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(71) Applicant: **JT International SA**
1202 Geneva (CH)

(72) Inventor: **WRIGHT, Alec**
Guildford, Surrey GU2 7SU (GB)

(74) Representative: **Gill Jennings & Every LLP**
The Broadgate Tower
20 Primrose Street
London EC2A 2ES (GB)

(54) CARTRIDGE FOR AN AEROSOL GENERATING DEVICE

(57) A cartridge for an aerosol generating device is disclosed. The cartridge has a distal end and a proximal end, and comprises: a reservoir configured to store aerosolisable liquid therein, a capillary transport element arranged to receive aerosolisable liquid from the reservoir, an air inlet configured to supply air to the capillary transport element, and one or more thermally conductive elements. The one or more thermally conductive elements are arranged around an exterior of the cartridge between the distal end and the proximal end and are configured to conduct heat into the cartridge towards the capillary transport element when the cartridge is heated within a heating chamber of an aerosol generating device.

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a cartridge for an aerosol generating device, and an aerosol generating system comprising a cartridge and an aerosol generating device. The disclosure is particularly applicable to a portable aerosol generating device, which may be self-contained and low temperature. Such devices may be configured to heat, rather than burn, tobacco or other suitable aerosol generating materials by conduction, convection, and/or radiation, to generate an aerosol for inhalation.

BACKGROUND

[0002] The popularity and use of reduced-risk or modified-risk devices (also known as vaporisers) has grown rapidly in the past few years as an aid to assist habitual smokers wishing to quit using traditional tobacco products such as cigarettes, cigars, cigarillos, and rolling tobacco. Various devices and systems are available that heat or warm aerosolisable substances as opposed to burning tobacco in conventional tobacco products.

[0003] A commonly available reduced-risk or modified-risk device is the heated substrate aerosol generation device or heat-not-burn device. Devices of this type generate an aerosol or vapour by heating an aerosol substrate (i.e. consumable) that typically comprises moist leaf tobacco or other suitable aerosolisable material to a temperature typically in the range of 150°C to 300°C.

[0004] However, a user may desire to have greater flexibility with regards to the form of the consumable that may be used with the aerosol generating device, e.g. the heat-not-burn device. In particular, it may be desirable for the user to utilise a cartridge containing aerosolisable liquid, rather than a typical aerosol generating substrate such as a rod of tobacco.

[0005] In general, it is also desirable to provide a compact cartridge for an aerosol generating device that is able to provide efficient and reliable heating of aerosolisable liquid contained within the cartridge.

[0006] An object of the present invention is to address one or more of these problems.

SUMMARY OF THE INVENTION

[0007] According to a first aspect of the invention, there is provided a cartridge for an aerosol generating device, wherein the cartridge has a distal end and a proximal end, comprising: a reservoir configured to store aerosolisable liquid therein; a capillary transport element arranged to receive aerosolisable liquid from the reservoir; an air inlet configured to supply air to the capillary transport element; and one or more thermally conductive elements, wherein the one or more thermally conductive elements are arranged around an exterior of the cartridge between the distal end and the proximal end and are configured to conduct heat into the cartridge towards the capillary transport element when the cartridge is heated within a heating chamber of an aerosol generating device.

[0008] In this way, a compact cartridge for an aerosol generating device is provided that is able to efficiently conduct heat into the cartridge to heat and aerosolise the aerosolisable liquid contained therein. Placement of the thermally conductive elements around the exterior of the cartridge between the distal end and the proximal end enables heat to be evenly supplied to the capillary transport element within the cartridge. This ensures a reliable and efficient generation of aerosol.

[0009] In addition, the configuration of the cartridge also provides compatibility with aerosol generating devices (e.g. heat-not-burn devices) which are not designed to receive cartridges of aerosolisable liquid, but instead are configured to receive consumable articles of aerosol generating substrate, such as sticks of tobacco. In particular, the arrangement of thermally conductive elements is suitable for conducting heat to vaporise or aerosolise a liquid present in or on the capillary transport element when the cartridge is inserted into any form of heating chamber arranged to apply an external heat to a cartridge, for example a heating chamber comprising a heater or heat exchange element arranged to heat the surface of the heating chamber. In this way, a wide range of conventional aerosol generating devices normally used for applying external heating to a consumable, particularly heat-not-burn devices, may be adapted for use with the cartridge of the present invention.

[0010] Furthermore, within such conventional aerosol generating devices, the heating chamber is typically designed with one or more of internal ridges or internal grooves configured to interface with the aerosol substrate generating substrate received within the heating chamber. The ridges provide a compressive force which creates one or more corresponding indentations in the rod of aerosol generating substrate. The one or more ridges define the one or more grooves therebetween and the temperature of the heating chamber is known to be highest at locations corresponding to either the grooves or the ridges, depending on the particular configuration of aerosol generating device. Therefore, by providing a cartridge having one or more thermally conductive elements arranged around the exterior of the cartridge, the cartridge may be inserted into the heating chamber of the aerosol generating device and orientated such that the thermally conductive elements are located within the respective grooves, or against the respective ridges. In this way, not only is the cartridge able to fit within and be used with a heating chamber originally only intended to receive an aerosol generating substrate, but the cartridge is also optimally configured to receive heat from the hottest portion of the heating chamber corresponding to either the one or more grooves or the one or more ridges.

[0011] Preferably, the cartridge comprises a plurality of thermally conductive elements.

[0012] Preferably, the plurality of thermally conductive elements are periodically spaced around the exterior of the cartridge. In this way, an optimal distribution of thermal energy is transferred into the cartridge around its exterior, thereby ensuring a reliable and efficient generation of aerosol.

[0013] Preferably, the one or more thermally conductive elements each extend along the exterior of the cartridge in a longitudinal direction of the cartridge. In this way, an optimal distribution of thermal energy is transferred into the cartridge along its length, thereby ensuring a reliable and efficient generation of aerosol.

[0014] Preferably, the one or more thermally conductive elements each protrude from the cartridge in a direction perpendicular to a longitudinal direction of the cartridge. In particular, the one or more thermally conductive elements form protrusions which extend in an outward (e.g. radially outward) direction when viewed in a transversal plane of the cartridge perpendicular to the longitudinal direction. In this way, thermal contact between the thermally conductive elements and the inner surface of the chamber of the aerosol generating device can be provided in a more efficient manner, e.g. when the cartridge is inserted in the device.

[0015] The skilled person will appreciate that the length of the cartridge extending from the proximal end to the distal end defines the longitudinal axis of the cartridge.

[0016] Preferably, the one or more thermally conductive elements are (outwardly) convex. In this way, a good thermal contact with the inner surface of a heating chamber comprising one or more grooves which act as heat transfer elements is provided. Furthermore, the outer surface of each thermally conductive element is complementary to the shape of respective (concave) grooves common to such heating chambers, thereby forming a flush interface for efficient heat transfer.

[0017] Alternatively, the one or more thermally conductive elements may be formed as indentations in the exterior (e.g. outer surface) of the cartridge. That is, the one or more thermally conductive elements are recessed in an inward (e.g. radially inward) direction when viewed in a transversal plane of the cartridge perpendicular to the longitudinal direction. In this way, the cartridge may be received within a heating chamber comprising a plurality of ridges which act as heat transfer elements, such that the recessed thermally conductive elements respectively interface with plurality of ridges. Preferably, the one or more thermally conductive elements are preferably (outwardly) concave. In this way, a good thermal contact with the inner surface of a heating chamber comprising one or more ridges is provided. Furthermore, the outer surface of each thermally conductive element is complementary to the shape of respective (convex) ridges common to such heating chambers, thereby forming a flush interface for efficient heat transfer.

[0018] Preferably, the capillary transport element is located adjacent to the distal end of the cartridge, and the reservoir is located adjacent to the proximal end of the cartridge. In this way, the capillary transport element and the reservoir are spatially separated which reduces the amount of heat conducted to the reservoir, thereby improving the thermal efficiency of the cartridge.

[0019] Preferably, the one or more thermally conductive elements are located around the exterior of the cartridge adjacent the capillary transport element. In this way, an efficient path of heat transfer is provided from the thermally conductive elements to the capillary transport element.

[0020] Preferably, the cartridge further comprises a thermally conductive mesh embedded with or on the surface of the capillary transport element. In this way, the heat received from the thermally conductive elements may be evenly conducted and distributed throughout the capillary transport element, thereby ensuring a reliable generation of aerosol from the aerosolisable liquid.

[0021] Preferably, the air inlet is disposed in the distal end of the cartridge.

[0022] Preferably, the cartridge further comprises: an air outlet disposed in the proximal end of the cartridge; and an airflow passage that connects the air inlet to the air outlet via the capillary transport element. In this way, aerosol that is generated at the distal end of the cartridge travels along the length of the cartridge before exiting through the air outlet in the proximal end of the cartridge and being inhaled by a user. Advantageously, this allows the aerosol time to cool so that it is received by the user at a more favourable, and safer, temperature.

[0023] Preferably, the capillary transport element is formed as an annular cylinder that is in contact with the one or more thermally conductive elements, and wherein the airflow passage extends along the central axis of the capillary transport element. In this way, a compact configuration of the cartridge is provided whilst ensuring an even and reliable supply of aerosolisable liquid. In addition, the annular capillary transport element is evenly heated by the thermally conductive elements around the circumference of the cartridge.

[0024] Preferably, the reservoir is formed as an annular cylinder, and wherein the airflow passage extends along the central axis of the reservoir. In this way, a compact configuration of the cartridge is provided.

[0025] Preferably, the cartridge further comprises a mouthpiece located at the proximal end of the cartridge, wherein the air outlet is disposed in the mouthpiece.

[0026] Preferably, the capillary transport element comprises a wicking material such as cotton and/or ceramic.

[0027] Preferably, the cartridge comprises four thermally conductive elements.

[0028] Preferably, the thermally conductive elements comprise (and optionally consist of) metal, preferably aluminium.

[0029] Preferably, the thermally conductive elements exhibit a thermal conductivity of at least 20 $Wm^{-1}K^{-1}$ at 20°C.

[0030] Preferably, the cartridge is substantially cylindrical, and the one or more thermally conductive elements are arranged around the circumferential exterior of the cartridge.

[0031] According to a second aspect of the invention, there is provided an aerosol generating system comprising: a cartridge according to the first aspect; and an aerosol generating device comprising a heating chamber configured to receive the cartridge such that heat is transferred from the heating chamber to the one or more thermally conductive elements of the cartridge.

[0032] Preferably, the heating chamber is substantially tubular and comprises one or more internal grooves configured to interface with the one or more thermally conductive elements of the cartridge. Preferably, the heating chamber comprises one or more internal ridges which define the one or more internal grooves therebetween.

[0033] Alternatively, the heating chamber is substantially tubular and comprises one or more internal ridges configured to interface with the one or more thermally conductive elements of the cartridge. Preferably, the heating chamber comprises one or more internal grooves respectively defined between the one or more internal ridges.

[0034] Preferably, the aerosol generating device is a heat-not-burn device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Embodiments of the invention are now described, by way of example, with reference to the drawings, in which:

Figure 1 is an exemplary aerosol generating device comprising a heating chamber according to an embodiment of the invention;

Figure 2 is a cross-sectional view of the heating chamber in Figure 1;

Figures 3A to 3C are various schematic external views of a cartridge according to an embodiment of the invention; and

Figures 4A and 4B are schematic cross-sectional views of the cartridge.

DETAILED DESCRIPTION

[0036] As described herein, a vapour is generally understood to refer to a substance in the gas phase at a temperature lower than its critical temperature, which means that the vapour can be condensed to a liquid by increasing its pressure without reducing the temperature, whereas an aerosol is a suspension of fine solid particles or liquid droplets, in air or another gas. It should, however, be noted that the terms 'aerosol' and 'vapour' may be used interchangeably in this specification, particularly with regard to the form of the inhalable medium that is generated for inhalation by a user.

[0037] Figure 1 illustrates an aerosol generating device 100 according to an embodiment of the invention. The aerosol generating device 100 is illustrated in an assembled configuration with the internal components visible. The aerosol generating device 100 is a heat-not-burn device, which may also be referred to as a tobacco-vapour device, and comprises a heating chamber 200 configured to receive an aerosol substrate such as a rod of aerosol generating material, e.g. tobacco. The heating chamber 200 is operable to heat, but not burn, the rod of aerosol generating material to produce a vapour or aerosol for inhalation by a user.

[0038] Figure 2 is a cross-sectional view of the heating chamber 200 in a transversal plane of the heating chamber 200 perpendicular to the longitudinal direction of the heating chamber 200. The heating chamber 200 is substantially tubular and comprises a tubular thermally conductive shell 202 that is surrounded by a tubular heating element 204, e.g. in a circumferential direction. The thermally conductive shell 202 defines an interior volume in which a consumable article may be received. The thermally conductive shell 202 comprises a plurality of ridges 206 (also referred to as ribs or protrusions) which are spaced around the thermally conductive shell 202 (e.g. in a circumferential direction) and extend along the length of the thermally conductive shell 202. The ridges 206 protrude into the interior volume of the heating chamber 200, i.e. in a radially inward direction. The plurality of ridges 206 define a plurality of grooves 208 which also extend along the length of the thermally conductive shell 202. Specifically, one groove 208 is defined between each pair of adjacent ridges 206. In the depicted example, the heating chamber 200 comprises four ridges 206, and thus four grooves 208, periodically spaced around the heating chamber 200. However, the skilled person will appreciate that the number and spacing of ridges 206, and thus grooves 208, may vary. The tubular heating element 204 may, for instance, be a thin film heater affixed to the thermally conductive shell 202. The heater may be wrapped on the shell or be a tubular element tightly fit around the shell. An example of such thin-film tubular heating element is described in co-pending PCT/EP2020/074151 entitled "heater assembly". Other heating elements are possible such as a series of resistors held by a ceramic frame such as described in co-pending EP20158052.9 entitled "aerosol generation device with ceramic heater base".

[0039] During typical operation, a rod of aerosol generating substrate is inserted within the heating chamber 200 such that the plurality of ridges 206 compress the rod of aerosol generating substrate and form corresponding indentations within the surface of the rod. When the aerosol generating device 100 is operated, heat is transferred to the rod of aerosol generating substrate via the thermally conductive shell 202, thereby producing an aerosol for inhalation by a user. Typically, in the heating chamber 200, as the surrounding heating element 204 directly interfaces with the thermally conductive shell 202 adjacent to the grooves 208, the temperature of the thermally conductive shell 202 is highest at locations corresponding to the grooves 208. However, in alternative heating chambers 200, the temperature of the thermally conductive shell 202 may be highest at locations corresponding to the ridges 206.

[0040] Under some circumstances, it may be desirable to utilise a consumable article containing aerosolisable liquid with the aerosol generating device 100, rather than using the typical rod of solid or semi-solid aerosol generating substrate as described above. Accordingly, as described below, a cartridge 300 has been developed which may be used with existing aerosol generating devices 100, originally designed for exclusive use with aerosol generating substrates such as a rod of tobacco.

[0041] Of course, the skilled person will appreciate that the aerosol generating device 100 depicted in Figure 1 is simply an exemplary aerosol generating device according to the invention. Other types and configurations of tobacco-vapour products, vaporisers, or electronic cigarettes may also be used as the aerosol generating device according to the invention. That is, the configuration of the cartridge 300 provides general compatibility with aerosol generating devices which are not designed to receive cartridges of aerosolisable liquid, but instead are configured to receive consumable articles of aerosol generating substrate, such as sticks of tobacco. In one example, the cartridge may be used with an aerosol generating device having a heating chamber comprising a heater arranged to heat the surface of the heating chamber, but wherein the heating chamber does not comprise internal ridges and grooves. In another example, an aerosol generating device may be used that is compatible with the cartridge 300 but not with standard aerosol generating substrates, i.e. the aerosol generating device may not be a heat-not-burn device.

[0042] Figures 3A to 3C show various schematic views of the external features of a cartridge 300 (also referred to as a capsule or a consumable) according to an embodiment of the invention. Figure 3A is a schematic side-view of the cartridge 300, Figure 3B is a schematic view looking down a distal end 305 of the cartridge 300, and Figure 3C is a schematic view looking down a proximal end 307 of the cartridge 300.

[0043] The cartridge 300 comprises a distal end 305 and a proximal end 307. That is, the cartridge 300 extends from the distal end 305 to the proximal end 307 to define an elongate body with a longitudinal axis. In the depicted example, the shape of the cartridge 300 may be described as substantially cylindrical, but the skilled person will appreciate that the shape of the cartridge 300 may vary.

[0044] The cartridge 300 comprises a housing 302 around which a plurality of thermally conductive elements 304 are disposed. The plurality of thermally conductive elements 304 are arranged around the exterior of the housing 302, between the distal end 305 and the proximal end 307 of the cartridge 300. That is, the plurality of thermally conductive elements 304 are arranged around the circumferential exterior of the cartridge 300. Each thermally conductive element 304 may be referred to as a strip of thermally conductive material that is attached to the housing 302. The thermally conductive elements 304 each extend along at least a portion of the length of the cartridge 300, in a direction parallel to the longitudinal axis of the cartridge 300. In the depicted example, there are four thermally conductive elements 304 which are periodically spaced around the circumference of the cartridge 300. However, the skilled person will appreciate that the number and spacing of the thermally conductive elements 304 may vary.

[0045] In the depicted embodiment, each thermally conductive element 304 protrudes away from the cartridge 300 in an outwardly radial direction, i.e. in a direction perpendicular to the longitudinal axis of the cartridge 300. In other words, the thermally conductive elements 304 are raised with respect to the surface of the housing 302. In this way, the cartridge 300 may be received within the heating chamber 200 such that the thermally conductive elements 304 of the cartridge 300 are located within the plurality of grooves 208, which are the highest temperature areas in the heating chamber 200. Preferably, the outer surface of each thermally conductive element 304 is convex, such that the thermally conductive elements 304 may be securely located within the respective concave grooves 208 of the heating chamber 200.

[0046] However, in other embodiments, the cartridge 300 may be configured such that the thermally conductive elements 304 are formed as recessed portions extending along the length of the cartridge 300. That is, the thermally conductive elements 304 may be recessed with respect to the surface of the housing 302, rather than being raised with respect to the surface of the housing 302. In other words, the thermally conductive elements 304 as formed as indentations extending along at least a portion of the length of the cartridge 300. This alternative configuration of cartridge 300 may be received within a modified version of the heating chamber 200 wherein the temperature is greatest at locations corresponding to the plurality of ridges 206, rather than at the plurality of grooves 208. In this way, the cartridge 300 may be received within the heating chamber 200 such that the recessed thermally conductive elements 304 of the cartridge 300 interface with the plurality of ridges 206, which are the highest temperature areas in the modified heating chamber 200. Preferably, in this modified embodiment, the outer surface of each thermally conductive element 304 is concave, such that the thermally conductive elements 304 may be securely located against the respective convex ridges 206 of the heating chamber 200, thereby forming a flush interface for efficient heat transfer.

[0047] An air inlet 306 is disposed in the distal end 305 of the cartridge 300. Similarly, an air outlet 308 is disposed in the proximal end 307 of the cartridge 300. In use, air may enter the cartridge 300 via the air inlet 306 and exit the cartridge 300, along with generated aerosol, via the air outlet 308. In some examples, the cartridge 300 may further comprise a mouthpiece (not shown) located at the proximal end 307 of the cartridge 300. In this case, the air outlet 308 may be located within or extend through the mouthpiece, thereby enabling the user to inhale aerosol from the cartridge 300 via the mouthpiece.

[0048] As will be appreciated by the skilled person, the cartridge 300 is configured such that the cartridge 300 may be inserted into the heating chamber of an aerosol generating device. In particular, the depicted cartridge 300 is configured such that it may be received within the heating chamber 200 of aerosol generating device 100, with the plurality of thermally conductive elements 304 located within respective grooves 208 (which typically correspond to the highest temperatures regions of the heating chamber 200). However, in the alternative embodiment (not depicted) wherein the thermally conductive elements 304 are formed as indentations, the cartridge 300 is configured such that it may be received within the heating chamber 200 of aerosol generating device 100, with the plurality of thermally conductive elements 304 located against respective ridges 208 (which, in this case, correspond to the highest temperatures regions of the heating chamber 200).

[0049] In general, the cartridge 300 is configured such that it may be inserted within a heating chamber for a heat-not-burn device. However, the skilled person will appreciate that the cartridge 300 may also be received within a heating chamber of other aerosol generating devices, such as an electronic cigarette, wherein the heating chamber comprises a plurality of grooves or ridges for engagement with the plurality of thermally conductive elements 304.

[0050] The thermally conductive elements 304 comprise (and optionally consist of) metal such as aluminium. Preferably, the thermally conductive elements exhibit a thermal conductivity of at least 20 $Wm^{-1}K^{-1}$ at 20°C.

[0051] Figures 4A and 4B illustrate the internal features of the cartridge 300. Figure 4A is a cross-sectional view of the cartridge in a plane parallel to the longitudinal axis of the cartridge 300 and Figure 4B is a cross-sectional view towards the distal end 305 of the cartridge 300 in a plane perpendicular to the longitudinal axis of the cartridge 300.

[0052] The cartridge 300 further comprises a reservoir 312 for containing aerosolisable liquid therein, a capillary transport element 314 arranged to receive aerosolisable liquid from the reservoir 312, a thermally conductive mesh 316 embedded with the capillary transport element 314, and an airflow passage 310 extending through the cartridge 300 from the air inlet 306 to the air outlet 308.

[0053] The reservoir 312 is located towards the proximal end 307 of the cartridge 300. The reservoir is configured to store aerosolisable liquid and supply the aerosolisable liquid to the capillary transport element 314 for aerosolisation during operation of the cartridge 300. The liquid reservoir 16 can be configured as a refillable "open tank" reservoir, or a removable/replaceable reservoir, or a single-use reservoir. Preferably, the liquid reservoir is a permanent or non-exchangeable part of the cartridge. The aerosolisable liquid may be propylene glycol or glycerin or a mixture thereof, which is able to produce a visible aerosol. The aerosolisable liquid may further comprise other substances such as nicotine and/or flavourings.

[0054] The reservoir 312 is shaped as an annular cylinder. The annular cylinder is coaxially aligned with the cartridge 300. In this way, the airflow passage 310 is able to extend along the central axis of the cartridge 300 to the air outlet 308 without being impeded by the reservoir 312. In particular, a portion of the airflow passage 310 may be defined by the cylindrical hollow within the reservoir 312, thereby providing a compact configuration for supplying air and aerosol along the length of the cartridge 300 to the air outlet 308. Of course, the skilled person will appreciate that, in alternative embodiments, the reservoir 312 may be formed in alternative shapes, such as a sector of an annular cylinder.

[0055] The capillary transport element 314 is located towards the distal end 305 of the cartridge 300. The capillary transport element 314 is configured to receive aerosolisable liquid from the reservoir 312. In particular, aerosolisable liquid is supplied along and throughout the capillary transport element 314 by capillary action. Preferably, the capillary transport element 314 comprises a wicking material such as cotton and/or ceramic.

[0056] The capillary transport element 314 is preferably shaped as an annular cylinder. The annular cylinder is coaxially aligned with the cartridge 300. In this way, the airflow passage 310 is able to extend along the central axis of the cartridge 300 to the air inlet 306 without being impeded by the capillary transport element 314. In particular, a portion of the airflow passage 310 may be defined by the cylindrical hollow within the capillary transport element 314, thereby providing a compact configuration for supplying air along the length of the cartridge 300. In addition, being shaped as an annular cylinder that is in contact with the one or more thermally conductive elements ensures that the capillary transport element 314 receives an even distribution of heat from the thermally conductive elements 304. Of course, the skilled person will appreciate that, in alternative embodiments, the capillary transport element 314 may be formed in alternative shapes, such as a sector of an annular cylinder, or there may be a plurality of capillary transport elements 314 or, a plurality of radial ridges or rods axially spaced from each other along the direction of the air flow passage.

[0057] The thermally conductive elements 304 are arranged to conduct heat to the capillary transport element 314 such that, in use, the aerosolisable liquid transported by the capillary transport element 314 is heated and an aerosol is generated. In particular, each thermally conductive element 304 interfaces with the capillary transport element 314, thereby forming a direct heat conduction path. Advantageously, as the airflow passage 310 extends through the capillary transport element 314, the aerosol generated in the vicinity of the capillary transport element 314 may be reliably transported to the air outlet 308 to be inhaled by a user. That is, air travels through the cartridge 300 from the air inlet 306 to the air outlet 308, such that aerosol generated by the heating of aerosolisable liquid within the capillary transport element 314 is carried along the airflow passage and out of the air outlet 308 for inhalation by a user. Accordingly, the portion of the airflow passage 310 adjacent to the capillary transport element 314 may also be referred to as an aerosolisation chamber. Advantageously, as the aerosol is generated adjacent to the distal end 305 of the cartridge 300, and then must travel along the length of the cartridge 300 to exit the cartridge 300 via the air outlet 308 in the proximal end 307, the temperature of the aerosol is reduced such that the aerosol is received by the user at a more favourable, and safer, temperature.

[0058] The cartridge 300 optionally further comprises a thermally conductive mesh 316 that is embedded with the capillary transport element 314. For example, the thermally conductive mesh 316 may be an array of thermally conductive wires that are integrated within the capillary transport element 314. The thermally conductive mesh 316 may contact the thermally conductive elements 304 such that, in use, heat energy may be conducted from the thermally conductive elements 304 throughout the capillary transport element 314 via the thermally conductive mesh 316. In this way, heat is efficiently distributed within the capillary transport element 314 and the aerosolisable liquid transported by the capillary transport element 314 may be aerosolised when the liquid contacts the thermally conductive mesh 316. As alternatives to a thermally conductive mesh, the cartridge 300 may comprise other thermally conductive internal elements such as thermally conductive particles, beads or a sintered metal embedded in the capillary transport element. The thermal conductive mesh or other thermally conductive internal elements may be constituted partly or wholly throughout the capillary transport element 314.

[0059] In summary, in use, a user may insert the cartridge 300 within the heating chamber 200 of the aerosol generating device 100 such that the plurality of thermally conductive elements 304 are engaged with respective heat exchange elements of the heating chamber 200, i.e. respective grooves 208 of the heating chamber 200 (or respective ridges 206 in the case that the thermally conductive elements 304 are formed as indentations). In the depicted example, wherein the cartridge 300 comprises four thermally conductive elements 304 and the heating chamber 200 comprises four grooves 208, the skilled person will appreciate that the cartridge 300 may be inserted in the heating chamber 200 in one of four orientations. When the aerosol generating device 100 is operated by the user, heat is generated by the heating element 204 and transferred to the thermally conductive shell 202, wherein the heat is concentrated at the plurality of grooves 208 (or at the plurality of ridges 206 in the case that the thermally conductive elements 304 are formed as indentations). The heat is conducted from the plurality of grooves 208 (or the plurality of ridges 206 in the case that the thermally conductive elements 304 are formed as indentations) into the cartridge 300 via the plurality of thermally conductive elements 304. The thermally conductive elements 304 are in contact with the capillary transport element 314 and/or the thermally conductive mesh 314 or similar thermally conductive internal elements (e.g. sintered metal or particles or beads) such that heat is transferred to the aerosolisable liquid carried by the capillary transport element 314 to generate an aerosol, e.g. within the airflow passage 310. The aerosol travels through the airflow passage 310, along the central axis of the capillary transport element 314 and the reservoir 312, and exits the cartridge 300 through the air outlet 308 to be inhaled by a user.

Claims

1. A cartridge for an aerosol generating device, wherein the cartridge has a distal end and a proximal end, comprising:

   a reservoir configured to store aerosolisable liquid therein;
   a capillary transport element arranged to receive aerosolisable liquid from the reservoir;
   an air inlet configured to supply air to the capillary transport element; and
   one or more thermally conductive elements, wherein the one or more thermally conductive elements are arranged around an exterior of the cartridge between the distal end and the proximal end and are configured to conduct heat into the cartridge towards the capillary transport element when the cartridge is heated within a heating chamber of an aerosol generating device.

2. The cartridge of claim 1, comprising a plurality of thermally conductive elements.

3. The cartridge of claim 2, wherein the plurality of thermally conductive elements are periodically spaced around the exterior of the cartridge.

4. The cartridge of any preceding claim, wherein the one or more thermally conductive elements each extend along the exterior of the cartridge in a longitudinal direction of the cartridge.

5. The cartridge of any preceding claim, wherein the one or more thermally conductive elements each protrude from the cartridge in a direction perpendicular to a longitudinal direction of the cartridge.

6. The cartridge of any of claims 1 to 4, wherein the one or more thermally conductive elements are formed as indentations in the exterior of the cartridge.

7. The cartridge of any preceding claim, wherein the capillary transport element is located adjacent to the distal end of the cartridge, and wherein the reservoir is located adjacent to the proximal end of the cartridge.

8. The cartridge of any preceding claim, further comprising a thermally conductive mesh embedded with or on the surface of the capillary transport element.

9. The cartridge of any preceding claim, wherein the air inlet is disposed in the distal end of the cartridge, and further comprising:

an air outlet disposed in the proximal end of the cartridge; and
an airflow passage that connects the air inlet to the air outlet via the capillary transport element.

10. The cartridge of claim 9, wherein the capillary transport element is formed as an annular cylinder that is in contact with the one or more thermally conductive elements, and wherein the airflow passage extends along the central axis of the capillary transport element.

11. The cartridge of claim 9 or claim 10, wherein the reservoir is formed as an annular cylinder, and wherein the airflow passage extends along the central axis of the reservoir.

12. The cartridge of any of claims 9 to 11, further comprising a mouthpiece located at the proximal end of the cartridge, wherein the air outlet is disposed in the mouthpiece.

13. An aerosol generating system comprising:

a cartridge according to any preceding claim; and
an aerosol generating device comprising a heating chamber configured to receive the cartridge such that heat is transferred from the heating chamber to the one or more thermally conductive elements of the cartridge.

14. The aerosol generating system of claim 13, wherein the heating chamber is substantially tubular and comprises one or more internal grooves configured to interface with the one or more thermally conductive elements of the cartridge.

15. The aerosol generating system of claim 13, wherein the heating chamber is substantially tubular and comprises one or more internal ridges configured to interface with the one or more thermally conductive elements of the cartridge.

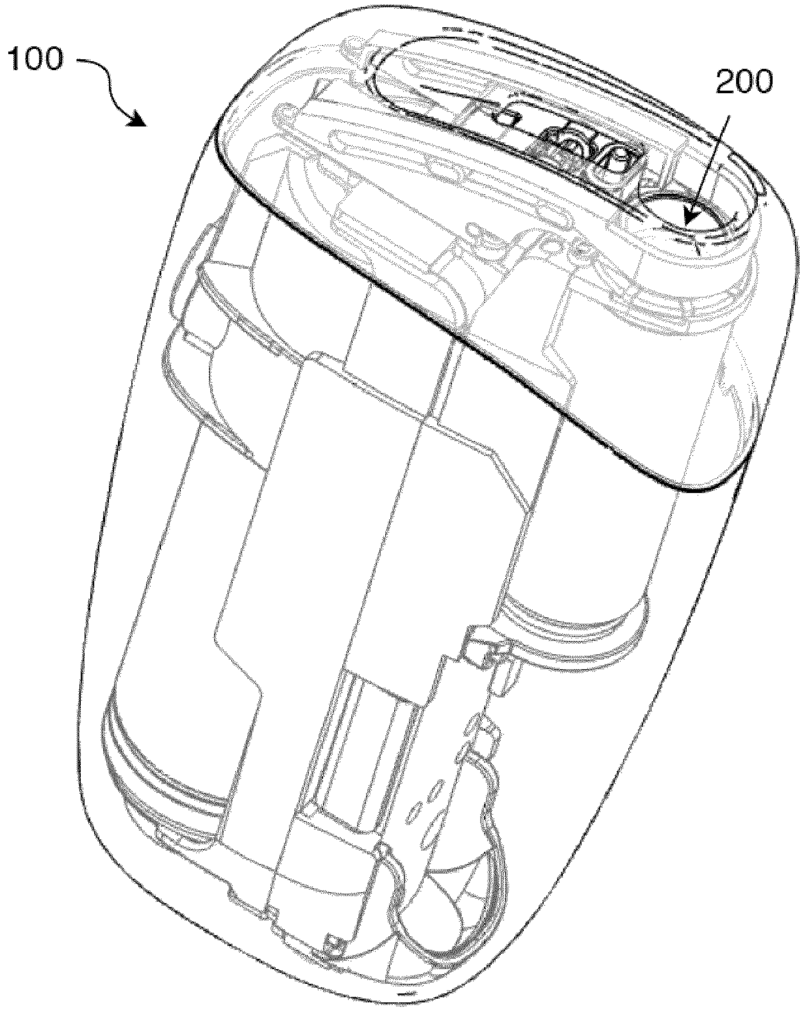

FIG. 1

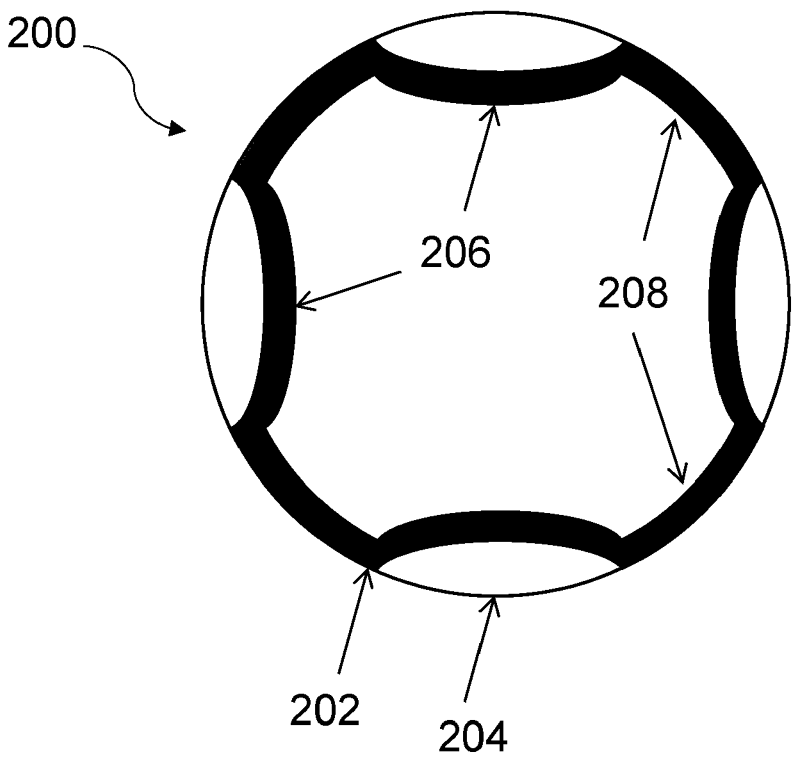

FIG. 2

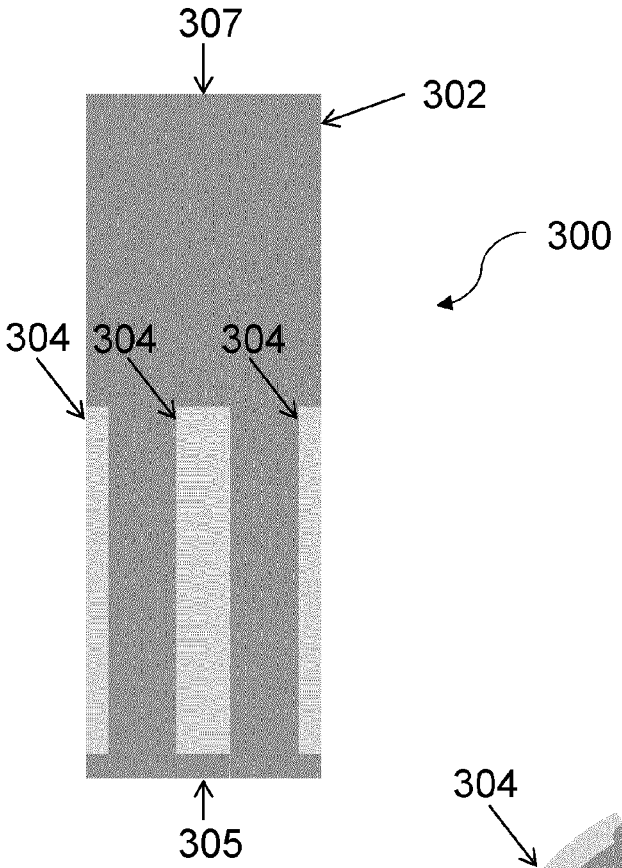

FIG. 3A

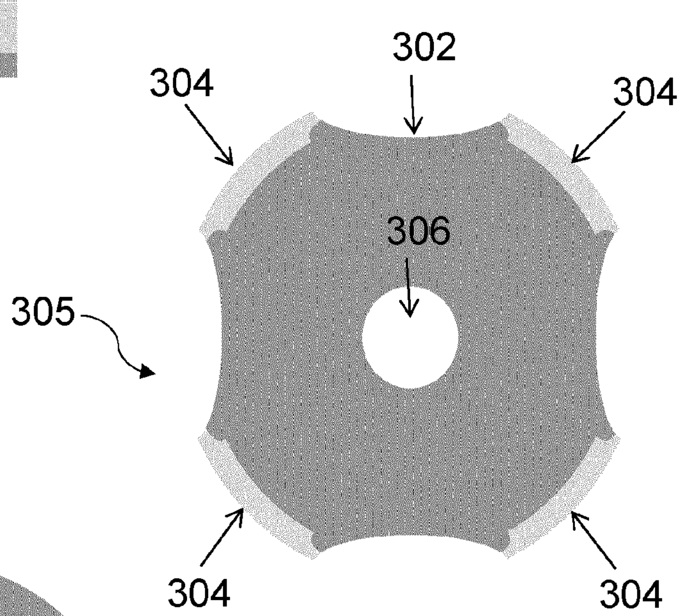

FIG. 3B

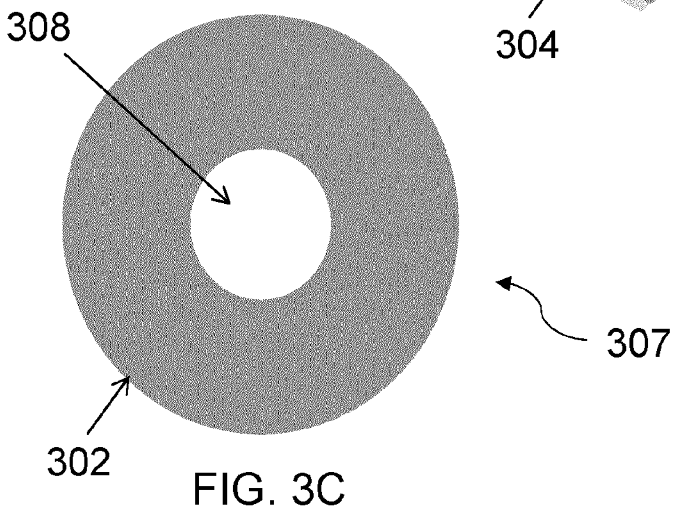

FIG. 3C

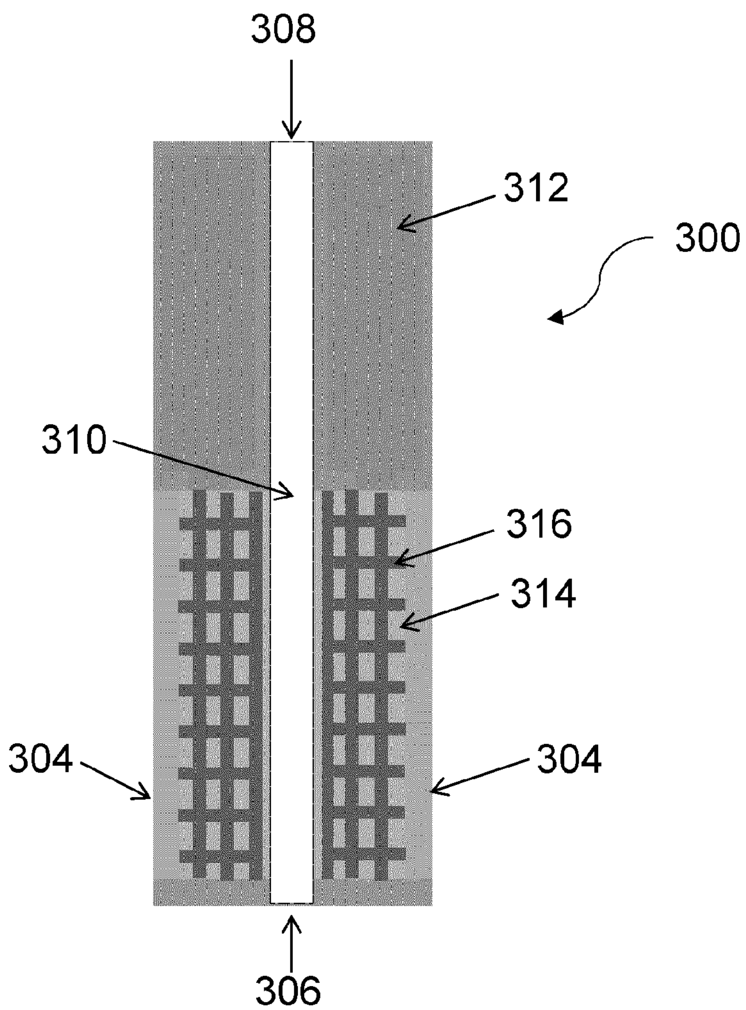

FIG. 4A

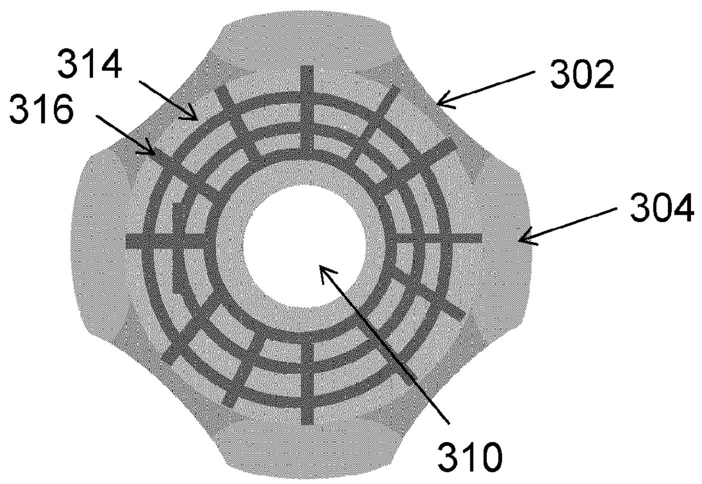

FIG. 4B

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EUROPEAN SEARCH REPORT

Application Number
EP 21 15 8784

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 2016/090303 A1 (PAX LABS INC [US]) 9 June 2016 (2016-06-09) * paragraph [0164] - paragraph [0166]; figure 7 * * paragraph [0125] *	1-9,11 10	INV. A24F40/10 A24F40/42 A24F40/44 A24F40/46 A61M11/04 A61M15/06
Y	WO 2019/129470 A1 (PHILIP MORRIS PRODUCTS SA [CH]) 4 July 2019 (2019-07-04) * page 16 - page 19; figures 1A, 3 * * page 11, line 23 - page 11, line 24 * * page 12, line 7 - page 12, line 8 * * page 11, line 1 - page 11, line 2 * * page 17, line 2 - page 17, line 4 * * page 1, line 16 - line 17 *	1,6, 12-15	
Y	US 2017/295844 A1 (THEVENAZ CRISTINA WENDT [CH] ET AL) 19 October 2017 (2017-10-19) * paragraph [0015] - paragraph [0016]; figure 2A *	1,6, 12-15	

TECHNICAL FIELDS SEARCHED (IPC)

A24F
A61M

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	30 July 2021	Schwertfeger, C

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 15 8784

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30-07-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2016090303 A1	09-06-2016	AU 2015357509 A1	29-06-2017
		CA 2969728 A1	09-06-2016
		CN 107427067 A	01-12-2017
		CN 112155255 A	01-01-2021
		EP 3226704 A1	11-10-2017
		EP 3821735 A1	19-05-2021
		HK 1245026 A1	24-08-2018
		IL 252658 A	29-04-2021
		JP 6802792 B2	23-12-2020
		JP 2017538410 A	28-12-2017
		KR 20170091737 A	09-08-2017
		RU 2017123539 A	09-01-2019
		RU 2019140840 A	03-03-2020
		US 2016157524 A1	09-06-2016
		US 2020120987 A1	23-04-2020
		WO 2016090303 A1	09-06-2016
WO 2019129470 A1	04-07-2019	BR 112020010673 A2	10-11-2020
		CN 111479478 A	31-07-2020
		EP 3731667 A1	04-11-2020
		JP 2021509255 A	25-03-2021
		KR 20200099175 A	21-08-2020
		WO 2019129470 A1	04-07-2019
US 2017295844 A1	19-10-2017	CA 3020806 A1	19-10-2017
		CN 109068751 A	21-12-2018
		DK 3316714 T3	18-03-2019
		EP 3316714 A1	09-05-2018
		EP 3443856 A1	20-02-2019
		ES 2711606 T3	06-05-2019
		HU E043516 T2	28-08-2019
		IL 262293 A	29-08-2019
		JP 6408190 B1	17-10-2018
		JP 6855424 B2	07-04-2021
		JP 2018534908 A	29-11-2018
		JP 2019022502 A	14-02-2019
		KR 20180125020 A	21-11-2018
		PL 3316714 T3	30-04-2019
		RU 2019116005 A	13-06-2019
		TR 201900539 T4	21-02-2019
		US 2017295844 A1	19-10-2017
		US 2018213846 A1	02-08-2018
		US 2019297950 A1	03-10-2019
		WO 2017179043 A1	19-10-2017

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2020074151 W **[0038]**
- EP 20158052 **[0038]**