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(54) **AEROSOL GENERATING DEVICE AND HEATING MODULE**

(57) The present application relates to an aerosol generating device and a heating module. The aerosol generating device comprises a holder; and a heating module, which is detachably connected to the holder, comprises a first accommodating cavity for accommodating at least part of an aerosol generating product, and further comprises a heating assembly arranged upstream of the first accommodating cavity in an airflow direction, wherein the heating assembly comprises a perforated component; one or more air holes in fluid communication with the first accommodating cavity are formed in the perforated component; the end of each air hole adjacent to the first accommodating cavity is an air output end, and the opposite end thereof is an air input end; the heating assembly is configured to heat the air flowing through the air hole; and the air input ends of at least some of the air holes are configured to be exposed when the heating module is removed from the holder.

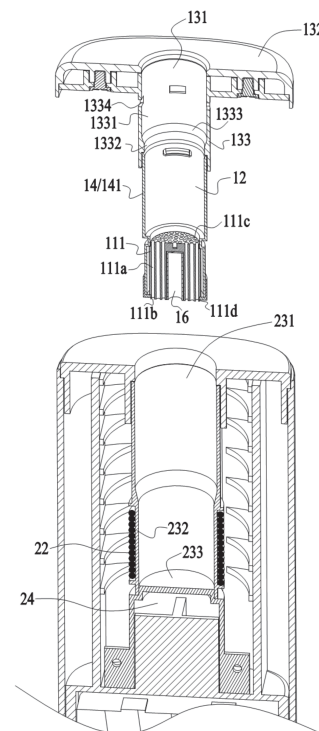


FIG. 5

Description**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority to Chinese Patent Application No. 202311021130.9, filed with the China National Intellectual Property Administration on August 11, 2023 and entitled "AEROSOL GENERATION DEVICE AND HEATING MODULE", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this application relate to the field of aerosol generation technologies, and in particular, to an aerosol generation device and a heating module.

BACKGROUND

[0003] An aerosol generation device is a device capable of generating aerosols from aerosol articles (such as cigarettes and cigars) without combustion. The device includes a heating assembly and a power supply component that is electrically connected to the heating assembly to provide power to the heating assembly. In some aerosol generation devices, the heating assembly is configured to heat air to form hot air. Then, the hot air flows into the aerosol article to heat the aerosol article. However, existing heating assemblies for heating air are prone to clogging.

SUMMARY

[0004] Embodiments of this application provide an aerosol generation device and a heating module, which are convenient for cleaning or replacing the heating module with a heating assembly, and help extend the service life of the aerosol generation device and improve user experience.

[0005] An embodiment of this application provides an aerosol generation device, including:

a holder; and
a heating module, removably connected to the holder, where the heating module includes a first accommodating cavity for accommodating at least part of an aerosol generation article, and further includes a heating assembly arranged upstream of the first accommodating cavity along an airflow direction;
the heating assembly includes a perforated member, one or more air holes in fluid communication with the first accommodating cavity are formed in the perforated member, an end of each of the air holes adjacent to the first accommodating cavity is an air outlet end, an opposite end thereof is an air inlet end, and the heating assembly is configured to heat air flowing through the air hole; and

the air inlet ends of at least some of the air holes are configured to be exposed when the heating module is removed from the holder.

[0006] An embodiment of this application provides an aerosol generation device, including:

a holder; and
a heating module, removably connected to the holder, where the heating module includes a first accommodating cavity for accommodating at least part of an aerosol generation article, and further includes a heating assembly arranged upstream of the first accommodating cavity along an airflow direction and in fluid communication with the first accommodating cavity, and an end cap, the heating assembly is configured to heat air flowing there-through, and a socket allowing insertion of the aerosol generation article into the first accommodating cavity is formed in the end cap; and
at least part of the end cap is exposed from the holder.

[0007] An embodiment of this application provides a heating assembly, including a first accommodating cavity for accommodating at least part of an aerosol generation article, and further including a heating assembly arranged upstream of the first accommodating cavity along an airflow direction, where

the heating assembly includes a perforated member, one or more air holes in fluid communication with the first accommodating cavity are formed in the perforated member, an end of each of the air holes adjacent to the first accommodating cavity is an air outlet end, and an opposite end thereof is an air inlet end;
the heating assembly is configured to heat air flowing through the air hole; and
the air inlet ends of at least some of the air holes are exposed.

[0008] According to the aerosol generation device and the heating module described above, the heating module that may accommodate at least part of the aerosol generation article includes the heating assembly capable of heating air. The heating module is removably connected to the holder, and when the heating module is removed, the air inlet ends of at least some of the air holes on the heating assembly are exposed. In this way, after the heating module is removed from the holder, the exposed air inlet ends may be cleaned to unclog the air holes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] One or more embodiments are exemplarily described with reference to pictures in accompanying drawings corresponding to the embodiments, and the exemp-

lary descriptions do not constitute a limitation on the embodiments. Elements in the accompanying drawings that have same reference numerals are represented as similar elements, and unless otherwise particularly stated, the figures in the accompanying drawings do not constitute a scale limitation.

FIG. 1 is a schematic diagram of an aerosol generation device according to an embodiment of this application;

FIG. 2 is a schematic diagram of a heating module according to an embodiment of this application after being removed from a body;

FIG. 3 is a cross-sectional view of an aerosol generation device according to an embodiment of this application;

FIG. 4 is a schematic diagram of a heating module according to an embodiment of this application;

FIG. 5 is a cross-sectional view of a heating module according to an embodiment of this application after being removed from a body;

FIG. 6 is a cross-sectional view of an aerosol generation device according to another embodiment of this application;

FIG. 7 is a schematic diagram of a heating module according to another embodiment of this application; and

FIG. 8 is a cross-sectional view of a heating module according to another embodiment of this application after being removed from a body.

[0010] In the figures:

- 1. Heating module;
- 11. Heating assembly; 111. Perforated member; 111a. Air hole; 111b. Air inlet end; 111c. Air outlet end; 111d. Upstream end; 12. First accommodating cavity; 13. End cap; 131. Socket; 132. Cap portion; 133. Tube portion; 1331. First portion; 1332. Second portion; 1333. Third portion; 1334. Through hole; 14. Connecting member; 141. First connecting member; 141a. Fourth portion; 141b. Fifth portion; 142. Second connecting member; 143. Third connecting member; 15. Gap; 16. Susceptor;
- 2. Body;
- 21. Power supply component; 22. Magnetic field generator; 23. Holder; 231. Second accommodating cavity; 232. First holder; 233. Second holder; 24. Cavity;
- 4. Airflow channel.

DETAILED DESCRIPTION

[0011] Technical solutions in embodiments of this application are clearly and completely described below with reference to accompanying drawings in the embodiments of this application. Apparently, the described embodiments are merely some rather than all of the embo-

diments of this application. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of this application without creative efforts shall fall within the protection scope of this application.

[0012] Terms "first", "second", and "third" in this application are merely intended for a purpose of description, and shall not be understood as an indication or implication of relative importance or implicit indication of a quantity or an order of indicated technical features. All directional indications (for example, up, down, left, right, front, and back) in the embodiments of this application are only used for explaining relative position relationships, movement situations, or the like among the various components in a specific posture (as shown in the accompanying drawings). If the specific posture changes, the directional indication changes accordingly. In addition, terms "include", "have", and any variant thereof are intended to cover a non-exclusive inclusion. For example, a process, a method, a system, a product, or a device that includes a series of steps or units is not limited to the listed steps or units, and instead, optionally further includes a step or a unit that is not listed, or optionally further includes another step or unit that is intrinsic to the process, the method, the product, or the device.

[0013] The "embodiment" mentioned in this specification means that particular features, structures, or characteristics described with reference to the embodiments may be included in at least one embodiment of this application. The phrase appearing at various locations in this specification does not necessarily refer to a same embodiment, and is not an independent or alternative embodiment mutually exclusive of another embodiment. A person skilled in the art explicitly or implicitly understands that the embodiments described in the specification may be combined with other embodiments.

[0014] It should be noted that when an element is considered to be "fixed" to another element, the element may be directly on the other element or an intermediate element may exist. When an element is considered to be "connected to" another element, the element may be directly connected to another element, or one or more intermediate elements may simultaneously exist between the element and another element. Terms "vertical", "horizontal", "left", "right", and similar expressions used in this specification are only for purpose of illustration, and do not represent a unique implementation.

[0015] Referring to FIG. 1 and FIG. 2, an embodiment of this application provides an aerosol generation device and a heating module applicable to the aerosol generation device. The aerosol generation device may be configured to heat an aerosol generation article, and may generate, from the aerosol generation article, an aerosol for a user to inhale.

[0016] As used herein, the term "aerosol generation article" refers to an article including an aerosol-forming substrate. When heated, the aerosol-forming substrate releases volatile compounds that can form an aerosol. The aerosol-forming substrate may be intended to be

heated rather than burned to release the volatile compounds that can form the aerosol. The aerosol formed by heating the aerosol-forming substrate may include fewer known harmful components than an aerosol generated through combustion or pyrolysis and degradation of the aerosol-forming substrate. In an embodiment, the aerosol generation article is removably coupled to the aerosol generation device. The aerosol generation article may be disposable or reusable.

[0017] The aerosol-forming substrate may be a solid aerosol-forming substrate. Alternatively, the aerosol-forming substrate may include solid and liquid components. The aerosol-forming substrate may include tobacco. The aerosol-forming substrate may include a tobacco-containing material. The tobacco-containing material can release compounds with a tobacco flavor or nicotine when heated. The aerosol-forming substrate may include a non-tobacco material. The aerosol-forming substrate may include the tobacco-containing material and a non-tobacco-containing material.

[0018] An outer diameter of the aerosol generation article may be between about 5 millimeters and about 12 millimeters, for example, between about 5.5 millimeters and about 8 millimeters. In an embodiment, the outer diameter of the aerosol generation article is in a range of 6.8 mm +/- 10%.

[0019] An overall length of the aerosol generation article may be between about 25 mm and about 100 mm. The overall length of the aerosol generation article may be between about 30 mm and about 100 mm.

[0020] As used herein, the term "aerosol generation device" is a device that engages or interacts with an aerosol generation article to form an inhalable aerosol. Specifically, referring to FIG. 1 to FIG. 4, the aerosol generation device includes a heating module 1 and a body 2. The heating module 1 may accommodate at least part of the aerosol generation article, and the heating module 1 includes a heating assembly 11. The heating assembly 11 may release heat. The body 2 may include a power supply component 21. The power supply component 21 can provide electrical support for the heating assembly 11 to release heat. The body 2 includes a holder 23. The heating module 1 is removably connected to the holder 23, so that the heating module 1 can be separated from the holder 23. Therefore, after the heating module 1 is removed from the holder 23, the heating module 1 may be cleaned or maintained, or even the heating module 1 may be replaced. In some examples, when the heating module 1 is removed from the holder 23, the heating module 1 is simultaneously disengaged from the body 2.

[0021] More specifically, a first accommodating cavity 12 for accommodating at least part of the aerosol generation article is provided in the heating module 1. The heating assembly 11 is arranged upstream of the first accommodating cavity 12 along an airflow direction. An air hole 111a that allows air to pass through is provided on the heating assembly 11, and the heating assembly 11 is

in fluid communication with the first accommodating cavity 12, so that the air flowing through the heating assembly 11 can be heated by the heating assembly 11, to form hot air. Then the hot air flows into the first accommodating cavity 12 to heat the aerosol generation article accommodated in the first accommodating cavity 12, so as to generate an aerosol from the aerosol-forming substrate.

[0022] Reference may be made to FIG. 2 to FIG. 8. The heating assembly 11 includes a perforated member 111. One or more air holes 111a in fluid communication with the first accommodating cavity 12 are provided on the perforated member 111. An end of each air hole 111a adjacent to the first accommodating cavity 12 is an air outlet end 111c, and an opposite end thereof is an air inlet end 111b. Along the airflow direction, the air inlet end 111b is located upstream of the air outlet end 111c. Air enters a corresponding air hole 111a through the air inlet end 111b, and then exits the air hole 111a through the air outlet end 111c.

[0023] Since the clogging of the perforated member 111 is mainly caused by clogging of the air inlet end 111b of the perforated member 111, the air inlet end 111b may be cleaned when the heating module 1 is removed from the holder 23 to disengage the heating module 1 from the holder 23, thereby unclogging the air hole 111a and reducing the impact of the perforated member 111 on suction resistance.

[0024] Based on this, in an embodiment, when the heating module 1 is removed from the main body 2 or the holder 23, the air inlet ends 111b of at least some air holes 111a are exposed to facilitate cleaning of the air inlet end 111b. That "the air inlet ends are exposed" means that the air inlet end may be directly exposed to the field of view of human eyes, or means that a cleaning tool may touch and clean the air inlet end without disassembling the heating module, or even that the cleaning tool can extend into the air hole 111a. After the heating module 1 is removed from the main body 2 or the holder 23, the air inlet end 111b on the perforated member 111 is occluded and exposed from the heating module 1. In an example, when the heating module 1 is removed from the main body 2, the air inlet ends 111b of all the air holes 111a on the perforated member 111 are exposed, so that the air inlet end 111b of each air hole 111a can be cleaned and each air hole 111a can be unclogged. Therefore, this helps reduce a replacement rate of the heating module 1 as a whole, which is beneficial to reduce usage costs and save social resources.

[0025] In an embodiment, reference may be made to FIG. 2. The heating module 1 further includes an end cap 13. A socket 131 allowing insertion of the aerosol generation article into the first accommodating cavity 12 is provided on the end cap 13. At least part of the end cap 13 is exposed from the body 2 or the holder 23, so that the heating module 1 may be disengaged from the body 2 or the holder 23 by acting on the end cap 13. That "at least part of the end cap is exposed from the body or the holder" means that at least part of the end cap may be directly

exposed to the field of view of human eyes, or that a user or jig may touch and/or apply a force to the end cap without disassembling the aerosol generation device (disassembly other than removing a dust cap that occludes the end cap). This helps conveniently remove the heating module 1 from the body 2 or the holder 23.

[0026] As an example, reference may be to FIG. 3 and FIG. 6. The end cap 13 includes a cap portion 132 extending along a radial direction of the first accommodating cavity 12. The cap portion 132 is located on an upper end of the aerosol generation device, and at least part of the cap portion 132 is arranged above the body 2 or the holder 23 and supported by the body 2 or the holder 23. In this way, the cap portion 132 is exposed from the body 2 or the holder 23. The heating module 1 may be removed from the body 2 or the holder 23 by acting on the cap portion 132. The heating module 1 may be integrated with the body 2 or the holder 23 along an axial direction of the first accommodating cavity 12, or the heating module 1 may be removed from the body 2 or the holder 23. At least part of a boundary of the socket 131 may be defined by the cap portion 132.

[0027] As an example, reference may be made to FIG. 3 and FIG. 6. The end cap 13 includes a tube portion 133 extending along the axial direction of the first accommodating cavity 12. The tube portion 133 may define at least part of the socket 131. The tube portion 133 is in communication with the first accommodating cavity 12. The tube portion 133 may guide the aerosol generation article into the first accommodating cavity 12. At least part of the tube portion 133 may clamp the aerosol generation article, to prevent the aerosol generation article from being carried out of the aerosol generation device by a mouth of the user when the user is inhaling the aerosol generation article.

[0028] In the embodiments shown in FIG. 5 and FIG. 8, the tube portion 133 and the cap portion 132 are formed independently and then connected by assembly. The tube portion 133 and the cap portion 132 respectively define parts of the boundary of the socket 131. In another embodiment, the tube portion 133 and the cap portion 132 may be integrally formed.

[0029] As an example, reference may be made to FIG. 3. An airflow channel 4 in fluid communication with the heating assembly 11 is provided in the aerosol generation device. The end cap 13 may provide an air inlet channel for air outside the aerosol generation device to enter the airflow channel 4, so that the air outside the aerosol generation device may pass through the end cap 13, the airflow channel 4, and the heating assembly 11 in sequence and enter the first accommodating cavity 12.

[0030] For example, a through hole 1334 in flow communication with the socket 131 and the airflow channel 4 may be provided on a wall of the tube portion 133, so that the air outside the aerosol generation device may pass through the socket 131 and the through hole 1334 in sequence and enter the airflow channel 4.

[0031] Based on this, reference may be made to FIG. 5.

The tube portion 133 may include a first portion 1331 and a second portion 1332. The first portion 1331 and the second portion 1332 may be distributed along the axial direction of the first accommodating cavity 12. An inner diameter of the first portion 1331 may be greater than an inner diameter of the second portion 1332. The through hole 1334 is provided on the first portion 1331, so that when the aerosol generation article is inserted into the socket 131, the through hole 1334 can be prevented from being clogged by the aerosol generation article, thereby helping reduce suction resistance. More specifically, the inner diameter of the second portion 1332 may be less than or equal to the outer diameter of the aerosol generation article, so that the second portion 1332 can clamp the aerosol generation article, to prevent the user from moving the aerosol generation article relative to the aerosol generation device unintentionally. The first portion 1331 is arranged upstream of the second portion 1332 along the airflow direction. The inner diameter of the first portion 1331 may be greater than the outer diameter of the aerosol generation article. The first portion 1331 may be arranged adjacent to the cap portion 132 or adjacent to the outside of the aerosol generation device. Compared with the second portion 1332, the first portion 1331 is closer to the cap portion 132 or closer to the outside.

[0032] A third portion 1333 located between the first portion 1331 and the second portion 1332 may further be arranged on the tube portion 133. An inner diameter of the third portion 1333 is greater than the inner diameter of the second portion 1332. In addition, the inner diameter of the third portion 1333 is less than the inner diameter of the first portion 1331. At least part of an inner wall of the third portion 1333 may form a slope surface. The slope surface facilitates easier entry of the aerosol generation article into the second portion 1332 after passing through the first portion 1331, thereby helping insert the aerosol generation article into the first accommodating cavity 12.

[0033] In an embodiment, reference may be made to FIG. 4, FIG. 5, FIG. 7, and FIG. 8. The heating module 1 further includes a connecting member 14. The connecting member 14 is connected to the heating assembly 11. When the heating module 1 is integrated with the body 2 or the holder 23, the heating assembly 11 is fed into the body 2 or the holder 23 through the connecting member 14. When the heating module 1 is removed from the body 2 or the holder 23, the heating assembly 11 is carried out of the body 2 or the holder 23 through the connecting member 14.

[0034] Reference may be made to FIG. 3 to FIG. 8. The connecting member 14 is arranged around the first accommodating cavity 12. At least part of the aerosol generation article may be held in the connecting member 14. The connecting member 14 may be connected to the heating assembly 11 and the end cap 13, so that the heating assembly 11 and the end cap 13 can synchronously move relative to the body 2. More specifically, the connecting member 14 may be connected to the tube

portion 133 and the heating assembly 11.

[0035] Based on this, as an example, the connecting member 14 includes a first connecting member 141. The first connecting member 141 defines at least part of a boundary of the first accommodating cavity 12. When the aerosol generation article is inserted into the first accommodating cavity 12, at least part of an inner wall of the first connecting member 141 may contact the aerosol generation article.

[0036] An inner diameter of at least part of the first connecting member 141 may be less than the outer diameter of the aerosol generation article, or the inner diameter of at least part of the first connecting member 141 may be slightly less than the inner diameter of the second portion 1332, so that the at least part of the first connecting member 141 can clamp the aerosol generation article, thereby helping maintain the aerosol generation article more stably in the heating module 1.

[0037] The inner diameter of the at least part of the first connecting member 141 may be greater than the outer diameter of the aerosol generation article, to facilitate insertion and removal of the aerosol generation article into and from the heating module 1.

[0038] Based on this, reference may be made to FIG. 8. The first connecting member 141 may include a fourth portion 141a and a fifth portion 141b. Compared with the fifth portion 141b, the fourth portion 141a is closer to the end cap 13, and the fourth portion 141a can even be connected to the end cap 13. An inner diameter of the fourth portion 141a is less than the outer diameter of the aerosol generation article, or the inner diameter of the fourth portion 141a is less than the inner diameter of the second portion 1332. The fourth portion 141a can clamp the aerosol generation article.

[0039] Along the airflow direction, the fifth portion 141b is located upstream of the fourth portion 141a. Therefore, when air heated by the heating assembly 11 flows along the airflow direction and releases heat, a temperature of the fifth portion 141b is higher than a temperature of the fourth portion 141a. In addition, a temperature of the aerosol generation article surrounded by the fifth portion 141b may be higher than a temperature of the aerosol generation article surrounded by the fourth portion 141a. To prevent overheating of the aerosol generation article surrounded by the fifth portion 141b, an inner diameter of the fifth portion 141b may be greater than the outer diameter of the aerosol generation article. In this way, when the aerosol generation article is accommodated in the first accommodating cavity 12, the fifth portion 141b has no contact with the aerosol generation article, and air between the fifth portion 141b and the aerosol generation article can form an air insulation layer, which helps prevent over-baking of the aerosol generation article surrounded by the fifth portion 141b.

[0040] To reduce a temperature gradient on the first connecting member 141 and ensure even heating of the aerosol generation article surrounded by the first connecting member 141, the first connecting member 141

may be made of a thermally conductive material. The thermally conductive material may be understood as a material with a thermal conductivity of at least 10 W/(m·K), preferably at least 40 W/(m·K), and more preferably at least 100 W/(m·K) at 23°C and relative humidity of 50%. Specifically, the first connecting member 141 is formed from a material having a thermal conductivity of at least 40 W/(m·K), preferably at least 100 W/(m·K), more preferably at least 150 W/(m·K), and most preferably at least 200 W/(m·K) at 23°C and relative humidity of 50%. An appropriate thermally conductive material includes, but is not limited to: graphite, graphene, aluminum, copper, zinc, steel, silver, a thermally conductive polymer, a metal, or any combination or an alloy thereof.

[0041] The first connecting member 141 is made of the thermally conductive material, which enables full heating of upstream and downstream regions inside the aerosol generation article surrounded by the first connecting member 141, helps to realize full utilization of the aerosol generation article, and helps improve inhalation taste.

[0042] As an example, the first connecting member 141 is connected to the heating assembly 11 and the end cap 13. For example, reference may be made to FIG. 4 and FIG. 5. The first connecting member 141 is constructed as a hollow tube. An interior of the first connecting member 141 may be provided with a first accommodating cavity 12 and a third accommodating cavity that are in fluid communication with each other. The first accommodating cavity 12 is configured to accommodate at least part of the aerosol generation article. At least part of the heating assembly 11 is arranged in the third accommodating cavity.

[0043] As an example, in addition to the first connecting member 141, the connecting member 14 may further include a second connecting member 142. The second connecting member 142 is connected to the first connecting member 141 and the heating assembly 11. For example, reference may be made to FIG. 7 and FIG. 8. The second connecting member 142 is constructed as a hollow tube. At least part of the first connecting member 141 may be arranged in the second connecting member 142. At least part of the heating assembly 11 is arranged in the second connecting member 142. In this example, the heating assembly 11 and the first connecting member 141 may not be in contact. Certainly, an example in which the heating assembly 11 may be connected to the first connecting member 141 is not excluded.

[0044] The second connecting member 142 may be configured to insulate at least part of the first accommodating cavity 12, to slow down a temperature drop rate of the air heated by the heating assembly 11 inside the aerosol generation article, which helps to reduce energy consumption of the aerosol generation device and facilitates more sufficient heating of the aerosol generation article.

[0045] The second connecting member 142 may be made of a thermal insulation material. The thermal insulation material means that a thermal conductivity of a

material is less than $100 \text{ W}/(\text{m}\cdot\text{K})$, preferably less than $40 \text{ W}/(\text{m}\cdot\text{K})$, or less than $10 \text{ W}/(\text{m}\cdot\text{K})$ at 23°C and relative humidity of 50%. For example, the thermal insulation material may be made of at least one of a PAEK-type material, a PI material, or a PBI material. The PAEK-type material includes a material such as PEEK, PEKK, PE-KEKK, or PEK. For example, the thermal insulation material may include glass fiber, glass felt, ceramic, silicon dioxide, aluminum oxide, carbon, ores, or any combination thereof.

[0046] Alternatively, the second connecting member 142 may have a hermetically sealed air interlayer. The hermetically sealed air interlayer may be a negative pressure layer (with an air pressure less than the atmospheric pressure), or may be a normal pressure layer (with the air pressure equal to the atmospheric pressure).

[0047] In an example, reference may be made to FIG. 6 and FIG. 8. The connecting member 14 includes the second connecting member 142 and a third connecting member 143. At least part of the heating assembly 11 is arranged in the third connecting member 143. The second connecting member 142 is connected to the end cap 13 and the third connecting member 143. In this example, the heating module 1 may not be provided with the first connecting member 141. Alternatively, in this example, referring to FIG. 6 to FIG. 8, the first connecting member 141 may still be arranged in the heating module 1.

[0048] The third connecting member 143 can withstand high temperatures of 300°C and above. The third connecting member 143 may be made of a thermal insulation material, or the third connecting member 143 may be made of a material with a high heat capacity. The material with a high heat capacity may be a material having a specific heat capacity of at least $0.5 \text{ J}/(\text{g}\cdot\text{K})$, such as at least $0.7 \text{ J}/(\text{g}\cdot\text{K})$, such as at least $0.8 \text{ J}/(\text{g}\cdot\text{K})$ at 25°C and a constant pressure. For example, the third connecting member 143 may include, but is not limited to, glass fiber, glass felt, ceramic, silicon dioxide, aluminum oxide, carbon, ores, or any combination thereof.

[0049] When both the first connecting member 141 and the second connecting member 142 are arranged, at least one of the first connecting member 141 and the second connecting member 142 may be connected to the end cap 13. In the embodiments shown in FIG. 6 and FIG. 8, the first connecting member 141 and the second connecting member 142 are both connected to the end cap 13. Specifically, the first connecting member 141 and the second connecting member 142 are both connected to the tube portion 133.

[0050] A gap 15 may be provided between the first connecting member 141 and the second connecting member 142. The connection between the first connecting member 141 and the tube portion 133 may be a gap connection, so that air in the socket 131 may enter the gap 15 between the first connecting member 141 and the second connecting member 142 through a connection gap between the first connecting member 141 and the tube portion 133. Therefore, an air insulation layer may

be formed between the first connecting member 141 and the second connecting member 142. The air insulation layer surrounds at least the fourth portion 141a of the first connecting member 141. Along a direction in which the air enters the gap 15 between the first connecting member 141 and the second connecting member 142, the second portion 1332 of the tube portion 133 is located upstream of the connection gap between the first connecting member 141 and the tube portion 133, so that the second portion 1332 may be tightly attached to the aerosol generation article for at least one full circumference. Thus, the cooperation between the second portion 1322 and the aerosol generation article can prevent the air from entering the connection gap between the first connecting member 141 and the tube portion 133, and then prevent the air from entering the gap 15 between the first connecting member 141 and the second connecting member 142. In this way, when the aerosol generation article is integrated in the heating module 1, the air insulation layer (the gap 15) between the first connecting member 141 and the second connecting member 142 is in a closed state, to reduce convection in the air insulation layer, thereby improving a thermal insulation effect of the air insulation layer. It should be noted that the air insulation layer between the first connecting member 141 and the second connecting member 142 is optional rather than mandatory.

[0051] When the first connecting member 141 is arranged in the heating module 1, at least part of the heating assembly 11 may be arranged outside the first connecting member 141. In the embodiments shown in FIG. 6 and FIG. 8, the heating assembly 11 is completely located outside the first connecting member 141.

[0052] However, in the embodiments shown in FIG. 3 and FIG. 5, the heating assembly 11 is almost completely located inside the first connecting member 141.

[0053] The perforated member 111 includes an upstream end 111d and a downstream end. The air inlet end 111b is formed on the upstream end 111d, and the air outlet end 111c is formed on the downstream end. With a position reference in which the socket 131 is located on the upper end of the aerosol generation device, a lower end of the connecting member 14 is open, so that the upstream end 111d of the perforated member 111 and the air inlet end 111b formed on the upstream end 111d are exposed. In the embodiments shown in FIG. 4 and FIG. 5, the upstream end 111d protrudes out of the connecting member 14, so that the upstream end 111d of the perforated member 111 and the air inlet end 111b formed on the upstream end 111d are exposed. It may be understood that the upstream end 111d and the air inlet end 111b formed on the upstream end 111d may further be exposed in a manner such as causing the upstream end 111d to be flush with the lower end of the connecting member 14, or as shown in FIG. 7 and FIG. 8, causing the upstream end 111d to be located inside the connecting member 14, and spacing the upstream end 111d apart from the lower end of the connecting member 14.

[0054] It should be noted that it is optional rather than mandatory that the heating module 1 can be removed from the body 2 or the holder 23 by acting on the end cap 13, and the heating module 1 may further be driven to be removed from the body 2 or the holder 23 by applying a force to another position of the heating module 1. The another component is referred to as a force-bearing component. The connecting member 14 may be connected to the force-bearing component and the heating assembly 11.

[0055] In an embodiment, the heating assembly 11 includes a susceptor 16 that can generate heat in a variable magnetic field. When used herein, the term "susceptor" refers to a material that may convert electromagnetic energy into heat. When the susceptor 16 is located in the variable electromagnetic field, an eddy current and hysteresis induced therein can cause heating of the susceptor 16. In such an embodiment, the susceptor 16 is designed to be joined to the aerosol generation device including a magnetic field generator 22. The magnetic field generator 22 generates the variable magnetic field to heat the susceptor 16 located in the variable magnetic field. When in use, the susceptor 16 is located in the variable magnetic field generated by the magnetic field generator 22. The magnetic field generator 22 is electrically connected to the power supply component 21, and the power supply component 21 provides the magnetic field generator 22 with a current to generate the variable magnetic field. The magnetic field generator 22 may include one or more induction coils that generate the variable magnetic field. The one or more induction coils may surround the susceptor 16. In an embodiment, the aerosol generation device can generate a variable magnetic field ranging from 1 MHz to 30 MHz, for example from 2 MHz to 10 MHz, or for example from 5 MHz to 7 MHz. In an embodiment, the aerosol generation device can generate a variable magnetic field with a field strength (H-field) ranging from 1 kA/m to 5 kA/m, for example from 2 kA/m to 3 kA/m, such as approximately 2.5 kA/m.

[0056] The susceptor 16 may include metal or carbon. In an embodiment, the susceptor 16 may include a ferromagnetic material, for example, ferrite, ferromagnetic steel, or stainless steel. In an embodiment, the susceptor 16 includes a nickel-iron alloy. In an embodiment, the susceptor 16 includes 400 series stainless steel. The 400 series stainless steel includes grade 410, grade 420, or grade 430 stainless steel. The carbon includes graphite, graphene, a graphite alloy, or the like.

[0057] As an example, at least part of the perforated member 111 is formed by the susceptor 16. In other words, at least some air holes 111a may be formed on the susceptor 16.

[0058] As an example, reference may be made to FIG. 5 and FIG. 8. The susceptor 16 is integrated with the perforated member 111. The perforated member 111 heats up by absorbing heat released by the susceptor 16, and then the perforated member 111 releases the

heat to heat air flowing through the air hole 111a. Based on this, the perforated member 111 may be made of a thermally conductive material such as graphite, graphene, a graphite alloy, or metal. Alternatively, the perforated member 111 may be made of a material with a high heat capacity.

[0059] When the susceptor 16 is integrated with the perforated member 111, at least part of the susceptor 16 may be embedded in the perforated member 111, or the susceptor 16 may be arranged around the perforated member 111.

[0060] The magnetic field generator 22 may be integrated with the heating module 1, so that the magnetic field generator 22 can be removed from the body 2 or the holder 23 together with the heating module 1. When the magnetic field generator 22 is integrated with the heating module 1, the heating module 1 further includes a first electrode electrically connected to the magnetic field generator 22. A second electrode electrically connected to the power supply component 21 is arranged on the body 2 or the holder 23. When the heating module 1 is integrated with the body 2 or the holder 23, the first electrode abuts against the second electrode, so that the first electrode can draw power from the second electrode and then provide electric energy for the magnetic field generator 22 to generate a variable magnetic field. The first electrode separably abuts against the second electrode, which does not affect the removal of the heating module 1 from the body 2 or the holder 23.

[0061] It should be noted that in another embodiment, the heating module 1 includes the first electrode. The heating assembly 11 includes a resistive heating element electrically connected to the first electrode. The body 2 or the holder 23 includes the second electrode. When the heating module 1 is integrated with the body 2 or the holder 23, the first electrode abuts against the second electrode, so that the first electrode can draw power from the second electrode and then provide electric energy for the resistive heating element to generate Joule heat. In the embodiment, the heating module 1 may not include the susceptor 16. The first electrode separably abuts against the second electrode, which does not affect the removal of the heating module 1 from the body 2.

[0062] Reference may be made to FIG. 5 and FIG. 8. The magnetic field generator 22 may be integrated with the body 2 or the holder 23, so that the magnetic field generator 22 can be retained on the body 2 or the holder 23 when the heating module 1 is removed from the body 2 or the holder 23. When the heating module 1 is integrated with the body 2 or the holder 23, at least part of the heating assembly 11, for example, the susceptor 16, is located within coverage range of the magnetic field of the magnetic field generator 22.

[0063] When the heating module 1 is integrated with the body 2 or the holder 23, as an example, referring to FIG. 3, FIG. 5, FIG. 6, and FIG. 8, a second accommodating cavity 231 is formed inside the holder 23. At least part of the heating module 1 is accommodated in the

second accommodating cavity 231. When the heating module 1 is removed from the holder 23, the heating module 1 is disengaged from the second accommodating cavity 231. The holder 23 may isolate the magnetic field generator 22 from the second accommodating cavity 231, to prevent the aerosol, condensate, or the like in the second accommodating cavity 231 from adhering to the magnetic field generator 22, thereby protecting the magnetic field generator 22. For example, the second accommodating cavity 231 is located on an inner side of the holder 23. The magnetic field generator 22 includes an induction coil. The induction coil is wrapped around an outer side of the holder 23.

[0064] It should be noted that regardless of whether the body 2 is integrated with the magnetic field generator 22, the body 2 may include the holder 23 that can form the second accommodating cavity 231.

[0065] In an embodiment, with a position reference in which the socket 131 is located on the upper end of the aerosol generation device, the holder 23 includes a first holder 232 arranged below the heating module 1. At least part of the first holder 232 may extend along a radial direction of the first accommodating cavity 12. At least part of the first holder 232 may define at least part of a boundary of a bottom of the second accommodating cavity 231. The heating assembly 11 and the first holder 232 are spaced apart from each other, so that the liquid spreading to the air inlet end 111b of the perforated member 111 is not to be retained at the air inlet end 111b due to the first holder 232, and then clog the air hole 111a or prevent the air from entering the air hole 111a. This helps to expel the liquid from the air hole 111a as soon as possible, to prevent the air hole 111a from being clogged. The heating module 1 may be removed from the body 2, and then liquid and greasy stains accumulated on the first holder 232 are cleaned to prevent the first holder 232 and the perforated member 111 from being connected through the liquid, and prevent the liquid on the first holder 232 from getting too close to or even submerging the upstream end 111d of the perforated member 111.

[0066] The air inlet end 111b and the first holder 232 may be spaced apart only by air. In other words, as shown in FIG. 3 and FIG. 6, no other structural members are arranged between the air inlet end 111b and the first holder 232. Alternatively, in a downward orthographic projection along an axial direction of the first accommodating cavity 12, projections of other members arranged between the heating module 1 and the first holder 232 are located on peripheries of orthographic projections of all the air holes 111a, and the connecting member 14 connected to the heating assembly 11 does not extend between the air inlet end 111b and the first holder 232. In the downward orthographic projection along the axial direction of the first accommodating cavity 12, an orthographic projection of the connecting member 14 does not overlap an orthographic projection of any air hole 111a. This prevents the liquid from clogging the air hole 111a

due to accumulation and formation of oil stains between the air inlet end 111b and the connecting member 14, and prevents the liquid from clogging the air hole 111a due to accumulation and formation of oil stains between the air inlet end 111b and the first holder 232.

[0067] As an example, reference may be made to FIG. 5 and FIG. 8. The first holder 232 seals the bottom of the second accommodating cavity 231, so that a condensate on a side wall of the second accommodating cavity 231 and the liquid in the perforated member 111 may collect on the first holder 232. The first holder 232 can prevent liquid leakage of the aerosol generation device. In addition, the first holder 232 can further isolate the power supply component 21 from the second accommodating cavity 231, to prevent aerosol pollution and corrosion of the power supply component 21, which helps protect the power supply component 21.

[0068] The first holder 232 seals the bottom of the second accommodating cavity 231, and the first holder 232 is spaced apart from the air inlet end 111b through air, so that an air insulation layer is formed between the first holder 232 and the heating module 1, which helps prevent temperature reduction of the heating assembly 11, and helps reduce energy consumption of the aerosol generation device.

[0069] In the embodiments shown in FIG. 5 and FIG. 8, a cavity 24 is formed on a side of the first holder 232 facing away from the second accommodating cavity 231. An air insulation layer may be formed in the cavity 24 to further insulate the heating assembly 11 and the second accommodating cavity 231. At least part of a boundary of the cavity 24 may be defined by the first holder 232.

[0070] As an example, reference may be made to FIG. 5 and FIG. 8. In addition to the first holder 232, the holder 23 further includes a second holder 233. The second holder 233 extends along the axial direction of the first accommodating cavity 12 and defines a local boundary of a second accommodating cavity 231. The second holder 233 may be complete, and a through hole in communication with inner and outer sides of the second holder 233 may not be formed on a side wall thereof. At least part of an airflow channel 4 may be provided between the second holder 233 and the heating module 1. Therefore, air flows along an outer wall of the heating module 1 to preheat the air entering the air hole 111a, and then enters the air hole 111a of the heating assembly 11, which helps to make full use of energy released by the heating assembly 11, and can further prevent an excessively high surface temperature of the aerosol generation device.

[0071] The first holder 232 and the second holder 233 may be assembled and connected to each other, or the first holder 232 and the second holder 233 may be integrally formed.

[0072] According to the aerosol generation device and the heating module 1 described above, the heating module 1 that may accommodate at least part of the aerosol generation article includes the heating assembly 11 that can heat air. The heating module 1 is removably con-

nected to the body 2. When the heating module 1 is removed, the air inlet ends 111b of at least some air holes 111a on the heating assembly 11 are exposed. Therefore, the heating module 1 may be replaced when the heating assembly 11 is clogged, or the exposed air inlet end 111b is cleaned to unclog the air hole 111a after the heating module 1 is removed.

[0073] It should be noted that the preferred embodiments of this application are provided in the specification and the accompanying drawings of this application, but are not limited to the embodiments described in this specification. Further, a person of ordinary skill in the art may make improvements or modifications according to the foregoing descriptions, and all of the improvements and modifications shall fall within the protection scope of the appended claims of this application.

Claims

1. An aerosol generation device, comprising:

a holder; and
a heating module, removably connected to the holder, wherein the heating module comprises a first accommodating cavity for accommodating at least part of an aerosol generation article, and further comprises a heating assembly arranged upstream of the first accommodating cavity along an airflow direction, wherein:

the heating assembly comprises a perforated member, wherein one or more air holes in fluid communication with the first accommodating cavity are formed in the perforated member, an end of each of the air holes adjacent to the first accommodating cavity being an air outlet end, and an opposite end thereof being an air inlet end; and

the heating assembly is configured to heat air flowing through the air hole, wherein the air inlet ends of at least some of the air holes are configured to be exposed when the heating module is removed from the holder.

2. The aerosol generation device according to claim 1, wherein the heating module further comprises an end cap, wherein a socket allowing insertion of the aerosol generation article into the first accommodating cavity is formed in the end cap, and at least part of the end cap is exposed from the holder.

3. The aerosol generation device according to claim 2, wherein the end cap comprises a cap portion extending along a radial direction of the first accom-

modating cavity, wherein the cap portion is located on an upper end of the aerosol generation device, and at least part of the cap portion is arranged above the holder and supported by the holder.

4. The aerosol generation device according to claim 2, wherein:

an airflow channel in fluid communication with the heating assembly is formed in the aerosol generation device; and

the end cap comprises a tube portion extending along an axial direction of the first accommodating cavity, wherein the tube portion defines at least part of the socket, and a through hole in fluid communication with the socket and the airflow channel is formed on a wall of the tube portion.

5. The aerosol generation device according to claim 4, wherein the tube portion comprises a first portion and a second portion, wherein the first portion is arranged upstream of the second portion along an airflow direction, an inner diameter of the first portion is greater than an inner diameter of the second portion, and the through hole is formed on the first portion.

6. The aerosol generation device according to claim 2, wherein the heating module further comprises a connecting member, wherein the connecting member is arranged around at least part of the first accommodating cavity, and the connecting member is connected to the end cap and the heating assembly.

7. The aerosol generation device according to claim 6, wherein the connecting member comprises a first connecting member, wherein at least part of the first connecting member is configured to contact the aerosol generation article.

8. The aerosol generation device according to claim 7, wherein:

the first connecting member is made of a thermally conductive material, wherein thermal conductivity of the thermally conductive material is greater than or equal to 40 W/(m·k), and preferably, the thermal conductivity of the thermally conductive material is greater than or equal to 100 W/(m·k); or

the first connecting member is made of metal.

9. The aerosol generation device according to claim 7, wherein the connecting member comprises a second connecting member, wherein the second connecting member is connected to the first connecting member and the heating assembly.

10. The aerosol generation device according to claim 9, wherein the first connecting member and/or the second connecting member is connected to the end cap.
11. The aerosol generation device according to claim 7, wherein the first connecting member is connected to the heating assembly and the end cap.
12. The aerosol generation device according to claim 6, wherein the connecting member comprises a second connecting member and a third connecting member, wherein at least part of the heating assembly is arranged in the third connecting member, and the second connecting member is connected to the end cap and the third connecting member.
13. The aerosol generation device according to claim 12, wherein the connecting member comprises a first connecting member connected to the second connecting member, wherein the first connecting member defines at least part of a boundary of the first accommodating cavity.
14. The aerosol generation device according to claim 7 or 13, wherein at least part of the heating assembly is arranged outside the first connecting member.
15. The aerosol generation device according to claim 1, comprising a magnetic field generator for generating a variable magnetic field, wherein the heating assembly comprises a susceptor capable of generating heat in the variable magnetic field, wherein the susceptor is configured to be within magnetic field coverage of the magnetic field generator when the heating module is integrated with the holder.
16. The aerosol generation device according to claim 15, wherein the magnetic field generator is integrated with the holder, and a second accommodating cavity is formed inside the holder, wherein at least part of the heating module is accommodated in the second accommodating cavity, and the holder isolates the magnetic field generator from the second accommodating cavity.
17. The aerosol generation device according to claim 15, wherein the magnetic field generator is integrated with the heating module, and the magnetic field generator is configured to be disengaged from the holder when the heating module is removed from the holder.
18. The aerosol generation device according to claim 1, comprising a socket allowing insertion of the aerosol generation article into the first accommodating cavity, wherein the socket is provided on the upper end of the aerosol generation device, wherein:
- a second accommodating cavity is formed inside the holder, and at least part of the heating module is accommodated in the second accommodating cavity; and
- the holder comprises a first holder arranged below the heating module, wherein at least part of the first holder extends along a radial direction of the first accommodating cavity and defines at least part of a boundary of a bottom of the second accommodating cavity, and the heating assembly is spaced apart from the first holder.
19. The aerosol generation device according to claim 18, wherein the first holder seals the bottom of the second accommodating cavity.
20. The aerosol generation device according to claim 18, wherein the air inlet end and the first holder are spaced apart only by air.
21. The aerosol generation device according to claim 18, wherein:
- the holder further comprises a second holder, wherein the second holder extends along an axial direction of the first accommodating cavity and defines a local boundary of the second accommodating cavity; and
- an airflow channel in fluid communication with the heating module is formed in the aerosol generation device, wherein at least part of the airflow channel is provided between the second holder and the heating module.
22. An aerosol generation device, comprising:
- a holder; and
- a heating module, removably connected to the holder and comprising:
- a first accommodating cavity for accommodating at least part of an aerosol generation article;
- a heating assembly arranged upstream of the first accommodating cavity along an airflow direction and in fluid communication with the first accommodating cavity; and
- an end cap, wherein:
- the heating assembly is configured to heat air flowing therethrough;
- a socket allowing insertion of the aerosol generation article into the first accommodating cavity is formed in the end cap; and
- at least part of the end cap is exposed from the holder.

23. A heating module, comprising a first accommodating cavity for accommodating at least part of an aerosol generation article, and further comprising a heating assembly arranged upstream of the first accommodating cavity along an airflow direction, wherein: 5

the heating assembly comprises a perforated member, wherein one or more air holes in fluid communication with the first accommodating cavity are formed in the perforated member, 10
an end of each of the air holes adjacent to the first accommodating cavity being an air outlet end, and an opposite end thereof being an air inlet end; and
the heating assembly is configured to heat air 15
flowing through the air hole,
wherein the air inlet ends of at least some of the air holes are exposed.

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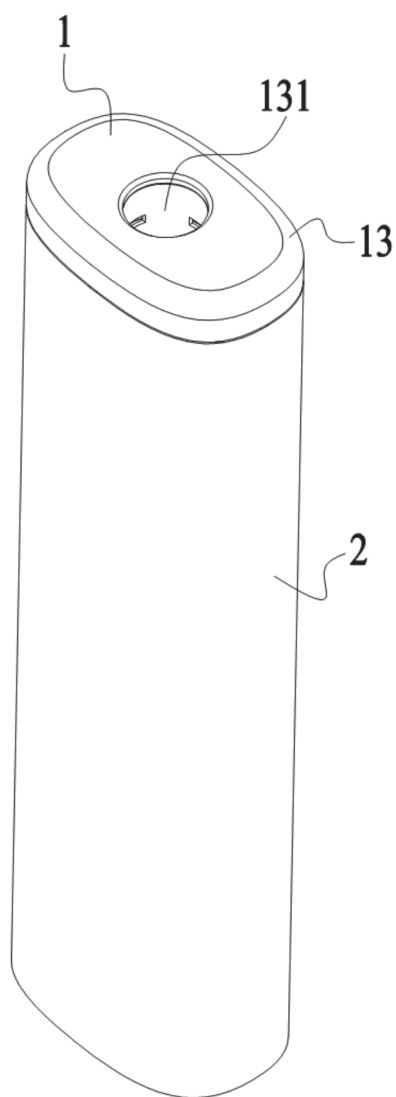


FIG. 1

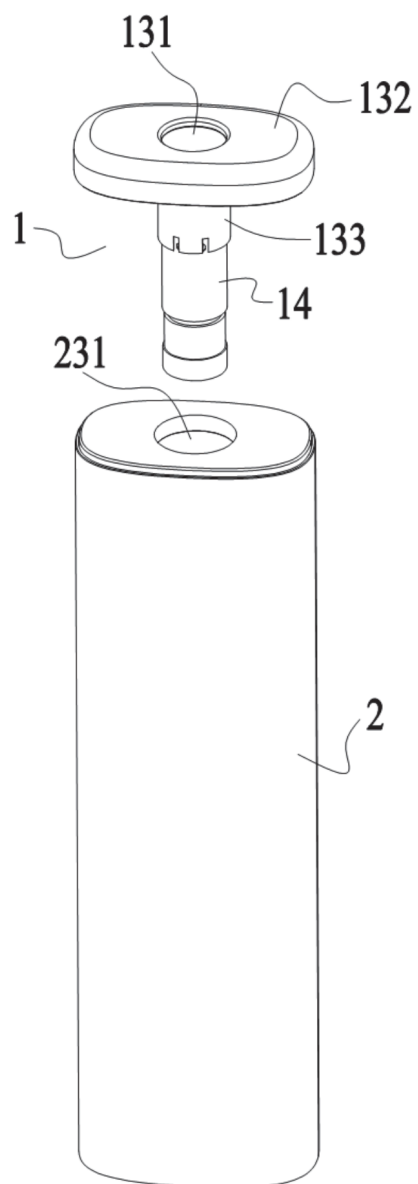


FIG. 2

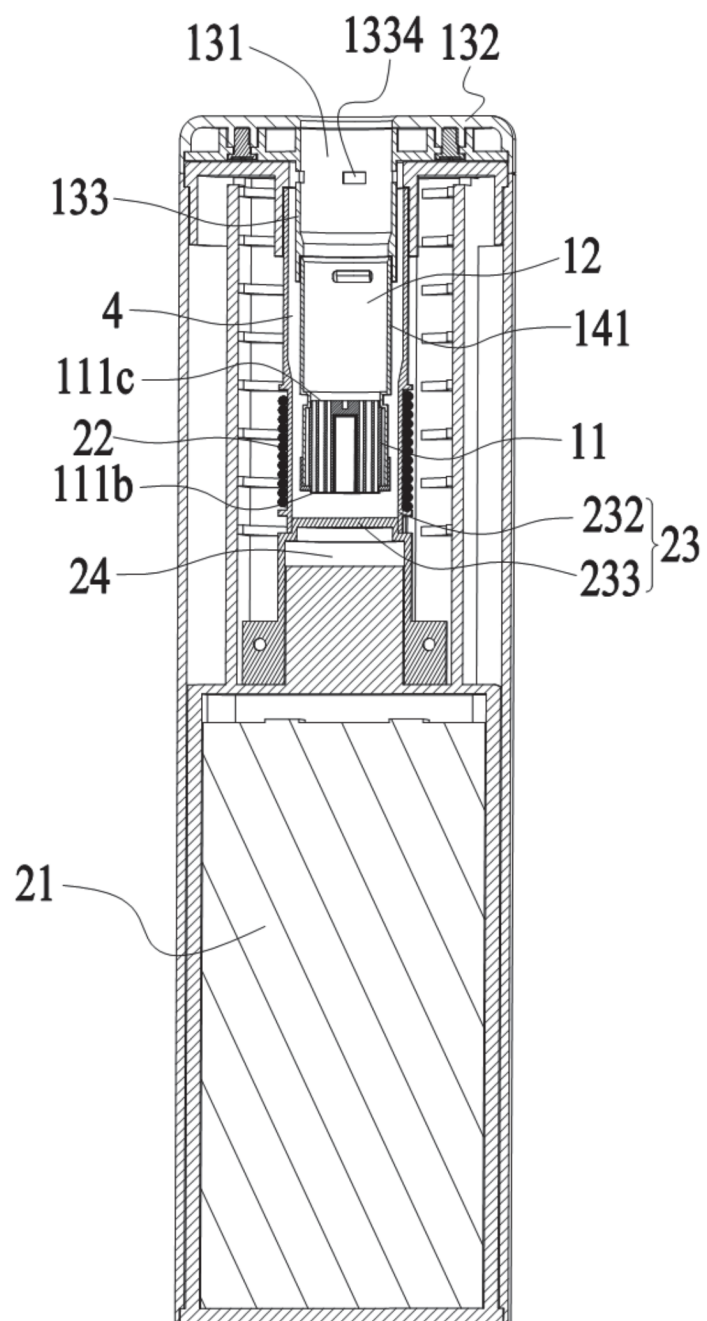


FIG. 3

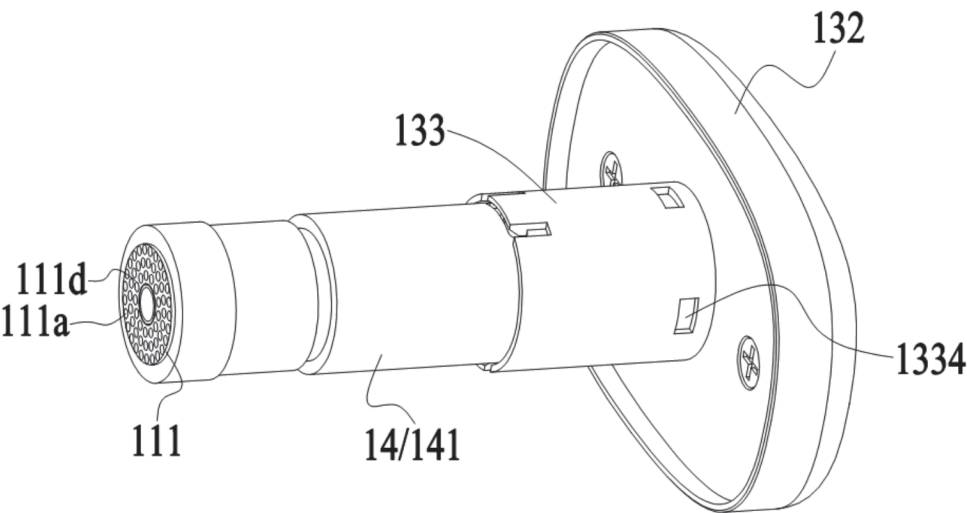


FIG. 4

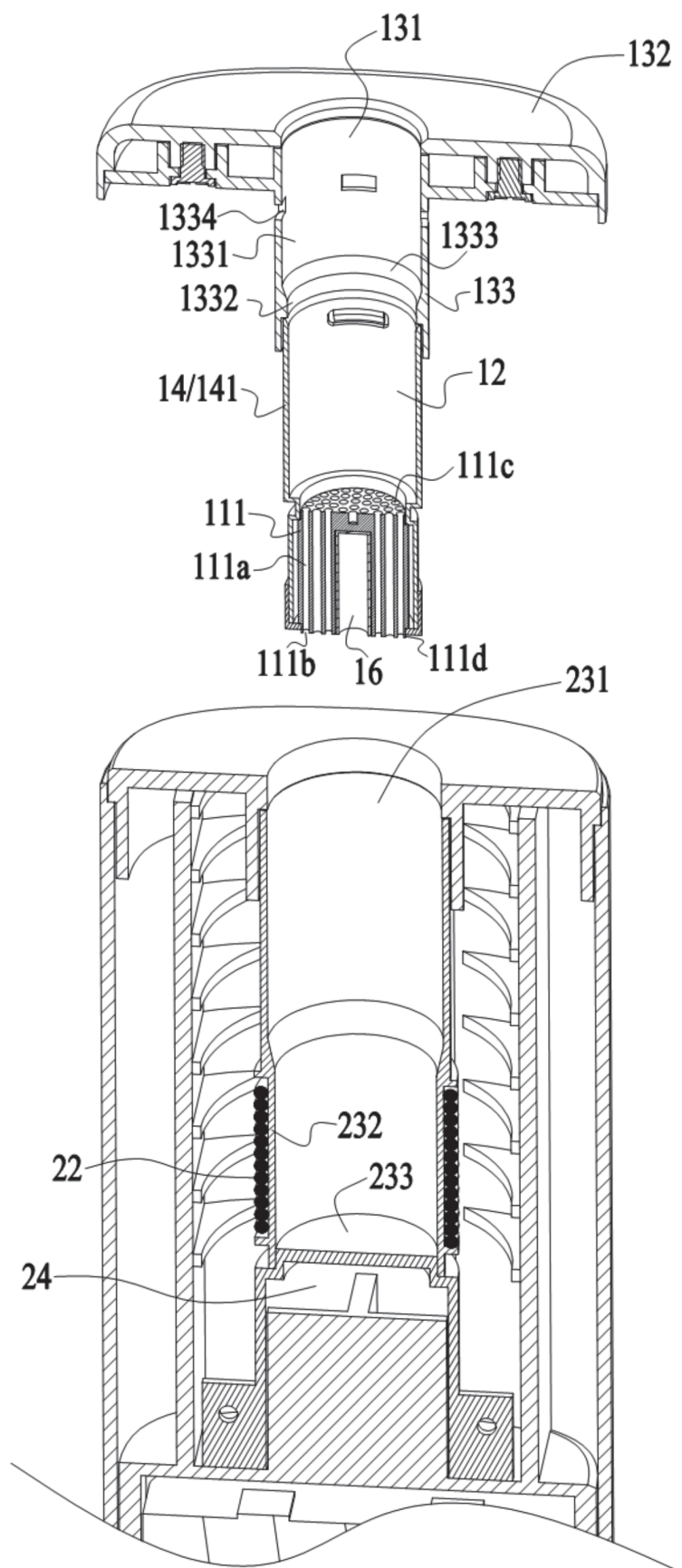


FIG. 5

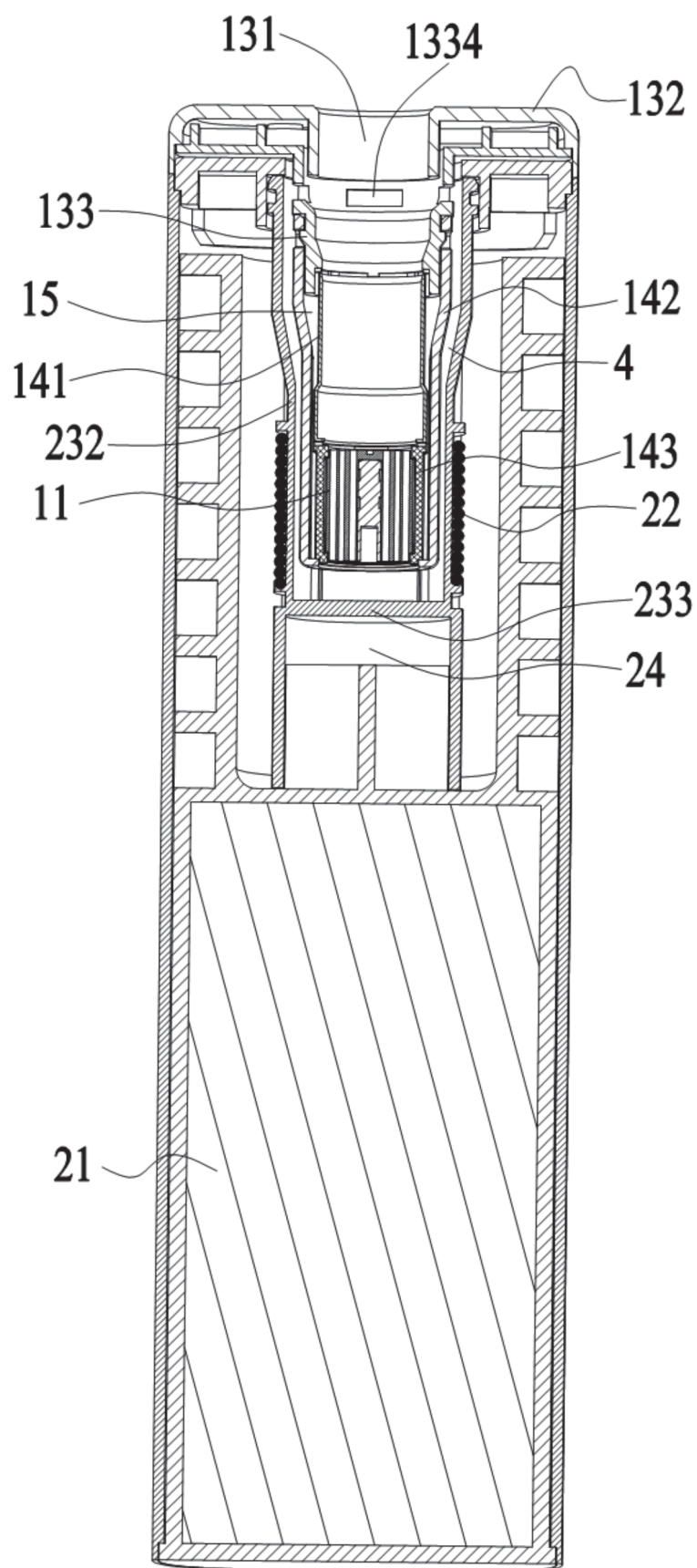


FIG. 6

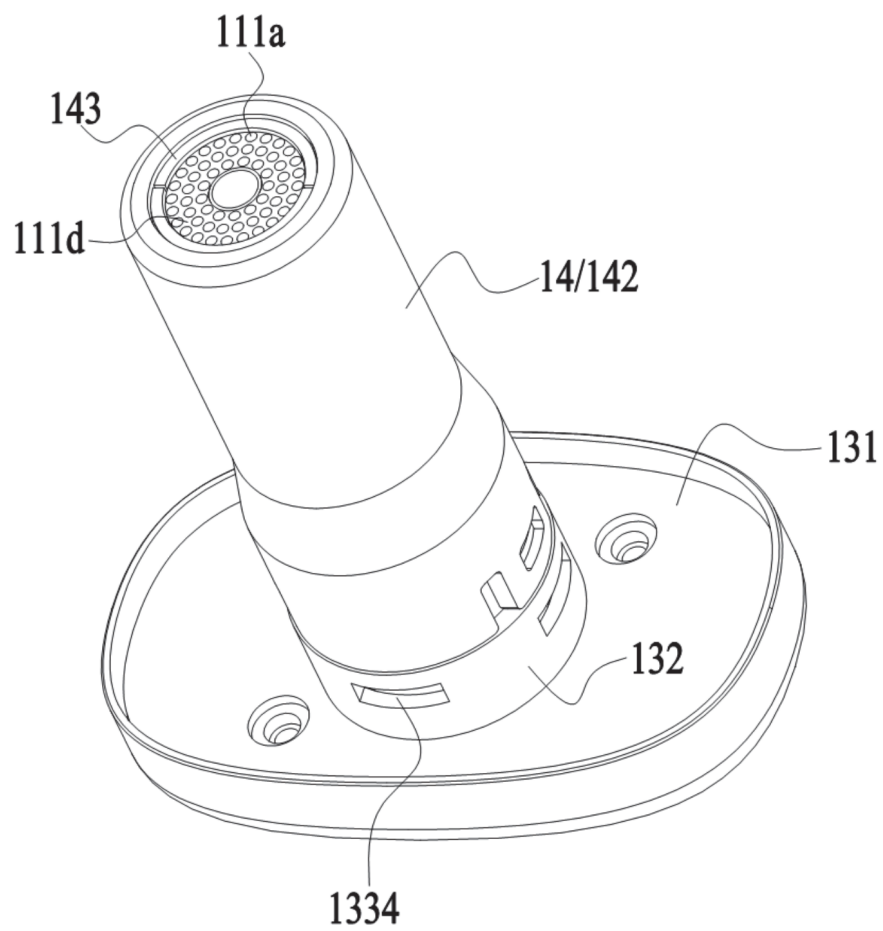


FIG. 7

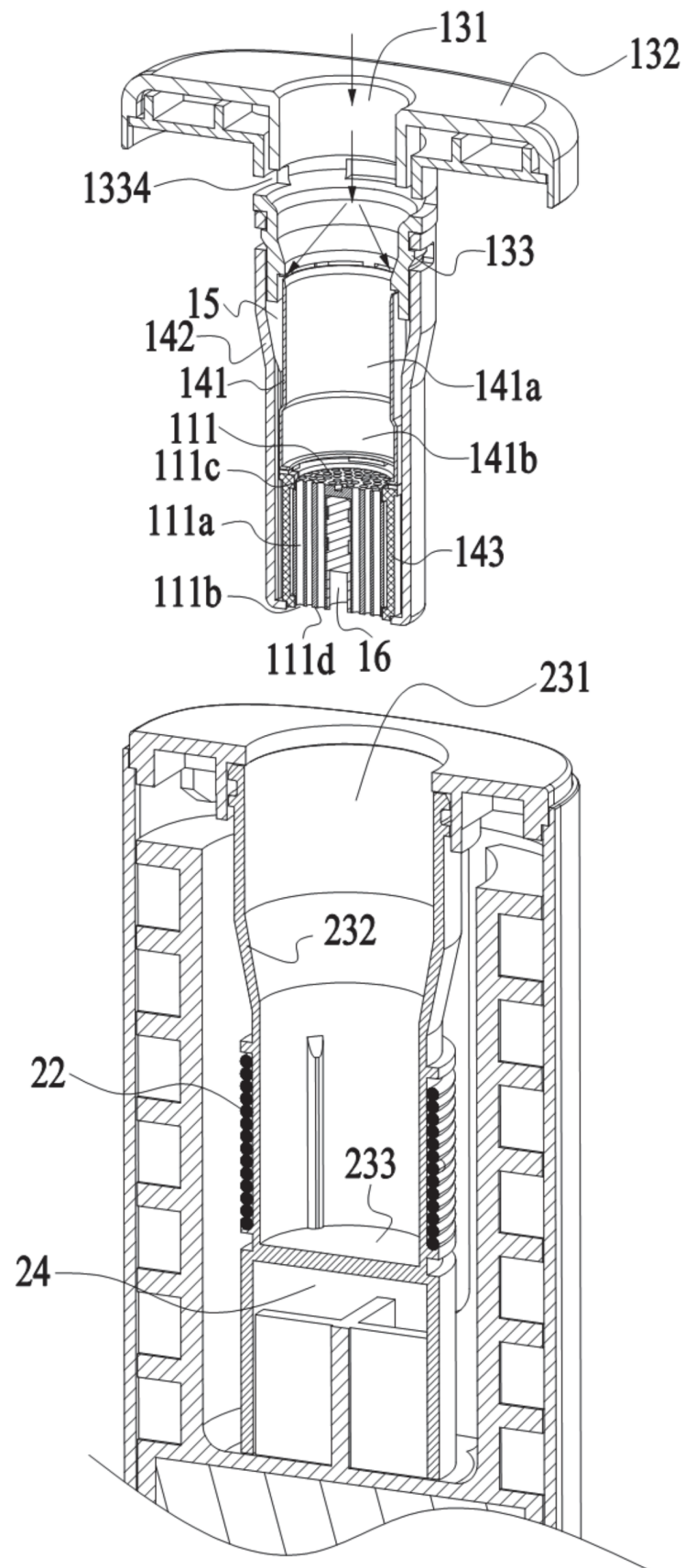


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/110762

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/46(2020.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:A24F40/-; A24F47/-; H05B6/-

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)

CNTXT, ENTXTC, ENTXT, WPABS, CJFD, CNKI: 气溶胶生成装置, 电子烟, 雾化器, 加热模组, 加热组件, 有孔构件, 多孔体, 气孔, 可拆卸, 可移除, 暴露, 露出, 清理, 清洁, 端盖, 吸嘴, 盖体, 保温, 隔热, 磁场, 线圈, 发生器, 感受器, aerosol, generat+, heater, air aperture?, air hole?, porous, expose?, remove?, clean+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 221449905 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 02 August 2024 (2024-08-02) description, paragraphs [0038]-[0095], and figures 1-8	1-23
PX	CN 220831953 U (SHENZHEN XIAOOU TECHNOLOGY CO., LTD.) 26 April 2024 (2024-04-26) description, paragraphs [0035]-[0056], and figures 1-6	1-23
Y	CN 112315040 A (SHENZHEN SMOORE TECHNOLOGY LIMITED) 05 February 2021 (2021-02-05) description, paragraphs [0061]-[0078], and figures 1-2	1-23
Y	CN 217429267 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 16 September 2022 (2022-09-16) description, paragraphs [0033]-[0052], and figures 1-3	1-23
A	CN 108523247 A (HUBEI CHINA TOBACCO INDUSTRY CO., LTD.) 14 September 2018 (2018-09-14) entire document	1-23

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 08 October 2024	Date of mailing of the international search report 16 October 2024
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/110762

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 206923682 U (CHINA TOBACCO HUNAN INDUSTRIAL CO., LTD.) 26 January 2018 (2018-01-26) entire document	1-23
A	CN 217089623 U (SHENZHEN WODEWEI TECHNOLOGY CO., LTD.) 02 August 2022 (2022-08-02) entire document	1-23
A	US 2011277780 A1 (TERRY Nathan Andrew et al.) 17 November 2011 (2011-11-17) entire document	1-23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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	Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
5	CN	221449905	U	02 August 2024	None			
	CN	220831953	U	26 April 2024	None			
10	CN	112315040	A	05 February 2021	None			
	CN	217429267	U	16 September 2022	None			
	CN	108523247	A	14 September 2018	None			
	CN	206923682	U	26 January 2018	None			
	CN	217089623	U	02 August 2022	None			
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					WO	2011146315	A2	24 November 2011
					US	2011278189	A1	17 November 2011
					US	8314591	B2	20 November 2012
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REFERENCES CITED IN THE DESCRIPTION

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