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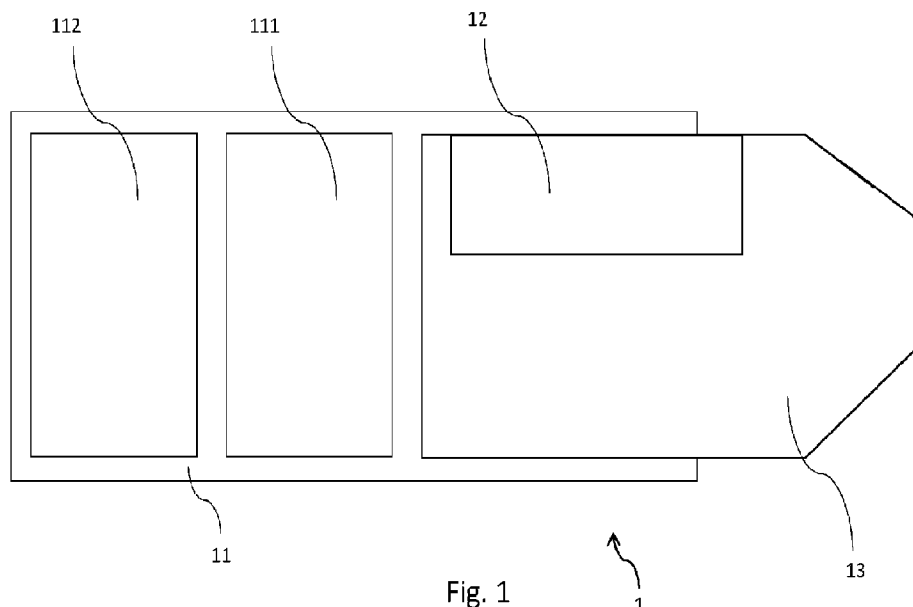


Fig. 1

(57) **Abrégé/Abstract:**

An aerosol generation device comprising: a power supply module comprising an electrical power supply; a substrate module comprising a container for an aerosol substrate; and a heater module configured to detachably engage with the power supply module, the heater module comprising: a mouthpiece; a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol substrate together for generating the aerosol, wherein: the container of the substrate module is sealed prior to engaging with the heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module, the heater module receiving means is adapted to partly enclose the substrate module when engaged therewith, and the power supply module is adapted to partly enclose the heater module when engaged therewith. Additionally described are the power supply module, substrate module and heater module as individual elements, as well as packages for distributing a plurality of substrate modules.



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Abstract:

An aerosol generation device comprising: a power supply module comprising an electrical power supply; a substrate module comprising a container for an aerosol substrate; and a heater module configured to detachably engage with the power supply module, the heater module comprising: a mouthpiece; a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol substrate together for generating the aerosol, wherein: the container of the substrate module is sealed prior to engaging with the heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module, the heater module receiving means is adapted to partly enclose the substrate module when engaged therewith, and the power supply module is adapted to partly enclose the heater module when engaged therewith. Additionally described are the power supply module, substrate module and heater module as individual elements, as well as packages for distributing a plurality of substrate modules.

AEROSOL GENERATION DEVICE

TECHNICAL FIELD

The following disclosure relates to devices for generating an aerosol which is inhaled by a user, such as electronic cigarettes. In particular, the disclosure relates to aerosol generation devices where the aerosol is generated by heating an aerosol substrate.

BACKGROUND

Aerosol generation devices consume an aerosol substrate in order to generate an aerosol. A user of the device must replace the aerosol substrate periodically in order to generate more of the aerosol.

Additionally, aerosol generation devices often include a mouthpiece through which the user may inhale the generated aerosol. The mouthpiece must be kept clean to maintain hygiene.

It is desirable to make it easy for the user to use the device. The simplest way to achieve this is to make the entire device disposable, such that the user replaces the aerosol substrate and provides a clean mouthpiece, by replacing the entire device. Alternatively, the consumable aerosol substrate can be packaged in a container configured to interface with the device, such that the user can replace the container without having to directly handle the aerosol substrate. Additionally, the mouthpiece may be provided as a part of the container.

However, it is also desirable to reduce the environmental impact of the aerosol generation device. This goal can conflict with making the device easy to use, because some types of container are not environmentally friendly, and an entirely disposable aerosol generation device may also not be environmentally friendly.

Accordingly, it is desirable to provide an aerosol generation device which supports easy and clean replacement of an aerosol substrate while reducing environmental impact.

SUMMARY

According to a first aspect, the present disclosure provides an aerosol generation device comprising: a power supply module comprising an electrical power supply;

a substrate module comprising a container for an aerosol substrate; and a heater module configured to detachably engage with the power supply module, the heater module comprising: a mouthpiece; a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol substrate together for generating the aerosol, wherein: the container of the substrate module is sealed prior to engaging with the heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module, the heater module is adapted to partly enclose the substrate module when engaged therewith, and the power supply module is adapted to partly enclose the heater module when engaged therewith.

By providing a three-module device, the power supply module, substrate module and heater module can be individually replaced only as often as necessary. Furthermore, each module can be made of entirely different materials and manufactured separately before being assembled into the device. The assembly of modules to form the complete aerosol generation device can be performed by the end user and/or performed as an additional industrial manufacturing stage.

Optionally, the aerosol substrate is a liquid or gel.

Liquid or gel substrates are particularly difficult for a user to handle directly, and the benefits of providing a container for the substrate are greater than for a solid substrate.

Optionally, the substrate module comprises a fluid transfer element configured to transfer liquid from the container to the heating element.

Providing a fluid transfer element configured to operate with the heater module makes handling a liquid substrate easier and more reliable to increase aerosol generation and decrease wastage of the substrate.

Optionally, the receiving means comprises a closure component arranged to open for receiving the substrate module and to close for aerosol generation.

By providing a closure component, the substrate module can be entirely contained within the receiving means during aerosol generation, meaning that the conditions for aerosol generation can be more precisely controlled, and the quality of generated aerosol can be improved.

- 5 Optionally, the receiving means is a clam-shell container or a container comprising a housing closed by a closing door.

A clam-shell container or housing-and-door container configuration each provide a specific closure component that is simple to operate and robust.

- 10 Optionally, the sealing of the container comprises a first layer that is not soluble in the aerosol substrate and a second layer that is soluble in the aerosol substrate.

With this configuration, a breach of the first layer becomes self-reinforcing as the second layer is exposed to the substrate, and dissolves to weaken the overall sealing.

- 15 Optionally, the soluble layer comprises a polysaccharide, starch or protein-based material or biodegradable polyvinylalcohol (PVA) film.

Optionally, the sealing of the container comprises a foil seal layer comprising a moisture barrier. This has the effect of improving hygiene and reducing moisture exchange between the substrate module and an environment.

- 20 Optionally, the container and/or sealing of the container comprises a polymer film comprising a gas barrier and/or moisture barrier layer or coating and at least one support layer.

Optionally, the gas and/or moisture barrier layer is EVOH, PVOH, SiOx, or natural wax or combinations thereof.

- 25 Optionally, the support layer comprises: paper, polylactic acid (PLA), poly(glycolic acid) (PGA), bio-PET, PBAT, polymer(s) of cellulose-derived or starch-derived biodegradable polymers (BPs), chitosan or microbially synthesized polyesters.

Optionally, the receiving means comprises a piercing element configured to pierce or cut the sealing of the container. This has the effect of making the device simpler and easier to operate, because a user does not need to manually open the

container upon providing a fresh substrate module for the aerosol generation device, and the container is opened under controlled conditions that are less likely to waste the aerosol substrate or create a mess due to a leak.

Optionally, the sealing of the container is configured to break upon melting,
5 burning or decomposing upon heating by the heating element and the heating element is configured to melt, burn or decompose the sealing of the container. This makes the device simpler and easier to operate, because a user does not need to manually open the container upon providing a fresh substrate module for the aerosol generation device, and the container is opened under controlled
10 conditions that are less likely to waste the aerosol substrate or create a mess due to a leak.

Optionally, the heater module is configured to open the sealing of the container upon commencing aerosol generation. This has the advantage of not opening the substrate module until the user wishes to perform aerosol generation, allowing the
15 user to store a substrate module in the device without any risk of a leak and, in the general case where multiple different aerosol substrates can be used in the device, allowing the user to change their mind about which aerosol substrate should be used by swapping the substrate module even after the substrate module has engaged with the receiving means.

20 Optionally, the substrate module is biodegradable or compostable (according to EN1342 Standard). This reduces the environmental impact of the device, particularly because the part of the device that is expected to be replaced most frequently has reduced environmental impact.

Optionally, the container and/or the sealing of the container comprise a
25 polysaccharide, starch or protein-based material, paper, polylactic acid (PLA), poly(glycolic acid) (PGA), bio-PET, PBAT, polymer(s) of cellulose-derived or starch-derived biodegradable polymers (BPs), chitosan or microbially synthesized polyesters.

Optionally, the heating element is detachable from the heater module. This
30 improves the adaptability of the device such that parts can be replaced only as frequently as necessary. For example, some users may wish to improve hygiene

by replacing the mouthpiece with the heater module more often than they replace the heating element. On the other hand, in some embodiments, the mouthpiece can be cleaned or covered to remain hygienic for longer, and the heating element may have a shorter lifetime than the rest of the heater module. Additionally or
5 alternatively, the heating element may be detached for the purpose of cleaning to extend its lifetime.

Optionally, the electrical power supply is detachable from the power supply module. This has the advantage that the device may be used continuously by swapping the electrical power supply. For example, rechargeable batteries could
10 be swapped into the aerosol generation device such that one battery can be used in the device while another is being recharged. Furthermore, this feature eliminates the need for a recharging port in rechargeable aerosol generation device embodiments.

According to a second aspect, the present disclosure provides a heater module
15 for an aerosol generation device, wherein the aerosol generation device comprises: a power supply module comprising an electrical power supply, wherein the power supply module is adapted to partly enclose the heater module when engaged therewith; and a substrate module comprising a container for an aerosol substrate, the heater module being configured to detachably engage with
20 the power supply module, the heater module comprising: a mouthpiece; a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol substrate together for generating the aerosol, wherein: the container
25 of the substrate module is sealed prior to engaging with the heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module, and the heater module is adapted to partly enclose the substrate module when engaged therewith.

According to a third aspect, the present disclosure provides a substrate module
30 for an aerosol generation device, wherein the aerosol generation device comprises: a power supply module comprising an electrical power supply; and a heater module configured to detachably engage with the power supply module,

the heater module comprising: a mouthpiece; and a heating element configured to receive power from the electrical power supply and heat an aerosol substrate to generate an aerosol; wherein the power supply module is adapted to partly enclose the heater module when engaged therewith, the substrate module comprising a container for the aerosol substrate, wherein: the substrate module is configured to detachably engage with a receiving means of the substrate module, the receiving means being configured to bring the heating element and the aerosol substrate together for generating the aerosol, the container of the substrate module is sealed prior to engaging with the heater module, and the sealing of the container is adapted to break upon the substrate module engaging with the heater module, and the heater module is adapted to partly enclose the substrate module when engaged therewith.

According to a fourth aspect, the present disclosure provides a package comprising: a plurality of substrate modules according to the third aspect; and a cardboard support.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic block diagram of an aerosol generation device;

Figs. 2A, 2B and 2C are schematic block diagrams of modules of the aerosol generation device in a disassembled state;

Fig. 3 is a schematic block diagram of a first example of a heater module receiving a substrate module;

Fig. 4 is a schematic block diagram of a second example of a heater module;

Fig. 5 is a schematic block diagram of a third example of a heater module receiving a substrate module;

Fig. 6 is a schematic block diagram of a fourth example of a heater module receiving a substrate module;

Fig. 7 is a schematic block diagram of a fifth example of a heater module receiving a substrate module;

Figs. 8A to 8D are schematic block diagrams of a sixth example of a heater module receiving a substrate module;

Fig. 9 is a schematic block diagram of a package of replaceable modules for an aerosol generation device.

5 DETAILED DESCRIPTION

Fig. 1 is a schematic block diagram of an aerosol generation device 1. The aerosol generation device is modular and can be assembled and disassembled in use.

Specifically, the aerosol generation device 1 comprises a power supply module
10 11, a substrate module 12 and a heater module 13.

Figs. 2A, 2B and 2C are schematic block diagrams illustrating disassembled modules of the aerosol generation device 1.

As shown in Fig. 2A, the power supply module 11 comprises an electrical power supply 111. The electrical power supply 111 may be any means of electrical power
15 storage, such as a battery. The electrical power supply 111 is preferably rechargeable. The power supply module 11 may additionally have a charging port for charging the electrical power supply 111.

Optionally, the power supply module 11 may additionally comprise control circuitry 112 to control delivery of power from the electrical power supply 111 to the heater
20 module 13. The control circuitry 112 may, for example, comprise a user input such as a button or switch to activate the heater module, and may also comprise a timing circuit for controlling a cycle of aerosol generation. The control circuitry may comprise sensing means for controlling aerosol generating conditions such as a pressure or flow rate sensor.

25 As further shown in Fig. 2A, the power supply module 11 comprises a heater module engaging element 113 for engaging with and partially enclosing the heater module 13. This may for example take the form of a recess with a screw thread or one or more flexible clips or magnets that are adapted to engage with corresponding features of the heater module 13. Additionally, the heater module

engaging element 113 comprises electrical contacts for supplying power to the heater module 13.

In some embodiments, the electrical power supply 111 is detachable from the power supply module 11. For example, the electrical power supply 111 may be a
5 rechargeable or disposable battery, and may be one of a plurality of electrical power supplies 111 that can be swapped into the aerosol generation device 1 and charged outside the device 1.

The power supply module 11 may be further configured to separate, providing an electrical power supply 111, a control circuitry 112 and a casing including the
10 heater module engaging element 113, such that each element of the power supply module 11 can be individually replaced only as required. Allowing disassembly of modules of the device also improves recyclability, by improving the ease of separating parts comprising different materials.

As shown in Fig. 2B, the substrate module 12 comprises a container for an aerosol
15 substrate 121.

The aerosol substrate 121 may be a liquid or gel aerosol substrate, for example comprising an aerosolisation agent and a flavourant. In particular, the aerosol substrate 121 may comprise nicotine, and may be used to generate a nicotine-containing aerosol as in reduced-risk smoking applications. The formulations of the
20 aerosol substrate usually comprise, in addition to nicotine, further components such as solvents, thickening agents, stabilizing agents, flavoring and/or taste regulators. Alternatively, the aerosol substrate 121 may be a solid or semi-solid aerosol substrate such as a tobacco product. This may be tobacco in dried or cured form, in some cases with additional ingredients for flavouring or producing
25 a smoother or otherwise more pleasurable experience. In some examples, the substrate such as tobacco may be treated with a vaporising agent. The vaporising agent may improve the generation of vapour from the substrate. The vaporising agent may include, for example, a polyol such as glycerol, or a glycol such as propylene glycol. The substrate may be provided as a solid or paste type material
30 in shredded, pelletised, powdered, granulated, strip or sheet form, optionally a combination of these.

In some cases, the aerosol substrate may contain no tobacco, or even no nicotine, but instead may contain naturally or artificially derived ingredients for flavouring, volatilisation, improving smoothness, and/or providing other pleasurable effects.

The container may take the form of a soft bag or capsule, or may have a rigid
5 form. The container is sealed prior to the substrate module 12 being assembled into the aerosol generation device 1, and a sealing 122 of the container is broken upon or after assembly of the aerosol generation device 1. The sealing 122 may form the whole of, or only one or more specific parts of, the container. The sealing 122 may be broken by any suitable means including piercing, cutting, bursting,
10 heating, burning, melting, or decomposing. For instance, the sealing may comprise a weakened area such as a reduced thickness or a weaker seam.

The container and/or sealing 122 preferably comprises a foil layer (such as aluminium foil) to improve hygiene and preserve freshness prior to the sealing 122 being broken.

15 The container and/or sealing may additionally or alternatively comprise a polymer layer to increase the strength of the sealing without increasing a required foil thickness. The polymer layer may be chosen to have a relatively low melting or decomposing temperature, so that the sealing 122 can be relatively easily broken by a deliberate thermal effect (e.g. heating, burning, melting, decomposing) that
20 can be supplied by the heater module 13 but is unlikely to be experienced during storage.

In embodiments that combine a foil layer and a polymer layer, a thickness of the foil layer may be made sufficiently thin so that the foil layer preserves freshness prior to use of the substrate module 12 but, after the polymer layer is broken, the
25 foil layer is not strong enough to maintain the integrity of the sealing 122 on its own. This means that the foil layer may be broken, for example, using a mechanical force such as tearing, breaking or piercing or using a thermal effect that is not actually hot enough to melt the material from which the foil layer is made (e.g. aluminium).

In an embodiment, the container may be substantially impervious to moisture and/or gas, for example to protect an aerosol substrate that contains hygroscopic or oxygen-sensitive components that may deteriorate during storage or reduce shelf life.

- 5 The container and/or sealing may comprise a polymer film comprising a gas barrier and/or moisture barrier layer or coating. The gas barrier and/or moisture barrier layer or coating may, for example, be EVOH, PVOH, SiOx, natural wax.

The container and/or sealing layer may further comprise at least one support layer. The support layer or layers may be polymer or cellulose or a combination thereof.

- 10 The polymer may be biodegradable or compostable (According to EN1342 Standard).

The polymer may be derived from renewable resources such as polylactic acid (PLA), poly(glycolic acid) (PGA). In an example, the container and/or sealing may be paper, PLA or PGA coated with natural wax or a laminate of paper, PLA or PGA
15 and natural wax.

The support layer may also be formed of biodegradable or compostable polymer(s) derived from non-renewable resources can be: bio-PET (Ethylene polyterephthalate), PBAT (Polybutylene adipate terephthalate).

- The support layer may also be formed of biodegradable or compostable
20 polymer(s) of cellulose-derived or starch-derived biodegradable polymers (BPs), chitosan or microbially synthesized polyesters such as PHB (polyhydroxybutyrate), P3HB, PHV or PHBV. Where the aerosol substrate 121 is a liquid or gel, the container and/or sealing 122 may additionally or alternatively comprise a layer that is soluble in the substrate, but is either not in contact with
25 the substrate prior to breaking the seal, or is only soluble when the substrate has been heated above room temperature. For example, the soluble layer may comprise a polysaccharide, starch or protein-based material or biodegradable polyvinylalcohol (PVA) film.

The materials for the substrate module 12 are preferably chosen such that the substrate module 12 is biodegradable or compostable, at least after the aerosol substrate 121 has been consumed. In one embodiment, this is achieved by providing the aerosol substrate in a container that is entirely made from a biodegradable or compostable sealing layer 122. The container and/or sealing layer may, for example, comprise a polysaccharide, starch or protein-based material.

As shown in Fig. 2C, the heater module 13 comprises a mouthpiece 131, a heating element 132 and a receiving means 133.

10 The mouthpiece 131 is configured for a user to draw aerosol from the aerosol generation device 1.

The heating element 132 is configured to receive power from the electrical power supply 111 (when the aerosol generation device 1 is assembled) and to heat the aerosol substrate 121 to generate an aerosol.

15 As used herein, the term “aerosol” shall mean a system of particles dispersed in the air or in a gas, such as mist, fog, or smoke. Accordingly the term “aerosolise” (or “aerosolize”) means to make into an aerosol and/or to disperse as an aerosol. For the avoidance of doubt, aerosol is used to consistently describe mists or droplets comprising atomised, volatilised or vaporised particles. Aerosol also includes mists or droplets comprising any combination of atomised, volatilised or vaporised particles.

The heating element 132 may be any suitable heater, producing heat via electrical resistance or via a chemical reaction that can be controlled electrically. For example, the heating element 132 may comprise a resistive wire or mesh. Alternatively, combustion of a fuel in the heating element may be electrically controlled by controlling ignition and controlling the supply of fuel to a combustion point, similar to the mechanism of a conventional lighter.

In embodiments where the aerosol substrate 121 is heated inside the substrate module 12, the heating element 132 may be arranged on a surface of the receiving

means 133 or embedded in the heater module 13 close to a surface of the receiving means 133. In other embodiments, the aerosol substrate 121 is transferred out of the substrate module 12 (as in examples below), and the heating element 132 may be located wherever is appropriate for generating the aerosol.

- 5 The receiving means 133 is configured to detachably engage with the substrate module 12 and to bring the heating element 132 and the aerosol substrate 121 together for generating the aerosol. The receiving means 133 of Fig. 2C is also configured to at least partly enclose the substrate module 12 in order to improve the change of the substrate module 12 correctly engaging when inserted by a user, and in order to at least partly fix a position of the substrate module 12 during aerosol generation. More specifically, in some embodiments, the receiving means 133 comprises a recess in a surface of the heater module 13.

As further shown in Fig. 2C, in some embodiments, the receiving means 133 comprises a closure component 1331 arranged to open for receiving the substrate module 12 and to close for aerosol generation. The closure component may take the form of a simple hinged door as shown in Fig. 2C, a clam-shell configuration where the door has a recess for receiving part of the substrate module 12, or may take other forms such as a sliding door on a rail, or a separate lid that is detachable from the heater module 13 or attached by a flexible connection.

- 20 The closure component is, in some embodiments, configured to seal a recess of the receiving means 133 such that the aerosol substrate 121 is contained in the receiving means 133 even if it leaks from the substrate module 12.

In other embodiments, the heater module engaging element 113 may also serve as an alternative to a closure component 1331. More specifically, as shown in Fig. 1, the heater module engaging element 113 can be configured to at least partly enclose the substrate module 12 within the receiving means 133 of the heater module 13. In such embodiments, the closure component 1331 may be omitted.

When the aerosol generation device 1 is assembled as shown in Fig. 1, the heater module 13 engages with the substrate module 12 and with the power supply

module 11 to form a complete aerosol generation device 1 that has a supply of aerosol substrate 121 and of electrical power 111 to be used with the heating element 132 to generate the aerosol.

Fig. 3 is a schematic block diagram of a first example of a heater module 13
5 receiving a substrate module 12.

In this example, the heater module 13 additionally comprises an air flow inlet 134 and an air flow outlet 135 arranged to allow a user to inhale air with aerosol via the mouthpiece 131. The power supply module 11 may comprise a hole corresponding to the air flow inlet, or may otherwise be shaped to leave a gap for
10 the air flow inlet.

The inlet and outlet 134, 135 are connected via respective channels to the receiving means 133 where they each end with a respective piercing elements 1332 configured to pierce the sealing 122 of the substrate module 12 upon the heater module 13 engaging with the substrate module 12. The piercing elements
15 may simply be protruding ends of the channels that are sharp enough to break the sealing 122 when a user pushes the substrate module 12 into the receiving means 133 or when the closure component 1331 is moved to a closed position.

The configuration of Fig. 3 is suitable when the aerosol substrate 121 is a porous solid or semi-solid substrate. When the aerosol generation device 1 is assembled
20 and the user inhales at the mouthpiece 131, air flows in through the inlet 134, through the substrate 121 and out through the outlet 135. The heating element 132 may be activated to transmit heat through the broken sealing 122 and to heat the aerosol substrate 121 to generate the aerosol. Thus, as the air flows through the substrate 121, the aerosol is added to the air flow and provided to the user.

25 Fig. 4 is a schematic block diagram of a second example of a heater module.

In the second example, a closure component 1331 takes the form of a clam-shell in which two parts of the receiving means 133 are hinged together so that the substrate module 12 can be received entirely within the heater module 13. In this particular example, the two parts are hinged near the mouthpiece but the two parts

could be hinged elsewhere, for example at a bottom end of the heater module or along a longitudinal side in the axial direction of the module.

Similarly to Fig. 3, piercing elements 1332 are again arranged at the ends of channels connected to an air flow inlet and outlet, and the air flow inlet and outlet
5 are configured to direct air through the aerosol substrate 121 (when the substrate module 12 is inserted).

Additionally, each part of the clam-shell comprises a heating element 132. More generally, any number of heating elements 132 can be included in embodiments, with different configurations, to improve efficiency of generating the aerosol.

10 Fig. 5 is a schematic block diagram of a third example of a heater module receiving a substrate module.

In the third example, the heater module 13 comprises an aerosol generation chamber 136 that is separate from the substrate module 12, and comprises a fluid transfer element configured to transfer a fluid or gel aerosol substrate 121 from
15 the substrate module 12 to the aerosol generation chamber 136.

The fluid transfer element 137 may for example be a capillary tube. An end of the fluid transfer element 137 extends into the receiving means and comprises a piercing element arranged to pierce the sealing 122 of a substrate module 12. Another end of the fluid transfer element 137 extends up to or into the aerosol
20 generation chamber 136.

In the third example, the heating element 132 is arranged near the fluid transfer element 137. For example, the heating element 132 may be arranged in a loop or coil around the fluid transfer element 137 or a resistive circuit printed on the element 137. The heating element 132 may be located between the receiving
25 means 133 and the aerosol generation chamber 136, or may be located in the aerosol generation chamber 136 (as shown in Fig. 5).

The fluid transfer element 137 may be formed from a material with high thermal conductivity in order to improve heat transfer from the heating element 132 to the aerosol substrate 121 as it passes through the fluid transfer element 137. For

example, the fluid transfer element 137 may be formed from a metal. The fluid transfer element may also be made of ceramic.

In some embodiments, the fluid transfer element 137 may comprise a pump (not shown).

5 With the configuration of Fig. 5, the aerosol substrate 121 is aerosolised as it leaves the fluid transfer element 137 and enters the aerosol generation chamber 136. As air flows through the aerosol generation chamber 136, this carries the aerosol to the mouthpiece 131. Fig. 6 is a schematic block diagram of a fourth example of a heater module 13 receiving a substrate module 12.

10 The fourth example is largely similar to the third example, except the fluid transfer element 137 does not have a piercing element 1332. Instead, the heating element 132 is configured to activate to supply heat towards the substrate module 12 and to provide a thermal effect (such as heating, burning, melting or decomposing) to break the sealing 122. The aerosol substrate 121 is then transferred through the
15 fluid transfer element either through capillary action or through pumping.

As with the configurations of Figs. 2C and 4, a closure component 1331 may be configured to close around the substrate module 12. The closure component 1331 may advantageously press the sealing 122 against the end of the fluid transfer element 137 to improve heat transfer efficiency for breaking the sealing 122 and
20 to reduce the chance of the aerosol substrate 121 leaking between the substrate module 12 and the receiving means 133.

This configuration, which lacks a piercing element 1332, has the advantage that the sealing 122 is not broken until the heating element 132 is activated at the time of aerosol generation, and therefore the substrate module 12 can be stored in the
25 assembled aerosol generation device 1 without any risk that a liquid or gel aerosol substrate 121 leaks through the broken sealing 122.

Fig. 7 is a schematic block diagram of a fifth example of a heater module receiving a substrate module.

The fifth example is largely similar to the fourth example, except the fluid transfer element 123 forms part of the substrate module 12 rather than the heater module 13.

5 Instead of the fluid transfer element, in this example, the heater module 13 has a gap 138 connecting the receiving means 133 to the aerosol generation chamber 136. The gap 138 is sized to receive the fluid transfer element 123, so that the fluid transfer element 123 extends past the heating element 132 and up to or into the aerosol generation chamber 136.

10 As with the fourth example, the sealing 122 is broken by a thermal effect caused by the heating element 132.

Figs. 8A to 8D are schematic block diagrams of a sixth example of a heater module receiving a substrate module.

15 The sixth example is largely similar to the third example, except the fluid transfer element 137 is replaced with a moveable fluid transfer element 1371 configured to break the sealing 122 after the heater module 13 engages with the substrate module 12.

Figs. 8A and 8C show a state of the moveable fluid transfer element 1371 prior to breaking the sealing 122, with Fig. 8C being a magnified view focussing on the moveable fluid transfer element 1371.

20 In Figs. 8A and 8C, the moveable fluid transfer element 1371 is in a retracted position in a gap 138, extending into the aerosol generation chamber 136, and not protruding from a surface of the receiving means 133.

25 The heating element 132 is arranged in the aerosol generation chamber 136 (preferably as a loop around the moveable fluid transfer element 1371), and an actuator 139 is arranged between the aerosol generation chamber 136 and the receiving means 133. The actuator 139 is configured to move the moveable fluid transfer element 1371. The actuator 139 may be any suitable actuator. For example, the actuator may comprise a grip engaged with the moveable fluid transfer element 1371, a spring configured to bias the grip towards the retracted

position, and an electromagnet configured to bias the grip towards an extended position when activated.

In Figs. 8B and 8D, the moveable fluid transfer element 1371 is in the extended position in the gap 138, extending out of the surface of the receiving means 133 and breaking the sealing 122 of the substrate module 12. An other end of the moveable fluid transfer element 1371 is still adjacent to the heating element 132. Thus, in the extended position, the aerosol substrate 121 can be drawn out of the substrate module 12 and the aerosol can be generated.

The sixth example of a heater module 13 may be configured to only move the moveable fluid transfer element 1371 into the extended position when the user is ready for aerosol generation. This means that the sealing 122 is not broken prior to commencing aerosol generation, and the risk of a leak is reduced when the substrate module 12 is stored assembled in the device 1.

The aerosol generation device 1 may be distributed in various forms. In some embodiments, the aerosol generation device 1 may be distributed as a fully formed device having a power supply module 11, a substrate module 12 and a heater module 13. The device 1 may also be distributed as a kit comprising a power supply module 11, one or more substrate modules 12 and one or more heater modules 13.

In many embodiments, the substrate module 12 will be replaced more frequently than the heater module 13 or the power supply module 11, and the substrate module 12 may be distributed as a package of one or more substrate modules 12.

Fig. 9 is a schematic block diagram of a package 2 of replaceable modules for an aerosol generation device.

As shown in Fig. 9, a plurality of substrate modules 12 may be distributed in a form where they are attached to a cardboard support 21. The cardboard support 21 may, for example, be an open cardboard sheet, a pair of open cardboard sheets between which the substrate modules are arranged, or a cardboard enclosure surrounding the substrate modules 12. Each substrate module 12 may be attached to the cardboard support 21 using a dot of glue. Using a cardboard

support has the advantage that, if the substrate modules 12 are biodegradable as described above, then the whole package is biodegradable.

Furthermore, if the number of substrate modules 12 which can be used with a heater module 13 while maintaining hygiene of the mouthpiece 131 is known, then
5 the substrate module 12 and heater module 13 can be distributed accordingly in a package with multiple substrate modules 12 per heater module 13. The number of substrate modules 12 per heater module 13 may typically be in the range of six to twenty. Each of the substrate modules 12 and the heater module 13 may be wrapped, for example in a foil pack such as flow wrap, for hygiene and to protect
10 the module before use. In the example shown in Fig. 9, the heater module 13 is recommended to be replaced after every six substrate modules 12 have been used, and the package 2 comprises one heater module 13 and six substrate modules 12 mounted on or enclosed in a cardboard support 21.

In some embodiments, it is also advantageous to allow replacing the mouthpiece
15 131 separately from the heating element 132, with either being replaced more frequently than the other. In order to accommodate this, the heating element 132 may be detachable from the heater module 13. For example, the heating element 132 may be fixed by press fitting to the heater module 13.

In one example shown in Fig. 10, the heater module 13 comprises a cradle 1321
20 adapted to receive the heating element 132 via the receiving means 133. More specifically, when the closure component 1331 is in an open position, and no portion 2 of aerosol generating substrate is present, the receiving means 133 may provide access to the cradle 1321 for inserting the heating element 132. The heating element 132 may for example be a disposable resistive element adapted
25 to engage with electrical contacts in the cradle 1321, and the cradle may consist of supports for two opposite ends of the heating element, each support having an electrical contact.

CLAIMS

1. An aerosol generation device comprising:
a power supply module comprising an electrical power supply;
a substrate module comprising a container for an aerosol substrate; and
5 a heater module configured to detachably engage with the power supply module, the heater module comprising:
a mouthpiece;
a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and
10 a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol substrate together for generating the aerosol,
wherein:
the container of the substrate module is sealed prior to engaging with the
15 heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module,
the receiving means is adapted to partly enclose the substrate module when engaged therewith, and
the power supply module is adapted to partly enclose the heater module
20 when engaged therewith.
2. An aerosol generation device according to claim 1, wherein the aerosol substrate is a liquid or a gel.
3. An aerosol generation device according to claim 2, wherein the heater module or the substrate module comprises a fluid transfer element configured to
25 transfer liquid from the container to the heating element.
4. An aerosol generation device according to any preceding claim, wherein the receiving means comprises a closure component arranged to open for receiving the substrate module and to close for aerosol generation.
5. An aerosol generation device according to claim 4, wherein the receiving
30 means is a clam-shell container or a container comprising a housing comprising

- a recess dimensioned for receiving the aerosol substrate and closed by a closing door.
6. An aerosol generation device according to any preceding claim, wherein the sealing of the container comprises a first layer that is not soluble in the aerosol substrate and a second layer that is soluble in the aerosol substrate.
7. An aerosol generation device according to claim 6, wherein the soluble layer comprises a polysaccharide, starch or protein-based material or biodegradable polyvinylalcohol (PVA) film.
8. An aerosol generation device according to any preceding claim, wherein the sealing of the container comprises a foil seal layer comprising a moisture barrier.
9. An aerosol generation device according to claim 8, wherein the container and/or sealing of the container comprises a polymer film comprising a gas barrier and/or moisture barrier layer or coating and at least one support layer.
10. An aerosol generation device according to claim 9, wherein the gas and/or moisture barrier layer comprises EVOH, PVOH, SiOx, or natural wax or combinations thereof.
11. An aerosol generation device according to claim 9 or 10, wherein the support layer comprises: paper, polylactic acid (PLA), poly(glycolic acid) (PGA), bio-PET, PBAT, polymer(s) of cellulose-derived or starch-derived biodegradable polymers (BPs), chitosan or microbially synthesized polyesters.
12. An aerosol generation device according to any preceding claim, wherein the receiving means comprises a piercing element configured to pierce or cut the sealing of the container.
13. An aerosol generation device according to any preceding claim, wherein the sealing of the container is configured to break upon melting, burning or decomposing upon heating by the heating element and the heating element is configured to melt, burn or decompose the sealing of the container.

14. An aerosol generation device according to any of claims 6 to 13, wherein the heater module is configured to open the sealing of the container upon commencing aerosol generation.
15. An aerosol generation device according to any preceding claim, wherein
5 the substrate module is biodegradable or compostable.
16. An aerosol generation device according to claim 15, wherein the container and/or the sealing of the container comprise a polysaccharide, starch or protein-based material, paper, polylactic acid (PLA), poly(glycolic acid) (PGA), bio-PET, PBAT, polymer(s) of cellulose-derived or starch-derived biodegradable
10 polymers (BPs), chitosan or microbially synthesized polyesters.
17. An aerosol generation device according to any preceding claim, wherein the heating element is detachable from the heater module.
18. An aerosol generation device according to any preceding claim, wherein the electrical power supply is detachable from the power supply module.
- 15 19. A heater module for an aerosol generation device, wherein the aerosol generation device comprises:
- a power supply module comprising an electrical power supply, wherein the power supply module is adapted to partly enclose the heater module when engaged therewith; and
 - 20 a substrate module comprising a container for an aerosol substrate,
- the heater module being configured to detachably engage with the power supply module, the heater module comprising:
- 25 a mouthpiece;
 - a heating element configured to receive power from the electrical power supply and heat the aerosol substrate to generate an aerosol; and
 - a receiving means configured to detachably engage with the substrate module and bring the heating element and the aerosol
30 substrate together for generating the aerosol,

wherein:

the container of the substrate module is sealed prior to engaging with the heater module, and the heater module is configured to break the sealing of the container upon or after engaging with the substrate module, and

5 the receiving means is adapted to partly enclose the substrate module when engaged therewith.

20. A substrate module for an aerosol generation device, wherein the aerosol generation device comprises:

 a power supply module comprising an electrical power supply;

10 and

 a heater module configured to detachably engage with the power supply module, the heater module comprising:

 a mouthpiece; and

 a heating element configured to receive power from the electrical power supply and heat an aerosol substrate to generate an aerosol;

15 wherein the power supply module is adapted to partly enclose the heater module when engaged therewith,

 the substrate module comprising a container for the aerosol substrate,

20 wherein:

 the substrate module is configured to detachably engage with a receiving means of the substrate module, the receiving means being configured to bring the heating element and the aerosol substrate together for generating the aerosol,

 the container of the substrate module is sealed prior to engaging with the heater module, and the sealing of the container is adapted to break upon the substrate module engaging with the heater module, and

25 the receiving means is adapted to partly enclose the substrate module when engaged therewith.

21. A package comprising:

30 a plurality of substrate modules according to claim 20; and
 a cardboard support.

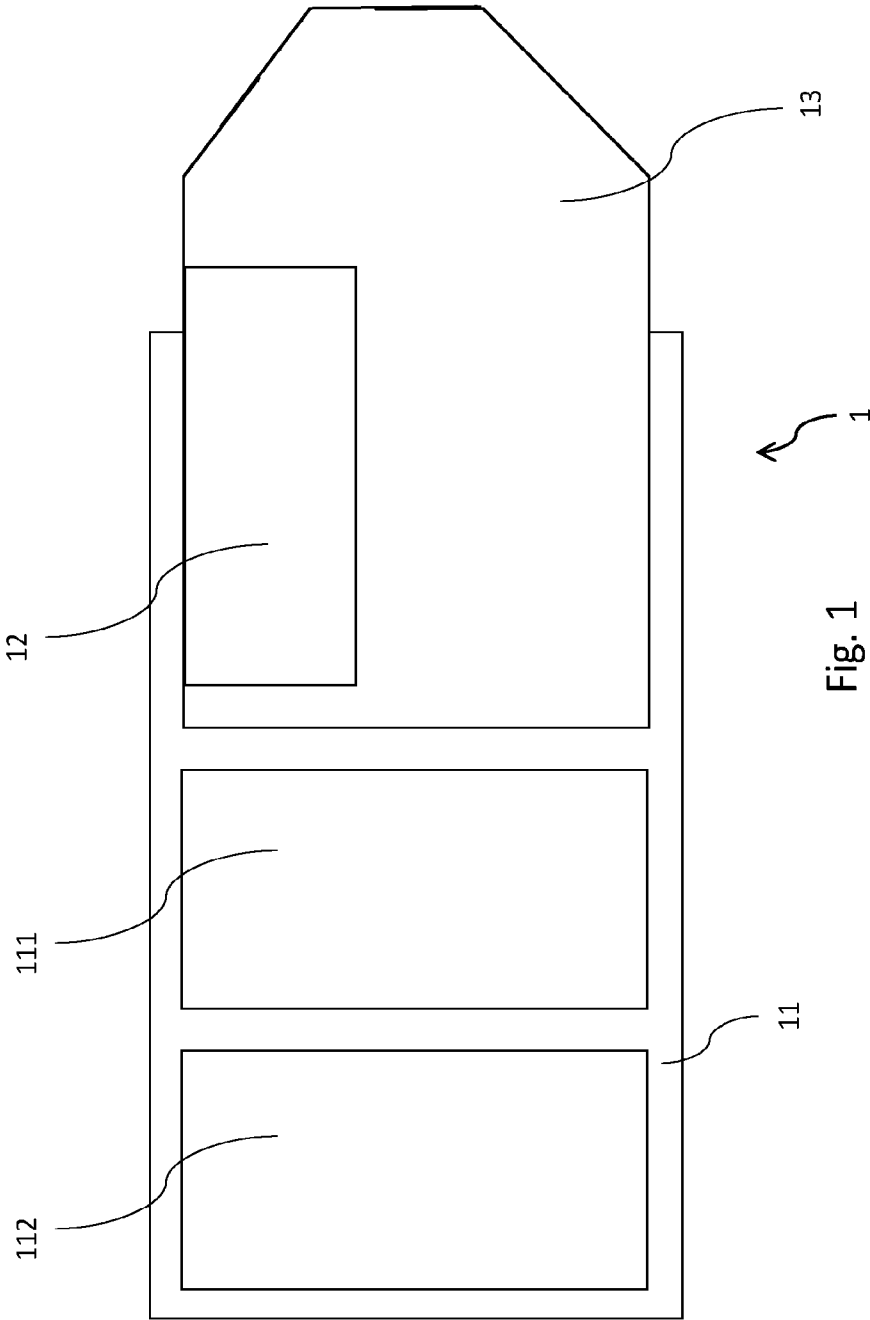


Fig. 1

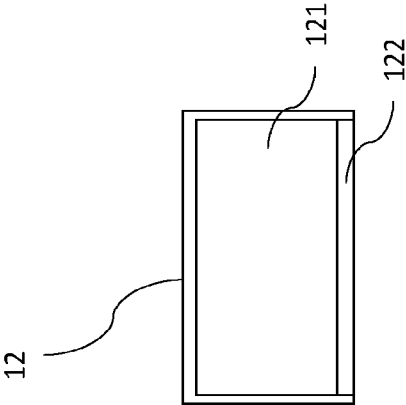


Fig. 2B

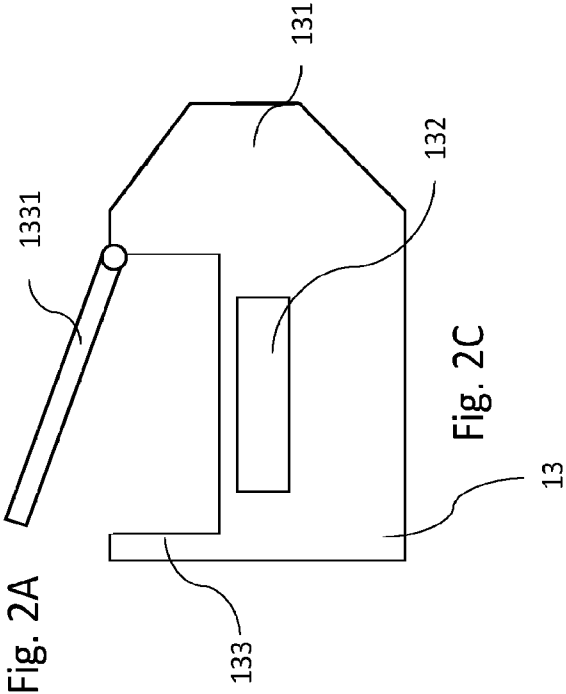
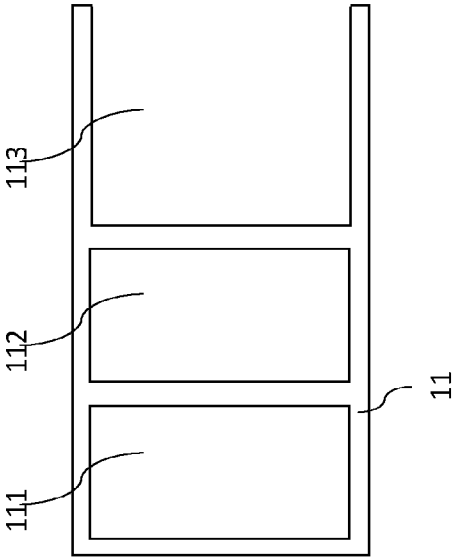


Fig. 2A

Fig. 2C

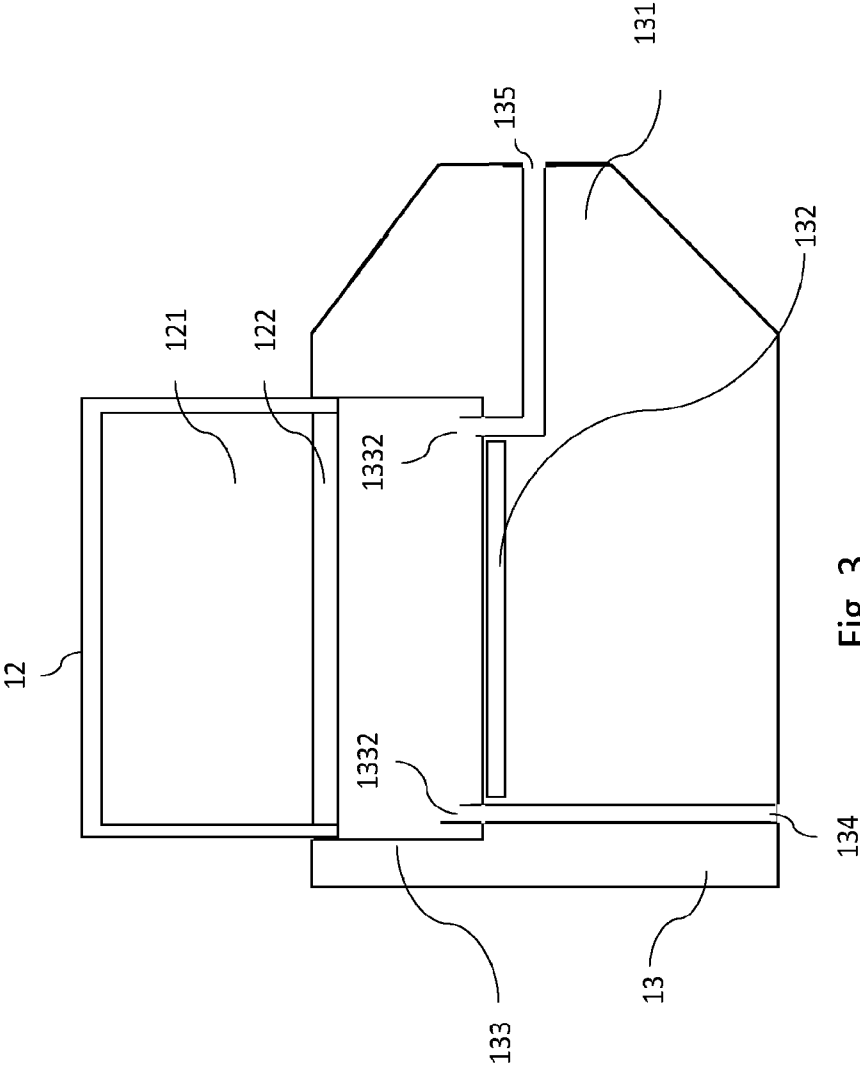


Fig. 3

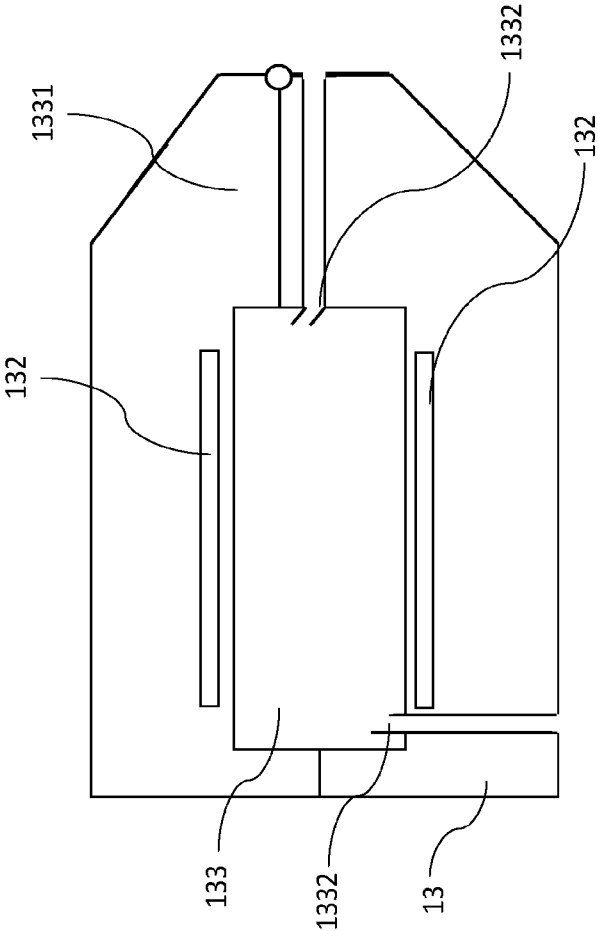
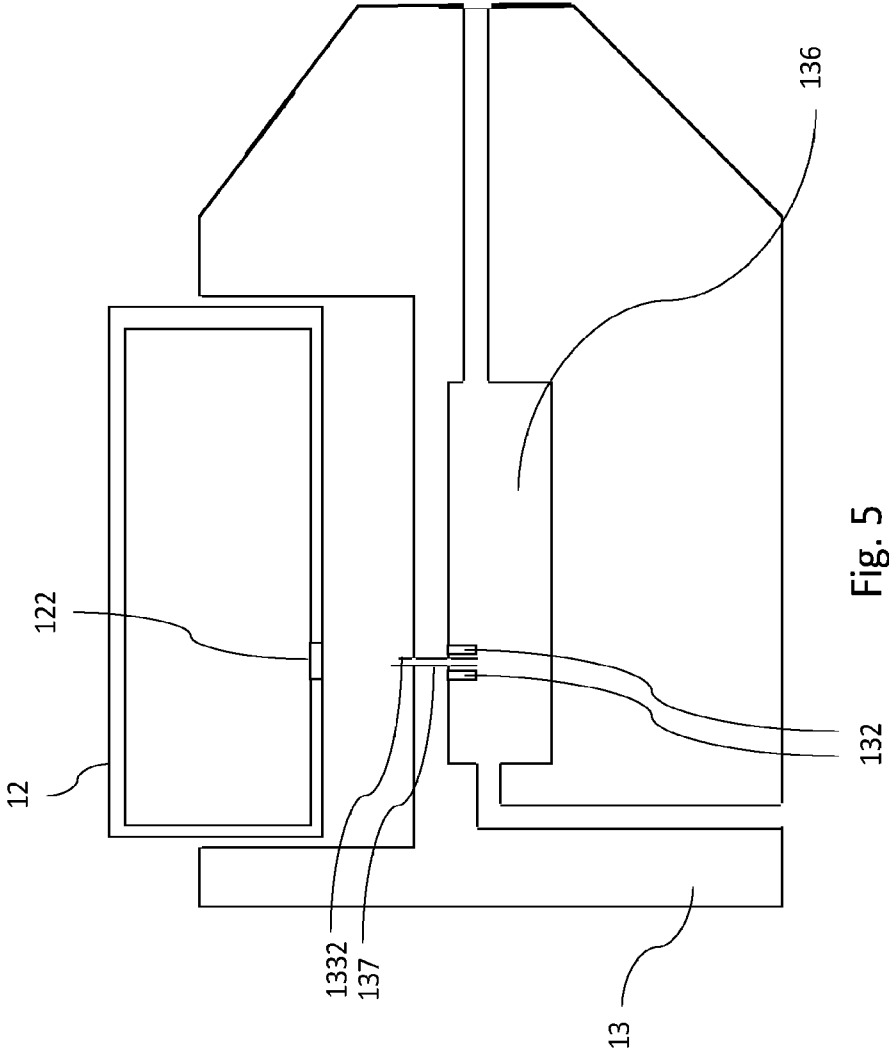
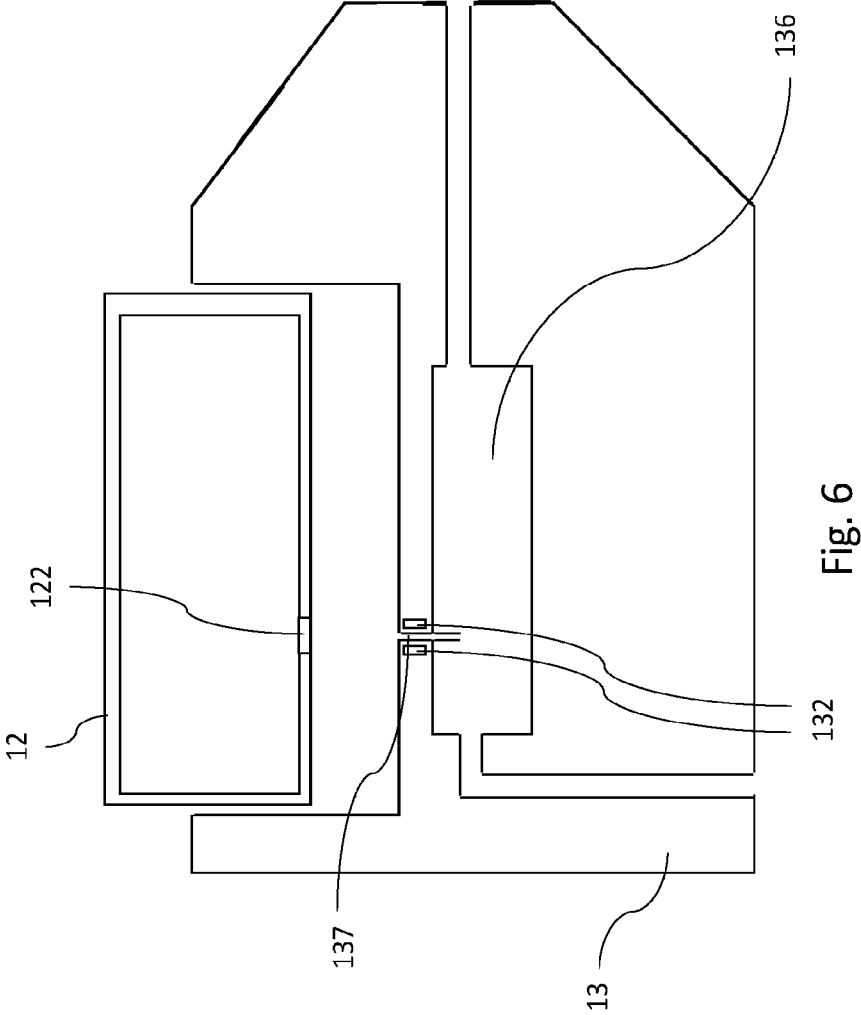
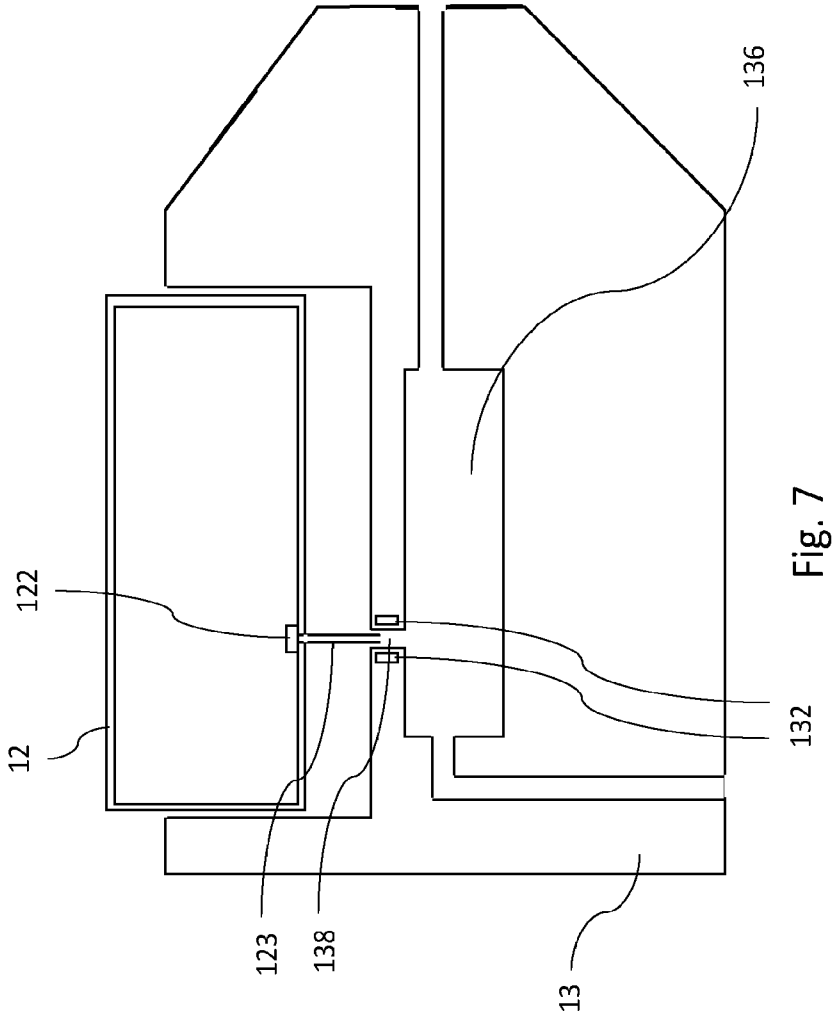
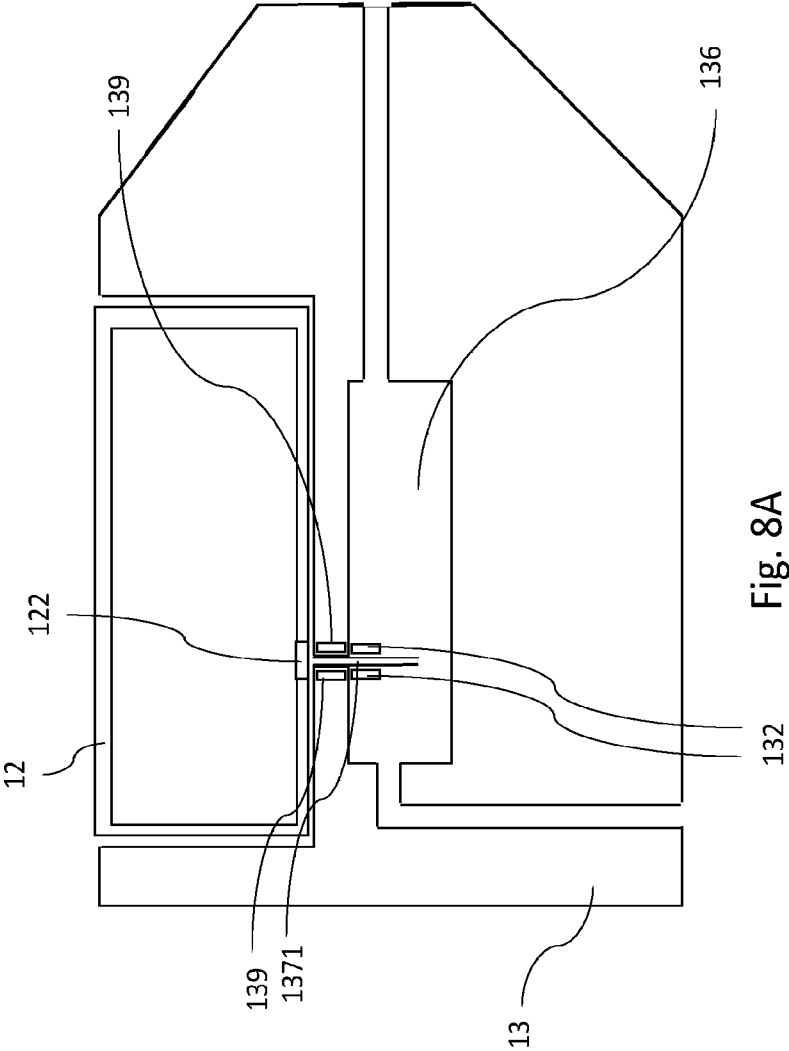


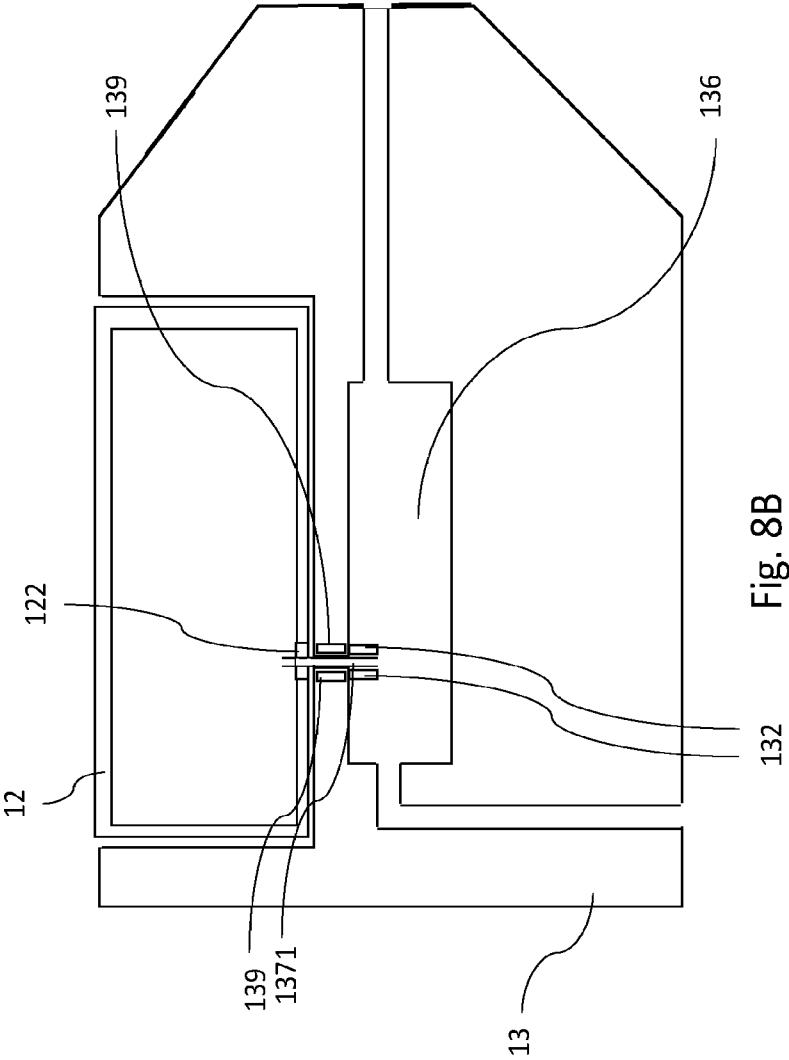
Fig. 4











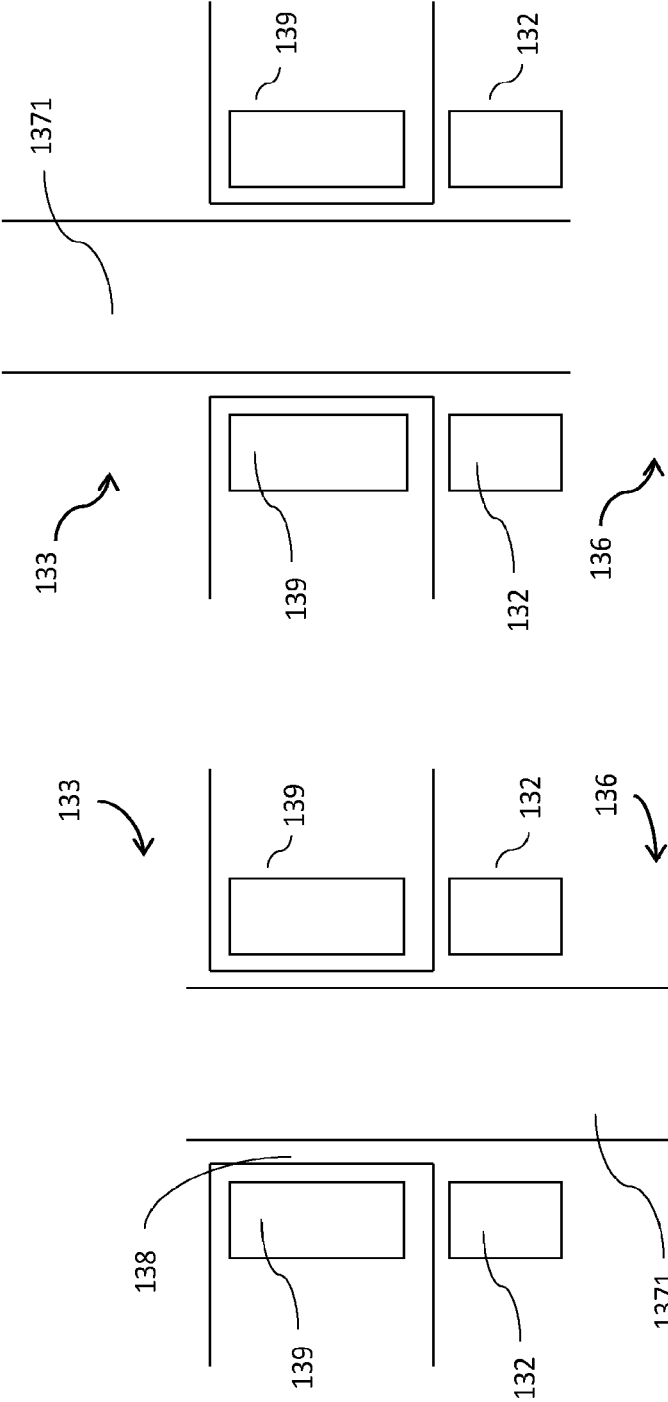


Fig. 8D

Fig. 8C

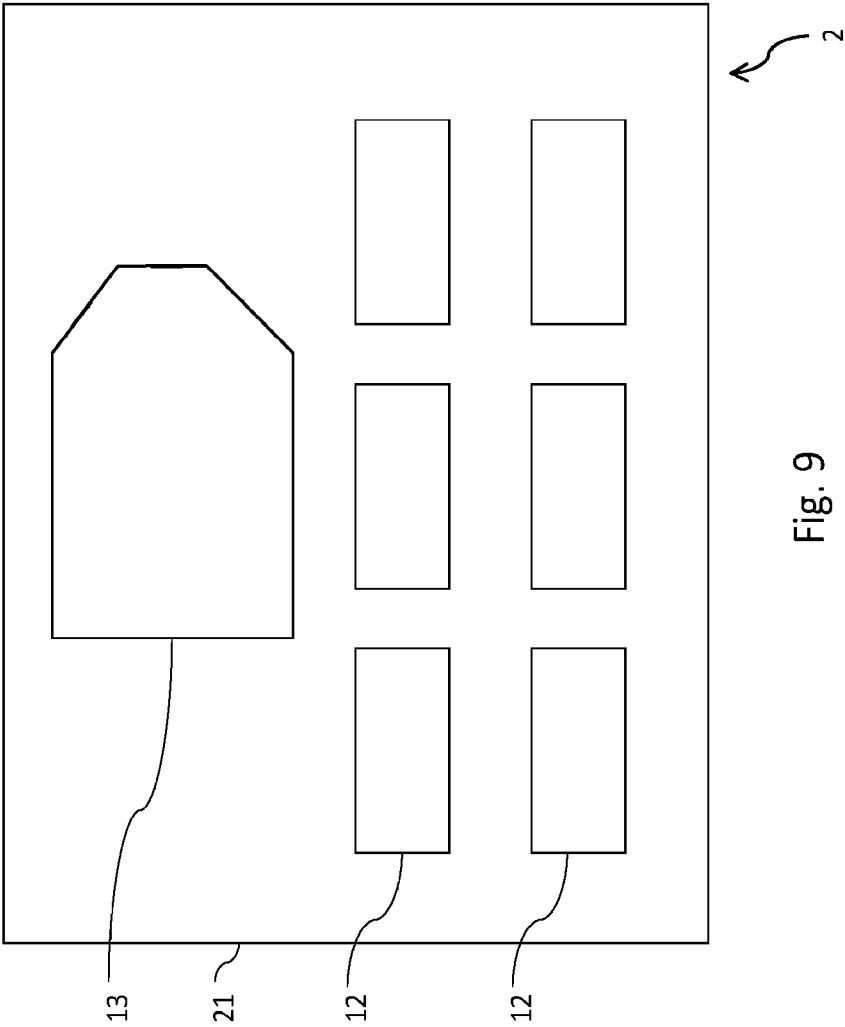


Fig. 9

