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(54) POD INCLUDING LIGHT-SWITCHABLE MATERIAL FOR AN AEROSOL-GENERATING DEVICE, AND AEROSOL-GENERATING DEVICE COMPRISING THE SAME

(57) The present invention relates to a pod (1) including a light-switchable layer (7) for an aerosol-generating device in which leakage of an aerosol-generating liquid material (e-liquid) during transit and storage is prevented. This is achieved by a pod (1) for an aerosol-generating device comprising a porous wick (2); a reservoir (3) including a discharge opening (4) for an aerosol-generating liquid material; and at least one light emitting source (6), wherein the porous wick (2) is coated with a light-switchable layer (7) on a surface thereof sealing the discharge opening (4) of the reservoir (3) so that the light-switchable layer (7) is arranged between the discharge opening (4) of the reservoir (3) and the porous wick (2), wherein the light-switchable layer (7) comprises an amphiphilic inorganic material being hydrophobic and impermeable for an aerosol-generating liquid material in the dark and becoming hydrophilic and permeable for an aerosol-generating liquid material when exposed to light, and wherein the at least one light emitting source (6) is configured to illuminate the light-switchable layer (7). Furthermore, the present invention also relates to an an aerosol-generating device comprising the pod (1).

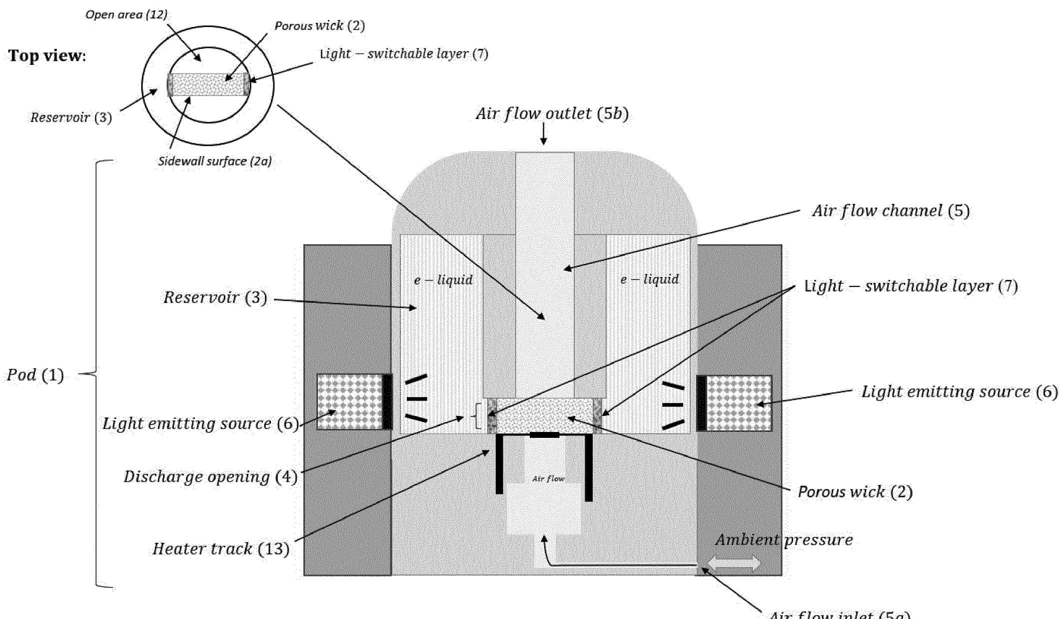

Figure 1 (a)

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Description

TECHNICAL FIELD

[0001] The present invention relates to a pod including a light-switchable material for an aerosol-generating device, in particular an electronic cigarette, vaporizer or e-vapor pod system, and an aerosol-generating device comprising said pod.

TECHNICAL BACKGROUND

[0002] Aerosol-generating devices, such as electronic cigarettes or "e-cigarettes" as they are also known, have gained in popularity over the past ten years as an alternative to traditional smoking articles, like cigarettes, cigars, and cigarillos. Developments in the design and configuration of such aerosol generating devices or vaporizer devices are ongoing to improve their performance and their reliability, as well as their ease of production and their production costs.

[0003] Conventional aerosol generating devices usually include an atomizer such as a heater, a power supply (e.g. an electrical power source) and a pod comprising a wick and a reservoir that contains flavored e-liquid. The e-liquid can be volatized using the heater and transferred to a user of the aerosol generating device in an airflow, which is preferably guided through a mouthpiece of the device.

[0004] In order to provide a convenient way for a user to load the e-liquid into the aerosol generating device and to avoid the need for the user to handle the e-liquid directly, thereby reducing the likelihood of spillage and waste, pods are conventionally provided.

[0005] The flow of e-liquid through the wicking material in e-cigarettes must be sufficient to avoid dry puffs. However, permeation of the e-liquid through the wicking material of the pod will contribute to undesired leakage of the e-liquid as it does not evaporate when the e-cigarette is not in use, in particular during storage and transit.

[0006] Therefore, there is need to develop systems which can prevent leakage of the e-liquid when the e-cigarette is not in use.

[0007] WO 2015/070405 A1, for example, relates to an atomizer for an electronic cigarette comprising an oil-storage mechanism and an atomizing component. A cigarette oil flowing channel is used for supplying cigarette oil stored within the oil-storage mechanism to the atomizing component. A hot-melt sealing structure is used for sealing the cigarette oil flowing channel before using the atomizer for the first time. When using the electronic cigarette for the first time and powering on the atomizing component for the first time, the hot-melt sealing structure is heated and melted to open the cigarette oil flowing channel, thus allowing the cigarette oil to be supplied to the atomizing component. However, according to WO 2015/070405 A1, leakage can only be prevented before the electronic cigarette is used for the first time. Once the hot-melt sealing structure is melted, it cannot reseal the cigarette oil flowing channel and leakage can occur during long periods of not using the electronic cigarette.

[0008] WO 2020/070109 A1 concerns a liquid supply system such as a cartridge (pod) for use with aerosol-generating devices, which includes a liquid substrate in a retention material, a liquid flow channel extending from the liquid retention material and a barrier layer disposed in the liquid flow channel. The barrier layer that is included in the cartridge prevents premature transfer of the liquid substrate into the airflow passage. The barrier degrades at elevated temperature and allows transfer of the liquid substrate into the liquid flow channel. However, according to WO 2020/070109 A1, leakage can likewise be prevented only before the aerosol-generating device is used for the first time. Once the barrier layer is degraded, it cannot reseal the liquid flow channel and leakage can occur during long periods of not using the aerosol-generating device.

SUMMARY OF THE INVENTION

Technical Problem

[0009] In view of the above, it is an object of the invention to provide a pod for an aerosol-generating device, which can prevent leakage of an aerosol-generating liquid material (e-liquid) during transit and storage before the aerosol-generating device is used for the first time and also afterwards, during long periods of not using the aerosol-generating device.

[0010] This aim is achieved by a pod (1) for an aerosol-generating device comprising a porous wick (2); a reservoir (3) including a discharge opening (4) for an aerosol-generating liquid material; and at least one light emitting source (6), wherein the porous wick (2) is coated with a light-switchable layer (7) on a surface thereof sealing the discharge opening (4) of the reservoir (3) so that the light-switchable layer (7) is arranged between the discharge opening (4) of the reservoir (3) and the porous wick (2), wherein the light-switchable layer (7) comprises an amphiphilic inorganic material being hydrophobic and impermeable for an aerosol-generating liquid material in the dark and becoming hydrophilic and permeable for an aerosol-generating liquid material when exposed to light, and wherein the at least one light emitting source (6) is configured to illuminate the light-switchable layer (7). The present invention also refers to an aerosol-generating device comprising a pod as described above. Preferable embodiments of the invention are indicated in the following description and the accompanying drawings.

[0011] A core idea of the present invention lies in a pod for an aerosol-generating device, which allows for the flow of the e-liquid to be selectively switched on so that the e-liquid can be supplied to the heating element when the pod is in use. This is achieved by including a light-switchable layer in the pod, which coats a porous wick and is arranged so that a discharge opening of a reservoir including the e-liquid is sealed. Before being exposed to light, the light-switchable layer is hydrophobic and impermeable for the e-liquid, thus preventing leakage of the e-liquid during storage or transit in non-use periods. When in use, the light-switchable layer is exposed to light whereupon it becomes hydrophilic and permeable for the e-liquid, which can then be supplied via the porous wick to the heating element and vaporized. During subsequent long periods of storage or transportation without illuminating the light-switchable layer, it again becomes hydrophobic and impermeable to the e-liquid, thus preventing leakage of the reservoir filled with the e-liquid. With this system, the wicking rate from fully off to fully on may be controlled, as the wicking only is switched on when the light-switchable layer is illuminated.

Brief Description of the Drawings

[0012]

Figure 1(a) is a schematic illustration of a pod for an aerosol-generating device in accordance with one embodiment of the present invention.

Figure 1(b) is a schematic illustration of a pod according to Figure 1(a) further comprising a UV transparent window.

Figure 2 is a schematic illustration of a pod for an aerosol-generating device in accordance with another embodiment of the present invention, wherein the porous wick has a vapor channel structure and wherein the pod further comprises a heat transfer material layer.

Figure 3 illustrates a porous wick having a vapor channel structure.

Figure 4 is a schematic illustration of a section of the pod for an aerosol-generating device according to the embodiment shown in Figure 2 during OFF state, i.e. during a non-use period.

Figure 5 is a schematic illustration of a section of the pod for an aerosol-generating device according to the embodiment shown in Figure 2 during ON state, i.e. during use.

Figure 6 is a schematic illustration according to the embodiment shown in Figure 4, wherein the porous wick has no vapor channel structure.

Figure 7 is a schematic illustration according to the embodiment shown in Figure 5, wherein the porous wick has no vapor channel structure.

Detailed Description

[Specification of Terms]

[0013] The term "aerosol-generating liquid material" is interchangeably used with the term "e-liquid" and refers to the liquid material from which the aerosol is created in an aerosol-generating device using for example a vaporizer, an atomizer, a nebulizer or a heating element.

[0014] The term "aerosol-generating device" refers to a device that can generate an aerosol for inhalation, such as an electronic cigarette, a vaporizing device, a nebulizing device, an e-vapor pod system or an inhalation device.

[0015] The term "light-switchable material" refers to an amphiphilic inorganic material being hydrophobic and impermeable for an aerosol-generating liquid material in the dark and becoming hydrophilic and permeable for an aerosol-generating liquid material when being exposed to light. This liquid permeation switching is valuable in e-vapor pod systems where the porous wicking media is desired to be in an OFF state when in storage/transit but need to rapidly switch to an operational ON state when in use, i.e. when illuminated. This helps reducing leakage risks during storage and transport.

[0016] According to the definition found in Wang et al., "light-induced amphiphilic surfaces", Nature, 388 (1997), the term "amphiphilic" means that the material may be both, oleophilic (which may interchangeably be used with hydrophobic) and hydrophilic depending on the conditions applied. Such amphiphilic materials may be temperature or light dependent, for example. In the present application, the light-switchable material is an amphiphilic inorganic material, which is hydrophobic in the dark and becomes hydrophilic when exposed to light.

[0017] The term "hydrophobic" refers to materials exhibiting a large water contact angle of at least 60° and the term "hydrophilic" refers to materials exhibiting a small water contact angle of less than 60°.

[0018] Preferably, the light-switchable material of the present invention is hydrophobic in the dark having a water contact angle of 90° or more. More preferably, the light-switchable material of the present invention is "superhydrophobic", meaning that it has a water contact angle of 150° or more in the dark.

[0019] Preferably, the light-switchable material of the present invention is hydrophilic when exposed to light having a water contact angle of 10° or less. More preferably, the light-switchable material is "superhydrophilic", meaning that it has a water contact angle of 1° or less when exposed to light.

[0020] The term "porous wick" refers to a wicking material having a porosity of 30 to 60%, and preferably 40 to 50%, wherein the porosity is a fraction of the volume of voids over the total volume of the wicking material. The porosity can be measured by microscope image analysis. Optionally, the porous wick has a vapor channel structure (10) as shown in Figure 3 of the present invention.

[0021] The term "light emitting source" refers to a source capable of emitting light. Preferably, the emitted light has a wavelength in the range of 350 to 450 nm, more preferably in the range of 365 to 405 nm. In one embodiment of the present invention, the light emitting source is an UV light emitting diode.

[Description of Embodiments]

[0022] The present invention relates to a pod (1) for an aerosol-generating device, which comprises a porous wick (2) and a reservoir (3). The reservoir (3) includes a discharge opening (4), through which an aerosol-generating liquid material (e-liquid) can be discharged when using the aerosol-generating device.

[0023] According to the invention, the porous wick (2) is coated with a light-switchable layer (7) on that surface of the porous wick (2) that seals the discharge opening (4) of the reservoir. Thereby, the light-switchable layer (7) is arranged between the discharge opening (4) of the reservoir (3) and the porous wick (2) and forms a hydrophobic barrier preventing the e-liquid to permeate into the porous wick (2) when the pod (1) is not in use, i.e. during storage and transportation, thus avoiding leakage. When in use, a light emitting source (6) emits light to the light-switchable layer (7), whereby the properties of the light-switchable layer (7) are switched so that it becomes hydrophilic. Once the light-switchable layer (7) is in the hydrophilic state, the e-liquid can permeate into the porous wick (2) and be subsequently vaporized.

[0024] The light-switchable layer (7) used in the present invention is made of an amphiphilic inorganic material, which is impermeable for an aerosol-generating liquid material in the dark and which becomes permeable for an aerosol-generating liquid material when being exposed to light. The present invention makes use of a switching mechanism based on illumination. That is, when illuminating the light-switchable layer (7) using the light emitting source (6), the wettability characteristics of the light-switchable layer (7) change. In particular, when illuminating the light-switchable layer (7), its hydrophobic properties are switched instantaneously to become hydrophilic. These hydrophilic properties of the light-switchable layer (7) are switched back to become hydrophobic and impermeable for the e-liquid when the pod (1) is not in use, such as during storage or transit.

[0025] Preferably, the amphiphilic inorganic material is hydrophobic in the dark and becomes hydrophilic when exposed to ultraviolet (UV) light.

[0026] The amphiphilic inorganic material according to the invention is not particularly limited, as long as it shows wettability characteristics that change with illumination. Several materials showing such wettability characteristics that change with illumination have been reported (see, e.g. Wang et al., "light-induced amphiphilic surfaces", Nature, 388 (1997); Roach et al., "Progress in superhydrophobic surface development", Soft Matter, 4, (2008), 224-240). The first report of an inorganic material showing reversible switching between hydrophobic and hydrophilic (to even superhydrophobic and superhydrophilic) states made use of ZnO. Also, TiO_2 and SnO_2 were reported to show reversible switching properties between (super)hydrophobic and (super)hydrophilic states.

[0027] In view thereof, the amphiphilic inorganic material preferably is at least one selected from the group consisting of TiO_2, ZnO and SnO_2. When the light-switchable material is at least one of the above, the switch in liquid permeation occurs due to the change from hydrophobic to hydrophilic with virtually no transition period. It is generally considered that the hydrophobic to hydrophilic switch occurs due to creation of free electrons or holes on the material surface. From the viewpoint of excellent switching properties, the amphiphilic inorganic material more preferably is at least one selected from the group consisting of TiO_2 nanoparticles, ZnO nanoparticles and SnO_2 nanoparticles. Smaller particle sizes are preferable from the viewpoint of reducing scattering of light, thereby increasing the penetration of light into the light-switchable layer. Even more preferably, the amphiphilic inorganic material is selected from the group consisting of TiO_2 nanoparticles and SnO_2 nanoparticles, because ZnO is reported to be more unstable in UV light compared to these two materials.

[0028] According to a further preferred embodiment of the invention, the amphiphilic inorganic material is at least one selected from the group consisting of TiO_2 nano-rods, ZnO nano-rods and SnO_2 nano-rods. It has been reported that ZnO films made of ZnO nanorods have the advantage that they display superhydrophobicity even if they are sparsely spread over the surface. However, since photo-corrosion may occur, with ZnO being more unstable in UV light compared to other photocatalytic metal oxides such as TiO_2 or SnO_2, the amphiphilic inorganic material according to the present invention particularly preferably is selected from TiO_2 nanorods and SnO_2 nano-rods.

[0029] The thickness of the light-switchable layer (7) in a pod (1) according to the invention is not particularly limited. Preferably, the thickness of the layer is between 10 nm to 100 μm, more preferably between 100 nm and 50 μm, even more preferably between 200 nm and 10 μm, and particularly preferably between 500 nm and 1 μm.

[0030] The pod (1) according to the invention comprises at least one light emitting source (6), and preferably comprises two or more light emitting sources (6). The light emitting source (6) is not particularly limited as long as it is configured to illuminate the light-switchable layer (7) by direct illumination and/or by reflection of the emitted light from the sidewall (8) of the reservoir (3). Preferably, the at least one light emitting source (6) is arranged to illuminate the light-switchable layer (7) by emitting light through the reservoir (3) of the pod (1).

[0031] Preferably, the light emitting source (6) emits light with a wavelength in the range of 350 to 450 nm, more preferably in the range of 365 to 405 nm from the viewpoint of improved switching properties of the light-switchable material. In one embodiment of the present invention, the pod (1) comprises at least one light emitting source (6), which is an UV light emitting diode.

[0032] Optionally, the reservoir (3) comprises at least one UV transparent window (9). This is particularly of advantage if polymers are used in the pod (1), whose transparency towards light in the above wavelengths is limited, which in turn may block a significant amount of light coming from the at least one light emitting source (6). By using specific materials for windows, the UV light flux coming from the light emitting source (6) towards the light-switchable layer (7) may be enhanced. The material of the window is not particularly limited as long as it is arranged to allow light, which is emitted by the at least one light emitting source (6), to reach the light-switchable layer (7) through the window (9).

[0033] Preferably, the UV transparent window (9) is made of any one of glass, inorganic quarz, silicone elastomer, acrylic polymer, polycarbonate (PC), polyethylene terephthalate (PET) and cyclic olefin copolymers (COC) from the viewpoint of having high transparency properties.

[0034] The porous wick (2) used in the pod (1) of the invention can be made entirely from one material or from a composite material. The porous wick can for example be made of ceramic, silica or cotton. A ceramic wick is preferable from the viewpoint of providing excellent mechanical properties, particularly in terms of rigidity. Ceramic wicks are, for example, not influenced by compression like cotton wicks. Furthermore, ceramic is a stable, inert and cheap material, which is mass producible.

[0035] The pod (1) of the present invention may further comprise an airflow channel (5). Air can enter the pod (1) through an inlet (5a) of the airflow channel (5), is guided through the porous wick (2) and/or along a surface of the porous wick (2) and exits the pod (1) through an outlet (5b) of the airflow channel (5). The design and position of the airflow channel (5) is not particularly limited. It may, for instance, be centered in the pod and have a tubular shape, wherein the porous wick (2), usually having a rod shape, is centered in the air flow channel (5), thereby forming two separate open areas (12) between two opposite sidewall surfaces (2a) of the porous wick (2) and the wall of the air flow channel (5), respectively. In this design, air may flow from the airflow inlet (5a) through the porous wick (2) and/or along a sidewall surface (2a) of the porous wick (2) facing the wall of the tubular airflow channel (5) to the airflow outlet (5b), i.e. from the bottom to the top as shown in e.g. Figures 1(a) and 1(b). Alternatively, the airflow channel (5) may be designed such that it is guided through the porous wick (2) as shown in Figures 6 and 7 or along a bottom surface (2b) of the porous wick (2) as shown in e.g. Figures 2, 4 and 5, so that air flows from the airflow inlet (5a) through the porous wick (2) or along the bottom surface (2b) of the porous wick (2) to the airflow outlet (5b). When the pod (1) according to the invention is in use, the vaporized e-liquid is mixed with the air that is guided through the porous wick (2) and/or along a surface of the porous wick (2) and is simultaneously discharged with the air through the outlet (5b) of the airflow channel (5).

[0036] In an embodiment of the present invention in which air is guided along a bottom surface (2b) of the porous wick (2), the porous wick (2) may have a vapor channel structure (10) forming vapor channels (10a) on that surface of the porous wick (2) along which air is guided. This vapor channel structure (10) increases the evaporation surface of the porous wick (2), thereby allowing for airflow control and vaporization rate control. The direction of the vapor channels (10a) is not particularly limited. Preferably, the channels run parallel to the airflow. For example, as shown in Figures 2, 4 and 5, the direction of the vapor channels (10a) is parallel to the direction of the air which is guided along the bottom surface (2b) of the porous wick (2).

[0037] The vapor channel structure (10) can have a geometrical structure selected from the group consisting of pin fins, rectangular channels, circular channels, reentrant cavities and flow mixer structures.

[0038] The pod (1) according to the invention may further comprise a heat transfer material layer (11) and a planar heating element (14). In that embodiment of the present invention in which the porous wick (2) has a vapor channel structure (10), the heat transfer material layer (11) may be arranged adjacent to a surface of the porous wick (2) along which the air is guided. This configuration may enhance heat supply to the porous wick (2), thereby reducing the time of commissioning.

[0039] The aerosol-generating device of the present invention comprises the pod (1) according to the invention. Usually, the device further comprises a heater unit for vaporizing the e-liquid. When the aerosol-generating device is used, the at least one light-emitting source (6) is switched on, thereby illuminating the light-switchable layer (7) of the pod, and thus initiating the light-induced wettability change of the layer (7). This allows the porous wick (2) to be saturated with the e-liquid at a controlled wicking rate from fully off to fully on, since the wicking only is switched on once the light-switchable layer (7) is illuminated by the light emitting source (6). The heater unit distributes heat to the saturated porous wick (2), thereby vaporizing the e-liquid. The heater unit can be provided separately from the pod (1) in a heater-in-device-configuration or can be provided integrally with the pod (1).

[0040] Embodiments of the invention will now be explained in detail, by way of non-limiting example only, with reference to the accompanying figures.

[0041] Where technical features in the drawings, detailed description or any claim are followed by reference signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the drawings, detailed description, and claims. Accordingly, neither the reference signs nor their absence have any limiting effect on the scope of any claim elements. The same reference signs listed in different figures refer to identical, corresponding or functionally similar elements.

[0042] Figure 1(a) shows a pod (1) according to an embodiment of the invention. The pod (1) includes an e-liquid reservoir (3) and a porous wick (2) having a rod shape that is coated with a light-switchable layer (7) on the surface sealing a discharge opening (4) of the reservoir (3). During non-use periods, such as during storage or transportation of the pod (1), the light-switchable layer (7) is impermeable to the e-liquid, and thus prevents it from leaking out. The pod (1) further comprises a light emitting source (6), which is arranged to illuminate the light-switchable layer (7) when the pod is used so that the light-switchable layer (7) becomes permeable for the e-liquid that can then permeate into the porous wick (2) and be subsequently vaporized. In this embodiment, the pod (1) has two light emitting sources (6) and further includes an airflow channel (5) including an airflow inlet (5a) and an airflow outlet (5b). The airflow channel (5) contains a chimney part having a tubular shape, in which the porous wick (2) is centered allowing for the formation of two separate open areas (12) between two opposite sidewall surfaces (2a) of the porous wick (2) and the wall of the tubular air flow channel (5) (shown in Figure 1(a), Top view). Furthermore, the pod (1) comprises a heater track (13) that distributes heat to the porous wick (2). When in use, air can enter the airflow inlet (5a) at ambient pressure, be guided through the porous wick (2) and/or along the two opposite sidewall surfaces (2a) of the porous wick (2) where it is supplied with the vaporized e-liquid to form an e-vapor, and exit the airflow outlet (5b) as e-vapor.

[0043] As shown in Figure 1(b), the pod (1) of Figure 1(a) can further comprise a UV transparent window (9) arranged to allow the light emitting source (6) to illuminate the light-switchable layer (7) by emitting light through the window (9) .

[0044] Figure 2 shows a pod (1) according to another embodiment of the invention. The pod (1) includes an e-liquid reservoir (3) and a porous wick (2) that is coated with a light-switchable layer (7) on the surface sealing a discharge opening (4) of the reservoir (3). In this embodiment, the pod (1) includes an airflow channel (5) including an airflow inlet (5a) and an airflow outlet (5b), whereby air is guided along a bottom surface (2b) of the porous wick (2). When in use, air can enter the airflow inlet (5a) at ambient pressure, be guided along the bottom surface (2b) of the porous wick (2) where it is supplied with the vaporized e-liquid to form an e-vapor, and exit the airflow outlet (5b) as e-vapor. In this embodiment, the porous wick (2) has a vapor channel structure (10) for achieving a preferable airflow and vaporization rate. The pod (1) further comprises a heat transfer material layer (11) arranged adjacent to the bottom surface (2b) of the porous wick (2) along which the air is guided. The heat transfer material layer (8) is in contact with a planar heating element (14). Such a configuration enhances heat supply to the porous wick (2) and thereby reduces the time of commissioning.

[0045] Figure 3 shows a schematic view of a porous wick (2) having a vapor channel structure (10) for controlling the airflow and the vaporization rate.

[0046] Figure 4 shows a schematic view of a section of pod (1) according to the embodiment shown in Figure 2 during OFF state, i.e. during a non-use period. The surface of the porous wick (2) that seals the discharge opening (4) of the e-liquid reservoir (3) is coated with the light-switchable layer (7). When no light is transmitted to the light-switchable layer (7), i.e. when the light emitting source (6) is in the off state and the light-switchable material is kept in the dark, the hydrophobic properties render the light-switchable layer (7) impermeable to the e-liquid and the porous wick (2) is kept dry. Thus, when the pod (1) is not in use, the light-switchable layer (7) forms a barrier layer so that the e-liquid cannot permeate into the dry porous wick (2) and leakage is prevented.

[0047] Figure 5 shows a schematic view of a section of pod (1) according to the embodiment shown in Figure 2 during ON state, i.e. during use. When the previously described pod (1) according to the invention is used and the light emitting source (6) is in the on state, light from the light emitting source (6) is transmitted by direct illumination and/or by reflection of the emitted light from a reservoir sidewall (8) to the light-switchable material (7) as shown in Figure 3. Thereby, the properties of the light-switchable layer (7) switch to become hydrophilic so that the e-liquid can permeate through the light-switchable layer (7) into the porous wick (2) to form a saturated porous wick (2) and be subsequently vaporized.

[0048] Figure 6 shows a schematic view according to Figure 4, wherein the porous wick (2) has no vapor channel structure (10). In this embodiment, air flows through the porous wick as indicated by the arrow showing the air flow.

[0049] Figure 7 shows a schematic view according to Figure 5, wherein the porous wick (2) has no vapor channel structure (10). In this embodiment, air flows through the porous wick as indicated by the arrow showing the air flow.

[0050] Although detailed embodiments have been described, these only serve to provide a better understanding of the invention defined by the independent claims and are not to be seen as limiting.

[0051] It will also be appreciated that the terms "comprise", "comprising", "include", "including", "contain", "containing", "have", "having", and any variations thereof as used herein, are intended to be understood in an inclusive (i.e. non-exclusive) sense, such that the product and device described herein is not limited to those features recited but may include other elements or features not expressly listed or inherent to such product or device. Furthermore, the terms "a" and "an" used herein are intended to be understood as meaning one or more unless explicitly stated otherwise.

REFERENCE LIST

[0052]

1	Pod
2	Porous wick
2a	Sidewall surface
2b	Bottom surface
3	Reservoir
4	Discharge opening
5	Air flow channel
5a	Air flow inlet
5b	Air flow outlet
6	Light emitting source
7	Light-switchable layer
8	Reservoir sidewall
9	UV transparent window
10	Vapor channel structure
11	Heat transfer material layer
12	Open area
13	Heater track
14	Planar heating element

Claims

1. A Pod (1) for an aerosol-generating device comprising

a porous wick (2);
a reservoir (3) including a discharge opening (4) for an aerosol-generating liquid material; and
at least one light emitting source (6),
wherein the porous wick (2) is coated with a light-switchable layer (7) on a surface thereof sealing the discharge opening (4) of the reservoir (3) so that the light-switchable layer (7) is arranged between the discharge opening (4) of the reservoir (3) and the porous wick (2),
wherein the light-switchable layer (7) comprises an amphiphilic inorganic material being hydrophobic and impermeable for an aerosol-generating liquid material in the dark and becoming hydrophilic and permeable for an aerosol-generating liquid material when exposed to light, and
wherein the at least one light emitting source (6) is configured to illuminate the light-switchable layer (7).

2. The pod (1) for an aerosol-generating device according to claim 1, wherein the amphiphilic inorganic material is hydrophobic in the dark and becomes hydrophilic when exposed to ultraviolet (UV) light.

3. The pod (1) for an aerosol-generating device according to claim 1 or 2, wherein the amphiphilic inorganic material is at least one selected from the group consisting of TiO_2, ZnO and SnO_2.

4. The pod (1) for an aerosol-generating device according to claim 3, wherein the amphiphilic inorganic material is at least one selected from the group consisting of TiO_2 nanoparticles, ZnO nanoparticles and SnO_2 nanoparticles.

5. The pod (1) for an aerosol-generating device according to any one of claims 1 to 4, wherein the light-switchable layer (7) has a thickness of 10 nm to 100 μm.

6. The pod (1) for an aerosol-generating device according to any one of claims 1 to 5, wherein the at least one light emitting source (6) is configured to illuminate the light-switchable layer (7) by direct illumination and/or by reflection of the emitted light from a reservoir sidewall (8).

7. The pod (1) for an aerosol-generating device according to any one of claims 1 to 6, wherein the at least one light emitting source (6) emits light with a wavelength in the range of 350 to 450 nm, preferably in the range of 365 to 405 nm.

8. The pod (1) for an aerosol-generating device according to any one of claims 1 to 7, wherein the at least one light emitting source (6) is an UV light emitting diode.

9. The pod (1) for an aerosol-generating device according to any one of claims 1 to 8, wherein the at least one light emitting source (6) is arranged to illuminate the light-switchable layer (7) by emitting light through the reservoir (3) .

10. The pod (1) for an aerosol-generating device according to claim 9, wherein the reservoir (3) comprises at least one UV transparent window (9) arranged to allow the at least one light emitting source (6) to illuminate the light-switchable layer (7) by emitting light through the window (9).

11. The pod (1) for an aerosol-generating device according to claim 10, wherein the UV transparent window (9) is made of any one of glass, inorganic quarz, silicone elastomer, acrylic polymer, polycarbonate (PC), polyethylene terephthalate (PET) and cyclic olefin copolymers (COC).

12. The pod (1) for an aerosol-generating device according to any one of claims 1 to 11, wherein the porous wick (2) is made of ceramic, silica or cotton.

13. The pod (1) for an aerosol-generating device according to any one of claims 1 to 12, further comprising an airflow channel (5) configured to allow air entering the pod (1) through an inlet (5a) being guided through the porous wick (2) and/or along a surface of the porous wick (2), and exiting the pod (1) through an outlet (5b).

14. The pod (1) for an aerosol-generating device according to any one of claims 1 to 13, wherein when the air is guided along the surface of the porous wick (2), the porous wick (2) has a vapor channel structure (10) forming vapor channels (10a) on that surface of the porous wick (2) along which the air is guided.

15. An aerosol-generating device comprising the pod (1) as defined in any one of claims 1 to 14.

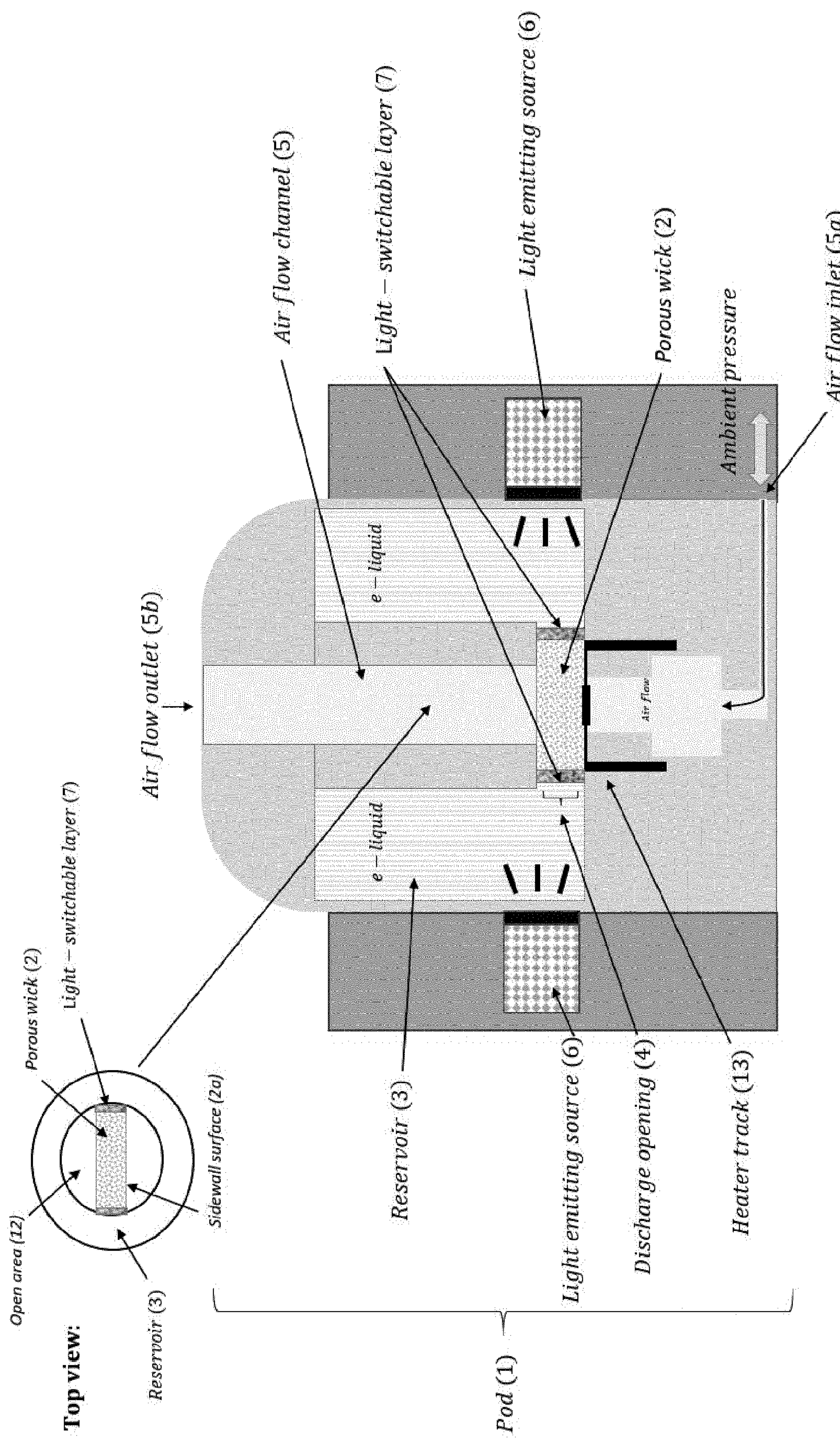

Top view:
Open area (12)
Reservoir (3)
Porous wick (2)
Light – switchable layer (7)
Sidewall surface (2a)
Pod (1)
Reservoir (3)
Light emitting source (6)
Discharge opening (4)
Heater track (13)
e – liquid
e – liquid
Air flow outlet (5b)
Air flow channel (5)
Light – switchable layer (7)
Light emitting source (6)
Porous wick (2)
Air flow
Ambient pressure
Air flow inlet (5a)

Figure 1 (a)

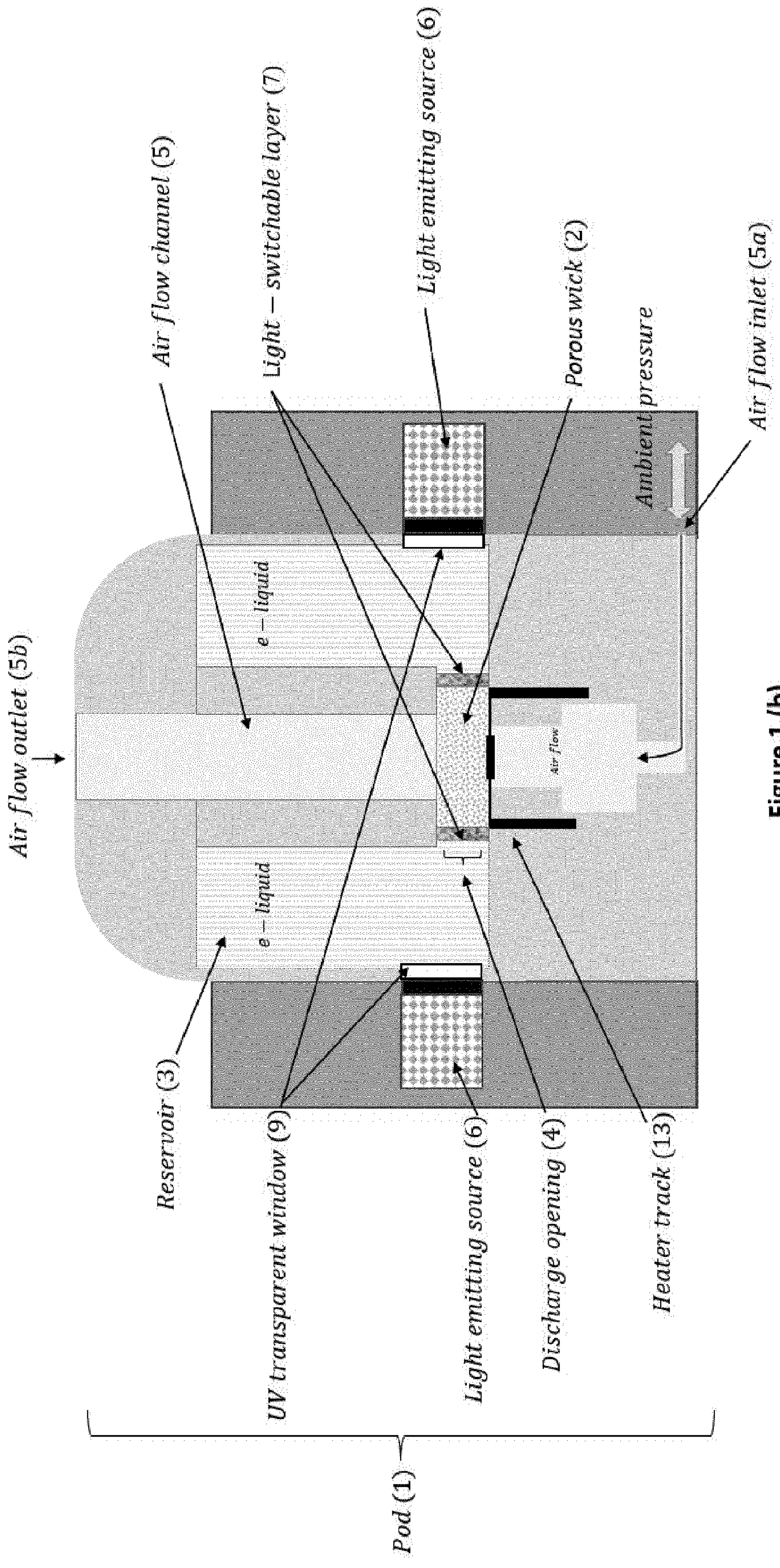

Air flow channel (5)
Light – switchable layer (7)
Light emitting source (6)
Porous wick (2)
Ambient pressure
Air flow inlet (5a)
Air flow outlet (5b)
e – liquid
e – liquid
Air flow
Reservoir (3)
UV transparent window (9)
Light emitting source (6)
Discharge opening (4)
Heater track (13)
Pod (1)

Figure 1 (b)

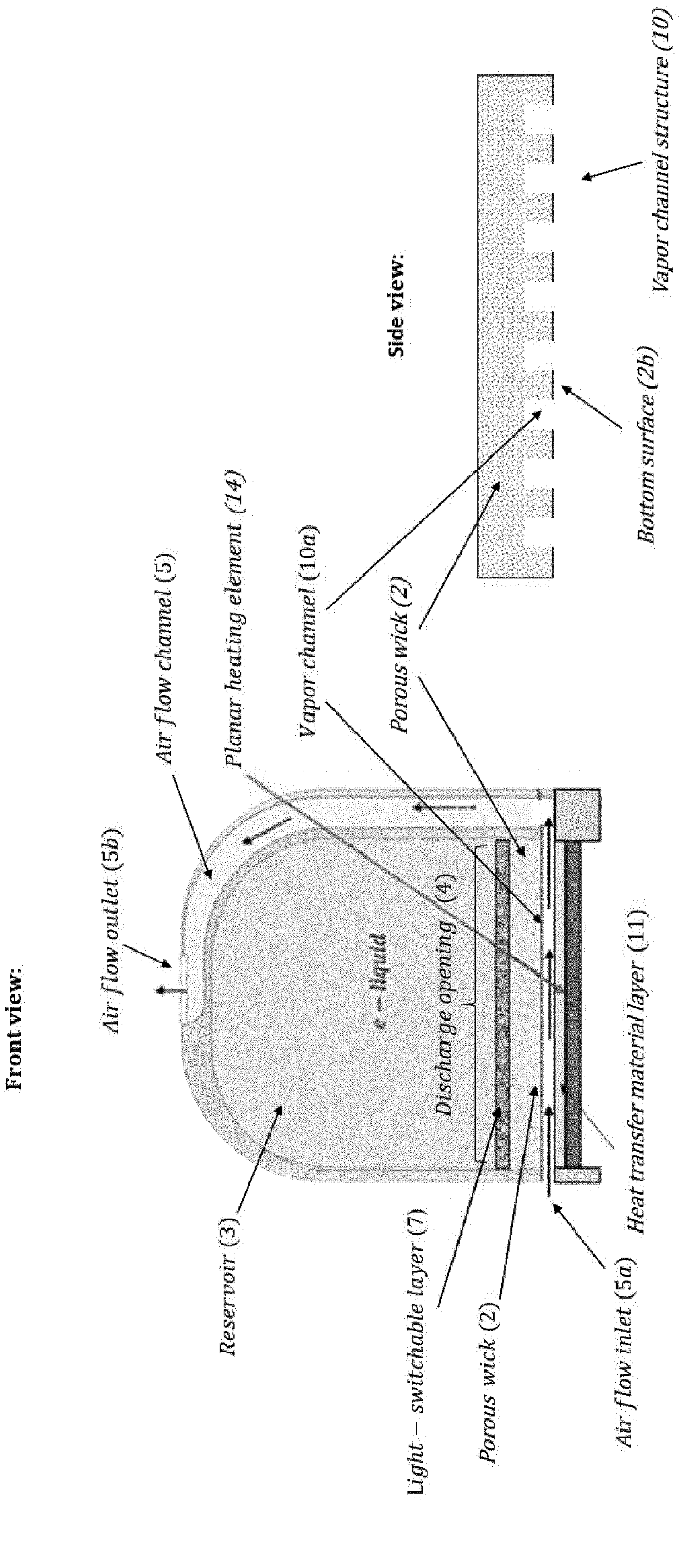

Front view:
Air flow outlet (5b)
Air flow channel (5)
Planar heating element (14)
Vapor channel (10a)
Porous wick (2)
e – liquid
Discharge opening (4)
Reservoir (3)
Light – switchable layer (7)
Porous wick (2)
Air flow inlet (5a)
Heat transfer material layer (11)
Side view:
Bottom surface (2b)
Vapor channel structure (10)

Figure 2

Figure 3

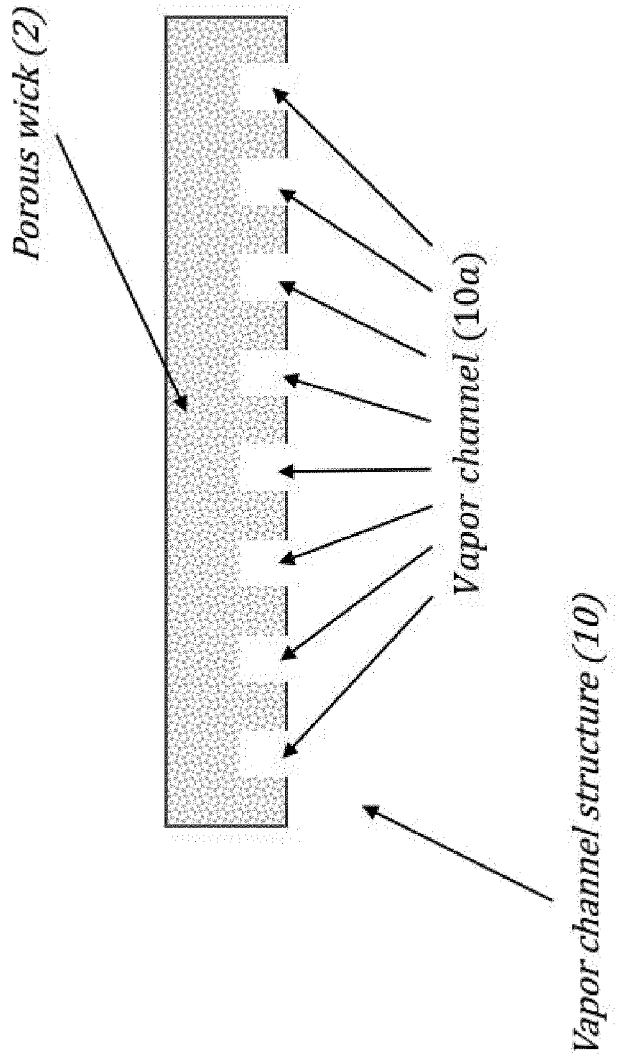


Figure 4 (OFF state)

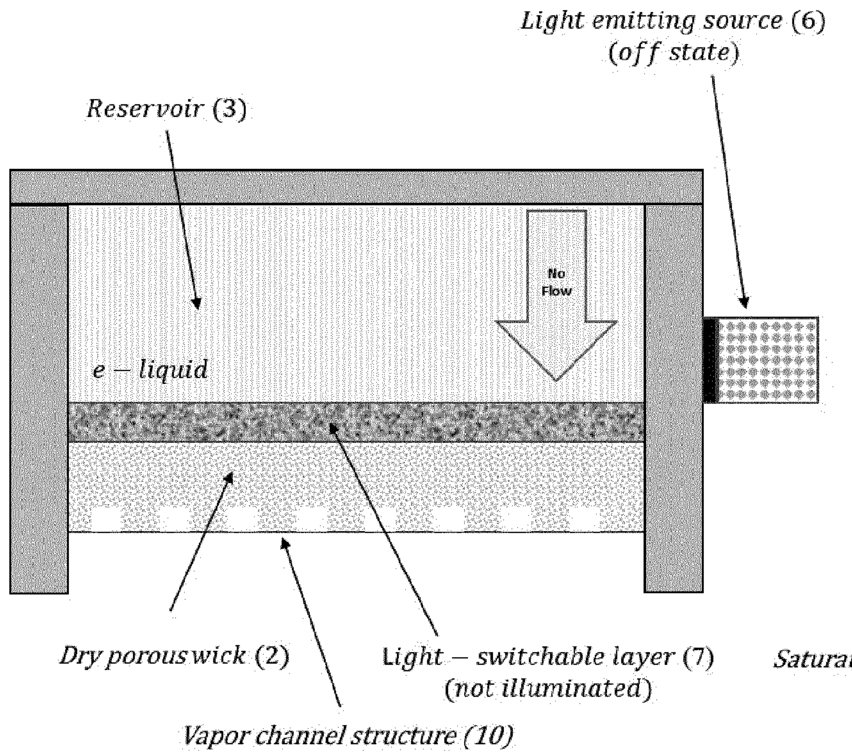


Figure 5 (ON state)

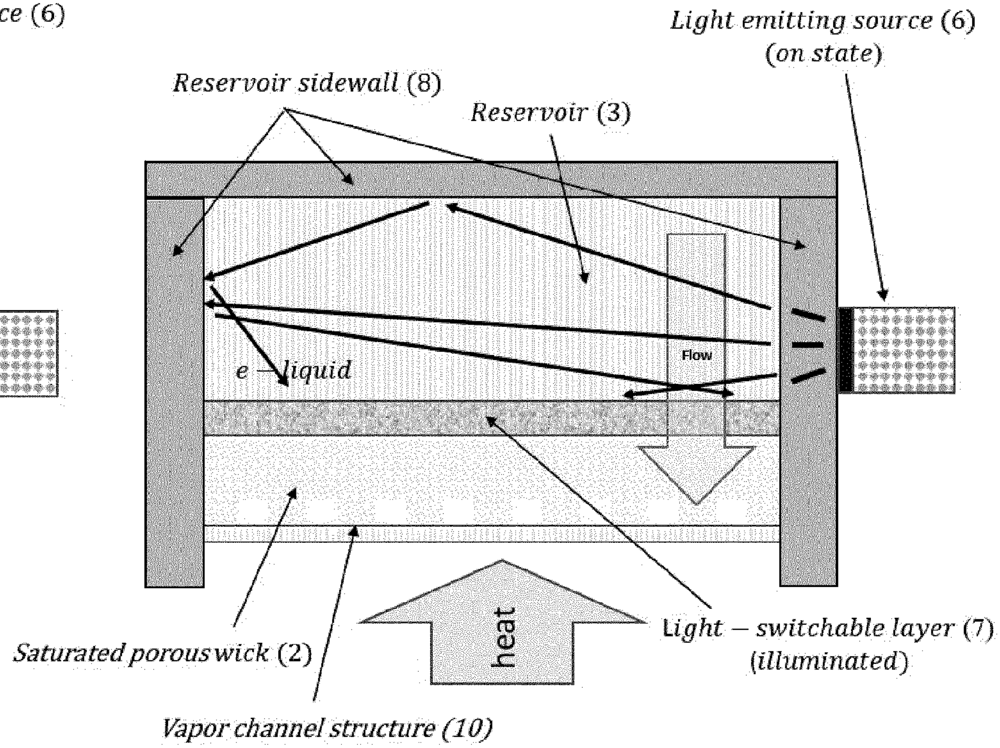


Figure 6 (OFF state)

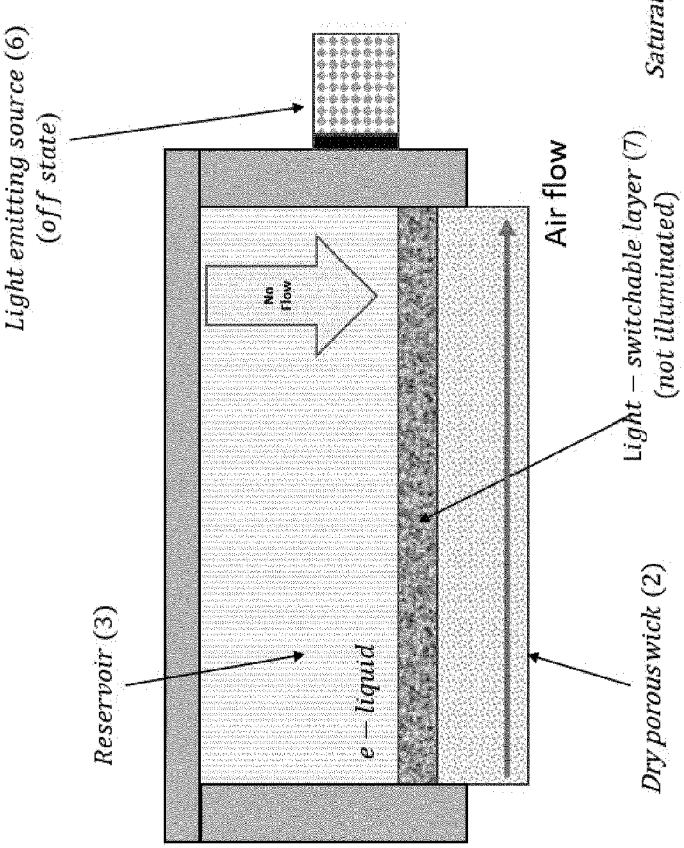
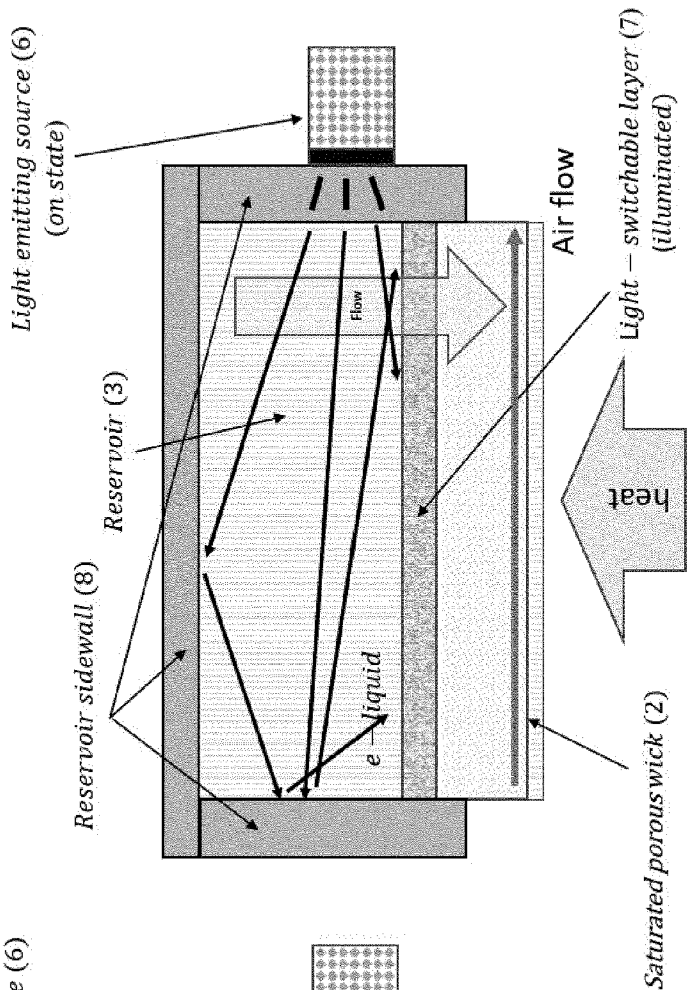


Figure 7 (ON state)



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EUROPEAN SEARCH REPORT

Application Number
EP 21 20 5538

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A	WO 2020/070110 A1 (PHILIP MORRIS PRODUCTS SA [CH]) 9 April 2020 (2020-04-09) * page 9, line 23 - page 10, line 2; claims; figures * * page 10, line 10 - page 11, line 8 * -----	1-15	INV. A24F40/44
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A	CN 206 808 673 U (SHENZHEN FIRST UNION TECH CO) 29 December 2017 (2017-12-29) * abstract; figures * -----	1-15	
A	WO 2017/182554 A1 (JT INT SA [CH]) 26 October 2017 (2017-10-26) * page 10, line 8 - page 12, line 22; claims; figures * -----	1-15	

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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	12 April 2022	Marzano Monterosso

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