

AEROSOL GENERATING DEVICE AND HEATING STRUCTURE THEREOF

Technical Field

[0001] The present utility model relates to the technical field of aerosol-generating devices, specifically relates to an aerosol-generating device and its heating structure.

Background

[0002] Heat-not-burn cigarettes are an important new type of tobacco product, which do not directly burn the cigarette but instead use an external heat source to heat the tobacco material, generating smoke to provide the smoker with a physiological-satisfy smoking experience. Compared to traditional cigarettes, heat-not-burn cigarettes do not involve a combustion process, thus not producing harmful substances such as tar and carbon monoxide, significantly reducing the harm of smoking to consumers and those around them.

[0003] The aerosol-forming substrate of heat-not-burn cigarettes needs to be heated and smoked by using an aerosol-generating device, which contains a heater to generate heat energy to heat the cigarette.

[0004] Prior-art forms of the heat-not-burn cigarettes can only implement side-heating and bottom-heating in the same time, with a single heating mode, unable to satisfy the smoking needs of different cigarettes or different users.

Summary

Technical Problem

[0005] The present utility model provides an aerosol-generating device and its heating structure, primarily to solve the problem of a single heating mode, which cannot satisfy the smoking needs of different cigarettes or different users.

Solution to the Problem

[0006] According to the first aspect, an embodiment provides a heating structure of an aerosol-generating device, including a heating tube, a heat exchanger, and a heater.

[0007] The heating tube has a first accommodating cavity and a second accommodating cavity communicated in an axial direction, the first accommodating cavity is used to accommodate the aerosol-forming substrate, and the heat exchanger is installed in the second accommodating cavity.

[0008] The heater comprises a first heating element and a second heating element, the first heating element corresponds to an end of the first accommodating cavity away from the second accommodating cavity, and is used to heat a part of the aerosol-forming substrate away from the heat exchanger. The second heating element corresponds to the position of the heat exchanger.

The first heating element and the second heating element are two independent heating elements, and are used to asynchronously and/or synchronously heat the heating tube.

[0009] In one embodiment, the first heating element and the second heating element are both resistance heating sheets, located on the outer side, inner side, or inside of the heating tube.

[0010] In one embodiment, the area covered by the first heating element on the heating tube is greater than the area covered by the second heating element on the heating tube.

[0011] In one embodiment, the first heating element and the second heating element are both electromagnetic induction coils, the heating tube is a metal tube, and the electromagnetic induction coil is radially spaced from the metal tube.

[0012] In one embodiment, it further comprises an outer tube, the heating tube is installed inside the outer tube, and the electromagnetic induction coil is set on the outer tube.

[0013] In one embodiment, the outer surface of the outer tube is provided with a first limit portion and a second limit portion, the first limit portion limits and fixes the first heating element, and the second limit portion limits and fixes the second heating element.

[0014] In one embodiment, there is a radial gap between the outer tube and the heating tube.

[0015] In one embodiment, the heating tube comprises a first heating tube and a second heating tube, the first accommodating cavity is located in the first heating tube, and the second accommodating cavity is located in the second heating tube.

[0016] In one embodiment, the first heating tube and the second heating tube are axially butted or axially spaced.

[0017] According to the second aspect, an embodiment provides an aerosol-generating device, including the heating structure of the aerosol-generating device described above.

Beneficial Effects

[0018] According to the aerosol-generating device and its heating structure of the above embodiments, due to the independent first heating element and second heating element, the two heating elements can be separately controlled for heating, allowing the first heating element and the second heating element to achieve synchronous or asynchronous heating, providing more heating modes to satisfy the smoking needs of different cigarettes or different users.

Brief Description of Drawings

[0019] FIG. 1 is an axial sectional view of a heating structure in one embodiment of the present application;

[0020] FIG. 2 is a structural schematic diagram of a heating structure in one embodiment of the present application;

[0021] FIG. 3 is a structural schematic diagram of a heating structure in one embodiment of the present application;

[0022] FIG. 4 is a structural schematic diagram of a heating structure in one embodiment of the present application;

[0023] FIG. 5 is a schematic diagram of the unfolded planar structure of a heating structure in one embodiment of the present application; and

[0024] FIG. 6 is a structural schematic diagram of a heating structure in one embodiment of the present application,

wherein the reference numerals are as follows:

1 - heating tube, 11 - heating chamber, 2 - heat exchanger, 21 - air intake hole, 3 - insulating member, 4 - first heating element, 5 - second heating element, 6 - aerosol-forming substrate, 7 - outer tube, 71 - first limit portion, 72 - second limit portion;

A - first pad, B - second pad, C - third pad.

Detailed Description

[0025] The present utility model will be further described in detail through specific embodiments in conjunction with the accompanying drawings. In different embodiments, similar elements 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 effortlessly recognize that some features can be omitted in different situations or replaced by other elements, materials, or methods. In certain cases, some operations related to the present application are not shown or described in the specification to avoid overwhelming the core part of the present application with excessive descriptions. 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.

[0026] Additionally, 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 reordered or adjusted in a manner that is obvious 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 a mandatory sequence unless otherwise specified that a particular sequence must be followed.

[0027] 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 "link" in the present application, unless specifically stated otherwise, include both direct and indirect connections (links).

[0028] Embodiment One.

[0029] The present embodiment provides a heating structure of an aerosol generation device,

which is used to be installed in the aerosol generation device to heat the aerosol-forming substrate and the air entering the aerosol-forming substrate. The heating structure in this embodiment includes two independent heaters, which can be separately controlled to perform partial heating, simultaneous heating with different power, sequential heating, and other heating methods according to usage needs, to meet the smoking needs of different cigarettes or different users.

[0030] Please refer to FIGs. 1 to 5. The heating structure of the aerosol-generating device in this embodiment mainly comprises a heating tube 1, a heat exchanger 2, and a heater.

[0031] The heating tube 1 is a high thermal conductivity inner shell tube, with good thermal conductivity, and the main body of the heating tube 1 is made of metal or ceramic or other thermally conductive materials.

[0032] The heating tube 1 is a hollow cylindrical structure, having a first accommodating cavity and a second accommodating cavity communicated in an axial direction. The inner diameter and axial length of the first accommodating cavity are adapted to the length of the aerosol-forming substrate 6, and it is used to accommodate the aerosol-forming substrate. The inner diameter and axial length of the second accommodating cavity are adapted to the heat exchanger 2, and it is used to accommodate the heat exchanger 2. The inner diameter of the first accommodating cavity is equal to or slightly larger than the outer diameter of the aerosol-forming substrate 6, allowing the aerosol-forming substrate 6 to be just inserted into the first accommodating cavity, preventing it from detaching from the first accommodating cavity. The heating tube 1 has a first end and a second end, with the first accommodating cavity extending from the first end to the middle, and the second accommodating cavity extending from the second end to the middle, with the position where the first accommodating cavity and the second accommodating cavity communicate being closer to the second end. The structure between the first accommodating cavity and the second accommodating cavity can have the same aperture without a separating part, or the first accommodating cavity and the second accommodating cavity can have different apertures or be provided with a separating part.

[0033] In this embodiment, the heat exchanger 2 has good thermal conductivity, is made of metal or ceramic or other thermally conductive materials, and is used to transfer heat energy to heat the air passing through it, i.e., to heat the air entering the aerosol-forming substrate 6 from the second end of the heating tube 1.

[0034] The heat exchanger 2 is installed in the second accommodating cavity of the heating tube 1, near the second end of the heat exchanger 2, and can be fixedly connected to the heating tube 1 by welding, clamping, or other methods. The heat exchanger 2 is a cylindrical structure with multiple axial air intake holes 21, which communicate with the first accommodating cavity to guide air into the aerosol-forming substrate 6. Preferably, the heat exchanger 2 is provided with honeycomb air intake holes 21, which can increase the contact area between the incoming air and

the heat exchanger 2, thereby improving the heating efficiency of the incoming air. The honeycomb arrangement can also increase the air intake volume.

[0035] In other embodiments, the air intake holes 21 of the heat exchanger 2 can be set as coal ball-shaped holes or several larger holes, which, although less effective than honeycomb air intake holes 21, can still provide a certain heating effect and are an improvement over the prior art.

[0036] In this embodiment, an insulating member 3 can be provided inside the heating tube 1. The insulating member 3 can be located at the communication position of the first accommodating cavity and the second accommodating cavity, or inside the first accommodating cavity or the second accommodating cavity. The insulating member 3 can be fixed on the heat exchanger 2 or on the inner wall of the heating tube 1.

[0037] The insulating member 3 is in contact with the heat exchanger 2 and is used to separate the aerosol-forming substrate 6 from the heat exchanger 2, preventing the heat exchanger 2 from directly heating the end face of the aerosol-forming substrate 6, thereby avoiding scorching the aerosol-forming substrate 6 at excessively high temperatures.

[0038] The insulating member 3 is preferably an annular insulating ring structure, with a through hole in the middle for guiding hot air into the aerosol-forming substrate 6.

[0039] In other embodiments, the insulating member 3 can also be of other structures, such as an I-shaped structure, with two ends as annular plates connected by a connecting part, with the two annular plates respectively connected to the heat exchanger 2 and the aerosol-forming substrate 6, also achieving separation between the heat exchanger 2 and the aerosol-forming substrate 6.

[0040] In this embodiment, the heater is set on the outer side of the heating tube 1, including a first heating element 4 and a second heating element 5, both being resistance heating sheets, attached to the circumferential outer side surface of the heating tube 1, capable of converting electrical energy into heat energy. The first heating element 4 and the second heating element 5 can use existing known heating materials. In other embodiments, the first heating element 4 and the second heating element 5 can also be set on the circumferential inner side surface of the heating tube 1, or integrally formed inside the heating tube 1 (between the outer side surface and the inner side surface), with the main body of the first heating element 4 and the second heating element 5 hidden, exposing only the two ends.

[0041] In this embodiment, the first heating element 4 is near the first end of the heating tube 1, located on the outer side of the first accommodating cavity, corresponding to the end of the first accommodating cavity away from the heat exchanger 2, and is used to heat the part of the aerosol-forming substrate 6 away from the heat exchanger 2. The second heating element 5 is near the second end of the heating tube 1, located on the outer side of the second accommodating

cavity, and is used to heat the heat exchanger 2, thereby heating the air entering the aerosol-forming substrate 6. The first heating element 4 and the second heating element 5 respectively heat the main body of the aerosol-forming substrate 6 and the incoming air, and heat both ends of the aerosol-forming substrate 6, achieving more uniform heating of the aerosol-forming substrate 6 and improving the smoking taste.

[0042] The sheet length of the first heating element 4 is greater than that of the second heating element 5, covering a larger area of the heating tube 1 than the second heating element 5, to increase the coverage of the circumferential surface of the aerosol-forming substrate 6 and improve the efficiency of directly heating the aerosol-forming substrate 6.

[0043] In this embodiment, the first heating element 4 and the second heating element 5 are independent structures, capable of being separately controlled for heating. This independent structure means that the first heating element 4 and the second heating element 5 can have separately controlled circuits, although the circuits connected to the first heating element 4 and the second heating element 5 can also be parallel. The separate control of heating by the first heating element 4 and the second heating element 5 can achieve different heating modes, such as synchronous heating and asynchronous heating, where the first heating element 4 and the second heating element 5 can be heated at different powers in synchronous and asynchronous heating modes.

[0044] Please refer to FIGs. 3 and 5. The two ends of the strip structure of the first heating element 4 are the first electrical connection end and the second electrical connection end, and the two ends of the second heating element 5 are the third electrical connection end and the fourth electrical connection end. The first electrical connection end and the third electrical connection end are the same electrode, and the second electrical connection end and the fourth electrical connection end are the same electrode. For example, the first electrical connection end is the positive electrode, the second electrical connection end is the negative electrode, the third electrical connection end is the positive electrode, and the fourth electrical connection end is the negative electrode.

[0045] In this embodiment, the first electrical connection end and the third electrical connection end are set apart, with the first electrical connection end as the first pad A, the third electrical connection end as the second pad B, and the second electrical connection end and the fourth electrical connection end connected together, forming the third pad C. The first pad A, the second pad B, and the third pad C are used for welding wires, allowing the first heating element 4 and the second heating element 5 to be connected to the circuit, providing electrical energy to the first heating element 4 and the second heating element 5. Connecting the second electrical connection end and the fourth electrical connection end as the same electrode can reduce wiring, lower costs, save space, and does not affect the separate control of heating by the first heating element 4 and

the second heating element 5.

[0046] In other embodiments, the second electrical connection end and the fourth electrical connection end can also be set apart, with the first electrical connection end and the third electrical connection end connected together, also achieving separate control of power supply to the first electrical connection end and the fourth electrical connection end.

[0047] The heating structure in this embodiment, due to the independent first heating element 4 and second heating element 5, allows the two heating elements to be separately controlled for heating, enabling the first heating element 4 and the second heating element 5 to achieve synchronous or asynchronous heating, providing more heating modes to satisfy the smoking needs of different cigarettes or different users.

[0048] In other embodiments, the heating tube 1 can also comprise a first heating tube and a second heating tube, which can be axially butted to form a single heating tube, or set apart and connected by other connecting parts. The first accommodating cavity is located in the first heating tube, and the second accommodating cavity is located in the second heating tube. The first heating tube is used to insert the aerosol-forming substrate 6, and the second heating tube is used to install the heat exchanger 2. The first heating element 4 is set on the outer side of the first heating tube, and the second heating element 5 is set on the outer side of the second heating tube. Splitting the heating tube 1 into two tubes also allows the first heating element 4 and the second heating element 5 to be separately controlled for heating.

[0049] Embodiment Two.

[0050] This embodiment provides a heating structure of an aerosol-generating device, differing from the first embodiment in that the first heating element 4 and the second heating element 5 are electromagnetic induction heating structures, and a double-tube structure is also provided.

[0051] Please refer to FIG. 6. In this embodiment, the heating structure comprises a heating tube 1, a heat exchanger 2, and an outer tube 7. The inner diameter of the outer tube 7 is greater than the outer diameter of the heating tube 1, and the length of the outer tube 7 can be greater than the length of the heating tube 1. The heating tube 1 is installed inside the outer tube 7, and can be entirely or partially located inside the outer tube 7.

[0052] The heat exchanger 2 is installed inside the heating tube 1, or can be installed outside the heating tube 1, connected to the end of the heating tube 1. Similarly, the insulating member 3 can be set inside or outside the heating tube 1, as long as it is between the aerosol-forming substrate 6 and the heat exchanger 2.

[0053] In this embodiment, the first heating element 4 and the second heating element 5 are induction coils, and the heating tube 1 is made of metal material that forms electromagnetic induction heating with the first heating element 4 and the second heating element 5.

[0054] The first heating element 4 and the second heating element 5 are located on the

circumferential outer side of the outer tube 7, wound around the outer tube 7. The first heating element 4 is radially aligned with the circumferential area near the first end of the heating tube 1, allowing it to heat the part of the aerosol-forming substrate 6 in the first accommodating cavity away from the heat exchanger 2. The second heating element 5 is radially aligned with the circumferential area near the second end of the heating tube 1, allowing it to heat the heat exchanger 2 in the second accommodating cavity.

[0055] In other embodiments, the first heating element 4 and the second heating element 5 can also be set on the inner circumference of the outer tube 7, or inside the outer tube 7, also capable of heating the heating tube 1.

[0056] In other embodiments, the second heating element 5 can also directly heat the heat exchanger 2, also achieving heating of the air entering the aerosol-forming substrate 6.

[0057] In this embodiment, the outer circumference of the outer tube 7 is provided with a first limit portion 71 and a second limit portion 72. The first limit portion 71 can be two spaced annular protrusions, axially limiting the first heating element 4 on the outer tube 7. The second limit portion 72 can also be two spaced annular protrusions, axially limiting the second heating element 5 on the outer tube 7. In other embodiments, the first limit portion 71 and the second limit portion 72 can be other limiting structures, such as annular grooves or several protrusions on two circumferences, also capable of axially limiting the first heating element 4 and the second heating element 5.

[0058] In other embodiments, only one limit portion can be set on the outer tube 7, or no limit portion, with the electromagnetic induction coil fixed on the outer tube 7 by winding binding force, also achieving a certain axial limitation.

[0059] In this embodiment, a radial gap can be set between the outer tube 7 and the heating tube 1, which can be used to accommodate air. During heating, the air in the gap can be heated together, playing a role in heat transfer, allowing other areas on the heating tube 1 to also be heated, improving the heating effect.

[0060] In this embodiment, the first heating element 4 and the second heating element 5 use electromagnetic induction for heating, and the two are spaced apart, forming two independent heating structures, also capable of being separately controlled for heating, enabling the first heating element and the second heating element to achieve synchronous or asynchronous heating, providing more heating modes to satisfy the smoking needs of different cigarettes or different users.

[0061] In other embodiments, one of the first heating element 4 and the second heating element 5 can be set as a resistance heating sheet, and the other as an electromagnetic induction coil, with the resistance heating sheet and the electromagnetic induction coil separately controlled for heating, also achieving multiple heating modes to satisfy the smoking needs of different

cigarettes or different users.

[0062] In other embodiments, part or all of the heat exchanger 2 can be located outside the heating tube 1, with the end or end face of the heat exchanger 2 connected to the end face of the second end of the heating tube 1, and the air intake holes 21 of the heat exchanger 2 still communicating with the first accommodating cavity, also achieving heating of the air entering the aerosol-forming substrate 6.

[0063] Embodiment Three.

[0064] This embodiment provides an aerosol-generating device, which is a heat-not-burn device, including a housing and the heating structure in any of the above embodiments, installed inside the housing. The housing also contains a power source and wires, with the power source connected to the first heating element 4 and the second heating element 5 through wires, providing power to the first heating element 4 and the second heating element 5, converting electrical energy into heat energy to heat and bake the circumferential side surface of the aerosol-forming substrate 6 and the incoming air.

[0065] The aerosol-generating device is also provided with a controller, electrically connected to the first heating element 4 and the second heating element 5, used to control the separate heating and combined heating of the first heating element 4 and the second heating element 5, forming multiple heating modes to satisfy different heating and smoking needs.

[0066] The aerosol-generating device in this embodiment uses the heating structure of the above embodiments, capable of heating the side surface of the aerosol-forming substrate, while also heating the air entering the aerosol-forming substrate, achieving uniform and thorough baking of the aerosol-forming substrate 6, providing a better smoking effect.

[0067] The above has been described with specific examples to help understand the present invention, but is not intended to limit the present invention. For those skilled in the art, based on the idea of the present invention, several simple deductions, modifications, or substitutions can be made.

Claims

1. A heating structure of an aerosol-generating device, characterized in that the heating structure comprises a heating tube, a heat exchanger, and a heater, wherein the heating tube has a first accommodating cavity and a second accommodating cavity communicated in an axial direction, the first accommodating cavity is configured to accommodate an aerosol-forming substrate, and the heat exchanger is mounted in the second accommodating cavity; and

wherein the heater comprises a first heating element and a second heating element, the first heating element corresponds to an end of the first accommodating cavity away from the second accommodating cavity, the first heating element is configured to heat a part of the aerosol-forming substrate far away from the heat exchanger, the second heating element corresponds to a position of the heat exchanger, the first heating element and the second heating element are two independent heating elements, and the first heating element and the second heating element are configured to heat the heating tube asynchronously and/or synchronously.

2. The heating structure of the aerosol-generating device according to claim 1, characterized in that the first heating element and the second heating element are both a resistance heating sheet, and the resistance heating sheet is disposed on an outer side, an inner side, or inside of the heating tube.

3. The heating structure of the aerosol-generating device according to claim 2, characterized in that an area covered by the first heating element on the heating tube is greater than an area covered by the second heating element on the heating tube.

4. The heating structure of the aerosol-generating device according to claim 1, characterized in that the first heating element and the second heating element are both an electromagnetic induction coil, the heating tube is a metal tube, and the electromagnetic induction coil is disposed at a radial interval with the metal tube.

5. The heating structure of the aerosol-generating device according to claim 4, characterized in that the heating structure further comprises an outer tube, the heating tube is mounted in the outer tube, and the electromagnetic induction coil is disposed on the outer tube.

6. The heating structure of the aerosol-generating device according to claim 5, characterized in that a first limit portion and a second limit portion are disposed on an outer

surface of the outer tube, the first limit portion limits and fixes the first heating element, and the second limit portion limits and fixes the second heating element.

7. The heating structure of the aerosol-generating device according to claim 5, characterized in that a radial gap is disposed between the outer tube and the heating tube.

8. The heating structure of the aerosol-generating device according to any one of claims 1 to 7, characterized in that the heating tube comprises a first heating tube and a second heating tube, the first accommodating cavity is disposed in the first heating tube, and the second accommodating cavity is disposed in the second heating tube.

9. The heating structure of the aerosol-generating device according to claim 8, characterized in that the first heating tube and the second heating tube are butted in an axial direction or are disposed at an axial interval.

10. An aerosol-generating device, characterized in that the aerosol-generating device comprises the heating structure of the aerosol-generating device according to any one of claims 1 to 9.