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(54) **Title:** A POWER MODULE FOR A MODULAR AEROSOL GENERATING DEVICE AND A MODULE FOR A MODULAR AEROSOL GENERATING DEVICE

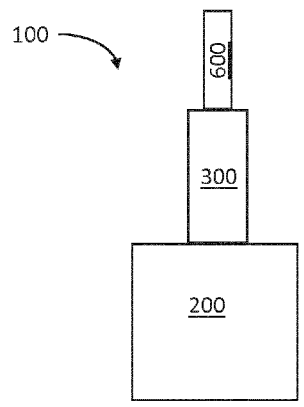

Figure 1

(57) **Abstract:** There is described a power module for a modular aerosol generating device for generating an inhalable aerosol. The power module is arranged so that a user can configure the aerosol generating device by selectively connecting to the power module a single module that is either a module of a first module type or a module of a second module type. The module of the first module type is for containing a non e-liquid material and comprises a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol. The module of the second module type is for containing an e-liquid for generating an inhalable aerosol.

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A POWER MODULE FOR A MODULAR AEROSOL GENERATING DEVICE AND A MODULE FOR A MODULAR AEROSOL GENERATING DEVICE

Technical Field

The present invention relates to a power module for a modular aerosol generating device, a module for a modular aerosol generating device and a modular aerosol generating device.

Background

Smoking articles such as cigarettes, cigars and the like burn tobacco during use to create tobacco smoke.

Attempts have been made to provide alternatives to these articles that burn tobacco by creating products that release compounds without burning.

Examples of such products are heating devices which release compounds by heating, but not burning, the material. The material may be for example tobacco or other non-tobacco products, which may or may not contain nicotine.

As another example, there are so-called e-cigarette devices. These devices typically contain a liquid, referred to as an e-liquid, which is heated to vaporise the liquid to produce an inhalable vapour or aerosol. The liquid may contain nicotine and/or flavourings and/or aerosol-generating substances, such as glycerol. E-cigarette devices typically do not contain or use tobacco.

As yet another example, there are so-called hybrid devices. These hybrid devices typically contain separately an e-liquid and tobacco or other flavour material. The liquid is heated to vaporise the liquid to produce an inhalable vapour or aerosol which passes through the tobacco or other flavour material so that a flavour is imparted to the vapour or aerosol.

Summary

According to a first aspect of the present invention, there is provided a power module for a modular aerosol generating device for generating an inhalable aerosol wherein the power module is arranged so that a user can configure the aerosol generating device by selectively connecting to the power module a single module that is either a module of a first module type or a module of a second module type, wherein the module of the first module type is for containing a non e-liquid material and comprises a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol and the module of the second module type is for containing an e-liquid for generating an inhalable aerosol.

The power module may comprise control circuitry configured to apply a first control scheme appropriate for controlling a module of the first module type when a module of the first module type is connected to the power module and to apply a second control scheme appropriate for controlling a module of the second module type when a module of the second module type is connected to the power module.

The control circuitry may be configured to identify which of the module of the first type and the module of the second type is connected to the power module.

The control circuitry is configured to select which of the first and second control schemes is to be applied in response to identifying which of the module of the first type and the module of the second type is connected to the control module.

According to a second aspect of the invention, there is provided a module of a first module type for use with the power module of the first aspect, the module of the first module type comprising a housing for containing a non e-liquid material and a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol and a first module type connection interface for connecting the module to the power module.

According to a third aspect of the invention, there is provided a module of a second module type for use with the power module of the third aspect, the module of the second module type comprising a housing for containing an e-liquid and an aerosol generating arrangement that can be activated to generate an inhalable aerosol from the e-liquid and a second module type connection interface for connecting the module to the power module.

According to a fourth aspect of the invention, there is provided a modular aerosol generating device for generating an inhalable aerosol, the device comprising: the power module of the first aspect; a module of the first module type of the second aspect; or, a module of the second module type of the third aspect.

Further features and advantages of the invention will become apparent from the following description of preferred embodiments of the invention, given by way of example only, which is made with reference to the accompanying drawings. Like features appearing in different ones of the drawings are giving the same reference numerals in the different drawings.

Brief Description of the Drawings

Figure 1 shows a schematic view of a modular aerosol provision device;

Figure 2 shows a schematic view of a module of a first module type;

Figure 3 shows a schematic view of a module of a second module type;

Figure 4 shows a schematic view of a power module;

Figure 5 shows a schematic view of a mouthpiece.

Detailed Description

Referring to Figure 1, a schematic of an example of a modular aerosol provision device 100 is illustrated. The aerosol provision device 100 is an inhalation device (i.e. a user uses it to inhale an aerosol produced by the device 100 and the device 100 is a hand-held device.

In very broad outline, the device 100 generates a vapour or an aerosol which passes from the device 100 into the mouth of a user when the user draws on the device 100.

In this respect, first it may be noted that, in general, a vapour is a substance in the gas phase at a temperature lower than its critical temperature, which means that for example the vapour can be condensed to a liquid by increasing its pressure without reducing the temperature. On the other hand, in general, an aerosol is a colloid of fine solid particles or liquid droplets, in air or another gas. A colloid is a substance in which microscopically dispersed insoluble particles are suspended throughout another substance. For reasons of convenience, as used herein the term aerosol should be taken as meaning an aerosol, a vapour or a combination of an aerosol and vapour.

Returning to Figure 1, the device 100 comprises a power module 200, a module 300 for containing a substance for generating an aerosol and, in this example, a mouthpiece 600. Advantageously, and as will be explained in more detail below, a user can configure the device 100 by selecting the type of module 300 to connect to the power module 200. In this example, the module 300 is either a module of a first module type or a module of a second module type. The module of the first module type is for containing a non e-liquid material and comprises a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol and the module of the second module type is for containing an e-liquid for generating an inhalable aerosol.

Referring now to Figure 2, there is illustrated an example of a module of the first module type 300a. The module of the first module type 300a comprises a housing 402 that comprises a cylindrical channel 403 running through the housing 402. The cylindrical channel 403 comprises an outlet 406 at one end 407, which is a proximal end, of the module 300a and is closed at the other end 409, which is a distal end, of the module 300a. The module 300a is for receiving in the channel 403 a material 408 which is a non e-liquid material. In some examples, the material 408 is a loose material that is contained within the channel 403. In those examples, the housing 402 may comprise an outlet screen 412 for preventing material from passing out of the outlet 406. The

outlet screen 412 may be removeable to allow a user to replenish material 408 within the channel 403. The outlet screen 412 is porous to allow aerosol to pass through.

In some examples, the material 408 may be held within its own container (not illustrated), for example an open-ended tube, which is itself within the channel 403. The tube may be formed of a suitable material, for example, a cellulose acetate wrapping or plastic.

The module of the first module type 300a further comprises a heating arrangement 414 for heating the material 408. The heating arrangement 414 may be of any suitable type including a resistive heating arrangement, an inductive heating arrangement and a radiative heating arrangement.

The material 408 typically comprises tobacco although some other botanical or flavourant agent may also be used.

In some examples, the material 408 has been ground or otherwise treated so that it is in the form of particles, for example, powder, granules, grains, fibres or the like so as to increase the active surface area of the material in order to maximise the amount of flavour provided by the material 408.

The module of the first module type 300a further comprises a first module type first connection interface 418 at the end 409 and a first module type second connection interface 420 at the outlet 406.

The first connection interface 418 is for releasably connecting the module of the first module type 300a to the power module 200. The first connection interface 418 mechanically and electrically connects the module of the first module type 300a to the power module 200.

The first connection interface 418 may comprise for example a threaded connection for connecting to a complimentary threaded connection of the power module 200 to provide a simple standardised mechanical connection between the two.

The second connection interface 420 is for releasably connecting the module of the first module type 300a to the mouthpiece 600.

The housing 400 further comprises an air flow inlet 422 for enabling air to flow into the channel 403.

Referring now to Figure 3, there is illustrated schematically an example of a module of the second module type 300b. The module of the second module type 300b comprises a housing 502 that contains a liquid container 506 for containing e-cig liquid 508.

In this example, the liquid container 506 is provided generally centrally of the module of the second module type 300b but other arrangements are possible. The liquid container 506 is cylindrical in shape, but may have a different shape, such as conical, cylindrical, etc. The liquid container 506 is annular and defines a cylindrical channel 507 running through the liquid container 506. The cylindrical channel 507 comprises an outlet 512 at one end 513 of the module and is closed at the other end 515 of the module. The liquid container 506 may be formed of rigid, watertight and airtight materials, such as metal, suitable plastics, etc.

In this example, the module of the second module type 300b is provided with a heater 514 and a wick 516 in thermal contact with the heater 514. In this example, the heater 514 and the wick 516 are provided as a single unit, sometimes known as an "atomiser". In this case, where the module of the second module type 300b includes an atomiser, such a module is often referred to as a "cartomiser".

The wick 516 is in fluidic contact with the liquid 508. The wick 516 is generally absorbent and acts to draw in liquid 508 from the liquid container 506 by capillary action. The wick 516 is preferably non-woven and may be for example a cotton or wool material or the like, or a synthetic material, including for example polyester, nylon, viscose, polypropylene or the like, or a ceramic material. In use, the heater 514 heats liquid in the wick 516 to generate an aerosol.

In alternative examples, the module of the second module type 300b is not provided with a heater to heat the liquid to generate an aerosol but is provided with alternative aerosol generating arrangement for example a piezo electric arrangement. As is known, in such arrangements, a mesh may be attached, either directly or indirectly, to a piezo arrangement, which in use causes the mesh to vibrate in response to an applied control current/voltage. The liquid is located under the mesh and as the mesh vibrates the liquid is pushed through the mesh to form an aerosol.

The module of the second module type 300b further comprises a second module type first connection interface 518 at the end 515 and a second module second connection interface 520 at the outlet 512.

The first connection interface 518 is for releasably connecting the module of the second module type 300b to a power module 200. The first connection interface 518 both mechanically and electrically connects the module of the second module type 300b to the power module 200.

The first connection interface 518 may comprise for example a threaded connection (which may be identical to that of the module of the first module type) for connecting to a complimentary threaded connection of the power module 200 to provide a simple standardised mechanical connection between the two.

The second connection interface 520 is for releasably connecting the module of the second module type 300b to the mouthpiece 600.

The housing 502 further comprises an air flow inlet 522 for enabling air to flow into the channel 507.

Referring now to Figure 4, there is illustrated a schematic drawing of a power module 200.

The power module 200 comprises a power source 202, for example, a battery for powering various components of the aerosol provision device 100. The battery 202 may be a rechargeable battery or a disposable battery. In this example, a control circuitry 204 is also provided for controlling the operation of various components of the device 100.

For example, the control circuitry 204 may be configured to apply a first control scheme appropriate for controlling a module of the first module type 300a (e.g. in terms of wattage, temperature, heating time or combinations thereof of the heater 414) when a module of the first module type 300a is connected to the power module 200 and to apply a second control scheme appropriate for controlling a module of the second module type 300b (e.g. in terms of wattage, temperature, heating time or combinations thereof of the heater 514) when a module of the second module type 300b is connected to the power module 200.

The control circuitry 204 may be configured to identify which of the module of the first type 300b and the module of the second type 300b is connected to the power module and further configured to select which of the first and second control schemes is to be applied in response to identifying which of the module of the first type 300a and the module of the second type 300b is connected to the power module.

In one example, the control circuitry 204 makes electrical measurements to determine the type of modules connected to it. For example, modules of the first module type may have a first electrical resistance associated with them (purely by way of example only, 1.2 ohm to 1.3 ohm) and modules of the second module type may have a second different electrical resistance associated with them (purely by way of

example only, 1.7 ohm to 1.8 ohm). Modules of the first type may have resistance values of between 1 ohm to 3 ohm, while modules of the second type may have resistance values of between 0.5 ohm to 4 ohm. The modules of the first and second type may have different resistance values to those described above. The control circuitry 204 may make one or more resistance measurements to identify what module is connected to it. This may particularly be the case where the resistance values of the first module type and the second module type are sufficiently different (i.e., the difference can be reliably detected by the control circuitry 204).

In a further example each module type may be provided with a transmitter, for example, a RF transmitter (such as an RFID tag) that transmits an identity signal that identifies the module. The control circuitry 204 may comprises a receiver for receiving the identity signals.

The power module 200 further comprises a power module connection interface 206 for releasably connecting the power module 200 to a module of the first module type 300a or to a module of the second module type 300b.

The connection interface 206 makes a mechanical connection with the first connection interface 418 of a module of the first module type 300a or the first connection interface 518 of a module of second module type 300b depending upon which module type is connected to the power module 200.

The connection interface 206 may comprise a threaded connection for connecting to a complimentary threaded connection of the module of the first type or of the module of the second type.

The connection interface 206 also makes an electrical connection with the first connection interface 418 of a module of the first module type 300a or the first connection interface 518 of a module of second module type 300b to supply power from

the power source 202 to the module of the first module type 300a or the module of the second module type 300b as the case may be.

Referring now to Figure 5, there is illustrated a mouthpiece 600. The mouthpiece 600 comprises a body 602 for being received in the mouth of a user. The body 602 comprises a channel 604 that runs along the length of the mouthpiece 600 from a mouthpiece inlet 606 to a mouthpiece outlet 608.

The inlet end 606 of the mouthpiece 600 is for connecting to the outlet end of a module of the first module type 300a or to the outlet end of a module of the second module type 300b.

Referring back to Figure 1, when the device 100 is configured as a THP device, the module 300 is a module of the first module type 300a.

The module of the first module type 300a is electrically connected to the power supply 202 in the power module 200 via the control circuitry 204 to enable the heater arrangement 414 in the module of the first module type 300a to be powered in accordance with a control scheme appropriate for the module of the first module type 300a.

When the heater arrangement 414 is powered (which may be instigated for example by the user operating a button (not shown) of the power module 200 or by a puff detector (not shown) of the overall device 100, as is known per se) the material 408 which may comprise tobacco is heated (but not burnt) by the heater 414 so as to generate an aerosol.

As the user draws on the mouthpiece 600, air is drawn from outside of the housing 402 through the air flow inlet 422 into channel 403 and material 408 volatised or vaporised by the heater arrangement 415 mixes with the airflow to produce a flow of an aerosol. The flow of aerosol is drawn through the channel 403 and through the channel 604 in the mouthpiece 600 for inhalation by a user.

Referring back again to Figure 1, when the device 100 is configured as an e-cig device, the module 300 is a module of the second module type 300b.

The module of the second module type 300b is electrically connected to the power supply 202 in the power module 200 via the control circuitry 204 to enable the heater 514 in the module of the second module type 300b to be powered in accordance with a control scheme appropriate for the module of the second module type 300b.

When the heater 514 is powered (which again may be instigated for example by the user operating a button (not shown) of the power module 200 or by a puff detector (not shown) of the overall device 100, as is known per se), liquid 508 drawn in from the liquid container 506 by the wick 516 is heated by the heater 514 so as to generate an aerosol.

In use, the liquid 508 may be heated to a temperature of between around70 - 300°C or more particularly around 150°C to 250°C. The liquid 508 may, or may not, comprise nicotine.

As the user draws on the mouthpiece 500, air is drawn from outside of the housing 502 through the air flow inlet 522 into the channel 507 and liquid 508 volatised or vaporised by the heater 514 mixes with the airflow to produce a flow of an aerosol. The flow of aerosol is drawn through the channel 507 and through the channel 604 in the mouthpiece 600 for inhalation by a user.

Accordingly, it will be appreciated that a user can very simply switch between configuring the device 100 as a THP device or an e-cig device simply by switching the type of module connected to the power module 200. This is very convenient and means that the user does not have to carry separate THP and e-cig devices on their person if they like using both types of devices.

In the example described above with respect to Figures 1 to 5, the control circuitry 204 for applying an appropriate control scheme for the module of the first module type 300a or the module of the second type 300b depending upon which is connected to the power module 200 is provided as part of the power module 200 itself. In alternative examples, rather than being provided in the power module 200, suitable control circuitry is provided in each of the module of the first module type 300a and the module of the second type 300b. In these examples, when a module of the first module type 300a or a module of the second type 300b is connected to the power module 200, the control circuitry in that module is electrically connected to the power source 202 in the power module 200 and applies an applies a control scheme suitable for that module. In these examples, either a module of the first module type 300a or a module of the second type 300b may be used with any suitable power module 200 that is arranged to be mechanically and electrically connectable to the modules and not just one that is provided with bespoke control circuitry.

In the examples described above, the mouthpiece 600 is separate from and releasably attachable to a module of the first module type 300a and a module of the second type 300b. In alternative examples, the mouthpiece 600 may be a part of a module of the first module type 300a and/or a part of a module of the second type 300b.

As used herein, the terms "flavour" and "flavourant" may refer to materials which, where local regulations permit, may be used to create a desired taste or aroma in a product for adult consumers. They may include extracts (e.g., licorice, hydrangea, Japanese white bark magnolia leaf, chamomile, fenugreek, clove, menthol, Japanese mint, aniseed, cinnamon, herb, wintergreen, cherry, berry, peach, apple, Drambuie, bourbon, scotch, whiskey, spearmint, peppermint, lavender, cardamom, celery, cascarilla, nutmeg, sandalwood, bergamot, geranium, honey essence, rose oil, vanilla, lemon oil, orange oil, cassia, caraway, cognac, jasmine, ylang-ylang, sage, fennel, piment, ginger, anise, coriander, coffee, or a mint oil from any species of the genus Mentha), flavour enhancers, bitterness receptor site blockers, sensorial receptor site activators or stimulators, sugars and/or sugar substitutes (e.g., sucralose, acesulfame potassium, aspartame, saccharine, cyclamates, lactose, sucrose, glucose, fructose,

sorbitol, or mannitol), and other additives such as charcoal, chlorophyll, minerals, botanicals, or breath freshening agents. They may be imitation, synthetic or natural ingredients or blends thereof. They may be in any suitable form, for example, oil, liquid, solid, or powder. For example, a liquid, oil, or other such fluid flavourant may be impregnated in a porous solid material so as to impart flavour and/or other properties to that porous solid material. As such, the liquid or oil is a constituent of the material in which it is impregnated.

The above embodiments are to be understood as illustrative examples of the invention. It is to be understood that any feature described in relation to any one embodiment may be used alone, or in combination with other features described, and may also be used in combination with one or more features of any other of the embodiments, or any combination of any other of the embodiments. Furthermore, equivalents and modifications not described above may also be employed without departing from the scope of the invention, which is defined in the accompanying claims.

CLAIMS

1. A power module for a modular aerosol generating device for generating an inhalable aerosol wherein the power module is arranged so that a user can configure the aerosol generating device by selectively connecting to the power module a single module that is either a module of a first module type or a module of a second module type, wherein the module of the first module type is for containing a non e-liquid material and comprises a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol and the module of the second module type is for containing an e-liquid for generating an inhalable aerosol.

2. A power module according to claim 1 wherein the power module comprises control circuitry configured to apply a first control scheme appropriate for controlling a module of the first module type when a module of the first module type is connected to the power module and to apply a second control scheme appropriate for controlling a module of the second module type when a module of the second module type is connected to the power module.

3. A power module according to claim 2 wherein the control circuitry is configured to identify which of the module of the first type and the module of the second type is connected to the power module.

4. A power module according to claim 3 wherein the control circuitry is configured to select which of the first and second control schemes is to be applied in response to identifying which of the module of the first type and the module of the second type is connected to the control module.

5. A power module according to any of claims 1 to 4, wherein the power module comprises a connection interface that can connect the power module to either the module of the first type or the module of the second type.

6. A power module according to claim 5 wherein the connection interface comprises a threaded connection for connecting to a complimentary threaded connection of the module of the first type or of the module of the second type.

7. A module of a first module type for use with the power module of any of claims 1 to 6, the module of the first module type comprising a housing for containing a non e-liquid material and a heater that can be activated to heat the non e-liquid material to generate an inhalable aerosol and a first module type connection interface for connecting the module to the power module.

8. A module according to claim 7 wherein the module further comprises module control circuitry for, in use, controlling the heater.

9. A module of a second module type for use with the power module of any of claims 1 to 6 the module of the second module type comprising a housing for containing an e-liquid and an aerosol generating arrangement that can be activated to generate an inhalable aerosol from the e-liquid and a second module type connection interface for connecting the module to the power module

10. A module according to claim 9 wherein the aerosol generating arrangement comprises one of a heater and a piezo electric arrangement.

11. A module according to claim 10 wherein the module further comprises module control circuitry for, in use, controlling the heater or the piezo electric arrangement.

12. A modular aerosol generating device for generating an inhalable aerosol, the device comprising:

the power module of any of claims 1 to 6;

a module of the first module type of any of claims 7 or 8; or;

a module of the second module type of any of claims 9 to 11.

13. A kit of parts for the modular aerosol generating device of claim 12, the kit comprising the power module, the module of the first module type and the module of the second module type.

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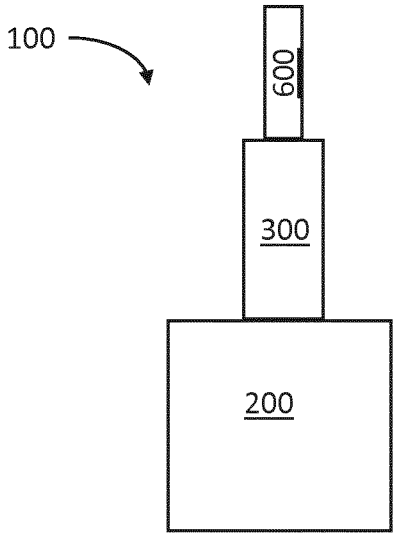

Figure 1

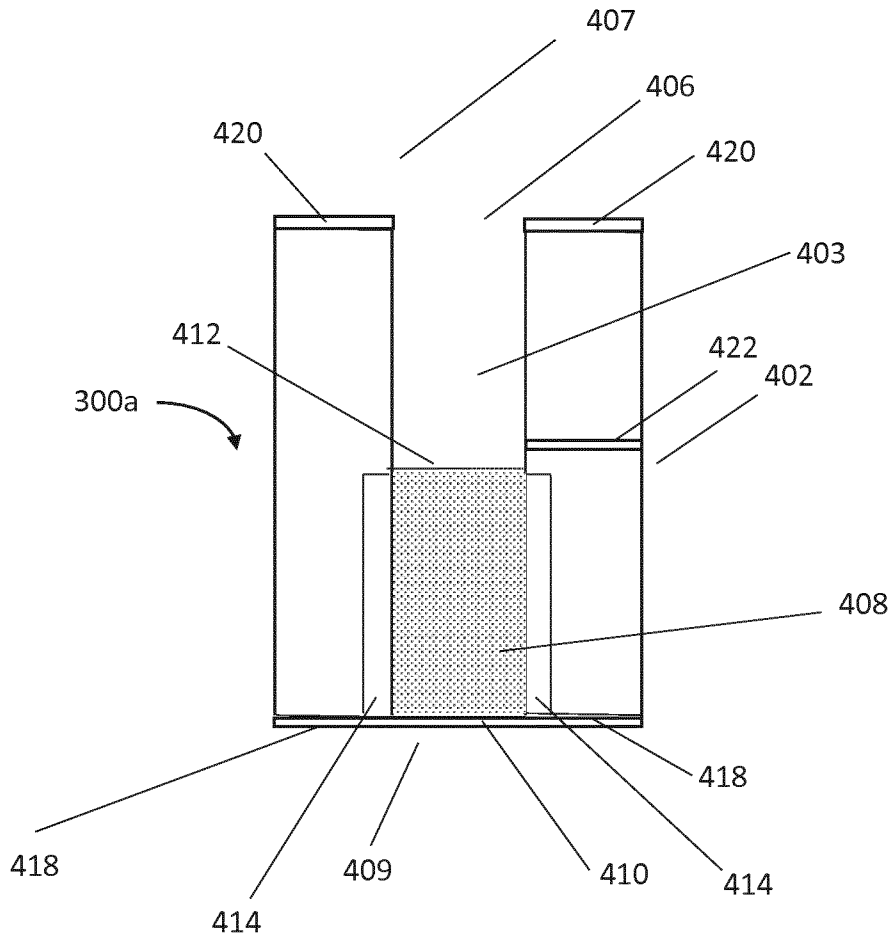

Figure 2

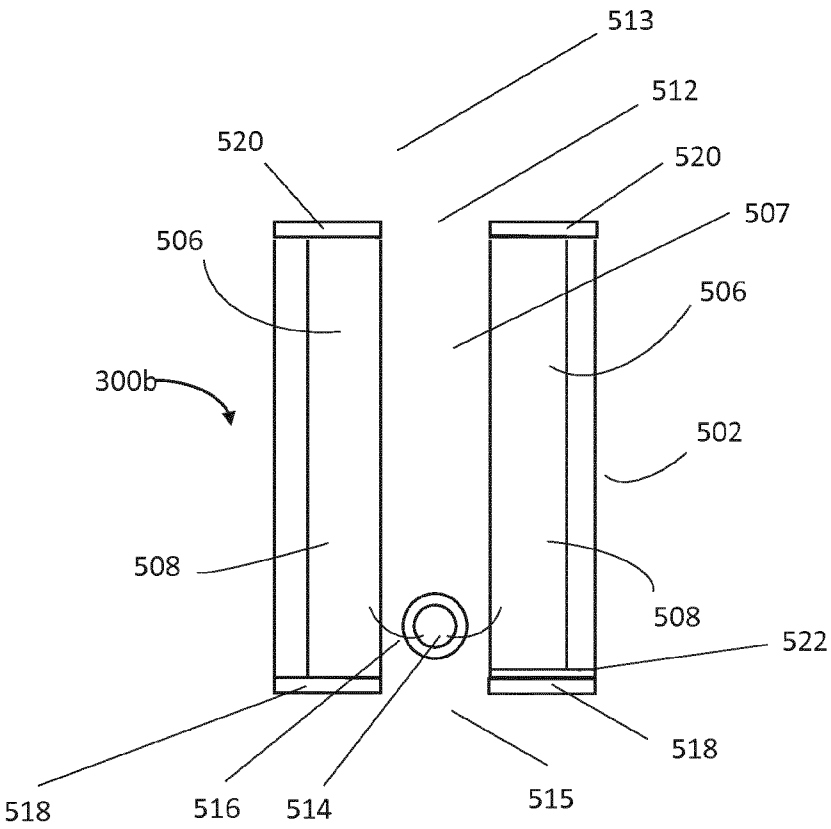
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Figure 3

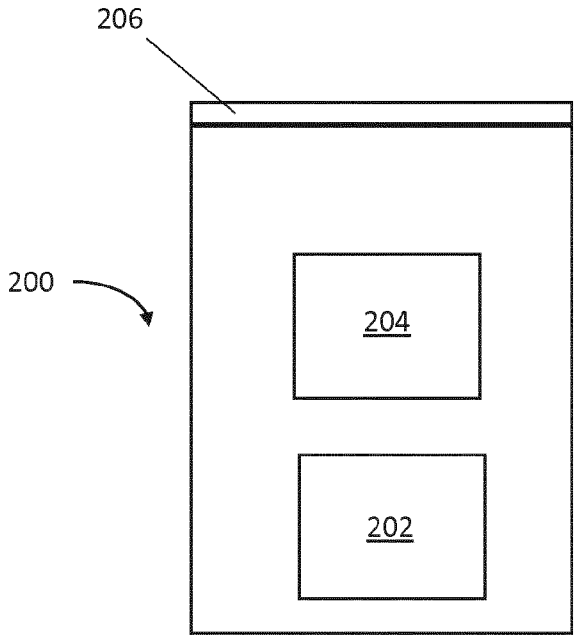

Figure 4

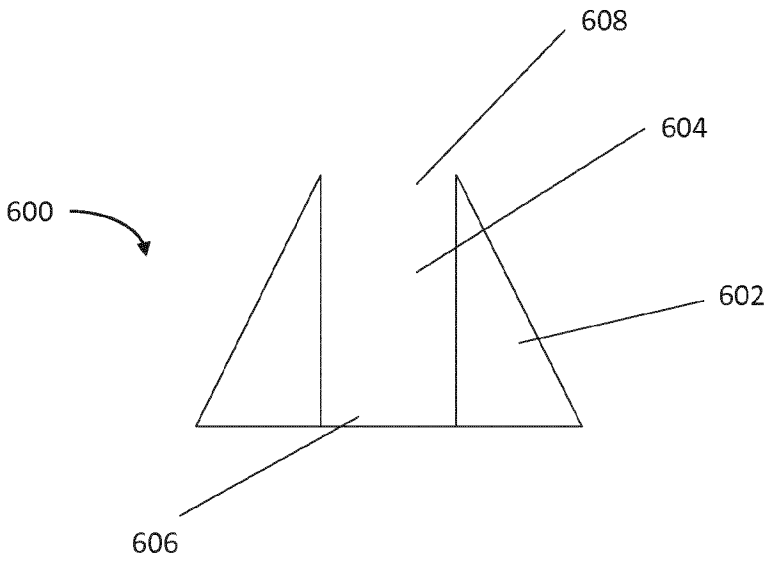

Figure 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/069941

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/162446 A1 (PHILIP MORRIS PRODUCTS SA) 13 October 2016 (2016-10-13) figures 1-4 page 5, lines 13-14 page 8, lines 8-25 page 9, lines 10-18 page 12, line 26 - page 13, line 25 page 14, lines 14-17 -----	1-5, 7-10,12, 13
X	US 2014/123989 A1 (THE SAGE CIG) 8 May 2014 (2014-05-08) figures 1-13 paragraphs [0018] - [0022], [0051] - [0054], [0059] -----	1-6,9-13

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2019	12/11/2019

Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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