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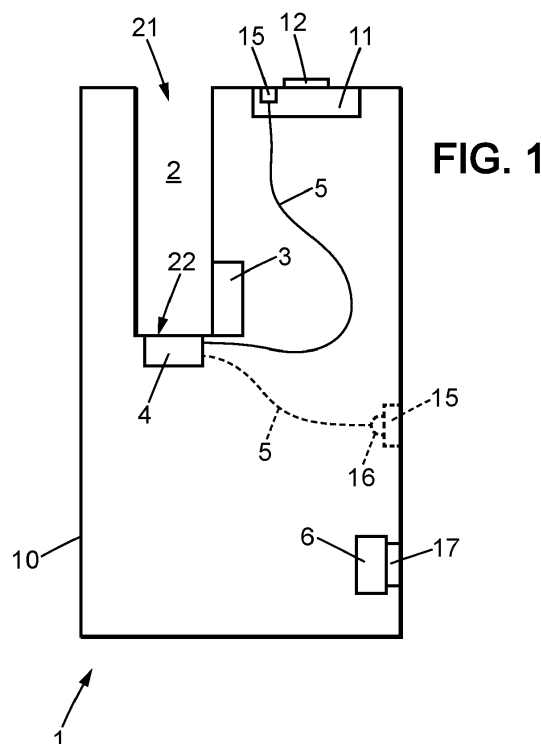
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(54) **AEROSOL-GENERATING DEVICE**

(57) An aerosol-generating device (1) comprises a chamber (2) designed to accommodate an aerosol precursor material, and also comprises a radioluminescence light source (4) arranged for emitting visible light inside the chamber. The radioluminescence light source facilitates visual inspection of the inside of the chamber, in

particular for detecting dirt therein. The radioluminescence light source provides safety with respect to a heater (3) dedicated to heating the aerosol precursor material, and does not consume electrical power from a battery of the aerosol-generating device.



Description

[0001] The invention relates to an aerosol-generating device, whatever the aerosol precursor material to be implemented in this device, such as a liquid or gel or a tobacco stick.

-- BACKGROUND OF THE INVENTION --

[0002] Existing aerosol-generating devices each comprise:

- a chamber that is designed to accommodate an aerosol precursor material, the chamber having an opening at a proximal end for receiving the aerosol precursor material in the chamber; and
- a heater which is arranged for heating the aerosol precursor material in the chamber in use.

[0003] Such arrangement is used for several types of aerosol precursor material, this latter possibly being contained in a pod or cartridge to be inserted into the chamber through its opening. During use of the aerosol-generating device, the aerosol precursor material that is accommodated within the chamber or a limited part of this material is heated to generate the aerosol, which is inhaled by a user of the device. To this end, the heater may be located near the chamber, possibly at a bottom thereof. Therefore, it is not easy to see the heater area from outside of the device when looking into the chamber. Indeed, the inside of the chamber may be dark and narrow so that limited light can enter into the chamber from outside.

[0004] However, dirt may accumulate within the chamber, in particular after some time using the aerosol-generating device. It is then necessary to clean the inside of the chamber, especially in the area of the heater.

[0005] Moreover, most existing aerosol-generating devices comprise at least one light-emitting diode arranged for lighting a user interface of these devices. But using such light-emitting diodes requires electrical power from a battery of each device, which reduces power availability for vaping before the battery is recharged from an external electrical source.

[0006] Document WO 2019/145104 A1 discloses incorporating a light source within a cartridge intended to be assembled in an aerosol-generating device. The light source is arranged for illuminating an interior of the cartridge, and a sidewall of this cartridge is provided with a transparent region for allowing vision to the interior of the cartridge through the transparent region. The light source in the cartridge may be comprised of a number of light-emitting diodes or comprise a radioluminescence material.

[0007] In view of the foregoing, there is a need to improve visibility into the chamber of an aerosol-generating device, for example to inspect dirt building in the chamber or cleaning the interior of this chamber, in particular in

the area of the heater.

-- SUMMARY OF THE INVENTION --

[0008] A first object of the invention consists in illuminating the interior of the chamber to allow easy visualizing of the inner walls of the chamber to allow cleaning therein.

[0009] Another object of the invention is to illuminate an aerosol generation device chamber without reducing a use time of the device that is available for vaping before next refill of its battery from an external electrical source.

[0010] Still another object of the invention consists in illuminating the interior of the chamber, including the heater area, in a manner that is safe for the user with respect to the electrical power existing at the heater area.

[0011] Still another object of the invention consists in allowing easy change of a colour of the light that is used for illuminating the interior of the chamber.

[0012] An aspect of the present invention proposes an aerosol-generating device which comprises the chamber for accommodating the aerosol precursor material and the heater as recited before. According to the invention, the aerosol-generating device further comprises:

- a light source that is arranged for emitting visible light inside the chamber, and that is a radioluminescence light source.

[0013] Thus, the invention device is provided internally with lighting means suitable for illuminating the interior of the chamber, thereby making it easier to inspect dirt possibly present in the chamber, in particular in the area of the heater. It facilitates in this way cleaning of the interior of the chamber.

[0014] In addition, because the light source that is thus provided in the aerosol-generating device is of radioluminescence type, it does not consume electrical power from a battery of the device. Use time of the aerosol-generating device for vaping by a user thereof is thus not reduced due to illuminating the chamber.

[0015] Also because the light source is of radioluminescence type, it cannot interact electrically with the heater, so that providing such light source in the vicinity of the heater does not jeopardize safety.

[0016] In preferred embodiments of the invention, the radioluminescence light source may be located at a distal end of the chamber opposite the opening thereof. Better view to the bottom of the chamber is made possible by such location of the light source.

[0017] Preferably, the radioluminescence light source may be removably arranged in the chamber. In this way, the radioluminescence light source can be swapped with another one, in particular for the light to be emitted for illuminating the inside of the chamber to be of a different color.

[0018] Generally for the invention, the radioluminescence light source may comprise a radioactive material and a phosphoric material in a sealed transparent con-

tainer. Preferably, respective amounts of the radioactive material and phosphoric material are arranged in the container so that beta-emission which is produced by the radioactive material amount is intercepted by the phosphoric material amount, thereby causing this phosphoric material amount to emit the light that illuminates the inside of the chamber. Preferably, the radioactive material in the radioluminescence light source may be tritium, in particular gaseous tritium.

[0019] When the radioactive and phosphoric materials are thus involved in the radioluminescence light source, they may be provided in amounts suitable for producing light for a lifetime of the aerosol-generating device of at least five years, preferably at least ten years.

[0020] In improved embodiments of the invention, the aerosol-generating device may comprise at least one light exit at an outer surface of a housing of the aerosol-generating device, this light exit being apart from the chamber and connected to the radioluminescence light source by means of a light guide. Such light exit at the device housing may have various functions, for example indicating a current state of the aerosol-generating device, or indicating a location of a user interface of the device, or also for helping the user to find the aerosol-generating device in dark ambient conditions, in particular at night.

[0021] Additionally or in other improved embodiments of the invention, the aerosol-generating device may further comprise an ancillary radioluminescence light source that is arranged to output light through the light exit, this light exit being located again at the outer surface of the housing of the aerosol-generating device and apart from the chamber. Then, the ancillary radioluminescence light source may advantageously have the following optional features:

- the ancillary radioluminescence light source may be removably arranged in the aerosol-generating device;
- the ancillary radioluminescence light source may be enclosed in a sealed transparent container; and
- the ancillary radioluminescence light source may comprise tritium, in particular gaseous tritium, as a radioactive material thereof.

[0022] When a light exit is implemented at the outer surface of the housing of the aerosol-generating device, apart from the chamber, and the device comprises a user interface, the light exit may be located at this user interface.

[0023] Again when a light exit is implemented at the outer surface of the housing of the aerosol-generating device, apart from the chamber, the light exit may be provided with a light concentrator that is arranged to increase a density of the light at the light exit. In this way, the light outputted through the light exit can be seen more

clearly even in daylight illumination condition.

-- BRIEF DESCRIPTION OF THE DRAWINGS --

[0024] Figure 1 is a cross-sectional view of an aerosol-generating device according to the invention.

[0025] For clarity sake, element sizes which appear in this figure do not correspond to actual dimensions or dimension ratios.

-- DETAILED DESCRIPTION OF THE INVENTION --

[0026] In Figure 1, reference number 1 denotes the aerosol-generating device as a whole. It is limited externally by a housing 10 which contains all the components necessary for operation of the device 1, although most of these components may not be described now because they do not relate directly to the invention and are well-known. In particular, the housing 10 supports a user interface 11 for allowing control of the operation of the device 1. The user interface 11 may comprise a power button 12 for the user to start or control an operation of the device 1, and may also comprise input and/or output interface components for monitoring of the device operation by the user.

[0027] The aerosol-generating device 1 is provided with a chamber 2 that may extend from the housing 10 internally to the device. For example, the chamber 2 may extend from a top part of the housing 10 when the device 1 is in a reference position for use. Alternatively, a removable part of the aerosol-generating device 1 can be disassembled from a main body of the device, and the chamber 2 extends in the main body from a mounting surface which is exposed upon separation of the removable part from the main body. The chamber 2 is dedicated to accommodating an amount of aerosol precursor material necessary for operation of the device 1. The aerosol precursor material may vary depending on the type of the device 1. It may be a liquid or gel contained in a pod or cartridge, or a stick of tobacco. In use of the device 1, the aerosol precursor material is made to produce an aerosol which is delivered to the user to breath it. Figure 1 shows the chamber 2 in the absence of aerosol precursor material and pod.

[0028] The aerosol-generating device 1 further comprises a heater 3 which is dedicated to heat part of the aerosol precursor material. The heater 3 may be arranged near the chamber 2 for receiving the part of the aerosol precursor material to heat. In particular, the heater 3 may be located at a distal end 22 of the chamber 2 which is opposite the opening 21 of the chamber dedicated to introducing therein the aerosol precursor material or pod. The side of the chamber 2 that is provided with the opening 21 has been called proximal end of the chamber in the general part of the description.

[0029] With such aerosol-generating device 1, the invention addresses the task of facilitating inspection of the inside of the chamber 2, in particular in the area of

the heater 3, for detecting dirt possibly present. To this end, the aerosol-generating device 1 further comprises a light source 4 of radioluminescence type. Such light source is well-known in other technical fields. The light source 4 may be in the form of a glass vial which constitutes a sealed transparent container, and which contains permanently amounts of a radioactive material and a phosphoric material. The radioactive material releases electrons through beta decay, and an energy of the emitted electrons is captured by the phosphoric material which then emits light therefrom. The radioactive material of the radioluminescence light source 4 may be radium or promethium, but it is preferably tritium, most preferably gaseous tritium. A colour of the emitted light depends on the type of the phosphoric material, so that light colour can be changed by swapping from one vial to another one with a different phosphoric material. The vial of the radioluminescence light source 4 may have a cylindrical shape, for example. It may be introduced appropriately into the device 1, through the chamber 2 from its opening 21 or through an aperture suitably arranged in the housing 10 so that the vial can be brought in position close to the chamber 2 so as to illuminate the inside of this chamber. For example, the radioluminescence light source 4 may be brought in position for use at the distal end 22 of the chamber 2, in the area of the heater 3.

[0030] In a well-known manner, a lifetime of a luminescence light source depends on the amounts of the radioactive and phosphoric materials that are contained in the vial. For the present invention directed to an aerosol-generating device, these radioactive and phosphoric materials are provided initially within the vial in amounts suitable for producing light for at least five years, preferably at least ten years. Such duration may correspond to a lifetime expected for the aerosol-generating device 1.

[0031] According to an optional improvement of the invention, the housing 10 of the device 1 may be provided with a light exit 15 to be supplied with light originating from a radioluminescence light source. In particular, such light exit 15 provided in the housing 10 apart from the chamber 2 may be supplied with light produced by the radioluminescence light source 4, in addition to this latter illuminating the inside of the chamber 2. To this purpose, a light guide 5 may connect optically the radioluminescence light source 4 to the light exit 15. The light guide 5 may be of various types, in particular an optical fiber or any transparent light duct, this latter possibly coated at this peripheral surface with a reflecting layer, for example a metal layer.

[0032] Outputting light through the light exit 15 may provide various additional functions to the aerosol-generating device 1. One function may be indicating the location of the user interface 11 in the surface of the housing 10. For example, when the user interface 11 contains a power button 12, the light exit 15 may be located close to this power button 12 for facilitating use of the device 1. Figure 1 illustrates such arrangement for the light exit 15 using continuous lines. Another function of the light

exit 15 may be producing a light spot for helping to find the device 1 in the dark. In such other case, the light exit 15 would advantageously be located at a most visible part of the housing 10, for example at a lateral part thereof. Then, the efficiency in helping to find the device 1 may be increased by providing the light exit 15 with a light concentrator 16 arranged to increase a density of the light at the light exit. For example, the light concentrator 16 may comprise at least one reflecting or refracting surface that focuses the light into a reduced area of the light exit 15. Such other arrangement is shown in Figure 1 using interrupted lines. Still another function may be producing a mood light using several light exits which are distributed in the outer surface of the housing 10. For example, the housing 10 may be provided with a network of light guides that are integrated therein and conduct light originating from the radioluminescence light source to the light exits. The hue of the mood light produced in this way can be changed by the user by selecting the radioluminescence light source as desired.

[0033] Instead of sharing the radioluminescence light source 4 between both functions of illuminating the inside of the chamber 2 and supplying light to the light exit 15, an ancillary radioluminescence light source 6 may be arranged to output light through the light exit 15 independently of the radioluminescence light source 4. The ancillary radioluminescence light source 6 may also be removably arranged in the aerosol-generating device 1, in particular for making it easy to vary the light color by changing the ancillary radioluminescence light source with another one of a different color. The ancillary radioluminescence light source 6 may have a configuration similar to that of the radioluminescence light source 4. In particular, it may also be comprised of a glass vial which contains permanently amounts of radioactive and phosphoric materials. The radioactive material of the ancillary radioluminescence light source 6 may be tritium again, in particular gaseous tritium. Figure 1 also shows such ancillary radioluminescence light source 6 which is dedicated to supply light to the light exit 17. As represented, the ancillary radioluminescence light source 6 is located just behind the light exit 17, but it may be alternatively located in the device 1 at a distance of the light exit 17 and optically connected thereto using a dedicated light guide.

[0034] One will understand that the invention can be implemented while modifying secondary aspects with respect to the detailed description hereabove provided, but maintaining at least some of the advantages which have been mentioned. It is also repeated that implementing a light exit apart from the chamber is optional, as well as implementing an ancillary radioluminescence light source dedicated to a function other than facilitating inspection of the inside of the chamber.

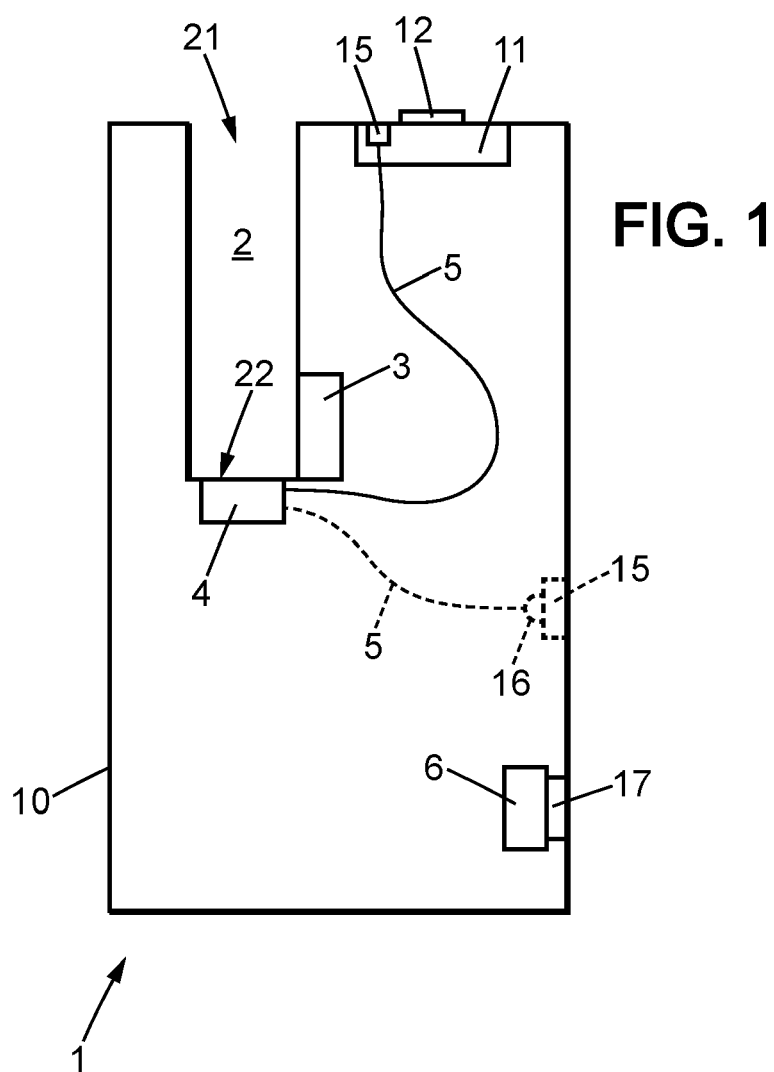
Claims

1. An aerosol-generating device (1), comprising:
 - a chamber (2) designed to accommodate an aerosol precursor material, the chamber having an opening (21) at a proximal end for receiving the aerosol precursor material in the chamber; and
 - a heater (3) arranged for heating the aerosol precursor material in the chamber (2) in use;

characterized in that the aerosol-generating device (1) further comprises:

 - a light source (4) arranged for emitting visible light inside the chamber (2),

and **in that** the light source (4) is a radioluminescence light source.
2. The aerosol-generating device (1) of claim 1, wherein the radioluminescence light source (4) is located at a distal end (22) of the chamber (2) opposite the opening (21) thereof.
3. The aerosol-generating device (1) of claim 1 or 2, wherein the radioluminescence light source (4) is removably arranged in the chamber (2).
4. The aerosol-generating device (1) of one of the preceding claims, wherein the radioluminescence light source (4) comprises a radioactive material and a phosphoric material in a sealed transparent container.
5. The aerosol-generating device (1) according to claim 4, wherein the radioactive material in the radioluminescence light source (4) is tritium, in particular gaseous tritium.
6. The aerosol-generating device (1) according to claim 4 or 5, wherein the radioactive material and the phosphoric material are provided in amounts suitable for producing light for a lifetime of the aerosol-generating device of at least five years, preferably at least ten years.
7. The aerosol-generating device (1) of one of claims 1 to 6, comprising at least one light exit (15) at an outer surface of a housing (10) of the aerosol-generating device, the light exit being apart from the chamber (2) and connected to the radioluminescence light source (4) by means of a light guide (5).
8. The aerosol-generating device (1) of one of claims 1 to 6, comprising at least one light exit (17) at an outer surface of a housing (10) of the aerosol-generating device, the light exit being apart from the chamber (2), the aerosol-generating device further comprising an ancillary radioluminescence light source (6) that is arranged to output light through the light exit.
9. The aerosol-generating device (1) of claim 8, wherein the ancillary radioluminescence light source (6) is removably arranged in the aerosol-generating device.
10. The aerosol-generating device (1) of claim 8 or 9, wherein the ancillary radioluminescence light source (6) is enclosed in a sealed transparent container.
11. The aerosol-generating device (1) of one of claims 8 to 10, wherein the ancillary radioluminescence light source (6) comprises tritium, in particular gaseous tritium, as a radioactive material thereof.
12. The aerosol-generating device (1) of one of claims 7 to 11, further comprising a user interface (11) of the aerosol-generating device, and the light exit (15; 17) is located at the user interface.
13. The aerosol-generating device (1) of one of claims 7 to 12, wherein the light exit (15; 17) is provided with a light concentrator (16) arranged to increase a density of the light at the light exit.





EUROPEAN SEARCH REPORT

Application Number

EP 23 15 3146

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 217 161 119 U (HUBEI CHINA TOBACCO IND CO LTD) 12 August 2022 (2022-08-12) * abstract * * paragraphs [0029] - [0038]; figures 1-2 *	1-13	INV. A24F40/53
Y	US 2019/231997 A1 (RICKETTS NIKOLAUS MARTIN ERNEST WILHELM [CH] ET AL) 1 August 2019 (2019-08-01) * abstract * * paragraphs [0066] - [0077] *	1-13	
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			TECHNICAL FIELDS SEARCHED (IPC)
			A24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 August 2023	Examiner Fyhr, Jonas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 23 15 3146

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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02-08-2023

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REFERENCES CITED IN THE DESCRIPTION

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