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(54) Title: FLAVOR DISK

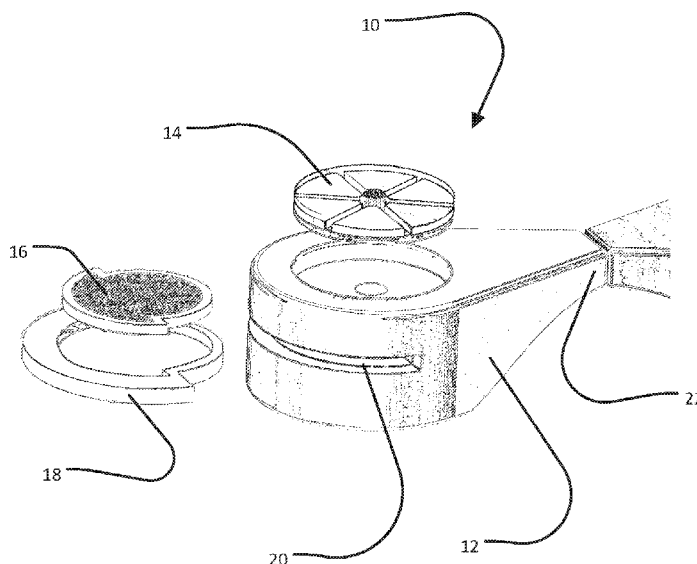


FIG. 1

(57) Abstract: A flavor disk for use in a vaporizer is disclosed. The flavor disk may include a plurality of chambers, each chamber storing a flavor component. The flavor disk may further include an actuator for each chamber, the actuator configured to selectively release a portion of the flavor component from the chamber. The flavor disk may further include a flow path positioned to receive the portion of the flavor component and mix the portion of the flavor component with incoming fluid. The flavor disk may further include control circuitry for actuating the actuator.



TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

FLAVOR DISK

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Serial Number 62/510,484 filed May 24, 2017, the disclosure of which is hereby incorporated herein by reference in its entirety.

BACKGROUND

1. Technical Field

[0002] This disclosure relates generally to vaporizers, and more particularly to a flavor disk for a vaporizer.

2. Background Information

[0003] Vaporizers have recently emerged as a new product for providing nicotine and other products through a smokeless inhalation process. There are many embodiments of vaporizers including the electronic cigarette. Most implementations consist of a power supply (typically a battery) and an atomizing device. In reusable electronic cigarettes the two items are separated into a battery and a cartomizer, to allow the disposal and replacement of the nicotine containing fluid cartomizer while preserving the more costly battery and associated circuitry (microcontroller, switch, indicating LED, etc.) In disposable electronic cigarettes the two items are combined to integrate the functions into one unit that is disposed of after either the battery energy or the nicotine containing E-liquid is exhausted.

[0004] The E-liquid that is used to produce vapor in electronic cigarettes is generally a solution of one or more of propylene glycol (PG) and/or vegetable glycerin (VG) and/or polyethylene glycol 400 (PEG400) mixed with concentrated flavors, and optionally, a variable percentage of a liquid nicotine concentrate. This liquid may be termed an "E-liquid" and is often sold in a bottle or in disposable cartridges or cartomizers. Many different flavors of such E-liquids are sold, including flavors that resemble the taste of regular tobacco, menthol, vanilla,

coffee, cola and various fruits. Various nicotine concentrations are also available, and nicotine-free E-Liquids are common.

BRIEF SUMMARY

[0005] In one aspect of the disclosure, a flavor disk for use in a vaporizer is disclosed. The flavor disk may include a plurality of chambers, each chamber storing a flavor component. The flavor disk may further include an actuator for each chamber, the actuator configured to selectively release a portion of a flavor component from a chamber. The flavor disk may further include a flow path positioned to receive the portion of a flavor component and mix the portion of a flavor component with incoming fluid. The flavor disk may further include control circuitry for actuating the actuator. Upon the control circuitry actuating the actuator, flavor from the flavor disk may be introduced into the flow path to mix with incoming fluid. The flavor may additionally be mixed with vapor produced by a vapor source.

[0006] In a second aspect of the disclosure, a vaporizer assembly is disclosed. The vaporizer assembly may include a flavor disk and a vaporizer. The flavor disk may include a plurality of chambers, each chamber storing a flavor component. The flavor disk may further include a respective actuator for each chamber, each actuator independently configured to selectively release a portion of the stored flavor component. The flavor disk may further include a flow path positioned to receive the portion of a flavor component and mix the portion of a flavor component with incoming fluid. The flavor disk may further include control circuitry for actuating the actuator(s). The vaporizer may be configured to receive the flavor disk. The vaporizer may further define a space configured to receive, from the flavor disk, the portion of a flavor component that is mixed with the incoming fluid. The space may further be configured to mix vapor produced by the vaporizer with the portion of a flavor component that is mixed with the incoming fluid.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 illustrates an exploded view of an embodiment vaporizer assembly having a flavor disk.

[0008] FIG. 2 illustrates a perspective view of a flavor disk.

[0009] FIG. 3 illustrates a sectional view of the flavor disk of FIG. 2.

[0010] FIG. 4 illustrates a sectional view of an embodiment of a vaporizer assembly.

DETAILED DESCRIPTION

[0011] The following detailed description and the appended drawings describe and illustrate some embodiments of the disclosure for the purpose of enabling one of ordinary skill in the relevant art to make and use these embodiments. As such, the detailed description and illustration of these embodiments are purely illustrative in nature and are in no way intended to limit the scope of the disclosure in any manner. It should also be understood that the drawings are not necessarily to scale and in certain instances details may have been omitted, which are not necessary for an understanding of the embodiments, such as details of fabrication and assembly. In the accompanying drawings, like numerals represent like components.

[0012] FIG. 1 illustrates an exploded view of a vaporizer assembly 10. The vaporizer assembly 10 includes a vaporizer 12, a flavor disk 14, a vaporizer product 16, and a tray 18. Vaporizer 12 has a slot 20 sized and shaped to receive tray 18. Tray 18 has a cavity sized and shaped to receive vaporizer product 16. Tray 18 is removed from vaporizer 12 to load vaporizer product 16 into tray 18, which may then be inserted into slot 20 to load vaporizer product 16 into vaporizer 12. Flavor disk 14 may be removable from vaporizer 12 to load flavors into flavor disk 14, or to replace a used flavor disk with a new flavor disk. In some embodiments, flavor disk 14 may not be detachable from the vaporizer, such that reloading flavors must be performed directly into vaporizer assembly 10. In other embodiments, the flavors may be non-replaceable.

[0013] Vaporizer 12 has a mouthpiece 22 opposite slot 20. A user inhales vapors produced by the vaporizer 12 at mouthpiece 22. Although mouthpiece 22 is shown as a relatively short mouthpiece 22 in the embodiment of FIG. 1, mouthpiece 22 may be of varying lengths. Additionally, mouthpiece 22 may be configured to connect to a mouthpiece extension depending on user preference. For example, a mouthpiece extension could have a length and internal diameter selected by a user. A mouthpiece extension having a smaller internal diameter extension may have a greater flow restriction, which may be preferable to some users.

[0014] FIG. 2 illustrates a flavor disk 14 for use in the vaporizer 12 of FIG. 1. FIG. 3 illustrates a cross section of the flavor disk 14 of FIG. 1. Flavor disk 14 contains individual flavors that may be mixed with vapor to produce a flavored vapor. Flavor disk 14 may have multiple flavors to allow a user to select a flavor according to their mood or preference. For example, the embodiment of FIG. 2 has six different chambers 24 a-f with each of chambers 24 a-f potentially storing a different respective flavor. In some embodiments, a flavor may be present in more than one of chambers 24 a-f. For example, although six chambers 24 a-f are present in the embodiment of FIG. 2, there may be three different flavors with each flavor being present in two of chambers 24 a-f. Although exemplary flavor disk 14 is depicted as including six chambers 24 a-f, flavor disks according to this disclosure may include any suitable number of chambers, which may include more or less than six chambers.

[0015] Flavor disk 14 has an electrical connector for providing electrical communication to a control panel of vaporizer 12. The control panel may be a component of or separate from printed circuit board assembly 26. In either embodiment, the control panel is in electrical communication with printed circuit board assembly 26. The printed circuit board assembly 26 may be located below the flavor chambers to control the release of flavors. Flavor disk 14 selectively releases flavor depending on a control signal from the control panel. In some embodiments, the control signal is one or more control voltages delivered to printed circuit board assembly 26.

[0016] Each of chambers 24 a-f may have a respective corresponding mechanism for releasing flavor into a flow path of the vapor. For a given chamber, its respective corresponding mechanism for releasing flavor may cause flavor to be released from that chamber only in response to a control signal targeting that chamber. For example, the corresponding mechanism for releasing flavor from chamber 24a may cause flavor to be released from chamber 24a only when the control signal includes a unique aspect targeting chamber 24a. Similarly, the corresponding mechanism for releasing flavor from chamber 24b may cause flavor to be released from chamber 24b only when the control signal includes a unique aspect targeting chamber 24b. A control signal may target only one chamber or may target a plurality of chambers at the same time. In one exemplary operation, at a first time, the printed circuit board assembly 26 may receive a control signal that includes a unique aspect targeting chamber 24a but that lacks a unique aspect targeting chamber 24b. At this first time, the corresponding mechanism for releasing flavor from chamber 24a would be activated but the corresponding mechanism for releasing flavor from chamber 24b would not be activated. In another exemplary operation, at a different second time, the printed circuit board assembly 26 may receive a control signal that includes both a unique aspect targeting chamber 24a and a different unique aspect targeting chamber 24b. At this second time, both the corresponding mechanism for releasing flavor from chamber 24a and the corresponding mechanism for releasing flavor from chamber 24b would be activated. Exemplary operations above explicitly discuss a control signal with a unique aspect targeting only one of chambers 24 a-f and a control signal with unique aspects targeting only two of chambers 24 a-f. However printed circuit board assembly 26 may be configured to receive and respond to control signals that include unique aspects targeting any suitable combinations of chambers 24 a-f.

[0017] A mechanism for releasing flavor into a flow path of the vapor may come in any suitable form. In some embodiments, the printed circuit board assembly 26 may have one or more actuators for releasing flavoring. In some embodiments, the one or more actuators may be one or more piezoelectric

actuators for releasing a liquid flavoring, similar to the operation of an inkjet printer. For example, printed circuit board assembly 26 may include six piezoelectric actuators, each respectively corresponding to, and configured to respectively release liquid flavoring from, one of chambers 24 a-f. Additionally or alternatively, in some embodiments, the printed circuit board assembly 26 may include one or more heat actuators that selectively heat one or more of chambers 24 a-f to release flavoring from the one or more of chambers 24 a-f. For example, a specific portion of printed circuit board assembly 26 may selectively heat chamber 24a, a different specific portion of circuit board assembly 26 may selectively heat chamber 24b, and so on. Additionally or alternatively, in some embodiments, printed circuit board assembly 26 may have one or more physical actuators for releasing flavor from one or more of chambers 24 a-f. For instance, an actuator of printed circuit board assembly 26 may selectively compress chamber 24a, forcing flavor from chamber 24a, a different actuator of printed circuit board assembly 26 may selectively compress chamber 24b, forcing flavor from chamber 24b, and so on.

[0018] Each of chambers 24 a-f may be sealed within flavor disk 14, with only flavor disk 14 being replaceable. For instance, in the embodiment of FIG. 2, each of chambers 24 a-f is encapsulated in a clear thermoplastic injection molded over the flavor chambers 24 a-f. In other embodiments, each of chambers 24 a-f may be individually replaceable to refill a flavor. In still other embodiments, chambers 24 a-f may be fixed, but respective passageways may provide respective access to chambers 24 a-f for refilling the flavors. The flavors within chambers 24 a-f may be liquid flavors or powder flavors.

[0019] Flavor disk 14 may be associated with a software application for controlling the release of flavor. The flavor disk 14 may work independently or coordinate with another device. A flavor disk 14 may communicate with an application on a device such as a smart phone. The smart phone may communicate to the user available flavors and flavor combinations. The smart phone may recognize that specific flavors and flavor combinations are available in association with a flavor disk 14 based upon characteristics of that flavor disk. In

some embodiments, a user may purchase flavors separate from a flavor disk, such that flavor combinations are unlocked upon purchase using the application.

[0020] A user may use the application to select a flavor or flavor combination available in association with that flavor disk 14 and thereby cause the flavor disk 14 to release that available flavor or flavor combination. The user's selection of distinct flavors and flavor combinations may be communicated from the application to flavor disk 14 as distinct codes that the control panel of vaporizer 12 containing flavor disk 14 converts into control signals that printed circuit board assembly 26 uses to control release of one or more flavors. For example, in an exemplary operation, the user may view the application on a device such as a smart phone, see that a particular flavor is available in association with flavor disk 14, and select that flavor in the application using the smart phone. The smart phone may then communicate the distinct code for that flavor to the control panel of vaporizer 12 containing flavor disk 14, and printed circuit board assembly 26 may convert the code into a control signal with a unique aspect targeting the release of the selected flavor from its chamber. In another exemplary operation, the user may view the application on a device such as a smart phone, see that a particular flavor combination is available in association with flavor disk 14, and select that flavor combination in the application using the smart phone. The smart phone may then communicate the distinct code for that flavor combination to the control panel of vaporizer 12 containing flavor disk 14, and printed circuit board assembly 26 may convert the code into a control signal with unique aspects targeting the release from their respective chambers of the various flavors that form the selected flavor combination.

[0021] A user may inhale the one or more flavors independently or use the one or more flavors as an additive for a tobacco or e-liquid vaporizer. For example, vaporizer 10 of FIG. 1 may provide an inhalation path without requiring the production of vapor. Or vaporizer 12 may produce vapor which is then mixed with the flavoring.

[0022] FIG. 4 illustrates a cross section of vaporizer assembly 10 illustrating its operation. The central portion of flavor disk 14 has a porous center 28 for

passing a fluid **30**, such as air, through flavor disk **14**. Each flavor chamber is in fluid communication with porous center **28** so that flavor from flavor disk **14** may be mixed with the fluid as it passes through the flavor disk.

[0023] Below flavor disk **14**, tray **18** stores vaporizer product **16** that produces vapor when exposed to heat, atomization conditions or other vapor source conditions. Vapor Source **31** is positioned below tray **18** and vaporizer product **16**. Exemplary vapor sources include an atomizer, a heater, or other known vapor source, and any combination(s) thereof. In certain embodiments vapor source **31** is a heater, and provides heat on demand to produce vapor from vapor product **16** when desired. The vapor travels upward into fluid (or air) channel **32** where it mixes with any flavor added to the incoming fluid **30** from porous center **28** of flavor disk **14**. If “flavor only” is selected, heater **31** is not activated and no vapor is produced. Instead, the flavored fluid (or air) passes through fluid channel **32** without mixing with vapor. A user inhales flavored fluid through mouthpiece **22** which is in fluid communication with fluid channel **32**. If heat button **34** is pressed, heater **31** is activated and vapor is produced, providing flavored vapor at the mouthpiece **22**.

[0024] The descriptions set forth above are meant to be illustrative and not limiting. Various modifications of the disclosure, in addition to those described herein, will be apparent to those skilled in the art from the foregoing description. Such modifications are also intended to fall within the scope of the concepts described herein. The disclosures of each patent, patent application and publication cited or described in this document are hereby incorporated herein by reference, in their entireties.

[0025] The foregoing description of possible implementations consistent with the present disclosure does not represent a comprehensive list of all such implementations or all variations of the implementations described. The description of some implementation should not be construed as an intent to exclude other implementations. For example, artisans will understand how to implement the disclosure in many other ways, using equivalents and alternatives that do not depart from the scope of the disclosure. Moreover, unless indicated

to the contrary in the preceding description, none of the components described in the implementations are essential to the disclosure. It is thus intended that the embodiments disclosed in the specification be considered as illustrative, with a true scope and spirit of the disclosure being indicated by the following claims.

CLAIMS

1. A flavor disk for a vaporizer, the flavor disk comprising:
 - a plurality of chambers, each chamber storing a flavor component;
 - an actuator for each chamber, the actuator configured to selectively release a portion of the flavor component from the chamber;
 - a flow path positioned to receive the portion of the flavor component and mix the portion of the flavor component with incoming fluid; and
 - control circuitry to selectively actuate the actuator.
2. A flavor disk according to claim 1, further comprising 2 to 6 chambers.
3. A flavor disk according to claim 1, wherein the actuator is a piezoelectric actuator.
4. A flavor disk according to claim 1, wherein the actuator is a heat actuator.
5. A flavor disk according to claim 1, wherein the chamber has a passageway suitable for refilling the chamber with the flavor component.
6. A flavor disk according to claim 1, further comprising a printed circuit board assembly.
7. A flavor disk according to claim 1, wherein the printed circuit board assembly is configured to receive and respond to a control signal targeting a chamber or any suitable combination of the chambers.
8. A vaporizer assembly comprising:
 - a flavor disk comprising:
 - a plurality of chambers, each chamber storing a flavor component,
 - an actuator for each chamber, the actuator configured to selectively release a portion of the flavor component from the chamber,

a flow path positioned to receive the portion of the flavor component and mix the portion of the flavor component with incoming fluid, and

control circuitry to selectively actuate the actuator; and

a vaporizer configured to receive the flavor disk, the vaporizer defining a space configured to:

receive, from the flavor disk, the portion of the flavor component that is mixed with the incoming fluid, and

mix vapor produced by the vaporizer with the portion of the flavor component that is mixed with the incoming fluid.

9. A vaporizer assembly according to claim 7, wherein the vaporizer further comprises a tray and a slot to receive the tray.
10. A vaporizer assembly according to claim 9, further comprising a vapor source positioned beneath the tray, the vaporizer configured to produce a vapor from the vaporizer product.
11. A vaporizer assembly according to claim 7, wherein the flavor disk is detachable from the vaporizer.
12. A vaporizer assembly according to claim 7, wherein the flavor disk is flavor-reloadable.
13. A vaporizer assembly according to claim 7, wherein the vaporizer further comprises a mouthpiece.
14. A vaporizer assembly according to claim 7, wherein the mouthpiece is configured to connect to a mouthpiece extension.

15. A method for producing a flavored fluid, the method comprising:
providing a vaporizer assembly according to claim 8;
actuating the actuator to release the portion of the flavor component from the chamber; and
mixing the portion of the released flavor component with incoming fluid.
16. A method for producing a flavored product vapor, the method comprising:
providing a vaporizer assembly according to claim 8;
actuating the actuator to release the portion of the flavor component from the chamber; and
mixing the portion of the released flavor component with incoming fluid;
providing a vapor from a vaporizer product; and
mixing the vapor with the fluid containing the released flavor component.

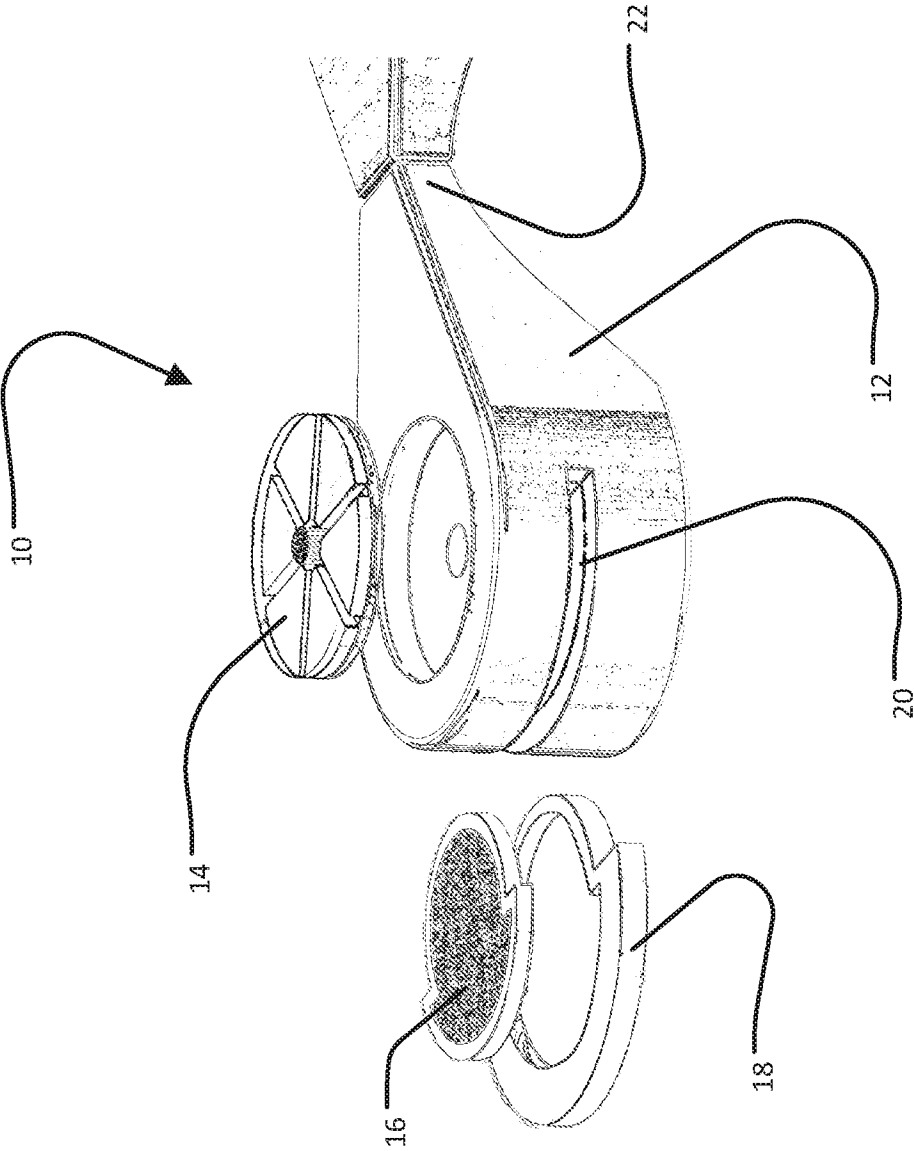


FIG. 1

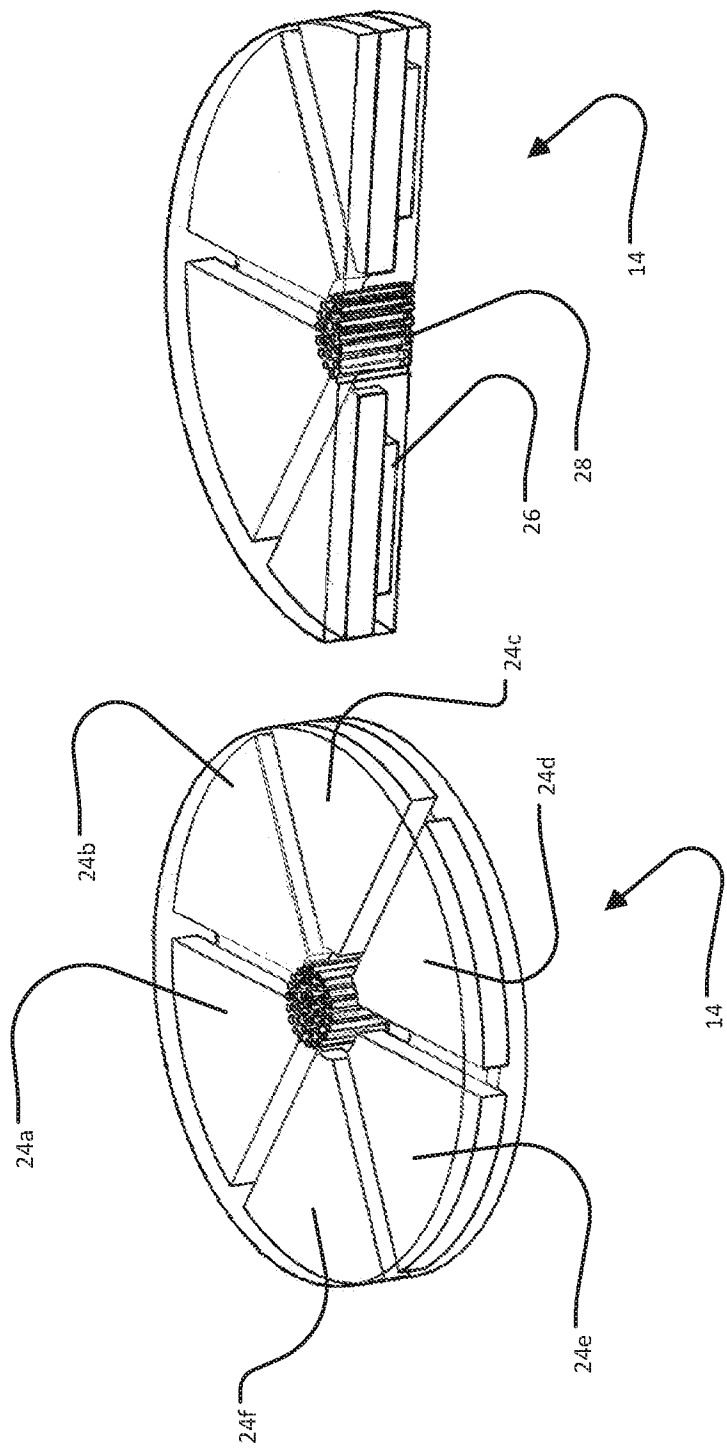


FIG. 3

FIG. 2

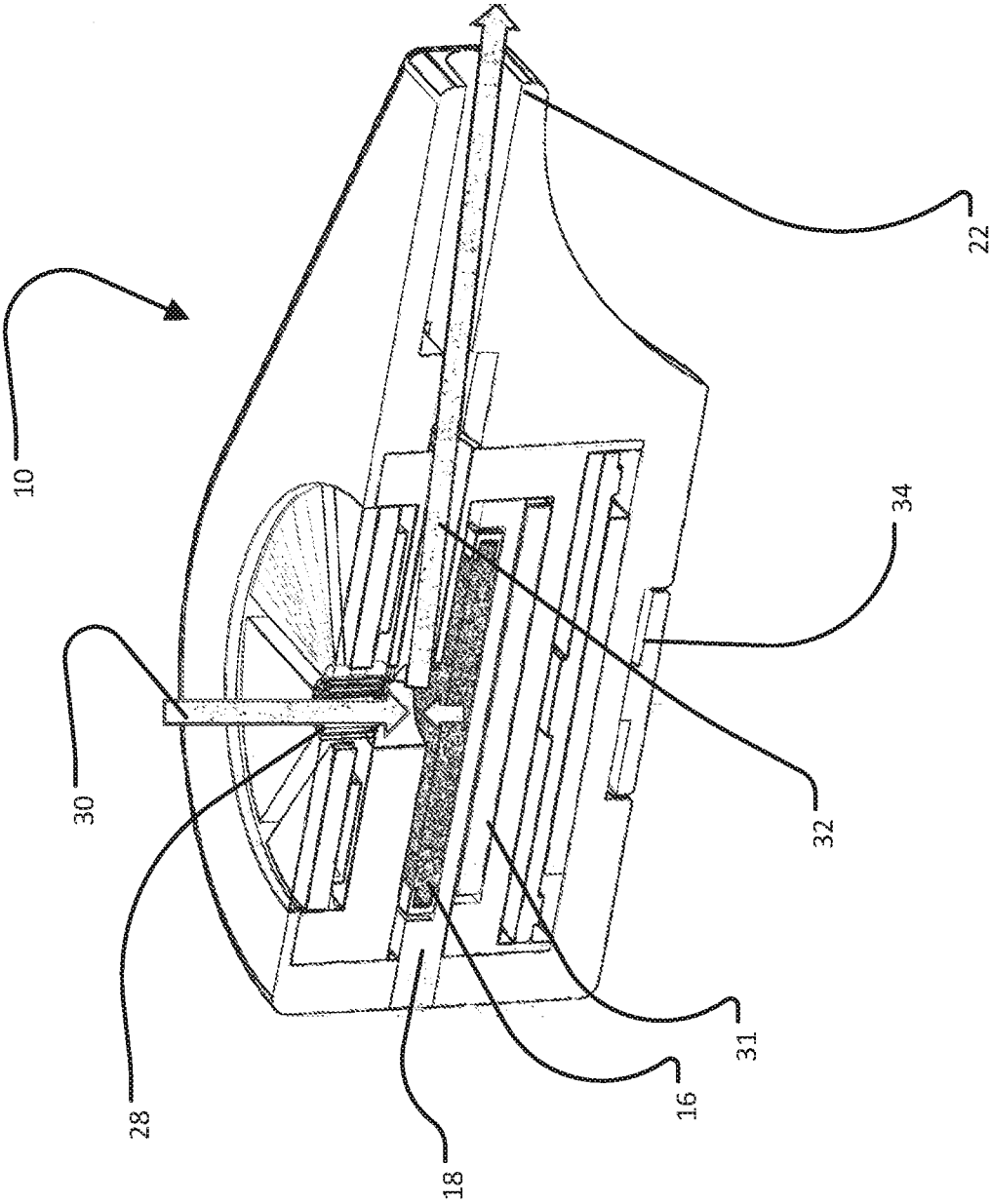


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2018/034189

A. CLASSIFICATION OF SUBJECT MATTER

INV. A24F47/00 A61M15/06 A61M11/04
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 A61M

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 2016/262454 A1 (SEARS STEPHEN BENSON [US] ET AL) 15 September 2016 (2016-09-15) abstract; figure 6 paragraph [0103] -----	1,2,4-9, 11-14 3 10
X Y A	US 2017/136196 A1 (DAVIDSON PERRY [IL] ET AL) 18 May 2017 (2017-05-18) abstract; figure 2 paragraphs [0315] - [0326] -----	1,2,4,5, 8 3 10
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A	US 2013/276799 A1 (DAVIDSON PERRY [IL] ET AL) 24 October 2013 (2013-10-24) the whole document -----	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

30 October 2018

Date of mailing of the international search report

13/11/2018

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/034189

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 15, 16
because they relate to subject matter not required to be searched by this Authority, namely:
see FURTHER INFORMATION sheet PCT/ISA/210
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 15, 16

Methods of providing ventilation to a subject as defined in claims 15, 16 of the present application are methods for treatment of human or animal body by therapy. Indeed these methods are meant to provide vapors to a user (see paragraphs 0013, 0021, 0023). Thus, claims 15, 16 relate to subject-matter considered by this Authority to be covered by the provisions of Rules 39.1(iv) and 67.1(iv) PCT, and no international search report has been established with respect to the subject-matter of these claims (Article 17(2)(a)(i)PCT). Consequently, no opinion will be formulated with respect to novelty, inventive step and industrial applicability of the subject-matter of these claims (Article 34(4)(a)(i)PCT).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2018/034189

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