-pores is movable into the first micro-pores through the flow channels.

2. The heating assembly according to claim 1, wherein the flow channels comprise a plurality of first flow

channels located in the heating region and a plurality of second flow channels located in the non-heating region, the first flow channels pass through surfaces of the first micro-pores, and the second flow channels pass through surfaces of the second micro-pores.

3. The heating assembly according to claim 2, wherein the heating region is provided with a plurality of first grooves extending along a first direction and a plurality of second grooves extending along a second direction, the first grooves and the second grooves are arranged in an intersecting manner, and each first groove and each second groove form the first flow channel; and/or
the non-heating region is provided with a plurality of third grooves extending along a third direction and a plurality of fourth grooves extending along a fourth direction, the third grooves and the fourth grooves are arranged in an intersecting manner, and each third groove and each fourth groove form the second flow channel.

4. The heating assembly according to claim 3, wherein the plurality of first micro-pores are distributed in an array, each first groove corresponds to one or more rows of first micro-pores, and each second groove corresponds to one or more columns of first micro-pores; and/or
the plurality of second micro-pores are distributed in an array, each third groove corresponds to one or more rows of second micro-pores, and each fourth groove corresponds to one or more columns of second micro-pores.

5. The heating assembly according to claim 2, wherein a width of the first flow channel ranges from 1 μm to 100 μm; and/or a width of the second flow channel ranges from 1 μm to 100 μm.

6. The heating assembly according to claim 5, wherein a ratio of the width of the first flow channel to a pore size of the first micro-pore is less than or equal to 1.2; and/or a ratio of the width of the second flow channel to a pore size of the second micro-pore is less than or equal to 1.2.

7. The heating assembly according to claim 2, wherein a depth of the first flow channel ranges from 1 μm to 200 μm; and/or a depth of the second flow channel ranges from 1 μm to 200 μm.

8. The heating assembly according to claim 2, wherein a depth of the second flow channel is greater than a depth of the first flow channel.

9. The heating assembly according to claim 1, wherein a pore size of the first micro-pore ranges from 1 μm to 100 μm; and/or a pore size of the second micro-pore ranges from 1 μm to 100 μm.

10. The heating assembly according to claim 1, wherein the first micro-pore is a first elongated hole, a width of the first elongated hole ranges from 1 μm to 100 μm, and a length-width ratio of the first elongated hole is greater than 1.5; and/or
the second micro-pore is a second elongated hole, a width of the second elongated hole ranges from 1 μm to 100 μm, and a length-width ratio of the second elongated hole is greater than 1.5.

11. The heating assembly according to claim 1, wherein a porosity of the heating region is less than a porosity of the non-heating region.

12. The heating assembly according to claim 11, wherein a porosity of the heating region ranges from 15% to 40%; and/or a porosity of the non-heating region ranges from 20% to 80%.

13. The heating assembly according to claim 11, wherein the ratio of the porosity of the non-heating region to the porosity of the heating region is 1 to 2.

14. The heating assembly according to claim 11, wherein a pore size of the first micro-pore is equal to a pore size of the second micro-pore, and a center-to-center distance between neighboring first micro-pores is greater than a center-to-center distance between neighboring second micro-pores.

15. The heating assembly according to claim 11, wherein a center-to-center distance between neighboring first micro-pores is equal to a center-to-center distance between neighboring second micro-pores, and a pore size of the first micro-pore is less than a pore size of the second micro-pore.

16. The heating assembly according to claim 1, comprising a heating element, wherein the heating element is an independent element disposed in the heating region; or the substrate has a conductive function.

17. The heating assembly according to claim 1, wherein the substrate is a dense substrate.

18. An atomizer, comprising:

a liquid storage cavity, configured to store an aerosol-forming material; and
the heating assembly according to any one of claims 1 to 17, wherein the heating assembly is in fluid communication with the liquid storage cavity.

19. An electronic atomization apparatus, comprising the

atomizer according to claim 18.

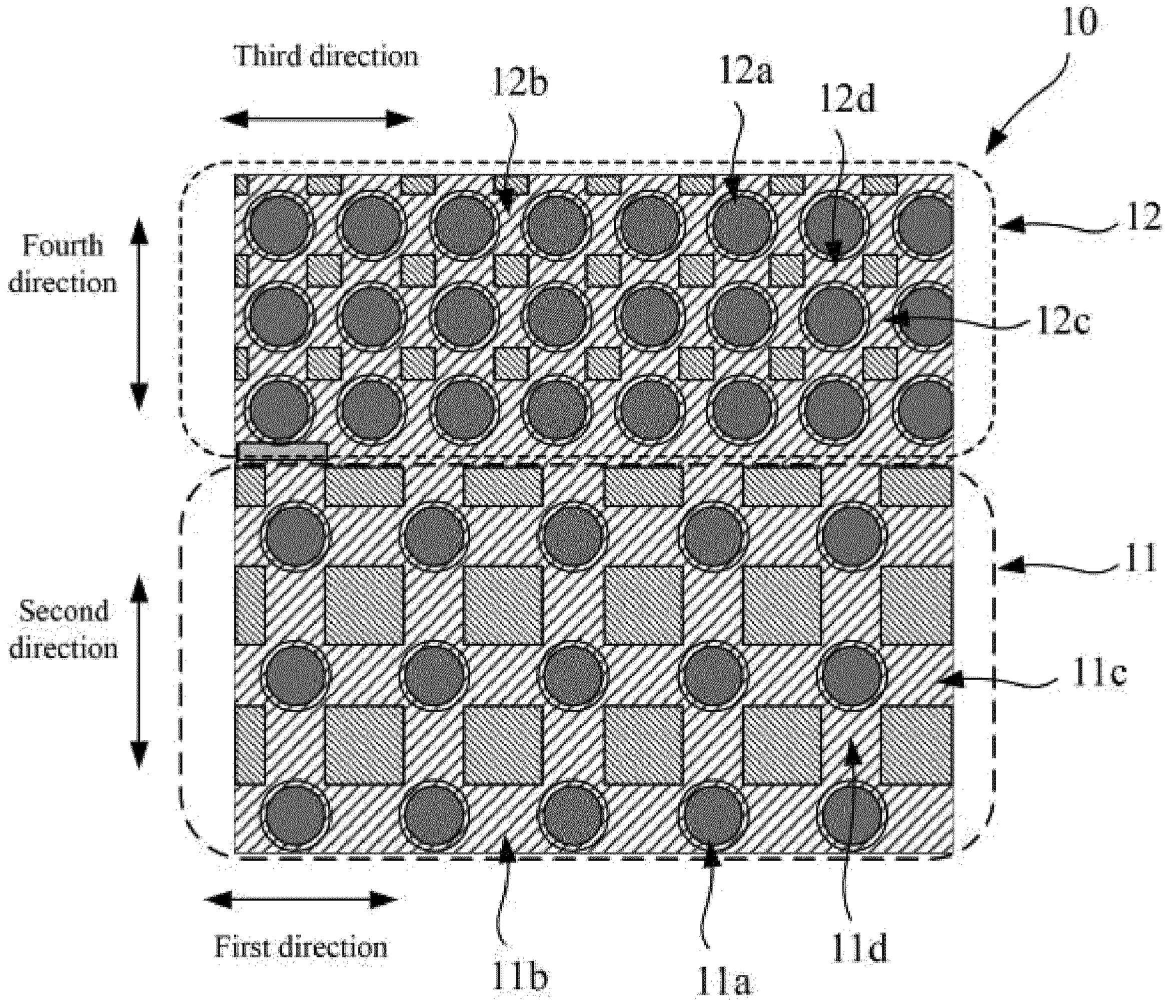

10
Third direction
12b
12a
12d
12
Fourth direction
12c
11
Second direction
11c
First direction
11b
11a
11d

FIG. 1

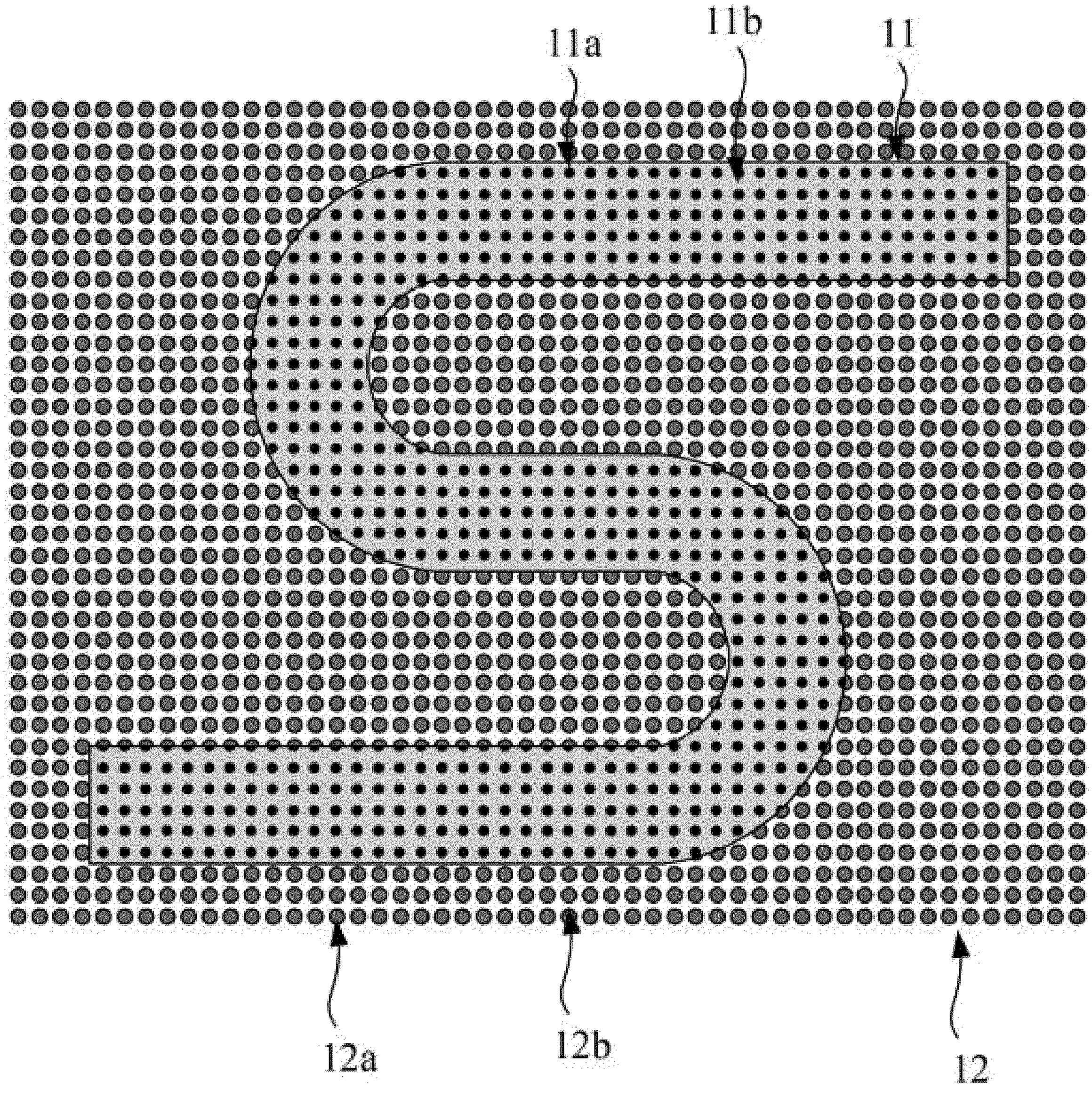
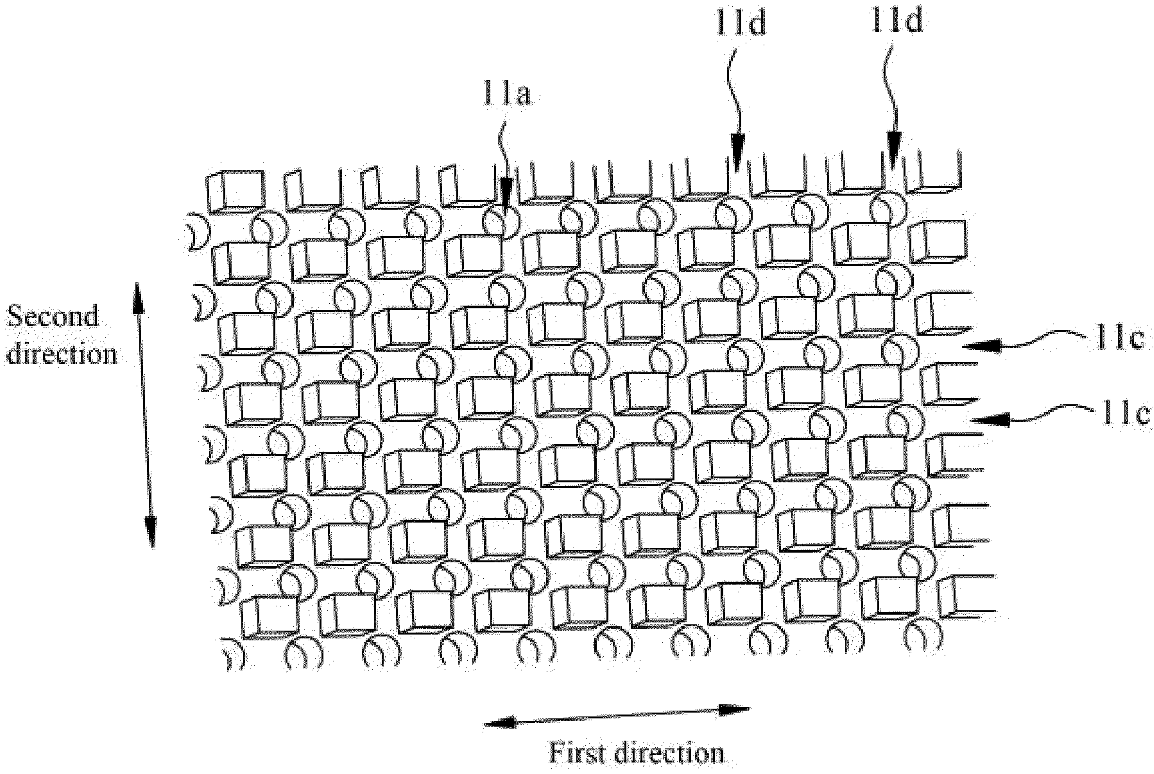


FIG. 2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11d
11a
Second
direction
11c
11c
First direction

FIG. 3

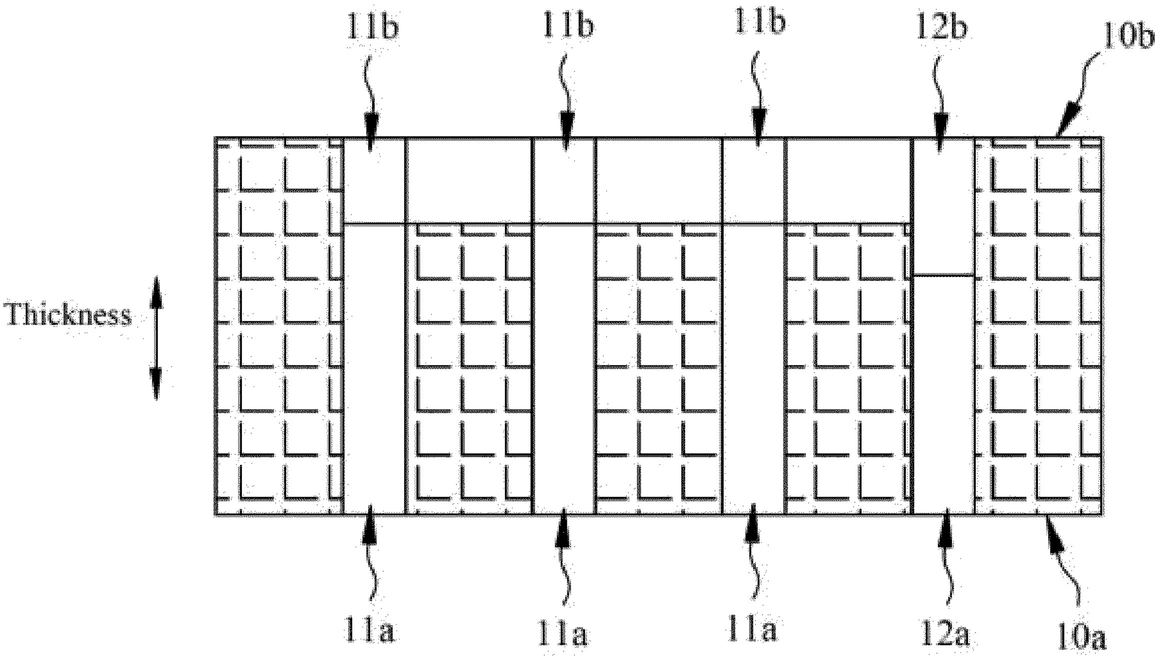
11b
11b
11b
12b
10b
Thickness
11a
11a
11a
12a
10a

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No. **PCT/CN2022/117565**

A. CLASSIFICATION OF SUBJECT MATTER

A24F40/46(2020.01)i;A24F40/40(2020.01)i;A24F40/48(2020.01)i;A24F40/10(2020.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:A24F 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, VEN: 电子烟, 雾化, 基体, 吸液, 雾化, 面, 孔, 流道, 槽, 毛细, e cigarette, electric+ cigarette, atomiz+, matrix, base, substrate, liquid suct+, face, surface, +pore?, flow channel, groove, capillary, wick+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2022179641 A2 (SHENZHEN SMOORE TECHNOLOGY LIMITED) 01 September 2022 (2022-09-01) description, paragraphs 0020-0023 and 0061-0109, and figures 1-9	1-19
Y	CN 114794576 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 29 July 2022 (2022-07-29) description, paragraphs 0055-0093, and figures 1-9	1-19
Y	CN 216019118 U (SHENZHEN SMOORE TECHNOLOGY LIMITED) 15 March 2022 (2022-03-15) description, paragraphs 0007-0026, and figures 1-4	1-19
Y	WO 2022179301 A2 (SHENZHEN SMOORE TECHNOLOGY LIMITED) 01 September 2022 (2022-09-01) description, page 4, last paragraph to page 11, paragraph 1, and figures 1-9	1-19
Y	CN 114794578 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 29 July 2022 (2022-07-29) description, paragraphs 0077-0168, and figures 1-9	1-19

☑ 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
- "D" document cited by the applicant in the international application
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 April 2023	**05 June 2023**

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Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/117565

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2022179300 A2 (SHENZHEN SMOORE TECHNOLOGY LIMITED) 01 September 2022 (2022-09-01) description, page 4, paragraph 4 to page 12, paragraph 1, and figures 1-9	1-19
A	CN 113729303 A (SHENZHEN CLOUPOR TECHNOLOGY CO., LTD.) 03 December 2021 (2021-12-03) entire document	1-19
A	CN 114794567 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 29 July 2022 (2022-07-29) entire document	1-19
A	CN 209376696 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 13 September 2019 (2019-09-13) entire document	1-19

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/117565

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CN 114794576 A	29 July 2022	None	
CN 216019118 U	15 March 2022	None	
WO 2022179301 A2	01 September 2022	WO 2022179301 A3	20 October 2022
CN 114794578 A	29 July 2022	None	
WO 2022179300 A2	01 September 2022	WO 2022179300 A3	20 October 2022
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CN 114794567 A	29 July 2022	None	
CN 209376696 U	13 September 2019	EP 3888479 A1	06 October 2021
		EP 3888479 A4	23 February 2022
		US 2021345670 A1	11 November 2021
		WO 2020108258 A1	04 June 2020

Form PCT/ISA/210 (patent family annex) (July 2022)