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(54) **HEATING ASSEMBLY FOR AEROSOL GENERATION DEVICE, AND AEROSOL GENERATION DEVICE**

(57) The application discloses a heating assembly for an aerosol generating device and an aerosol generating device, relating to the field of aerosol generation. The heating assembly comprises a longitudinally extending cavity, an electric heating element , a housing and an air inlet passage. The electric heating element located at one end of the longitudinally extending cavity, the heating assembly having multiple pore passages extending along the longitudinal axis, the electric heating element configured to heat the gas flowing through the pore passages to a temperature not lower than 200°C, so as to allow the gas to flow into the longitudinally extending cavity. The housing is provided around an outer peripheral side of the electric heating element, and an air gap is provided between the housing and the electric heating element. The air inlet channel, adjacent to the inner wall of the housing and provided only partially in the area of the air gap. This configuration allows for the collection of heat energy, provides temperature compensation for the aerosol-forming substrate, and effectively utilizes the waste heat of the electric heating element.

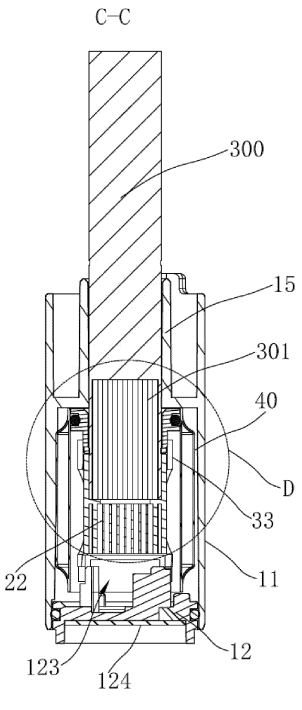

FIG.10

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Description

TECHNICAL FIELD

[0001] The application relates to the technical field of aerosol generation, in particular to a heating assembly for an aerosol generating device and an aerosol generating device.

BACKGROUND

[0002] At present, with the popularization of electronic products in cigarette technology, more and more smokers are turning to electrically operated aerosol-generating systems. There is an aerosol generating system for non-combustible tobacco products. The core principle involves using a heating element to burn the low-temperature, non-combustible tobacco, thereby generating aerosol gas for the smoker to inhale. For the existing aerosol generating system with heating but no combustion, the heating mode of aerosol generating system is usually tubular peripheral heating or central embedded heating. Central embedding heating means that when the heating sheet is inserted into the aerosol-producing matrix, the porosity of the aerosol-producing matrix section will change and the suction resistance will increase. Moreover, after inhaling, the residual aerosol-producing matrix will not be easy to clean the heating sheet. Tubular peripheral heating means that the heating tube surrounds the outside of aerosol-producing matrix. Especially, when the tubular peripheral heating element heats around the heating element, it is easy to over-burn the wrapping paper wrapped with aerosol-producing matrix, and it is likely to cause waste if the central part of aerosol-producing matrix is not fully heated, which is not conducive to the full heating of aerosol-producing matrix.

SUMMARY

[0003] In view of this, the purpose of the application is to overcome the deficiencies in the prior art. The application provides a heating assembly for an aerosol generating device to solve the technical problem of poor heating effect of the existing aerosol generating system.

[0004] The application provides:

A heating assembly for an aerosol generating device, comprising:

a longitudinally extending cavity for receiving an aerosol generating article including an aerosol-forming substrate, the longitudinally extending cavity has a longitudinal axis and comprises a wall body forming at least a portion of the longitudinally extending cavity; wherein the heating assembly further comprises:

an electric heating element, located at one end of the longitudinally extending cavity and having multiple pore passages extending along the longitudinal axis, the electric heating element is configured to heat a gas flowing through the pore passage to a temperature not lower than 200°C, so as to allow the gas to flow into the longitudinally extending cavity;

a housing, provided around an outer peripheral side of the electric heating element, and an air gap is provided between the housing and the electric heating element;

and an air inlet channel, adjacent to an inner wall of the housing and provided only partially in the area of the air gap.

[0005] In an exemplary embodiment, the heating assembly further comprises a rigid tube body connected to the electric heating element along a direction of the longitudinal axis, and the rigid tube body is least a part of the wall body of the longitudinally extending cavity.

[0006] In an exemplary embodiment, the heating assembly further comprises a metal support tube extending along the longitudinal axis, the metal support tube is arranged over the outer peripheral side of the electric heating element and the rigid tube body.

[0007] In an exemplary embodiment, the heating assembly further comprises a thermal-insulating element arranged between the housing and the electric heating element, at least a portion of the air inlet channel is formed between the housing and an inner wall of the thermal-insulating element, which is adjacent to the housing.

[0008] In an exemplary embodiment, the thermal-insulating element includes a sleeve with an internal cavity, and the internal cavity is evacuated to a lower pressure than the exterior of the sleeve.

[0009] In an exemplary embodiment, the thermal-insulating element is located on an outer peripheral side of the metal support tube, a first gap is arranged between the thermal-insulating element and the electric heating element.

[0010] In an exemplary embodiment, the metal support tube is provided with multiple hollow areas.

[0011] In an exemplary embodiment, at least part of the hollow area overlaps with an outer peripheral surface of the electric heating element.

[0012] In an exemplary embodiment, a second gap is provided between the thermal-insulating element and the metal support tube.

[0013] In an exemplary embodiment, the space of the second gap in the direction perpendicular to the longitudinal axis is smaller than the thickness of the first gap.

[0014] In an exemplary embodiment, the rigid tube body comprises at least a part of the wall body connected to the electric heating element to form the longitudinally extending cavity, and an annular protrusion extending from the wall body in a direction away from the electric heating element, with the annular protrusion being nested and connected by the thermal-insulating element.

[0015] In an exemplary embodiment, the housing comprises a housing wall and a base mated to the housing wall, the housing wall includes an opening-defining portion at the end and a side wall extending from the opening-

defining portion and connected to the base, with the opening-defining portion being a portion of the wall body of the longitudinally extending cavity.

[0016] In an exemplary embodiment, the side wall of the housing is provided with multiple convex prisms, and the thermal-insulating element abuts the convex prisms, so that at least a portion of the air inlet channel is formed between the thermal-insulating element and the housing wall.

[0017] In an exemplary embodiment, the opening-defining portion further comprises an extension tube extending away from the electric heating element, the extension tube is configured to accommodate only a portion of the wall body of the longitudinally extending cavity of the aerosol generating article.

[0018] In an exemplary embodiment, one end of the rigid tube body abuts the opening-defining portion, with the inner diameter of the opening-defining portion equal to or greater than that of rigid tube body.

[0019] In an exemplary embodiment, the base is provided with a bracket supporting the electric heating element, an air passage is provided between the base and the electric heating element, and the air passage communicates with the air inlet channel and multiple pore passages of the electric heating element.

[0020] In an exemplary embodiment, the housing wall is provided with multiple air inlet pore passages that allow external air to communicate with the air inlet channel.

[0021] In an exemplary embodiment, multiple air inlet pore passages are provided in the opening-defining portion.

[0022] In an exemplary embodiment, the electric heating element further includes a heat conduction tube coaxial with the longitudinally extending cavity, the heat conduction tube comprises an annular tube wall and a locating portion extending from the annular tube wall, the annular tube wall accommodates a heating core with multiple pore passages.

[0023] In an exemplary embodiment, the heating core is fixed by the locating portion and has a gap with the annular tube wall.

[0024] In an exemplary embodiment, the locating portion divides the heat conduction tube into two cavity regions, one cavity region contains the electric heating element, and the other cavity region contains a portion of the aerosol generating article of the aerosol-forming substrate.

[0025] In an exemplary embodiment, the inner diameter of the cavity region containing the aerosol generating article is greater than or equal to a diameter of the aerosol generating article.

[0026] The application also provides an aerosol generating device having the heating assembly for the aerosol generating device described in the above embodiment.

[0027] Compared with the prior art, this application presents a heating assembly for an aerosol generating device, comprising a longitudinally extending cavity, an electric heating element , a housing , an air inlet passage. The electric heating element is connected with the power supply through the connecting electrode, heating the aerosol-forming substrate in the longitudinally extending cavity (such as a non-combustible tobacco product). The electric heating element located at one end of the longitudinally extending cavity and has multiple pore passages extending along the longitudinal axis,the electric heating element configured to heat the gas flowing through the pore passages to a temperature not lower than 200 °C, so as to allow the gas to flow into the longitudinally extending cavity to heat the aerosol-forming substrate. Compared to peripheral or penetrating heating methods, this method uses airflow to carry the heat energy from the electric heating element through the pore passages into the aerosol-forming substrate, resulting in better heating efficiency. Additionally, the air gap insulates the heat emitted by the electric heating element and the cavity's periphery, facilitating heat energy collection, storage, and temperature compensation for the aerosol-forming substrate. This design optimally utilizes the electric heating element's waste heat, thus enhancing the assembly's overall thermal efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] In order to more clearly explain the technical solutions of the embodiments of the application, the drawings used in the embodiments will be briefly described below. And it will be understood that the following drawings only illustrate certain embodiments of the application and therefore should not be regarded as limiting in scope, and other related drawings may be obtained from these drawings without creative effort for those of ordinary skill in the art.

FIG.1 shows a schematic view of a heating assembly for an aerosol generating device in some embodiments of the application;

FIG.2 is a schematic diagram of sectional structure in the viewing direction of A-A shown in FIG. 1;

FIG.3 shows a schematic diagram of a stereoscopic structure of a longitudinally extending cavity in one embodiment of the application;

FIG.4 shows a structural schematic diagram of a longitudinally extending cavity in one embodiment of the application;

FIG. 5 is a schematic diagram of sectional structure in the viewing direction of B-B shown in FIG.4;

FIG.6 shows a schematic diagram of an aerosol generating substrate within a heating assembly in one embodiment of the application;

FIG.7 shows a partial schematic diagram of a metal support tube sheathed with an electric heating element extending from a longitudinally extending cavity in one embodiment of the application;

FIG.8 shows a schematic diagram of the three-dimensional structure of the base in one embodiment

of the application;

FIG.9 shows a schematic diagram of an aerosol generating device in one embodiment of the application;

FIG.10 is a structural schematic diagram of sectional structure in the viewing direction of C-C shown in FIG.9;

FIG. 11 shows a schematic view of an enlarged structure of Part D in FIG. 10;

FIG. 12 shows an exploded schematic diagram of an aerosol generating device in one embodiment of the application;

FIG. 13 shows a perspective schematic diagram of a housing in some embodiments of the application;

FIG. 14 shows a cross-sectional schematic diagram of a housing and thermal-insulating element in some embodiments of the application;

FIG. 15 shows a schematic diagram of a cross-sectional structure of another embodiment of the application;

FIG. 16 is a cross-sectional schematic diagram of the explosive structure of the application in Drawing 15.

Description of main component symbols:

[0029] 100-heating assembly; 10-housing; 11-housing wall; 111-air inlet pore passage; 12-base; 121-connecting pore passage; 122-bracket; 123-air passage; 124-circuit board; 13-convex prism; 14-opening-defining portion; 15-extension tube; 20-electric heating element; 21-pore passage; 22-heating core; 30-longitudinally extending cavity; 31-heat conduction tube; 311-annular tube wall; 312-locating portion; 313-cavity region; 32-rigid tube body; 321-annular protrusion; 33-metal support tube; 331-hollow area; 40-thermal-insulating element; 41-internal cavity; 42-sleeve; 50-sealing ring; 60-air inlet channel; 200-aerosol generating device; 300-aerosol generating article; 301-aerosol-forming substrate.

DESCRIPTION OF EMBODIMENTS

[0030] Embodiments of the application are described in detail below. Examples of the embodiments are shown in the drawings, in which identical or similar reference numbers throughout indicate identical or similar elements or elements having identical or similar functions. The embodiments described below with reference to the drawings are only intended to be illustrative of the application and are not to be construed as a limitation of the application.

[0031] In the description of the application, it should be understood that the terms "up," "down," "horizontal," "top," "bottom," "inner," "outer," "axial," "circumferential," etc. indicate orientation or positional relationships based on those shown in the drawings and are intended for simplifying the description only, and are not intended to indicate or imply that the device or element must have a particular orientation, be constructed and operate in a particular orientation. Therefore, the above terms are not to be construed as a limitation of the application.

[0032] Furthermore, the terms "first" and "second" are used for descriptive purposes only and cannot be understood as indicating or implying relative importance or implying the number of technical features indicated. Therefore, a feature defined as "first" and "second" may explicitly or implicitly include one or more of such features. In the description of the application, "multiple" means two or more, unless expressly limited otherwise.

[0033] In the application, the terms "installation" "connection" "fixing" etc. should be understood in a broad sense, for example, "connection" may a fixed connection, a detachable connection, or an integral part, unless otherwise expressly specified and limited; "connection" may be mechanical connection or electrical connection; "connection may be directly connected or indirectly connected by intermediate element, and may be the internal communication of two elements or the interaction between two elements. The specific meanings of the above terms in the application may be understood on a case-by-case basis to those of ordinary skill in the art.

[0034] In the application, the first feature "above" or "below" the second feature may be a direct contact between the first and second features, or an indirect contact between the first and second features via an intermediary, unless otherwise expressly specified and limited. The first feature "below" the second feature may mean that the first feature is directly below or obliquely below the second feature, or simply mean that the horizontal height of the first feature is less than that of the second feature.

[0035] As shown in FIGS. 1, 6 and 9, embodiments of the application provide a heating assembly 100 for an aerosol generating device 200, which is applied to the aerosol generating device 200 to heat non-combustible tobacco, such as an aerosol generating article 300, for consumption by a smoker. In the application, the aerosol generating device 200 may interact with the aerosol-forming substrate 301 of the aerosol generating article 300 to generate aerosol capble of being inhaled directly into the mouth of the user. The aerosol generating device 200 involves interacting with an aerosol-forming substrate to generate aerosol. The aerosol-forming substrate may be a component part of an aerosol generating article. The aerosol generating device may include one or more components for supplying energy from a power supply to an aerosol-forming substrate to generate aerosol. The aerosol-forming substrate 301 is a matrix, able to release volatile compounds capable of forming aerosol. In some embodiments, the aerosol-forming substrate 301 may be formed from or may include processed tobacco such as homogeneous tobacco, cast leaf tobacco or plant materials that do not include tobacco components.

[0036] Referring to FIGS. 2 and 10, the heating assembly 100 includes a longitudinally extending cavity 30, an electric heating element 20, a housing 10 and air inlet

channel 60. The longitudinally extending cavity 30 for receiving an aerosol generating article 300 including an aerosol-forming substrate 301, the longitudinally extending cavity 30 having a longitudinal axis and including a wall body forming at least a portion of the longitudinally extending cavity 30. The wall body of the longitudinally extending cavity 30 is formed by splicing together one or more elements. The electric heating element 20 is located at one end of the longitudinally extending cavity 30, the heating assembly having multiple pore passages 21 extending along the longitudinal axis H. The electric heating element 20 configured to heat the gas flowing through the pore passages 21 to a temperature not lower than 200°C, so as to allow the gas to flow into the longitudinally extending cavity 30, thereby heating the aerosol-forming substrate of the aerosol generating article 300 to release aerosol gas for inhalation.

[0037] As shown in connection with FIG. 15, in the application, the housing 10 provided around an the outer peripheral side of the electric heating element 20 and having an air gap D3 with the electric heating element 20. The air inlet channel 60 is adjacent to the inner wall of the housing 10 and provided only partially in the area of the air gap 3D.

[0038] In the heating assembly 100 for an aerosol generating device provided by an embodiment of the application, the electric heating element 20 is connected with the power supply through the connecting electrode, heating the aerosol-forming substrate 301 in the longitudinally extending cavity 30 (such as a non-combustible tobacco product). The electric heating element 20 is located at one end of the longitudinally extending cavity30 and has multiple pore passages 21 extending along the longitudinal axis, the electric heating element 20 is configured to heat the gas flowing through the pore passages 21 to a temperature not lower than 200 °C, so as to allow the gas to flow into the longitudinally extending cavity30, and enter the gas from the bottom of the aerosol-forming substrate 301 into the aerosol generating article 300. Additionally, the air gap insulates the heat emitted by the electric heating element 20 and the cavity's periphery, facilitating heat energy collection, storage, and temperature compensation for the aerosol-forming substrate. This design optimally utilizes the electric heating element 20's waste heat, thus enhancing the assembly's overall thermal efficiency.

[0039] It should be noted that the electric heating element 20 may consist of one or more multi-pore passage heating elements. These multi-pore passage heating elements are made from a ceramic element containing zirconia and a precious metal heating paste. The materials for the heating pattern include, but are not limited to, silver, tungsten, and other suitable printed circuit materials. The printing thickness of the heating pattern ranges from 0.005 mm to 0.05 mm. The connecting electrodes are made from materials such as copper, silver, and nickel, with diameters ranging from 0.1 mm to 0.3 mm. Additionally, the multi-pore passage heating element may be made of a metal material and can be electrically connected to a power supply for resistance heating or can utilize eddy current induction heating in a periodically alternating magnetic field.

[0040] As shown in FIGS. 3-5, in some embodiments, the heating assembly further includes a rigid tube body 32 made of metal or high temperature resistant plastic material such as polyimide or polyetheretherketone (PEEK), etc. The rigid strength of the rigid tube body 32 is significantly greater than the overall strength of the aerosol generating article 300. The rigid tube body 32 abuts the electric heating element 20 in the direction of the longitudinal axis, and the rigid tube body configured to least a part of the wall body of the longitudinally extending cavity 30 to improve the overall structural strength.

[0041] It should be noted that in the embodiment, the rigid tube body 32 is made of metal or high temperature resistant plastic material such as polyimide or polyetheretherketone (PEEK), etc, and its rigid strength is significantly greater than the overall strength of the aerosol generating article 300. The heat transfer efficiency of the rigid tube body 32 made of plastic is low, which ensures that the aerosol-forming substrate of non-combustible tobacco products in the rigid tube 32 not to exceed the temperature of 400°C.

[0042] As shown in FIGS. 3-5, in some embodiments, the heating assembly further comprises a metal support tube 33 extending along the longitudinal axis, which is arranged over the outer peripheral side of the electric heating element 20 and the outer peripheral side of the rigid tube body 32. This design reduces the rate at which heat dissipates from the electric heating element 20 to the housing 10, thereby enhancing the heat preservation effect.

[0043] As shown in FIG. 1 and FIG.2, in some embodiments, the heating assembly further comprises a thermal-insulating element 40 arranged between the housing 10 and the electric heating element 20, at least a portion of the air inlet channel 60 is formed between the housing 10 and an inner wall of the thermal-insulating element 40, which is adjacent to the housing 10. Therefore, with the thermal-insulating element 40, the heat energy emitted by the electric heating element 20 and the peripheral side of the longitudinally extending cavity 30 is insulated by the thermal-insulating element 40, thus realizing the collection of heat energy and carrying out temperature compensation for the aerosol-forming substrate.

[0044] As shown in FIG.1 and FIG.2, in some embodiments, the thermal-insulating element 40 includes a sleeve with an internal cavity 41, and the internal cavity 41 is evacuated to a lower pressure than the exterior of the sleeve 42. The internal cavity 41 is a sealed cavity designed to be close to a vacuum state, thereby avoiding rapid heat loss. Optionally, the sleeve can be integrally formed from a metal material.

[0045] Apparently, in other embodiments, the internal cavity 41 may be filled with inert gas or liquid. If the in-

ternal cavity 41 is filled with liquid, the liquid can slow down the heat dissipation from the thermal-insulating element 40 to the outside. Alternatively, the internal cavity 41 may be filled with inert gas.

[0046] Optionally, the thermal-insulating element 40 is a sleeve made of a thermal insulation material such as a ceramic material. The thermal-insulating element 40 may also be other components capable of heat absorption and transfer.

[0047] Optionally, the thermal-insulating element 40 is a vacuum tube. Because of the particularity of the vacuum tube, the thermal conductivity of the cavity in the middle is very low, and a large amount of heat will be conducted through stainless steel, so that the inner wall and outer wall of the vacuum tube will contain heat. Of course, such as sleeves made of phase change materials or thermal insulation materials.

[0048] Referring to FIGS. 15 and 16, the embodiment differs from other embodiments in that the thermal-insulating element 40 is a sleeve made of a metallic material such as 304# stainless steel, and the sleeve includes a sleeve wall and flange flanges deriving and extending from the sleeve wall at both ends and the flange flanges abut against the housing.

[0049] Further, the thermal-insulating element 40 is located on an outer peripheral side of the metal support tube 33, a first gap D1 is arranged between the thermal-insulating element 40 and the electric heating element 20. In this way, the heat emitted by the electric heating element 20 is transferred first through the gas in the first gap D1 to avoid direct contact with the electric heating element 20 for heat transfer.

[0050] When the electric heating element 20 heats the aerosol-forming substrate of the aerosol-generating article 300, heat transfers to the tube wall of the longitudinal cavity 30. This heat accumulation causes the temperature to rise, leading to the cigarette wrapping paper of the aerosol-forming substrate 301 in the longitudinal cavity 30 to be easily burned and discolored, generating a peculiar smell and reducing the smoker's experience. As shown in FIGS.3-5, in order to avoid the cigarette wrapping paper of the aerosol-forming substrate 301 in the longitudinal cavity 30 from being burned and discolored, the metal support tube 33 is provide with multiple hollow areas 331. The hollow areas 331 at least partially overlap with the outer peripheral surface of the electric heating element 20.

[0051] In this context, "overlapping" means that when the inner diameter of the metal support tube 33 is greater than or equal to the outer diameter of the longitudinal cavity 30, the hollow areas 331 are positioned on the outer peripheral side surface of the electric heating element 20. These hollow areas 331 superimpose on the outer surface of the electric heating element 20 when viewed from the orthographic projection direction of the cylindrical electric heating element 20. In the embodiment, the hollow area 331 is not limited to being at least partially laminated on the outer peripheral surface of the longitudinally extending cavity 30.

[0052] In this embodiment, at least part of the hollow area 331 overlaps with an outer peripheral surface of the electric heating element 20. This structure allows the heat emitted by the electric heating element 20 to pass through the air in the hollow area 331 and dissipate outside the metal support tube 33. This design prevents direct heat conduction to the longitudinal cavity 30, thereby reducing its temperature. Consequently, it prevents the cigarette wrapping paper of the aerosol-forming substrate in the longitudinal cavity 30 from burning at high temperatures, avoiding the generation of unpleasant smells and the choking sensation from the burning paper. This improvement enhances the smoker's experience by maintaining the consistency and quality of the taste.

[0053] Further, a second gap D2 is provided between the thermal-insulating element 40 and the metal support tube 33. This structure allows the heat dissipated from the electric heating element 20 to pass through a gas interlayer, thus reducing heat transfer efficiency.

[0054] Further, when the metal support tube 33 has multiple hollow areas 331 uniformly distributed, the space of the second gap D2 in the direction perpendicular to the longitudinal axis is smaller than the thickness of the first gap D1. Consequently, the heat from the electric heating element 20 passes first through the gas interlayer of the second gap D2 and then through a gas interlayer of varying thickness between the first gap D1 and the second gap D2, further reducing heat transfer efficiency.

[0055] In some embodiments, the rigid tube body 32 comprises at least a part of the wall body connected to the electric heating element to form the longitudinally extending cavity 30, and an annular protrusion 321 extending from the wall body in a direction away from the electric heating element 20, with the annular protrusion 321 being nested and connected by the thermal-insulating element. 40. This facilitates the mounting of the thermal-insulating element 40 while achieves a first gap D1 between the thermal-insulating element 40 and the electric heating element 20.

[0056] As shown in FIG. 4, a sealing ring 50 is provided between the annular protrusion 321 and the thermal-insulating element 40, improving the sealing performance between them. Specifically, an annular groove in the annular protrusion 321 houses the sealing ring 50.

[0057] As shown in FIGS. 2, 6, 10 and 12, in some embodiments, the housing 10 comprises a housing wall 11 and a base 12 matched with the housing wall 11, the housing wall 11 includes an opening-defining portion 14 at the end and a side wall extending from the opening-defining portion 14 and connected to the base 12, with the opening defining being a portion of the wall body of the longitudinally extending cavity 30 to form the housing 10.

[0058] Specifically, the base 12 has a bracket 122 supporting the electric heating element 20, creating a space between them and forming an air passage 123. This air passage 123 connects to the air inlet channel 60 and

multiple pore passages 21 in the electric heating element 20. As shown in conjunction with FIG. 13, the housing wall 11 is provided with multiple air inlet pore passages 111 communicating external air and the air inlet channel 60.

[0059] In the embodiment, the waste heat from the electric heating element 20 is transmitted from the hollow area 331 to the air inlet channel 60, so that high temperature gas is formed in the air inlet channel 60. In this way, when the user absorbs the aerosol generating article 300, the external normal temperature gas enters the air inlet channel 60 from the air inlet pore passage 111 to replace the high temperature gas in the air inlet channel 60. The hot air is then drawn from the air inlet channel 60 into the air passage 123 between the base 12 and the electric heating element 20, which transfers heat back to the electric heating element 20, thus enhancing heating efficiency and effectively utilizing the waste heat. This process prevents unpleasant smell caused by insufficient heating during continuous use. Additionally, as external air replaces the hot air, it cools the housing 10, enhancing heat dissipation.

[0060] As shown in FIG. 14, optionally, the side wall of the housing 10 is provided with multiple convex prisms 13, the thermal-insulating element 40 abuts the convex prism 13 and forms at least a portion of the air inlet channel 60 with the housing wall 11, and the air inlet channel 60 communicates with the air inlet pore passage 111.

[0061] In the embodiment, multiple convex prisms 13 are installed on the outer wall of the thermal-insulating element 40, forming air inlet channels 60 between each pair of convex prisms and the outer wall. This arrangement facilitates gas flow and improves heat exchange efficiency around the thermal-insulating element 40. In other embodiments, the thermal-insulating element 40 may be a sleeve with flanges abutting the convex prisms 13, creating a gap between the thermal-insulating element 40 and the housing side wall 10, which forms part of the air inlet channels 60. Additionally, the air inlet channel 60 may also be limited in a spiral groove on the inner wall of the housing 10 or the outer wall of the thermal-insulating element 40.

[0062] As shown in FIG. 13, in the above embodiment, optionally, multiple air inlet pore passages 111 are provided in the opening-defining portion 14.

[0063] As shown in FIGS. 11 and 13, in the above embodiment, the opening-defining portion 14 further includes an extension tube 15 extending away from the direction of the electric heating element 20. The extension tube 15 is configured to accommodate only a portion of the wall body of the longitudinally extending cavity 30 of the aerosol generating article 300 for the insertion of the aerosol generating article 300.

[0064] Optionally, one end of the rigid tube body 32 abuts the opening-defining portion 14, with the inner diameter of the opening-defining portion 14 equal to or greater than that of rigid tube body 32.

[0065] As shown in FIGS. 3-5, in some embodiments, the electric heating element 20 further comprises a heat conduction tube 31 coaxial with the longitudinally extending cavity 30, the heat conduction tube 31 comprises an annular tube wall 311 and a locating portion 312 extending from the annular tube wall 311, the annular tube wall 311 accommodates a heating core with multiple pore passages 21. The aerosol-forming substrate 301 in the longitudinally extending cavity 30 is heated by the heating core 22.

[0066] Further, the heating core 22 is supported and fixed by the locating portion 312 and has a gap D4 with the annular tube wall 311. This gap forms a gas interlayer, preventing rapid heat loss due to direct contact between the heating core 22 and the annular tube wall 311.

[0067] In the above embodiment, optionally, the locating portion 312 divides the heat conduction tube 31 into two cavity regions 313, and one cavity region 313 accommodates the electric heating element 20, thus facilitating the installation of the electric heating element 20. Another cavity region 313 contains a portion of the aerosol-forming substrate. Additionally, the inner diameter of the cavity region 313 containing a portion of the aerosol-generating article 300 is equal to or greater than the diameter of the aerosol-generating article 300, facilitating the placement of the aerosol-generating article 300.

[0068] As shown in FIG.7, in some embodiments, the metal support tube 33 also sheathes a portion d of the electric heating element 20 extending from the longitudinally extending cavity 30, and the hollow area 331 is at least partially interconnected with a gap between the electric heating element 20 and the metal support tube 33. This facilitates the heat in the gap between the electric heating element 20 and the metal support tube 33 to be dissipated from the hollow area 331.

[0069] As shown in FIG.8, in any of the above embodiments, a connecting pore passage 121 is provided on the base 12. The connecting electrode of the electric heating element 20 passes through the connecting electrode 121 and is electrically connected with the circuit board 124. This facilitates the electric connection between the connecting electrode of the electric heating element 20 and the circuit board 124.

[0070] As shown in FIGS. 9-12, the embodiment of the application also provides an aerosol generating device 200 having the heating assembly 100 for the aerosol generating device 200 described in the above embodiment. Therefore, all of the beneficial effects of the heating assembly 100 for the aerosol generating device 200 in the first embodiment described above will not be described here.

[0071] In the description, the schematic representation of the above terms need not be directed to the same embodiments or examples. What's more, the specific features, structures, materials or characteristics described may be combined in a suitable manner in any one or more embodiments or examples. In addition, without mutual contradiction, those skilled in the art may combine different embodiments or examples described in the

description and features of different embodiments or examples.

[0072] Although the embodiments of the application have been shown and described above, it is understood that the above embodiments are exemplary and shall not be construed as a limitation of the application. And changes, modifications, substitutions and modifications may be made to the above embodiments by those of ordinary skill in the art within the scope of the application.

Claims

1. A heating assembly for an aerosol generating device, comprising:
a longitudinally extending cavity for receiving an aerosol generating article including an aerosol-forming substrate, the longitudinally extending cavity has a longitudinal axis and comprises a wall body forming at least a portion of the longitudinally extending cavity; wherein the heating assembly further comprises:

an electric heating element, located at one end of the longitudinally extending cavity and having multiple pore passages extending along the longitudinal axis, the electric heating element is configured to heat a gas flowing through the pore passage to a temperature not lower than 200°C, so as to allow the gas to flow into the longitudinally extending cavity;
a housing, provided around an outer peripheral side of the electric heating element, and an air gap is provided between the housing and the electric heating element;
and an air inlet channel, adjacent to an inner wall of the housing and provided only partially in the area of the air gap.

2. The heating assembly according to claim 1, wherein the heating assembly further comprises a rigid tube body connected to the electric heating element along a direction of the longitudinal axis, and the rigid tube body is least a part of the wall body of the longitudinally extending cavity.

3. The heating assembly according to claim 2, wherein the heating assembly further comprises a metal support tube extending along the longitudinal axis, the metal support tube is arranged over the outer peripheral side of the electric heating element and the rigid tube body.

4. The heating assembly according to claim 3, wherein the heating assembly further comprises a thermal-insulating element arranged between the housing and the electric heating element, at least a portion of the air inlet channel is formed between the housing and an inner wall of the thermal-insulating element, which is adjacent to the housing.

5. The heating assembly according to claim 4, wherein the thermal-insulating element includes a sleeve with an internal cavity, and the internal cavity is evacuated to a lower pressure than the exterior of the sleeve.

6. The heating assembly according to claim 4, wherein the thermal-insulating element is located on an outer peripheral side of the metal support tube, a first gap is arranged between the thermal-insulating element and the electric heating element.

7. The heating assembly according to claim 4, wherein the metal support tube is provided with multiple hollow areas.

8. The heating assembly according to claim 7, wherein at least part of the hollow area overlaps with an outer peripheral surface of the electric heating element.

9. The heating assembly according to claim 6, wherein a second gap is provided between the thermal-insulating element and the metal support tube.

10. The heating assembly according to claim 9, wherein the space of the second gap in the direction perpendicular to the longitudinal axis is smaller than the thickness of the first gap.

11. The heating assembly according to claim 4, wherein the rigid tube body comprises at least a part of the wall body connected to the electric heating element to form the longitudinally extending cavity, and an annular protrusion extending from the wall body in a direction away from the electric heating element, with the annular protrusion being nested and connected by the thermal-insulating element.

12. The heating assembly according to claim 4, wherein the housing comprises a housing wall and a base mated to the housing wall, the housing wall includes an opening-defining portion at the end and a side wall extending from the opening-defining portion and connected to the base, with the opening-defining portion being a part of the wall body of the longitudinally extending cavity.

13. The heating assembly according to claim 12, wherein the side wall of the housing is provided with multiple convex prisms, and the thermal-insulating element abuts the convex prisms, so that at least a portion of the air inlet channel is formed between the thermal-insulating element and the housing wall.

14. The heating assembly according to claim 12, wherein the opening-defining portion further comprises an

extension tube extending away from the electric heating element, the extension tube is configured to accommodate only a portion of the wall body of the longitudinally extending cavity of the aerosol generating article.

15. The heating assembly according to claim 12, wherein one end of the rigid tube body abuts the opening-defining portion, with the inner diameter of the opening-defining portion equal to or greater than that of rigid tube body.

16. The heating assembly according to claim 12, wherein the base is provided with a bracket supporting the electric heating element, an air passage is provided between the base and the electric heating element, and the air passage communicates with the air inlet channel and multiple pore passages of the electric heating element.

17. The heating assembly according to any one of claims 12 to 16, wherein the housing wall is provided with multiple air inlet pore passages that allow external air to communicate with the air inlet channel.

18. The heating assembly according to claim 17, wherein multiple air inlet pore passages are provided in the opening-defining portion.

19. The heating assembly according to claim 1, wherein the electric heating element further includes a heat conduction tube coaxial with the longitudinally extending cavity, the heat conduction tube comprises an annular tube wall and a locating portion extending from the annular tube wall, the annular tube wall accommodates a heating core with multiple pore passages.

20. The heating assembly according to claim 19, wherein the heating core is fixed by the locating portion and has a gap with the annular tube wall.

21. The heating assembly according to claim 20, wherein the locating portion divides the heat conduction tube into two cavity regions, one cavity region contains the electric heating element and the other cavity region contains a portion of the aerosol generating article of the aerosol-forming substrate.

22. An aerosol generating device, wherein the device comprises the heating assembly according to any one of claims 1 to 21.

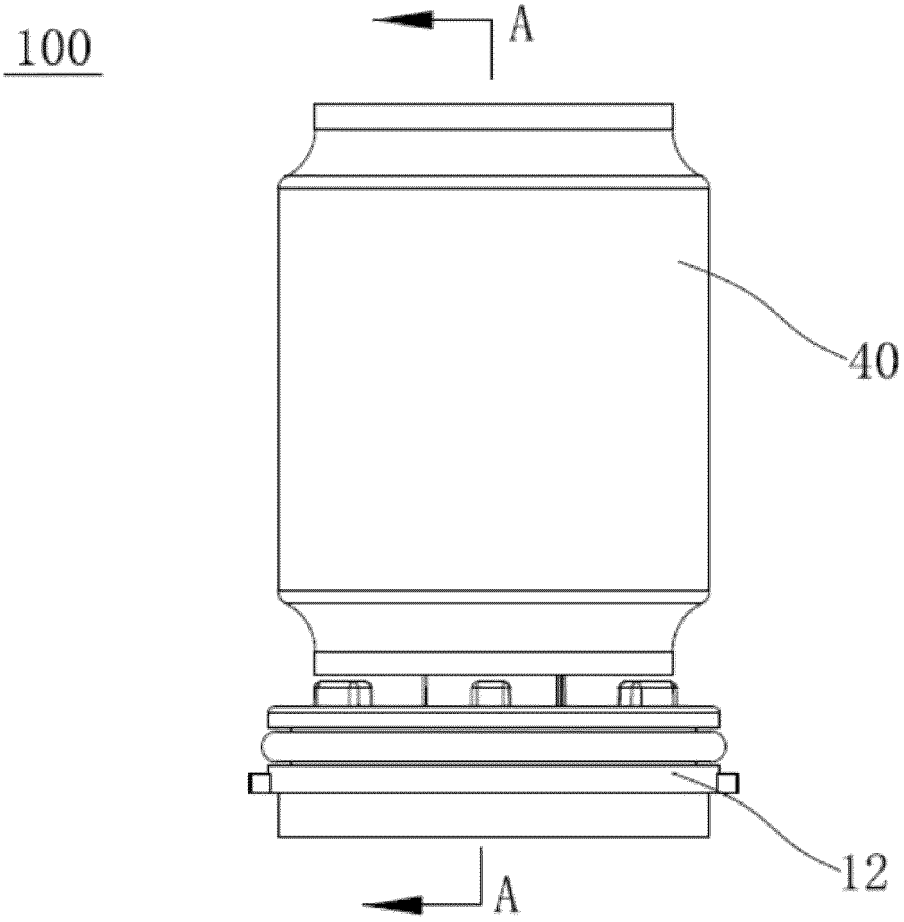


FIG. 1

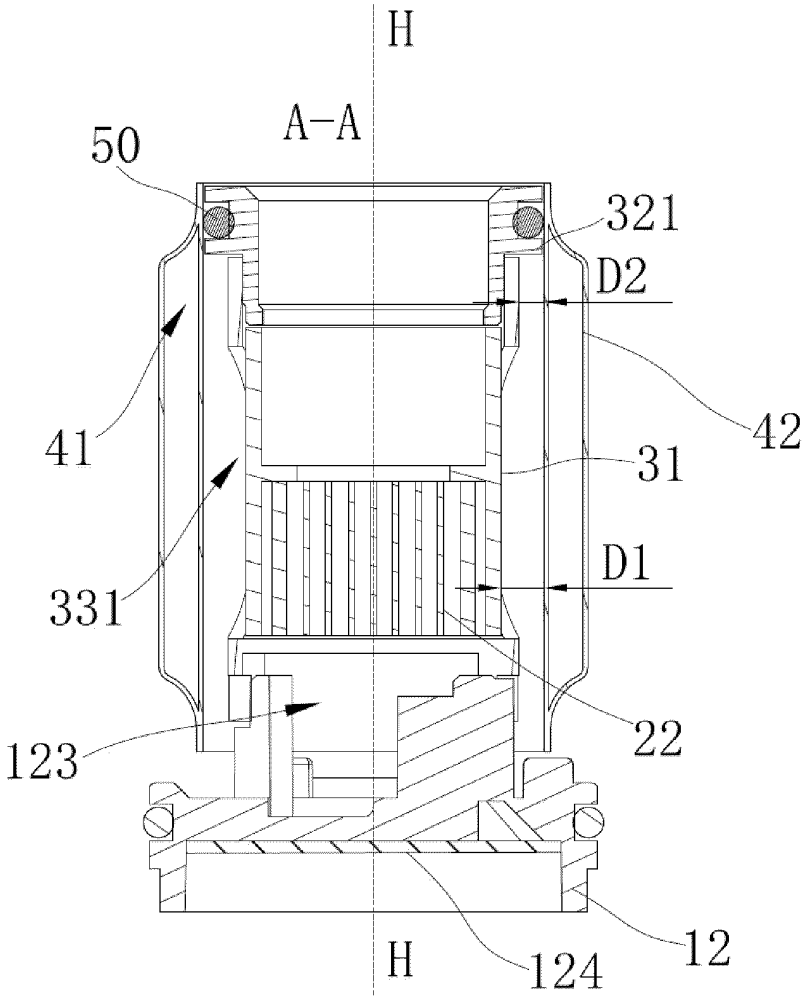


FIG. 2

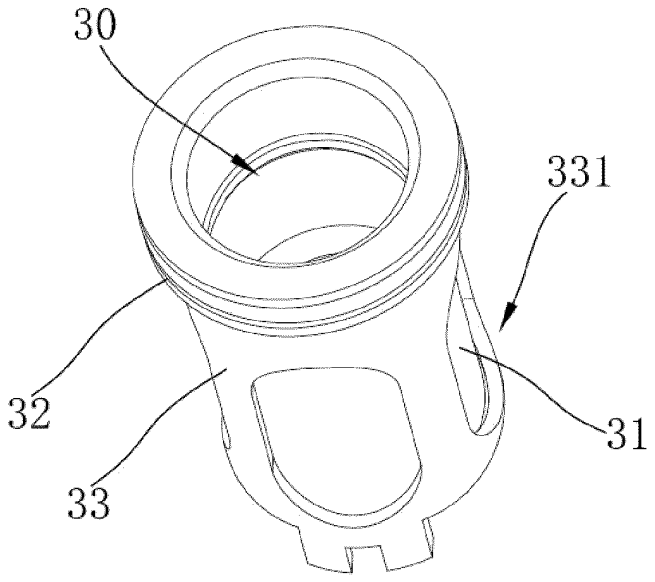
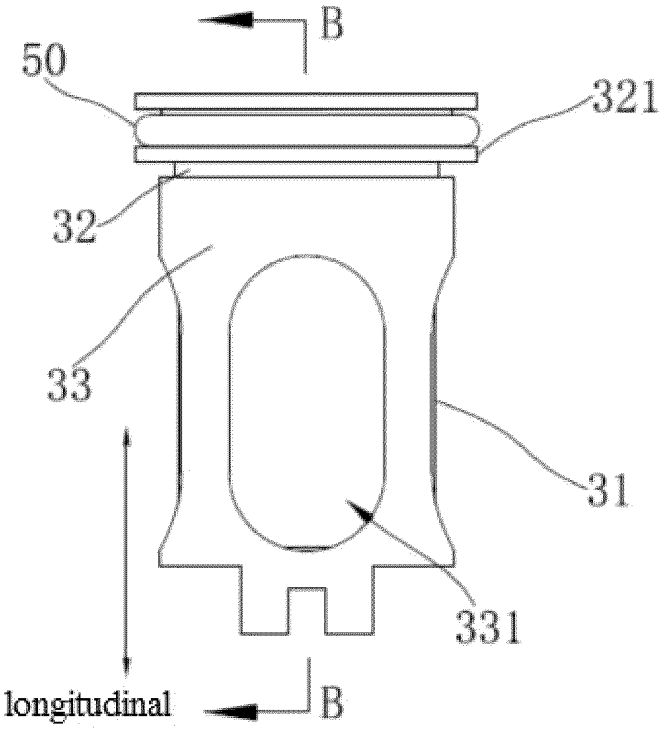


FIG. 3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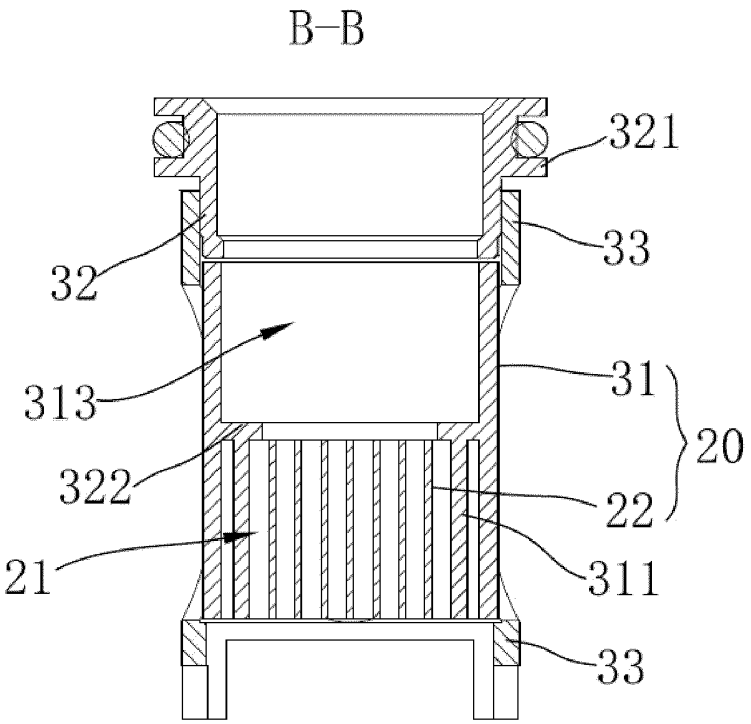
31
331
longitudinal
B

FIG. 4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322
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311
33

FIG. 5

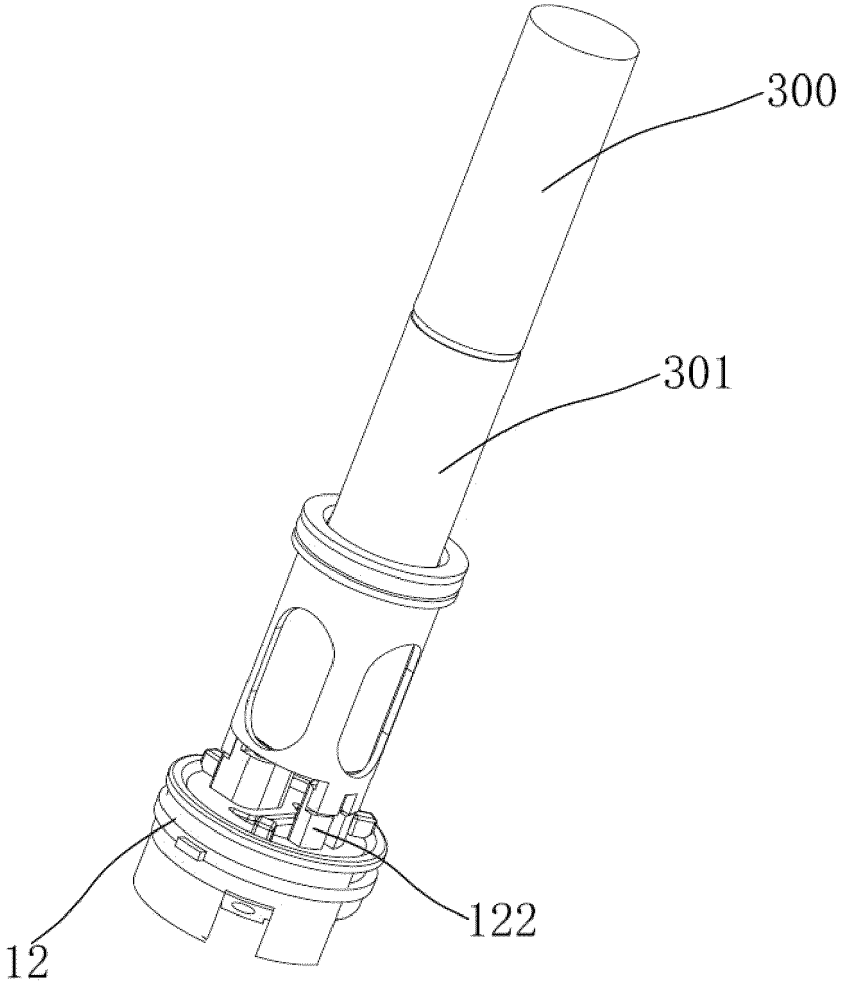

FIG.6

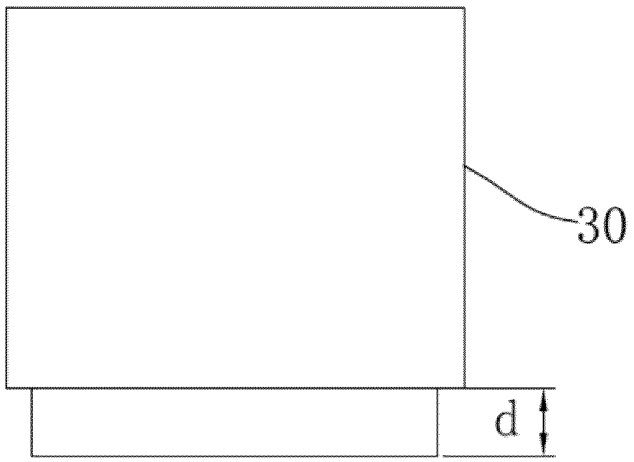

FIG.7

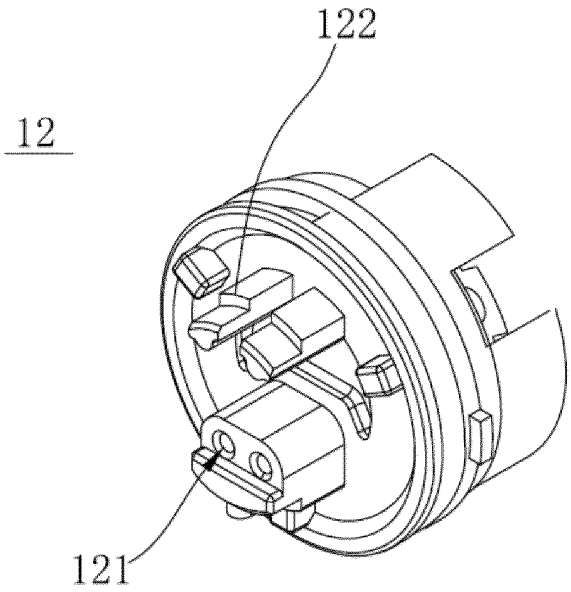

FIG.8

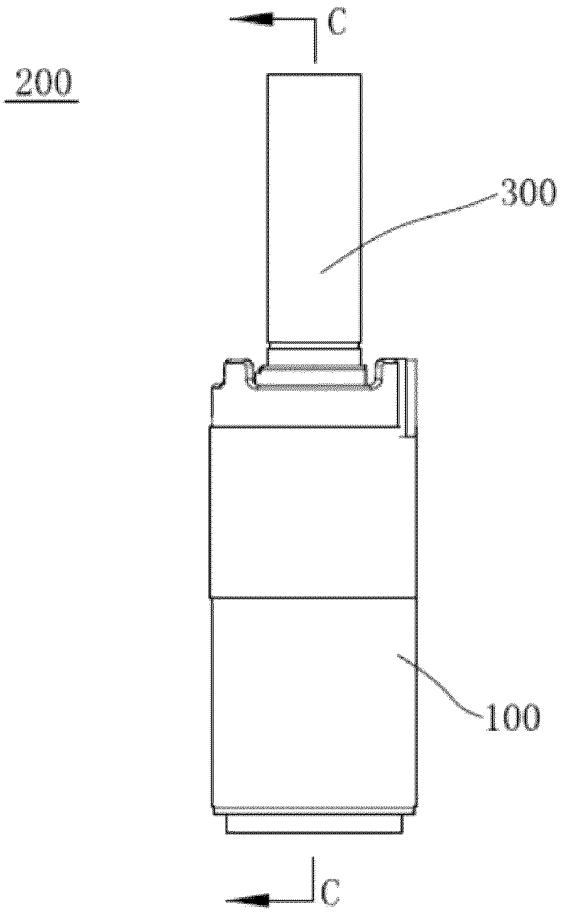

FIG.9

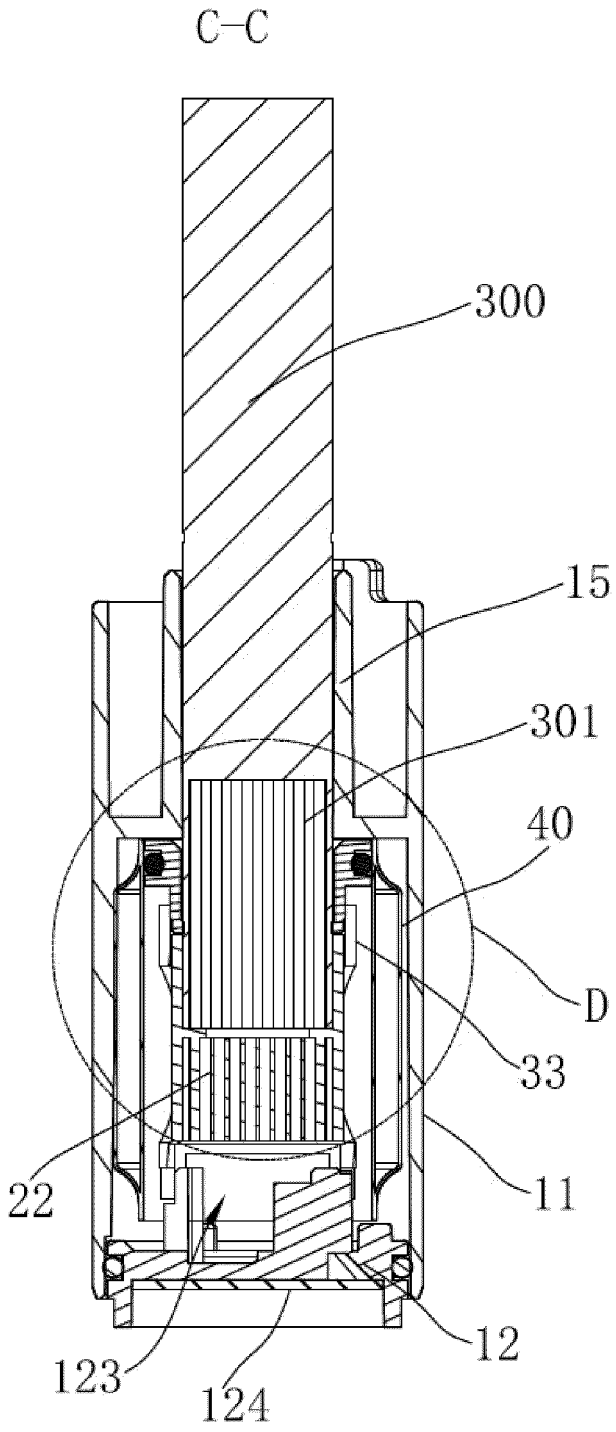

FIG.10

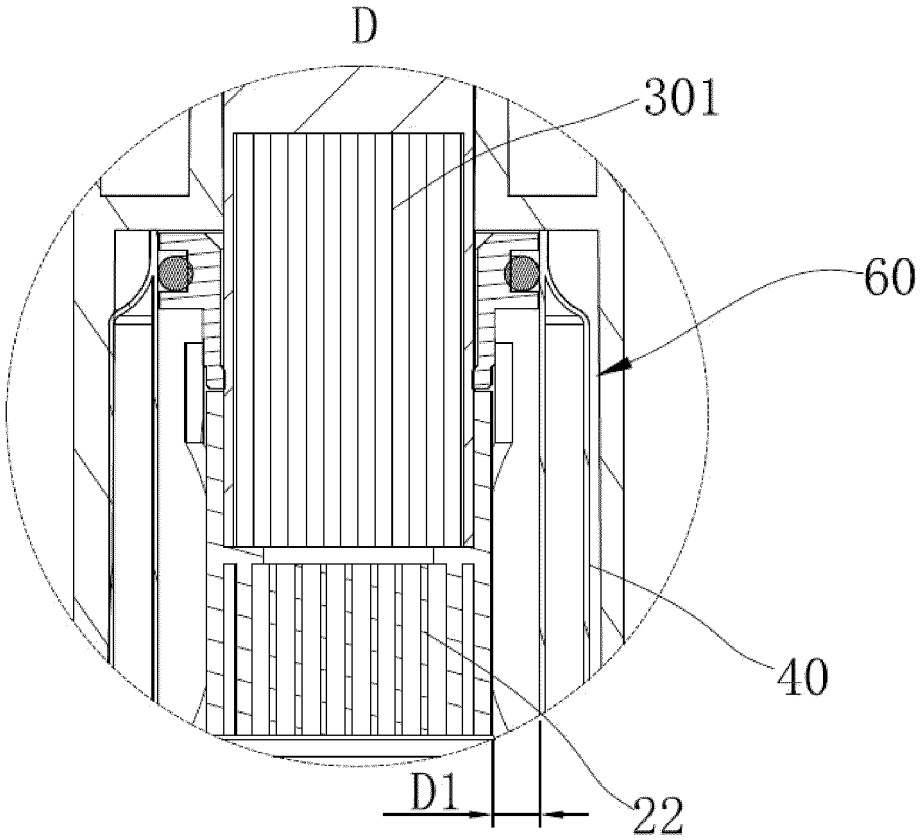

FIG.11

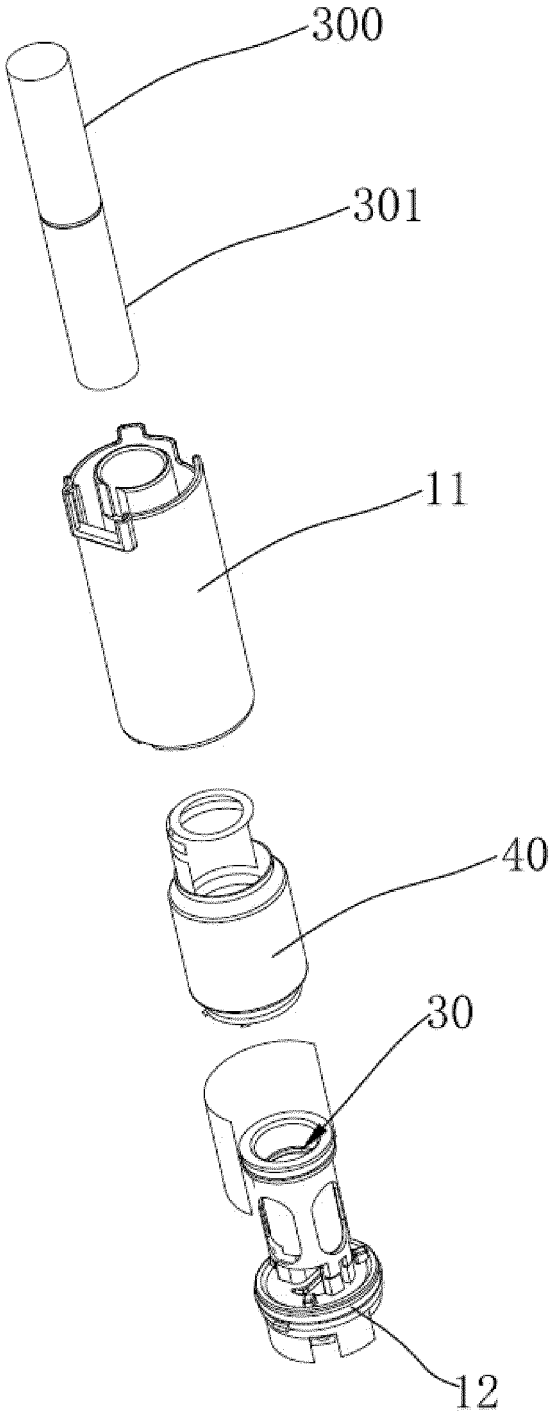

FIG.12

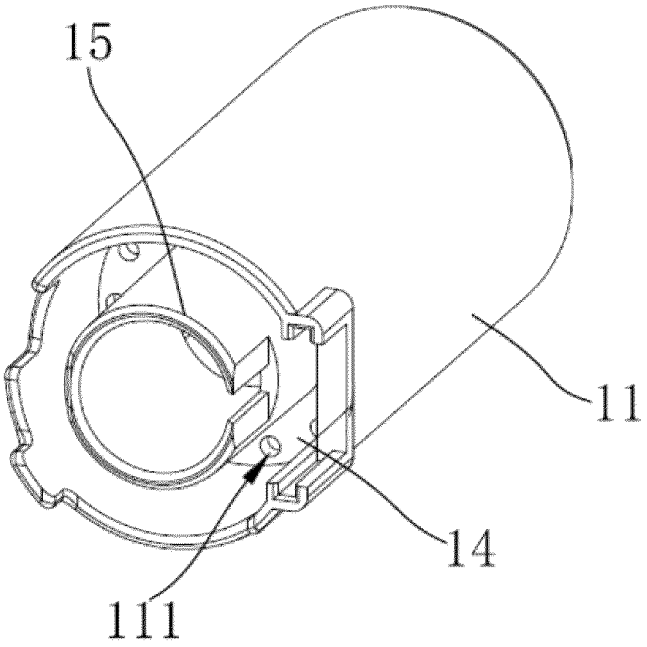

FIG.13

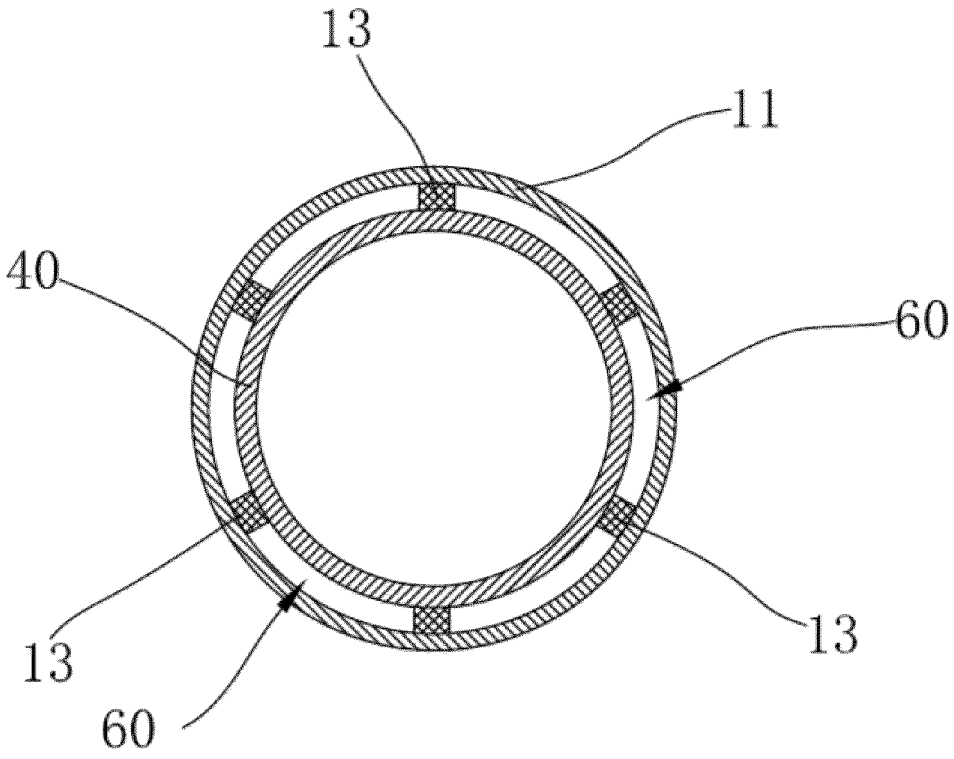

FIG.14

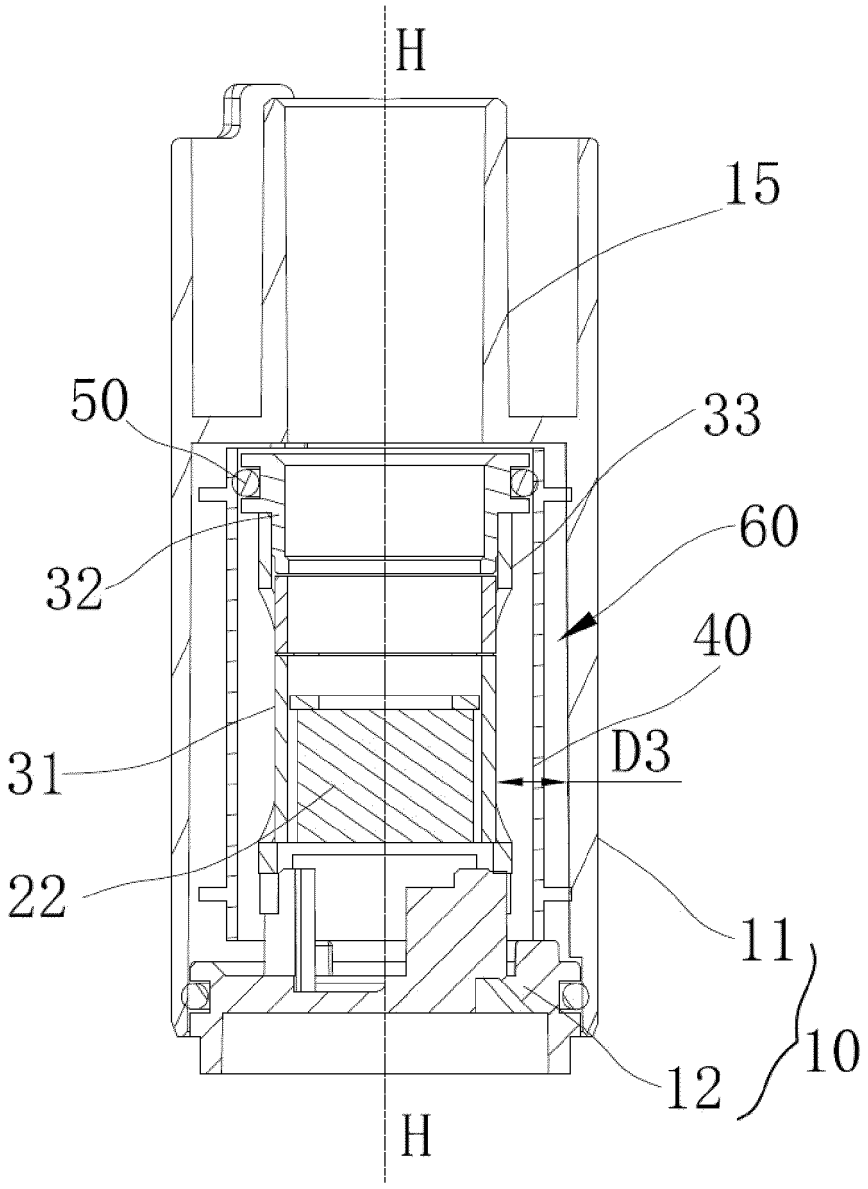

FIG.15

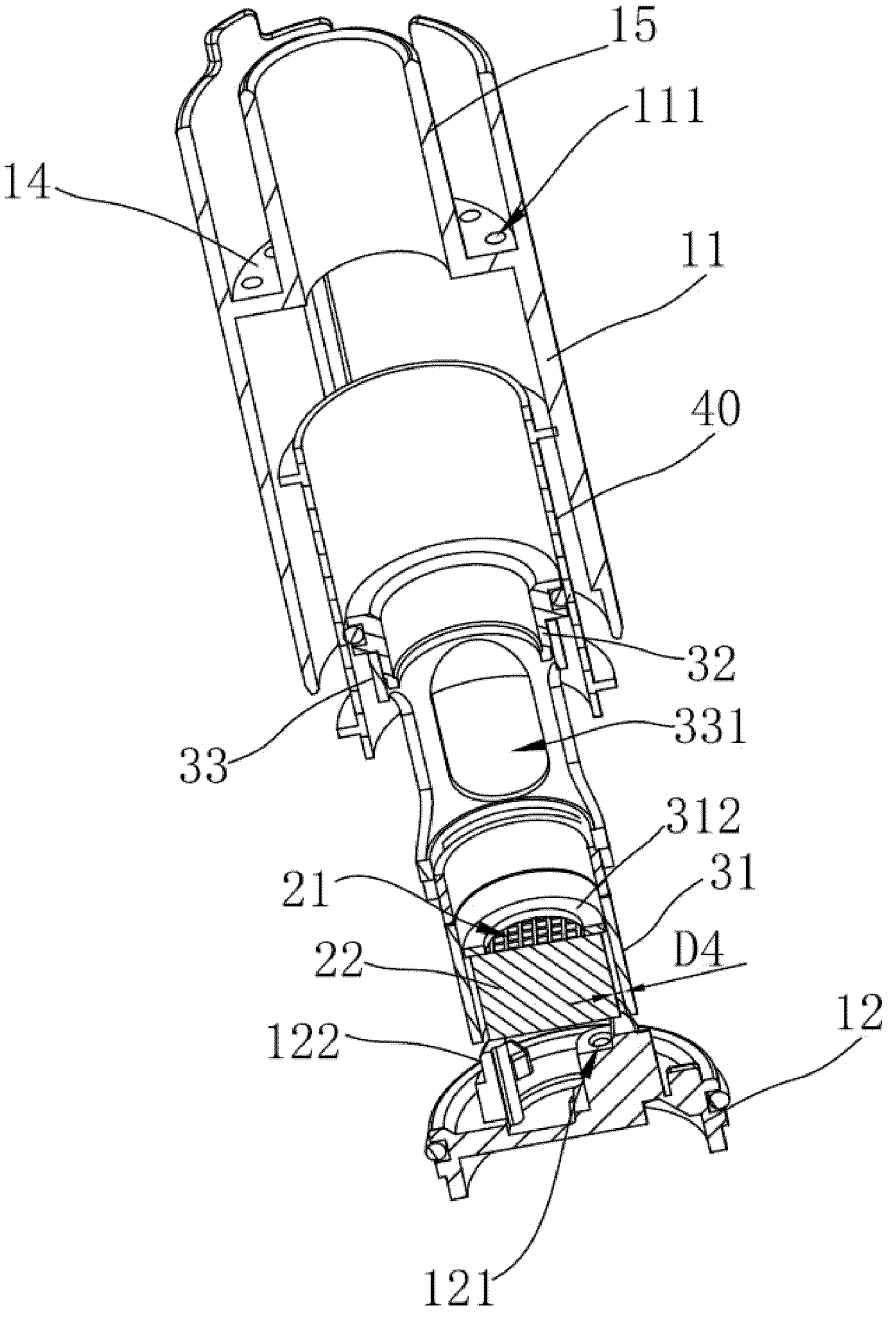

FIG.16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/105045

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/40(2020.01)i; A24F 40/46(2020.01)i; A24F 40/50(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)

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)

CNPAT, CNKI, WPI, EPODOC: 深圳华宝协同创新技术研究院有限公司, 朱文斌, 李思文, 符小松, 唐志强, 魏勇, 多孔, 蜂窝, 多流道, 多通道, 气溶胶, 制品, 套管, 绝热, 隔热, 保温, 加热, 发热, aerosol, generating, heating, sleeve, cigarette, hollow

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 216601677 U (SHENZHEN HUABAO COLLABORATIVE INNOVATION TECHNOLOGY RESEARCH INSTITUTE CO., LTD.) 27 May 2022 (2022-05-27) description, paragraphs [0041]-[0071], and figures 1-10	1-22
Y	CN 210988231 U (XIAMEN FENGTAO CERAMICS CO., LTD.) 14 July 2020 (2020-07-14) description, paragraphs [0046]-[0115], and figures 1-7	1-22
A	CN 114081212 A (CHINA TOBACCO JIANGSU INDUSTRIAL CO., LTD. et al.) 25 February 2022 (2022-02-25) entire document	1-22
A	CN 113925227 A (SHENZHEN WOODY VAPES TECHNOLOGY CO., LTD.) 14 January 2022 (2022-01-14) entire document	1-22
A	CN 216601678 U (SHENZHEN HUBAO COLLABORATIVE INNOVATION TECHNOLOGY RESEARCH INSTITUTE LIMITED COMPANY) 27 May 2022 (2022-05-27) entire document	1-22

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

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 December 2022	**29 December 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/105045

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 113925230 A (SHENZHEN WOODY VAPES TECHNOLOGY CO., LTD.) 14 January 2022 (2022-01-14) entire document	1-22
A	CN 216533831 U (NANTONG JINYUAN NEW MATERIAL CO., LTD.) 17 May 2022 (2022-05-17) entire document	1-22
A	WO 2021250153 A1 (PHILIP MORRIS PRODUCTS S.A.) 16 December 2021 (2021-12-16) entire document	1-22

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/105045

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 216601677 U	27 May 2022	None	
CN 210988231 U	14 July 2020	US 2022061388 A1	03 March 2022
		EP 3970539 A1	23 March 2022
		CN 110710725 A	21 January 2020
		WO 2020228777 A1	19 November 2020
		CN 211298448 U	21 August 2020
		JP 2022532882 A	20 July 2022
		KR 20220008848 A	21 January 2022
CN 114081212 A	25 February 2022	None	
CN 113925227 A	14 January 2022	None	
CN 216601678 U	27 May 2022	None	
CN 113925230 A	14 January 2022	None	
CN 216533831 U	17 May 2022	None	
WO 2021250153 A1	16 December 2021	None	

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