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(54) **HEATER, AND HEATING ATOMIZATION APPARATUS**

(57) A heater (10) and an electronic atomization device. The heater (10) is used for heating a heating base and comprises a support assembly (100) provided with a helical channel (140) and an open cavity (130); an air inlet (141) and an air outlet (142) are formed on two ends of the helical channel (140); the open cavity (130) is used for accommodating the heating base, and an opening (131) communicated with the outside is formed at one end of the open cavity (130); the air inlet (141) is closer to the opening (131) than the air outlet (142); at least part of the helical channel (140) surrounds the open cavity (130); and external air entering the helical channel (140) from the air inlet (141) is output to the open cavity (130) by means of the air outlet (142).

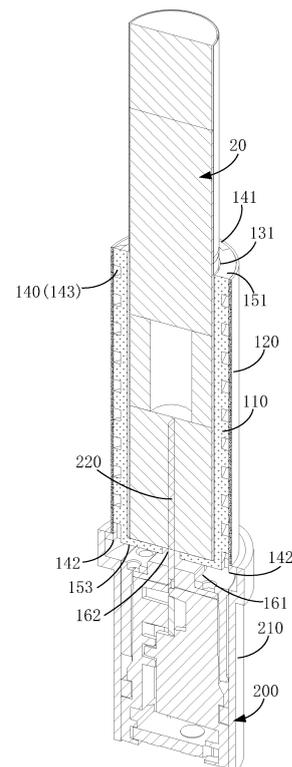


FIG. 3

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## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of Chinese Patent Application No. 202022783416.9, filed on November 26, 2020, entitled "HEATER, AND HEATING ATOMIZATION APPARATUS", the content of which is hereby incorporated by reference in its entirety.

### TECHNICAL FIELD

[0002] The present application relates to the technical field of heating atomization device, in particular to a heater and a heating atomization device having the heater.

### BACKGROUND

[0003] Heating atomization devices heat aerosol generating substrates such as aerosol generation substrates through a heat-not-burn method, thereby generating aerosol that can be inhaled by a user. Compared with directly burning the aerosol generation substrate to generate the aerosol, this heating method can greatly reduce the harmful components in the aerosol, so that the heating atomization devices have a broad market demand. The heating atomization usually includes a heater and a power supply assembly. The power supply assembly supplies power to the heater, and the heater converts electrical energy into heat energy. The aerosol generating substrate absorbs heat and releases the aerosol. However, with conventional heaters, the outer surface of the heater may generate localized high temperature, which will cause burning discomfort or even burns to the user when holding the heater.

### SUMMARY

[0004] According to some exemplary embodiments of the present application, a heater and a heating atomization device having the heater are provided.

[0005] A heater configured to heat a heating substrate includes a support assembly provided with a spiral channel and an open cavity. The two ends of the spiral channel form an air inlet and an air outlet, the open cavity is configured to accommodate the heating substrate, an end of the open cavity forms an opening in communication with external environment, the air inlet is closer to the opening than the air outlet, the spiral channel at least partially surrounds the opening. ambient air input into the spiral channel from the air inlet is output to the open cavity through the air outlet.

[0006] In one of the embodiments, the support assembly includes a top end surface and an inner bottom surface that are axially spaced apart and face the same direction, the inner bottom surface defines part of the boundary of the open cavity, both the opening and the air inlet are provided on the top end surface.

[0007] In one of the embodiments, a plurality of spiral channels are provided, and the air inlets of the plurality of spiral channels are spaced on the top end surface in a circumferential direction.

5 [0008] In one of the embodiments, the support assembly includes an inner support and an outer support, the open cavity is provided on the inner support, the inner support comprise an annular inner surface of sidewall and the outer surface of sidewall, the inner surface of sidewall is surrounded by the outer surface of sidewall and defines part of the boundary of the open cavity, the outer surface of sidewall is recessed to form a spiral groove, the outer support is sleeved on the inner support and covers the spiral groove to form the spiral channel.

10 [0009] In one of the embodiments, the heater further includes a heating assembly connected to the support assembly. The inner support further includes a bottom end surface and an inner bottom surface, the inner bottom surface is opposite to the bottom end surface and defines part of the boundary of the open cavity, the inner support is further provided with a matching hole that extends through the bottom end surface and the inner bottom surface, an air guide channel is formed between the heating assembly and the bottom end surface, the air outlet is provided on the bottom end surface, and the ambient air output from the air outlet flows through the air guide channel and the matching hole in sequence to enter the open cavity.

20 [0010] In one of the embodiments, the support assembly includes an inner bottom surface and an inner surface of sidewall that define the boundary of the open cavity, the inner surface of sidewall surrounds the inner bottom surface, the inner surface of sidewall is provided with a spiral groove, an end of the spiral groove extends to the inner bottom surface, the heating substrate is sleeved in the inner surface of sidewall and covers the spiral groove to form the spiral channel.

25 [0011] In one of the embodiments, along the axial direction of the support assembly, the distance between the air inlet and the air outlet is greater than or equal to the length of the open cavity.

30 [0012] In one of the embodiments, the support assembly further includes a protruding portion, the protruding portion is connected to the inner bottom surface and protrudes from the inner bottom surface, when the heating substrate abuts against the protruding portion, a space of the open cavity between the heating substrate and the inner bottom surface forms an air guide channel in communication with the spiral channel.

35 [0013] In one of the embodiments, the heater further includes a thermal insulation layer with a blackness coefficient of less than 0.1, the thermal insulation layer covers the outer surface of the support assembly.

40 [0014] In one of the embodiments, the heater further includes a heating assembly connected to the support assembly, the heating assembly includes a base and a heating sheet, one end of the heating sheet is fixed on the base, and the other end of the heating sheet is ca-

pable of being inserted into the interior of an aerosol generation substrate.

**[0015]** A heating atomization device includes a power supply assembly and the heater described in any one of the above, the heater is detachably connected to the power supply assembly.

**[0016]** Since the open cavity includes an orthographic projection along the axial direction of the vertical support assembly, at least part of the orthographic projection is located within the area where the spiral channel is located. The ambient air in the spiral channel can be directly contact with the heat transferred outward from the support assembly. At the same time, the flow path of the ambient air in the spiral channel is longer, so that the ambient air has enough opportunities and time to recover as much heat as possible, thereby further improving a utilization rate of energy and preventing the local high temperature of the support assembly to cause burning discomfort. Moreover, the flow velocity of the ambient air is the same everywhere in the spiral channel, which can effectively prevent poor flow of the ambient air such as eddy currents, and can effectively ensure that the heat transferred to the support assembly is evenly distributed on the outer surface of the support assembly, so as to further prevent local high temperature of the support assembly.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0017]** In order to illustrate the technical solutions in the embodiments of the present application or the conventional technology more clearly, the following will briefly describe the accompanying drawings that will be used in the description of the embodiments or the traditional technology. It is clear that the accompanying drawings in the following description are only some embodiments of the present application. For those skilled in the art, other drawings can also be obtained based on these drawings without creative effort.

FIG. 1 is a perspective view of a heater according to a first embodiment.

FIG. 2 is a perspective view of the heater shown in FIG. 1 cooperating with an atomizing medium carrier.

FIG. 3 is a cross-sectional perspective view of FIG. 2.

FIG. 4 is a cross-sectional perspective view of the heater shown in FIG. 1.

FIG. 5 is an exploded view of the heater shown in FIG. 1.

FIG. 6 is a cross-sectional perspective view of FIG. 5.

FIG. 7 is a cross-sectional exploded view of the heater according to a second embodiment.

FIG. 8 is a perspective view of a support assembly in the heater shown in FIG. 7.

FIG. 9 is a cross-sectional perspective view of the support assembly in the heater shown in FIG. 7.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

**[0018]** In order to facilitate the understanding of the present disclosure, the present disclosure is described more comprehensively below with reference to the relevant accompanying drawings. Preferred embodiments of the present disclosure are shown in the accompanying drawings. However, the present disclosure may be implemented in many different forms and is not limited to the embodiments described herein. On the contrary, the purpose of providing these embodiments is to make the public content of the present disclosure more thoroughly and comprehensively understood.

**[0019]** It should be noted that when an element is referred to as being "fixed" to another element, it can be directly on the other element or intervening elements may also be present. When an element is referred to as being "connected to" another element, it can be directly connected to the other element or intervening elements may also be present. The terms "inner", "outer", "left", "right" and similar expressions are used herein for the purpose of description only and do not represent the only embodiment.

**[0020]** Referring to FIG. 1 and FIG. 2, the present application provides a heater 10, which is configured to heat a heating substrate, to make the heating substrate to form an aerosol that can be inhaled by a user. The heating substrate may be an aerosol generating substrate such as an atomizing medium carrier 20.

First embodiment

**[0021]** Referring to FIG. 2, FIG. 3 and FIG. 4, the heater 10 includes a support assembly 100, a heating assembly 200, and a thermal insulation layer (not shown). The support assembly 100 and the heating assembly 200 are connected to each other. The heating assembly 200 includes a base 210 and a heating sheet 220. One end of the heating sheet 220 is fixed on the base 210, and the other end of the heating sheet 220 is a free end, which can insert into the interior of the atomizing medium carrier 20. When the heating sheet 220 converts electrical energy into heat energy, the atomizing medium carrier 20 absorbs the heat energy of the heating sheet 220 to form aerosol.

**[0022]** The support assembly 100 includes an inner support 110 and an outer support 120. Both the inner support 110 and the outer support 120 may be cylindrical structures. The outer support 120 is sleeved outside the inner support 110. The thermal insulation layer may be attached to the outer surface of the outer support 120, so that the thermal insulation layer can be contact with the user directly. A blackness coefficient of the thermal insulation layer may be less than 0.1, so that the thermal insulation layer has good heat insulation performance.

**[0023]** Referring to FIG. 4, FIG. 5, and FIG. 6, the inner support 110 has a top end surface 151, the outer surface 152 of sidewall, a bottom end surface 153, an inner sur-

face 154 of sidewall, and an inner bottom surface 155. The top end surface 151, the bottom end surface 153, and the outer surface 152 of sidewall form the outer surface of the inner support 110, and the inner bottom surface 155 and the inner surface 154 of sidewall cooperatively form an inner surface of the inner support 110. The inner bottom surface 155 may be a flat surface, and the inner surface 154 of sidewall may be a cylindrical surface. The inner surface 154 of sidewall is connected to a periphery of the inner bottom surface 155 and surrounds the inner bottom surface 155. The inner bottom surface 155 extends horizontally, and the inner surface 154 of sidewall extends vertically. The inner support 110 is provided with an open cavity 130, and the inner surface 154 of sidewall and the inner bottom surface 155 cooperatively define the boundary of the open cavity 130. The inner surface 154 of sidewall and the inner bottom surface 155 cooperatively define the open cavity 130, and the atomizing medium carrier 20 is accommodated in the open cavity 130. Both the top end surface 151 and the bottom end surface 153 may also be plane extending horizontally, the top end surface 151, the bottom end surface 153 and the inner bottom surface 155 are spaced along the axial direction of the inner support 110. The inner bottom surface 155 is located between the top end surface 151 and the bottom end surface 153. Both the top end surface 151 and the inner bottom surface 155 are arranged facing upward, and the bottom end surface 153 is arranged facing downward. The bottom end surface 153 is close to the base 210, the inner bottom surface 155 is further away from the base 210 than the bottom end surface 153, and the top end surface 151 is opposite to the bottom end surface 153 and is away from the base 210. The outer surface 152 of sidewall is also a cylindrical surface, an upper end of the outer surface 152 of sidewall is connected to the top end surface 151, a lower end of the outer surface 152 of sidewall is connected to the bottom end surface 153, and the outer surface 152 of sidewall surrounds the inner surface 154 of sidewall.

**[0024]** The outer surface 152 of sidewall is provided with spiral grooves 143, and a plurality of the spiral grooves 143, for example four or three, etc., may be provided. Rotation directions of the four spiral grooves 143 may be the same, for example, they may rotate clockwise or counterclockwise at the same time. An upper end of each spiral groove 143 extends through the top end surface 151 of the inner support 110, so that the upper end of the spiral groove 143 forms an air inlet 141. A lower end of the spiral groove 143 extends through the bottom end surface 153 of the inner support 110, so that the lower end of the spiral groove 143 forms an air outlet 142. When the outer support 120 is sleeved on the inner support 110, the outer support 120 abuts against the outer surface 152 of sidewall, so that the spiral groove 143 is covered by the outer support 120 to form a spiral channel 140. The ambient air input into the spiral channel 140 from the air inlet 141 is output through the air outlet 142. In other words, the ambient air is first input into the spiral

channel 140 from the air inlet 141, and finally is output outside the spiral channel 140 through the air outlet 142.

**[0025]** An end of the open cavity 130 extends through the top end surface 151 of the inner support 110 to form an opening 131. That is, the opening 131 is provided on the top end surface 151, and the atomizing medium carrier 20 can be inserted into the open cavity 130 through the opening 131, so that the opening 131 serves to accommodate the atomizing medium carrier 20. A part of the heating sheet 220 is accommodated in the open cavity 130, and when the atomizing medium carrier 20 cooperates with the open cavity 130, the heating sheet 220 can insert into the interior of the atomizing medium carrier 20. The air inlet 141 of the spiral channel 140 is also located on the top end surface 151. When a plurality of spiral channels 140 are provided, a plurality of air inlets 141 surround the opening 131, and the plurality of air inlets 141 are spaced along a circumferential direction of the inner support 110. For example, angles between any two adjacent air inlets 141 are equal, that is, the plurality of air inlets 141 are evenly distributed along the circumferential direction. Since the air outlet 142 of the spiral channel 140 is located at the bottom end surface 153, if the axial direction of the entire support assembly 100 is taken as a reference direction, then the distance between the air inlet 141 and the air outlet 142 is greater than the length of the open cavity 130. In other words, the entire orthographic projection of the open cavity 130 along a direction perpendicular to this reference direction falls within an area covered by the spiral channel 140. Apparently, the air inlet 141 is closer to the opening 131 than the air outlet 142. Of course, the air inlet 141 can also be located on the outer surface 152 of sidewall, that is, there is a certain distance between the air inlet 141 and the opening 131 in the reference direction. At this time, the distance between the air inlet 141 and the air outlet 142 can be less than the length of the open cavity 130, so that a part of the orthographic projection of the open cavity 130 along the direction perpendicular to the reference direction falls within the area covered by the spiral channel 140, and the other part thereof falls outside the area covered by the spiral channel 140. In general, at least part of the orthographic projection lies within the area covered by the spiral channel 140.

**[0026]** An air guide channel 161 is also formed between the base 210 and the bottom end surface 153 of the inner support 110. A matching hole 162 is provided on the inner support 110, and the matching hole 162 is a through hole extending through the inner bottom surface 155 and the bottom end surface 153, so that the matching hole 162 is in communication with the open cavity 130 and the air guide channel 161 at the same time. The heating sheet 220 extends through the matching hole 162, such that a part of the heating sheet 220 is accommodated in the open cavity 130. When the user inhales the atomizing medium carrier 20, the ambient air is input into the spiral channel 140 from the air inlet 141 and output into the air guide channel 161 from the air

outlet 142, and then enters the open cavity 130 from the air guide channel 161 through the matching hole 162, so that the ambient air carrying the aerosol is absorbed by the user. Therefore, the ambient air enters into the open cavity 130 through the spiral channel 140, the air guide channel 161 and the matching hole 162 successively to carry the aerosol.

**[0027]** By providing the spiral channel 140, when the user inhales and the heating sheet 220 generates heat, when the ambient air with lower temperature flows through the spiral channel 140, the ambient air will absorb the heat from the inner support 110 and flow into the open cavity 130 again from the air guide channel 161 and the matching hole 162, so that the ambient air can play a role of heat recycle. On the one hand, the heat recycled from the ambient air can be reused for heating the atomizing medium carrier 20, so as to reduce a heat loss rate as much as possible, thereby improving an energy utilization rate of the entire heater 10. On the other hand, the heat transferred from the open cavity 130 to the outer support 120 can be reduced, so as to lower a temperature of the outer support 120, and prevent the user from experiencing discomfort of burning or even getting burned when holding the entire support assembly 100.

**[0028]** Assuming that the spiral channel 140 is replaced by a linear channel, since a flow path of the ambient air in the linear channel is much shorter than that in the spiral channel 140, the ambient air cannot absorb enough heat to enter the open cavity 130 in a short flow path. That is, the ambient air does not have enough time for heat exchange, resulting in a low recycle rate of heat. Most of the heat is still transferred to the outer surface of the support assembly 100, which will cause discomfort of burning on the outer surface of the support assembly 100. In this embodiment, the spiral channel 140 is provided, and an axial distance between air inlet 141 and air outlet 142 is greater than the length of open cavity 130, so that the ambient air in spiral channel 140 can be in direct contact with the heat transferred outward from each part of the inner support 110, while the flow path of the ambient air in the spiral channel 140 is longer, so that the ambient air has enough opportunities and time to recycle as much heat as possible, thereby further improving the utilization rate of energy and preventing the support assembly 100 from creating the discomfort of burning.

**[0029]** Assuming that the spiral channel 140 is replaced by an irregular channel, the ambient air will generate eddy and turbulent flow (i.e., turbulence) in the irregular channel, so that a flow velocity of the ambient air in the irregular channel is not the same everywhere. The ambient air flows slowly at the vortex, and flows relatively fast at other portions. Therefore, when the ambient air flows faster somewhere in the irregular channel, the ambient air will not be able to absorb more heat at the position in a shorter period of time. The heat that cannot be absorbed in time will be directly transferred to the outer surface of the support assembly 100, and then local high

temperature will occur on the outer surface of the support assembly 100 at a position corresponding to the position where the flow velocity of the air in the irregular channel is fast. In this embodiment, the spiral channel 140 is provided, and the flow velocity of the ambient air in the spiral channel 140 is substantially the same everywhere, which effectively prevents poor flow of the ambient air such as vortex. When most of the heat is recycled into the open cavity 130 by the ambient air in the spiral channel 140, it can effectively ensure that the heat transferred to the support assembly 100 is evenly distributed on the outer surface of the support assembly 100, so as to prevent local high temperature on the outer surface that may cause discomfort to the user.

**[0030]** At the same time, the thermal insulation layer is attached to the outer support 120, and the thermal insulation layer further prevents the heat in the open cavity 130 from radiating outwards, so as to improve the energy utilization rate of the entire heater 10, and prevent the temperature of the outer surface of the heater 10 from being too high.

#### Second embodiment

**[0031]** Referring to FIG. 7, FIG. 8 and FIG. 9, the main difference between the heater 10 of the second embodiment and the heater 10 of the first embodiment lies in that the spiral channel 140 is directly provided on the inner surface 154 of sidewall of the support assembly 100, so that the airflow formed by the ambient air in the spiral channel 140 can be directly in contact with the atomizing medium carrier 20. As for the heater 10 in the first embodiment, apparently, the airflow formed by the ambient air in the spiral channel 140 cannot be directly in contact with the atomizing medium carrier 20.

**[0032]** Specifically, the heater 10 includes a support assembly 100, a heating assembly 200, and a thermal insulation layer, and the support assembly 100 and the heating assembly 200 are connected to each other. The heating assembly 200 includes a base 210 and a heating sheet 220. One end of the heating sheet 220 in a sheet shape is fixed on the base 210, and the other end of the heating sheet 220 is a free end, which can insert into the interior of the atomizing medium carrier 20. When the heating sheet 220 converts electrical energy into heat energy, the atomizing medium carrier 20 absorbs the heat energy of the heating sheet 220 to form an aerosol.

**[0033]** The support assembly 100 may be a cylindrical structure, and the thermal insulation layer may be attached to the outer surface of the support assembly 100, so that the thermal insulation layer can be contact with the user directly. A blackness coefficient of the thermal insulation layer may be less than 0.1, so that the thermal insulation layer has good heat insulation performance.

**[0034]** The support assembly 100 has a top end surface 151, the outer surface 152 of sidewall, a bottom end surface 153, an inner surface 154 of sidewall, and an inner bottom surface 155. The top end surface 151, the

bottom end surface 153 and the outer surface 152 of sidewall form the outer surface of the support assembly 100, and the inner bottom surface 155 and the inner surface 154 of sidewall cooperatively form an inner surface of the support assembly 100. The inner bottom surface 155 may be a flat surface, and the inner surface 154 of sidewall may also be annular. The inner surface 154 of sidewall is connected to a periphery of the inner bottom surface 155 and surrounds the inner bottom surface 155. The inner bottom surface 155 extends horizontally, and the inner surface 154 of sidewall extends vertically. The support assembly 100 is provided with an open cavity 130, and the inner surface 154 of sidewall and the inner bottom surface 155 cooperatively define the boundary of the open cavity 130. The inner surface 154 of sidewall and the inner bottom surface 155 cooperatively define the open cavity 130, and the atomizing medium carrier 20 is accommodated in the open cavity 130. Both the top end surface 151 and the bottom end surface 153 can also be planes extending horizontally, the top end surface 151, the bottom end surface 153 and the inner bottom surface 155 are spaced along the axial direction of the support assembly 100. The inner bottom surface 155 is located between the top end surface 151 and the bottom end surface 153. Both the top end surface 151 and the inner bottom surface 155 are arranged facing upward, and the bottom end surface 153 is arranged facing downward. The bottom end surface 153 is close to the base 210, the inner bottom surface 155 is further away from the base 210 than the bottom end surface 153, and the top end surface 151 is opposite to the bottom end surface and is away from the base 210. The outer surface 152 of sidewall is also annular, an upper end of the outer surface 152 of sidewall is connected to the top end surface 151, a lower end of the outer surface 152 of sidewall is connected to the bottom end surface 153, and the outer surface 152 of sidewall surrounds the inner surface 154 of sidewall.

**[0035]** The inner surface 154 of sidewall is provided with spiral grooves 143, and a plurality spiral grooves 143, for example four or three, etc., may be provided. Rotation directions of the four spiral grooves 143 may be the same, for example, they may rotate clockwise or counterclockwise at the same time. An upper end of the spiral groove 143 extends through the top end surface 151 of the support assembly 100, so that the upper end of the spiral groove 143 forms an air inlet 141. A lower end of the spiral groove 143 extends to the inner bottom surface 155, so that the lower end of the spiral groove 143 forms an air outlet 142. When the atomizing medium carrier 20 is accommodated in the open cavity 130, the atomizing medium carrier 20 abuts against the inner surface 154 of sidewall, so that the spiral groove 143 is covered by the atomizing medium carrier 20 to form a spiral channel 140. The ambient air input into the spiral channel 140 from the air inlet 141 is output through the air outlet 142. In other words, the ambient air is first input into the spiral channel 140 from the air inlet 141, and finally is

output outside the spiral channel 140 through the air outlet 142.

**[0036]** An end of the open cavity 130 extends through the top end surface 151 of the inner support 110 to form an opening 131. That is, the opening 131 is provided on the top end surface 151, and the atomizing medium carrier 20 can be inserted into the open cavity 130 through the opening 131, so that the opening 131 serves to accommodate the atomizing medium carrier 20. A part of the heating sheet 220 is accommodated in the open cavity 130, and when the atomizing medium carrier 20 cooperates with the open cavity 130, the heating sheet 220 can puncture into the interior of the atomizing medium carrier 20. The air inlet 141 of the spiral channel 140 is also located on the top end surface 151. When a plurality of spiral channels 140 are provided, a plurality of air inlets 141 are spaced along a circumferential direction of the support assembly 100. For example, angles between any two adjacent air inlets 141 are equal, that is, the plurality of air inlets 141 are evenly distributed along the circumferential direction. Since a lower end of the spiral channel 140 extends to the inner bottom surface 155 to form the air outlet 142, if the axial direction of the entire support assembly 100 is taken as a reference direction, then the distance between the air inlet 141 and the air outlet 142 is equal to the open the length of the open cavity 130. In other words, the entire orthographic projection of the open cavity 130 along a direction perpendicular to this reference direction just falls within an area covered by the spiral channel 140. That is, the orthographic projection covers the entire area where the spiral channel 140 is located. Apparently, the air inlet 141 is closer to the opening 131 than the air outlet 142. Of course, the air inlet 141 can also be located on the outer surface 152 of sidewall, that is, there is a certain distance between the air inlet 141 and the opening 131 in the reference direction. At this time, the distance between the air inlet 141 and the air outlet 142 can be less than the length of the open cavity 130, so that a part of the orthographic projection of the open cavity 130 along the direction perpendicular to the reference direction falls within the area covered by the spiral channel 140, and the other part thereof falls in the area covered by the spiral channel 140 outside. In general, at least part of the orthographic projection lies within the area covered by the spiral channel 140.

**[0037]** The support assembly 100 further includes a protruding portion 170, which is provided on the inner bottom surface 155, and the protruding portion 170 protrudes a certain height from the inner bottom surface 155. When the lower end of the atomizing medium carrier 20 abuts against the protruding portion 170, a space of the open cavity 130 between the atomizing medium carrier 20 and the inner bottom surface 155 forms an air guide channel 161. In other words, both the atomizing medium carrier 20 and the inner bottom surface 155 surround a part of the open cavity 130 to form the air guide channel 161. The support assembly 100 is also provided with a matching hole 162, which is a through hole extending

through the inner bottom surface 155 and the bottom end surface 153 at the same time, so that the matching hole 162 is in communication with the air guide channel 161. The heating sheet 220 extends through the matching hole 162, such that a part of the heating sheet 220 is accommodated in the open cavity 130. Of course, the matching hole 162 may be sealed, so that the air in the air guide channel 161 cannot flow out of the matching hole 162. When the user inhales the atomizing medium carrier 20, the ambient air is input into the interior of the spiral channel 140 from the air inlet 141 and output into the air guide channel 161 from the air outlet 142, so that the aerosol carried by the ambient air is absorbed by the user. Therefore, the ambient air enters the air guide channel 161 through the spiral channel 140 successively to carry the aerosol.

**[0038]** By providing the spiral channel 140, when the user inhales and the heating sheet 220 generates heat, when the ambient air with lower temperature flows through the spiral channel 140, the ambient air will absorb the heat from the support assembly 100 and flow into the air guide channel 161 again, so the ambient air can play a role of heat recycle. On the one hand, the heat recycled from the ambient air can be reused for heating the atomizing medium carrier 20, so as to reduce a heat loss rate as much as possible, thereby improving an energy utilization rate of the entire heater 10. On the other hand, the heat transferred from the open cavity 130 to the support assembly 100 can be reduced, so as to lower a temperature of the support assembly 100, and prevent the user from experiencing discomfort of burning or even getting burned when holding the entire support assembly 100.

**[0039]** Assuming that the spiral channel 140 is replaced by a linear channel, since a flow path of the ambient air in the linear channel is much shorter than that in the spiral channel 140, the ambient air cannot absorb enough heat to enter the open cavity 130 in a short flow path. That is, the ambient air does not have enough time for heat exchange, resulting in a low recycle rate of heat. Most of the heat is still transferred to the outer surface of the support assembly 100, which will cause discomfort of burning on the outer surface of the support assembly 100. In this embodiment, the spiral channel 140 is provided, and an axial distance between air inlet 141 and air outlet 142 is greater than the length of open cavity 130, so that the ambient air in spiral channel 140 can be in direct contact with the heat transferred outward from each part of the support assembly 100, while the flow path of the ambient air in the spiral channel 140 is longer, so that the ambient air has enough opportunities and time to recycle as much heat as possible, thereby further improving the utilization rate of energy and preventing the support assembly 100 from creating the discomfort of burning.

**[0040]** Assuming that the spiral channel 140 is replaced by an irregular channel, the ambient air will generate eddy and turbulent flow (i.e., turbulence) in the ir-

regular channel, so that a flow velocity of the ambient air in the irregular channel is not the same everywhere. The ambient air flows slowly at the vortex, and flows relatively fast at other portions. Therefore, when the ambient air flows faster somewhere in the irregular channel, the ambient air will not be able to absorb more heat at the position in a shorter period of time. The heat that cannot be absorbed in time will be directly transferred to the outer surface of the support assembly 100, and then local high temperature will occur on the outer surface of the support assembly 100 at a position corresponding to the position where the flow velocity of the air in the irregular channel is fast. In this embodiment, the spiral channel 140 is provided, and the flow velocity of the ambient air in the spiral channel 140 is substantially the same everywhere, which effectively prevents poor flow of the ambient air such as vortex. When most of the heat is recycled into the air guide channel 161 by the ambient air in the spiral channel 140, it can effectively ensure that the heat transferred to the support assembly 100 is evenly distributed on the outer surface of the support assembly 100, so as to prevent local high temperature on the outer surface that may cause discomfort to the user.

**[0041]** At the same time, the thermal insulation layer is attached to the support assembly 100, and the thermal insulation layer further prevents the heat in the open cavity 130 from radiating outward, so as to improve the energy utilization rate of the entire heater 10, and prevent the temperature of the outer surface of the heater 10 from being too high.

**[0042]** The present application also provides an electronic atomization device, which includes a power supply assembly and a heater 10. The heater 10 is detachably connected to the power supply assembly, and the power supply assembly supplies power to the heating sheet 220 in the heater 10.

**[0043]** The above-mentioned embodiments do not constitute a limitation on the protection scope of the technical solution. Any modifications, equivalent replacements and improvements made within the spirit and principles of the above-mentioned embodiments shall be included within the protection scope of this technical solution.

**[0044]** The foregoing descriptions are merely specific embodiments of the present application, but are not intended to limit the protection scope of the present application. Any variation or replacement readily figured out by a person skilled in the art within the technical scope disclosed in the present application shall all fall within the protection scope of the present application.

## Claims

1. A heater configured to heat a heating substrate, comprising:

a support assembly provided with a spiral chan-

- nel and an open cavity;  
 wherein the two ends of the spiral channel form an air inlet and an air outlet, the open cavity is configured to accommodate the heating substrate, an end of the open cavity forms an opening in communication with external environment, the air inlet is closer to the opening than the air outlet, the spiral channel at least partially surrounds the open cavity, ambient air input into the spiral channel from the air inlet is output to the open cavity through the air outlet.
2. The heater according to claim 1, wherein the support assembly comprises a top end surface and an inner bottom surface that are axially spaced apart and face the same direction, the inner bottom surface defines part of the boundary of the open cavity, both the opening and the air inlet are provided on the top end surface.
  3. The heater according to claim 2, wherein a plurality of spiral channels are provided, and the air inlets of the plurality of spiral channels are spaced on the top end surface in circumferential direction.
  4. The heater according to claim 1, wherein the support assembly comprises an inner support and an outer support, the open cavity is provided on the inner support, the inner support comprises an annular inner surface of sidewall and the outer surface of sidewall, the inner surface of sidewall is surrounded by the outer surface of sidewall and defines part of the boundary of the open cavity, the outer surface of sidewall is recessed to form a spiral groove, the outer support is sleeved on the inner support and covers the spiral groove to form the spiral channel.
  5. The heater according to claim 4, further comprising a heating assembly connected to the support assembly, wherein the inner support further comprises a bottom end surface and an inner bottom surface, the inner bottom surface is opposite to the bottom end surface and defines part of the boundary of the open cavity, the inner support is further provided with a matching hole that extends through the bottom end surface and the inner bottom surface, an air guide channel is formed between the heating assembly and the bottom end surface, the air outlet is provided on the bottom end surface, and ambient air output from the air outlet flows through the air guide channel and the matching hole in sequence to enter the open cavity.
  6. The heater according to claim 1, wherein the support assembly comprises an inner bottom surface and an inner surface of sidewall that define the boundary of the open cavity, the inner surface of sidewall surrounds the inner bottom surface, the inner surface of sidewall is provided with a spiral groove, an end of the spiral groove extends to the inner bottom surface, the heating substrate is sleeved in the inner surface of sidewall and covers the spiral groove to form the spiral channel.
  7. The heater according to claim 4 or 6, wherein along the axial direction of the support assembly, the distance between the air inlet and the air outlet is greater than or equal to the length of the open cavity.
  8. The heater according to claim 6, wherein the support assembly further comprises a protruding portion, the protruding portion is connected to the inner bottom surface and protrudes from the inner bottom surface, when the heating substrate abuts against the protruding portion, a space of the open cavity between the heating substrate and the inner bottom surface forms an air guide channel in communication with the spiral channel.
  9. The heater according to claim 1, further comprising a thermal insulation layer with a blackness coefficient of less than 0.1, wherein the thermal insulation layer covers the outer surface of the support assembly.
  10. The heater according to claim 1, further comprising a heating assembly connected to the support assembly, wherein the heating assembly comprises a base and a heating sheet, one end of the heating sheet is fixed on the base, and the other end of the heating sheet is capable of being inserted into the interior of an aerosol generation substrate.
  11. A heating atomization device, comprising a power supply assembly and the heater according to any one of claims 1 to 10, wherein the heater is detachably connected to the power supply assembly.

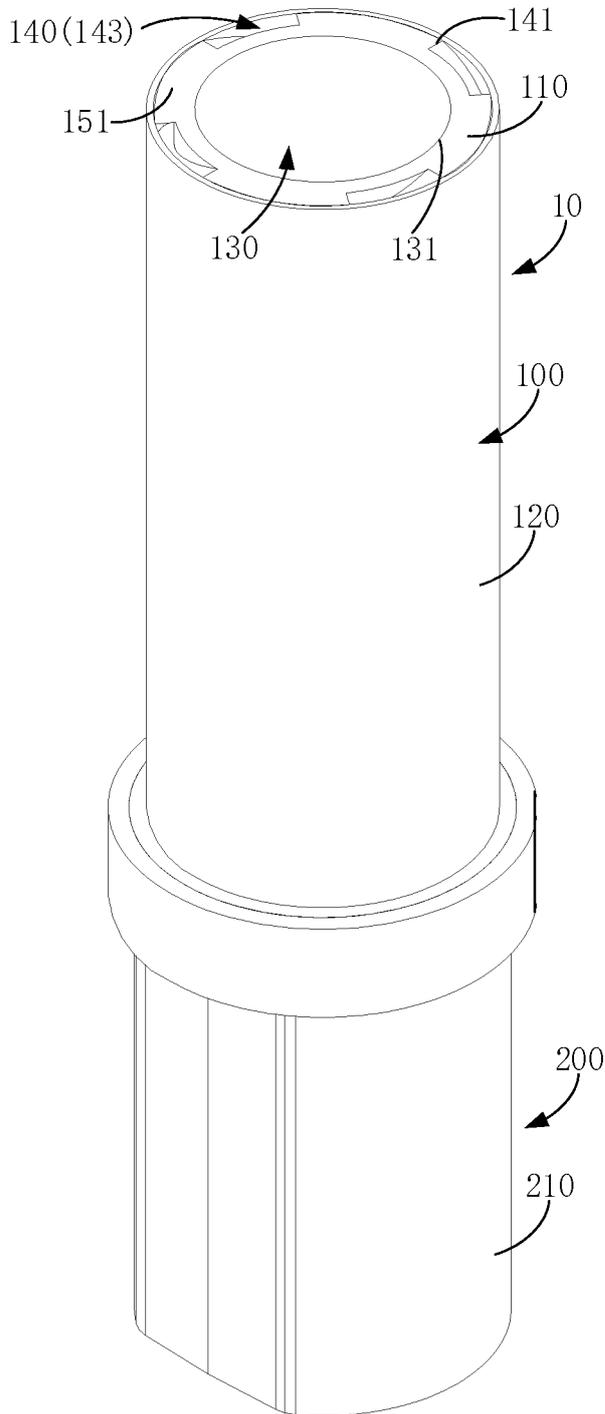


FIG. 1

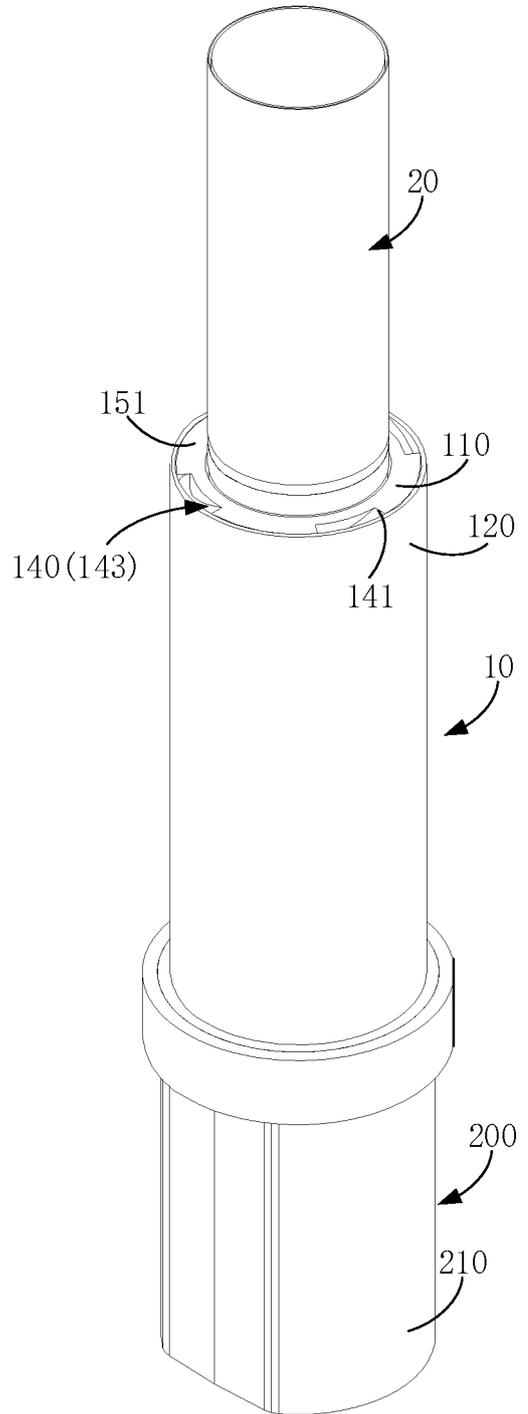


FIG. 2

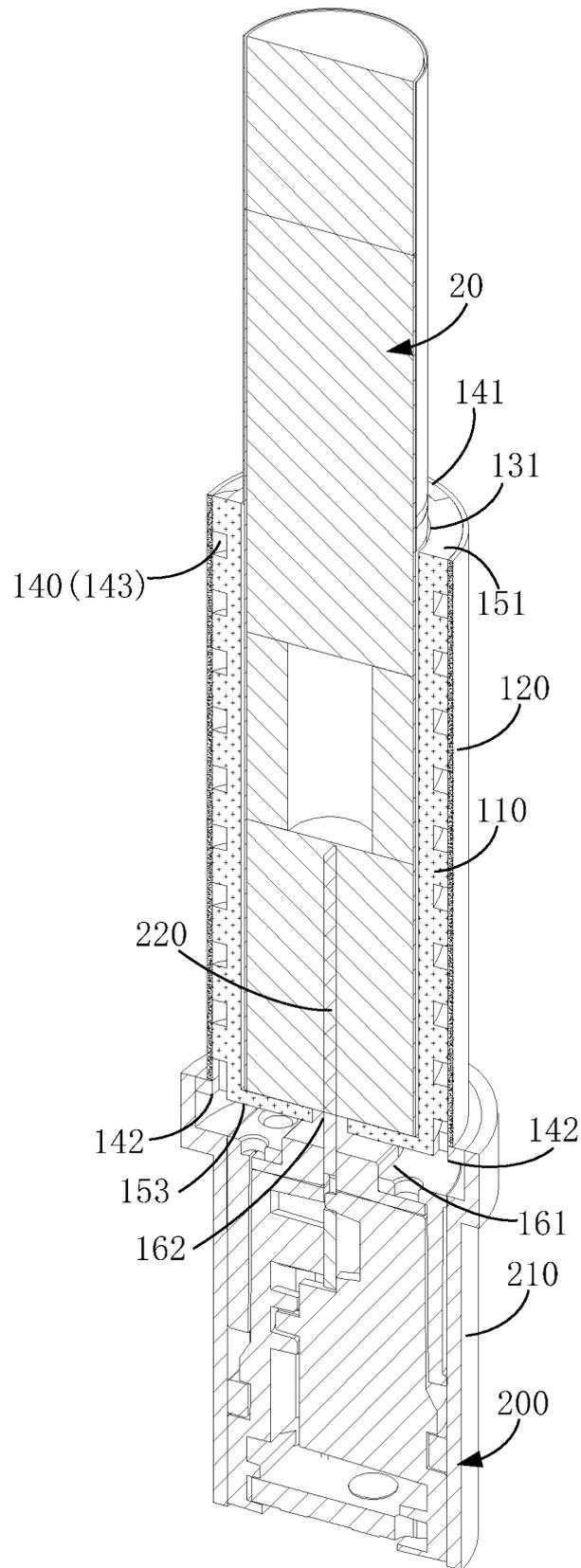


FIG. 3

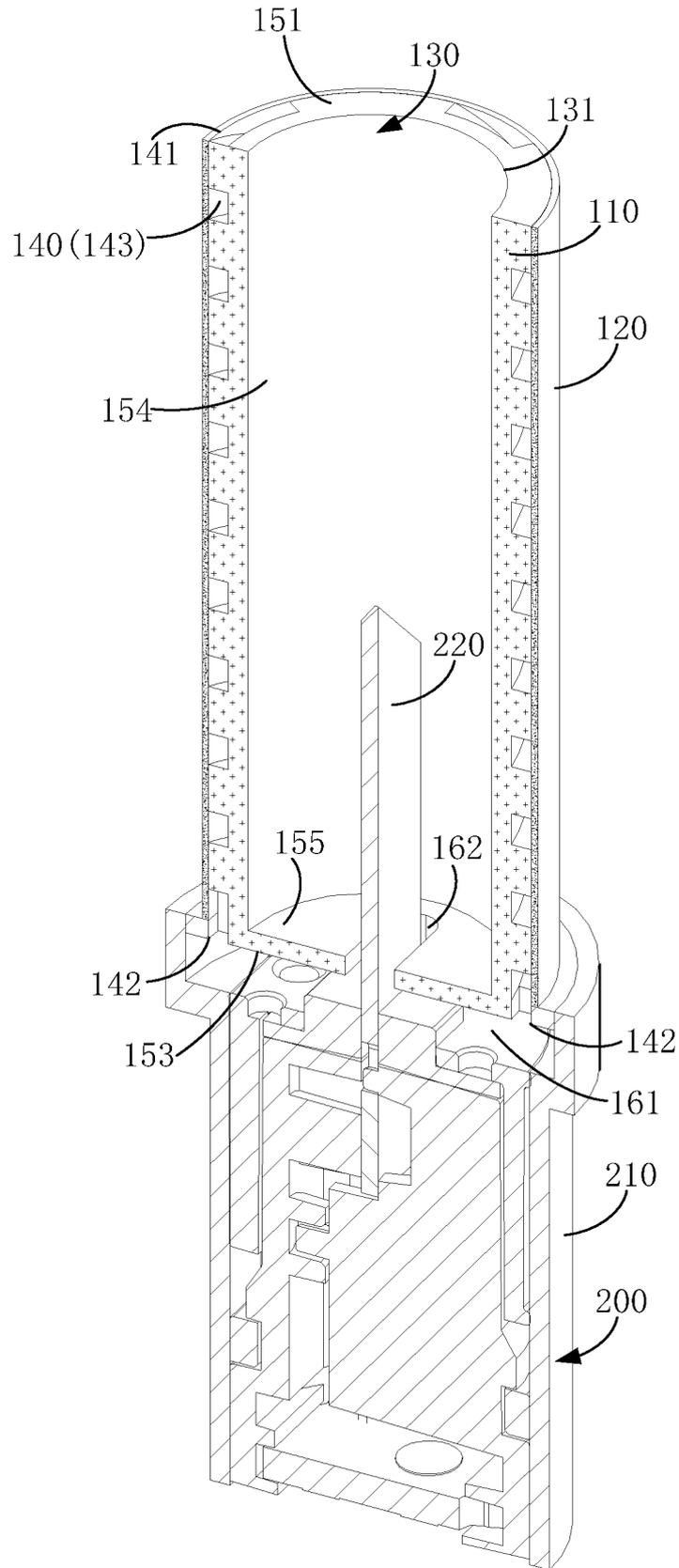


FIG. 4

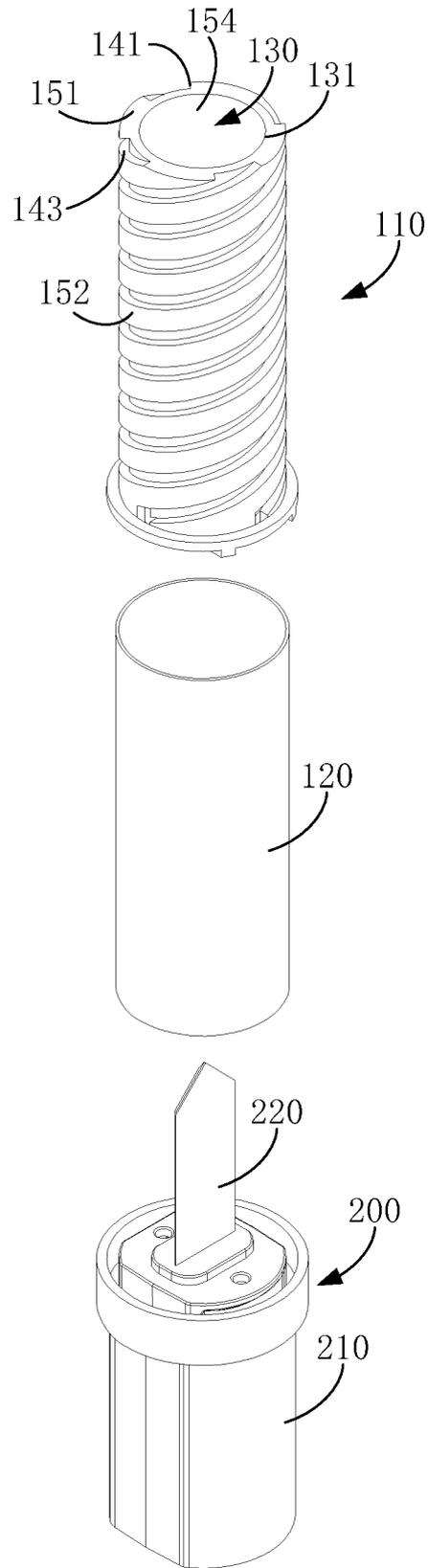


FIG. 5

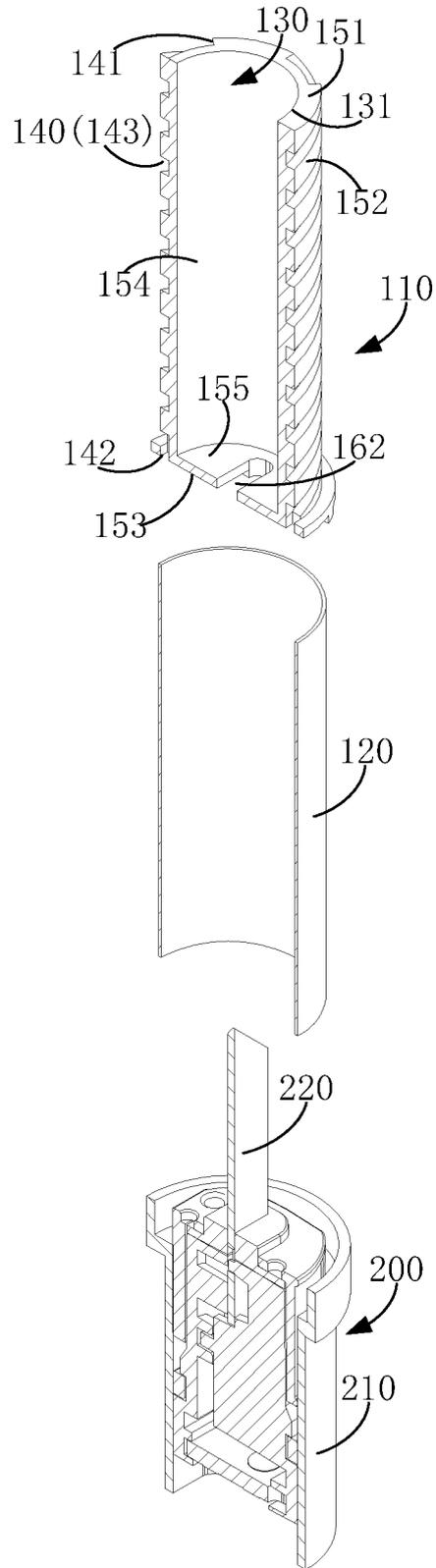


FIG. 6





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/130524

5	<b>A. CLASSIFICATION OF SUBJECT MATTER</b> A24F 40/00(2020.01)i; A24F 40/46(2020.01)j  According to International Patent Classification (IPC) or to both national classification and IPC	
10	<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) A24F40; A24F47; A61M15  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, VEN: 仿真, 雾化, 模拟, 加热器, 通道, 凹槽, electrical, cigarette, substitute, simulate, cigar, tobacco, atomizer, imitate, heater, passage, channel, groove	
20	<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>	
25	Category*	Citation of document, with indication, where appropriate, of the relevant passages
30	PX	CN 214629887 U (SHENZHEN MAISHI TECHNOLOGY CO., LTD.) 09 November 2021 (2021-11-09) description paragraphs 26-49, claims 1-10, figures 1-9
35	X	CN 108618201 A (LYUYAN INDUSTRIAL (SHENZHEN) CO., LTD.) 09 October 2018 (2018-10-09) description, paragraphs 32-52, and figures 1-3
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	Y	CN 104135881 A (PHILIP MORRIS PRODUCTS S. A.) 05 November 2014 (2014-11-05) description paragraph 65, figure 2
	Y	CN 111436663 A (NANTONG JINYUAN NEW MATERIAL CO., LTD.) 24 July 2020 (2020-07-24) the abstract, and the figure of the abstract
	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.	
40	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
45	Date of the actual completion of the international search <b>27 January 2022</b>	Date of mailing of the international search report <b>09 February 2022</b>
50	Name and mailing address of the ISA/CN <b>China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China</b> Facsimile No. (86-10)62019451	Authorized officer  Telephone No.

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International application No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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