

HEATING ASSEMBLY AND AEROSOL GENERATION DEVICE

Technical Field

[0001] The present application relates to the technical field of atomization devices, specifically to a heating assembly and an aerosol generation device.

Background

[0002] Heat-not-burn aerosol generation devices are gaining increasing attention and favor due to their advantages of safety, convenience, health, and environmental friendliness. These devices generate aerosol by heating and baking various forms of aerosol generation substrates and deliver the aerosol to users for inhalation. This "heat-not-burn" method ensures that the aerosol generation substrate is heated at a relatively low temperature without combustion and without producing an open flame, effectively avoiding the generation of harmful substances caused by the aerosol generation substrate.

[0003] In heat-not-burn devices, the heating element typically provides circumferential heating to the aerosol generation substrate. However, this heating element tends to concentrate heat around the circumference of the aerosol generation substrate, resulting in excessively high heating temperatures, which can produce high-temperature aerosol and negatively affect user experience.

Summary

[0004] The objective of the present application is to provide a heating assembly that forms relatively independent heating zones to avoid excessively high heating temperatures that produce high-temperature aerosol, thereby improving user experience.

[0005] Additionally, the present application aims to provide an aerosol generation device using the aforementioned heating assembly.

[0006] According to the first aspect, an embodiment provides a heating assembly including a heating element configured to heat an aerosol generation substrate, where the heating element includes at least two heating zones. A thermal barrier structure is provided between at least one pair of adjacent heating zones, the thermal barrier structure being configured to reduce heat transfer between the adjacent heating zones.

[0007] In the heating assembly of the above embodiment, the heating element includes at least two heating zones, and a thermal barrier structure is provided between at least one pair of adjacent heating zones. The thermal barrier structure is used to prevent heat conduction between adjacent heating zones, reducing the heat transfer speed between different heating zones, improving the thermal insulation performance between adjacent heating zones, and forming relatively independent heating zones between adjacent heating zones. This allows for selective heating of the heating zones as needed, thereby helping to reduce the overall temperature of the heating element and consequently lowering the temperature of the aerosol generated by the aerosol generation substrate, improving user experience.

[0008] Further, in one embodiment, the heating element includes a heat-insulating zone, which

is provided between two adjacent heating zones. The thermal barrier structure includes an insulating body embedded in the heat-insulating zone of the heating element to block heat transfer between the adjacent heating zones.

[0009] In the heating assembly of the above embodiment, the heating element uses an insulating body embedded in the heat-insulating zone to separate different heating zones, employing physical blocking to prevent heat transfer between the heating zones. Thus, when the heating element heats a certain heating zone, the heat transfer from that heating zone to other heating zones is reduced, achieving localized heating of the aerosol generation substrate. During the first few puffs of the user, local heating can be controlled, and the temperature of the aerosol will not be too high, allowing the user to feel a lower temperature during the first few puffs, reducing the risk of burning the mouth and improving user experience.

[0010] Further, in one embodiment, the heating element includes a heating pipe configured to heat the aerosol generation substrate. The pipe wall of the heating pipe includes at least two heating zones, each capable of heating the aerosol generation substrate. A thermal insulation interval is provided between adjacent heating zones to prevent heat transfer between the adjacent heating zones, with the thermal insulation interval penetrating the pipe wall of the heating pipe in the radial direction. The heating zones form the heating zones, and the thermal insulation interval forms the thermal barrier structure. The heating assembly includes a thermoplastic sealing layer provided on the heating pipe and covering the thermal insulation interval to prevent airflow within the heating pipe from flowing out through the thermal insulation interval.

[0011] In the heating assembly of the above embodiment, the thermal insulation interval is used to prevent heat conduction between adjacent heating zones, reducing the heat transfer speed between different heating zones. Consequently, when the heating requirements of adjacent heating zones differ, mutual influence is minimized, and heat loss is reduced. Meanwhile, by covering the thermal insulation interval with a thermoplastic sealing layer, airflow within the heating pipe is prevented from flowing out through the thermal insulation interval, further reducing heat loss.

[0012] Further, in one embodiment, the heating element includes a thermally conductive pipe and electric heating elements provided on the thermally conductive pipe. The thermally conductive pipe has a heating chamber for inserting the aerosol generation substrate, and the pipe wall of the thermally conductive pipe includes at least two heating zones. The number of electric heating elements is at least two, with each heating zone corresponding to at least one electric heating element, and the electric heating element is configured to heat the corresponding heating zone. A pipe wall thinning portion is provided on the pipe wall of the thermally conductive pipe between at least one pair of adjacent heating zones, and the wall thickness of the pipe wall thinning portion is less than the wall thickness of the heating zones. The heating zones form the heating zones, and the pipe wall thinning portion forms the thermal barrier structure.

[0013] In the heating assembly of the above embodiment, the pipe wall thinning portion slows down the heat transfer speed between adjacent heating zones. When one of the adjacent heating zones is heating, the heat is more concentrated in the heated area of the working heating zone, resulting in higher heat utilization efficiency, less heat loss, and improved independent heating efficiency of the heating zones.

Brief Description of Drawings

[0014] FIG. 1 is a sectional view of the aerosol generation device provided in the present application;

[0015] FIG. 2 is a partial enlarged schematic view of area A in FIG. 1;

[0016] FIG. 3 is a perspective view of the thermally conductive body and heating structure in the first embodiment of the heating assembly provided in the present application;

[0017] FIG. 4 is an exploded view of the thermally conductive body and heating structure in the first embodiment of the heating assembly provided in the present application;

[0018] FIG. 5 is a perspective view of the thermally conductive body and heating structure in the second embodiment of the heating assembly provided in the present application;

[0019] FIG. 6 is an exploded view of the thermally conductive body and heating structure in the second embodiment of the heating assembly provided in the present application;

[0020] FIG. 7 is a perspective view of the thermally conductive body and heating structure in the third embodiment of the heating assembly provided in the present application;

[0021] FIG. 8 is an exploded view of the thermally conductive body and heating structure in the third embodiment of the heating assembly provided in the present application;

[0022] FIG. 9 is a structural schematic view from one perspective of the heating assembly provided in one embodiment of the present application;

[0023] FIG. 10 is a structural schematic view from another perspective of FIG. 9;

[0024] FIG. 11 is an exploded schematic view of FIG. 9;

[0025] FIG. 12 is an exploded schematic view of the heating assembly provided in another embodiment of the present application;

[0026] FIG. 13 is a structural schematic view of the aerosol generation device provided in one embodiment of the present application;

[0027] FIG. 14 is a front view of the aerosol generation device in one embodiment;

[0028] FIG. 15 is a sectional view along A-A in FIG. 14;

[0029] FIG. 16 is a structural schematic view of the aerosol generation substrate heating assembly in one embodiment;

[0030] FIG. 17 is a structural schematic view of the thermoplastic sealing layer and heating pipe in one embodiment;

[0031] FIG. 18 is a structural schematic view of the heating pipe and electric heating element in one embodiment;

[0032] FIG. 19 is a sectional view of the thermoplastic sealing layer and heating pipe in one embodiment;

[0033] FIG. 20 is a schematic view of the position of the heating pipe and electric heating element after unfolding in one embodiment;

[0034] FIG. 21 is a structural schematic view of the thermally conductive pipe in one embodiment;

[0035] FIG. 22 is a sectional view of the thermally conductive pipe in one embodiment;

[0036] FIG. 23 is a structural schematic view of the thermally conductive pipe and electric heating element in one embodiment;

[0037] FIG. 24 is a schematic view of the position of the thermally conductive pipe and electric heating element after unfolding in one embodiment;

[0038] FIG. 25 is a structural schematic view of the flow guide seat in one embodiment; and

[0039] FIG. 26 is a structural schematic view of the heat exchanger in one embodiment.

Detailed Description

[0040] The present application will be further described in detail below in conjunction with specific embodiments and accompanying drawings. Similar elements in different embodiments are denoted by similar reference numerals. In the following embodiments, many details are described to enable a better understanding of the present application. However, those skilled in the art can easily recognize that some features can be omitted or replaced by other elements, materials, or methods in different situations. In some cases, certain operations related to the present application are not shown or described in the specification to avoid obscuring the core part of the present application with excessive description. For those skilled in the art, it is not necessary to describe these related operations in detail, as they can fully understand the related operations based on the description in the specification and general technical knowledge in the field.

[0041] Furthermore, the features, operations, or characteristics described in the specification can be combined in any suitable manner to form various embodiments. Also, the steps or actions in the method description can be rearranged or adjusted in a manner apparent to those skilled in the art. Therefore, the various sequences in the specification and drawings are merely for clearly describing a particular embodiment and do not imply that the sequence is necessary unless otherwise specified.

[0042] The numbering of components in this document, such as "first," "second," etc., is only used to distinguish the described objects and does not have any sequential or technical meaning. The terms "connect" and "couple" in the present application, unless otherwise specified, include both direct and indirect connections (couplings).

[0043] In one embodiment, the heating assembly includes a heating element configured to heat an aerosol generation substrate, and the heating element includes at least two heating zones. A thermal barrier structure is provided between at least one pair of adjacent heating zones, the thermal barrier structure being configured to prevent heat transfer between the adjacent heating zones. The heating assembly is an aerosol generation substrate heating assembly.

[0044] The aerosol generation device includes a power supply and the heating assembly, with the power supply powering the heating assembly. The aerosol generation device is also referred to as an aerosol generation device, an electronic atomizer, or an atomization device.

[0045] The following mainly introduces the heating assembly and aerosol generation device from four aspects.

[0046] First Aspect.

[0047] The present application provides a heating assembly and an aerosol generation device, where the heating assembly is applied to the aerosol generation device. The aerosol generation device can generate aerosol by heating the aerosol generation substrate, which is a colloidal

dispersion system where solid or liquid particles are dispersed and suspended in a gaseous medium. In the present application, the aerosol generation device generates aerosol by heating the aerosol generation substrate without combustion, utilizing a special heat source to heat the aerosol generation substrate. During heating, various substances in the aerosol generation substrate volatilize to produce aerosol, without open flame generation, making it environmentally friendly and providing a good user experience while reducing harmful substances produced by high-temperature pyrolysis of conventional atomization substrates during combustion.

[0048] Referring to FIGs. 1-8, the heating assembly provided in this embodiment includes: a thermally conductive body 1010, a heating structure 1020, and a heat exchange structure 1030.

[0049] The thermally conductive body 1010 forms an open-ended accommodating cavity 1011, with axially distributed first thermal conductive zone 1012 and second thermal conductive zone 1013. The portion of the accommodating cavity 1011 corresponding to the first thermal conductive zone 1012 is for inserting the aerosol generation substrate 10100. The heat exchange structure 1030 is mounted at the portion of the accommodating cavity 1011 corresponding to the second thermal conductive zone 1013. The heating structure 1020 is positioned at the first thermal conductive zone 1012, generating heat. The first thermal conductive zone 1012 conducts heat generated by the heating structure 1020 to the second thermal conductive zone 1013, and the heat exchange structure 1030 is configured to perform heat exchange with the second thermal conductive zone 1013 to preheat incoming gas.

[0050] The aerosol generated by the aerosol generation substrate 10100 at high temperatures should be suspended in the gaseous medium. Therefore, one port of the accommodating cavity with open ends in the thermally conductive body 1010 is used for air intake, with the heat exchange structure 1030 installed inside. The heat exchange structure 1030 can preheat the incoming gas, which then enters the aerosol generation substrate 10100. The heat exchange structure 1030 cooperates with the heating structure 1020 to reduce the energy of the heating structure 1020.

[0051] To ensure thermal conductivity, the thermally conductive body 1010 is usually made of materials with high thermal conductivity. The heating structure 1020 can be a heating wire, heating plate, or other structure capable of generating heat when electrified. The heat generated by the heating structure 1020 positioned at the first thermal conductive zone 1012 can be conducted through the thermally conductive body 1010 to the interior of the accommodating cavity 1011, thereby heating the aerosol generation substrate 10100 to generate aerosol. Meanwhile, part of the heat can be conducted from the first thermal conductive zone 1012 to the second thermal conductive zone 1013, which then conducts the heat to the heat exchange structure 1030 inside the accommodating cavity 1011 corresponding to the second thermal conductive zone 1013, allowing the heat exchange structure to preheat the incoming gas.

[0052] In this embodiment, the first thermal conductive zone 1012 includes at least two heating zones 10121, and the heating structure 1020 includes at least two heating elements 1021, with the heating elements 1021 positioned in the heating zones 10121. The thermally conductive body 1010 further includes a heat-insulating hollow portion 10122 between two adjacent heating zones 10121.

[0053] Most of the heat generated by the heating zones 10121 is concentrated inside the

accommodating cavity 1011 corresponding to the first thermal conductive zone 1012, with part of the heat conducted through the first thermal conductive zone 1012 to the second thermal conductive zone 1013, providing heat to the heat exchange structure 1030 inside the accommodating cavity 1011 corresponding to the second thermal conductive zone 1013, thereby heating the incoming gas.

[0054] In one embodiment, a heat-insulating hollow portion 10122 is provided between two adjacent heating zones 10121, forming a gap between each pair of adjacent heating zones 10121 through the heat-insulating hollow portion 10122. The remaining part, excluding the heat-insulating hollow portion 10122, connects the adjacent heating zones 10121 and has a smaller area relative to the heat-insulating hollow portion 10122, making it difficult for the heat generated by the heating elements 1021 positioned in each heating zone 10121 to be conducted through the heat-insulating hollow portion 10122 to the adjacent heating zone 10121. Heat can only be conducted through the remaining part with a smaller area between the adjacent heating zones 10121, thereby improving the thermal insulation performance between the adjacent heating zones 10121, forming relatively independent heating zones between the adjacent heating zones 10121, and creating different heating spaces inside the accommodating cavity 1011 corresponding to the first thermal conductive zone 1012, which helps reduce the overall temperature inside the accommodating cavity 1011, thereby lowering the temperature of the aerosol generated by the aerosol generation substrate 10100 and improving the user experience.

[0055] In this embodiment, two heating zones 10121 are provided in the first thermal conductive zone 1012 of the thermally conductive body 1010. Correspondingly, the heating structure 1020 includes two heating elements 1021, both capable of independent heating, meaning that when one heating element 1021 is heating, the other heating element 1021 can either heat or not heat. The two heating elements 1021 can use independent control circuits, without interfering with each other.

[0056] Of course, in other embodiments, the two heating elements 1021 can also heat synchronously, as long as the heating temperature meets the actual needs.

[0057] In this embodiment, the thermally conductive body 1010 is of a hollow tubular structure, with both ends of the inner cavity of the hollow tubular structure of the thermally conductive body 1010 open, forming the accommodating cavity 1011, which is also tubular in shape, facilitating the manufacture of the thermally conductive body 1010. Meanwhile, using a tubular structure for the thermally conductive body 1010 allows the interior of the accommodating cavity 1011 to be heated more evenly.

[0058] In one embodiment of the present application, as shown in FIGs. 3 and 4, the two heating zones 10121 are uniformly distributed along the circumferential direction of the thermally conductive body 1010, meaning that the two heating zones 10121 are distributed along the circumferential direction of the hollow tubular structure of the thermally conductive body 1010 in the first thermal conductive zone 10121, with the heat-insulating hollow portion 10122 extending along the axial direction of the thermally conductive body 1010. As shown in FIGs. 5-8, the two heating zones 10121 are uniformly distributed along the axial direction of the heating elements 1021, meaning that the two heating zones 10121 are uniformly distributed along the axial direction of the hollow tubular structure of the heating elements 1021 in the first thermal

conductive zone 1012, with the heat-insulating hollow portion 10122 extending along the circumferential direction of the thermally conductive body 1010.

[0059] In this embodiment, the length of the heat-insulating hollow portion 10122 is greater than or equal to the length of the thermally conductive body 1010 along a direction parallel to the heat-insulating hollow portion 10122, meaning that the extension length of the heat-insulating hollow portion 10122 can block most of the heat conduction, thereby maintaining relatively independent temperature zones, and better controlling the temperature of the aerosol generated by the aerosol generation substrate.

[0060] Continuing to refer to FIGs. 3 and 4, the distance between the heat-insulating hollow portion 10122 extending along the axial direction of the thermally conductive body 1010 and the nearest port of the thermally conductive body 1010 is greater than 1 mm. This distance connects the two heating zones 10121, and the connecting part has a smaller area, thereby reducing heat conduction between the two heating zones 10121.

[0061] Referring to FIGs. 3-8, the heat-insulating hollow portion 10122 includes at least one elongated hollow hole. As shown in FIGs. 5-8, the heat-insulating hollow portion 10122 is provided with two coaxial elongated hollow holes. Of course, in other embodiments, the heat-insulating hollow portion 10122 can also be provided with three, four, or other numbers of elongated hollow holes, which can be set according to actual needs.

[0062] In this embodiment, the width of the elongated hollow hole is greater than 0.1 mm, ensuring thermal insulation while reducing the impact on the strength of the thermally conductive body 1010.

[0063] Referring to FIGs. 4, 6, and 8, the heat-insulating hollow portion 10122 is provided along the boundary line L (as shown by the dashed line in the figure) between two adjacent heating zones 10121. The boundary line L is the middle position between two adjacent heating zones 10121.

[0064] Referring to FIG. 2, the heating assembly provided in this embodiment further includes a flow guide 1040, which is mounted at the portion of the accommodating cavity 1011 corresponding to the second thermal conductive zone 1013 and located between the heat exchange structure 1030 and the aerosol generation substrate 10100. The flow guide 1040 is provided with a flow guide hole 1041, which is used to guide the air preheated by the heat exchange structure 1030 to the aerosol generation substrate 10100.

[0065] In one embodiment, the heat exchange structure 1030 is provided with multiple air intake holes 1031, which communicate with the flow guide hole 1041, thereby guiding the preheated air through the flow guide hole 1041 to the aerosol generation substrate 10100.

[0066] Referring to FIG. 1, this embodiment also provides an aerosol generation device, including: the heating assembly in the above embodiment, and further including: an inner shell 1050, a reflective film 1060, a circuit board 1070, a battery 1080, and an outer shell 1090, where the heating assembly is disposed inside the inner shell 1050, which also adopts a hollow structure with openings at both ends. The reflective film 1060 is laid on the inner surface of the inner shell 1050, capable of reflecting the heat of the heating assembly. The inner shell 1050, circuit board 1070, and battery 1080 are all disposed inside the outer shell 1090. The battery 1080 is connected to the heating assembly to provide power for the heating assembly. The heating assembly is

connected to the circuit board 1070, which can control the two heating elements 1021 to heat independently or synchronously, or adjust the temperature generated by the heating elements 1021.

[0067] In summary, in the heating assembly and aerosol generation device provided in this embodiment, a heat-insulating hollow portion is provided between two adjacent heating zones, forming a gap between each pair of adjacent heating zones through the heat-insulating hollow portion. The remaining part connecting the adjacent heating zones, excluding the heat-insulating hollow portion, has a smaller area, making it difficult for the heat generated by the heating elements positioned in each heating zone to be conducted through the heat-insulating hollow portion to the adjacent heating zone. Heat can only be conducted through the remaining part with a smaller area between the adjacent heating zones, thereby improving the thermal insulation performance between the adjacent heating zones, forming relatively independent heating zones between the adjacent heating zones, and creating different heating spaces inside the accommodating cavity corresponding to the first thermal conductive zone, which helps reduce the overall temperature inside the accommodating cavity, thereby lowering the temperature of the aerosol generated by the aerosol generation substrate and improving the user experience.

[0068] Second Aspect.

[0069] Current heating assemblies usually heat the aerosol generation substrate as a whole, and the temperature of the aerosol generated by the aerosol generation substrate during overall heating is prone to being too high, causing the user to feel a burning sensation during the first few puffs, resulting in a poor user experience.

[0070] Please refer to FIGs. 9-13. The present application provides a heating assembly 2010, which can be specifically used to accommodate the aerosol generation substrate 2020 and heat the aerosol generation substrate 2020 when electrified. The aerosol generation substrate 2020 can specifically include plant leaf substrates, such as tobacco substrates. The aerosol generation substrate 2020 can also include a protective sleeve, which can wrap the plant leaf substrate, for example, the plant leaf substrate can be wrapped inside aluminum foil or paper for use.

[0071] Specifically, in one embodiment, the heating assembly 2010 includes a heating element 2011 and a thermal insulation body 2012.

[0072] The heating element 2011 is used to accommodate the aerosol generation substrate 2020 and includes a heating material. The heating element 2011 can support the aerosol generation substrate 2020 accommodated therein and can generate heat when electrified to heat the aerosol generation substrate 2020 accommodated therein, thereby forming an aerosol for user use.

[0073] The heating element 2011 can be entirely made of conductive material, such as conductive ceramics, or it can include an insulating substrate and a conductive heating layer provided on the surface of the insulating substrate. In the embodiment shown in FIGs. 9-11, the heating element 2011 includes a substrate 20111 and a heating layer 20112. The heating layer 20112 is used to generate heat when electrified to heat the aerosol generation substrate 2020. Both ends of the heating layer 20112 can be connected to two electrodes 20113, which can be electrically connected to the power supply assembly 2040 and the controller 2050 through external wires. The electrodes 20113 can be conductive coatings applied to the substrate 20111,

such as metal coatings, conductive silver paste, or conductive tape, etc., or they can be metal conductive sheets provided on the substrate 20111 or metals deposited on the substrate 20111, such as gold film, aluminum film, or copper film, etc.

[0074] The heating layer 20112 can be a metal layer, conductive ceramic layer, or conductive carbon layer. The shape of the heating layer 20112 can be a continuous film structure, porous mesh structure, or strip structure. The substrate 20111 is made of insulating material, and the substrate 20111 can be quartz glass, ceramic, mica, or other high-temperature-resistant insulating materials. The substrate 20111 has an accommodating cavity 201111, which is used to accommodate the aerosol generation substrate 2020. The accommodating cavity 201111 has an opening to allow the aerosol generation substrate 2020 to be inserted or withdrawn from the accommodating cavity 201111.

[0075] The heating element 2011 can be a tubular structure. In this embodiment, the substrate 20111 is a cylindrical tubular structure, and the accommodating cavity 201111 is also cylindrical, with the wall thickness of the side wall of the substrate 20111 being a fixed value, allowing the heating element 2011 to heat the aerosol generation substrate 2020 evenly.

[0076] In the present application, the heating element 2011 has a heat-insulating zone 20114 and at least two independent heating zones 20115. The independent heating zones 20115 refer to each heating zone 20115 being capable of heating independently. The heat-insulating zone 20114 is provided between two adjacent heating zones 20115, and the thermal insulation body 2012 is embedded in the heat-insulating zone 20114 to block heat transfer between the adjacent heating zones 20115.

[0077] Specifically, in the embodiment shown in FIGs. 9-11, the number of heating zones 20115 is the same as the number of heating layers 20112, and the heating zones 20115 correspond one-to-one with the heating layers 20112, meaning one heating layer 20112 corresponds to one heating zone 20115. At least part of the thermal insulation body 2012 is provided between two adjacent heating layers 20112 to block heat transfer between the two adjacent heating layers 20112. It can be as shown in FIGs. 9-11, where the entire thermal insulation body 2012 is provided between two adjacent heating layers 20112, or it can be a section of the thermal insulation body 2012 provided between two adjacent heating layers 20112.

[0078] The material of the thermal insulation body 2012 needs to meet the conditions of high-temperature resistance and low thermal conductivity. For example, in one embodiment, the thermal conductivity of the thermal insulation body 2012 is less than $8\text{W}/(\text{m}\cdot\text{K})$, and/or the material of the thermal insulation body 2012 includes at least one of microcrystalline glass, zirconia ceramics, polyether ether ketone, and polyimide.

[0079] The heating element 2011 of the present application uses the thermal insulation body 2012 embedded in the heat-insulating zone 20114 to separate different heating zones 20115, using physical blocking to prevent heat transfer between the heating zones 20115. Therefore, when the heating element 2011 heats in a certain heating zone 20115, the heat transfer from that heating zone 20115 to other heating zones 20115 is reduced, thereby achieving local heating of the aerosol generation substrate 2020. During the first few puffs of the user, local heating can be controlled, and the temperature of the aerosol will not be too high, allowing the user to feel a lower temperature during the first few puffs, reducing the risk of burning the mouth and

improving the user experience.

[0080] Additionally, some existing heating assemblies 2010 set two heating elements, meaning the existing independent heating zones 20115 are respectively set on two heating elements, and the two heating elements are respectively connected to the two ends of the thermal insulation body to achieve thermal insulation. The existing structure has more parts, the assembly steps are cumbersome, and the reliability of the connection strength of the two heating elements fixedly connected by the thermal insulation body is poor. In contrast, the independent heating zones 20115 and the heat-insulating zone 20114 in the present application are all set on the same heating element, and the heat-insulating zone 20114 achieves thermal insulation by embedding the thermal insulation body 2012. Compared with the above existing structure, there are fewer parts, eliminating the assembly steps of connecting the heating element and the thermal insulation body. The thermal insulation body 2012 is embedded in the heating element 2011, which does not excessively affect the structural strength of the heating element 2011, and the reliability of the structural strength of the heating element 2011 is strong.

[0081] In one embodiment, as shown in FIGs. 9-11, the heat-insulating zone 20114 has a hollow structure 201141, and the thermal insulation body 2012 can be filled in the hollow structure 201141. The hollow structure 201141 refers to a through groove or through hole in the heat-insulating zone 20114 that penetrates the side wall of the heating element 2011 along the thickness direction of the heating element 2011. The thermal insulation body 2012 can be filled in the hollow structure 201141 through processes such as coating, spraying, or dispensing. On the one hand, the hollow structure 201141 prevents energy diffusion between different heating zones 20115 through physical blocking, improving the independence of each heating zone 20115. On the other hand, the thermal insulation body 2012 filled in the hollow structure 201141 can maintain a certain degree of sealing of the heating element 2011, making it difficult for the aerosol generated by the heating element 2011 to escape from the hollow structure 201141, improving energy utilization efficiency.

[0082] As shown in FIGs. 9-11, the hollow structure 201141 can be an insulating hole 201141a, which is a linear hole structure. Of course, in other embodiments, the insulating hole 201141a can also be a bent structure, a zigzag structure, or other regular or irregular shapes.

[0083] In one embodiment, the hollow structure 201141 can be an intermittently spaced hollow structure 201141. For example, referring to FIG. 12, in the embodiment of FIG. 12, the hollow structure 201141 includes multiple intermittently spaced insulating holes 201141a. Setting the hollow structure 201141 as intermittently spaced can improve the structural strength of the heat-insulating zone 20114 compared to a continuous hollow structure 201141.

[0084] In one embodiment, as shown in FIGs. 9-12, each heating zone 20115 is arranged in parallel along the circumferential direction of the heating element 2011, and the insulating hole 201141a can extend along the axial direction to block adjacent heating zones 20115. In other embodiments, each heating zone 20115 can also be arranged in parallel along the axial direction of the heating element 2011, and the insulating hole 201141a can extend along the circumferential direction to block adjacent heating zones 20115. Of course, in one embodiment, there can also be both circumferential and axial arrangements between the heating zones 20115, with some insulating holes 201141a arranged along the axial direction and some insulating holes

201141a arranged along the circumferential direction, as long as each heating zone 20115 is physically blocked.

[0085] In the embodiment shown in FIGs. 9-11, the heating element 2011 has a first heating zone 201151 and a second heating zone 201152. The number of heat-insulating zones 20114 is two, and the number of insulating holes 201141a is two, namely the first insulating hole 201142 and the second insulating hole 201143. Both the first insulating hole 201142 and the second insulating hole 201143 extend along the axial direction. The first heating zone 201151 has opposite first and second ends along the circumferential direction, and the second heating zone 201152 has opposite first and second ends along the circumferential direction. The first end of the first heating zone 201151 is close to the second end of the second heating zone 201152. The first insulating hole 201142 is provided between the first end of the first heating zone 201151 and the second end of the second heating zone 201152, and the second insulating hole 201143 is provided between the second end of the first heating zone 201151 and the first end of the second heating zone 201152.

[0086] In one embodiment, the heat-insulating zone 20114 may not have a hollow structure 201141, and the heat-insulating zone 20114 has a groove, which is a blind groove, with the thermal insulation body 2012 provided in the groove. Compared to the heat-insulating zone 20114 with a hollow structure 201141, the groove structure of the heat-insulating zone 20114 can better prevent aerosol leakage, maintaining better sealing of the heating element 2011. Of course, in other embodiments, the heat-insulating zone 20114 can include both a hollow structure 201141 and a groove.

[0087] Please refer to FIG. 13. In one embodiment, the heating assembly 2010 further includes a housing assembly 2013, a thermal insulation layer 2014, a flow guide 2015, and a heat exchange core 2016.

[0088] The housing assembly 2013 includes an upper housing 20131 and a lower housing 20132. The upper housing 20131 has an installation cavity 201311 and an insertion passage 201312. The insertion passage 201312 is provided at one end of the installation cavity 201311 and communicates with the installation cavity 201311. The lower housing 20132 is provided at the end of the installation cavity 201311 away from the insertion passage 201312 and blocks the end of the installation cavity 201311 away from the insertion passage 201312. The heating element 2011 is provided in the installation cavity 201311, and one end of the heating element 2011 close to the lower housing 20132 is detachably connected to the lower housing 20132. The end of the heating element 2011 close to the insertion passage 201312 is detachably connected to the side wall of the insertion passage 201312.

[0089] The aerosol generation substrate 2020 is inserted into the accommodating cavity 201111 of the heating element 2011 through the insertion passage 201312. The lower housing 20132 has an air intake channel 201321, which communicates with the air intake port of the heating assembly 2010. When the heating assembly 2010 is working, the airflow enters the air intake channel 201321 of the lower housing 20132 from the air intake port of the heating assembly 2010 and flows into the heating element 2011 from the air intake channel 201321. The heating element 2011 heats the aerosol generation substrate 2020 to generate aerosol, which flows out from the air outlet of the heating assembly 2010 for user use.

[0090] The thermal insulation layer 2014 can be provided on the inner wall of the installation cavity 201311. The provision of the thermal insulation layer 2014 can block the heat generated by the heating element 2011 from being transferred outside the installation cavity 201311, thereby improving the energy utilization efficiency of the heating element 2011. The thermal insulation layer 2014 can be made of high-temperature-resistant thermal insulation materials, such as zirconia, alumina, quartz, or glass.

[0091] The heat exchange core 2016 can be installed in the heating element 2011 and provided at the end of the heating element 2011 close to the lower housing 20132. Usually, the airflow flows directly from the air intake channel 201321 of the lower housing 20132 to the heating element 2011. This direct air intake heating method has a short heat exchange distance for the airflow, resulting in a small heat exchange area for the airflow, which can easily cause the temperature of the heated hot airflow to gradually decrease during the ascent, and the temperature reaching the aerosol generation substrate is insufficient, affecting the suction taste. Setting the heat exchange core 2016 between the heating element 2011 and the air intake channel 201321 can increase the heat exchange area of the airflow.

[0092] The flow guide 2015 can be provided in the heating element 2011 and set between the aerosol generation substrate 2020 and the heat exchange core 2016. The flow guide 2015 can guide the airflow in the heat exchange core 2016 to the middle of the aerosol generation substrate 2020. In the direct air intake heating method, during use, after the airflow temperature rises, nicotine is easily carried out directly, causing the nicotine content to be too high in the first few puffs, and the subsequent nicotine content is low, with poor uniformity. The present application adds a flow guide 2015, which guides the hot airflow into the central area of the aerosol generation substrate 2020 through the flow guide 2015, allowing the hot airflow to carry out the nicotine in the central area of the aerosol generation substrate 2020, thereby achieving a gradual release process of nicotine, improving the uniformity of suction, and extending the use time of the aerosol generation substrate 2020, enhancing the user experience.

[0093] As shown in FIG. 13, the present application also provides an aerosol generation device 2030, which includes the heating assembly 2010, a power supply assembly 2040, and a controller 2050. The controller 2050 is connected to the heating assembly 2010 and the power supply assembly 2040 to control the power supply assembly 2040 to power the heating assembly 2010 and control the heating power and heating duration of the heating assembly 2010 upon receiving a start signal. The power supply assembly 2040 is electrically connected to the heating assembly 2010 to power the heating assembly 2010. In one embodiment, the power supply assembly 2040 can specifically include a rechargeable lithium-ion battery. The heating assembly 2010 of the aerosol generation device 2030 can have the same or similar structure as the heating assembly 2010 in any of the above embodiments and achieve the same or similar effects, which will not be repeated here.

[0094] Third Aspect.

[0095] The aerosol generation device includes a heating pipe. To make the heating method of the heating pipe more flexible, some current aerosol generation devices have independent heating zones set on the heating pipe. By setting independent heating zones, the problem of excessive temperature of the generated aerosol can be improved. However, the heat transfer between

adjacent heating zones is fast, with a lot of heat transferred through the heating pipe to other heating zones, and this part of the heat cannot be utilized, even negatively affecting the set heating program, causing serious heat loss. For example, when one adjacent heating zone is working and the other is not, a lot of heat is transferred from the working heating zone to the non-working heating zone, and the heat transferred to the non-working heating zone cannot be utilized, resulting in serious heat loss. To solve this problem, the present application sets a thermal insulation interval between adjacent heating zones and then covers the thermal insulation interval with a thermoplastic sealing layer to prevent airflow leakage. This can reduce heat transfer between adjacent heating zones through the thermal insulation interval, thereby reducing heat loss.

[0096] Please refer to FIGs. 14 to 20. Before introducing the heating assembly for the aerosol generation substrate in detail, the heating object of the heating assembly, i.e., the aerosol generation substrate 301, is first explained. The aerosol generation substrate 301 is an aerosol generation stick, with one end of the aerosol generation substrate 301 being the suction end 3011 for inhaling aerosol, and the other end being the air intake end 3012 for airflow to enter the aerosol generation substrate 301 during suction. In one embodiment, the suction end 3011 of the aerosol generation substrate 301 has a filter element (not shown in the figure). The material of the filter element (not shown in the figure) can be various existing or future feasible methods, such as sponge, cigarette paper, etc. The aerosol generation substrate 301 includes an aerosol generation section 3013, which is used to be inserted into the heating assembly of the aerosol generation device. The aerosol generation section 3013 contains an aerosol generation substrate for generating aerosol, which can be aerosol filaments or aerosol sheets. In one embodiment, the aerosol generation substrate 301 is a heat-not-burn stick. Heating the aerosol generation substrate does not require burning the aerosol generation substrate to generate aerosol.

[0097] In some embodiments, please refer to FIGs. 14 to 16. The aerosol generation substrate heating assembly includes a heating pipe 302 and a thermoplastic sealing layer 304. In one embodiment, the aerosol generation substrate heating assembly is used to heat the aerosol generation substrate 301 and prevent the aerosol generation substrate from burning, generating aerosol.

[0098] In some embodiments, the heating pipe itself can heat. In some other embodiments, the aerosol generation substrate heating assembly further includes an electric heating element 303 (please refer to FIG. 18), which is configured on the heating pipe 302 and in thermal contact with the heating pipe 302 to transfer the generated heat to the heating pipe 302 to heat the aerosol generation substrate 301. The electric heating element 303 can be in various feasible forms, such as a resistance coating or resistance wire coil. For example, the electric heating element 303 can be a heating film printed on the outer peripheral surface of the heating pipe 302, in which case the electric heating element 303 and the heating pipe 302 together form a thick film pipe, with an insulating layer outside the heating film, and the heating pipe 302 can use a metal pipe with good thermal conductivity. For example, the electric heating element 303 can be embedded in the wall of the heating pipe 302. The electric heating element 303 can use resistance wire, in which case the heating pipe 302 is suitable for being made of insulating thermal conductive material. Of course, an insulating layer can also be applied to the outer periphery of the resistance wire, in

which case the heating pipe 302 can also be made of conductive material; for example, the electric heating element 303 can also be resistance wire wound on the outer wall of the heating pipe 302; and for example, the electric heating element 303 is laid on the inner surface of the heating pipe 302.

[0099] The thermal contact in the present application includes both direct contact and indirect contact capable of transferring heat. There are various ways of indirect contact, such as applying thermal grease between the electric heating element and the heating pipe. For example, to ensure safety, an insulating layer is added between the heating pipe and the electric heating element.

[00100] The heating pipe 302 has a heating chamber 3021 for inserting the aerosol generation substrate 301 to heat the aerosol generation substrate 301 (please refer to FIG. 17). Specifically, in one embodiment, both ends of the heating pipe 302 are open, with one end of the heating pipe 302 being the insertion end 3022 for inserting the aerosol generation substrate 301, and the other end being the ventilation end 3023 for airflow to enter the heating pipe 302. In some other embodiments, the heating pipe 302 can use any feasible method. For example, the heating pipe 302 can seal the ventilation end 3023 of the above embodiment, in which case the gas enters the heating pipe 302 from the insertion end 3022 and enters the suction end of the aerosol generation substrate 301 through the gap between the heating pipe 302 and the aerosol generation substrate 301. For example, the aerosol generation substrate 301 passes through the heating pipe 302, in which case the suction end of the aerosol generation substrate 301 extends out of the heating pipe 302.

[00101] Please refer to FIGs. 17 to 20. The wall of the heating pipe 302 includes at least two heating zones 3024, each heating zone 3024 being capable of heating the aerosol generation substrate 301 inserted into the heating chamber 3021. A thermal insulation interval 3025 is provided between adjacent heating zones 3024 to prevent heat transfer between the adjacent heating zones 3024. The thermal insulation interval 3025 penetrates the wall of the heating pipe 302 in the radial direction. The thermal insulation interval 3025 is transparent in the thickness direction of the wall of the heating pipe 302, meaning that the thermal insulation interval is a hollow structure for blocking heat transfer. The thermal insulation interval 3025 can reduce heat transfer between adjacent heating zones 3024, reducing heat loss.

[00102] To prevent the heated hot airflow from leaking out from the thermal insulation interval 3025, the thermoplastic sealing layer 304 in the present application is provided on the heating pipe 302 and covers the thermal insulation interval 3025 to prevent the airflow inside the heating pipe 302 from leaking out through the thermal insulation interval 3025. This can further improve the energy utilization efficiency of each heating zone.

[00103] The thermal insulation interval 3025 in the aerosol generation substrate heating assembly of the present application can reduce heat transfer between adjacent heating zones 3024, while the thermoplastic sealing layer 304 can cover the thermal insulation interval 3025 to prevent airflow from leaking out through the thermal insulation interval 3025, reducing heat loss.

[00104] In one embodiment, please refer to FIGs. 17 and 20. Each heating zone 3024 corresponds to at least one electric heating element 303, and the electric heating element 303 is used to independently heat the corresponding heating zone 3024, allowing each heating zone 3024 to independently heat the aerosol generation substrate 301 inserted into the heating chamber

3021. When each heating zone 3024 is independently heated, the thermal insulation interval 3025 can reduce heat transfer to the non-working heating zone, reducing heat loss while improving the heating efficiency of the independently heated working heating zone 3024.

[00105] It should be noted that in this embodiment, the heating zones 3024 on the heating pipe 302 can independently heat the aerosol generation substrate 301. In actual use, it is not limited to only part of the heating zones 3024 being turned on for heating. According to actual needs, all heating zones 3024 can be turned on for heating at the same time, in which case the heating pipe 302 as a whole heats the aerosol generation substrate 301. For example, a heating strategy for the aerosol generation substrate 301 is as follows.

[00106] When starting to heat the aerosol generation substrate 301, since there is a certain amount of moisture in the aerosol generation substrate 301, the aerosol generated after heating contains water vapor. If the temperature of the aerosol is too high at this time, the water vapor can easily burn the mouth when inhaling the aerosol. Therefore, when starting to heat the aerosol generation substrate 301, only part of the heating zones 3024 is used to heat the aerosol generation substrate 301. After the moisture in the aerosol generation substrate 301 is expelled, all heating zones 3024 work simultaneously, and the heating pipe 302 as a whole heats the aerosol generation substrate 301.

[00107] For example, a heating strategy for the aerosol generation substrate 301 is as follows: divide the heating zones 3024 into two groups, with one group of heating zones 3024 heating one section of the aerosol generation substrate 301, and then the other group of heating zones 3024 heating another section of the aerosol generation substrate 301. The two groups of heating zones 3024 work in different time periods to heat the aerosol generation substrate 301 in sections, which can extend the number of puffs of the aerosol generation substrate 301.

[00108] In some other embodiments, all heating zones can always work simultaneously, with at least one pair of heating zones having one heating zone (i.e., the low-temperature heating zone) corresponding to an electric heating element with a lower heating power than the other heating zone (i.e., the high-temperature heating zone).

[00109] In one specific embodiment, the number of electric heating elements 303 corresponds one-to-one with the number of heating zones 3024. The number of heating zones 3024 is two, and the number of electric heating elements 303 is also two. In some other embodiments, the number of heating zones 3024 and the number of electric heating elements 303 can be increased as needed, such as setting three or more heating zones 3024. In some other embodiments, one heating zone 3024 can correspond to two or more electric heating elements 303.

[00110] The arrangement of heating zones 3024 on the heating pipe 302 can use any feasible form. For example, please refer to FIG. 18, where the heating zones 3024 are arranged in the circumferential direction of the heating pipe 302; for example, the heating zones 3024 can also be arranged in the axial direction of the heating pipe 302; and for example, there are four or more heating zones 3024, with at least two arranged in the circumferential direction of the heating pipe 302 and at least two arranged in the axial direction of the heating pipe 302.

[00111] The thermal insulation interval 3025 can be arranged in any feasible manner. For example, a straight-line thermal insulation interval 3025 can be used; multiple thermal insulation intervals 3025 can be arranged in a continuous interval, in which case the blocking interval can

be in a strip shape, square shape, circular shape, or any shape; and a curved thermal insulation interval 3025 can also be used.

[00112] Further, in one embodiment, please refer to FIGs. 17 and 19. The thermoplastic sealing layer 304 is a heat-shrinkable tube heat-shrunk on the heating pipe 302. The heat-shrinkable tube is sleeved on the heating pipe 302 and heat-shrunk to be fixed with the heating pipe 302. The heat-shrinkable tube heat-shrinking process is simple. In some other embodiments, the thermoplastic sealing layer 304 can be a thermoplastic film heat-shrunk on the heating pipe 302. The thermoplastic film can specifically use any feasible heat-resistant and heat-shrinkable film in the related art, such as a PI film, peek film, etc. In one embodiment, the material of the heat-shrinkable sealing layer is required to be heat-resistant above 250°C. Of course, in some other embodiments, according to the temperature change of the aerosol generation substrate 301 generating aerosol, this heat resistance requirement can be reduced or increased.

[00113] Further, in one embodiment, please refer to FIGs. 17 and 18. The electric heating element 303 is located between the thermoplastic sealing layer 304 and the heating pipe 302. This way, after the thermoplastic sealing layer 304 is heat-shrunk and fixed with the heating pipe 302, it also has a certain fixing effect on the electric heating element 303, improving the structural stability of the electric heating element 303, making it less likely to separate from the heating pipe 302.

[00114] Further, in one embodiment, please refer to FIG. 18. The electric heating element 303 is fixed on the outer surface of the heating pipe 302, making it less likely to separate from the heating pipe 302 and more convenient for the thermoplastic sealing layer 304 to be heat-shrunk on the heating pipe 302. Specifically, the electric heating element 303 is a heating film formed on the outer surface of the heating pipe 302, in which case the electric heating element 303 and the heating pipe 302 together form a thick film pipe, with an insulating layer outside the heating film, and the heating pipe 302 uses a metal pipe with good thermal conductivity. In some other embodiments, the electric heating element 303 can also be embedded in the heating pipe 302 or a heating wire wound on the outer peripheral surface of the heating pipe 302.

[00115] In some other embodiments, the electric heating element 303 can be kept in thermal contact with the heating pipe 302 through the heat-shrinking action of the thermoplastic sealing layer 304. In this case, before the thermoplastic sealing layer 304 is formed, there is no need to fixedly connect the electric heating element 303 with the heating pipe 302. During the heat-shrinking process of the thermoplastic sealing layer 304, the electric heating element 303 is fixed with the heating pipe 302. In some other embodiments, the electric heating element 303 can be located on the outer side of the thermoplastic sealing layer 304, i.e., on the side of the thermoplastic sealing layer 304 away from the heating pipe 302. In this case, it can prevent the aerosol inside the heating pipe 302 from contacting the electric heating element 303, eroding the electric heating element 303, thereby extending the life of the electric heating element 303.

[00116] In one embodiment, please refer to FIGs. 15, 16, and 19. The heating pipe 302 includes an airflow heating section 3026 and a generation stick heating section 3027. The airflow heating section 3026 and the generation stick heating section 3027 are arranged in the axial direction of the heating pipe 302. The airflow heating section 3026 is used to heat the airflow entering the aerosol generation substrate 301. A generation stick blocking structure is provided inside the

airflow heating section 3026, which is used to block the end face of the aerosol generation substrate 301 inserted into the heating chamber 3021, limiting the insertion depth of the aerosol generation substrate 301 into the heating chamber 3021. The heating zones 3024 are all located on the generation stick heating section 3027. By preheating the airflow entering the aerosol generation substrate 301 through the airflow heating section 3026, the aerosol generation substrate 301 is heated both inside and outside, making the overall heating more uniform.

[00117] Further, in one embodiment, please refer to FIGs. 15 and 16. A heat exchanger 305 is provided inside the airflow heating section 3026, and the airflow heating section 3026 is in thermal contact with the heat exchanger 305. The heat exchanger 305 has multiple airflow channels 3051, which allow airflow to pass through to heat the passing airflow. By uniformly heating the airflow through the heat exchanger 305, the airflow heating efficiency is improved.

[00118] Specifically, in one embodiment, please refer to FIGs. 15 and 16. The airflow channels 3051 of the heat exchanger 305 extend along the axial direction of the heating pipe 302, and multiple airflow channels 3051 are evenly spaced. In some other embodiments, the heat exchanger 305 may not be provided, in which case the airflow is directly heated after passing through the airflow heating section 3026.

[00119] To further improve the uniformity of heating the aerosol generation substrate 301, please refer to FIGs. 15 and 16. The generation stick blocking structure is a flow guide seat 306 located on one side of the heat exchanger 305. The flow guide seat 306 has a generation stick blocking surface 3061 for blocking cooperation with the aerosol generation substrate 301. The generation stick blocking surface 3061 is located on the side of the flow guide seat 306 facing away from the heat exchanger 305. The center of the flow guide seat 306 has a flow guide hole 3062, which is used to guide airflow into the aerosol generation substrate 301 from the center of the end face of the aerosol generation substrate 301. In some other embodiments, an annular protrusion can be provided in the heating pipe 302 to block the end face of the aerosol generation substrate 301.

The heat exchanger 305 can also form a generation stick blocking structure, blocking the end face of the aerosol generation substrate 301.

[00120] Specifically, in one embodiment, please refer to FIGs. 15 and 16. The flow guide seat 306 and the heat exchanger 305 are both interference-fitted in the heating pipe 302.

[00121] To facilitate the installation of the heating pipe 302, in one embodiment, please refer to FIGs. 15 and 16. The aerosol generation substrate heating assembly includes a first heating pipe seat 307 and a second heating pipe seat 308. The heating pipe 302 is clamped between the first heating pipe seat 307 and the second heating pipe seat 308. The first heating pipe seat 307 has a first pipe seat hole 3071 for the aerosol generation substrate 301 to pass through and insert into the heating chamber 3021. The second heating pipe seat 308 has a second pipe seat hole 3081 for the airflow entering the aerosol generation substrate 301 to pass through.

[00122] Specifically, in one embodiment, please refer to FIGs. 15 and 16. The insertion end 3022 of the heating pipe 302 is inserted into the first pipe seat hole 3071 and interference-fitted with the first pipe seat hole 3071. The ventilation end 3023 is inserted into the second pipe seat hole 3081 and interference-fitted with the second pipe seat hole 3081. The first heating pipe seat 307 includes a first seat body 3072 and a sheath 3073, with the first seat body 3072 and the sheath

3073 being integrally formed. One end of the sheath 3073 is connected to the first seat body 3072, and the other end is interference-fitted with the second heating pipe seat 308. An annular gap 309 is formed between the sheath 3073 and the heating pipe 302, which can block heat transfer to the sheath 3073, thereby reducing heat spillage. To further reduce heat conduction to the outside, the inner wall of the sheath 3073 is covered with a reflective film 3010, which can reflect infrared light to the heating pipe 302, reducing the absorption of infrared light by the sheath 3073 and lowering the temperature of the sheath 3073.

[00123] In addition, the heating pipe 302 can be assembled in any feasible manner, such as the heating pipe 302 being directly fixed to the outer shell of the aerosol generation device; for example, the insertion end 3022 of the heating pipe 302 is fixed to the outer shell of the aerosol generation device, and the ventilation end 3023 is fixed to the second heating pipe seat 308, in which case the first heating pipe seat is not needed.

[00124] In some embodiments of the aerosol generation device, please refer to FIGs. 14 to 16. The aerosol generation device includes an aerosol generation substrate heating assembly, a power supply 30101, and an outer shell 30102. The aerosol generation substrate heating assembly is the aerosol generation substrate heating assembly in any of the above embodiments, and the power supply 30101 powers the aerosol generation substrate heating assembly. The power supply 30101 and the aerosol generation substrate heating assembly are both installed in the outer shell 30102. Specifically, the power supply 30101 is a battery.

[00125] Fourth Aspect.

[00126] Currently, when using the aerosol generation substrate to generate aerosol, the overall heating temperature of the heating pipe in the aerosol generation device is relatively high. At the beginning of suction, due to the high temperature of the aerosol and the high moisture content in the aerosol, it is easy to burn the mouth. To facilitate controlling the heating temperature of the heating pipe, independent heating zones are usually set on the heating pipe to select the corresponding heating zones for heating as needed, generating aerosol by heating part of the aerosol generation substrate. Although this method can reduce the overall temperature of the aerosol, the current heat transfer between the heating zones is fast, with a lot of heat diffusing to other heating zones, causing the part of the aerosol generation substrate heated by the heating zones to heat up slowly, with poor independent heating effect, and there is a problem of large heat loss.

[00127] The present application provides a heating assembly and also provides an atomization device for generating aerosol using the heating assembly. The atomization device for generating aerosol can heat the solid aerosol generation substrate, allowing the aerosol generation substrate to generate aerosol. In one embodiment, the atomization device for generating aerosol heats the aerosol generation substrate and prevents the aerosol generation substrate from burning. During heating, the aerosol generation substrate generates aerosol, and no open flame is generated during the heating process, reducing harmful substances produced by high-temperature pyrolysis of conventional aerosol generation substrates during combustion.

[00128] The heating assembly and aerosol generation device in the fourth aspect have some structures in common with those in the third aspect. The specific implementation can refer to the embodiments in the third aspect, with the following focusing on the differences from the third

aspect.

[00129] In some embodiments, please refer to FIGs. 14 to 16. The heating assembly includes an electric heating element 303 and a thermally conductive pipe, with the thermally conductive pipe being the heating pipe 302. The electric heating element 303 is configured on the heating pipe 302 and in thermal contact with the heating pipe 302 to transfer the generated heat to the heating pipe 302 to heat the aerosol generation substrate 301.

[00130] Please refer to FIGs. 15, 21 to 23. The heating pipe 302 has a heating chamber 3021 for inserting the aerosol generation substrate 301. The electric heating element 303 is installed on the outer wall of the heating pipe 302 or embedded in the heating pipe 302.

[00131] Specifically, in one embodiment, one end of the heating pipe 302 is the insertion end 3022 for inserting the aerosol generation substrate 301, and the other end is the ventilation end 3023 for airflow to enter the heating pipe 302. Both the insertion end 3022 and the ventilation end 3023 are open. In some other embodiments, the heating pipe 302 can use any feasible method, such as sealing the opening of the ventilation end 3023 in the above embodiment, in which case the gas enters the heating pipe 302 from the insertion end 3022 and enters the air intake end 3012 of the aerosol generation substrate 301 through the gap between the heating pipe 302 and the aerosol generation substrate 301.

[00132] Please refer to FIGs. 23 and 24. The wall of the heating pipe 302 includes at least two heating zones 3024, and the number of electric heating elements 303 is at least two. Each heating zone 3024 corresponds to at least one electric heating element 303, and the electric heating element 303 is used to independently heat the corresponding heating zone 3024. In one specific embodiment, please refer to FIG. 23. The number of electric heating elements 303 corresponds one-to-one with the number of heating zones 3024. The number of heating zones 3024 is two, and the number of electric heating elements 303 is also two. In some other embodiments, the number of heating zones 3024 and the number of electric heating elements 303 can be increased as needed, such as setting three or more heating zones 3024. In some other embodiments, one heating zone 3024 can correspond to two or more electric heating elements 303.

[00133] At least one pair of adjacent heating zones 3024 has a pipe wall thinning portion 3028 provided on the wall of the heating pipe 302. The wall thickness of the pipe wall thinning portion 3028 is less than the wall thickness of the heating zones 3024, allowing the heat conduction speed between adjacent heating zones 3024 to be slowed down.

[00134] The wall thickness of the pipe wall thinning portion 3028 in the present application is less than the wall thickness of the heating zones 3024, allowing the heat conduction speed through the pipe wall thinning portion 3028 to decrease. When only one heating zone 3024 is heating and the other heating zone 3024 is not heating, the heat transferred to the non-working heating zone 3024 is reduced, reducing energy waste. The temperature of the independently heating working heating zone rises faster, and the heating efficiency is higher.

[00135] Specifically, in one embodiment, each heating zone 3024 can independently heat the aerosol generation substrate 301 inserted into the heating chamber 3021.

[00136] In one embodiment, please refer to FIGs. 23 and 24. The heating zones include a first heating zone 30241 and a second heating zone 30242. The first heating zone 30241 and the second heating zone 30242 are adjacent, with a pipe wall thinning portion 3028 provided between

the first heating zone 30241 and the second heating zone 30242. The wall thickness of the pipe wall thinning portion 3028 is less than the wall thickness of the first heating zone 30241 and less than the wall thickness of the second heating zone 30242, allowing the heat conduction speed between the first heating zone 30241 and the second heating zone 30242 to be slowed down.

[00137] The wall thickness of the pipe wall thinning portion 3028 in the present application is less than the wall thickness of the first heating zone 30241 and less than the wall thickness of the second heating zone 30242, allowing the heat conduction speed through the pipe wall thinning portion 3028 to decrease. When only the first heating zone 30241 is heating and the second heating zone 30242 is not heating, the heat transferred to the second heating zone 30242 is reduced. When only the second heating zone 30242 is heating and the first heating zone 30241 is not heating, the heat transferred to the first heating zone 30241 is reduced, reducing energy waste. The temperature of the independently heating working heating zone rises faster, and the heating efficiency is higher.

[00138] It should be noted that the heating zones 3024 on the heating pipe 302 in the present application can independently heat the aerosol generation substrate 301. In actual use, it is not limited to only the first heating zone 30241 or only the second heating zone 30242 being turned on for heating. According to actual needs, the first heating zone 30241 and the second heating zone 30242 can be turned on for heating at the same time, in which case the heating pipe 302 as a whole heats the aerosol generation substrate 301. For example, a heating strategy for the aerosol generation substrate 301 is as follows.

[00139] When starting to heat the aerosol generation substrate 301, since there is a certain amount of moisture in the aerosol generation substrate 301, the aerosol generated after heating contains water vapor. If the temperature of the aerosol is too high at this time, the water vapor can easily burn the mouth when inhaling the aerosol. Therefore, when starting to heat the aerosol generation substrate 301, only the first heating zone 30241 is used to heat the aerosol generation substrate 301. After the moisture in the aerosol generation substrate 301 is expelled, the first heating zone 30241 and the second heating zone 30242 work simultaneously, and the heating pipe 302 as a whole heats the aerosol generation substrate 301.

[00140] For example, a heating strategy for the aerosol generation substrate 301 is as follows: arrange the first heating zone 30241 and the second heating zone 30242 vertically, with the first heating zone 30241 heating one section of the aerosol generation substrate 301, and then the second heating zone 30242 heating another section of the aerosol generation substrate 301. The first heating zone 30241 and the second heating zone 30242 work in different time periods to heat the aerosol generation substrate 301 in sections, which can extend the number of puffs of the aerosol generation substrate 301.

[00141] Further, in one embodiment, the outer side surface of the pipe wall thinning portion 3028 is recessed toward the inside of the heating pipe 302. In some other embodiments, the inner side surface of the pipe wall thinning portion 3028 is recessed toward the outside of the heating pipe 302. In some other embodiments, the outer side surface of the pipe wall thinning portion 3028 is recessed toward the inside of the heating pipe 302, and the inner side surface of the pipe wall thinning portion 3028 is recessed toward the outside of the heating pipe 302. Since the inner side

surface of the wall of the heating pipe 302 is inherently an outwardly concave arc surface, the description of the inner side surface of the pipe wall thinning portion 3028 being recessed toward the outside of the heating pipe 302 in the present application means that the degree of outward concavity of the pipe wall thinning portion 3028 is greater than that of other areas, thereby achieving a wall thickness of the pipe wall thinning portion 3028 that is less than the wall thickness of other areas.

[00142] Further, in one embodiment, please refer to FIG. 23. The first heating zone 30241 and the second heating zone 30242 are arranged adjacent to each other in the circumferential direction of the heating pipe 302, with the pipe wall thinning portion 3028 extending along the axial direction of the heating pipe 302.

[00143] The arrangement of heating zones 3024 on the heating pipe 302 can use any feasible form. For example, in addition to the above arrangement form, the first heating zone 30241 and the second heating zone 30242 can also be arranged adjacent to each other in the axial direction of the heating pipe 302, with the pipe wall thinning portion 3028 extending along the circumferential direction of the heating pipe 302. For example, there are four or more heating zones 3024, with at least two arranged adjacent to each other in the circumferential direction of the heating pipe 302 and at least two arranged adjacent to each other in the axial direction of the heating pipe 302.

[00144] The pipe wall thinning portion 3028 can use any feasible shape, such as a straight line or curve; and it can also be multiple discontinuously arranged, or it can be any shape such as square or circular.

[00145] Specifically, in one embodiment, please refer to FIGs. 25 and 26. The flow guide seat 306 and the heat exchanger 305 are both interference-fitted in the heating pipe 302. The heat exchanger 305 includes a shell cylinder 3052 and a blocking edge 3053 located at one end of the shell cylinder 3052. The blocking edge 3053 blocks the ventilation end of the heating pipe 302, limiting the insertion depth of the shell cylinder 3052. To facilitate the positioning of the flow guide seat 306, the shell cylinder 3052 of the heat exchanger 305 is provided with a positioning protrusion 3054, and the flow guide seat 306 is provided with a positioning groove 3063 that fits with the positioning protrusion 3054 for positioning. The heat exchanger 305 and the flow guide seat 306 are stacked together after positioning.

[00146] In one embodiment, the blocking edge 3053 is clamped between the heating pipe 302 and the second heating pipe seat 308.

[00147] The above uses specific examples to explain the present application, which is only to help understand the present application and is not intended to limit the present application. For those skilled in the art, based on the idea of the present application, several simple deductions, deformations, or substitutions can be made.

Claims

1. A heating assembly, characterized in that the heating assembly comprises a heating element, wherein the heating element is configured to heat an aerosol generation substrate, and the heating element comprises at least two heating zones; and

wherein a thermal barrier structure is provided between at least one pair of adjacent heating zones, the thermal barrier structure being configured to prevent heat transfer between the adjacent heating zones.

2. The heating assembly according to claim 1, characterized in that the heating element comprises a thermally conductive body and a heating structure, and the heating assembly further comprises a heat exchange structure; and

wherein the thermally conductive body forms an open-ended accommodating cavity, the thermally conductive body comprises axially distributed first thermal conductive zone and second thermal conductive zone, a portion of the accommodating cavity corresponding to the first thermal conductive zone is for inserting the aerosol generation substrate, the heat exchange structure is mounted at a portion of the accommodating cavity corresponding to the second thermal conductive zone, the heating structure is positioned at the first thermal conductive zone, the heating structure generates heat, the first thermal conductive zone conducts heat generated by the heating structure to the second thermal conductive zone, and the heat exchange structure is configured to perform heat exchange with the second thermal conductive zone to heat incoming gas;

wherein the first thermal conductive zone comprises at least two heating zones, the heating structure comprises at least two heating elements, and the heating elements correspond to the heating zones one by one; and

wherein the thermally conductive body further comprises a heat-insulating hollow portion between two adjacent heating zones, the heat-insulating hollow portion forming the thermal barrier structure.

3. The heating assembly according to claim 2, characterized in that a length of the heat-insulating hollow portion is greater than or equal to a length of the heating element along a direction parallel to the heat-insulating hollow portion.

4. The heating assembly according to claim 2, characterized in that the heat-insulating hollow portion comprises: at least one elongated hollow hole.

5. The heating assembly according to claim 4, characterized in that a width of the elongated hollow hole is greater than 0.1 mm.

6. The heating assembly according to claim 2, characterized in that the heat-insulating hollow portion is provided along a boundary line between the two adjacent heating zones.

7. The heating assembly according to claim 2, characterized in that the thermally conductive body is of a hollow tubular structure, and the accommodating cavity is an inner cavity of the thermally conductive body.

8. The heating assembly according to claim 7, characterized in that at least two heating zones are uniformly distributed along a circumference of the thermally conductive body, and the heat-insulating hollow portion extends axially along the thermally conductive body; or

wherein at least two heating zones are uniformly distributed along an axial direction of the thermally conductive body, and the heat-insulating hollow portion extends circumferentially along the thermally conductive body.

9. The heating assembly according to claim 8, characterized in that a distance between the heat-insulating hollow portion extending axially along the thermally conductive body and a nearest port of the heating element is greater than 1 mm.

10. The heating assembly according to claim 2, characterized by further comprising a flow guide, wherein the flow guide is mounted at a portion of the accommodating cavity corresponding to the second thermal conductive zone, and is located between the heat exchange structure and the aerosol generation substrate, the flow guide is provided with a flow guide hole, and the flow guide hole is configured to guide preheated air to the aerosol generation substrate.

11. The heating assembly according to claim 1, characterized in that the heating element comprises a heat-insulating zone; and

wherein the heat-insulating zone is positioned between two adjacent heating zones, and the thermal barrier structure comprises an insulating body, the insulating body being embedded in the heat-insulating zone of the heating element to block heat transfer between the adjacent heating zones.

12. The heating assembly according to claim 11, characterized in that the heat-insulating zone comprises a hollow structure, the insulating body filling the hollow structure.

13. The heating assembly according to claim 11, characterized in that the heat-insulating zone has a groove, and the insulating body is arranged in the groove.

14. The heating assembly according to claim 12, characterized in that the hollow structure is a thermal insulation hole, and the thermal insulation hole is of a linear hole structure.

15. The heat assembly according to claim 14, characterized in that the heating element is of a tubular structure, the thermal insulation hole is provided in an axial direction, and the heating element has a first heat generating zone and a second heat generating zone; and two or more thermal insulation holes are provided, the thermal insulation holes comprise a first thermal insulation hole and a second thermal insulation hole, the first heat generating zone has a first end and a second end opposite to each other in a circumferential direction, the second heat generating zone has a first end and a second end opposite to each other in a circumferential direction, the first end of the first heat generating zone is close to the second end of the second heat generating zone, the first thermal insulation hole is provided between the first end of the first heat generating zone and the second end of the second heat generating zone, and the thermal insulation hole is provided between the second end of the first heat generating zone and the first end of the second heat generating zone.

16. The heat assembly according to claim 12, characterized in that the hollow structure is of an intermittently spaced hollow structure.

17. The heat assembly according to claim 11, characterized in that a thermal conductivity of the insulating body is less than $8\text{W}/(\text{m}\cdot\text{K})$, and/or, a material of the insulating

body comprises at least one of microcrystalline glass, zirconia ceramics, polyether ether ketone, and polyimide.

18. The heating assembly according to claim 11, characterized in that the heating element comprises:

a substrate, wherein the substrate has an accommodating cavity, and the accommodating cavity is configured to accommodate the aerosol generation substrate; and

at least two heat generating layers, wherein the heat generating layers are arranged on the substrate, the heat generating layers are in one-to-one correspondence with the heat generating zones, and the heat generating layers are configured to generate heat when electrified to heat the aerosol generation substrate.

19. The heating assembly according to claim 11, characterized by further comprising a housing assembly and a thermal insulation layer, wherein the housing assembly has an installation cavity, the heating element is arranged in the installation cavity, and the thermal insulation layer is arranged on an inner wall of the installation cavity.

20. The heating assembly according to claim 1, characterized in that the heating element comprises a heating pipe, the heating pipe being configured to heat the aerosol generation substrate, a pipe wall of the heating pipe comprises at least two heating zones, each heating zone being capable of heating the aerosol generation substrate; a thermal insulation interval is provided between adjacent heating zones to prevent heat transfer between the adjacent heating zones, the thermal insulation interval penetrating the pipe wall of the heating pipe in a radial direction; the heating zones form the heating zones, and the thermal insulation interval forms the thermal barrier structure; and

wherein the heating assembly comprises a thermoplastic sealing layer, the thermoplastic sealing layer being positioned on the heating pipe and covering the thermal insulation interval to prevent airflow within the heating pipe from flowing out through the thermal insulation interval.

21. The heating assembly according to claim 20, characterized in that the thermoplastic sealing layer is a heat-shrinkable tube or heat-shrinkable film heat-shrunk on the heating pipe.

22. The heating assembly according to claim 20, characterized by further comprising an electric heating element, each heating zone corresponds to at least one electric heating element, and the electric heating element is configured to separately heat the corresponding heating zone to enable each heating zone to separately heat the aerosol generation substrate inserted into the heating pipe.

23. The heating assembly according to claim 22, characterized in that the electric heating element is located between the thermoplastic sealing layer and the heating pipe.

24. The heating assembly according to claim 23, characterized in that the electric heating element maintains thermal contact with the heating pipe under an action of thermoplastic sealing layer.

25. The heating assembly according to claim 23, characterized in that the electric heating element is fixed to an outer surface of the heating pipe.

26. The heating assembly according to claim 22, characterized in that the electric heating element is located on one side of the thermoplastic sealing layer away from the heating pipe.

27. The heating assembly according to claim 20, 21, or 22, characterized in that the heating pipe comprises an airflow heating section and a generation stick heating section, the airflow heating section and the generation stick heating section are arranged in an axial direction of the heating pipe, and the airflow heating section is configured to heat airflow entering the aerosol generation substrate; the heating pipe has a heating chamber for the aerosol generation substrate to insert to heat the aerosol generation substrate; a generation stick blocking structure is arranged in the airflow heating section; the generation stick blocking structure is configured to block an end face of the aerosol generation substrate inserted into the heating chamber to limit an insertion depth of the aerosol generation substrate into the heating chamber; and the heating zones are all located on the generation stick heating section.

28. The heating assembly according to claim 27, characterized in that a heat exchanger is arranged in the airflow heating section, the airflow heating section is in thermal contact with the heat exchanger, a plurality of airflow channels are provided in the heat exchanger, and the airflow channels allow airflow to pass to heat the passing airflow.

29. The heating assembly according to claim 1, characterized in that the heating element comprises a thermally conductive pipe and an electric heating element provided on the thermally conductive pipe, the thermally conductive pipe comprises a heating chamber for inserting the aerosol generation substrate, a pipe wall of the thermally conductive pipe comprises at least two heating zones, a number of electric heating elements is at least two, each heating zone corresponds to at least one electric heating element, and the electric heating element is configured to heat the corresponding heating zone; and

wherein a pipe wall thinning portion is provided on the pipe wall of the thermally conductive pipe between at least one pair of adjacent heating zones, and a wall thickness of the pipe wall thinning portion is less than a wall thickness of the heating zones, the heating zones forming the heating zones, and the pipe wall thinning portion forming the thermal barrier structure.

30. The heating assembly according to claim 29, characterized in that an outer side surface of the pipe wall thinning portion is recessed toward inside of the thermally conductive pipe and/or an inner side surface of the pipe wall thinning portion is recessed toward outside of the thermally conductive pipe.

31. The heating assembly according to claim 29, characterized in that the pipe wall thinning portion is provided between any one pair of adjacent heating zones.

32. The heating assembly according to claim 29, characterized in that the heating zones comprise a first heating zone and a second heating zone, the first heating zone and the second heating zone are adjacent in a circumferential direction of the thermally conductive pipe, and the pipe wall thinning portion extends axially along the thermally conductive pipe; or

wherein the first heating zone and the second heating zone are adjacent in an axial direction of the thermally conductive pipe, and the pipe wall thinning portion extends circumferentially along the thermally conductive pipe.

33. The heating assembly according to claim 29, characterized in that the electric heating element is laid on an outer surface of the thermally conductive pipe;

wherein the electric heating element is laid on an inner surface of the thermally conductive pipe; or

wherein the electric heating element is embedded within the pipe wall of the thermally conductive pipe.

34. The heating assembly according to any one of claims 29 to 33, characterized in that the thermally conductive pipe comprises an airflow heating section and a generation stick heating section, the airflow heating section and the generation stick heating section are arranged in an axial direction of the thermally conductive pipe, and the airflow heating section is configured to heat airflow entering the aerosol generation substrate; a generation stick blocking structure is arranged in the airflow heating section, and the generation stick blocking structure is configured to block an end face of the aerosol generation substrate inserted into the heating chamber to limit an insertion depth of the aerosol generation substrate into the heating chamber; and the heating zones are all located on the generation stick heating section.

35. The heating assembly according to claim 34, characterized in that a heat exchanger is arranged in the airflow heating section, the airflow heating section is in thermal contact with the heat exchanger, a plurality of airflow channels are provided in the heat exchanger, and the airflow channels allow airflow to pass to heat the passing airflow.

36. The heating assembly according to claim 35, characterized in that the generation stick blocking structure is a flow guide seat located on one side of the heat exchanger, the flow guide seat has a generation stick blocking surface that is in stop fit with the aerosol generation substrate, and the generation stick blocking surface is located on one side of the flow guide seat facing away from the heat exchanger, a center of the flow guide seat has a flow guide hole, and the flow guide hole is configured to guide airflow to enter the aerosol generation substrate from the center of the end face of the aerosol generation substrate.

37. The heating assembly according to claim 29 or 30, characterized by comprising a first thermally conductive seat and a second thermally conductive seat, wherein the thermally conductive pipe is clamped between the first thermally conductive seat and the second thermally conductive seat, the first thermally conductive seat has a first pipe seat hole for the aerosol generation substrate to pass to insert into the heating chamber, and the second thermally conductive seat has a second pipe seat hole for the airflow entering aerosol generation substrate to pass.

38. An aerosol generation device, characterized in that the aerosol generation device comprises a power supply and the heating assembly according to any one of claims 1 to 37, wherein the power supply powers the heating assembly.