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(54) **AIRFLOW HEATING CIGARETTE MECHANISM AND HEAT-NOT-BURN CIGARETTE**

(57) The present application discloses a mechanism for heating cigarette by airflow, comprising a central heat source, and a heat exchange space surrounding the central heat source. The airflow enters from a bottom side of the heat exchange space and forms a hot airflow with even temperature after passing through the heat exchange space, and the hot airflow exits from an upper side of the heat exchange space and heats the cigarette. The present application also provides a heated cigarette

applying the mechanism for heating cigarette by airflow provided by the present application. The problems regarding the temperature stability and evenness of the hot airflow for heating cigarettes are effectively solved by the present application through a simple structural solution. This approach is not only cost-effective but also brings outstanding results, demonstrating a strong practical application effect.

EP 4 523 558 A1

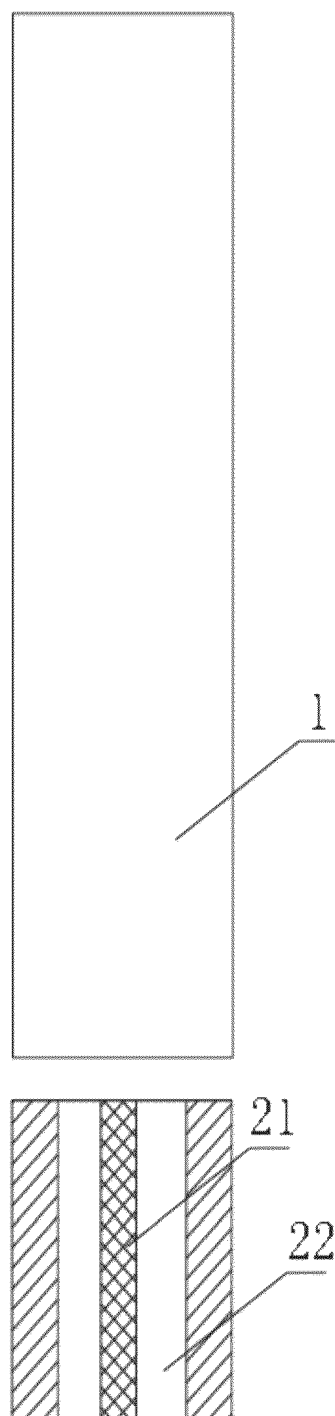


FIG. 2

Description

Technical Field

[0001] The present application relates to the technical field of aerosol generating devices, and more specifically to a heating mechanism and an aerosol generating device.

Background Art

[0002] Heated cigarettes emerged as a trending research focus in China. The heated cigarettes aim to significantly reduce the harmful substances generated by tobacco combustion while preserving the smoking experience. They achieve this by retaining the original flavor of tobacco and avoiding the byproducts associated with tobacco combustion. As a result, the detrimental health impacts from the combustion are mitigated.

[0003] The core of heated cigarette research lies in research of the heating mechanism. The heating methods can be generally categorized into two types: contact heating and non-contact heating. The contact heating encompasses a central heating method and a peripheral heating method. The underlying principle involves the heating body being in direct contact with the aerosol generating section of the cigarette, which is heated to generate the aerosol through heat conduction. The primary drawback of the contact heating is that it can cause localized excessive carbonization of the shredded tobacco at the contact area, which increases the risk of scorching. Additionally, portions of the shredded tobacco that are away from the contact area may not have adequate heating due to the limited capacity for heat conduction, resulting in a low overall carbonization rate of cigarettes, which adversely impacts the smoking experience and results in the waste of a portion of the shredded tobacco. In contrast, the non-contact heating may ensure a more uniform heat distribution across the entire cigarette. As a result, the overall carbonization rate of the aerosol generating material in cigarettes subjected to the non-contact heating method is superior to that achieved with the contact heating method.

[0004] At present, the commonly used non-contact heating methods include infrared heating, microwave heating, and hot airflow heating. Both infrared heating and microwave heating are facing considerable challenges, such as high costs and complex structure of the heating mechanism, which make them difficult to popularize their applications. However, the hot airflow heating involves using a heating mechanism to heat the airflow, and then allowing the heated hot airflow to heat the cigarettes, so that the cigarettes can produce aerosols for users to inhale.

[0005] When the hot airflow is heated, whether through internal or external peripheral heating, there is a risk of uneven temperature distribution within the heated airflow. This unevenness can lead to variable carbonization

rates across different sections of the cigarette, thereby impacting the stability of the smoke inhaled by the user.

Summary

[0006] An object of the present application is to overcome the problem of uneven temperature distribution within the heated airflow upon heating of the airflow in the prior art, and to provide a mechanism for heating cigarette by airflow that can ensure even temperature distribution of the hot airflow in various sections, so as to improve the stability of the smoke from one puff to another by the user.

[0007] The present application is specifically implemented in such a way that:

A mechanism for heating cigarette by airflow comprises a central heat source, and a heat exchange space surrounding the central heat source, the airflow enters from a bottom side of the heat exchange space, and forms a hot airflow with even temperature after passing through the heat exchange space, and the hot airflow exits from an upper side of the heat exchange space and heats the cigarette.

[0008] A further solution is as follows:

[0009] In order to ensure even temperature of the hot airflow, the heat exchange space is located at a distance of 1 mm to 2.5 mm from a peripheral part of the central heat source, and the heat exchange space as a whole is of a cylindrical shape, and the central heat source is located at a central position of the cylindrical shape. The heat exchange space is located from the peripheral part of the central heat source by a distance ranging from 1 mm to 2.5 mm, which means that the space that is distanced from the outside wall of the central heat source by 1 mm to 2.5 mm is the heat exchange space. That is, the distance from the peripheral part of the heat exchange space to the outside wall of the central heat source is in a range of 1 mm to 2.5 mm.

[0010] By limiting the size of the heat exchange space, the present application ensures that the central heat source can efficiently and stably heat the heat exchange space within the size range. This arrangement also maintains a relatively even temperature within the heat exchange space, which in turn guarantees an even temperature distribution in the final hot airflow.

[0011] A further solution is provided as follows:

When the hot airflow exits from the upper side of the heat exchange space, it flows through a perforated partition plate provided above the heat exchange space to exit. With the provision of a perforated partition plate, the area through which the airflow flows can be reduced, a pressure difference is created across the heat exchange space. The speed at which the airflow exits is increased, thereby contributing to the improvement of the heating efficiency of the cigarette. Moreover, the presence of the partition plate facilitates the generation of turbulence on both sides of the partition plate due to the accelerated airflow, which is also conducive to further homogenizing

the temperature of the hot airflow.

[0012] A further solution is provided as follows:

The outside wall of the central heat source is isolated from the heat exchange space by means of a heat conduction material with excellent heat conductivity. With such a provision, airflow is avoided from coming into direct contact with the heating body of the central heat source, thus avoiding a possible risk of heavy metal contamination and improving safety.

[0013] A further solution is provided as follows:

The heat conduction material with excellent heat conductivity is selected from alumina, silicon oxide, zinc oxide, aluminum nitride, silicon carbide, graphite, ceramic and the like.

[0014] A further solution is provided as follows:

A heat-insulating material is provided at an outer side of the heat exchange space. This avoids heat from being conducted to an outer surface of the cigarette, which could otherwise render it too hot to have a comfortable inhalation of the cigarette. Additionally, this insulation avoids heat loss, thereby increasing the temperature of the hot airflow.

[0015] A further solution is provided as follows:

Due to the heating method of the central heat source in combination with the heat exchange space, in order to ensure the heating effect, the heat exchange space will not be provided too large. When the airflow exits the heat exchange space, the airflow directly above the heat exchange space is at a high temperature and is able to effectively heat the portions of the cigarette that are positioned above the heat exchange space. However, the portions of the cigarette, that are not directly above the heat exchange space and the central heat source, are subjected to inadequate heating because there is no or only a minimal amount of hot airflow passing through them. For addressing this issue, the partition plate arranged above the heat exchange space is of an arc-shaped structure that protrudes outward at the central portion thereof. With the provision of the arc-shaped structure, the hot airflow exits the heat exchange space will be evenly distributed across the bottom of the entire cigarette, thereby ensuring even heating of the cigarette and improving the smoking experience.

[0016] The present application also provides a heated cigarette applying the mechanism for heating cigarette by airflow provided by the present application.

[0017] The problems regarding the temperature stability and evenness of the hot airflow for heating cigarettes are effectively solved by the present application through a simple structural arrangement. This approach is not only cost-effective but also brings outstanding results, demonstrating a strong practical application effect.

Brief Description of the Drawings

[0018]

FIG. 1 is a schematic view of an overall structure of a

heated cigarette according to one embodiment of the present application;

FIG. 2 shows a schematic view of a mechanism for heating cigarette by airflow according to one embodiment of the present application;

FIG. 3 shows a top view schematic view of a heat exchange space according to another embodiment of the present application;

FIG. 4 is a schematic view of a cross-section of the top of the heat exchange space according to a further embodiment of the present application.

Detailed Description of the Embodiments

[0019] The following is a further detailed description of the present application based on the accompanying drawings in combination with specific embodiments.

[0020] FIG. 1 shows a schematic view of the overall structure of a heated cigarette according to an embodiment of the present application. As can be seen, the heated cigarette comprises a power supply assembly 3, a mechanism 2 for heating cigarette by airflow and a cigarette 1, which are sequentially provided. The power supply assembly 3 supplies power to a central heat source in the mechanism 2 for heating cigarette by airflow. The airflow is heated by the central heat source in the mechanism 2 for heating cigarette by airflow, and then a cigarette positioned above is heated by using the heated hot airflow, thereby generating an aerosol for a smoker to inhale.

[0021] The main idea of the present application is illustrated by the following specific embodiments.

Embodiment 1

[0022] As shown in FIG. 2, a mechanism for heating cigarette by airflow comprises a central heat source 21, and a heat exchange space 22 located to surround the central heat source. The airflow enters from a bottom side of the heat exchange space, and forms a hot airflow with even temperature after passing through the heat exchange space. The hot airflow exits from an upper side of the heat exchange space and then heats the cigarette.

[0023] The central heat source 21 is powered by the power supply assembly 3 self-equipped in the cigarette. The power supply assembly 3 is turned on when needed, and the central heat source 21 begins to heat the heat exchange space 22. The airflow is heated by passing through the heat exchange space during smoking, and then heats the cigarette 1 to generate an aerosol for the smoker to inhale.

[0024] In this embodiment, the current conventional honeycomb heating mode is discarded. With the arrangement of the heat exchange space, the heating efficiency is effectively enhanced and the evenness of the temperature distribution within the hot airflow is ensured.

[0025] As a further embodiment, in order to ensure an

even temperature of the hot airflow, the heat exchange space is located at an outer side of the central heat source, and the central heat source is of a cylindrical shape. The overall shape of the heat exchange space is coaxial with the cylindrical shape of the central heat source and has a cylindrical shape with an annular cross-section. A distance between the outer side of the heat exchange space and the outside wall of the central heat source is not more than 2.5 mm, and not less than 1 mm.

[0026] For ensuring the heating effect and an even temperature distribution within the hot airflow, the heat exchange space is located directly at an outer side of the central heat source, completely wrapping the central heat source as viewed from the exterior form, and the heating efficiency is high. Moreover, the heat exchange space is smaller, and the temperature inside the heat exchange space is relatively even. The airflow brings about an overall effect of even heating due to the flow of airflow during heat exchange process.

Embodiment 2

[0027] Embodiment 2 is provided based on Embodiment 1. In Embodiment 2, a perforated partition plate 23 is provided at the top of the heat exchange space 22. As shown in FIG. 3 which is a top view of the heat exchange space, it can be seen that the partition plate 23 is provided in an annular shape at the top of the heat exchange space. When the hot airflow exits from the upper side of the heat exchange space, it flows through the perforated partition plate provided above the heat exchange space to exit. With the provision of a perforated partition plate, the area through which the airflow flows can be reduced, a pressure difference is created across the front and rear ends of the heat exchange space. The speed at which the airflow exits is increased, thereby contributing to the improvement of the heating efficiency of the cigarette. In addition, the presence of the partition plate facilitates the generation of turbulence on both sides of the partition plate due to the accelerated airflow, which is also conducive to further homogenizing the temperature of the hot airflow.

[0028] As a further improved solution to the embodiment, the area of the holes in the partition plate accounts for 50% to 75% of the total area of the partition plate. If the area of the holes is too small, it results in excessive force during smoking and less aerosol is produced. The area of the holes in this embodiment has been calculated. Within above range, the influence on the airflow rate is minimized, allowing for an appropriate increase in airflow velocity while maintaining normal aerosol production under typical smoking force. Moreover, tests have confirmed that the temperature of the hot airflow directly above the heat exchange space is evenly distributed, and there is no significant hot or cold spots.

Embodiment 3

[0029] In Embodiment 3 which is based on Embodiment 2, further improvements have been made to the partition plate. With the partition plate of Embodiment 2, the hot airflow can be well accelerated to flow to heat the cigarette. However, since the partition plate is provided above the heat exchange space, the hot airflow is concentrated at portions directly above the heat exchange space. This concentration leads to a superior heating effect on the portion of the cigarette that are positioned above the heat exchange space, while the remaining portions of the cigarette experience a less satisfactory heating effect, which affects the overall heating performance.

[0030] In view of the above, the inventor has provided a partition plate provided above the heat exchange space. The partition plate is configured into an arc-shaped structure that protrudes outward at a center thereof. That is, the partition plate is shaped in a form of the arc along a radial direction of the annular structure, and the arc protrudes towards the direction of the cigarette. The structure is depicted in FIG. 4 which is a schematic cross-sectional view of the top of the heat exchange space. With the provision of the arc-shaped structure, the hot airflow exits the heat exchange space would be evenly distributed across the bottom of the entire cigarette. Accordingly, the even heating of the overall cigarette is ensured, thereby improving the smoking experience.

Embodiment 4

[0031] The overall structure of Embodiment 4 is the same as that of Embodiments 1 to 3, with the difference that in Embodiment 4, an outside wall of the central heat source is isolated from the heat exchange space by a heat conduction material with excellent heat conductivity. For example, the central heat source is spaced apart from the heat exchange space by alumina, silicon oxide, zinc oxide, aluminum nitride, silicon carbide, graphite, ceramics, and the like. With such a provision, airflow is avoided from coming into direct contact with the heating body of the central heat source, thus avoiding a possible risk of heavy metal contamination, and improving safety.

Embodiment 5

[0032] In this embodiment which is based on Embodiment 4, a heat-insulating material is provided at an outer side of the heat exchange space. This avoids heat from being conducted to an outer surface of the cigarette, which could otherwise render the cigarette too hot to have a comfortable inhalation thereof. Additionally, this insulation avoids heat loss, thereby increasing the temperature of the hot airflow.

Embodiment 6

[0033] This embodiment provides a heated cigarette, applying the mechanism for heating cigarette by airflow of Embodiments 1 to 5. Its overall structure is divided into three parts: an upper part is a cigarette, a middle part is a mechanism for heating cigarette by airflow, and a lower part is a power supply system. In use, the power supply system is connected to the central heat source of the mechanism for heating cigarette by airflow. Once the central heat source is heated, the temperature within the heat exchange space is raised to a level that meets the temperature required for heating the cigarette without burning. The hot airflow enters into the upper-located cigarette and heats the cigarette during smoking. An aerosol is generated and then inhaled into the mouth.

[0034] It should be noted that the embodiments and figures of the present application only indicate the core points of invention of the present application, and there is no illustration of the necessary accessories, such as air holes, wires, brackets, temperature measuring parts, etc., which pertain to conventional parts for those skilled in the art.

[0035] Although the present application has been described herein with reference to the explanatory embodiments of the present application, the above embodiments are only the preferred embodiments of the present application, and the embodiments of the present application are not limited by the above embodiments. It should be understood that those skilled in the art may devise many other modifications and embodiments, which will fall within the scope of the principles and spirit of the disclosure of the present application.

Claims

1. A mechanism for heating cigarette by airflow, comprising a central heat source, wherein further comprising a heat exchange space surrounding the central heat source, the airflow enters from a bottom side of the heat exchange space and forms a hot airflow with even temperature after passing through the heat exchange space, and the hot airflow exits from an upper side of the heat exchange space and heats the cigarette.
2. The mechanism for heating cigarette by airflow according to claim 1, wherein the heat exchange space is located at a distance of 1 mm to 2.5 mm from a peripheral part of the central heat source, and the heat exchange space as a whole is of a cylindrical shape, and the central heat source is located at a central position of the cylindrical shape.
3. The mechanism for heating cigarette by airflow according to claim 1, wherein a perforated partition plate is provided above the heat exchange space.

4. The mechanism for heating cigarette by airflow according to claim 3, wherein the partition plate is an arc-shaped structure that protrudes outwardly at a center thereof.
5. The mechanism for heating cigarette by airflow according to any one of claims 1 to 4, wherein an outside wall of the central heat source is isolated from the heat exchange space by means of a heat conduction material with excellent heat conductivity.
6. The mechanism for heating cigarette by airflow according to claim 5, wherein the heat conduction material with excellent heat conductivity is selected from alumina, silicon oxide, zinc oxide, aluminum nitride, silicon carbide, graphite and ceramic.
7. The mechanism for heating cigarette by airflow according to any one of claims 1 to 4, wherein a heat-insulating material is provided at an outer side of the heat exchange space.
8. A heated cigarette, applying the mechanism for heating cigarette by airflow according to any one of claims 1 to 7.

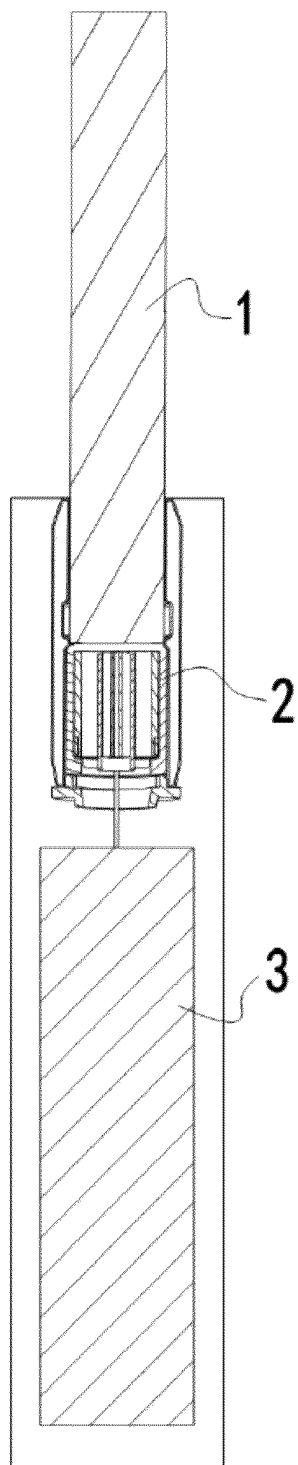


FIG. 1

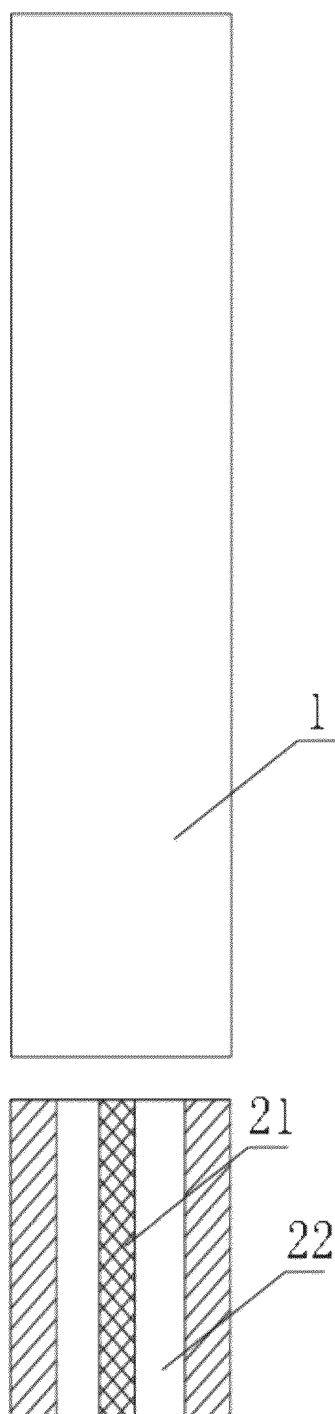


FIG. 2

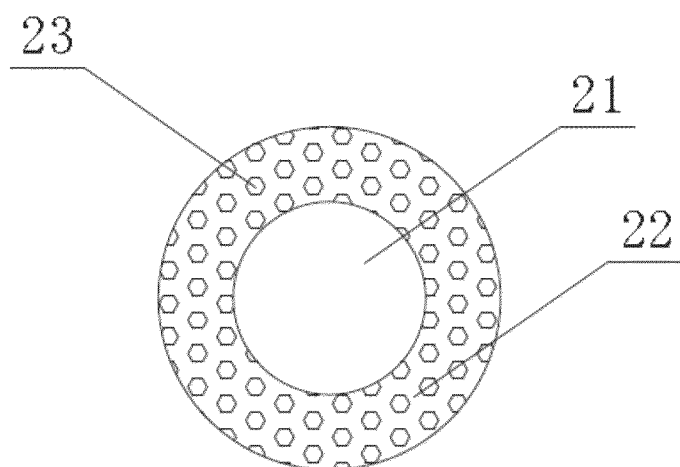


FIG. 3

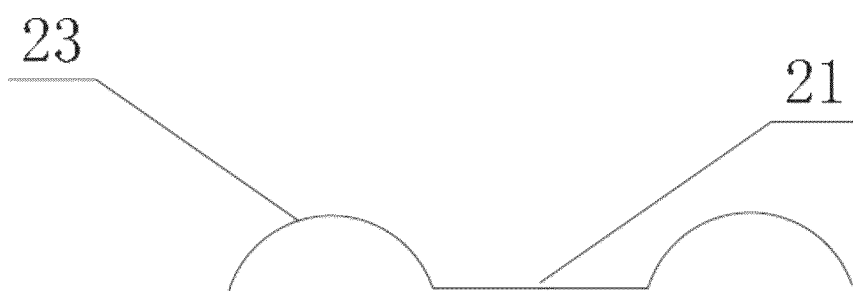


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/114961

A. CLASSIFICATION OF SUBJECT MATTER

A24F47/00(2020.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:A24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT: 空气加热, 气流加热, 换热, 气体加热, 发热组件, 加热组件, 隔板, 滤网, 隔层, 导流片, 隔片, 导气层, 导气板, 导气网, 腔, 空间; VEN, USTXT, EPTXT: air heating, airflow heating, heat exchange, gas heating, heat generating component, heating component, partition, baffle, air guide plate, air guide grid, cavity, space

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	CN 115997996 A (SHENZHEN SMISS TECHNOLOGY CO., LTD.) 25 April 2023 (2023-04-25) description, paragraphs 2 and 37-65, and figures 1-3	4

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

* Special categories of cited documents:

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Date of the actual completion of the international search

20 March 2024

Date of mailing of the international search report

26 March 2024

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/114961

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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