PTO/AIA/15 (03-13)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisionol applications under 37 CFR 1.53(b))

Attorney Docket No.	13211-736.200
First Named Inventor	Nicholas Jay HATTON
Title	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
Express Mail Label No.	FILED VIA EFS ON 2/10/2017

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☑ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [*Total Pages* 72] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. ☑ **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 18]
6. **Inventor's Oath or Declaration** [*Total Pages* ____] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. ☐ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ADDRESS TO:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers** (cover sheet & document(s))
    Name of Assignee _____
11. ☐ **37 CFR 3.73(c) Statement** (*when there is an assignee*) ☐ **Power of Attorney**
12. ☐ **English Translation Document** (*if applicable*)
13. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. ☐ **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. ☐ **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☐ **Other:** _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 66854 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature		Date	February 10, 2017
Name (Print/Type)	Richard D. Shoop	Registration No. (Attorney/Agent)	45,763

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

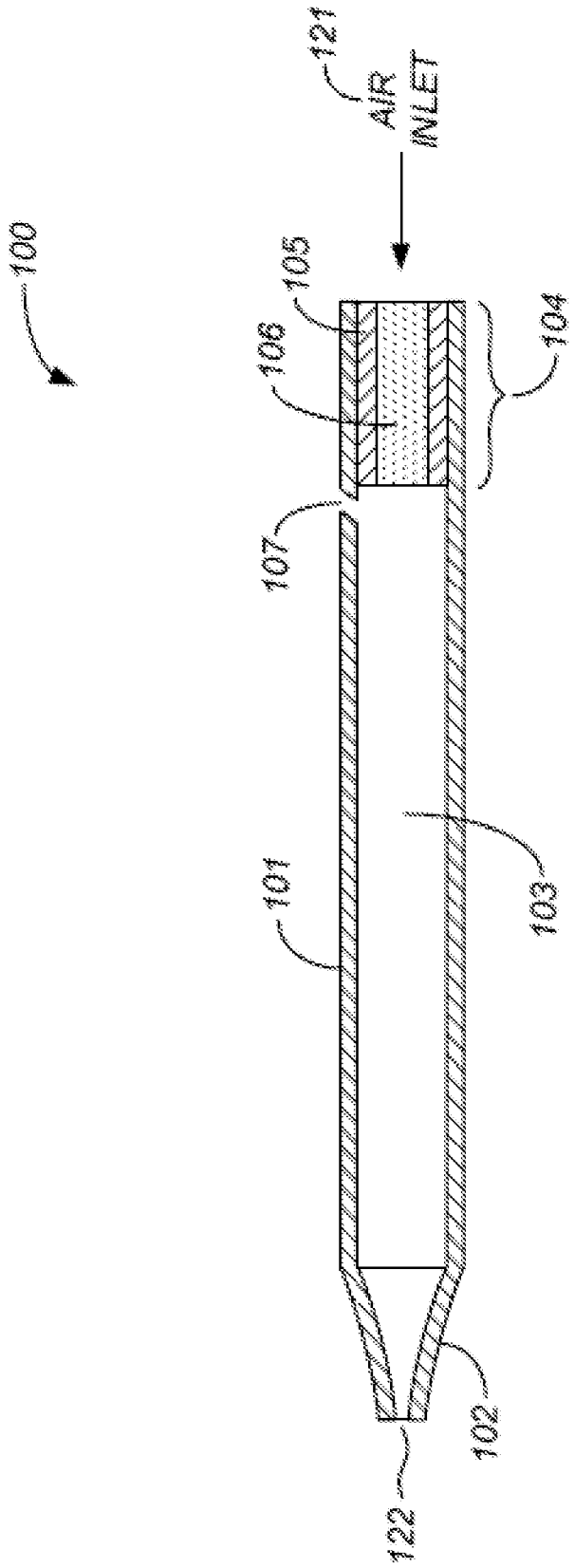


FIG. 1

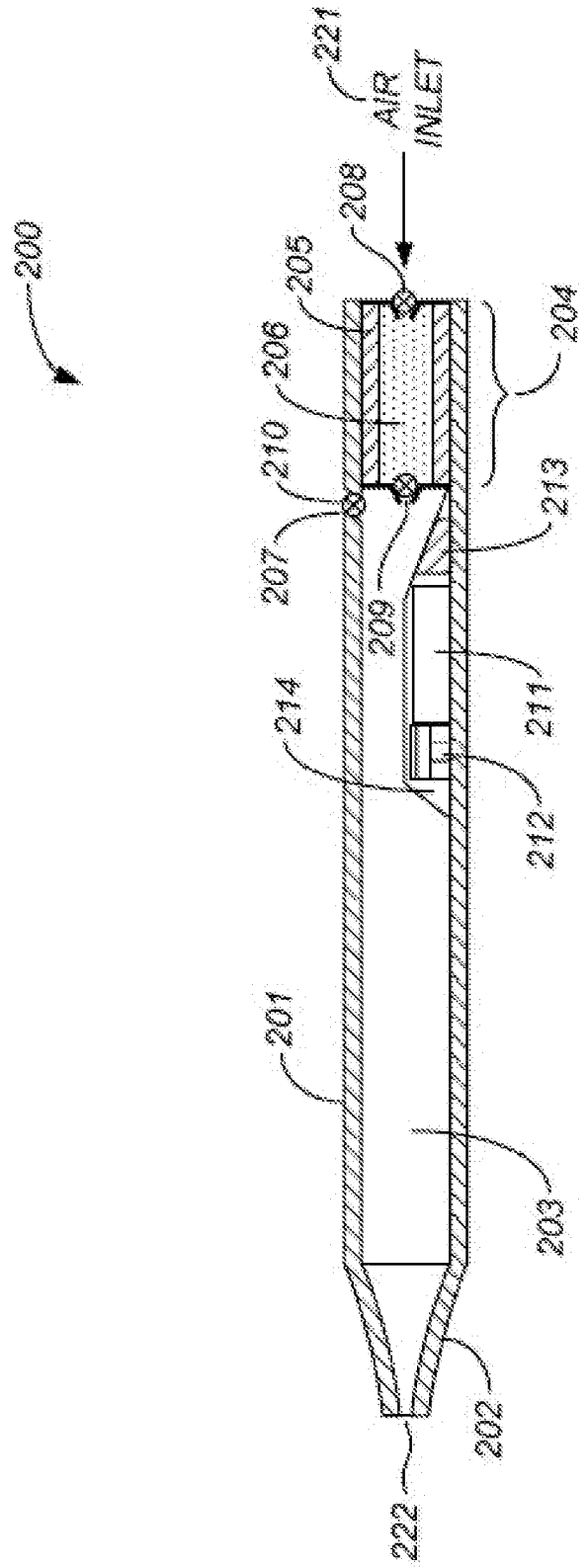

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FIG. 2

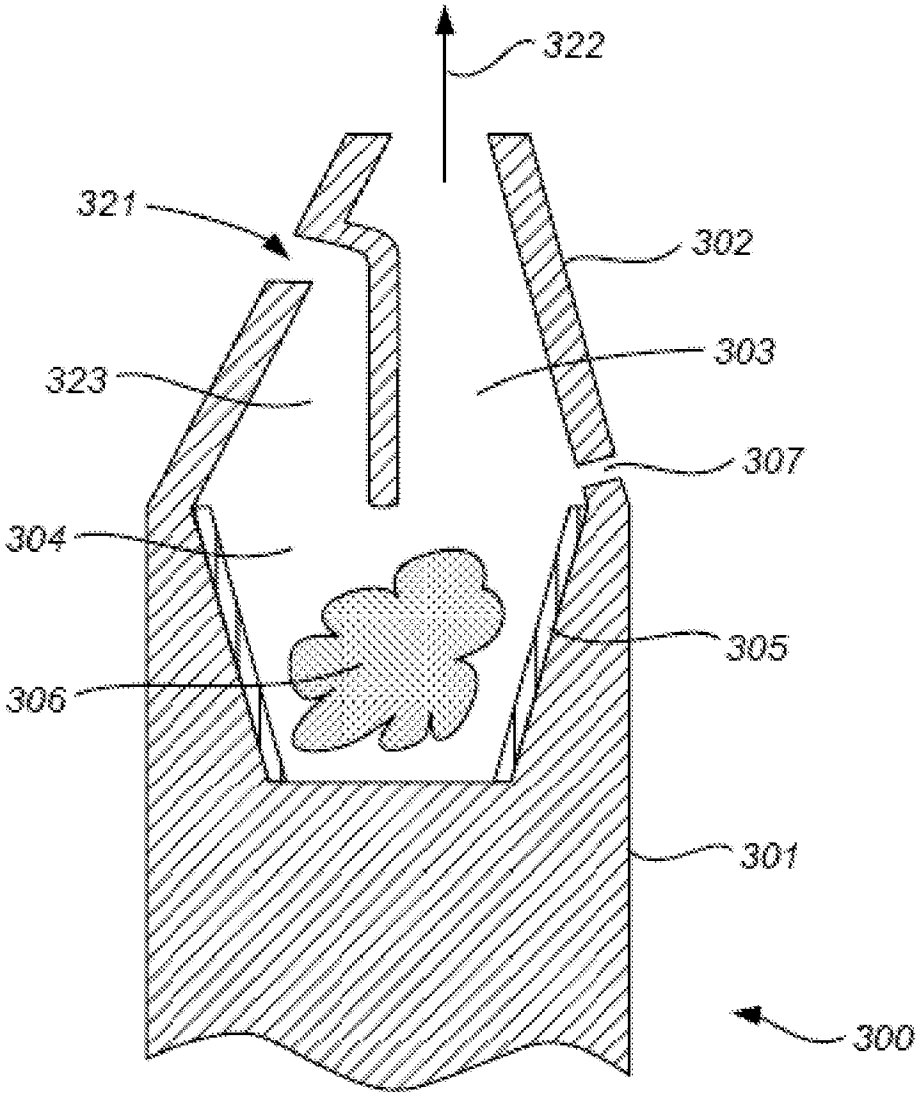


FIG. 3

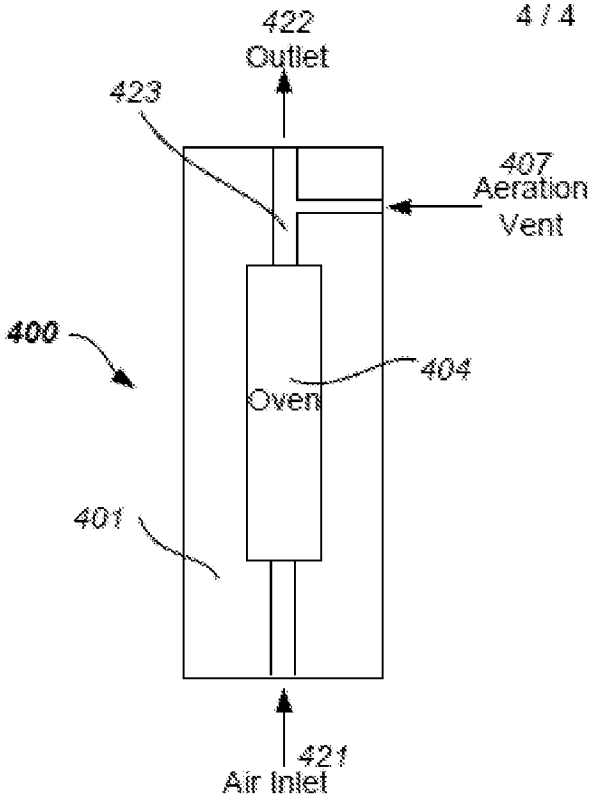


FIG. 4A

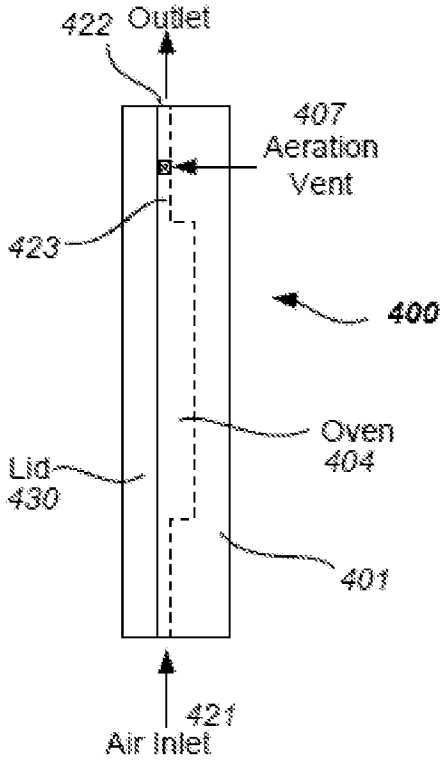


FIG. 4B

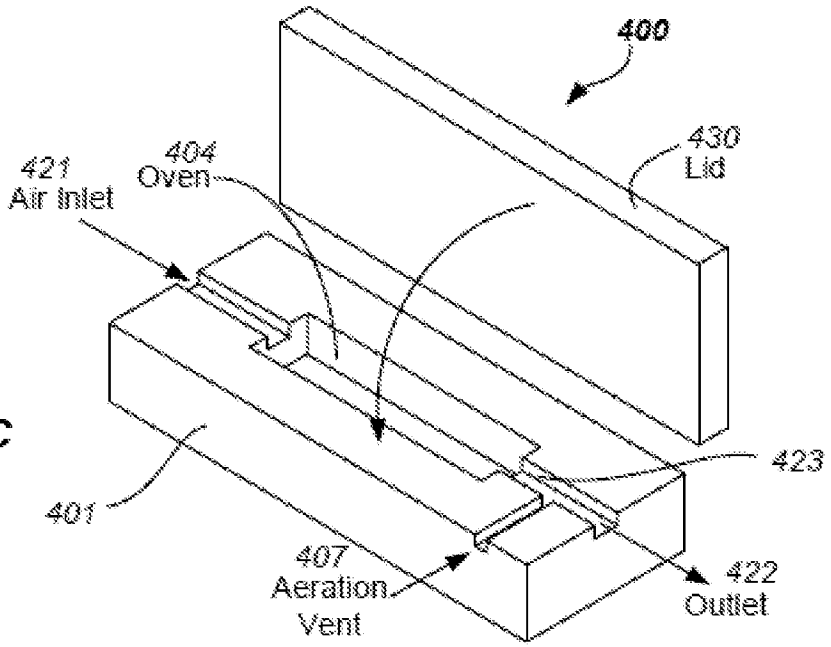


FIG. 4C

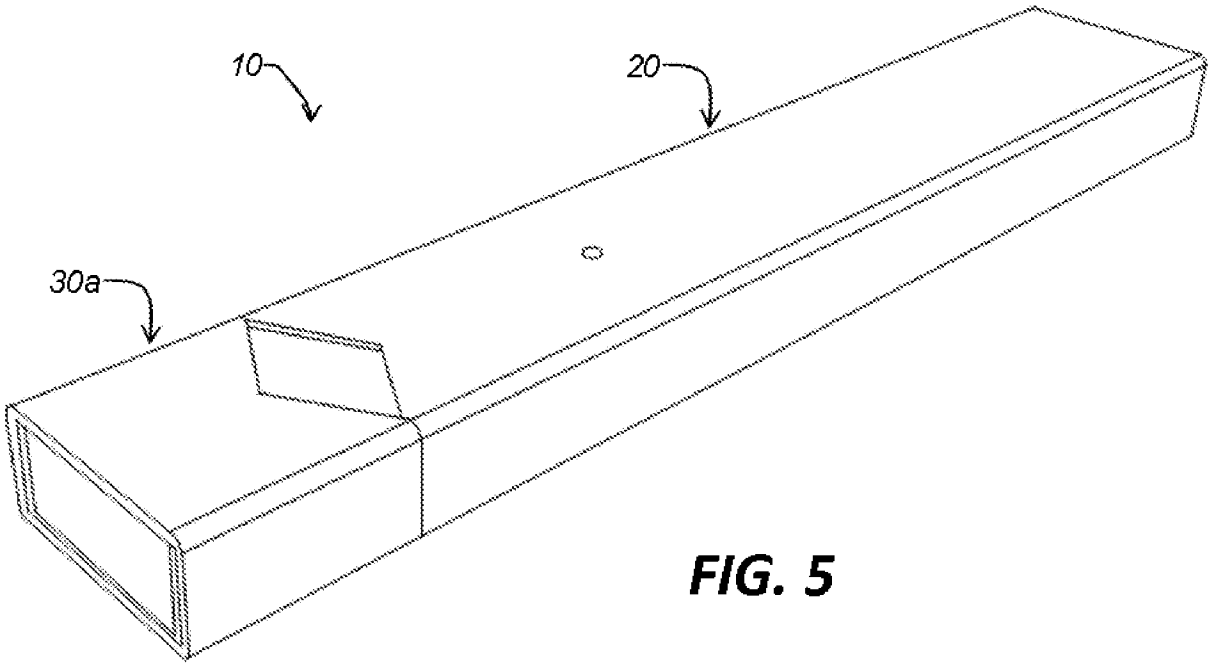


FIG. 5

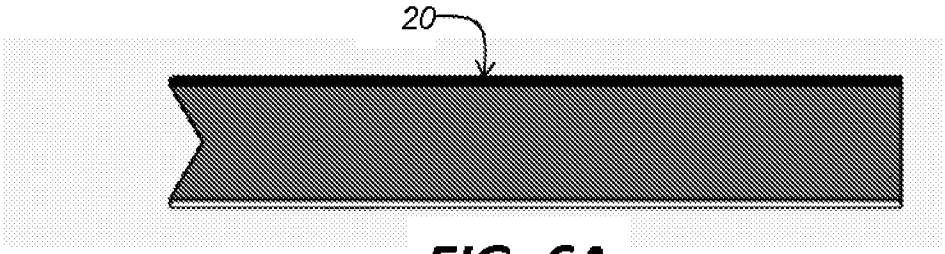


FIG. 6A

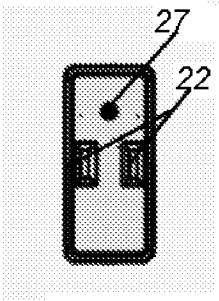


FIG. 6C

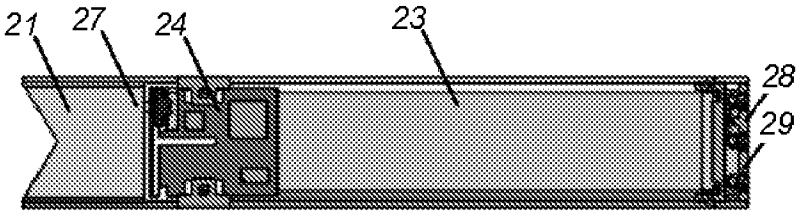


FIG. 6B

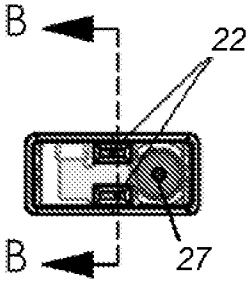
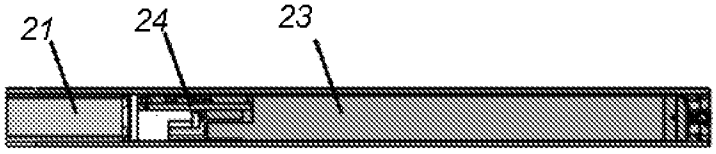


FIG. 6D



Section B-B

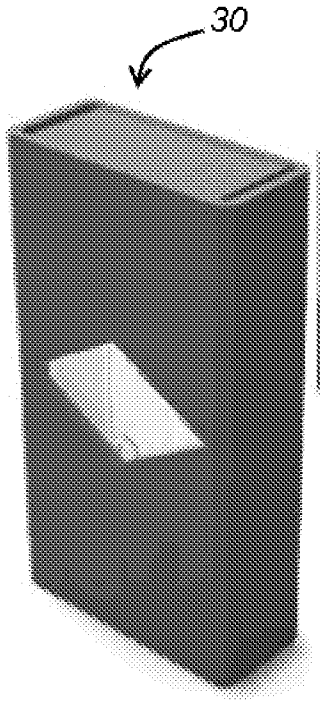


FIG. 7A

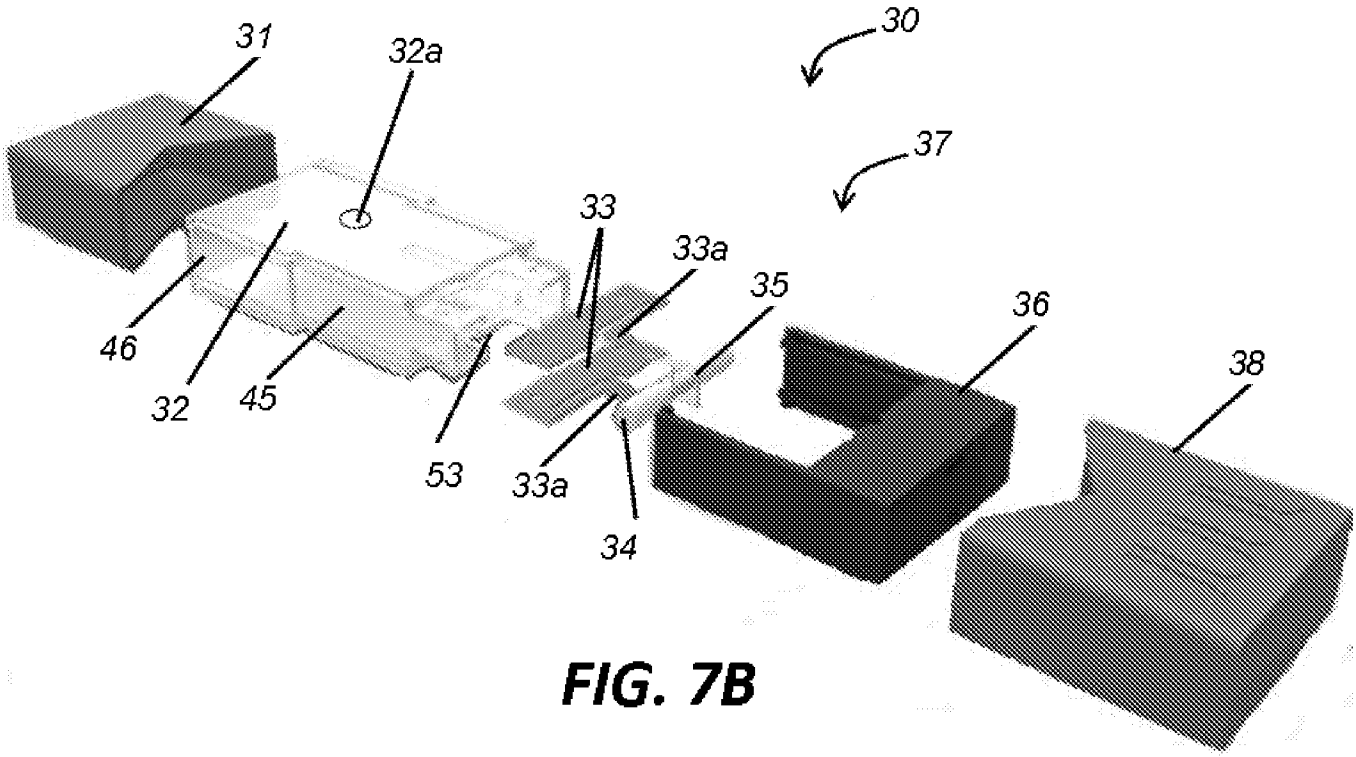


FIG. 7B

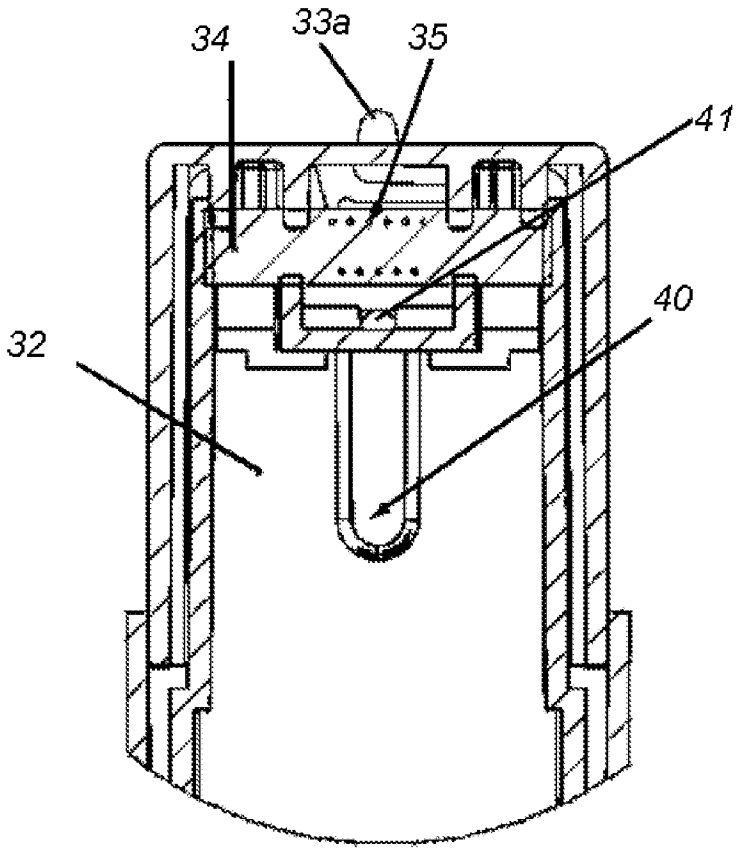


FIG. 7C

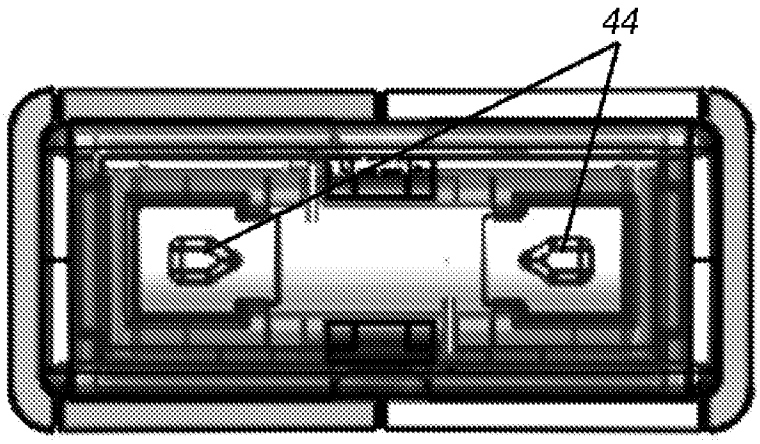


FIG. 8A

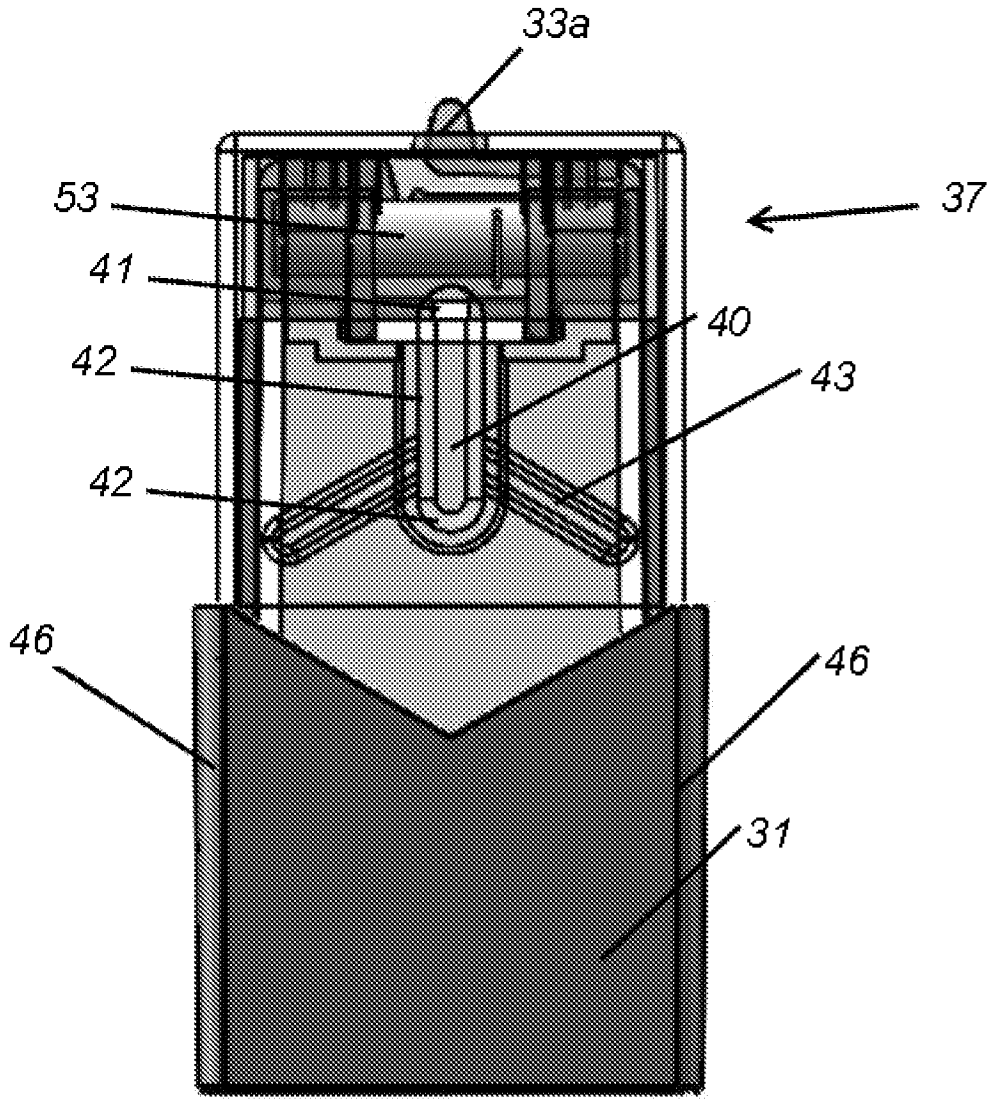
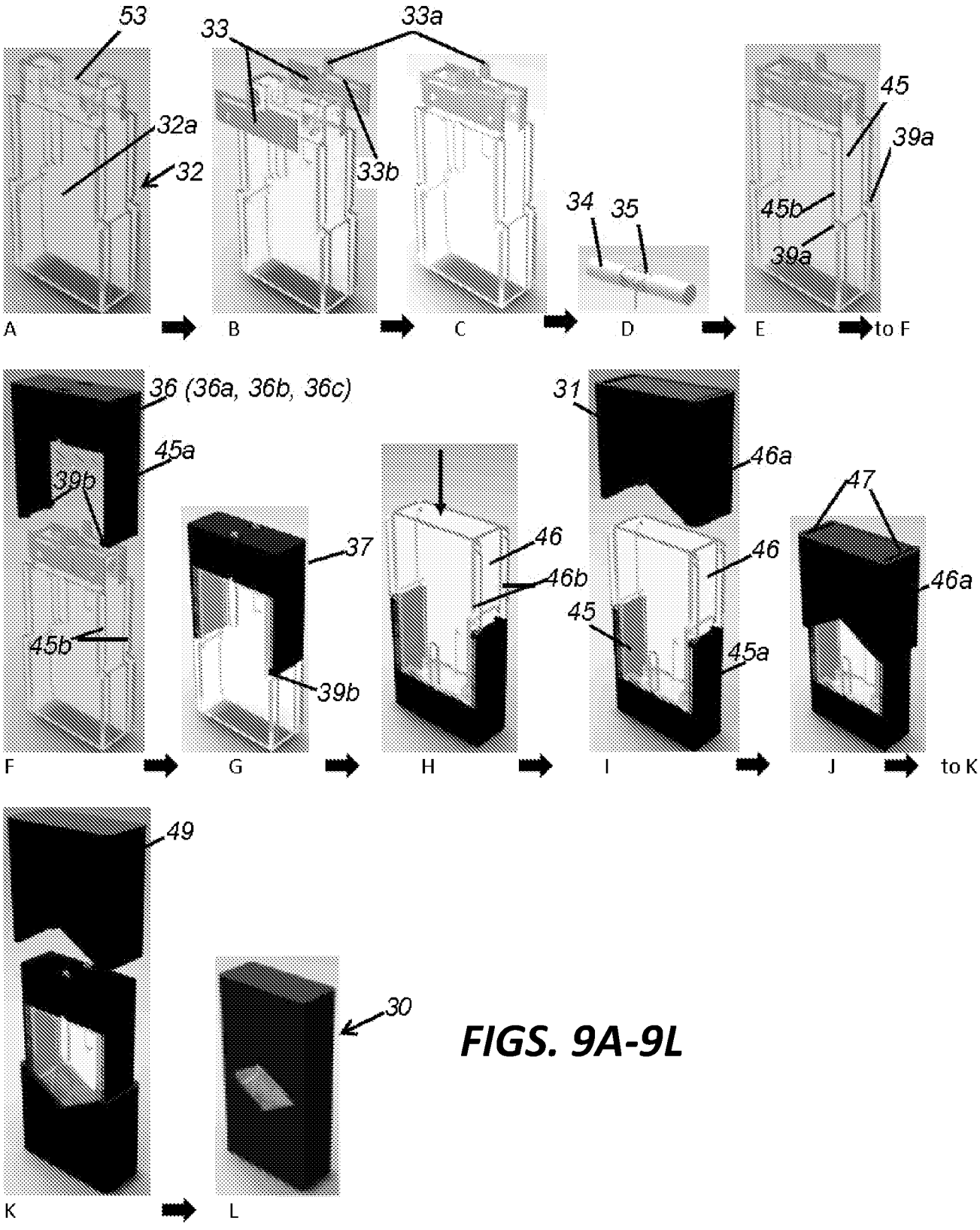


FIG. 8B


53
33
33a
32a
32
33b
34
35
45
39a
45b
39a
A
B
C
D
E
to F
36 (36a, 36b, 36c)
45a
39b
45b
37
39b
46
46b
31
46a
46
45
45a
47
46a
F
G
H
I
J
to K
49
30
K
L

FIGS. 9A-9L

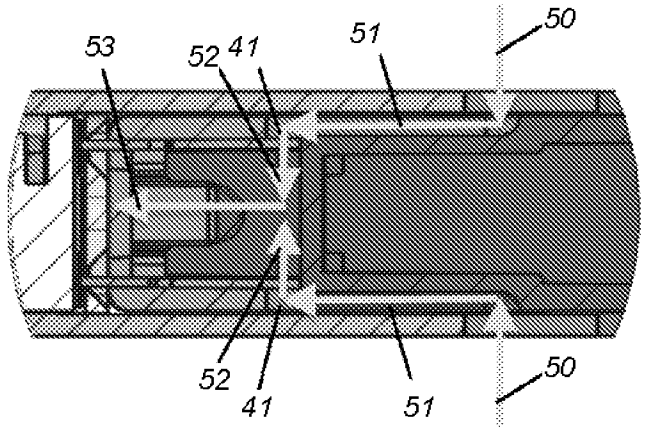


FIG. 10A

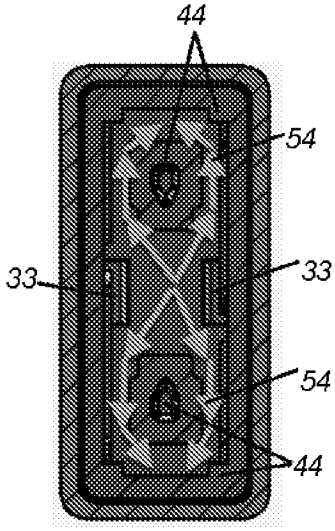


FIG. 10B

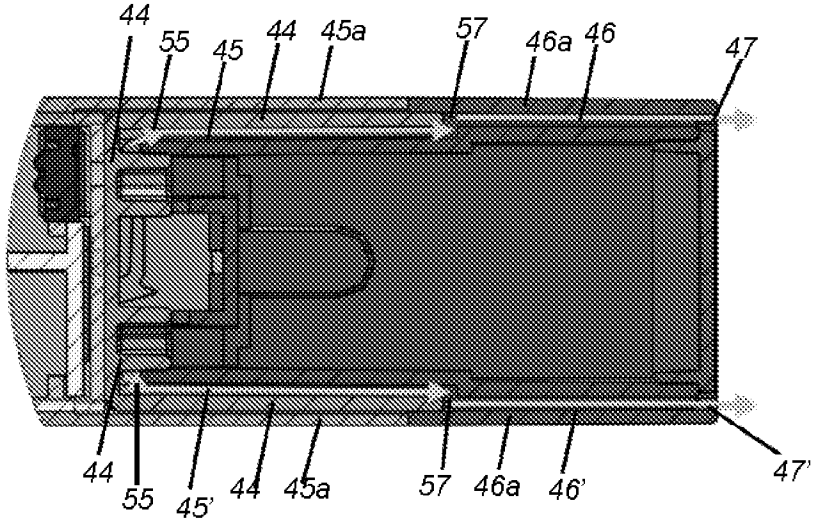


FIG. 10C

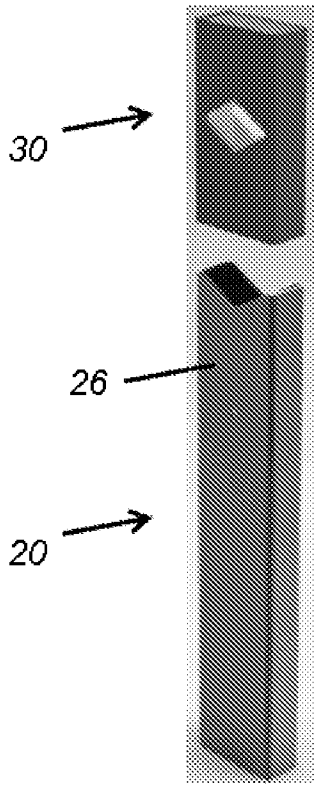


FIG. 11

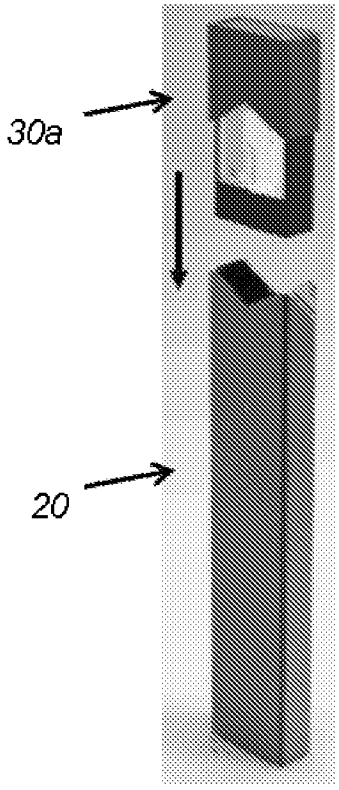


FIG. 12

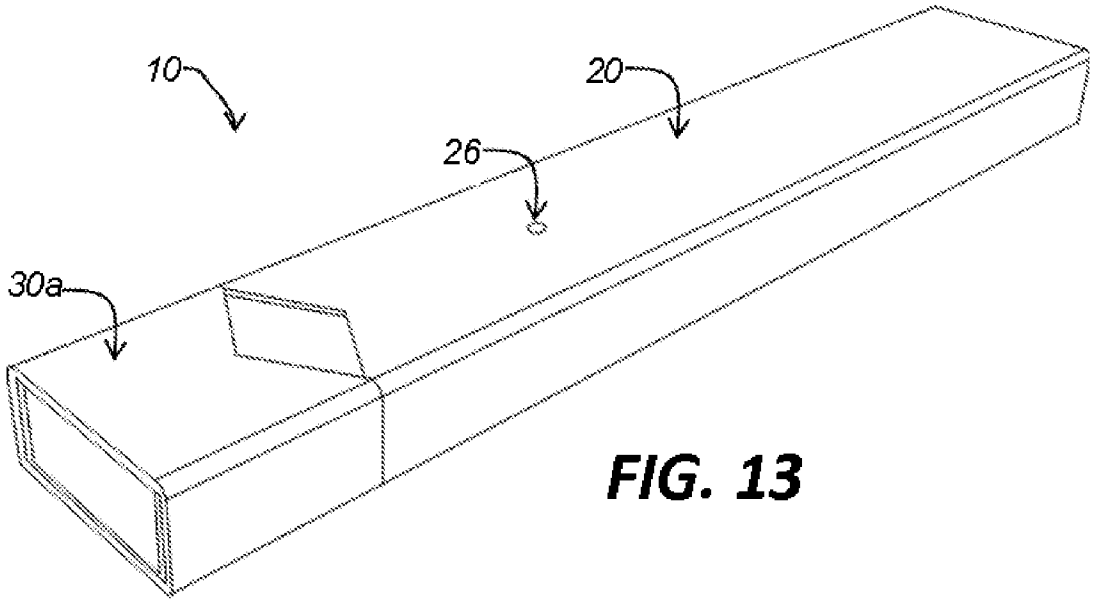


FIG. 13

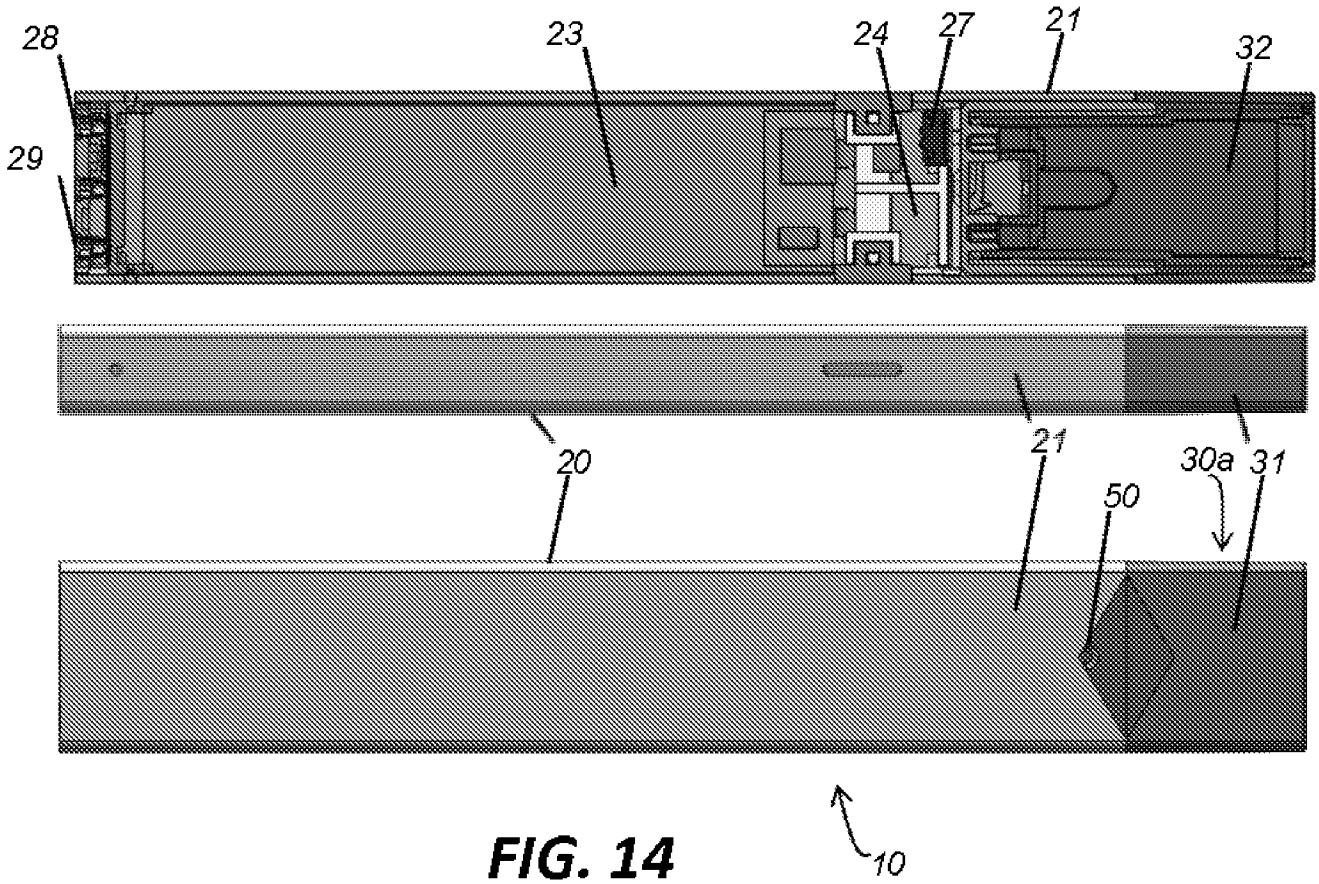


FIG. 14

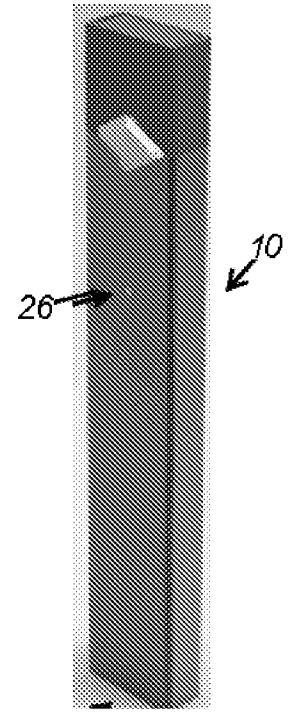


FIG. 15

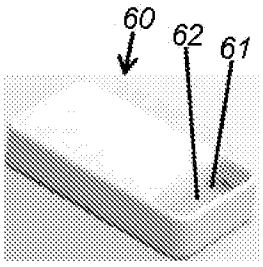


FIG. 16A

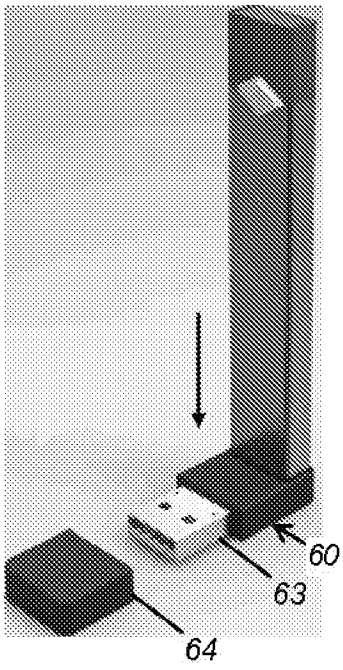


FIG. 16B

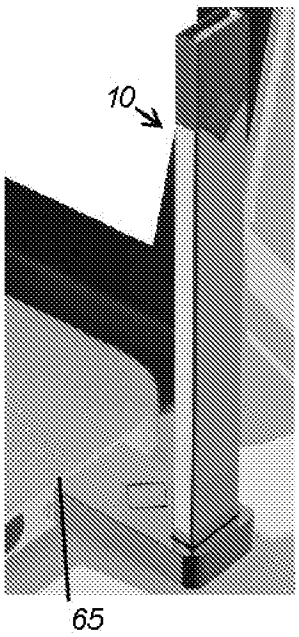


FIG. 16C

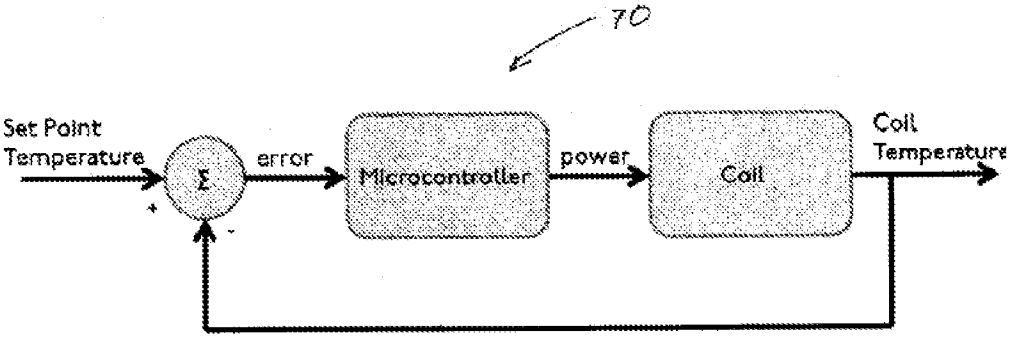


FIG. 17A

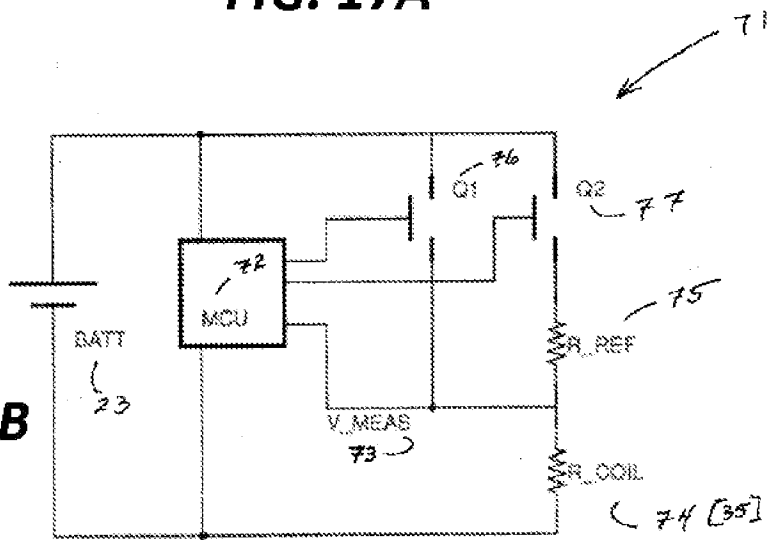


FIG. 17B

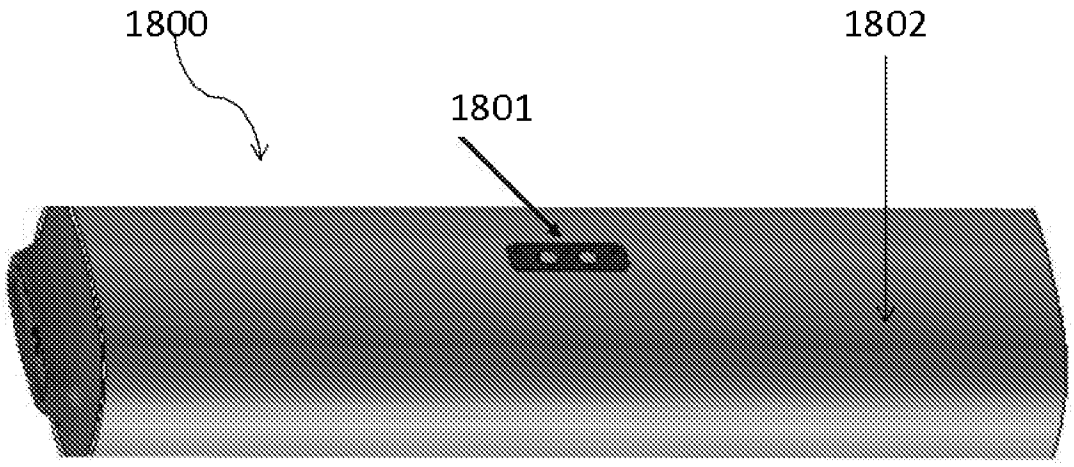


FIG. 18

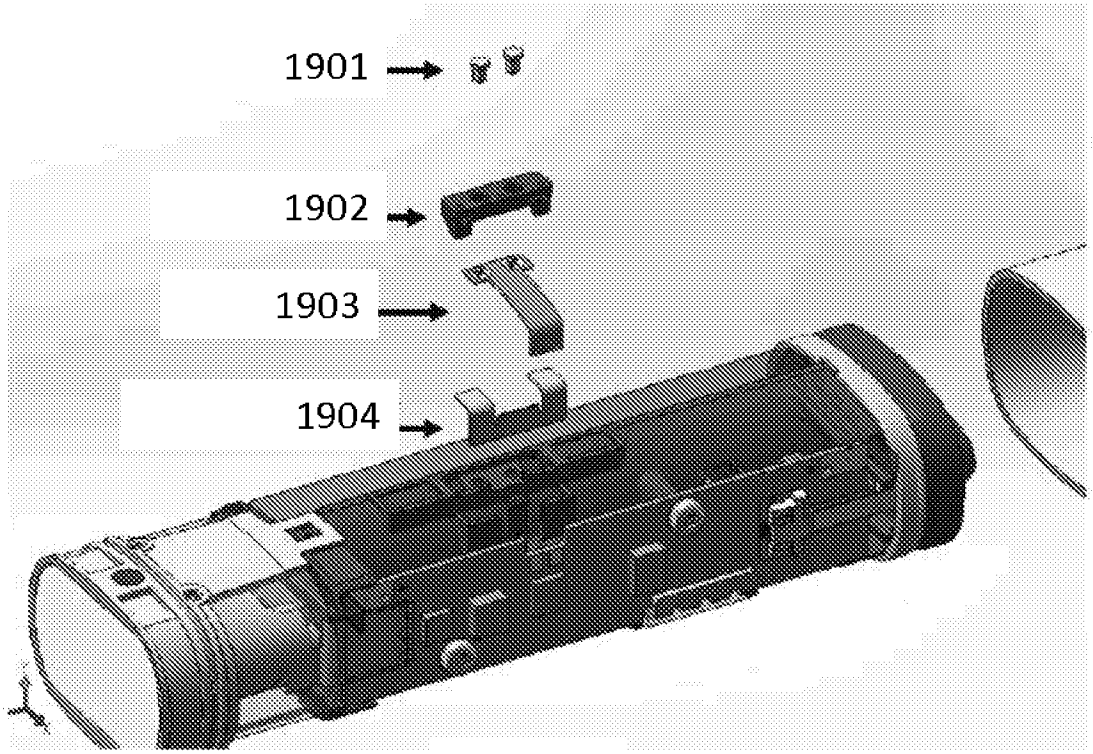


FIG. 19

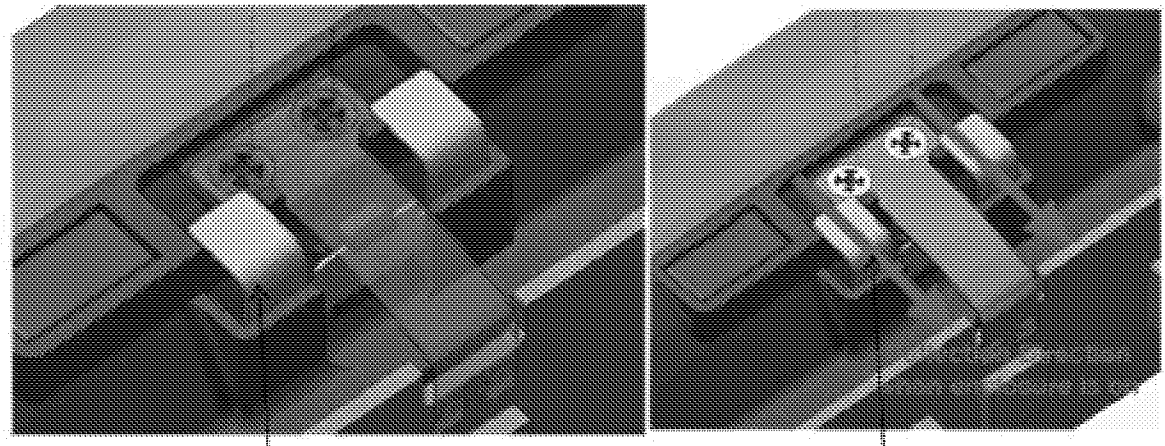


FIG. 20

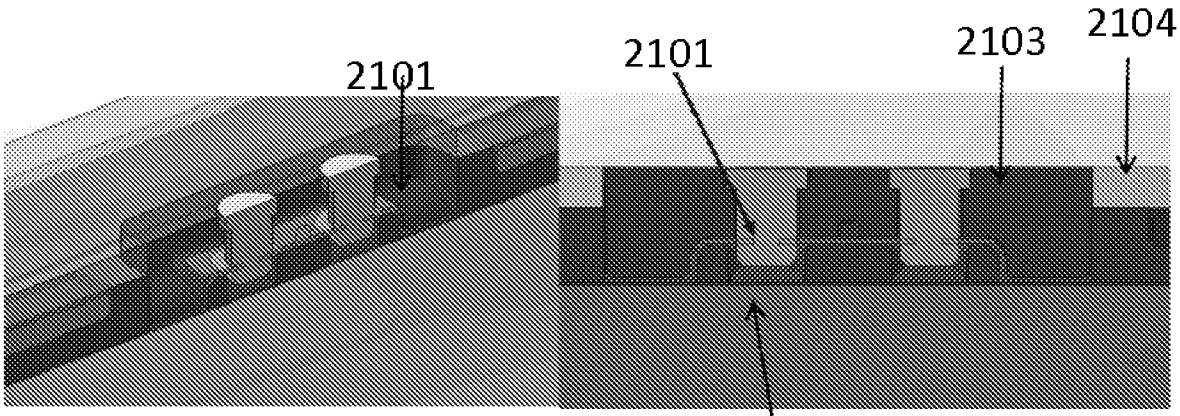


FIG. 21

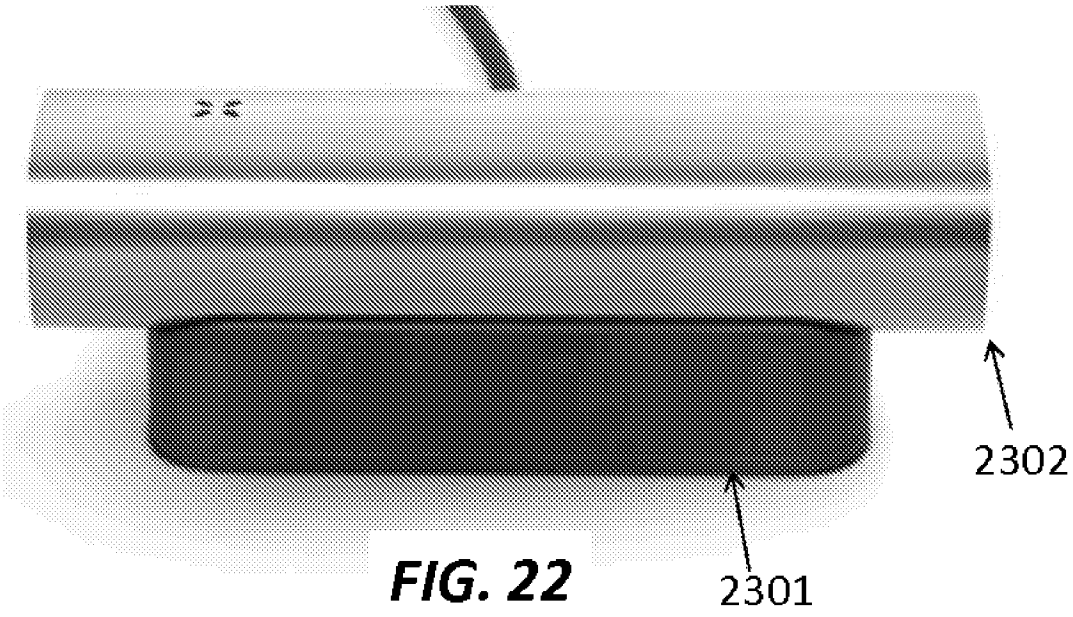


FIG. 22

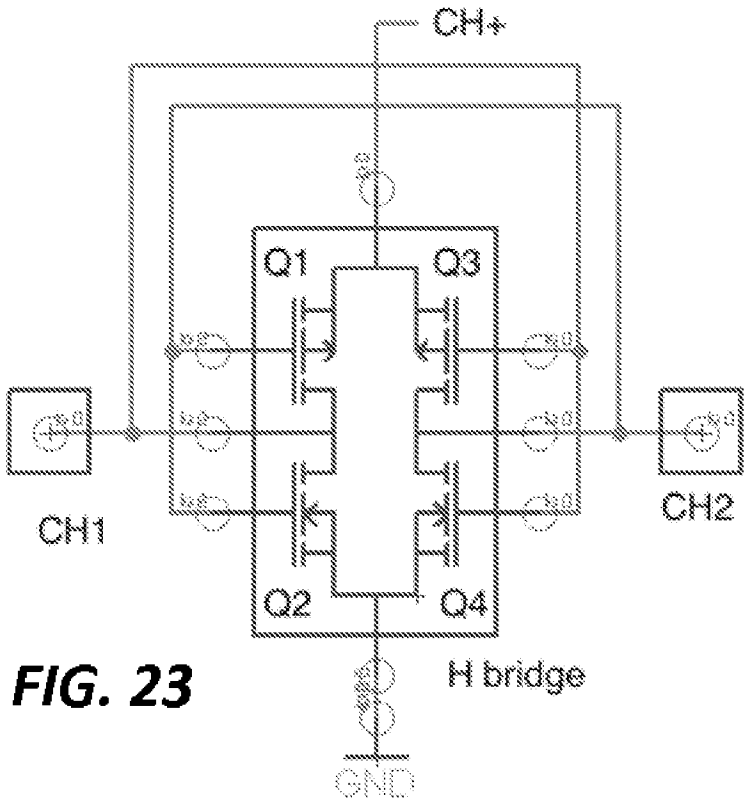


FIG. 23

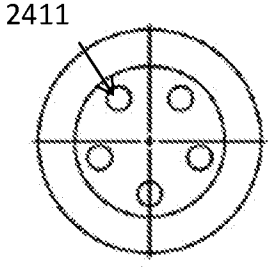


FIG. 24A

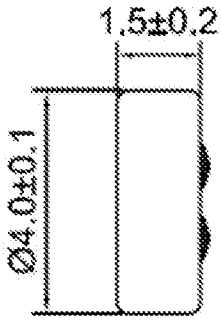


FIG. 24B

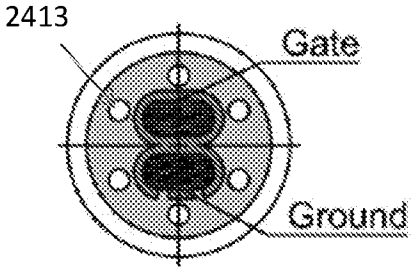


FIG. 24C

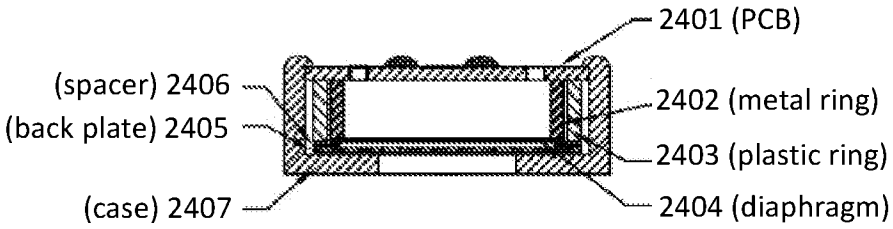


FIG. 24D

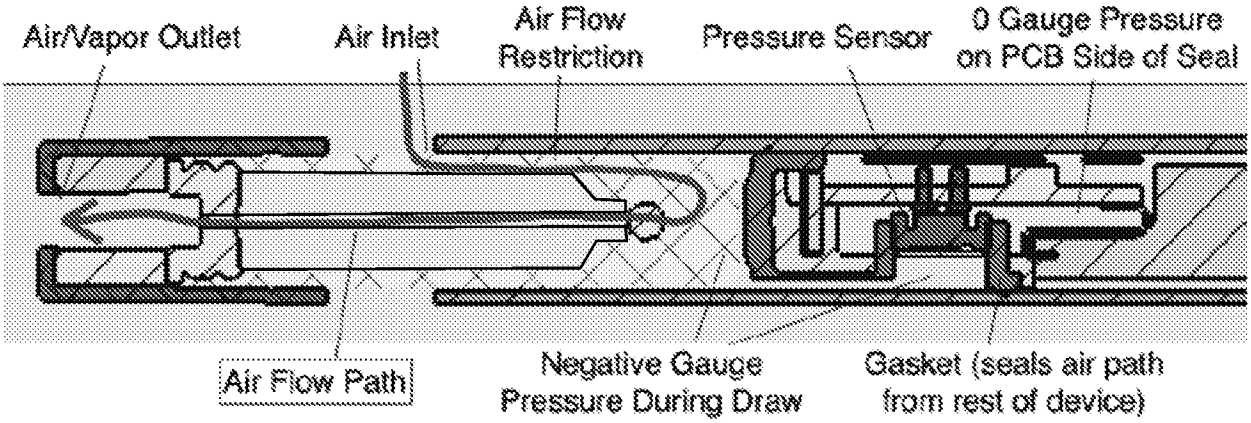


FIG. 25

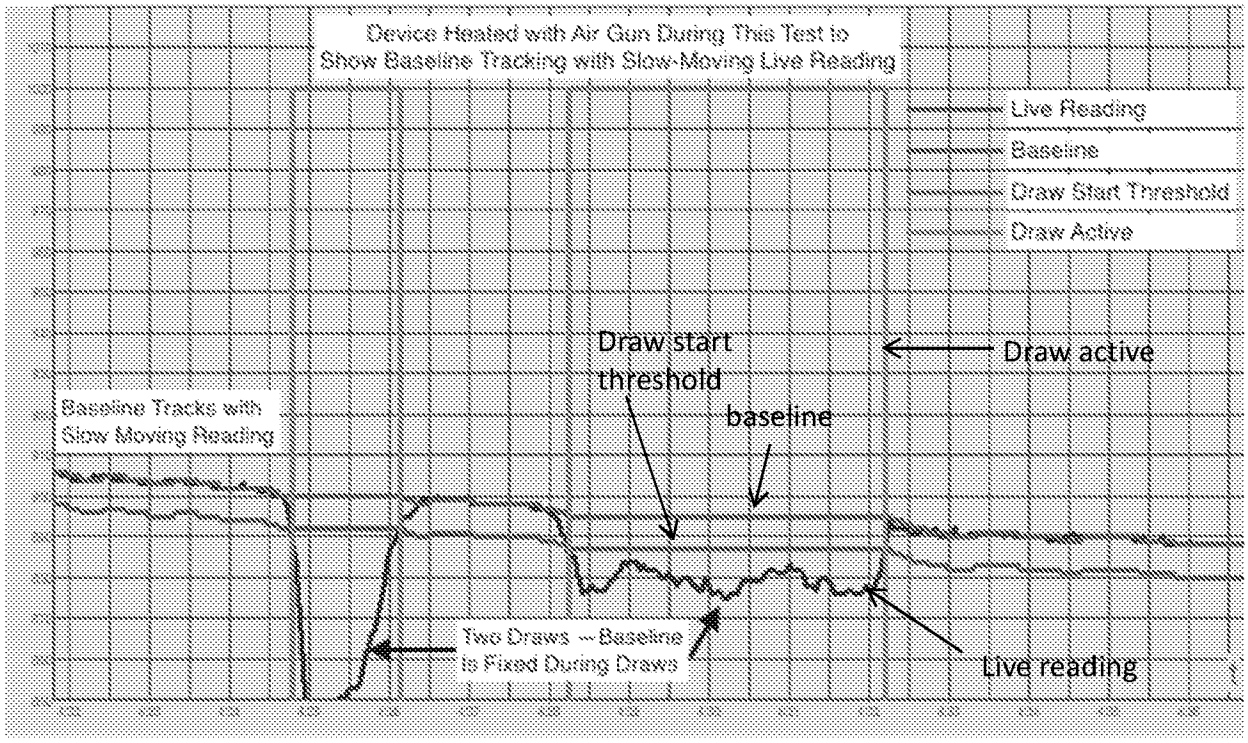

Device Heated with Air Gun During This Test to
Show Baseline Tracking with Slow-Moving Live Reading
Live Reading
Baseline
Draw Start Threshold
Draw Active
Draw start
threshold
Draw active
baseline
Baseline Tracks with
Slow Moving Reading
Two Draws -- Baseline
Is Fixed During Draws
Live reading

FIG. 26

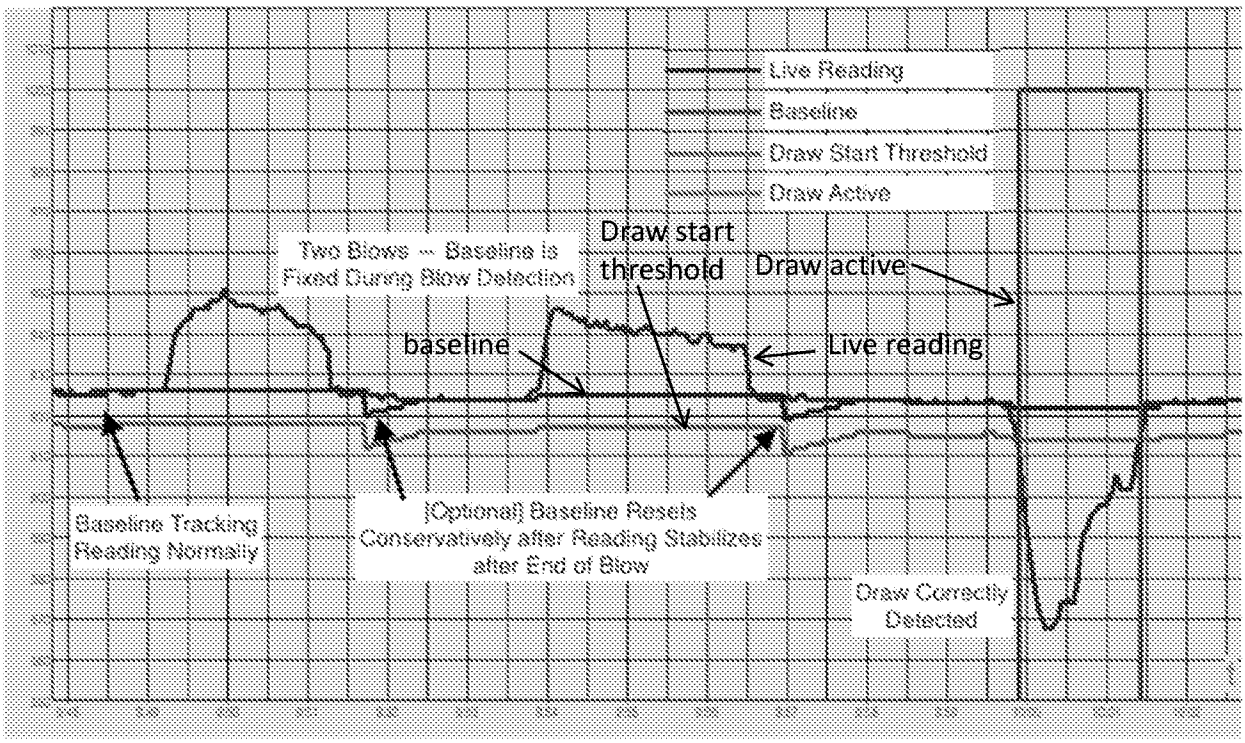

Live Reading
Baseline
Draw Start Threshold
Draw Active
Two Blows -- Baseline is
Fixed During Blow Detection
Draw start
threshold
Draw active
baseline
Live reading
Baseline Tracking
Reading Normally
[Optional] Baseline Resets
Conservatively after Reading Stabilizes
after End of Blow
Draw Correctly
Detected

FIG. 27

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Nicholas	Jay	HATTON	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
San Francisco	CA	US

Mailing Address of Inventor:

Address 1	660 Alabama Street, Second Floor
Address 2	
City	San Francisco
State/Province	CA
Postal Code	94110
Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Steven		CHRISTENSEN	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
San Francisco	CA	US

Mailing Address of Inventor:

Address 1	660 Alabama Street, Second Floor
Address 2	
City	San Francisco
State/Province	CA
Postal Code	94110
Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

NJOY Exhibit 1002.020

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	66854		
Email Address	info@shayglenn.com	Add Email	Remove Email

Application Information:

Title of the Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION		
Attorney Docket Number	13211-736.200	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	18	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	66854		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Claims benefit of provisional	62294271	2016-02-11

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Applicant:

Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

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Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Richard D. Shoop/			Date (YYYY-MM-DD)	2017-02-10
First Name	Richard	Last Name	Shoop	Registration Number	45763

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	13211-736.200
	Application Number	
Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Filer:	Richard Douglas Shoop/Mary Buggie
Attorney Docket Number:	13211-736.200

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	5	40	200
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	210	210
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1210**

Electronic Acknowledgement Receipt

EFS ID:	28329894
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	66854
Filer:	Richard Douglas Shoop/Mary Buggie
Filer Authorized By:	Richard Douglas Shoop
Attorney Docket Number:	13211-736.200
Receipt Date:	10-FEB-2017
Filing Date:	
Time Stamp:	19:07:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1210
RAM confirmation Number	021317INTEFSW00005637504050
Deposit Account	504050
Authorized User	Richard Shoop

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		13211-736-200_Application.pdf	4411425 a06c0c9f8e6c17bed33a82e1fa4bf0ee24489845	yes	73

Multipart Description/PDF files in .zip description

Document Description	Start	End
Abstract	73	73
Claims	69	72
Specification	2	68
Transmittal of New Application	1	1

Warnings:					
Information:					
2	Drawings-other than black and white line drawings	13211-736-200_Drawings.pdf	2436044 a60f2a9ed31629e7c2ed8403e42f3b64acfe3ca6	no	18
Warnings:					
Information:					
3	Application Data Sheet	13211-736-200_ADS.pdf	1822899 4c7633f7d30e574ce9fed01b7d98704d483db159	no	8
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	40085 b5ca9c3916f4c1229aa3a6e03ae3a587ab354a50	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	8710453		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

ABSTRACT

Methods and apparatuses for discriminating between user blowing and drawing (sucking) in an electronic vaporization device. Described herein are electronic aerosol devices and methods of controlling or operating them which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.

CLAIMS

What is claimed is:

1. A vaporizer device comprising:
   a reservoir configured to hold a vaporizable material;
   a heater configured to heat the vaporizable material;
   a mouthpiece in communication with the reservoir;
   a pressure sensor configured to output instantaneous sensor readings; and
   a microcontroller, wherein the microcontroller is configured to:
      determine a baseline based on filtering the instantaneous sensor readings;
      hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value;
      compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece.

2. The device of claim 1, wherein a first side of the pressure sensor is exposed to a first air path through the mouthpiece and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the pressure sensor.

3. The device of claim 1, wherein the third offset value is the same as the second offset value.

4. The device of claim 1, wherein the third offset value is the same as the first offset value.

5. The device of claim 1, wherein the first offset value is zero.

6. The device of claim 1, wherein the second offset value is zero.

7. The device of claim 1, wherein the pressure sensor comprise a capacitive membrane.

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8. The devices of claim 1, wherein the pressure sensor comprises a MEMS pressure sensor.

9. The device of claim 1, wherein the instantaneous pressure sensor output is a capacitance.

10. The device of claim 1, wherein the instantaneous pressure sensor output is a pressure.

11. The device of claim 1, wherein the microcontroller is configured to determine the baseline based on filtering the instantaneous sensor output by low pass filtering the instantaneous sensor output.

12. The device of claim 1, wherein the microcontroller is configured to determine the baseline based on filtering the instantaneous sensor output by taking a running average of the instantaneous sensor output.

13. The device of claim 1, wherein the microcontroller is further configured to stop activating the heater to generate vapor when the instantaneous sensor output is offset from the baseline by less than the third offset value.

14. A vaporizer device comprising:

a reservoir configured to hold a vaporizable material;

a heater configured to heat the vaporizable material;

a mouthpiece in communication with the reservoir;

a pressure sensor comprising configured to output instantaneous sensor readings; and

a microcontroller, wherein the microcontroller is configured to:

determine a baseline based on filtering the instantaneous sensor readings;

hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value;

compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are above the baseline by more than a third offset value indicating suction is being applied to the mouthpiece.

15. A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a differential pressure sensor;

determining a baseline by filtering the instantaneous sensor readings;

holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value;

holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by a second offset value;

comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is offset from the baseline by more than a third offset value, indicating that suction is being applied to the mouthpiece.

16. The method of claim 15, wherein the third offset value is the same as the second offset value.

17. The method of claim 15, wherein the third offset value is the same as the first offset value.

18. The method of claim 15, wherein the first offset value is zero.

19. The method of claim 15, wherein the second offset value is zero.

20. The method of claim 15, wherein the instantaneous pressure sensor reading is a capacitance.

21. The method of claim 15, wherein the instantaneous pressure sensor reading is a pressure.

22. The method of claim 15, wherein determining comprising determining the baseline based on filtering the instantaneous sensor readings by low pass filtering the instantaneous sensor readings.

23. The method of claim 15, wherein determining comprising determining the baseline based on filtering the instantaneous sensor readings by taking a running average of the instantaneous sensor readings.

24. The method of claim 15, further comprising stopping activating the heater to generate vapor when the instantaneous sensor readings are offset from the baseline by less than the third offset value.

25. A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking instantaneous sensor readings from a pressure sensor in the vaporizer device;

determining a baseline by filtering the instantaneous sensor readings;

holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline;

holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by an offset value;

comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is below the baseline by more than the offset value indicating that suction is being applied to the mouthpiece.

UNITED STATES PATENT APPLICATION

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

Inventors:

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VAPORIZER DEVICES WITH BLOW DISCRIMINATION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. provisional patent application no. 62/294,271, titled "VAPORIZER DEVICES WITH BLOW DISCRIMINATION," filed on 2/11/2016 which is herein incorporated by reference in its entirety.

[0002] This patent application may be related to U.S. Patent Application No. 14/581,666, filed on 12/23/2014, and titled "VAPORIZATION DEVICE SYSTEMS AND METHODS", which claimed priority to U.S. Provisional Patent Application No. 61/920,225, filed 12/23/2013, U.S. Provisional Patent Application No. 61/936,593, filed 2/6/2014, and U.S. Provisional Patent Application No. 61/937,755, filed 2/10/2014.

[0003] This application may also be related to or may be used with the inventions in one or more of the following patent applications: U.S. Patent Application No. 14/578,193, filed on 12/19/2014, and titled "METHOD AND SYSTEM FOR VAPORIZATION OF A SUBSTANCE"; U.S. Patent Application No. 14/625,042, filed on 2/18/2015, and titled "AEROSOL DEVICES AND METHODS FOR INHALING A SUBSTANCE AND USES THEREOF"; U.S. Patent Application No. 13/837,438, filed on 3/15/2013, and titled "LOW TEMPERATURE ELECTRONIC VAPORIZATION DEVICE AND METHODS"; U.S. Patent Application No. 14/271,071, filed on 5/6/2014, and titled "NICOTINE SALT FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/304,847, filed on 6/13/2014, and titled "MULTIPLE HEATING ELEMENTS WITH SEPARATE VAPORIZABLE MATERIALS IN AN ELECTRIC VAPORIZATION DEVICE"; U.S. Patent Application No. 14/461,284, filed on 8/15/2014, and titled "METHODS AND DEVICES FOR DELIVERING AND MONITORING OF TOBACCO, NICOTINE, OR OTHER SUBSTANCES"; PCT Patent Application No. PCT/US2015/031152, filed on 5/15/2015, and titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL"; PCT Patent Application No. PCT/US2014/064690, filed on 11/7/2014, and titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/960,259, filed on 12/4/2015, and titled "CALIBRATED DOSE CONTROL"; U.S. patent application no. 15/257,748, titled

"CARTRIDGE FOR USE WITH A VAPORIZER DEVICE," filed on 9/6/2016; U.S. patent application no. 15/257,760, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/257,768, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/379,898, titled "VAPORIZATION DEVICE SYSTEMS AND METHODS," filed on 12/15/2016; U.S. patent application no. 15/309,554, titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL," filed on 11/8/2016; U.S. patent application no. 15/101,303, titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF," filed on 6/2/2016; U.S. patent application no. 14/960,259, titled "CALIBRATED DOSE CONTROL," filed on 12/4/2015; U.S. patent application no. 15/396,584, titled "LEAK-RESISTANT VAPORIZER CARTRIDGES FOR USE WITH CANNABINOIDS," filed on 12/31/2016. Each of these applications is herein incorporated by reference in their entirety.

INCORPORATION BY REFERENCE

[0004] All publications and patent applications mentioned in this specification are herein incorporated by reference in their entirety to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

FIELD

[0005] Described herein are electronic inhalable aerosol devices, or electronic vaping devices, and particularly electronic aerosol devices which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.

BACKGROUND

[0006] Electronic cigarettes are typically battery-powered vaporizers that simulate the feeling of smoking, but without tobacco. Instead of cigarette smoke, the user inhales an aerosol, commonly called vapor, typically released by a heating element that atomizes a liquid solution (vaporizable material or solution). Typically, the user activates the e-cigarette by taking a puff or pressing a button. Some vaporizers look like traditional cigarettes, but they come in many variations.

[0007] Many electronic cigarettes use a pressure sensor to determine when the device should be heating or not. This may allow for an intuitive user interface where the user simply draws from (sucks on) the device to power it. It is advantageous over powering the device with a button in that the device's heating element is only powered when there is airflow over it assuming the device's pressure sensor and microcontroller can accurately detect the start and end of a draw.

[0008] Unfortunately, the vast majority of electronic cigarettes described and currently in use have an unexpected failure mode which may reduce the life of the battery and the overall device. Specifically, such devices may inadvertently (and transiently) detect a draw or inhalation following blowing or exhalation through the device. A recent test of numerous pressure sensor-based electronic cigarettes currently on the market found that these devices can easily be turned on and apply power to the heating element by blowing rather than inhaling into the mouthpiece of the device as if the user had drawn from the device. Specifically, such devices falsely indicate a draw (inhalation) and activate the heater at the end of a blow into the device because they detect a pressure drop at the end of the blow, and falsely interpret this is the start of a draw. Depending on the controller for the vaporizer, this pressure drop at the end of a blow may power the heater for some amount of time, and potentially until a timeout for max draw time. This failure mode may result in the device heating without the user drawing on it, which pay provide a non-ideal user experience, may waste of battery life and vaporizable material, and in devices without temp control may overheat the vaporizable material, which can produce e-juice degradants that taste bad and are potentially more harmful when vaporized that the original contents of the e-juice formulation.

[0009] Many commercially available electronic cigarettes use pressure sensors that are mechanically similar to electret microphones, but packaged with an ASIC (application specific integrated circuit) instead of a standard electret microphone circuit. An electret microphone is an electrostatic capacitor-based microphone that does not require a polarizing power supply. Pressure sensors of this type typically accept two power signals and have one output signal to indicate whether or not a pressure drop was recently detected. For the pressure sensor's ASIC to accommodate changes in environment conditions (humidity and temperature), slight differences in mechanical assembly from sensor to sensor, and potential shifting of parts in the mechanical assembly from vibration or drop, the ASIC's output usually depends on changes in capacitance between the sensor's conductive diaphragm (which deflects with a pressure differential across it)

and a conductive static plate in the sensor instead of depending on absolute measured capacitance crossing some threshold. Given that not all measured pressure drops indicate that the user is drawing from the device, this approach is not ideal.

[0010] In all electronic cigarettes tested (some of which may not use the standard modified electret microphone with ASIC), the device can be made to start heating at the end of a blow into the device's air/vapor outlet. In devices in which direct capacitance measurements may be made by the microcontroller, the same behavior can be produced, meaning there is no software actively handling blows into the device correctly.

[0011] This failure mode may be largely unnoticed, but it is relevant based on many user practices. For example, some electronic cigarette users hold devices in their mouths, resulting in blowing into the device. Devices that don't adequately distinguish between drawing and the end of a blowing into the mouthpiece may start heating after a user has exhaled onto the device.

[0012] Described herein are apparatuses (systems and devices) and methods that may address the problem identified above.

SUMMARY OF THE DISCLOSURE

[0013] The present invention relates generally to apparatuses, including systems and devices, for vaporizing material to form an inhalable aerosol. Specifically, these apparatuses may include vaporizers.

[0014] In particular, described herein are apparatuses including vaporizers that are adapted to prevent one or more failure modes that may result from blowing into the mouthpiece, which may be referred to herein as blow rejection or blow discrimination. In general, such vaporizers and methods of operating a vaporizer may include a pressure sensor that regulates the baseline pressure readings (which may be actual pressure readings or may be unconverted sensor readings, such as capacitance measurements) during a blow and/or a draw through the mouthpiece to prevent instability that may otherwise result from blowing into the mouthpiece.

[0015] For example, described herein are vaporizer devices comprising: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor comprising a differential pressure sensor (e.g., MEMS, capacitive membrane, etc.) configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a

baseline based on filtering the instantaneous sensor readings; hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value; compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece.

[0016] A vaporizer device may include a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings; hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value; compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are below the baseline by more than a third offset value indicating suction is being applied to the mouthpiece.

[0017] A vaporizer device may include: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings; hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value; compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are above the baseline by more than a third offset value indicating suction is being applied to the mouthpiece.

[0018] The first side of the pressure sensor may be exposed to a first air path through the mouthpiece and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the pressure sensor. The third offset value may be the same as the second offset value or

the third offset value may be the same as the first offset value. The first offset value may be zero, or the second offset value is zero.

[0019] The instantaneous pressure sensor output may be capacitance or pressure.

[0020] In general, the pressure sensors described herein may be any differential pressure sensor, such as MEMS, capacitive pressures sensors (e.g., including a capacitive membrane), or any force collector type pressure sensors that use a transducer to measure pressure or pressure differences (e.g., diaphragm, piston, etc.), piezorestrictive, electromagnetic, piezoelectric, optical, potentiometric, resonant (including MEMS), etc. Differential pressure sensors may measure the distance between two pressures, one connected on different sides of the sensor. This includes pressure sensors in which one side is open/connected to ambient atmosphere (pressure).

[0021] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by low pass filtering the instantaneous sensor output.

[0022] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by taking a running average of the instantaneous sensor output.

[0023] The microcontroller may further be configured to stop activating the heater to generate vapor when the instantaneous sensor output is offset from the baseline by less than the third offset value.

[0024] Also described herein are methods of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device that include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by a second offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is offset from the baseline by more than a third offset value, indicating that suction is being applied to the mouthpiece.

[0025] A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device may include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive

membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by an offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is below the baseline by more than the offset value indicating that suction is being applied to the mouthpiece.

[0026] In some variations, the apparatuses described herein may include an inhalable aerosol comprising: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber to generate a vapor; a condenser comprising a condensation chamber in which at least a fraction of the vapor condenses to form the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0027] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The device may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0028] In some variations, the oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet. The aeration vent may comprise a third valve. The first valve, or said second valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The third valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The first or second valve may be mechanically actuated. The first or second valve may be electronically actuated. The first valve or second valve may be manually actuated. The third valve may be mechanically

actuated. The third valve may be mechanically actuated. The third valve may be electronically actuated. The third valve may be manually actuated.

[0029] In some variations, the device may further comprise a body that comprises at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. The device may further comprise a temperature regulator in communication with a temperature sensor. The temperature sensor may be the heater. The power source may be rechargeable. The power source may be removable. The oven may further comprise an access lid. The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may be mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of about 1 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.9 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.8 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.7 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.6 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.5 micron.

[0030] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be

about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0031] Also described herein are methods for generating an inhalable aerosol. Such a method may comprise: providing an inhalable aerosol generating device wherein the device comprises: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0032] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The method may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0033] The oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0034] The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may comprise particle diameters of average mass

of about 1 micron. The vapor may comprise particle diameters of average mass of about 0.9 micron. The vapor may comprise particle diameters of average mass of about 0.8 micron. The vapor may comprise particle diameters of average mass of about 0.7 micron. The vapor may comprise particle diameters of average mass of about 0.6 micron. The vapor may comprise particle diameters of average mass of about 0.5 micron.

[0035] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0036] The device may be user serviceable. The device may not be user serviceable.

[0037] A method for generating an inhalable aerosol may include: providing a vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein said vapor is formed by heating a vapor forming medium in an oven chamber to a first temperature below the pyrolytic temperature of said vapor forming medium, and cooling said vapor in a condensation chamber to a second temperature below the first temperature, before exiting an aerosol outlet of said device.

[0038] A method of manufacturing a device for generating an inhalable aerosol may include: providing said device comprising a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the

condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0039] The method may further comprise providing the device comprising a power source or battery, a printed circuit board, a temperature regulator or operational switches.

[0040] A device for generating an inhalable aerosol may comprise a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0041] A device for generating an inhalable aerosol may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; and a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user.

[0042] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

[0043] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

[0044] The channel may comprise at least one of a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge. The cartridge may further comprise a heater. The heater may be attached to a first end of the cartridge.

[0045] The heater may comprise a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick, wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between. The first pair of heater contacts may further comprise a formed shape that comprises a tab having a flexible spring value that extends out of the heater to couple to complete a circuit with the device body. The first pair of heater contacts may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may contact a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise a first condensation chamber. The heater may comprise more than one first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge. The cartridge may further comprise a mouthpiece. The mouthpiece may be attached to a second end of the cartridge. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one

second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0046] The cartridge may comprise a first condensation chamber and a second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise more than one aerosol outlet in fluid communication with more than one the second condensation chamber. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

[0047] The device may comprise an airflow path comprising an air inlet passage, a second air passage, a heater chamber, a first condensation chamber, a second condensation chamber, and an aerosol outlet. The airflow path may comprise more than one air inlet passage, a heater chamber, more than one first condensation chamber, more than one second condensation chamber, more than one second condensation chamber, and more than one aerosol outlet. The heater may be in fluid communication with the fluid storage compartment. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol. The humectant may comprise vegetable glycerin.

[0048] The cartridge may be detachable. The cartridge may be receptacle and the detachable cartridge forms a separable coupling. The separable coupling may comprise a friction assembly, a snap-fit assembly or a magnetic assembly. The cartridge may comprise a fluid storage compartment, a heater affixed to a first end with a snap-fit coupling, and a mouthpiece affixed to a second end with a snap-fit coupling.

[0049] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage when a cartridge comprising a channel integral to an exterior surface is inserted into the cartridge receptacle, and wherein the channel forms a second side of the air inlet passage.

[0050] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a

cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage.

[0051] A cartridge for a device for generating an inhalable aerosol may include: a fluid storage compartment; a channel integral to an exterior surface, wherein the channel forms a first side of an air inlet passage; and wherein an internal surface of a cartridge receptacle in the device forms a second side of the air inlet passage when the cartridge is inserted into the cartridge receptacle.

[0052] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment, wherein an exterior surface of the cartridge forms a first side of an air inlet channel when inserted into a device body comprising a cartridge receptacle, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage.

[0053] The cartridge may further comprise a second air passage in fluid communication with the channel, wherein the second air passage is formed through the material of the cartridge from an exterior surface of the cartridge to the fluid storage compartment.

[0054] The cartridge may comprise at least one of: a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage.

[0055] A device for generating an inhalable aerosol may comprise: a cartridge comprising; a fluid storage compartment; a heater affixed to a first end comprising; a first heater contact, a resistive heating element affixed to the first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; wherein the PCB is configured to detect the absence of fluid based on the measured resistance of the resistive heating element, and turn off the device.

[0056] The printed circuit board (PCB) may comprise a microcontroller; switches; circuitry comprising a reference resister; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the

resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0057] The micro-controller may instruct the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0058] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end comprising: a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick; wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between.

[0059] The first pair of heater contacts may further comprise: a formed shape that comprises a tab having a flexible spring value that extends out of the heater to complete a circuit with the device body. The heater contacts may be configured to mate with a second pair of heater contacts in a cartridge receptacle of the device body to complete a circuit. The first pair of heater contacts may also be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may be a heat shield that protect the heater chamber from excessive heat produced by the resistive heating element.

[0060] A cartridge for a device for generating an inhalable aerosol may comprise: a heater comprising; a heater chamber, a pair of thin plate heater contacts therein, a fluid wick positioned between the heater contacts, and a resistive heating element in contact with the wick; wherein the heater contacts each comprise a fixation site wherein the resistive heating element is tensioned therebetween.

[0061] A cartridge for a device for generating an inhalable aerosol may comprise a heater, wherein the heater is attached to a first end of the cartridge.

[0062] The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise more than one first condensation chamber. The heater may comprise a first condensation chamber. The condensation chamber may be formed along an exterior wall of the cartridge.

[0063] A cartridge for a device for generating an inhalable aerosol may comprise a fluid storage compartment; and a mouthpiece, wherein the mouthpiece is attached to a second end of the cartridge.

[0064] The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0065] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein the heater comprises a first condensation chamber and the mouthpiece comprises a second condensation chamber.

[0066] The heater may comprise more than one first condensation chamber and the mouthpiece comprises more than one second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise two to more aerosol outlets. The cartridge may meet ISO recycling standards. The cartridge may meet ISO recycling standards for plastic waste.

[0067] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; and a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

[0068] A method of fabricating a device for generating an inhalable aerosol may comprise: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly.

[0069] A method of fabricating a cartridge for a device for generating an inhalable aerosol may comprise: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0070] A cartridge for a device for generating an inhalable aerosol with an airflow path may include: a channel comprising a portion of an air inlet passage; a second air passage in fluid communication with the channel; a heater chamber in fluid communication with the second air passage; a first condensation chamber in fluid communication with the heater chamber; a second condensation chamber in fluid communication with the first condensation chamber; and an aerosol outlet in fluid communication with second condensation chamber.

[0071] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein said mouthpiece comprises two or more aerosol outlets.

[0072] A system for providing power to an electronic device for generating an inhalable vapor may comprise; a rechargeable power storage device housed within the electronic device for generating an inhalable vapor; two or more pins that are accessible from an exterior surface of the electronic device for generating an inhalable vapor, wherein the charging pins are in electrical communication with the rechargeable power storage device; a charging cradle comprising two or more charging contacts configured to provided power to the rechargeable storage device, wherein the device charging pins are reversible such that the device is charged in the charging cradle for charging with a first charging pin on the device in contact a first charging contact on the charging cradle and a second charging pin on the device in contact with second charging contact on the charging cradle and with the first charging pin on the device in contact with second charging contact on the charging cradle and the second charging pin on the device in contact with the first charging contact on the charging cradle.

[0073] The charging pins may be visible on an exterior housing of the device. The user may permanently disable the device by opening the housing. The user may permanently destroy the device by opening the housing.

[0074] Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only illustrative embodiments of the present disclosure are shown and described. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0075] FIG. 1 is an illustrative cross-sectional view of an exemplary vaporization device.

[0076] FIG. 2 is an illustrative cross-sectional view of an exemplary vaporization device with various electronic features and valves.

[0077] FIG. 3 is an illustrative sectional view of another exemplary vaporization device comprising a condensation chamber, air inlet and aeration vent in the mouthpiece.

[0078] FIGS. 4A-4C is an illustrative example of an oven section of another exemplary vaporization device configuration with an access lid, comprising an oven having an air inlet, air outlet, and an additional aeration vent in the airflow pathway, after the oven.

[0079] FIG. 5 is an illustrative isometric view of an assembled inhalable aerosol device.

[0080] FIGS. 6A-6D are illustrative arrangements and section views of the device body and sub-components.

[0081] FIG. 7A is an illustrative isometric view of an assembled cartridge.

[0082] FIG. 7B is an illustrative exploded isometric view of a cartridge assembly

[0083] FIG. 7C is a side section view of Figure 3A illustrating the inlet channel, inlet hole and relative placement of the wick, resistive heating element, and heater contacts, and the heater chamber inside of the heater.

[0084] FIG. 8A is an illustrative end section view of an exemplary cartridge inside the heater.

[0085] FIG. 8B is an illustrative side view of the cartridge with the cap removed and heater shown in shadow / outline.

[0086] FIGS. 9A-9L is an illustrative sequence of the assembly method for the cartridge.

[0087] FIGS. 10A-10C are illustrative sequences showing the airflow / vapor path for the cartridge.

[0088] FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device.

[0089] FIG. 14 illustrates front, side and section views of the assembled inhalable aerosol device.

[0090] FIG. 15 is an illustrative view of an activated, assembled inhalable aerosol device.

[0091] FIGS. 16A-16C are representative illustrations of a charging device for the aerosol device and the application of the charger with the device.

[0092] FIGS. 17A and 17B are representative illustrations of a proportional-integral-derivative controller (PID) block diagram and circuit diagram representing the essential components in a device to control coil temperature.

[0093] FIG. 18 is a device with charging contacts visible from an exterior housing of the device.

[0094] FIG. 19 is an exploded view of a charging assembly of a device.

[0095] FIG. 20 is a detailed view of a charging assembly of a device.

[0096] FIG. 21 is a detailed view of charging pins in a charging assembly of a device.

[0097] FIG. 22 is a device in a charging cradle.

[0098] FIG. 23 is a circuit provided on a PCB configured to permit a device to comprise reversible charging contacts.

[0099] FIGS. 24A-24D illustrate schematics for one variation of a pressure sensor that may be used with any of the apparatuses described herein. FIGS. 24A-24C show dimensional drawings of the bottom, side and top, respectively, while FIG. 24D shows a section through the structure. In some variations pins may replace the solder pads labeled "gate" and "ground" in FIG. 24C.

[0100] FIG. 25 is a sectional view of a schematic illustration through one variation of a vaporizer device as described herein, showing an air path through the device.

[0101] FIG. 26 is a graph illustrating draw detection using an apparatus as described herein, illustrating tracking of multiple draws.

[0102] FIG. 27 is a graph illustrating blow detection (and rejection) and draw detection using an apparatus as described herein.

DETAILED DESCRIPTION

[0103] Provided herein are systems and methods for generating a vapor from a material. The vapor may be delivered for inhalation by a user. The material may be a solid, liquid, powder, solution, paste, gel, or any a material with any other physical consistency. The vapor may be delivered to the user for inhalation by a vaporization device. The vaporization device may be a handheld vaporization device. The vaporization device may be held in one hand by the user.

[0104] The vaporization device may comprise one or more heating elements the heating element may be a resistive heating element. The heating element may heat the material such that the temperature of the material increases. Vapor may be generated as a result of heating the material. Energy may be required to operate the heating element, the energy may be derived from a battery in electrical communication with the heating element. Alternatively a chemical

reaction (e.g., combustion or other exothermic reaction) may provide energy to the heating element.

[0105] One or more aspects of the vaporization device may be designed and/or controlled in order to deliver a vapor with one or more specified properties to the user. For example, aspects of the vaporization device that may be designed and/or controlled to deliver the vapor with specified properties may comprise the heating temperature, heating mechanism, device air inlets, internal volume of the device, and/or composition of the material.

[0106] In some cases, a vaporization device may have an "atomizer" or "cartomizer" configured to heat an aerosol forming solution (e.g., vaporizable material). The aerosol forming solution may comprise glycerin and/or propylene glycol. The vaporizable material may be heated to a sufficient temperature such that it may vaporize.

[0107] An atomizer may be a device or system configured to generate an aerosol. The atomizer may comprise a small heating element configured to heat and/or vaporize at least a portion of the vaporizable material and a wicking material that may draw a liquid vaporizable material in to the atomizer. The wicking material may comprise silica fibers, cotton, ceramic, hemp, stainless steel mesh, and/or rope cables. The wicking material may be configured to draw the liquid vaporizable material in to the atomizer without a pump or other mechanical moving part. A resistance wire may be wrapped around the wicking material and then connected to a positive and negative pole of a current source (e.g., energy source). The resistance wire may be a coil. When the resistance wire is activated the resistance wire (or coil) may have a temperature increase as a result of the current flowing through the resistive wire to generate heat. The heat may be transferred to at least a portion of the vaporizable material through conductive, convective, and/or radiative heat transfer such that at least a portion of the vaporizable material vaporizes.

[0108] Alternatively or in addition to the atomizer, the vaporization device may comprise a "cartomizer" to generate an aerosol from the vaporizable material for inhalation by the user. The cartomizer may comprise a cartridge and an atomizer. The cartomizer may comprise a heating element surrounded by a liquid-soaked poly-foam that acts as holder for the vaporiable material (e.g., the liquid). The cartomizer may be reusable, rebuildable, refillable, and/or disposable. The cartomizer may be used with a tank for extra storage of a vaporizable material.

[0109] Air may be drawn into the vaporization device to carry the vaporized aerosol away from the heating element, where it then cools and condenses to form liquid particles suspended in air, which may then be drawn out of the mouthpiece by the user.

[0110] The vaporization of at least a portion of the vaporizable material may occur at lower temperatures in the vaporization device compared to temperatures required to generate an inhalable vapor in a cigarette. A cigarette may be a device in which a smokable material is burned to generate an inhalable vapor. The lower temperature of the vaporization device may result in less decomposition and/or reaction of the vaporized material, and therefore produce an aerosol with many fewer chemical components compared to a cigarette. In some cases, the vaporization device may generate an aerosol with fewer chemical components that may be harmful to human health compared to a cigarette. Additionally, the vaporization device aerosol particles may undergo nearly complete evaporation in the heating process, the nearly complete evaporation may yield an average particle size (e.g., diameter) value that may be smaller than the average particle size in tobacco or botanical based effluent.

[0111] A vaporization device may be a device configured to extract for inhalation one or more active ingredients of plant material, tobacco, and/or a botanical, or other herbs or blends. A vaporization device may be used with pure chemicals and/or humectants that may or may not be mixed with plant material. Vaporization may be alternative to burning (smoking) that may avoid the inhalation of many irritating and/or toxic carcinogenic by-products which may result from the pyrolytic process of burning tobacco or botanical products above 300° C. The vaporization device may operate at a temperature at or below 300° C.

[0112] A vaporizer (e.g., vaporization device) may not have an atomizer or cartomizer. Instead the device may comprise an oven. The oven may be at least partially closed. The oven may have a closable opening. The oven may be wrapped with a heating element, alternatively the heating element may be in thermal communication with the oven through another mechanism. A vaporizable material may be placed directly in the oven or in a cartridge fitted in the oven. The heating element in thermal communication with the oven may heat a vaporizable material mass in order to create a gas phase vapor. The heating element may heat the vaporizable material through conductive, convective, and/or radiative heat transfer. The vapor may be released to a vaporization chamber where the gas phase vapor may condense, forming an aerosol cloud having typical liquid vapor particles with particles having a diameter of average

mass of approximately 1 micron or greater. In some cases the diameter of average mass may be approximately 0.1-1 micron.

[0113] A used herein, the term "vapor" may generally refer to a substance in the gas phase at a temperature lower than its critical point. The vapor may be condensed to a liquid or to a solid by increasing its pressure without reducing the temperature.

[0114] As used herein, the term "aerosol" may generally refer to a colloid of fine solid particles or liquid droplets in air or another gas. Examples of aerosols may include clouds, haze, and smoke, including the smoke from tobacco or botanical products. The liquid or solid particles in an aerosol may have varying diameters of average mass that may range from monodisperse aerosols, producible in the laboratory, and containing particles of uniform size; to polydisperse colloidal systems, exhibiting a range of particle sizes. As the sizes of these particles become larger, they have a greater settling speed which causes them to settle out of the aerosol faster, making the appearance of the aerosol less dense and to shorten the time in which the aerosol will linger in air. Interestingly, an aerosol with smaller particles will appear thicker or denser because it has more particles. Particle number has a much bigger impact on light scattering than particle size (at least for the considered ranges of particle size), thus allowing for a vapor cloud with many more smaller particles to appear denser than a cloud having fewer, but larger particle sizes.

[0115] As used herein the term "humectant" may generally refer to as a substance that is used to keep things moist. A humectant may attract and retain moisture in the air by absorption, allowing the water to be used by other substances. Humectants are also commonly used in many tobaccos or botanicals and electronic vaporization products to keep products moist and as vapor-forming medium. Examples include propylene glycol, sugar polyols such as glycerol, glycerin, and honey.

[0116] Rapid Aeration

[0117] In some cases, the vaporization device may be configured to deliver an aerosol with a high particle density. The particle density of the aerosol may refer to the number of the aerosol droplets relative to the volume of air (or other dry gas) between the aerosol droplets. A dense aerosol may easily be visible to a user. In some cases the user may inhale the aerosol and at least a fraction of the aerosol particles may impinge on the lungs and/or mouth of the user. The user may exhale residual aerosol after inhaling the aerosol. When the aerosol is dense the residual

aerosol may have sufficient particle density such that the exhaled aerosol is visible to the user. In some cases, a user may prefer the visual effect and/or mouth feel of a dense aerosol.

[0118] A vaporization device may comprise a vaporizable material. The vaporizable material may be contained in a cartridge or the vaporizable material may be loosely placed in one or more cavities the vaporization device. A heating element may be provided in the device to elevate the temperature of the vaporizable material such that at least a portion of the vaporizable material forms a vapor. The heating element may heat the vaporizable material by convective heat transfer, conductive heat transfer, and/or radiative heat transfer. The heating element may heat the cartridge and/or the cavity in which the vaporizable material is stored.

[0119] Vapor formed upon heating the vaporizable material may be delivered to the user. The vapor may be transported through the device from a first position in the device to a second position in the device. In some cases, the first position may be a location where at least a portion of the vapor was generated, for example, the cartridge or cavity or an area adjacent to the cartridge or cavity. The second position may be a mouthpiece. The user may suck on the mouthpiece to inhale the vapor.

[0120] At least a fraction of the vapor may condense after the vapor is generated and before the vapor is inhaled by the user. The vapor may condense in a condensation chamber. The condensation chamber may be a portion of the device that the vapor passes through before delivery to the user. In some cases, the device may include at least one aeration vent, placed in the condensation chamber of the vaporization device. The aeration vent may be configured to introduce ambient air (or other gas) into the vaporization chamber. The air introduced into the vaporization chamber may have a temperature lower than the temperature of a gas and/or gas/vapor mixture in the condensation chamber. Introduction of the relatively lower temperature gas into the vaporization chamber may provide rapid cooling of the heated gas vapor mixture that was generated by heating the vaporizable material. Rapid cooling of the gas vapor mixture may generate a dense aerosol comprising a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user.

[0121] An aerosol with a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user may be formed in a two-step process. The first step may occur in the oven chamber

where the vaporizable material (e.g., tobacco and/or botanical and humectant blend) may be heated to an elevated temperature. At the elevated temperature, evaporation may happen faster than at room temperature and the oven chamber may fill with the vapor phase of the humectants. The humectant may continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 (S = Ppartial/Psat).

[0122] In the second step, the gas (e.g., vapor and air) may exit the oven and enter a condenser or condensation chamber and begin to cool. As the gas phase vapor cools, the saturation pressure may decrease. As the saturation pressure decreases, the saturation ratio may increase and the vapor may begin to condense, forming droplets. In some devices, with the absence of added cooling aeration, the cooling may be relatively slower such that high saturation pressures may not be reached, and the droplets that form in the devices without added cooling aeration may be relatively larger and fewer in numbers. When cooler air is introduced, a temperature gradient may be formed between the cooler air and the relatively warmer gas in the device. Mixing between the cooler air and the relatively warmer gas in a confined space inside of the vaporization device may lead to rapid cooling. The rapid cooling may generate high saturation ratios, small particles, and high concentrations of smaller particles, forming a thicker, denser vapor cloud compared to particles generated in a device without the aeration vents.

[0123] For the purpose of this disclosure, when referring to ratios of humectants such as vegetable glycerol or propylene glycol, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0124] For the purpose of this disclosure, when referring to a diameter of average mass in particle sizes, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0125] A vaporization device configured to rapidly cool a vapor may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the condensation chamber after the vapor is formed in the

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oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0126] In some embodiments, the oven is within a body of the device. The oven chamber may comprise an oven chamber inlet and an oven chamber outlet. The oven may further comprise a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0127] The oven may be contained within a device housing. In some cases the body of the device may comprise the aeration vent and/or the condenser. The body of the device may comprise one or more air inlets. The body of the device may comprise a housing that holds and/or at least partially contains one or more elements of the device.

[0128] The mouthpiece may be connected to the body. The mouthpiece may be connected to the oven. The mouthpiece may be connected to a housing that at least partially encloses the oven. In some cases, the mouthpiece may be separable from the oven, the body, and/or the housing that at least partially encloses the oven. The mouthpiece may comprise at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be integral to the body of the device. The body of the device may comprise the oven.

[0129] In some cases, the one or more aeration vents may comprise a valve. The valve may regulate a flow rate of air entering the device through the aeration vent. The valve may be controlled through a mechanical and/or electrical control system.

[0130] A vaporization device configured to rapidly cool a vapor may comprise: a body, a mouthpiece, an aerosol outlet, a condenser with a condensation chamber, a heater, an oven with an oven chamber, a primary airflow inlet, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0131] FIG. 1 shows an example of a vaporization device configured to rapidly cool a vapor. The device 100, may comprise a body 101. The body may house and/or integrate with one or more components of the device. The body may house and/or integrate with a mouthpiece 102. The mouthpiece 102 may have an aerosol outlet 122. A user may inhale the generated aerosol through the aerosol outlet 122 on the mouthpiece 102. The body may house and/or integrate with an oven region 104. The oven region 104 may comprise an oven chamber where vapor forming medium 106 may be placed. The vapor forming medium may include tobacco and/or

botanicals, with or without a secondary humectant. In some cases the vapor forming medium may be contained in a removable and/or refillable cartridge.

[0132] Air may be drawn into the device through a primary air inlet 121. The primary air inlet 121 may be on an end of the device 100 opposite the mouthpiece 102. Alternatively, the primary air inlet 121 may be adjacent to the mouthpiece 102. In some cases, a pressure drop sufficient to pull air into the device through the primary air inlet 121 may be due to a user puffing on the mouthpiece 102.

[0133] The vapor forming medium (e.g., vaporizable material) may be heated in the oven chamber by a heater 105, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components. The heater 105 may transfer heat to the vapor forming medium through conductive, convective, and/or radiative heat transfer. The generated vapor may be drawn out of the oven region and into the condensation chamber 103a, of the condenser 103 where the vapors may begin to cool and condense into micro-particles or droplets suspended in air, thus creating the initial formation of an aerosol, before being drawn out of the mouthpiece through the aerosol outlet 122.

[0134] In some cases, relatively cooler air may be introduced into the condensation chamber 103a, through an aeration vent 107 such that the vapor condenses more rapidly compared to a vapor in a device without the aeration vent 107. Rapidly cooling the vapor may create a denser aerosol cloud having particles with a diameter of average mass of less than or equal to about 1 micron, and depending on the mixture ratio of the vapor-forming humectant, particles with a diameter of average mass of less than or equal to about 0.5 micron

[0135] Also described herein are devices for generating an inhalable aerosol said device comprising a body with a mouthpiece at one end, an attached body at the other end comprising a condensation chamber, a heater, an oven, wherein the oven comprises a first valve in the airflow path at the primary airflow inlet of the oven chamber, and a second valve at the outlet end of the oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0136] FIG. 2 shows a diagram of an alternative embodiment of the vaporization device 200. The vaporization device may have a body 201. The body 201 may integrate with and/or contain one or more components of the device. The body may integrate with or be connected to a mouthpiece 202

[0137] The body may comprise an oven region 204, with an oven chamber 204a having a first constricting valve 208 in the primary air inlet of the oven chamber and a second constricting valve 209 at the oven chamber outlet. The oven chamber 204a may be sealed with a tobacco or botanical and/or humectant / vapor forming medium 206 therein. The seal may be an air tight and/or liquid tight seal. The heater may be provided to the oven chamber with a heater 205. The heater 205 may be in thermal communication with the oven, for example the heater may be surrounding the oven chamber during the vaporization process. Heater may contact the oven. The heater may be wrapped around the oven. Before inhalation and before air is drawn in through a primary air inlet 221, pressure may build in the sealed oven chamber as heat is continually added. The pressure may build due to a phase change of the vaporizable material. Elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components may be achieved by continually adding heat to the oven. This heated pressurization process may generate even higher saturation ratios when the valves 208, 209 are opened during inhalation. The higher saturation ratios may cause relatively higher particle concentrations of gas phase humectant in the resultant aerosol. When the vapor is drawn out of the oven region and into the condensation chamber 203a of the condenser 203, for example by inhalation by the user, the gas phase humectant vapors may be exposed to additional air through an aeration vent 207, and the vapors may begin to cool and condense into droplets suspended in air. As described previously the aerosol may be drawn through the mouthpiece 222 by the user. This condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0138] FIG. 2 also illustrates an exemplary embodiment of the additional components which would be found in a vaporizing device, including a power source or battery 211, a printed circuit board 212, a temperature regulator 213, and operational switches (not shown), housed within an internal electronics housing 214, to isolate them from the damaging effects of the moisture in the vapor and/or aerosol. The additional components may be found in a vaporizing device that may or may not comprise an aeration vent as described above.

[0139] In some embodiments of the vaporization device, components of the device are user serviceable, such as the power source or battery. These components may be replaceable or rechargeable.

[0140] Also described herein are devices for generating an inhalable aerosol said device comprising a first body, a mouthpiece having an aerosol outlet, a condensation chamber within a condenser and an airflow inlet and channel, an attached second body, comprising a heater and oven with an oven chamber, wherein said airflow channel is upstream of the oven and the mouthpiece outlet to provide airflow through the device, across the oven, and into the condensation chamber where an auxiliary aeration vent is provided.

[0141] FIG. 3 shows a section view of a vaporization device 300. The device 300 may comprise a body 301. The body may be connected to or integral with a mouthpiece 302 at one end. The mouthpiece may comprise a condensation chamber 303a within a condenser section 303 and an airflow inlet 321 and air channel 323. The device body may comprise a proximally located oven 304 comprising an oven chamber 304a. The oven chamber may be in the body of the device. A vapor forming medium 306 (e.g., vaporizable material) comprising tobacco or botanical and humectant vapor forming medium may be placed in the oven. The vapor forming medium may be in direct contact with an air channel 323 from the mouthpiece. The tobacco or botanical may be heated by heater 305 surrounding the oven chamber, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components and air drawn in through a primary air inlet 321, across the oven, and into the condensation chamber 303a of the condenser region 303 due to a user puffing on the mouthpiece. Once in the condensation chamber where the gas phase humectant vapors begin to cool and condense into droplets suspended in air, additional air is allowed to enter through aeration vent 307, thus, once again creating a denser aerosol cloud having particles with a diameter of average mass of less than a typical vaporization device without an added aeration vent, before being drawn out of the mouthpiece through the aerosol outlet 322.

[0142] The device may comprises a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the

inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0143] The device may comprise a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user, as illustrated in exemplary FIG. 3.

[0144] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body comprising the condensation chamber, a heater, and an oven, as illustrated in exemplary FIGS. 1 or 2.

[0145] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body. The mouthpiece may comprise the condensation chamber, and may be attached to or immediately adjacent to the oven and which is separable from the body comprising a heater, and the oven, as illustrated in exemplary FIG. 3.

[0146] The at least one aeration vent may be located in the condensation chamber of the condenser, as illustrated in exemplary FIGS. 1, 2, or 3 . The at least one aeration vent may comprise a third valve in the airflow path of the at least one aeration vent, as illustrated in exemplary FIG. 2. The first, second and third valve is a check valve, a clack valve, a non-return valve, or a one-way valve. In any of the preceding variations, the first, second or third valve may be mechanically actuated, electronically actuated or manually actuated. One skilled in the art will recognize after reading this disclosure that this device may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

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[0147] The device may further comprise at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. Alternately, one skilled in the art would recognize that each configuration previously described will also accommodate said power source (battery), switch, printed circuit board, or temperature regulator as appropriate, in the body.

[0148] The device may be disposable when the supply of pre-packaged aerosol-forming media is exhausted. Alternatively, the device may be rechargeable such that the battery may be rechargeable or replaceable, and /or the aerosol-forming media may be refilled, by the user/operator of the device. Still further, the device may be rechargeable such that the battery may be rechargeable or replaceable, and/or the operator may also add or refill a tobacco or botanical component, in addition to a refillable or replaceable aerosol-forming media to the device.

[0149] As illustrated in FIGS. 1, 2 or 3, the vaporization device may comprise tobacco or a botanical heated in said oven chamber, wherein said tobacco or botanical further comprises humectants to produce an aerosol comprising gas phase components of the humectant and tobacco or botanical. The gas phase humectant and tobacco or botanical vapor produced by said heated aerosol forming media 106, 206, 306 may further be mixed with air from a special aeration vent 107, 207, 307 after exiting the oven area 104, 204, 304 and entering a condensation chamber 103a, 203a, 303a to cool and condense said gas phase vapors to produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0150] Each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0151] The possible variations and ranges of aerosol density are great in that the possible number of combinations of temperature, pressure, tobacco or botanical choices and humectant selections are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures ranges and the humectant ratios to those described herein, the inventor has demonstrated that this device will produce a far denser, thicker aerosol comprising more particles

than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0152] The humectant may comprise glycerol or vegetable glycerol as a vapor-forming medium.

[0153] The humectant may comprise propylene glycol as a vapor-forming medium.

[0154] In preferred embodiments, the humectant may comprise a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio may vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of about 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0155] In a preferred embodiment the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0156] In a most preferred embodiment, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol.

[0157] In any of the preferred embodiments, the humectant may further comprise flavoring products. These flavorings may include enhancers comprising cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name but a few.

[0158] The tobacco or botanical may be heated in the oven up to its pyrolytic temperature, which as noted previously is most commonly measured in the range of 300 - 1000° C.

[0159] In preferred embodiments, the tobacco or botanical is heated to about 300° C at most. In other preferred embodiments, the tobacco or botanical is heated to about 200° C at most. In still other preferred embodiments, the tobacco or botanical is heated to about 160° C at most. It should be noted that in these lower temperature ranges (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization,

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depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0160] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant is mixed with air provided through an aeration vent.

[0161] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C at most, and even as low as 35° C before exiting the mouthpiece, depending on the air temperature being mixed into the condensation chamber. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0162] Also described herein are vaporization devices for generating an inhalable aerosol comprising a unique oven configuration, wherein said oven comprises an access lid and an auxiliary aeration vent located within the airflow channel immediately downstream of the oven and before the aeration chamber. In this configuration, the user may directly access the oven by removing the access lid, providing the user with the ability to recharge the device with vaporization material.

[0163] In addition, having the added aeration vent in the airflow channel immediately after the oven and ahead of the vaporization chamber provides the user with added control over the amount of air entering the aeration chamber downstream and the cooling rate of the aerosol before it enters the aeration chamber.

[0164] As noted in FIGS. 4A-4C, the device 400 may comprise a body 401, having an air inlet 421 allowing initial air for the heating process into the oven region 404. After heating the tobacco or botanical, and humectant (heater not shown), the gas phase humectant vapor generated may travel down the airflow channel 423, passing the added aeration vent 407 wherein the user may selectively increase airflow into the heated vapor. The user may selectively increase and/or decrease the airflow to the heated vapor by controlling a valve in communication with the aeration vent 407. In some cases, the device may not have an aeration vent. Airflow into the heated vapor through the aeration vent may decrease the vapor temperature before exiting the airflow channel at the outlet 422, and increase the condensation rate and vapor density by decreasing the diameter of the vapor particles within the aeration chamber (not shown), thus producing a thicker, denser vapor compared to the vapor generated by a device

without the aeration vent.. The user may also access the oven chamber 404a to recharge or reload the device 400, through an access lid 430 provided therein, making the device user serviceable. The access lid may be provided on a device with or without an aeration vent.

[0165] Provided herein is a method for generating an inhalable aerosol, the method comprising: providing an vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein the vapor is formed by heating a vapor forming medium in an oven chamber of the device to a first temperature below the pyrolytic temperature of the vapor forming medium, and cooling the vapor in a condensation chamber to a temperature below the first temperature, before exiting an aerosol outlet of said device.

[0166] In some embodiments the vapor may be cooled by mixing relatively cooler air with the vapor in the condensation chamber during the condensation phase, after leaving the oven, where condensation of the gas phase humectants occurs more rapidly due to high saturation ratios being achieved at the moment of aeration, producing a higher concentration of smaller particles, with fewer by-products, in a denser aerosol, than would normally occur in a standard vaporization or aerosol generating device.

[0167] In some embodiments, formation of an inhalable aerosol is a two-step process. The first step occurs in the oven where the tobacco or botanical and humectant blend is heated to an elevated temperature. At the elevated temperature, evaporation happens faster than at room temperature and the oven chamber fills with the vapor phase of the humectants. The humectant will continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 (S = Ppartial/Psat).

[0168] In the second step, the gas leaves the oven chamber, passes to a condensation chamber in a condenser and begins to cool. As the gas phase vapor cools, the saturation pressure also goes down, causing the saturation ratio to rise, and the vapor to condensate, forming droplets. When cooling air is introduced, the large temperature gradient between the two fluids mixing in a confined space leads to very rapid cooling, causing high saturation ratios, small particles, and higher concentrations of smaller particles, forming a thicker, denser vapor cloud.

[0169] Provided herein is a method for generating an inhalable aerosol comprising: a vaporization device having a body with a mouthpiece at one end, and an attached body at the other end comprising; a condenser with a condensation chamber, a heater, an oven with an oven

chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece, wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0170] As previously described, a vaporization device having an auxiliary aeration vent located in the condensation chamber capable of supplying cool air (relative to the heated gas components) to the gas phase vapors and tobacco or botanical components exiting the oven region, may be utilized to provide a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0171] In another aspect, provided herein is a method for generating an inhalable aerosol comprising: a vaporization device, having a body with a mouthpiece at one end, and an attached body at the other end comprising: a condenser with a condensation chamber, a heater, an oven with an oven chamber, wherein said oven chamber further comprises a first valve in the airflow path at the inlet end of the oven chamber, and a second valve at the outlet end of the oven chamber; and at least one aeration vent provided in said body, downstream of the oven, and upstream of the mouthpiece wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0172] As illustrated in exemplary FIG. 2, by sealing the oven chamber 204a with a tobacco or botanical and humectant vapor forming medium 206 therein, and applying heat with the heater 205 during the vaporization process, before inhalation and air is drawn in through a primary air inlet 221, the pressure will build in the oven chamber as heat is continually added with an electronic heating circuit generated through the combination of the battery 211, printed circuit board 212, temperature regulator 213, and operator controlled switches (not shown), to generate even greater elevated temperature gas phase humectants (vapor) of the tobacco or botanical and humectant vapor forming components. This heated pressurization process generates even higher saturation ratios when the valves 208, 209 are opened during inhalation, which cause higher particle concentrations in the resultant aerosol, when the vapor is drawn out of the oven region and into the condensation chamber 203a, where they are again exposed to additional air through an aeration vent 207, and the vapors begin to cool and condense into droplets suspended in air, as described previously before the aerosol is withdrawn through the mouthpiece 222. The inventor

also notes that this condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0173] In some embodiments of any one of the inventive methods, the first, second and/or third valve is a one-way valve, a check valve, a clack valve, or a non-return valve. The first, second and/or third valve may be mechanically actuated. The first, second and/or third valve may be electronically actuated. The first, second and/or third valve may be automatically actuated. The first, second and/or third valve may be manually actuated either directly by a user or indirectly in response to an input command from a user to a control system that actuates the first, second and/or third valve.

[0174] In other aspects of the inventive methods, said device further comprises at least one of: a power source, a printed circuit board, or a temperature regulator.

[0175] In any of the preceding aspects of the inventive method, one skilled in the art will recognize after reading this disclosure that this method may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms or electronics as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

[0176] The possible variations and ranges of aerosol density are great in that the possible number of temperature, pressure, tobacco or botanical choices and humectant selections and combinations are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures to within the ranges and the humectant ratios described herein, the inventor has demonstrated a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to 1 micron.

[0177] In some embodiments of the inventive methods, the humectant comprises a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio will vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of

5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0178] Because vegetable glycerol is less volatile than propylene glycol, it will recondense in greater proportions. A humectant with higher concentrations of glycerol will generate a thicker aerosol. The addition of propylene glycol will lead to an aerosol with a reduced concentration of condensed phase particles and an increased concentration of vapor phase effluent. This vapor phase effluent is often perceived as a tickle or harshness in the throat when the aerosol is inhaled. To some consumers, varying degrees of this sensation may be desirable. The ratio of vegetable glycerol to propylene glycol may be manipulated to balance aerosol thickness with the right amount of "throat tickle."

[0179] In a preferred embodiment of the method, the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0180] In a most preferred embodiment of the method, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol. On will envision that there will be blends with varying ratios for consumers with varying preferences.

[0181] In any of the preferred embodiments of the method, the humectant further comprises flavoring products. These flavorings include enhancers such as cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name a few.

[0182] In some embodiments of the method, the tobacco or botanical is heated to its pyrolytic temperature.

[0183] In preferred embodiments of the method, the tobacco or botanical is heated to about 300° C at most.

[0184] In other preferred embodiments of the method, the tobacco or botanical is heated to about 200° C at most. In still other embodiments of the method, the tobacco or botanical is heated to about 160° C at most.

[0185] As noted previously, at these lower temperatures, (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. As may be inferred from the data supplied by Baker et al., an aerosol produced at these temperatures is also substantially free from Hoffman analytes or at least 70% less Hoffman analytes than a common tobacco or botanical cigarette and scores

significantly better on the Ames test than a substance generated by burning a common cigarette. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0186] In any one of the preceding methods, said inhalable aerosol produced by tobacco or a botanical comprising a humectant and heated in said oven produces an aerosol comprising gas phase humectants is further mixed with air provided through an aeration vent.

[0187] In any one of the preceding methods, said aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C, and even as low as 35° C, before exiting the mouthpiece. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0188] In some embodiments of the method, the vapor comprising gas phase humectant may be mixed with air to produce an aerosol comprising particle diameters of average mass of less than or equal to about 1 micron.

[0189] In other embodiments of the method, each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0190] Cartridge Design and Vapor Generation from Material in Cartridge

[0191] In some cases, a vaporization device may be configured to generate an inhalable aerosol. A device may be a self-contained vaporization device. The device may comprise an elongated body which functions to complement aspects of a separable and recyclable cartridge with air inlet channels, air passages, multiple condensation chambers, flexible heater contacts, and multiple aerosol outlets. Additionally, the cartridge may be configured for ease of manufacture and assembly.

[0192] Provided herein is a vaporization device for generating an inhalable aerosol. The device may comprise a device body, a separable cartridge assembly further comprising a heater, at least one condensation chamber, and a mouthpiece. The device provides for compact assembly and disassembly of components with detachable couplings; overheat shut-off protection for the resistive heating element; an air inlet passage (an enclosed channel) formed by the assembly of the device body and a separable cartridge; at least one condensation chamber within the separable cartridge assembly; heater contacts; and one or more refillable, reusable, and/or recyclable components.

[0193] Provided herein is a device for generating an inhalable aerosol comprising: a device body comprising a cartridge receptacle; a cartridge comprising: a storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle. The cartridge may be formed from a metal, plastic, ceramic, and/or composite material. The storage compartment may hold a vaporizable material. FIG. 7A shows an example of a cartridge 30 for use in the device. The vaporizable material may be a liquid at or near room temperature. In some cases the vaporizable material may be a liquid below room temperature. The channel may form a first side of the air inlet passage, and an internal surface of the cartridge receptacle may form a second side of the air inlet passage, as illustrated in various non-limiting aspects of FIGS. 5-6D, 7C, 8A, 8B, and 10A

[0194] Provided herein is a device for generating an inhalable aerosol. The device may comprise a body that houses, contains, and or integrates with one or more components of the device. The device body may comprise a cartridge receptacle. The cartridge receptacle may comprise a channel integral to an interior surface of the cartridge receptacle; and an air inlet passage formed by the channel and an external surface of the cartridge when the cartridge is inserted into the cartridge receptacle. A cartridge may be fitted and/or inserted into the cartridge receptacle. The cartridge may have a fluid storage compartment. The channel may form a first side of the air inlet passage, and an external surface of the cartridge forms a second side of the air inlet passage. The channel may comprise at least one of: a groove; a trough; a track; a depression; a dent; a furrow; a trench; a crease; and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The

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channel may have a round, oval, square, rectangular, or other shaped cross section. The channel may have a closed cross section. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm wide. The channel may be about 0.1 mm, 0.5 mm, 1 mm, 2 mm, or 5 mm deep. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm long. There may be at least 1 channel.

[0195] In some embodiments, the cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge.

[0196] FIGS. 5-7C show various views of a compact electronic device assembly 10 for generating an inhalable aerosol. The compact electronic device 10 may comprise a device body 20 with a cartridge receptacle 21 for receiving a cartridge 30. The device body may have a square or rectangular cross section. Alternatively, the cross section of the body may be any other regular or irregular shape. The cartridge receptacle may be shaped to receive an opened cartridge 30a or "pod". The cartridge may be opened when a protective cap is removed from a surface of the cartridge. In some cases, the cartridge may be opened when a hole or opening is formed on a surface of the cartridge. The pod 30a may be inserted into an open end of the cartridge receptacle 21 so that an exposed first heater contact tips 33a on the heater contacts 33 of the pod make contact with the second heater contacts 22 of the device body, thus forming the device assembly 10.

[0197] Referring to FIG. 14, it is apparent in the plan view that when the pod 30a is inserted into the notched body of the cartridge receptacle 21, the channel air inlet 50 is left exposed. The size of the channel air inlet 50 may be varied by altering the configuration of the notch in the cartridge receptacle 21.

[0198] The device body may further comprise a rechargeable battery, a printed circuit board (PCB) 24 containing a microcontroller with the operating logic and software instructions for the device, a pressure switch 27 for sensing the user's puffing action to activate the heater circuit, an indicator light 26, charging contacts (not shown), and an optional charging magnet or magnetic contact (not shown). The cartridge may further comprise a heater 36. The heater may be powered by the rechargeable battery. The temperature of the heater may be controlled by the microcontroller. The heater may be attached to a first end of the cartridge.

[0199] In some embodiments, the heater may comprise a heater chamber 37, a first pair of heater contacts 33, 33', a fluid wick 34, and a resistive heating element 35 in contact with the

wick. The first pair of heater contacts may comprise thin plates affixed about the sides of the heater chamber. The fluid wick and resistive heating element may be suspended between the heater contacts.

[0200] In some embodiments, there may be two or more resistive heating elements 35, 35' and two or more wicks 34, 34'. In some of the embodiments, the heater contact 33 may comprise: a flat plate; a male contact; a female receptacle, or both; a flexible contact and/or copper alloy or another electrically conductive material. The first pair of heater contacts may further comprise a formed shape that may comprise a tab (e.g., flange) having a flexible spring value that extends out of the heater to complete a circuit with the device body. The first pair of heater contact may be a heat sink that absorb and dissipate excessive heat produced by the resistive heating element. Alternatively, the first pair of heater contacts may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment.

[0201] As illustrated in the exploded assembly of FIG. 7B, a heater enclosure may comprises two or more heater contacts 33, each comprising a flat plate which may be machined or stamped from a copper alloy or similar electrically conductive material. The flexibility of the tip is provided by the cut-away clearance feature 33b created below the male contact point tip 33a which capitalizes on the inherent spring capacity of the metal sheet or plate material. Another advantage and improvement of this type of contact is the reduced space requirement, simplified construction of a spring contact point (versus a pogo pin) and the easy of assembly. The heater may comprise a first condensation chamber. The heater may comprise more one or more additional condensation chambers in addition to the first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0202] In some cases, the cartridge (e.g., pod) is configured for ease of manufacturing and assembly. The cartridge may comprise an enclosure. The enclosure may be a tank. The tank may comprise an interior fluid storage compartment 32. The interior fluid storage compartment 32 which is open at one or both ends and comprises raised rails on the side edges 45b and 46b. The cartridge may be formed from plastic, metal, composite, and/or a ceramic material. The cartridge may be rigid or flexible.

[0203] The tank may further comprise a set of first heater contact plates 33 formed from copper alloy or another electrically conductive material, having a thin cut-out 33b below the contact tips 33a (to create a flexible tab) which are affixed to the sides of the first end of the tank and straddle the open-sided end 53 of the tank. The plates may affix to pins, or posts as shown in FIGS. 7B or 5, or may be attached by other common means such as compression beneath the enclosure 36. A fluid wick 34 having a resistive heating element 35 wrapped around it, is placed between the first heater contact plates 33, and attached thereto. A heater 36, comprising raised internal edges on the internal end (not shown), a thin mixing zone (not shown), and primary condensation channel covers 45a that slide over the rails 45b on the sides of the tank on the first half of the tank, creating a primary condensation channel / chamber 45. In addition, a small male snap feature 39b located at the end of the channel cover is configured fall into a female snap feature 39a, located mid-body on the side of the tank, creating a snap-fit assembly.

[0204] As will be further clarified below, the combination of the open-sided end 53, the protruding tips 33a of the contact plates 33, the fluid wick 34 having a resistive heating element 35, enclosed in the open end of the fluid storage tank, under the heater 36, with a thin mixing zone therein, creates an efficient heater system. In addition, the primary condensation channel covers 45a which slide over the rails 45b on the sides of the tank create an integrated, easily assembled, primary condensation chamber 45, all within the heater at the first end of the cartridge 30 or pod 30a.

[0205] In some embodiments of the device, as illustrated in FIGS. 9A-9L, the heater may encloses at least a first end of the cartridge. The enclosed first end of the cartridge may include the heater and the interior fluid storage compartment. In some embodiments, the heater further comprises at least one first condensation chamber 45.

[0206] FIGS. 9A-9L show diagramed steps that mat be performed to assemble a cartomizer and/or mouthpiece. In A-B the fluid storage compartment 32a may be oriented such that the heater inlet 53 faces upward. The heater contacts 33 may be inserted into the fluid storage compartment. Flexible tabs 33a may be inserted into the heater contacts 33. In a step D the resistive heating element 35 may be wound on to the wick 34. In step E the wick 34 and heater 35 may be placed on the fluid storage compartment. One or more free ends of the heater may sit outside the heater contacts. The one or more free ends may be soldered in place, rested in a groove, or snapped into a fitted location. At least a fraction of the one or more free ends may be

in communication with the heater contacts 33. In a step F the heater enclosure 36 may be snapped in place. The heater enclosure 36 may be fitted on the fluid storage compartment. Step G shows the heater enclosure 36 is in place on the fluid storage compartment. In step H the fluid storage compartment can be flipped over. In step I the mouthpiece 31 can be fitted on the fluid storage compartment. Step J shows the mouthpiece 31 in place on the fluid storage compartment. In step K an end 49 can be fitted on the fluid storage compartment opposite the mouthpiece. Step L shows a fully assembled cartridge 30. FIG. 7B shows an exploded view of the assembled cartridge 30.

[0207] Depending on the size of the heater and/or heater chamber, the heater may have more than one wick 34 and resistive heating element 35.

[0208] In some embodiments, the first pair of heater contacts 33 further comprises a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater. In some embodiments, the cartridge 30 comprises heater contacts 33 which are inserted into the cartridge receptacle 21 of the device body 20 wherein, the flexible tabs 33a insert into a second pair of heater contacts 22 to complete a circuit with the device body. The first pair of heater contacts 33 may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element 35. The first pair of heater contacts 33 may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element 35. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater 36 may enclose a first end of the cartridge and a first end of the fluid storage compartment 32a. The heater may comprise a first condensation chamber 45. The heater may comprise at least one additional condensation chamber 45, 45', 45", etc. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0209] In still other embodiments of the device, the cartridge may further comprise a mouthpiece 31, wherein the mouthpiece comprises at least one aerosol outlet channel / secondary condensation chamber 46; and at least one aerosol outlet 47.The mouthpiece may be attached to a second end of the cartridge. The second end of the cartridge with the mouthpiece may be exposed when the cartridge is inserted in the device. The mouthpiece may comprise more than one second condensation chamber 46, 46', 46", etc. The second condensation chamber is formed along an exterior wall of the cartridge.

[0210] The mouthpiece 31 may enclose the second end of the cartridge and interior fluid storage compartment. The partially assembled (e.g., mouthpiece removed) unit may be inverted and filled with a vaporizable fluid through the opposite, remaining (second) open end. Once filled, a snap-on mouthpiece 31 that also closes and seals the second end of the tank is inserted over the end. It also comprises raised internal edges (not shown), and aerosol outlet channel covers 46a that may slide over the rails 46b located on the sides of the second half of the tank, creating aerosol outlet channels / secondary condensation chambers 46. The aerosol outlet channels / secondary condensation chambers 46 slide over the end of primary condensation chamber 45, at a transition area 57, to create a junction for the vapor leaving the primary chamber and proceed out through the aerosol outlets 47, at the end of the aerosol outlet channels 46 and user-end of the mouthpiece 31.

[0211] The cartridge may comprise a first condensation chamber and a second condensation chamber 45, 46. The cartridge may comprise more than one first condensation chamber and more than one second condensation chamber 45, 46, 45', 46', etc.

[0212] In some embodiments of the device, a first condensation chamber 45 may be formed along the outside of the cartridge fluid storage compartment 31. In some embodiments of the device an aerosol outlet 47 exists at the end of aerosol outlet chamber 46. In some embodiments of the device, a first and second condensation chamber 45, 46 may be formed along the outside of one side of the cartridge fluid storage compartment 31. In some embodiments the second condensation chamber may be an aerosol outlet chamber. In some embodiments another pair of first and/or second condensation chambers 45', 46' is formed along the outside of the cartridge fluid storage compartment 31 on another side of the device. In some embodiments another aerosol outlet 47' will also exist at the end of the second pair of condensation chambers 45', 46'.

[0213] In any one of the embodiments, the first condensation chamber and the second condensation chamber may be in fluid communication as illustrated in FIG. 10C.

[0214] In some embodiments, the mouthpiece may comprise an aerosol outlet 47 in fluid communication with the second condensation chamber 46. The mouthpiece may comprise more than one aerosol outlet 47, 47' in fluid communication with more than one the second condensation chamber 46, 46'.The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

[0215] In each of the embodiments described herein, the cartridge may comprise an airflow path comprising: an air inlet passage; a heater; at least a first condensation chamber; an aerosol outlet chamber, and an outlet port. In some of the embodiments described herein, the cartridge comprises an airflow path comprising: an air inlet passage; a heater; a first condensation chamber; a secondary condensation chamber; and an outlet port.

[0216] In still other embodiments described herein the cartridge may comprise an airflow path comprising at least one air inlet passage; a heater; at least one first condensation chamber; at least one secondary condensation chamber; and at least one outlet port.

[0217] As illustrated in FIGS. 10A-10C, an airflow path is created when the user draws on the mouthpiece 31 to create a suction (e.g., a puff), which essentially pulls air through the channel air inlet opening 50, through the air inlet passage 51, and into the heater chamber 37 through the second air passage (tank air inlet hole) 41 at the tank air inlet 52, then into the heater inlet 53. At this point, the pressure sensor has sensed the user's puff, and activated the circuit to the resistive heating element 35, which in turn, begins to generate vapor from the vapor fluid (e-juice). As air enters the heater inlet 53, it begins to mix and circulate in a narrow chamber above and around the wick 34 and between the heater contacts 33, generating heat, and dense, concentrated vapor as it mixes in the flow path 54 created by the sealing structure obstacles 44. FIG. 8A shows a detailed view of the sealing structure obstacles 44. Ultimately the vapor may be drawn, out of the heater along an air path 55 near the shoulder of the heater and into the primary condensation chamber 45 where the vapor expands and begins to cool. As the expanding vapor moves along the airflow path, it makes a transition from the primary condensation chamber 45 through a transition area 57, creating a junction for the vapor leaving the primary chamber, and entering the second vapor chamber 46, and proceeds out through the aerosol outlets 47, at the end of the mouthpiece 31 to the user.

[0218] As illustrated in FIGS. 10A-10C, the device may have a dual set of air inlet passages 50-53, dual first condensation chambers 55/45, dual second condensation chambers and aeration channels 57/46, and/or dual aerosol outlet vents 47.

[0219] Alternatively, the device may have an airflow path comprising: an air inlet passage 50, 51; a second air passage 41; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and/or an aerosol outlet 47.

[0220] In some cases, the devise may have an airflow path comprising: more than one air inlet passage; more than one second air passage; a heater chamber; more than one first condensation chamber; more than one second condensation chamber; and more than one aerosol outlet as clearly illustrated in FIGS. 10A-10C.

[0221] In any one of the embodiments described herein, the heater 36 may be in fluid communication with the internal fluid storage compartment 32a.

[0222] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater chamber 37, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid, as illustrated in FIGS. 10A, 10C and 14.

[0223] In some embodiments of the device, the condensed aerosol fluid may comprise a nicotine formulation. In some embodiments, the condensed aerosol fluid may comprise a humectant. In some embodiments, the humectant may comprise propylene glycol. In some embodiments, the humectant may comprise vegetable glycerin.

[0224] In some cases, the cartridge may be detachable from the device body. In some embodiments, the cartridge receptacle and the detachable cartridge may form a separable coupling. In some embodiments the separable coupling may comprise a friction assembly. As illustrated in FIGS. 11-14, the device may have a press-fit (friction) assembly between the cartridge pod 30a and the device receptacle. Additionally, a dent / friction capture such as 43 may be utilized to capture the pod 30a to the device receptacle or to hold a protective cap 38 on the pod, as further illustrated in FIG. 8B.

[0225] In other embodiments, the separable coupling may comprise a snap-fit or snap-lock assembly. In still other embodiments the separable coupling may comprise a magnetic assembly.

[0226] In any one of the embodiments described herein, the cartridge components may comprise a snap-fit or snap-lock assembly, as illustrated in FIG. 5. In any one of the embodiments, the cartridge components may be reusable, refillable, and/or recyclable. The design of these cartridge components lend themselves to the use of such recyclable plastic materials as polypropylene, for the majority of components.

[0227] In some embodiments of the device 10, the cartridge 30 may comprise: a fluid storage compartment 32; a heater 36 affixed to a first end with a snap-fit coupling 39a, 39b; and a mouthpiece 31 affixed to a second end with a snap-fit coupling 39c, 39d (not shown – but similar to 39a and 39b). The heater 36 may be in fluid communication with the fluid storage

compartment 32. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol and / or vegetable glycerin.

[0228] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage 51 when a cartridge comprising a channel integral 40 to an exterior surface is inserted into the cartridge receptacle 21, and wherein the channel forms a second side of the air inlet passage 51.

[0229] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage 51.

[0230] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a channel integral 40 to an exterior surface, wherein the channel forms a first side of an air inlet passage 51; and wherein an internal surface of a cartridge receptacle 21 in the device forms a second side of the air inlet passage 51 when the cartridge is inserted into the cartridge receptacle.

[0231] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32, wherein an exterior surface of the cartridge forms a first side of an air inlet channel 51 when inserted into a device body 10 comprising a cartridge receptacle 21, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage 51.

[0232] In some embodiments, the cartridge further comprises a second air passage 41 in fluid communication with the channel 40, wherein the second air passage 41 is formed through the material of the cartridge 32 from an exterior surface of the cartridge to the internal fluid storage compartment 32a.

[0233] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises at least one of: a groove; a trough; a depression; a dent; a furrow; a trench; a crease; and a gutter.

[0234] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises walls that are either recessed into the surface or protrude from the surface where it is formed.

[0235] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the internal side walls of the channel 40 form additional sides of the air inlet passage 51.

[0236] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge comprising; a fluid storage compartment; a heater affixed to a first end comprising; a first heater contact, a resistive heating element affixed to the first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; wherein the PCB is configured to detect the absence of fluid based on the measured resistance of the resistive heating element, and turn off the device.

[0237] Referring now to FIGS. 13, 14, and 15, in some embodiments, the device body further comprises at least one: second heater contact 22 (best shown in FIG. 6C detail); a battery 23;; a printed circuit board 24; a pressure sensor 27; and an indicator light 26.

[0238] In some embodiments, the printed circuit board (PCB) further comprises: a microcontroller; switches; circuitry comprising a reference resister; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0239] As illustrated in the basic block diagram of FIG. 17A, the device utilizes a proportional-integral-derivative controller or PID control law. A PID controller calculates an "error" value as the difference between a measured process variable and a desired SetPoint. When PID control is enabled, power to the coil is monitored to determine whether or not acceptable vaporization is occurring. With a given airflow over the coil, more power will be required to hold the coil at a given temperature if the device is producing vapor (heat is removed from the coil to form vapor). If power required to keep the coil at the set temperature drops below a threshold, the device indicates that it cannot currently produce vapor. Under normal

operating conditions, this indicates that there is not enough liquid in the wick for normal vaporization to occur.

[0240] In some embodiments, the micro-controller instructs the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0241] In still other embodiments, the printed circuit board further comprises logic capable of detecting the presence of condensed aerosol fluid in the fluid storage compartment and is capable of turning off power to the heating contact(s) when the condensed aerosol fluid is not detected. When the microcontroller is running the PID temperature control algorithm 70, the difference between a set point and the coil temperature (error) is used to control power to the coil so that the coil quickly reaches the set point temperature, [between 200°C and 400°C]. When the over-temperature algorithm is used, power is constant until the coil reaches an over-temperature threshold, [between 200°C and 400°C]; (FIG. 17 A applies: set point temperature is over-temperature threshold; constant power until error reaches 0).

[0242] The essential components of the device used to control the resistive heating element coil temperature are further illustrated in the circuit diagram of FIG. 17B. Wherein, BATT 23 is the battery; MCU 72 is the microcontroller; Q1 (76) and Q2 (77) are P-channel MOSFETs (switches); R_COIL 74 is the resistance of the coil. R_REF 75 is a fixed reference resistor used to measure R_COIL 74 through a voltage divider 73.

[0243] The battery powers the microcontroller. The microcontroller turns on Q2 for 1 ms every 100ms so that the voltage between R_REF and R_COIL (a voltage divider) may be measured by the MCU at V_MEAS. When Q2 is off, the control law controls Q1 with PWM (pulse width modulation) to power the coil (battery discharges through Q1 and R_COIL when Q1 is on).

[0244] In some embodiments of the device, the device body further comprises at least one: second heater contact; a power switch; a pressure sensor; and an indicator light.

[0245] In some embodiments of the device body, the second heater contact 22 may comprise: a female receptacle; or a male contact, or both, a flexible contact; or copper alloy or another electrically conductive material.

[0246] In some embodiments of the device body, the battery supplies power to the second heater contact, pressure sensor, indicator light and the printed circuit board. In some

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embodiments, the battery is rechargeable. In some embodiments, the indicator light 26 indicates the status of the device and / or the battery or both.

[0247] In some embodiments of the device, the first heater contact and the second heater contact complete a circuit that allows current to flow through the heating contacts when the device body and detachable cartridge are assembled, which may be controlled by an on / off switch. Alternatively, the device can be turned on an off by a puff sensor. The puff sensor may comprise a capacitive membrane. The capacitive membrane may be similar to a capacitive membrane used in a microphone.

[0248] In some embodiments of the device, there is also an auxiliary charging unit for recharging the battery 23 in the device body. As illustrated in FIGS. 16A-16C, the charging unit 60, may comprise a USB device with a plug for a power source 63 and protective cap 64, with a cradle 61 for capturing the device body 20 (with or without the cartridge installed). The cradle may further comprise either a magnet or a magnetic contact 62 to securely hold the device body in place during charging. As illustrated in FIG. 6B, the device body further comprises a mating charging contact 28 and a magnet or magnetic contact 29 for the auxiliary charging unit. FIG. 16C is an illustrative example of the device 20 being charged in a power source 65 (laptop computer or tablet).

[0249] In some cases the microcontroller on the PCB may be configured to monitor the temperature of the heater such that the vaporizable material is heated to a prescribed temperature. The prescribed temperature may be an input provided by the user. A temperature sensor may be in communication with the microcontroller to provide an input temperature to the microcontroller for temperature regulation. A temperature sensor may be a thermistor, thermocouple, thermometer, or any other temperature sensors. In some cases, the heating element may simultaneously perform as both a heater and a temperature sensor. The heating element may differ from a thermistor by having a resistance with a relatively lower dependence on temperature. The heating element may comprise a resistance temperature detector.

[0250] The resistance of the heating element may be an input to the microcontroller. In some cases, the resistance may be determined by the microcontroller based on a measurement from a circuit with a resistor with at least one known resistance, for example, a Wheatstone bridge. Alternatively, the resistance of the heating element may be measured with a resistive voltage divider in contact with the heating element and a resistor with a known and substantially constant

resistance. The measurement of the resistance of the heating element may be amplified by an amplifier. The amplifier may be a standard op amp or instrumentation amplifier. The amplified signal may be substantially free of noise. In some cases, a charge time for a voltage divider between the heating element and a capacitor may be determined to calculate the resistance of the heating element. In some cases, the microcontroller must deactivate the heating element during resistance measurements. The resistance of the heating element may be directly proportional to the temperature of the heating element such that the temperature may be directly determine from the resistance measurement. Determining the temperature directly from the heating element resistance measurement rather than from an additional temperature sensor may generate a more accurate measurement because unknown contact thermal resistance between the temperature sensor and the heating element is eliminated. Additionally, the temperature measurement may be determined directly and therefore faster and without a time lag associated with attaining equilibrium between the heating element and a temperature sensor in contact with the heating element.

[0251] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge comprising a first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; and a single button interface; wherein the PCB is configured with circuitry and an algorithm comprising logic for a child safety feature.

[0252] In some embodiments, the algorithm requires a code provided by the user to activate the device. In some embodiments; the code is entered by the user with the single button interface. In still further embodiments the single button interface is the also the power switch.

[0253] Provided herein is a cartridge 30 for a device 10 for generating an inhalable aerosol comprising: a fluid storage compartment 32; a heater 36 affixed to a first end comprising: a heater chamber 37, a first pair of heater contacts 33, a fluid wick 34, and a resistive heating element 35 in contact with the wick; wherein the first pair of heater contacts 33 comprise thin plates affixed about the sides of the heater chamber 37, and wherein the fluid wick 34 and resistive heating element 35 are suspended there between.

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[0254] Depending on the size of the heater or heater chamber, the heater may have more than one wick 34, 34' and resistive heating element 35, 35'.

[0255] In some embodiments, the first pair of heater contacts further comprise a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater 36 to complete a circuit with the device body 20.

[0256] In some embodiments, the heater contacts 33 are configured to mate with a second pair of heater contacts 22 in a cartridge receptacle 21 of the device body 20 to complete a circuit.

[0257] In some embodiments, the first pair of heater contacts is also a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element.

[0258] In some embodiments, the first pair of heater contacts is a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element.

[0259] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a heater 36 comprising; a heater chamber 37, a pair of thin plate heater contacts 33 therein, a fluid wick 34 positioned between the heater contacts 33, and a resistive heating element 35 in contact with the wick; wherein the heater contacts 33 each comprise a fixation site 33c wherein the resistive heating element 35 is tensioned there between.

[0260] As will be obvious to one skilled in the art after reviewing the assembly method illustrated in FIGS. 9A-9L, the heater contacts 33 simply snap or rest on locator pins on either side of the air inlet 53 on the first end of the cartridge interior fluid storage compartment, creating a spacious vaporization chamber containing the at least one wick 34 and at least one heating element 35.

[0261] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a heater 36 attached to a first end of the cartridge.

[0262] In some embodiments, the heater encloses a first end of the cartridge and a first end of the fluid storage compartment 32, 32a.

[0263] In some embodiments, the heater comprises a first condensation chamber 45.

[0264] In some embodiments, the heater comprises more than one first condensation chamber 45, 45'.

[0265] In some embodiments, the condensation chamber is formed along an exterior wall of the cartridge 45b.

[0266] As noted previously, and described in FIGS. 10A, 10B and 10C, the airflow path through the heater and heater chamber generates vapor within the heater circulating air path 54, which then exits through the heater exits 55 into a first (primary) condensation chamber 45, which is formed by components of the tank body comprising the primary condensation channel/chamber rails 45b, the primary condensation channel cover 45a, (the outer side wall of the heater enclosure).

[0267] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32 and a mouthpiece 31, wherein the mouthpiece is attached to a second end of the cartridge and further comprises at least one aerosol outlet 47.

[0268] In some embodiments, the mouthpiece 31 encloses a second end of the cartridge 30 and a second end of the fluid storage compartment 32, 32a.

[0269] Additionally, as clearly illustrated in FIG. 10C in some embodiments the mouthpiece also contains a second condensation chamber 46 prior to the aerosol outlet 47, which is formed by components of the tank body 32 comprising the secondary condensation channel/chamber rails 46b, the second condensation channel cover 46a, (the outer side wall of the mouthpiece). Still further, the mouthpiece may contain yet another aerosol outlet 47' and another (second) condensation chamber 46' prior to the aerosol outlet, on another side of the cartridge.

[0270] In other embodiments, the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0271] In some preferred embodiments, the second condensation chamber is formed along an exterior wall of the cartridge 46b.

[0272] In each of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; at least a first condensation chamber 45; and an outlet port 47. In some of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and an outlet port 47.

[0273] In still other embodiments described herein the cartridge 30 may comprise an airflow path comprising at least one air inlet channel and passage 40, 41, 42; a heater chamber 37; at least one first condensation chamber 45; at least one second condensation chamber 46; and at least one outlet port 47.

[0274] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater 36, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid.

[0275] In some embodiments of the device, the condensed aerosol fluid comprises a nicotine formulation. In some embodiments, the condensed aerosol fluid comprises a humectant. In some embodiments, the humectant comprises propylene glycol. In some embodiments, the humectant comprises vegetable glycerin.

[0276] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a heater 36 affixed to a first end; and a mouthpiece 31 affixed to a second end; wherein the heater comprises a first condensation chamber 45 and the mouthpiece comprises a second condensation chamber 46.

[0277] In some embodiments, the heater comprises more than one first condensation chamber 45, 45' and the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0278] In some embodiments, the first condensation chamber and the second condensation chamber are in fluid communication. As illustrated in FIG. 10C, the first and second condensation chambers have a common transition area 57, 57', for fluid communication.

[0279] In some embodiments, the mouthpiece comprises an aerosol outlet 47 in fluid communication with the second condensation chamber 46.

[0280] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47'.

[0281] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47' in fluid communication with the two or more second condensation chambers 46, 46'.

[0282] In any one of the embodiments, the cartridge meets ISO recycling standards.

[0283] In any one of the embodiments, the cartridge meets ISO recycling standards for plastic waste.

[0284] And in still other embodiments, the plastic components of the cartridge are composed of polylactic acid (PLA), wherein the PLA components are compostable and or degradable.

[0285] Provided herein is a device for generating an inhalable aerosol 10 comprising a device body 20 comprising a cartridge receptacle 21; and a detachable cartridge 30; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, and wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

[0286] In other embodiments of the device, the cartridge is a detachable assembly. In any one of the embodiments described herein, the cartridge components may comprise a snap-lock assembly such as illustrated by snap features 39a and 39b. In any one of the embodiments, the cartridge components are recyclable.

[0287] Provided herein is a method of fabricating a device for generating an inhalable aerosol comprising: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly when the cartridge is inserted into the cartridge receptacle.

[0288] Provided herein is a method of making a device 10 for generating an inhalable aerosol comprising: providing a device body 20 with a cartridge receptacle 21 comprising one or more interior coupling surfaces 21a, 21b, 21c...; and further providing a cartridge 30 comprising: one or more exterior coupling surfaces 36a, 36b, 36c,..., a second end and a first end; a tank 32 comprising an interior fluid storage compartment 32a; at least one channel 40 on at least one exterior coupling surface, wherein the at least one channel forms one side of at least one air inlet passage 51, and wherein at least one interior wall of the cartridge receptacle forms at least one side one side of at least one air inlet passage 51when the detachable cartridge is inserted into the cartridge receptacle.

[0289] FIGS. 9A-9L provide an illustrative example of a method of assembling such a device.

[0290] In some embodiments of the method, the cartridge 30 is assembled with a [protective] removable end cap 38 to protect the exposed heater contact tabs 33a protruding from the heater 36.

[0291] Provided herein is a method of fabricating a cartridge for a device for generating an inhalable aerosol comprising: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0292] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 with an airflow path comprising: a channel 50 comprising a portion of an air inlet passage 51; a second air passage 41 in fluid communication with the channel; a heater chamber 37 in fluid communication with the second air passage; a first condensation chamber 45 in fluid communication with the heater chamber; a second condensation chamber 46 in fluid

communication with the first condensation chamber; and an aerosol outlet 47 in fluid communication with second condensation chamber.

[0293] Provided herein is a device 10 for generating an inhalable aerosol adapted to receive a removable cartridge 30, wherein the cartridge comprises a fluid storage compartment [or tank] 32; an air inlet 41; a heater 36, a [protective] removable end cap 38, and a mouthpiece 31.

[0294] Charging

[0295] In some cases, the vaporization device may comprise a power source. The power source may be configured to provide power to a control system, one or more heating elements, one or more sensors, one or more lights, one or more indicators, and/or any other system on the electronic cigarette that requires a power source. The power source may be an energy storage device. The power source may be a battery or a capacitor. In some cases, the power source may be a rechargeable battery.

[0296] The battery may be contained within a housing of the device. In some cases the battery may be removed from the housing for charging. Alternatively, the battery may remain in the housing while the battery is being charged. Two or more charge contact may be provided on an exterior surface of the device housing. The two or more charge contacts may be in electrical communication with the battery such that the battery may be charged by applying a charging source to the two or more charge contacts without removing the battery from the housing.

[0297] FIG. 18 shows a device 1800 with charge contacts 1801. The charge contacts 1801 may be accessible from an exterior surface of a device housing 1802. The charge contacts 1801 may be in electrical communication with an energy storage device (e.g., battery) inside of the device housing 1802. In some cases, the device housing may not comprise an opening through which the user may access components in the device housing. The user may not be able to remove the battery and/or other energy storage device from the housing. In order to open the device housing a user must destroy or permanently disengage the charge contacts. In some cases, the device may fail to function after a user breaks open the housing.

[0298] FIG. 19 shows an exploded view of a charging assembly 1900 in an electronic vaporization device. The housing (not shown) has been removed from the exploded view in FIG. 19. The charge contact pins 1901 may be visible on the exterior of the housing. The charge contact pins 1901 may be in electrical communication with a power storage device of the

electronic vaporization device. When the device is connected to a power source (e.g., during charging of the device) the charging pins may facilitate electrical communication between the power storage device inside of the electronic vaporization device and the power source outside of the housing of the vaporization device. The charge contact pins 1901 may be held in place by a retaining bezel 1902. The charge contact pins 1901 may be in electrical communication with a charger flex 1903. The charging pins may contact the charger flex such that a need for soldering of the charger pins to an electrical connection to be in electrical communication with the power source may be eliminated. The charger flex may be soldered to a printed circuit board (PCB). The charger flex may be in electrical communication with the power storage device through the PCB. The charger flex may be held in place by a bent spring retainer 1904.

[0299] FIG. 20 shows the bent spring retainer in an initial position 2001 and a deflected position 2002. The bent spring retainer may hold the retaining bezel in a fixed location. The bent spring retainer may deflect only in one direction when the charging assembly is enclosed in the housing of the electronic vaporization device.

[0300] FIG. 21 shows a location of the charger pins 2101 when the electronic vaporization device is fully assembled with the charging pins 2101 contact the charging flex 2102. When the device is fully assembled at least a portion of the retaining bezel may be fitted in an indentation 2103 on the inside of the housing 2104. In some cases, disassembling the electronic vaporization device may destroy the bezel such that the device cannot be reassembled after disassembly.

[0301] A user may place the electronic smoking device in a charging cradle. The charging cradle may be a holder with charging contact configured to mate or couple with the charging pins on the electronic smoking device to provide charge to the energy storage device in the electronic vaporization device from a power source (e.g., wall outlet, generator, and/or external power storage device). FIG. 22 shows a device 2302 in a charging cradle 2301. The charging cable may be connected to a wall outlet, USB, or any other power source. The charging pins (not shown) on the device 2302 may be connected to charging contacts (not shown) on the charging cradle 2301. The device may be configured such that when the device is placed in the cradle for charging a first charging pin on the device may contact a first charging contact on the charging cradle and a second charging pin on the device may contact a second charging contact on the charging cradle or the first charging pin on the device may contact a second charging contact on the charging cradle and the second charging pin on the device may contact the first charging

contact on the charging cradle. The charging pins on the device and the charging contacts on the cradle may be in contact in any orientation. The charging pins on the device and the charging contacts on the cradle may be agnostic as to whether they are current inlets or outlets. Each of the charging pins on the device and the charging contacts on the cradle may be negative or positive. The charging pins on the device may be reversible.

[0302] FIG. 23 shows a circuit 2400 that may permit the charging pins on the device to be reversible. The circuit 2400 may be provided on a PCB in electrical communication with the charging pins. The circuit 2400 may comprise a metal–oxide–semiconductor field-effect transistor (MOSFET) H bridge. The MOSFET H bridge may rectify a change in voltage across the charging pins when the charging pins are reversed from a first configuration where in a first configuration the device is placed in the cradle for charging with the first charging pin on the device in contact with the first charging contact on the charging cradle to a second charging pin on the device in contact with the second charging contact on the charging cradle to a second configuration where the first charging pin on the device is in contact with the second charging contact on the charging cradle and the second charging pin on the device is in contact with the first charging contact on the charging cradle. The MOSFET H bridge may rectify the change in voltage with an efficient current path.

[0303] As shown in FIG. 23 the MOSFET H bridge may comprise two or more n-channel MOSFETs and two or more p-channel MOSFETs. The n-channel and p-channel MOSFETs may be arranged in an H bridge. Sources of p-channels MOSFETs (Q1 and Q3) may be in electrical communication. Similarly, sources of n-channel FETs (Q2 and Q4) may be in electrical communication. Drains of pairs of n and p MOSFETs (Q1 with Q2 and Q3 with Q4) may be in electrical communication. TA common drain from one n and p pair may be in electrical communication with one or more gates of the other n and p pair and/or vice versa. Charge contacts (CH1 and CH2) may be in electrical communication to common drains separately. A common source of the n MOSFETs may be in electrical communication to PCB ground (GND). The common source of the p MOSFETs may be in electrical communication with the PCB's charge controller input voltage (CH+). When CH1 voltage is greater than CH2 voltage by the MOSFET gate threshold voltages, Q1 and Q4 may be "on," connecting CH1 to CH+ and CH2 to GND. When CH2 voltage is greater than CH1 voltage by the FET gate threshold voltages, Q2 and Q3 may be "on," connecting CH1 to GND and CH2 to CH+. For example, whether there is

9V or -9V across CH1 to CH2, CH+ will be 9V above GND. Alternatively, a diode bridge could be used, however the MOSFET bridge may be more efficient compared to the diode bridge.

[0304] In some cases the charging cradle may be configured to be a smart charger. The smart charger may put the battery of the device in series with a USB input to charge the device at a higher current compared to a typical charging current. In some cases, the device may charge at a rate up to about 2 amps (A), 4A, 5A, 6A, 7A, 10A, or 15A. In some cases, the smart charger may comprise a battery, power from the battery may be used to charge the device battery. When the battery in the smart charger has a charge below a predetermined threshold charge, the smart charger may simultaneously charge the battery in the smart charger and the battery in the device.

[0305] Blow discrimination

[0306] In any of the devices and system (e.g., vaporizers) described herein, a pressure sensor may be used and configured to detect blowing and to distinguish blowing from draw (sucking/inhaling). For example, a modified electret microphone may be used as a pressure sensor connected to the device's microcontroller so that pressure-dependent measurements can be made by the microcontroller. The microcontroller's draw detection algorithm, which uses measurements of pressure sensor's capacitance to determine the start and end of the draw, may be configured to include blow detection and/or blow discrimination.

[0307] As mentioned above, other types of pressures sensors may be used (e.g., MEMS pressure sensors or any other differential pressure sensor). In such cases the output of the sensor (which may be converted by the sensor and/or associated circuitry into a pressure value (e.g., in mmHg, atm, etc.) or it may be a raw sensor output or value (e.g., reading) such as a capacitance value in the case of a pressure sensor using a capacitive membrane, electrical value (resistive, voltage, etc.), digital value, force and/or displacement value, etc. As described herein, this raw value may be used in the controls described (e.g., microcontrollers) without requiring conversion to an actual pressure reading. Although the examples described herein refer to a capacitive pressure sensor having a capacitive membrane (e.g., an electret microphone), any other differential pressure sensor may be used instead with the methods and apparatuses described herein, including controlling the baseline during a putative blow and/or draw through the mouthpiece as described in greater detail below.

[0308] Thus, any pressure sensor that can distinguish positive and negative pressure may be used. For example a pressure sensor may comprise an electrically conductive diaphragm held in close proximity to a conductive static plate, forming an air capacitor, with both conductors connected to pins or pads on a circuit (e.g., PCB) opposite the static plate side of the sensor. FIGS. 24A-24D illustrate one example of a pressure sensor that is a capacitive pressure sensor. In this example, the diaphragm 2404 (shown in FIG. 24D) is mounted to a rigid thin wall tube (case 2403) that is a close fit within the outer conductive case 2407 of the sensor such that air cannot flow through the sensor around the diaphragm. Holes 2411 in the static plate on one side of a gasket and holes 2413 in the PCB 2401 on the opposite side of the diaphragm allow pressure differences between the two sides of the sensor to been seen by the diaphragm, which deflects with a pressure difference across it.

[0309] Within the vaporizer, the sensor may be included in a sealed air path so as to distinguish a difference between internal pressure and air pressure. In some variations, a gasket 2502 in the device forms an air-tight seal around the sensor's case such that the static plate side of the sensor sees gauge pressures in the device's air path when a user draws from or blows into the device, as shown in FIG. 25. Air flow restriction between the device's nominal air inlet 2505 and the pressure sensor 2509 creates a pressure that the static plate side of the pressure registers. The PCB 2511 side of the pressure sensor stays at an external reference (e.g., 0 gauge) pressure during a draw or blow as the PCB side of the pressure sensor is not part of the air path and is not sealed from ambient air. Pressure difference on either side of the sensor resolve onto either side of the diaphragm; negative gauge pressure in the air path from a draw pulls the diaphragm towards the static plate, increasing the capacitance of the sensor, while positive gauge pressures in the air path from a blow push the diaphragm away from the static plate, decreasing the sensor's capacitance.

[0310] Differences between the pressure on either side of the diaphragm 2404 and the back plate 2404 change the spacing between the diaphragm and back plate and therefore the capacitance of the sensor. This different separation may be read as the capacitance of the sensor and compared to ambient. In some variations, capacitance is measured with an oscillating circuit that sources and sinks current to/from the sensor to charge and discharge the sensor repeatedly. The device's microcontroller counts the number of times the sensor's intrinsic capacitor is charged and discharged within a fixed time period (e.g., 0.5 ms, 1 ms, 1.5 ms, 2 ms, etc.) and

uses this value in a draw detection algorithm. This measurement may be inversely related to the capacitance of the sensor, since an increase in capacitance will make the capacitor charge slower, resulting in fewer charge and discharge cycles during the measurement period. So an increase in capacitance from negative air path gauge pressure, normally a draw, will result in a lower reading than when the user is not drawing from the device. Blowing into the nominal outlet of the air path will result in an increase in this measured value. Actual capacitance and air path gauge pressure are not needed by the draw detection algorithm, so they are not calculated, though they could be approximated and used in a similar draw detection algorithm.

[0311] In any of the apparatuses described herein, a capacitive sensing module within the microcontroller may handle the oscillation and current sourcing/sinking needed for the measurement via a direct connection to the pressure sensor diaphragm. The pressure sensor's case may be tied to PCB ground.

[0312] Because the ambient pressure around the device may change, the 'baseline' capacitance of the sensor may also change. This may be incorporated into the control circuitry that determines draw (and may determine or reject blow). For example, the draw detection algorithm may respond to environmental changes (not including draw or blow) that may change the nominal pressure measurement by using a baseline pressure measurement value which normally follows live pressure measurements using a software low-pass filter. With a moving baseline, a threshold for detecting the start of a draw can be kept very close to the baseline and live readings for consistent sensitivity and maximum sensitivity without falsely detected draws. The draw detection algorithm may therefore detect the start of a draw when the live pressure measurement drops (indicating a pressure drop in the air path) to some threshold below the baseline value for some number of measurements. The algorithm detects end of draw when live pressure measurements rise above some threshold below the baseline. The baseline may be fixed during the draw so that end of draw detection does not happen prematurely, and so that subsequent draws don't require larger pressure drops for the algorithm to detect the start of a draw.

[0313] For example, see FIG. 26, which graphically illustrates the output of the pressure sensor over time and when draws are detected by the microcontroller (which is performing the control logic as described herein). In this example, the live reading is the pressure output (converted capacitance measurement in this example) from the sensor. The baseline is a low-pass

filtered measure of the live reading. This baseline is fixed during the two draw events. Draw detection state is shown by the square wave, where the high state corresponds to a draw currently being detected. A first threshold is positioned at a fixed offset below the baseline; when the live reading from the sensor (the pressure measurement) crosses the threshold (e.g., exceeds this offset), it detects a draw event, and can again detect the end of the draw event when the pressure returns past the same threshold. These two thresholds may differ from each other in the draw detection logic (algorithm). A similar method may be applied to detect blowing; a second threshold or second offset (blow threshold/offset) maybe represented as a line on the opposite side of the baseline from the draw threshold/offset. In this example, draws are detected as downward pressure deflection and offset, whereas blowing is upward deflection relative to the baseline; if the orientation of the sensor is reversed, or if the raw sensor values, depending on the type of sensor, are used, the direction of blow and draw relative to the baseline may be different.

[0314] Blowing into the device may be detected and/or ignored using this algorithm. For example, when the live pressure measurement rises to values above the baseline value (e.g., in the more positive direction in the configuration shown in FIGS. 25, 26 and 27), which is usually caused by the user blowing into the air path outlet, the baseline may also stop following the live pressure measurements (e.g., remain at the last value) until the sensor output returns to below some threshold above the baseline value, as shown in FIG. 27. Holding the baseline during a blowing event may prevent the baseline from rising to a value at which draw start would be detected at the end of the blow. With this feature, users can hold the device with their lips and/or teeth without worrying about the device heating when they didn't intend for it to heat. Without this feature, it the device may apparently heat on its own. Thus, preventing false draw may save, battery life and vaporizable material by preventing detection of false draws which may occur, for example if the baseline during a blow event were reset to higher values so that the end of the blow would drop the sensor signal to beyond the threshold (which is an offset of the now-incorrect baseline) for detecting draw.

[0315] Thus, in general, the pressure sensor is configured to detect draw by comparing the instantaneous sensor output ("live reading" in FIGS. 26 and 27) to a baseline value which is a based on a filtered (e.g., low pass filtered, averaged, windowed, weighted averaged, etc.) version of the instantaneous sensor output. Detection of draw is made more accurate by rejecting changes to the baseline during blowing (e.g., "blow rejection" or "blow discrimination"). This

may be achieved by freezing the value of the baseline when the instantaneous sensor output is greater than the baseline or greater than some predetermined offset above or below (whichever direction corresponds to blowing based on the orientation of the sensor in the system) the baseline. The baseline value may also be frozen when the instantaneous sensor crosses a threshold for detection of draw (e.g., above or below this threshold based on the orientation of the sensor in the system).

[0316] In an alternative embodiment, an oscillating circuit external to the microcontroller may be used to charge and discharge the pressure sensor's intrinsic capacitor. This circuit could be a multivibrator circuit, relaxation oscillator, or other oscillator that is self-resonant or excited by the microcontroller. The pressure sensor case may not be grounded. A microcontroller is still used to count charge and discharge cycles within a fixed interval.

[0317] In an alternative embodiment, a fixed resistance may be used to charge the pressure sensor's intrinsic capacitor. Charge time up to some voltage or discharge time down to some voltage is measured using a comparator internal or external to the microcontroller. In this case, readings will increase with increased sensor capacitance, as opposed to oscillator charge count readings which decrease with increased sensor capacitance, and the draw detection algorithm may be modified accordingly, with increased readings required for draw start detection and decreased readings required for blow detection.

[0318] In an alternative embodiment, the diaphragm is in between the static plate and the air path, such that negative pressure from a draw would decrease the capacitance of the sensor. If the sensor is still measured with an oscillator, the sensor output for reading deviations from baseline required for draw start detection and blow detection are switched.

[0319] In an alternative embodiment, the pressure sensor has solder pads and/or lead wires instead of pins on its PCB.

[0320] In an alternative embodiment, the draw detection circuitry (e.g., algorithm) may not detect a draw start unless it has a "stable" baseline. When a blow is detected, a flag may be set that indicates that the baseline is not stable. When the end of blow is detected and pressure readings stabilize, the baseline is set conservatively below live pressure readings and the flag for unstable baseline is cleared, meaning drops in the reading will again be detected as draw start event, similar to what is shown in FIG. 27.

[0321] Any of the methods (including user interfaces) described herein may be implemented as software, hardware or firmware, and may be described as a non-transitory computer-readable storage medium storing a set of instructions capable of being executed by a processor (e.g., computer, tablet, smartphone, etc.), that when executed by the processor causes the processor to control perform any of the steps, including but not limited to: displaying, communicating with the user, analyzing, modifying parameters (including timing, frequency, intensity, etc.), determining, alerting, or the like.

[0322] When a feature or element is herein referred to as being "on" another feature or element, it can be directly on the other feature or element or intervening features and/or elements may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature may have portions that overlap or underlie the adjacent feature.

[0323] Terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. For example, as used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

[0324] Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship

to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal" and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

[0325] Although the terms "first" and "second" may be used herein to describe various features/elements (including steps), these features/elements should not be limited by these terms, unless the context indicates otherwise. These terms may be used to distinguish one feature/element from another feature/element. Thus, a first feature/element discussed below could be termed a second feature/element, and similarly, a second feature/element discussed below could be termed a first feature/element without departing from the teachings of the present invention.

[0326] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising" means various components can be co-jointly employed in the methods and articles (e.g., compositions and apparatuses including device and methods). For example, the term "comprising" will be understood to imply the inclusion of any stated elements or steps but not the exclusion of any other elements or steps.

[0327] In general, any of the apparatuses and methods described herein should be understood to be inclusive, but all or a sub-set of the components and/or steps may alternatively be exclusive, and may be expressed as "consisting of" or alternatively "consisting essentially of" the various components, steps, sub-components or sub-steps.

[0328] As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced by the word "about" or "approximately," even if the term does not expressly appear. The phrase "about" or "approximately" may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions.

For example, a numeric value may have a value that is +/- 0.1% of the stated value (or range of values), +/- 1% of the stated value (or range of values), +/- 2% of the stated value (or range of values), +/- 5% of the stated value (or range of values), +/- 10% of the stated value (or range of values), etc. Any numerical values given herein should also be understood to include about or approximately that value, unless the context indicates otherwise. For example, if the value "10" is disclosed, then "about 10" is also disclosed. Any numerical range recited herein is intended to include all sub-ranges subsumed therein. It is also understood that when a value is disclosed that "less than or equal to" the value, "greater than or equal to the value" and possible ranges between values are also disclosed, as appropriately understood by the skilled artisan. For example, if the value "X" is disclosed the "less than or equal to X" as well as "greater than or equal to X" (e.g., where X is a numerical value) is also disclosed. It is also understood that the throughout the application, data is provided in a number of different formats, and that this data, represents endpoints and starting points, and ranges for any combination of the data points. For example, if a particular data point "10" and a particular data point "15" are disclosed, it is understood that greater than, greater than or equal to, less than, less than or equal to, and equal to 10 and 15 are considered disclosed as well as between 10 and 15. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0329] Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others. Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

[0330] The examples and illustrations included herein show, by way of illustration and not of limitation, specific embodiments in which the subject matter may be practiced. As mentioned, other embodiments may be utilized and derived there from, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. Such embodiments of the inventive subject matter may be referred to herein individually or

collectively by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept, if more than one is, in fact, disclosed. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

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Application Number: 15430317 Document Date: 02/10/2017

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/430,317	02/10/2017	2465	1210	13211-736.200	25	4

CONFIRMATION NO. 8844

66854
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FILING RECEIPT

OC000000089358618

Date Mailed: 02/23/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

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Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/294,271 02/11/2016

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/21/2017

NJOY Exhibit 1002.106

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/430,317**

Projected Publication Date: 08/17/2017

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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NJOY Exhibit 1002.107

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/430,317

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	25 minus 20 =	* 5	x 40 =	200	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 210 =	210			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1140		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/430,317	02/10/2017	Nicholas Jay HATTON	13211-736.200

CONFIRMATION NO. 8844

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INFORMAL NOTICE

OC000000089356619

Date Mailed: 02/23/2017

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Nicholas Jay HATTON
  Steven CHRISTENSEN

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/tgebre/

NJOY Exhibit 1002.110

Docket No.: 52210-515001US/736.200
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Nicholas Jay Hatton et al.

Application No.: 15/430,317 Confirmation No.: 8844

Filed: February 10, 2017 Art Unit: Not Yet Assigned

For: VAPORIZER DEVICES WITH BLOW DISCRIMINATION Examiner: Not Yet Assigned

REQUEST FOR CORRECTION OF APPLICANT UNDER 37 CFR §1.46(C)

FILED VIA EFS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Applicants hereby request that the name of the applicant for the above-mentioned application be changed from Nicholas Jay Hatton and Steven Christensen, of San Francisco, California, to **PAX Labs, Inc.** Applicant encloses a Corrected Application Data Sheet that identifies the "new" applicant in the applicant information section and is underlined. Also included with this submission is a Power of Attorney and Statement under 37 C.F.R. §3.73(c), showing the complete chain of title. In addition to the requested change, Applicant requests acceptance of the Power of Attorney, signed by an authorized officer of PAX Labs, Inc. Based on this submission, Applicant requests a Corrected Filing Receipt.

If there are any questions regarding this submission, the Examiner is encouraged to contact the undersigned at the telephone number provided below. No fees are believed to be due, however, the Commissioner is hereby authorized to charge any fees that may be due, or credit any overpayment of same, to Deposit Account No. 50-0311, Reference No.: 52210-515001US/736.200

Respectfully submitted,

Dated: May 19, 2017

/npm/
Nicholas P. Mouton, Esq.
Registration No.: 75,306
MINTZ LEVIN COHN FERRIS GLOVSKY AND POPEO, P.C.
3580 Carmel Mountain Road, Suite 300
San Diego, California 92130-6768
(858) 314-1500 //(858) 314-1501 (Fax)
Attorney for Applicant

Corrected Application Data Sheet

Inventor Information

Inventor Number::	1
Given Name::	Nicholas
Middle Name::	Jay
Family Name::	Hatton
City of Residence::	San Francisco
State or Province of Residence::	CA
Country of Residence::	US
Street of mailing address::	660 Alabama Street, Second Floor
City of mailing address::	San Francisco
State or Province of mailing address::	CA
Country of mailing address::	US
Postal or Zip Code of mailing address::	94110

Inventor Number::	2
Given Name::	Steven
Family Name::	Christensen
City of Residence::	San Francisco
State or Province of Residence::	CA
Country of Residence::	US
Street of mailing address::	660 Alabama Street, Second Floor
City of mailing address::	San Francisco

State or Province of mailing address::	CA
Country of mailing address::	US
Postal or Zip Code of mailing address::	94110

Correspondence Information

Correspondence Customer Number::	~~64046~~ 148514
	~~info@shayglenn.com~~
E-Mail address::	IPDocketingBOS@mintz.com

Application Information

Application Number::	15/430,317
Filing Date::	02/10/17
Application Type::	Nonprovisional
Subject Matter::	Utility
CD-ROM or CD-R?::	None
Sequence submission?::	None
Computer Readable Form (CRF)?::	No
Title::	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
Attorney Docket Number::	~~13211-736.200~~ 52210-515001US/736.200
Request for Early Publication?::	No
Request for Non-Publication?::	No
Small Entity?::	Yes
Petition included?::	No

Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2::	No

Applicant Information

Applicant Number::	1
Applicant Type::	Assignee
Organization Name::	PAX LABS, INC.
Street of mailing address::	660 Alabama Street, Second Floor
City of mailing address::	San Francisco
State or Province of mailing address::	CA
Country of mailing address::	US
Postal or Zip Code of mailing address::	94110

Assignee Information Including Non-Applicant Assignee Information

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/npm/	Date (YYYY-MM-DD)	2017-05-19
Name	Nicholas P. Mouton, Esq.	Registration Number	75,306

Corrected 15430317 02/10/2017 05/03/2017

NJOY Exhibit 1002.114

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/430,317
Filing Date	February 10, 2017
First Named Inventor	Nicholas Jay Hatton
Title	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	52210-515001US/736.200

SIGNATURE of Applicant or Patent Practitioner

Signature	/npm/	Date (Optional)	May 19, 2017
Name	Nicholas P. Mouton, Esq.	Registration Number	75,306
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of 1 forms are submitted.

NJOY Exhibit 1002.115

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

[X] I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 148514

OR

[ ] I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

[X] The address associated with the above-mentioned Customer Number

OR

[ ] The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

PAX Labs, Inc.

[ ] Inventor or Joint Inventor (title not required below)

[ ] Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

[X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

[ ] Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	
Name	Wayne Sobon		
Title	Vice President, Intellectual Property		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

[ ] Total of 1 forms are submitted.

NJOY Exhibit 1002.116

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: PAX Labs, Inc.

Application No./Patent No.: 15/430,317 Filed/Issue Date: 2/10/2017

Titled: VAPORIZER DEVICES WITH BLOW DISCRIMINATION

PAX Labs, Inc. (Name of Assignee) , a corporation (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1 [x] The assignee of the entire right, title, and interest.

2 [ ] An assignee of less than the entire right, title, and interest (check applicable box):

[ ] The extent (by percentage) of its ownership interest _____ %). Additional Statement(s) by the holding the balance of the interest must be submitted to account for 100% of the ownership interest.

[ ] There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3 [ ] The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was
The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4 [ ] The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose one of options A or B below):

A. [x] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at 042346 ,
Fram 0628 , or for which a copy thereof is attached.

B. [ ] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

4. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

5. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

6. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/npm/	May 19, 2017
Signature	Date
Nicholas P. Mouton, Esq.	75,306
Printed or Typed Name	Title or Registration Number

Electronic Acknowledgement Receipt

EFS ID:	29264765
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	66854
Filer:	Nicholas Paul Mouton/Teri Barnett
Filer Authorized By:	Nicholas Paul Mouton
Attorney Docket Number:	13211-736.200
Receipt Date:	19-MAY-2017
Filing Date:	10-FEB-2017
Time Stamp:	18:22:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Corrected Filing Receipt	52210_515001US_Req_Correct_Applicant.pdf	99568 6ed6f4eeab1114ac85f486255d272089e8c58523	no	1

Warnings:

NJOY Exhibit 1002.119

Information:					
2	Application Data Sheet	52210_515001US_Corrected_ADS.pdf	92902 bc2e64d85df7572283c09e1cc1ec57c43ceee770	no	3
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3		52210_515001US_POA.pdf	216089 beff4d41176dbdfa0eeef62345932a1c66240b03	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Power of Attorney	1	2
	Assignee showing of ownership per 37 CFR 3.73	3	4

Warnings:	
Information:	
Total Files Size (in bytes):	408559

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200

CONFIRMATION NO. 8844

148514
Mintz Levin/PAX
One Financial Center
Boston, MA 02111

POA ACCEPTANCE LETTER

OC000000091533820

Date Mailed: 05/26/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 05/19/2017.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/ttran/

NJOY Exhibit 1002.121

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/430,317	02/10/2017	1747	1210	52210-515001US/736.200	25	4

CONFIRMATION NO. 8844

CORRECTED FILING RECEIPT

148514
Mintz Levin/PAX
One Financial Center
Boston, MA 02111

OC000000091533792

Date Mailed: 05/26/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Nicholas Jay HATTON, San Francisco, CA;
Steven CHRISTENSEN, San Francisco, CA;

Applicant(s)

PAX LABS, INC., San Francisco, CA;

Power of Attorney: The patent practitioners associated with Customer Number 148514

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/294,271 02/11/2016

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/21/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/430,317**

NJOY Exhibit 1002.122

Projected Publication Date: 08/17/2017

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

Preliminary Class

131

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

NJOY Exhibit 1002.123

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

NJOY Exhibit 1002.124

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200

CONFIRMATION NO. 8844

148514
Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

PUBLICATION NOTICE

OC000000093527182

Title:VAPORIZER DEVICES WITH BLOW DISCRIMINATION

Publication No.US-2017-0231281-A1
Publication Date:08/17/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

NJOY Exhibit 1002.125

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

148514 7590 11/27/2017

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER
GIRARDI, VANESSA MARY

ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
11/27/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketingBOS@mintz.com
IPFileroombos@mintz.com

NJOY Exhibit 1002.126

Office Action Summary	Application No. 15/430,317	Applicant(s) HATTON ET AL.	
	Examiner VANESSA GIRARDI	Art Unit 2833	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Feb 10 2017 - Initial App*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-25* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,3-7,9,10,13-21,24 and 25* is/are rejected.

8)☒ Claim(s) *2,8,11,12,22 and 23* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☒ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *Feb 10 2017* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

NJOY Exhibit 1002.127

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Drawings - Specification

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, a programing decision tree illustrating the functions of the microcontroller, and gasket must be shown or the features cancelled from the affected claims.

2. Figures 6A-6D, 7A/B, 8A/B, 9A-9L, 10A-10C, 11, 12, 14, 15, 16A-C, 17A/B, 18-22, 24C/D, 25 and 27 are objected to under 37 CFR 1.84(m)(p3) because the shading of the figures and size of the numerals lend themselves to poor reproductive quality as evidenced in Pre-Grant Publication US 2017/0231281.

3. Figure 14 is objected to under 37 CFR 1.84(u1) because the views depicted do not have a unique number allocation.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in response to the Office action to avoid abandonment of the application.

If the changes are not accepted by the Examiner, the Applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

4. Paragraphs [0015] – [0074], [0103]- do not contain any reference numerals by which the claimed attributes can be correlated to the figures.

5. The Brief Description of Figs. 11-13 does not appear to be accurate.

> [0088] FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device.

6. Re: Paragraph [0141], it is not clear what the difference is in Figure 3 between the condenser section (303) and the oven (304), furthermore neither the condensation chamber nor oven chamber are depicted in the figures.

> [0141] FIG. 3 shows a section view of a vaporization device 300. The device 300 may comprise a body 301. The body may be connected to or integral with a mouthpiece 302 at one end. The mouthpiece may comprise a condensation chamber **303a** within a condenser section **303** and an airflow inlet 321 and air channel 323. The device body may comprise a proximally located oven **304** comprising an oven chamber **304a**.

7. Paragraph [0142] introduces the claimed first and second air paths, yet does not provide reference numerals whereby they can be correlated to the drawings.

8. None of the claimed components described in paragraph [0144] are identified by reference numeral whereby they can be correlated to the drawings.

> [0144] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body comprising the condensation chamber, a heater, and an oven, as illustrated in exemplary FIG. 1 or 2.

9. Both a heater and an oven are mentioned raising the question of what is the difference between the two. Same issues exists within paragraphs [0145]-[0148].

10. The cartridge receptacle is not identified in the written description and the cartridge (30) is not clearly depicted in any of the Figures 5-6D, 7C, 8A, 8B, and 10A.

> [0193]. . . The channel may form a first side of the air inlet passage, and an internal surface of the cartridge receptacle may form a second side of the air inlet passage, as illustrated in various non-limiting aspects of FIGS. 5-6D, 7C, 8A, 8B, and 10A

11. Only Figure 5 shows various views, rendering the following statement false.

> [0196] FIGS. 5-7C show various views of a compact electronic device assembly 10 for generating an inhalable aerosol.

12. Neither the pod nor the cap are depicted in the referenced figures, furthermore it is not clear what the cartridge receptacle is.

> [0224] In some cases, the cartridge may be detachable from the device body. In some embodiments, the **cartridge receptacle** and the detachable cartridge may form a separable coupling. In some embodiments the separable coupling may comprise a friction assembly. As illustrated in FIGS. 11-14, the device may have a press-fit (friction) assembly between the cartridge pod 30a and the device receptacle. Additionally, a dent/friction capture such as 43 may be utilized to capture the **pod 30a** to the device receptacle or to hold a protective **cap 38** on the pod, as further illustrated in FIG. 8B.

13. None of the figures provided clearly illustrate the structural relationships described in paragraphs [0228]-[0231].

> [0228] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage 51 when a cartridge comprising a channel integral 40 to an exterior surface is inserted into the cartridge receptacle 21, and wherein the channel forms a second side of the air inlet passage 51.

14. None of the components described in paragraph [0236] are identified by reference numeral whereby they can be correlated to the drawings.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 1, 3-6, 13-19, 21, 24 and 25 are rejected under 35 U.S.C. 103 as being unpatentable over **Thorens (US 2017/0318861)**.

With respect to Claims 1, 3-6, 14; **Thorens** shows a vaporizer device **100** comprising: a reservoir **113** configured to hold a vaporizable material **115**; a heater **119** configured to heat the vaporizable material [0032]; a mouthpiece **103** in communication with the reservoir [FIG. 1]; a pressure sensor [0042 – **111**] configured to output instantaneous sensor readings [0019]; and a microcontroller [0034], wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor

readings [0006]; hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value [0007]; compare the instantaneous sensor readings to the baseline and activate the heater [0043] to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece [0008].

Although Thorens does not illustrate the workings of the microcontroller in terms of specific measures the microcontroller of Thorens clearly compares any suitable parameters of the "pressure sensor" [0039].

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention to determine a baseline as comparative valued from which activation of the heater is determined.

With respect to Claims 7, 9, 10, 20 and 21; **Thorens** teaches the pressure sensor output is a capacitance or a pressure [0011].

With respect to Claim 13; **Thorens** teaches the microcontroller is further configured to stop activating the heater to generate vapor [0036] when the instantaneous sensor output is offset from the baseline by less than the third offset value.

The same reasoning applied in the rejection of apparatus claims 1, 3-6 and 13, *mutatis mutandis*, applies to the subject-matter of method Claims 15-19, 24 and 25 given the apparatus is considered inseparable from the method of using the apparatus.

Allowable Subject Matter

16. Claims 2, 8, 11, 12, 22 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable *if rewritten in independent form or amended into the respective independent base claim including all of the limitations of the base claim and any intervening claims, as well as overcoming applicable objections discussed above.*

Conclusion

Any inquiry concerning communications from the examiner should be directed to Vanessa Girardi: OFFICE PHONE 571.272.5924
Vanessa.Girardi@USPTO.Gov

Interviews are available Monday - Thursday preferably prior to 1 p.m. (EST).

If attempts to reach the examiner are unsuccessful, the Examiner's supervisor, Amy C. Johnson can be reached at 571.272.2238.

The central fax phone number for the organization is 571.273.8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://portal.uspto.gov/pair/PublicPair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ VANESSA GIRARDI /

PRIMARY EXAMINER
ART UNIT 2833

Notice of References Cited	Application/Control No. 15/430,317	Applicant(s)/Patent Under Reexamination HATTON ET AL.	
	Examiner VANESSA GIRARDI	Art Unit 2833	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2017/0318861 A1	11-2017	THORENS; Michel	A24F47/008	1/1
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

NJOY Exhibit 1002.134

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15430317"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 09:28
S2	9	(("HATTON") near3 ("Nicholas")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/11/09 16:51
S3	26	("20150034104" | "20150216237" | "20140261495" | "20140270729" | "20140376895" | "20150027460" | "20140007891" | "20140305454" | "20140332022" | "20140270730" | "20140224244" | "20140332020" | "20150335071" | "20130228191" | "20150027457" | "20150083147" | "20140261408" | "20140190496" | "20150217068" | "20150305409" | "9549573" | "20110155153" | "20150027471" | "20150189919" | "20150101626" | "20160270442").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2017/11/09 17:00
S4	74	(("CHRISTENSEN") near3 ("Steven")).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2017/11/09 18:32
S5	2488	131/273,328,329.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 20:21
S6	4447	A24F47/008.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 20:22
S7	824	H05B1/0244.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 20:22
S8	878	H05B3/03.cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 20:22
S9	5287	(S5 S6 S7 S8) and @AD<="20160211"	US-PGPUB;	OR	ON	2017/11/09

NJOY Exhibit 1002.135

			USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB			20:24
S10	126	S9 and ((first and second) near2 (value reading setpoint point set$4))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/09 20:25
S13	6	("20150128976" | "9609893").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/10 11:57
S14	195405	((vapor vaporize$1 ecigarette (electronic adj cigarette))).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/10 12:23
S15	10675	S14 and ((suction puff draw pressure) near2 sensor)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/10 12:24
S16	463	S15 and (PID)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/10 12:25
S19	195405	((vapor vaporize$1 ecigarette (electronic adj cigarette))).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/13 08:11
S20	10675	S19 and ((suction puff draw pressure) near2 sensor)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/13 08:11
S21	463	S20 and (PID)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/13 08:11
S22	429	S21 and @AD<="20160211"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/11/13 08:11
S23	3	"5388594".pn.	US-PGPUB;	OR	ON	2017/11/13

NJOY Exhibit 1002.136

			USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB			12:05
S24	27	("20020007849" | "20030072875" | "20040007180" | "20050095859" | "20060115593" | "20060133955" | "20070266949" | "20080044573" | "20080047607" | "20080141937" | "5553395" | "5648113" | "6027760" | "6216726" | "6338759" | "6424800" | "6444041" | "6607785" | "6637475" | "6868869" | "6880592" | "6921062" | "7673856" | "7722720" | "7975718" | "7980264" | "8501266").PN. OR ("8997775").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2017/11/13 13:50

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S11	405	((vapor vaporize$1) and heat$3 and pressure and (microcontroller control$3) and ((first and second) near2 (value reading setpoint point set$4))).clm.	US-PGPUB; USPAT	OR	ON	2017/11/09 19:21
S12	391	S11 and @AD<="20160211"	US-PGPUB; USPAT	OR	ON	2017/11/09 19:22

11/16/2017 7:06:58 PM
C:\Users\vgirardi\Documents\EAST\Workspaces\(1195) 15-430 317 - VAPORIZER w BLOW DISCRIMINATION.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	Art Unit
	VANESSA GIRARDI	2833

CPC- SEARCHED		
Symbol	Date	Examiner
A24F 47 / 008	NOV 9 2017	VG
.		
H05B 1 / 0244 -- 3 / 03	NOV 9 2017	VG

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
131	328, 273, 329	NOV 9 2017	VG

SEARCH NOTES		
Search Notes	Date	Examiner
EAST search strategy attached	NOV 15 2017	VG
.		
Inventor name search in EAST and PALM	NOV 9 2017	VG

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
ALL	((vapor vaporize$1) and heat$3 and pressure and (microcontroller control$3) and ((first and second) near2 (value reading setpoint point set$4))).clm.	NOV 9 2017	VG

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/430,317
Filing Date	2017-02-10
First Named Inventor	Nicholas J. Hatton
Title	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
Art Unit	2833
Examiner Name	Girardi, Vanessa Mary
Attorney Docket Number	52210-515001US/736.200

SIGNATURE of Applicant or Patent Practitioner

Signature	/LMF/	Date (Optional)	March 9, 2018
Name	Lawrence M. Firestone	Registration Number	75217
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

[X] I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 148514

OR

[ ] I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

[X] The address associated with the above-mentioned Customer Number

OR

[ ] The address associated with Customer Number:

OR

[ ] Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

JUUL Labs, Inc.

[ ] Inventor or Joint Inventor (title not required below)

[ ] Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

[X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

[ ] Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	8 August 2017
Name	Wayne Sobon		
Title	Vice President, Intellectual Property		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

[ ] Total of 1 forms are submitted.

NJOY Exhibit 1002.140

Corrected Application Data Sheet

Correspondence Information

Customer Number::	148514
Email Address::	ipdocketingbos@mintz.com

Application Information

Application Number::	15/430,317
Filing Date::	02-10-2017
Application Type::	Regular
Subject Matter::	Utility
Title::	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
Attorney Docket Number::	52210-515001US/736.200
Small Entity?::	Yes

Representative Information

Representative Customer Number::	148514

Applicant Information

Applicant Number::	1
Applicant Type::	Assignee
Organization Name::	~~PAX LABS, INC.~~ JUUL LABS, INC.
Street of mailing address::	660 Alabama Street, Second Floor
City of mailing address::	San Francisco

NJOY Exhibit 1002.141

State or Province of mailing address::	CA
Country of mailing address::	US
Postal or Zip Code of mailing address::	94110

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/LMF/	Date (YYYY-MM-DD)	2018-03-09
Name	Lawrence M. Firestone	Registration Number	75,217

76148702v.1

NJOY Exhibit 1002.142

Doc Code: R46C.REQ
Document Description: Request under 37 CFR 1.46(c) to correct, update or change the applicant.

PTO/AIA/41 (04-15)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST TO CORRECT OR UPDATE THE NAME OF THE APPLICANT UNDER 37 CFR 1.46(c)(1), OR CHANGE THE APPLICANT UNDER 37 CFR 1.46(c)(2)

(FOR USE ONLY IN APPLICATIONS FILED ON OR AFTER SEPTEMBER 16, 2012)

Application Number	15/430,317
Filing Date	2017-02-10
First Named Inventor	Nicholas J. Hatton
Art Unit	2833
Examiner Name	Girardi, Vanessa Mary
Practitioner Docket Number	52210-515001US/736.200

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicant hereby **requests that the name of the applicant be corrected or updated under 37 CFR 1.46(c)(1), or that the applicant be changed under 37 CFR 1.46(c)(2),** in the above-identified application. **Requests under 37 CFR 1.46(c)(1) or (c)(2) cannot be submitted after payment of the issue fee or if the application has been patented.**

Please check the applicable box(es) below.

☐ 1. This request is to **correct or update the name of the applicant** (**under 37 CFR 1.46(c)(1)**) and includes:

☐ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) with the corrected or updated information shown with markings (*e.g.*, underlining for insertions, strikethrough for deletions). A Corrected Web-based ADS may be used.

Note: Requests under 37 CFR 1.46(c)(1) may be filed to correct typographical errors in the name of the § 1.46 applicant, or for updating the name of the § 1.46 applicant (*i.e.*, where there is no change in the applicant itself but just in the applicant's name). See the Manual of Patent Examining Procedure (MPEP) section 605.01.

■ 2. This request is to **change the applicant** (**under 37 CFR 1.46(c)(2)**) and includes:

■ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) that identifies the changes with proper markings (underlining for insertions and strikethrough for deletions). A Corrected Web-based ADS may be used.

■ A Statement Under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent). See MPEP 325.

I am the

☐ applicant* ■ attorney or agent of record Registration number 75,217 ☐ attorney or agent acting under 37 CFR 1.34 Registration number _____

Signature /LMF/

Typed or printed name Lawrence M. Firestone

Date March 9, 2018

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. *Juristic entities must be represented by a patent practitioner (See 37 CFR 1.31, applicable to any paper filed on or after September 16, 2012 that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below**.

■ ** Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	32014853
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Lawrence Mitchell Firestone
Filer Authorized By:	
Attorney Docket Number:	52210-515001US/736.200
Receipt Date:	09-MAR-2018
Filing Date:	10-FEB-2017
Time Stamp:	19:32:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	52210-515001US_373.pdf	121221 01f6206116c9c79ad93bac266c6e4c212a4d eb01	no	2

Warnings:

NJOY Exhibit 1002.145

Information:					
2	Power of Attorney	52210-515001US_POA.pdf	397624 3bc49588dc8d5e96e7f965015d9fdb0c83200376	no	2
Warnings:					
Information:					
3	Application Data Sheet	52210-515001US_Corrads.pdf	98085 e7284183355f4ea7e6f0b5d4af56ae9f7b928515	no	2
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
4	Request for Corrected Filing Receipt	52210-515001US_ChangeApplicantForm.pdf	195124 e7ba0ceefa3ba63504bc01407bd1ce4e19db2d78	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	812054		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: JUUL LABS, INC.

Application No./Patent No.: 15/430,317 Filed/Issue Date: February 10, 2017

Titled: VAPORIZER DEVICES WITH BLOW DISCRIMINATION

JUUL LABS, INC. , a a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. [x] The assignee of the entire right, title, and interest.

2. [ ] An assignee of less than the entire right, title, and interest (check applicable box):

   [ ] The extent (by percentage) of its ownership interest is _____ %). Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   [ ] There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. [ ] The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. [ ] The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. [ ] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____ , Frame _____ , or for which a copy thereof is attached.

B. [x] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Nicholas Jay Hatton et al. To: PAX LABS, INC.
   The document was recorded in the United States Patent and Trademark Office at
   Reel 042346 , Frame 0628 , or for which a copy thereof is attached.

2. From: PAX LABS, INC. To: JUUL LABS, INC.
   The document was recorded in the United States Patent and Trademark Office at
   Reel 043544 , Frame 0004 , or for which a copy thereof is attached.

NJOY Exhibit 1002.147

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

4. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

5. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

6. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/LMF/	March 9, 2018
Signature	Date
Lawrence M. Firestone	75,217
Printed or Typed Name	Title or Registration Number

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200

CONFIRMATION NO. 8844

148514
Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

POA ACCEPTANCE LETTER

OC000000097986369

Date Mailed: 03/14/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/09/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/ngfissha/

NJOY Exhibit 1002.149

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/430,317	02/10/2017	2833	1210	52210-515001US/736.200	25	4

CONFIRMATION NO. 8844

CORRECTED FILING RECEIPT

148514
Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

OC000000097988371

Date Mailed: 03/14/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Nicholas Jay HATTON, San Francisco, CA;
Steven CHRISTENSEN, San Francisco, CA;

Applicant(s)

JUUL LABS, INC., San Francisco, CA;

Power of Attorney: The patent practitioners associated with Customer Number 148514

Domestic Priority data as claimed by applicant

This appln claims benefit of 62/294,271 02/11/2016

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/21/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/430,317**

NJOY Exhibit 1002.150

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

Preliminary Class

131

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

NJOY Exhibit 1002.151

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 15/430,317 filed on 02/10/2017 .

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

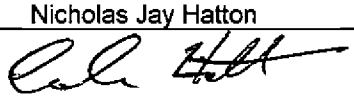
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Nicholas Jay Hatton Date (Optional): 11/10/17

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VAPORIZER DEVICES WITH BLOW DISCRIMINATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 15/430,317 filed on 02/10/2017 .

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

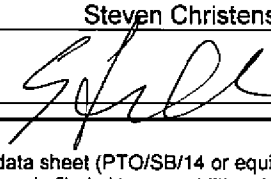
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Steven Christensen Date (Optional) : _____

Signature: 

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

70503973v.1

Electronic Acknowledgement Receipt

EFS ID:	32618433
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Erin E. Weinlick/Todd Jones
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Application Type:	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	052210_515001US_Executed_Declarations.pdf	69695 240db2c8f2091e0ccc2bb27d4f603a40e2b95901	no	2

Warnings:

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Information:	
Total Files Size (in bytes):	69695

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.:	15/430,317	TC/Art Unit:	2833
Applicant:	Nicholas Jay Hatton et al.	Conf. No.:	8844
Filing Date:	February 10, 2017	Examiner:	V. M. Girardi
Title:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION		

FILED VIA EFS

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

In response to the non-final Office Action dated November 27, 2017 (hereinafter "Office Action"), Applicant respectfully submits the following amendments and remarks for consideration.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Drawings begin on page 3 of this paper

Amendments to the Claims are reflected in the listing of claims which begins on page 4 of this paper.

Remarks/Arguments begin on page 12 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please amend the specification of the instant application, as reflected in the marked-up substitute specification. Marked-up and clean copies of the Specification are both included herewith.

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AMENDMENTS TO THE DRAWINGS

Applicant submits herewith formal replacement drawings to provide clearer copies of the drawings to improve clarity in FIGs. 1-27 and add new FIG. 28. Please replace the original first through eighteenth drawing sheets (with FIGs. 1-27) with the nineteen formal replacement drawing sheet submitted herewith.

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AMENDMENTS TO THE CLAIMS

Please amend the claims as set forth below. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims:

1. **(Currently Amended)** A vaporizer device comprising:

a reservoir configured to hold a vaporizable material;

a heater configured to heat the vaporizable material;

a mouthpiece in fluid communication with the ~~reservoir~~ heater via a sealed air flow path, the sealed air flow path passing from an air inlet, to the heater, and to an outlet formed in the mouthpiece;

a pressure sensor configured to output ~~instantaneous~~ sensor readings, wherein a first side of the pressure sensor is exposed to the sealed air path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure;

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path; and

a microcontroller~~, wherein the microcontroller is~~ configured to perform operations comprising:

~~determine~~ tracking a baseline based on filtering the ~~instantaneous~~ sensor readings as the sensor readings are output by the pressure sensor;

holding ~~hold~~ the baseline ~~at a prior value of the baseline~~ constant while the ~~instantaneous~~ sensor readings output by the pressure sensor are above the baseline by a first ~~offset value~~ threshold or below the baseline by a second ~~offset value~~ threshold, the first and second thresholds respectively indicating blowing or suction is being applied to the mouthpiece;

comparing ~~compare~~ the ~~instantaneous~~ sensor readings to the baseline and activating ~~activate~~ the heater to generate ~~vapor~~ an aerosol from the vaporizable material when the ~~instantaneous~~ sensor readings output by the pressure sensor are offset from the baseline by more than a third ~~offset value~~

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threshold, the third threshold indicating suction is being applied to the mouthpiece.

2. **(Canceled)**

3. **(Currently Amended)** The vaporizer device of claim 1, wherein the third ~~offset value~~ threshold is the same as the second ~~offset value~~ threshold.

4. **(Currently Amended)** The vaporizer device of claim 1, wherein the third ~~offset value~~ threshold is the same as the first ~~offset value~~ threshold.

5. **(Currently Amended)** The vaporizer device of claim 1, wherein the first ~~offset value~~ threshold is zero.

6. **(Currently Amended)** The vaporizer device of claim 1, wherein the second ~~offset value~~ threshold is zero.

7. **(Currently Amended)** The vaporizer device of claim 1, wherein the pressure sensor ~~comprise~~ comprises a capacitive membrane.

8. **(Currently Amended)** The vaporizer device ~~devices~~ of claim 1, wherein the pressure sensor comprises a MEMS pressure sensor.

9. **(Currently Amended)** The vaporizer device of claim 1, wherein the ~~instantaneous~~ pressure sensor output is a capacitance.

10. **(Currently Amended)** The vaporizer device of claim 1, wherein the ~~instantaneous~~ pressure sensor output is a pressure.

11. **(Currently Amended)** The vaporizer device of claim 1, wherein the operations performed by the microcontroller ~~is configured to determine~~ further comprise tracking the baseline based on filtering the ~~instantaneous~~ sensor output by low pass filtering the ~~instantaneous~~ sensor output.

12. **(Currently Amended)** The vaporizer device of claim 1, wherein the operations performed by the microcontroller ~~is configured to determine~~ further comprise tracking

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the baseline based on filtering the ~~instantaneous~~ sensor output by taking a running average of the ~~instantaneous~~ sensor output.

13. (**Currently Amended**) The vaporizer device of claim 1, wherein the operations performed by the microcontroller ~~is configured stop~~ further comprise stopping activating of the heater to generate vapor when the ~~instantaneous~~ sensor output is offset from the baseline by less than the third offset value.

14. (**Currently Amended**) A vaporizer device comprising:

a reservoir configured to hold a vaporizable material;

a heater configured to heat the vaporizable material;

a mouthpiece in fluid communication with the ~~reservoir~~ heater via a sealed air flow path, the sealed air path passing from an air inlet, to the heater, and to an outlet formed in the mouthpiece;

a MEMS pressure sensor ~~comprising~~ configured to output ~~instantaneous~~ sensor readings; and

a microcontroller~~, wherein the microcontroller is~~ configured to perform operations comprising:

~~determine~~ tracking a baseline based on filtering the ~~instantaneous~~ sensor readings as the sensor readings are output by the pressure sensor;

holding ~~hold~~ the baseline ~~at a prior value of the baseline~~ constant while the ~~instantaneous~~ sensor readings output by the pressure sensor are above the baseline by a first ~~offset value~~ threshold or below the baseline by a second ~~offset value~~ threshold, the first and second thresholds respectively indicating blowing or suction is being applied to the mouthpiece;

comparing ~~compare~~ the ~~instantaneous~~ sensor readings to the baseline and activate the heater to generate ~~vapor~~ an aerosol from the vaporizable material when the ~~instantaneous~~ sensor readings output by the pressure sensor are above the baseline by more than a third ~~offset value~~ threshold, the third threshold indicating suction is being applied to the mouthpiece.

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15. (**Currently Amended**) A method of controlling a vaporizer device to prevent heating of a heater after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking ~~instantaneous~~ sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a differential pressure sensor, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, wherein the sealed air path passes from an air inlet, to the heater, and to an outlet formed in the mouthpiece, and wherein the device air path is sealed from the sealed air flow path by a gasket around the pressure sensor;

~~determining~~ tracking a baseline by filtering the ~~instantaneous~~ sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline ~~at a prior value of the baseline~~ constant while the ~~instantaneous~~ sensor readings output by the pressure sensor are above the baseline by a first ~~offset value~~ threshold or below the baseline by a second threshold, the first and second thresholds indicating blowing or suction is being applied to the mouthpiece;

holding the baseline at a prior value of the baseline while the ~~instantaneous~~ sensor readings are below the baseline by a second ~~offset value~~ threshold;

comparing the ~~instantaneous~~ sensor readings to the baseline and activating a heater in the vaporizer to generate ~~vapor~~ an aerosol from a vaporizable material when the ~~instantaneous~~ sensor readings output by the pressure sensor is offset from the baseline by more than a third ~~offset value~~ threshold, the third threshold indicating that suction is being applied to the mouthpiece.

16. (**Currently Amended**) The method of claim 15, wherein the third ~~offset value~~ threshold is the same as the second ~~offset value~~ threshold.

17. (**Currently Amended**) The method of claim 15, wherein the third ~~offset value~~ threshold is the same as the first ~~offset value~~ threshold.

18. (**Currently Amended**) The method of claim 15, wherein the first ~~offset value~~ threshold is zero.

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19. **(Currently Amended)** The method of claim 15, wherein the second ~~offset value~~ threshold is zero.

20. **(Currently Amended)** The method of claim 15, wherein the ~~instantaneous~~ pressure sensor reading is a capacitance.

21. **(Currently Amended)** The method of claim 15, wherein the ~~instantaneous~~ pressure sensor reading is a pressure.

22. **(Currently Amended)** The method of claim 15, wherein ~~determining comprising determining~~ tracking the baseline ~~based on filtering the instantaneous sensor readings by~~ comprises low pass filtering the ~~instantaneous~~ sensor readings.

23. **(Currently Amended)** The method of claim 15, wherein d~~etermining comprising determining~~ tracking the baseline ~~based on filtering the instantaneous sensor readings by~~ comprises taking a running average of the ~~instantaneous~~ sensor readings.

24. **(Currently Amended)** The method of claim 15, further comprising stopping activating the heater to generate vapor when the ~~instantaneous~~ sensor readings are offset from the baseline by less than the third ~~offset value~~ threshold.

25. **(Currently Amended)** A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking ~~instantaneous~~ sensor readings from a MEMS pressure sensor in the vaporizer device;

~~determining~~ tracking a baseline by filtering the ~~instantaneous~~ sensor readings;

holding the baseline ~~at a prior value of the baseline~~ constant while the ~~instantaneous~~ sensor readings are above the baseline;

holding the baseline ~~at a prior value of the baseline~~ constant while the ~~instantaneous~~ sensor readings are below the baseline by ~~an offset value~~ a threshold;

comparing the ~~instantaneous~~ sensor readings to the baseline and activating a heater in the vaporizer to generate ~~vapor~~ an aerosol from a vaporizable material when the ~~instantaneous~~ sensor output is below the baseline by more than the ~~offset value~~ threshold, the threshold indicating that suction is being applied to the mouthpiece.

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26. (**New**) The vaporizer device of claim 1, further comprising a cartridge and a device body having a receptacle configured to insertably receive the cartridge, wherein the cartridge comprises the reservoir, the heater, the mouthpiece, and an exterior surface, wherein the device body comprises the pressure sensor, the gasket, and the microcontroller, and wherein the sealed air path passes from the air inlet through a channel formed between the exterior surface of the cartridge and an interior surface of the cartridge receptacle when the cartridge is insertably received within the cartridge receptacle.

27. (**New**) The method of claim 15, wherein the vaporizer device comprises a cartridge and a device body having a receptacle configured to insertably receive the cartridge, wherein the cartridge comprises the reservoir, the heater, the mouthpiece, and an exterior surface, wherein the device body comprises the pressure sensor, the gasket, and the microcontroller, and wherein the sealed air path passes from the air inlet through a channel formed between the exterior surface of the cartridge and an interior surface of the cartridge receptacle when the cartridge is insertably received within the cartridge receptacle.

28. (**New**) The method of claim 25, wherein a first side of the MEMS pressure sensor is exposed to a first air path through the mouthpiece and a second side of the MEMS pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the MEMS pressure sensor.

29. (**New**) A vaporizer device body comprising:

a cartridge receptacle configured to insertably receive a cartridge containing a vaporizable material;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air path comprising a channel formed between an interior surface of the receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet,

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through the channel and to a heater and an outlet of mouthpiece within the cartridge; and

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

30. (**New**) The vaporizer device body of claim 29, further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first and second thresholds respectively indicating blowing or suction is being applied to the mouthpiece;

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

31. (**New**) A vaporizer device comprising:

a cartridge comprising a reservoir configured to hold a vaporizable material, a heater configured to heat the vaporizable material, and a mouthpiece in fluid communication with the heater; and

a device body comprising:

a cartridge receptacle configured to insertably receive the cartridge;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air path comprising a channel formed between an interior surface of the receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet, through the channel and to the heater and an outlet in the mouthpiece of the cartridge; and

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a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

32. (**New**) The vaporizer device body of claim 29, further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first and second thresholds respectively indicating blowing or suction is being applied to the mouthpiece;

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

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REMARKS

With this paper, Claims 1 and 3-25 have been amended, Claims 25-32 have been added, and Claim 2 has been canceled without prejudice to its prosecution at a later time. Support for these amendments is present in the originally filed specification and figures. For example, support can be found in at least claim 2, paragraphs [0314]-[0316], and FIGS. 26 and 27 of the specification and figures as filed (hereinafter "Specification" and "Figures," respectively). Accordingly, no new matter has been added.

The specification has also been amended to correct typographical and minor errors, for internal consistency within the specification, and for consistency between the specification and the figures. In accordance with 37 CFR §§1.52, 1.121(b)(3), and 1.125, a redlined and clean copy of the substitute specification are submitted herewith. Support for the amendments is present in the originally-filed application. Accordingly, no new matter has been added.

The drawings are also replaced to improve clarity and correct minor errors in FIGs. 1-27, as well as to add new FIG. 28. Support for the replacement and new figures is present in the originally-filed application. Accordingly, no new matter has been added.

Upon entry of the amendments, Claims 1 and 3-32 will remain pending. Reconsideration is respectfully requested in light of the amendments above and the following remarks.

Allowable Subject Matter

Applicant thanks the Examiner for the indication that Claims 2, 8, 11, 12, 22, and 23 would be allowable if rewritten in independent form or amended into the respective independent base claims including all of the limitations of the base claim and any intervening claims, as well as overcoming objections discussed in the Office Action. *Office Action* at p. 7. Claims 1 and 15 are amended herein to incorporate features substantially similar to those recited in Claim 2. Further, Claims 14 and 25 are amended to incorporate features substantially similar to those recited in Claim 8.

Objections to the Drawings

The Office has objected to the drawings under 37 C.F.R. 1.83(a) for allegedly failing to show every feature of the invention specified in the claims. In particular, the Office Action

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states "a programming decision tree illustrating the functions of the microcontroller, and gasket must be shown." *Office Action* at p. 2. However, the Figures show a gasket 2502 in FIG. 25.

The Specification describes claimed functions of the gasket (e.g., "a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path") in at least paragraph [0309] of the Specification as follows.

> In some variations, a gasket 2502 in the device forms an air-tight seal around the sensor's case such that the static plate side of the sensor sees gauge pressures in the device's air path when a user draws from or blows into the device, as shown in FIG. 25. Air flow restriction between the device's nominal air inlet 2505 and the pressure sensor 2509 creates a pressure that the static plate side of the pressure registers. The PCB side 2511 of the pressure sensor stays at an external reference (e.g., 0 gauge) pressure during a draw or blow as the PCB side of the pressure sensor is not part of the air path and is not sealed from ambient air. *Specification*, paragraph [0309].

With regard to the claimed functions of the microcontroller, although Applicant does not necessarily agree that a new figure is required, Applicant has added new FIG. 28 depicting these claimed functions of the microcontroller to advance prosecution. No new matter has been added with this figure and the associated description, which are fully supported by the original application.

For at least the reasons noted above, the gasket and microcontroller are sufficiently shown in the figures. Accordingly, withdrawal of the objections to the drawings on the grounds of alleged failure to show all of the claimed elements is respectfully requested.

Figures 6A-6D, 7A/B, 8A/B, 9A-9L, 10A-10C, 11, 12, 14, 15, 16A-16C, 17A/b, 18-22, 24C/D, 25 and 27 are objected to under 37 C.F.R. 1.84(m)(p3) because the shading of the figures and size of the numerals allegedly lend themselves to poor reproductive quality. *Office Action* at p. 2. Although Applicant does not necessarily agree with the objections, Applicant has provided replacement figures herewith to advance prosecution. Applicant respectfully submits that the objection is overcome.

In addition to improving the clarity of the figures, the following figure labels are added or corrected for consistency (e.g., between the specification Figures and/or among the Figures:

- Fig. 7A: aerosol outlets 47 labeled (see e.g., FIG. 9J);
- Fig. 9K: label for the protective cap 38 corrected (see e.g., FIG. 7B);

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- Fig. 11: line for label "26" corrected to point to indicator light 26, cartridge receptacle 21 labeled (see e.g., FIG. 6B), and end cap 38 labeled (see e.g., FIG. 7B);
- Fig. 12: cartridge receptacle 21 labeled (see e.g., FIG. 6B);
- Fig. 14: views A, B, and C separately labeled as requested in the Office Action;
- Fig. 19: charging assembly 1900 labeled (see e.g., Specification);
- Fig. 23: circuit 2400 labeled (see e.g., Specification);
- Fig. 25: air inlet 2505, pressure sensor 2509, 0 gauge pressure on PCB side of seal 2511, gasket 2502 (seals sealed air flow path from rest of device), sealed air flow path 2520, and device air path 2530 are labeled for consistency with the specification.

Figure 14 is objected to under 37 C.F.R. 1.84(u1) because the section view, side view, and top view of the device are not individually labeled. *Office Action* at p. 2. With the amendments submitted herewith, the section view, side view, and top view are labeled as views A, B, and C, and the specification is amended based on these views as FIGS. 14A-C. Withdrawal of this rejection is respectfully requested for at least these reasons.

Objections to the Specification

Paragraphs [0015]-[0074] are objected to for allegedly not containing reference numerals by which the claimed attributes can be correlated to the figures. *Office Action* at p. 2. However, paragraphs [0015]-[0074] are summary paragraphs relating to other embodiments not claimed herein. As it is respectfully submitted that there is no requirement to include reference numerals in there paragraphs, withdrawal of this objection is requested.

Paragraphs in the detailed description, from [0103], are objected to for allegedly not containing "any reference numerals by which the claimed attributes can be correlated to the figures." *Office Action* at p. 2. A substitute specification adding reference numerals to numbered features in the drawings is submitted herewith and is believed to be sufficient to overcome this objection.

The Brief Description of Figs. 11-13 is objected to for allegedly appearing to be inaccurate. The brief description states "FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device." *Office Action* at p. 3. As amended with this paper, FIG. 11 shows a cartridge 30, with protective cap 38, positioned above a cartridge

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receptacle 21 of the device body 20. FIG. 12 shows the pod 30a after protective cap 38 was removed from the cartridge 30, with an arrow down showing that the pod 30a may be lowered into the cartridge receptacle 21 of the device body 20. FIG 13 depicts the assembled device. With these corrections, the brief description of FIGS. 11-13 is accurate and the objection should be withdrawn.

Paragraph [0141] is objected to for allegedly being unclear about the difference between "the condenser section 303 and the oven 304," and because allegedly neither the condensation chamber nor oven chamber are depicted in the figures. *Office Action* at p. 3. Paragraph [0141] is amended with this paper to remove the reference numbers 303a and 304a for clarity.

Paragraph [0142] is objected to for allegedly not providing reference numerals whereby the first and second air paths can be correlated to the drawings. *Office Action* at p. 3. Applicant respectfully notes that the amended description of FIG. 25 corresponds to and properly describes the first and second air flow paths.

Paragraph [0144] is objected to for allegedly not identifying by reference numerals the claimed components whereby they can be correlated to the drawings. *Office Action* at p. 3. Applicant has amended the specification to include the references numerals for components in FIG. 1 and 2, as follows.

> The device may comprise a body 101 or 201 with one or more separable components. For example, the mouthpiece 102 or 202 may be separably attached to the body 101 or 201, comprising the condensation chamber 103 or 203, a heater 105 or 205, and an oven 104 or 204, as illustrated in exemplary FIGS. 1 or 2. *Specification*, paragraph [0144].

Paragraphs [0144]-[0148] are objected to for mentioning both a heater and an oven, raising the question of what is the difference between the two. *Office Action* at p. 3. Oven 204 includes an oven chamber 204 with a vapor forming medium. The specification in paragraph [0137] of the Application differentiates between the oven 204 and the heater 205, as follows.

> The body may comprise an **oven 204, with an oven chamber** having a first constricting valve 208 in the primary air inlet of the oven chamber and a second constricting valve 209 at the oven chamber outlet. The **oven 204 chamber may be sealed with a** tobacco or botanical and/or humectant / **vapor forming medium 206 therein**. The seal may be an air tight and/or liquid tight seal. **The heater may be provided to the oven chamber with a heater 205. The heater 205 may be in thermal communication with the oven, for example the heater**

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> **may be surrounding the oven chamber during the vaporization process. Heater may contact the oven. The heater may be wrapped around the oven.** *Specification*, paragraph [0137].

Therefore, the oven includes an oven chamber holding vaporizable material. The heater is in thermal communication with the oven – and may directly contact the oven or be wrapped around the oven. The oven may line at least some of the interior walls of the oven, as shown in FIG. 3, in which the heater 305 lines at least some of the interior walls of oven 304. Therefore, the oven and heater are distinct elements in thermal communication with each other. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0193] is objected to because cartridge receptacle is allegedly not identified in the written description and the cartridge 30 is allegedly not clearly depicted in any of Figures 5-6D, 7C, 8A, 8B, and 10A. *Office Action* at p. 4. With the current amendments, the cartridge receptacle 21 is labeled in FIG. 10A and 10B. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0196] is objected to as allegedly being false because only Figure 5 shows various views. Applicant has amended paragraph [0196] to address the alleged issue. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0224] is objected to because allegedly neither the pod nor the cap is depicted in the referenced figures and it is allegedly unclear what is the cartridge receptacle. *Office Action* at p. 4. Paragraph [0224] is amended with reference numerals for the cartridge receptacle 21, and FIGS. 11 and 12 are labeled with reference markings for the cartridge receptacle 21 and the cap 38. Furthermore, FIGS. 11 and 12 include cartridge 30, pod 30a, cap 38, and cartridge receptacle 21. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0228] is objected to because allegedly none of the figures clearly illustrate the structural relationships described in the paragraph. *Office Action* at p. 5. However, FIGs. 11 and 12 illustrate a cartridge receptacle receiving a cartridge 30. FIG. 8B illustrates channel 40 integral to an exterior surface of a cartridge, and FIG. 10A illustrates passage 51. Therefore, the structural relationships described in paragraph [0228] are illustrated in the figures. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0229] is objected to because allegedly none of the figures clearly illustrate the structural relationships described in the paragraph. *Office Action* at p. 5. However, FIGs. 11 and

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12 illustrate a device body 20 including a cartridge receptacle 21 receiving a cartridge 30. FIG. 6B illustrates a cross section view of the cartridge receptacle 21 with channels at the top and bottom edges of the cross section that forms the first side of an air passage. FIG. 6B, reproduced below, is marked with dark arrows pointing to the channels.

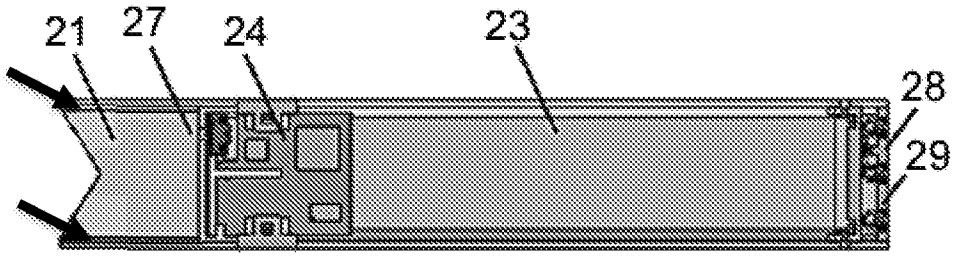


FIG. 6B

FIG. 10A illustrates passage 51 on the exterior surface of the cartridge that slides into the cartridge receptacle 21. Therefore, the structural relationships described in paragraph [0229] are illustrated in the figures. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0230] is objected to because allegedly none of the figures clearly illustrate the structural relationships described in the paragraph. *Office Action* at p. 5. However, FIGs. 11-13 illustrate a cartridge 30 with fluid storage compartment 32a for a device 10, in which the pod 30a of the cartridge 30 is inserted into cartridge receptacle 21 of device body 20. FIG. 8B illustrates channel 40 integral to an exterior surface of a cartridge that can form the first side of an air inlet passage. FIG. 10A illustrates passage 53 on the exterior surface of the cartridge that forms the second side of an air inlet passage when the cartridge slides into the cartridge receptacle 21. Therefore, the structural relationships described in paragraph [0230] are illustrated in the figures. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0231] is objected to because allegedly none of the figures clearly illustrate the structural relationships described in the paragraph. *Office Action* at p. 5. However, FIGs. 11-13 illustrate a cartridge 30 with fluid storage compartment 32a for a device 10, in which the pod 30a of the cartridge 30 is inserted into cartridge receptacle 21 of device body 20. FIG. 10A illustrates passage 51 on the exterior of the cartridge, that can form the first side of an air inlet passage. As noted above, FIG. 6B illustrates a cross section view of the cartridge receptacle 21

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with channels at the top and bottom edges of the cross section that forms the second side of an air passage when the cartridge is inserted into the cartridge receptacle 21. Therefore, the structural relationships described in paragraph [0231] are illustrated in the figures. Withdrawal of this objection is respectfully requested at least for these reasons.

Paragraph [0236] is objected to because allegedly none of the components are identified by reference numeral whereby they can be correlated to the drawings. Paragraph [236] is amended wit this paper to include reference numerals, as follows, such that the objection should be withdrawn:

> Provided herein is a device for generating an inhalable aerosol comprising: a cartridge 30 comprising; a fluid storage compartment 32a; a heater 36 affixed to a first end comprising; a first heater contact 33, a resistive heating element 35 affixed to the first heater contact 33; a device body 20 comprising; a cartridge receptacle 21 for receiving the cartridge 30; a second heater contact 33 adapted to receive the first heater contact 33 and to complete a circuit; a power source (battery 23) connected to the second heater contact 33; a printed circuit board (PCB) 24 connected to the power source 23 and the second heater contact 33; wherein the PCB 24 is configured to detect the absence of fluid based on the measured resistance of the resistive heating element 35, and turn off the device. *Specification*, paragraph [0236].

Further to the edits noted above to FIG. 25, both FIG. 25 and the associated description in paragraphs [0311] to [0313] are amended to more clearly label a sealed air flow path 2520, which passes from an air inlet 2505 to an outlet 2550, and a device air flow path 2530, which provides exposure to ambient pressure to the second side of the pressure sensor 2509. As claimed, the gasket 2502 separates the sealed air flow path from the device air path, which connects to ambient pressure. While the subject matter of claim 2 is added to claims 1 and 15 in the amendments shown above, terminology relating to a first air flow path and a second air flow as presented in original claim 2 is replaced with terminology from original paragraphs [0311] to [0313] in the as-amended claims. These terms relate to a "sealed air flow path," which is now labeled in the amended specification and figures as reference number 2520 and a "device air flow path" exposed to ambient pressure, which is now labeled in the amended specification and figures as reference number 2530. The meaning of these terms is comparable to what was intended with the "first air flow path" and "second air flow path" limitations of original claim 2.

No new matter is added with the amendments to the specification.

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Rejections under 35 U.S.C. §103

The Office has rejected claims 1, 3-7, 9, 10, 13-21, 24, and 25 under 35 U.S.C. §103(a) as allegedly being unpatentably obvious over U.S. Patent Publication No. 2017/0318861 ("Thorens"). *Office Action*, pp. 5 and 6. These rejections are respectfully traversed.

Applicant thanks the Examiner for determining that Claims 2, 8, 11, 12, 22, and 23 would be allowable if rewritten in independent form or amended into the respective independent base claims including all of the limitations of the base claim and any intervening claims, as well as overcoming objections discussed in the Office Action. *Office Action* at p. 7.

Claims 1, 3-7, 9, 10, 13, 15-21, and 24

By this Amendment, independent Claim 1 is amended for clarification and to incorporate features substantially similar to those recited in Claim 2. For example, Claim 1 now recites a mouthpiece in fluid communication with the heater via a sealed air flow path, where the sealed air path passes from an air inlet, to the heater, and to an outlet formed in the mouthpiece, a pressure sensor configured to output sensor readings, where a first side of the pressure sensor is exposed to the sealed air path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, and a gasket around the pressure sensor, where the gasket is configured to seal the device air path from the sealed air flow path.

Further, Claim 1 is amended to clarify the wording of the operations of the microcontroller. It is respectfully submitted that the subject matter of Claim 1 as amended herein is comparable to that of original claim 2. For at least these reasons, independent Claim 1 is believed to be allowable.

Also in this Amendment, independent method Claim 15 is amended to recite certain limitations that also appear in amended Claim 1, although Claims 1 and 15 are directed to subject matter of differing scope. For at least these reasons, independent Claim 15 is believed to be allowable.

Dependent Claims 3-13 and 16-24 depend either directly or indirectly from one of independent Claims 1 and 15. Thus, dependent Claims 3-13 and 16-24 incorporate by reference all the features of their respective independent claims, pursuant to 35 U.S.C. §112, ¶ 4. In view of the features as recited in the independent claims, and in view of the additional features as recited in the dependent claims, the dependent claims are believed to be allowable for at least the reasons discussed above and their respective additional novel features.

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For at least these reasons, withdrawal of the pending rejections of Claims 1, 3-7, 9, 10, 13, 15-21, and 24, and the allowance thereof, is respectfully requested.

Amendments to the claims to accept the subject matter of dependent claims considered by the examiner to be allowable should not be construed as an admission that the original independent claims are not patentable in their own right.

Claims 14 and 25

By this Amendment, independent Claim 14 is amended for clarification and to incorporate features substantially similar to those recited in Claim 8. For example, Applicant has amended Claim 14 to recite "a MEMS pressure sensor configured to output sensor readings."

Further, Claim 14 is amended to clarify the wording of the operations of the microcontroller. It is respectfully submitted that the subject matter of Claim 14 as amended herein is comparable to that of original claim 8. For at least these reasons, independent Claim 14 is believed to be allowable.

For at least these reasons, Applicant respectfully submits that independent Claim 14 is allowable.

Also in this Amendment, independent method Claim 25 is amended to recite certain limitations that also appear in amended Claim 14, although Claims 14 and 25 are directed to subject matter of differing scope. For at least these reasons, independent Claim 25 is believed to be allowable.

For at least these reasons, withdrawal of the pending rejections of Claims 4 and 25, and the allowance thereof, is respectfully requested.

New Claims

New Claims 26 and 27 are added to include features relating to a cartridge and device body configuration as described in multiple locations throughout the original specification and figures. Claims 26 and 27 are allowable at least due to their dependence on allowable claims, as well as for their additional technical features.

New dependent Claim 28 incorporates features substantially similar to those originally recited in Claim 8, added here to depend from method claim 25.

New independent Claims 29 and 31 incorporate features of allowable claim 2 while omitting some of the features of original Claim 1. **If features of original claim 1 were relied**

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upon to overcome references that might impact the patentability of new Claims 29 and 31, the examiner is respectfully requested to re-review those references in considering Claims 29 and 31 and their dependents Claim 30 and 32.

Request for Interview

The amendments/arguments presented herein are believed to be sufficient to overcome the pending rejections. However, if the contents of this paper are not deemed sufficient to further prosecution in this matter, or if any issues arise that can be most efficiently handled by telephone, the Examiner is respectfully requested to contact the undersigned by either phone or e-mail to schedule an interview at a mutually convenient time.

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CONCLUSION

On the basis of the foregoing amendments, the pending claims are in condition for allowance. It is believed that all of the pending claims have been addressed in this paper. However, failure to address a specific rejection, issue or comment, does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above are not intended to be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper.

The Commissioner is hereby authorized to charge any additional claim fees and any additional fees that may be due, or credit any overpayment of same, to Deposit Account No. 50-0311, Reference No. 52210-515001US/735.200. If there are any questions regarding this reply, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

Dated: May 29, 2018

/npm/

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Electronic Acknowledgement Receipt

EFS ID:	32751273
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Nicholas Paul Mouton
Filer Authorized By:	
Attorney Docket Number:	52210-515001US/736.200
Receipt Date:	30-MAY-2018
Filing Date:	10-FEB-2017
Time Stamp:	00:00:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	052210-515001US_CleanSpec.pdf	348918 36814fa6e3fc54edcb1d8ec6f6bca1a4eec6f69f	no	66

Warnings:

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Information:					
2	Specification	052210-515001US_MarkedSpec.pdf	357221 2f06f97a8fc9f9637b26db1972800edf371e392a	no	67
Warnings:					
Information:					
3	Drawings-other than black and white line drawings	1-10rd.pdf	2728916 c31663d78ab4ee7b3fa86167c445cd826796073c	no	10
Warnings:					
Information:					
4	Drawings-other than black and white line drawings	11-19rd.pdf	1577885 fc794c893c953d61d65d8e54ed2d861943a30aec	no	9
Warnings:					
Information:					
5	Amendment/Req. Reconsideration-After Non-Final Reject	515.pdf	284585 13d830f194b411f1202c1b763861fab656e65bda	no	22
Warnings:					
Information:					
			Total Files Size (in bytes):	5297525	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. provisional patent application no. 62/294,271, titled "VAPORIZER DEVICES WITH BLOW DISCRIMINATION," filed on 2/11/2016 which is herein incorporated by reference in its entirety.

[0002] This patent application may be related to U.S. Patent Application No. 14/581,666, filed on 12/23/2014, and titled "VAPORIZATION DEVICE SYSTEMS AND METHODS", which claimed priority to U.S. Provisional Patent Application No. 61/920,225, filed 12/23/2013, U.S. Provisional Patent Application No. 61/936,593, filed 2/6/2014, and U.S. Provisional Patent Application No. 61/937,755, filed 2/10/2014.

[0003] This application may also be related to or may be used with the inventions in one or more of the following patent applications: U.S. Patent Application No. 14/578,193, filed on 12/19/2014, and titled "METHOD AND SYSTEM FOR VAPORIZATION OF A SUBSTANCE"; U.S. Patent Application No. 14/625,042, filed on 2/18/2015, and titled "AEROSOL DEVICES AND METHODS FOR INHALING A SUBSTANCE AND USES THEREOF"; U.S. Patent Application No. 13/837,438, filed on 3/15/2013, and titled "LOW TEMPERATURE ELECTRONIC VAPORIZATION DEVICE AND METHODS"; U.S. Patent Application No. 14/271,071, filed on 5/6/2014, and titled "NICOTINE SALT FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/304,847, filed on 6/13/2014, and titled "MULTIPLE HEATING ELEMENTS WITH SEPARATE VAPORIZABLE MATERIALS IN AN ELECTRIC VAPORIZATION DEVICE"; U.S. Patent Application No. 14/461,284, filed on 8/15/2014, and titled "METHODS AND DEVICES FOR DELIVERING AND MONITORING OF TOBACCO, NICOTINE, OR OTHER SUBSTANCES"; PCT Patent Application No. PCT/US2015/031152, filed on 5/15/2015, and titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL"; PCT Patent Application No. PCT/US2014/064690, filed on 11/7/2014, and titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/960,259, filed on 12/4/2015, and titled "CALIBRATED DOSE CONTROL"; U.S. patent application no. 15/257,748, titled

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"CARTRIDGE FOR USE WITH A VAPORIZER DEVICE," filed on 9/6/2016; U.S. patent application no. 15/257,760, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/257,768, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/379,898, titled "VAPORIZATION DEVICE SYSTEMS AND METHODS," filed on 12/15/2016; U.S. patent application no. 15/309,554, titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL," filed on 11/8/2016; U.S. patent application no. 15/101,303, titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF," filed on 6/2/2016; U.S. patent application no. 14/960,259, titled "CALIBRATED DOSE CONTROL," filed on 12/4/2015; U.S. patent application no. 15/396,584, titled "LEAK-RESISTANT VAPORIZER CARTRIDGES FOR USE WITH CANNABINOIDS," filed on 12/31/2016. Each of these applications is herein incorporated by reference in their entirety.

INCORPORATION BY REFERENCE

[0004] All publications and patent applications mentioned in this specification are herein incorporated by reference in their entirety to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

FIELD

[0005] Described herein are electronic inhalable aerosol devices, or electronic vaping devices, and particularly electronic aerosol devices which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.

BACKGROUND

[0006] Electronic cigarettes are typically battery-powered vaporizers that simulate the feeling of smoking, but without tobacco. Instead of cigarette smoke, the user inhales an aerosol, commonly called vapor, typically released by a heating element that atomizes a liquid solution (vaporizable material or solution). Typically, the user activates the e-cigarette by taking a puff or pressing a button. Some vaporizers look like traditional cigarettes, but they come in many variations.

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[0007] Many electronic cigarettes use a pressure sensor to determine when the device should be heating or not. This may allow for an intuitive user interface where the user simply draws from (sucks on) the device to power it. It is advantageous over powering the device with a button in that the device's heating element is only powered when there is airflow over it assuming the device's pressure sensor and microcontroller can accurately detect the start and end of a draw.

[0008] Unfortunately, the vast majority of electronic cigarettes described and currently in use have an unexpected failure mode which may reduce the life of the battery and the overall device. Specifically, such devices may inadvertently (and transiently) detect a draw or inhalation following blowing or exhalation through the device. A recent test of numerous pressure sensor-based electronic cigarettes currently on the market found that these devices can easily be turned on and apply power to the heating element by blowing rather than inhaling into the mouthpiece of the device as if the user had drawn from the device. Specifically, such devices falsely indicate a draw (inhalation) and activate the heater at the end of a blow into the device because they detect a pressure drop at the end of the blow, and falsely interpret this is the start of a draw. Depending on the controller for the vaporizer, this pressure drop at the end of a blow may power the heater for some amount of time, and potentially until a timeout for max draw time. This failure mode may result in the device heating without the user drawing on it, which pay provide a non-ideal user experience, may waste of battery life and vaporizable material, and in devices without temp control may overheat the vaporizable material, which can produce e-juice degradants that taste bad and are potentially more harmful when vaporized that the original contents of the e-juice formulation.

[0009] Many commercially available electronic cigarettes use pressure sensors that are mechanically similar to electret microphones, but packaged with an ASIC (application specific integrated circuit) instead of a standard electret microphone circuit. An electret microphone is an electrostatic capacitor-based microphone that does not require a polarizing power supply. Pressure sensors of this type typically accept two power signals and have one output signal to indicate whether or not a pressure drop was recently detected. For the pressure sensor's ASIC to accommodate changes in environment conditions (humidity and temperature), slight differences in mechanical assembly from sensor to sensor, and potential shifting of parts in the mechanical assembly from vibration or drop, the ASIC's output usually depends on changes in capacitance between the sensor's conductive diaphragm (which deflects with a pressure differential across it)

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and a conductive static plate in the sensor instead of depending on absolute measured capacitance crossing some threshold. Given that not all measured pressure drops indicate that the user is drawing from the device, this approach is not ideal.

[0010] In all electronic cigarettes tested (some of which may not use the standard modified electret microphone with ASIC), the device can be made to start heating at the end of a blow into the device's air/vapor outlet. In devices in which direct capacitance measurements may be made by the microcontroller, the same behavior can be produced, meaning there is no software actively handling blows into the device correctly.

[0011] This failure mode may be largely unnoticed, but it is relevant based on many user practices. For example, some electronic cigarette users hold devices in their mouths, resulting in blowing into the device. Devices that don't adequately distinguish between drawing and the end of a blowing into the mouthpiece may start heating after a user has exhaled onto the device.

[0012] Described herein are apparatuses (systems and devices) and methods that may address the problem identified above.

SUMMARY OF THE DISCLOSURE

[0013] The present invention relates generally to apparatuses, including systems and devices, for vaporizing material to form an inhalable aerosol. Specifically, these apparatuses may include vaporizers.

[0014] In particular, described herein are apparatuses including vaporizers that are adapted to prevent one or more failure modes that may result from blowing into the mouthpiece, which may be referred to herein as blow rejection or blow discrimination. In general, such vaporizers and methods of operating a vaporizer may include a pressure sensor that regulates the baseline pressure readings (which may be actual pressure readings or may be unconverted sensor readings, such as capacitance measurements) during a blow and/or a draw through the mouthpiece to prevent instability that may otherwise result from blowing into the mouthpiece.

[0015] For example, described herein are vaporizer devices comprising: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor comprising a differential pressure sensor (e.g., MEMS, capacitive membrane, etc.) configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a

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baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0016] A vaporizer device may include a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are below the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0017] A vaporizer device may include: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are above the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0018] The first side of the pressure sensor may be exposed to a first air path through the mouthpiece and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the pressure sensor. The third offset value may be the same as the second offset value or

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the third offset value may be the same as the first offset value. The first offset value may be zero, or the second offset value is zero.

[0019] The instantaneous pressure sensor output may be capacitance or pressure.

[0020] In general, the pressure sensors described herein may be any differential pressure sensor, such as MEMS, capacitive pressures sensors (e.g., including a capacitive membrane), or any force collector type pressure sensors that use a transducer to measure pressure or pressure differences (e.g., diaphragm, piston, etc.), piezoresistive, electromagnetic, piezoelectric, optical, potentiometric, resonant (including MEMS), etc. Differential pressure sensors may measure the distance between two pressures, one connected on different sides of the sensor. This includes pressure sensors in which one side is open/connected to ambient atmosphere (pressure).

[0021] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by low pass filtering the instantaneous sensor output.

[0022] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by taking a running average of the instantaneous sensor output.

[0023] The microcontroller may further be configured to stop activating the heater to generate vapor when the instantaneous sensor output is offset from the baseline by less than the third offset value.

[0024] Also described herein are methods of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device that include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by a second offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is offset from the baseline by more than a third offset value, indicating that suction is being applied to the mouthpiece.

[0025] A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device may include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive

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membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by an offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is below the baseline by more than the offset value indicating that suction is being applied to the mouthpiece.

[0026] In some variations, the apparatuses described herein may include an inhalable aerosol comprising: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber to generate a vapor; a condenser comprising a condensation chamber in which at least a fraction of the vapor condenses to form the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0027] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The device may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0028] In some variations, the oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet. The aeration vent may comprise a third valve. The first valve, or said second valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The third valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The first or second valve may be mechanically actuated. The first or second valve may be electronically actuated. The first valve or second valve may be manually actuated. The third valve may be mechanically

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actuated. The third valve may be mechanically actuated. The third valve may be electronically actuated. The third valve may be manually actuated.

[0029] In some variations, the device may further comprise a body that comprises at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. The device may further comprise a temperature regulator in communication with a temperature sensor. The temperature sensor may be the heater. The power source may be rechargeable. The power source may be removable. The oven may further comprise an access lid. The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may be mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of about 1 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.9 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.8 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.7 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.6 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.5 micron.

[0030] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be

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about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0031] Also described herein are methods for generating an inhalable aerosol. Such a method may comprise: providing an inhalable aerosol generating device wherein the device comprises: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0032] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The method may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0033] The oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0034] The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may comprise particle diameters of average mass

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of about 1 micron. The vapor may comprise particle diameters of average mass of about 0.9 micron. The vapor may comprise particle diameters of average mass of about 0.8 micron. The vapor may comprise particle diameters of average mass of about 0.7 micron. The vapor may comprise particle diameters of average mass of about 0.6 micron. The vapor may comprise particle diameters of average mass of about 0.5 micron.

[0035] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0036] The device may be user serviceable. The device may not be user serviceable.

[0037] A method for generating an inhalable aerosol may include: providing a vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein said vapor is formed by heating a vapor forming medium in an oven chamber to a first temperature below the pyrolytic temperature of said vapor forming medium, and cooling said vapor in a condensation chamber to a second temperature below the first temperature, before exiting an aerosol outlet of said device.

[0038] A method of manufacturing a device for generating an inhalable aerosol may include: providing said device comprising a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the

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condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0039] The method may further comprise providing the device comprising a power source or battery, a printed circuit board, a temperature regulator or operational switches.

[0040] A device for generating an inhalable aerosol may comprise a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0041] A device for generating an inhalable aerosol may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; and a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user.

[0042] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

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[0043] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

[0044] The channel may comprise at least one of a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge. The cartridge may further comprise a heater. The heater may be attached to a first end of the cartridge.

[0045] The heater may comprise a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick, wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between. The first pair of heater contacts may further comprise a formed shape that comprises a tab having a flexible spring value that extends out of the heater to couple to complete a circuit with the device body. The first pair of heater contacts may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may contact a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise a first condensation chamber. The heater may comprise more than one first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge. The cartridge may further comprise a mouthpiece. The mouthpiece may be attached to a second end of the cartridge. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one

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second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0046] The cartridge may comprise a first condensation chamber and a second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise more than one aerosol outlet in fluid communication with more than one the second condensation chamber. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

[0047] The device may comprise an airflow path comprising an air inlet passage, a second air passage, a heater chamber, a first condensation chamber, a second condensation chamber, and an aerosol outlet. The airflow path may comprise more than one air inlet passage, a heater chamber, more than one first condensation chamber, more than one second condensation chamber, more than one second condensation chamber, and more than one aerosol outlet. The heater may be in fluid communication with the fluid storage compartment. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol. The humectant may comprise vegetable glycerin.

[0048] The cartridge may be detachable. The cartridge may be receptacle and the detachable cartridge forms a separable coupling. The separable coupling may comprise a friction assembly, a snap-fit assembly or a magnetic assembly. The cartridge may comprise a fluid storage compartment, a heater affixed to a first end with a snap-fit coupling, and a mouthpiece affixed to a second end with a snap-fit coupling.

[0049] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage when a cartridge comprising a channel integral to an exterior surface is inserted into the cartridge receptacle, and wherein the channel forms a second side of the air inlet passage.

[0050] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a

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cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage.

[0051] A cartridge for a device for generating an inhalable aerosol may include: a fluid storage compartment; a channel integral to an exterior surface, wherein the channel forms a first side of an air inlet passage; and wherein an internal surface of a cartridge receptacle in the device forms a second side of the air inlet passage when the cartridge is inserted into the cartridge receptacle.

[0052] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment, wherein an exterior surface of the cartridge forms a first side of an air inlet channel when inserted into a device body comprising a cartridge receptacle, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage.

[0053] The cartridge may further comprise a second air passage in fluid communication with the channel, wherein the second air passage is formed through the material of the cartridge from an exterior surface of the cartridge to the fluid storage compartment.

[0054] The cartridge may comprise at least one of: a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage.

[0055] A device for generating an inhalable aerosol may comprise: a cartridge comprising; a fluid storage compartment; a heater affixed to a first end comprising; a first heater contact, a resistive heating element affixed to the first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; wherein the PCB is configured to detect the absence of fluid based on the measured resistance of the resistive heating element, and turn off the device.

[0056] The printed circuit board (PCB) may comprise a microcontroller; switches; circuitry comprising a reference resister; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the

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resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0057] The micro-controller may instruct the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0058] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end comprising: a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick; wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between.

[0059] The first pair of heater contacts may further comprise: a formed shape that comprises a tab having a flexible spring value that extends out of the heater to complete a circuit with the device body. The heater contacts may be configured to mate with a second pair of heater contacts in a cartridge receptacle of the device body to complete a circuit. The first pair of heater contacts may also be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may be a heat shield that protect the heater chamber from excessive heat produced by the resistive heating element.

[0060] A cartridge for a device for generating an inhalable aerosol may comprise: a heater comprising; a heater chamber, a pair of thin plate heater contacts therein, a fluid wick positioned between the heater contacts, and a resistive heating element in contact with the wick; wherein the heater contacts each comprise a fixation site wherein the resistive heating element is tensioned therebetween.

[0061] A cartridge for a device for generating an inhalable aerosol may comprise a heater, wherein the heater is attached to a first end of the cartridge.

[0062] The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise more than one first condensation chamber. The heater may comprise a first condensation chamber. The condensation chamber may be formed along an exterior wall of the cartridge.

[0063] A cartridge for a device for generating an inhalable aerosol may comprise a fluid storage compartment; and a mouthpiece, wherein the mouthpiece is attached to a second end of the cartridge.

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[0064] The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0065] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein the heater comprises a first condensation chamber and the mouthpiece comprises a second condensation chamber.

[0066] The heater may comprise more than one first condensation chamber and the mouthpiece comprises more than one second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise two to more aerosol outlets. The cartridge may meet International Standards Organization (ISO) recycling standards. The cartridge may meet ISO recycling standards for plastic waste.

[0067] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; and a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

[0068] A method of fabricating a device for generating an inhalable aerosol may comprise: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly.

[0069] A method of fabricating a cartridge for a device for generating an inhalable aerosol may comprise: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0070] A cartridge for a device for generating an inhalable aerosol with an airflow path may include: a channel comprising a portion of an air inlet passage; a second air passage in fluid communication with the channel; a heater chamber in fluid communication with the second air passage; a first condensation chamber in fluid communication with the heater chamber; a second

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condensation chamber in fluid communication with the first condensation chamber; and an aerosol outlet in fluid communication with second condensation chamber.

[0071] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein said mouthpiece comprises two or more aerosol outlets.

[0072] A system for providing power to an electronic device for generating an inhalable vapor may comprise; a rechargeable power storage device housed within the electronic device for generating an inhalable vapor; two or more pins that are accessible from an exterior surface of the electronic device for generating an inhalable vapor, wherein the charging pins are in electrical communication with the rechargeable power storage device; a charging cradle comprising two or more charging contacts configured to provided power to the rechargeable storage device, wherein the device charging pins are reversible such that the device is charged in the charging cradle for charging with a first charging pin on the device in contact a first charging contact on the charging cradle and a second charging pin on the device in contact with second charging contact on the charging cradle and with the first charging pin on the device in contact with second charging contact on the charging cradle and the second charging pin on the device in contact with the first charging contact on the charging cradle.

[0073] The charging pins may be visible on an exterior housing of the device. The user may permanently disable the device by opening the housing. The user may permanently destroy the device by opening the housing.

[0074] Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only illustrative embodiments of the present disclosure are shown and described. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0075] FIG. 1 is an illustrative cross-sectional view of an exemplary vaporization device.

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[0076] FIG. 2 is an illustrative cross-sectional view of an exemplary vaporization device with various electronic features and valves.

[0077] FIG. 3 is an illustrative sectional view of another exemplary vaporization device comprising a condensation chamber, air inlet and aeration vent in the mouthpiece.

[0078] FIGS. 4A-4C is an illustrative example of an oven section of another exemplary vaporization device configuration with an access lid, comprising an oven having an air inlet, air outlet, and an additional aeration vent in the airflow pathway, after the oven.

[0079] FIG. 5 is an illustrative isometric view of an assembled inhalable aerosol device.

[0080] FIGS. 6A-6D are illustrative arrangements and section views of the device body and sub-components.

[0081] FIG. 7A is an illustrative isometric view of an assembled cartridge.

[0082] FIG. 7B is an illustrative exploded isometric view of a cartridge assembly

[0083] FIG. 7C is a side section view of Figure 3A illustrating the inlet channel, inlet hole and relative placement of the wick, resistive heating element, and heater contacts, and the heater chamber inside of the heater.

[0084] FIG. 8A is an illustrative end section view of an exemplary cartridge inside the heater.

[0085] FIG. 8B is an illustrative side view of the cartridge with the cap removed and heater shown in shadow / outline.

[0086] FIGS. 9A-9L is an illustrative sequence of the assembly method for the cartridge.

[0087] FIGS. 10A-10C are illustrative sequences showing the airflow / vapor path for the cartridge.

[0088] FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device.

[0089] FIG. 14A illustrates a cross-section view of the assembled inhaled aerosol device.

[0090] FIG. 14B illustrates a side view of the assembled inhalable aerosol device.

[0091] FIG. 14C illustrates a top view of the assembled inhalable aerosol device.

[0092] FIG. 15 is an illustrative view of an activated, assembled inhalable aerosol device.

[0093] FIGS. 16A-16C are representative illustrations of a charging device for the aerosol device and the application of the charger with the device.

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[0094] FIGS. 17A and 17B are representative illustrations of a proportional-integral-derivative controller (PID) block diagram and circuit diagram representing the essential components in a device to control coil temperature.

[0095] FIG. 18 is a device with charging contacts visible from an exterior housing of the device.

[0096] FIG. 19 is an exploded view of a charging assembly of a device.

[0097] FIG. 20 is a detailed view of a charging assembly of a device.

[0098] FIG. 21 is a detailed view of charging pins in a charging assembly of a device.

[0099] FIG. 22 is a device in a charging cradle.

[0100] FIG. 23 is a circuit provided on a PCB configured to permit a device to comprise reversible charging contacts.

[0101] FIGS. 24A-24D illustrate schematics for one variation of a pressure sensor that may be used with any of the apparatuses described herein. FIGS. 24A-24C show dimensional drawings of the bottom, side and top, respectively, while FIG. 24D shows a section through the structure. In some variations pins may replace the solder pads labeled "gate" and "ground" in FIG. 24C.

[0102] FIG. 25 is a sectional view of a schematic illustration through one variation of a vaporizer device as described herein, showing an air path through the device.

[0103] FIG. 26 is a graph illustrating draw detection using an apparatus as described herein, illustrating tracking of multiple draws.

[0104] FIG. 27 is a graph illustrating blow detection (and rejection) and draw detection using an apparatus as described herein.

[0105] FIG. 28 is a flow diagram of a process for activating a heater.

DETAILED DESCRIPTION

[0106] Provided herein are systems and methods for generating a vapor from a material. The vapor may be delivered for inhalation by a user. The material may be a solid, liquid, powder, solution, paste, gel, or any a material with any other physical consistency. The vapor may be delivered to the user for inhalation by a vaporization device. The vaporization device may be a handheld vaporization device. The vaporization device may be held in one hand by the user.

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[0107] The vaporization device may comprise one or more heating elements the heating element may be a resistive heating element. The heating element may heat the material such that the temperature of the material increases. Vapor may be generated as a result of heating the material. Energy may be required to operate the heating element, the energy may be derived from a battery in electrical communication with the heating element. Alternatively a chemical reaction (e.g., combustion or other exothermic reaction) may provide energy to the heating element.

[0108] One or more aspects of the vaporization device may be designed and/or controlled in order to deliver a vapor with one or more specified properties to the user. For example, aspects of the vaporization device that may be designed and/or controlled to deliver the vapor with specified properties may comprise the heating temperature, heating mechanism, device air inlets, internal volume of the device, and/or composition of the material.

[0109] In some cases, a vaporization device may have an "atomizer" or "cartomizer" configured to heat an aerosol forming solution (e.g., vaporizable material). The aerosol forming solution may comprise glycerin and/or propylene glycol. The vaporizable material may be heated to a sufficient temperature such that it may vaporize.

[0110] An atomizer may be a device or system configured to generate an aerosol. The atomizer may comprise a small heating element configured to heat and/or vaporize at least a portion of the vaporizable material and a wicking material that may draw a liquid vaporizable material in to the atomizer. The wicking material may comprise silica fibers, cotton, ceramic, hemp, stainless steel mesh, and/or rope cables. The wicking material may be configured to draw the liquid vaporizable material in to the atomizer without a pump or other mechanical moving part. A resistance wire may be wrapped around the wicking material and then connected to a positive and negative pole of a current source (e.g., energy source). The resistance wire may be a coil. When the resistance wire is activated the resistance wire (or coil) may have a temperature increase as a result of the current flowing through the resistive wire to generate heat. The heat may be transferred to at least a portion of the vaporizable material through conductive, convective, and/or radiative heat transfer such that at least a portion of the vaporizable material vaporizes.

[0111] Alternatively or in addition to the atomizer, the vaporization device may comprise a "cartomizer" to generate an aerosol from the vaporizable material for inhalation by the user. The

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cartomizer may comprise a cartridge and an atomizer. The cartomizer may comprise a heating element surrounded by a liquid-soaked poly-foam that acts as holder for the vaporizable material (e.g., the liquid). The cartomizer may be reusable, rebuildable, refillable, and/or disposable. The cartomizer may be used with a tank for extra storage of a vaporizable material.

[0112] Air may be drawn into the vaporization device to carry the vaporized aerosol away from the heating element, where it then cools and condenses to form liquid particles suspended in air, which may then be drawn out of the mouthpiece by the user.

[0113] The vaporization of at least a portion of the vaporizable material may occur at lower temperatures in the vaporization device compared to temperatures required to generate an inhalable vapor in a cigarette. A cigarette may be a device in which a smokable material is burned to generate an inhalable vapor. The lower temperature of the vaporization device may result in less decomposition and/or reaction of the vaporized material, and therefore produce an aerosol with many fewer chemical components compared to a cigarette. In some cases, the vaporization device may generate an aerosol with fewer chemical components that may be harmful to human health compared to a cigarette. Additionally, the vaporization device aerosol particles may undergo nearly complete evaporation in the heating process, the nearly complete evaporation may yield an average particle size (e.g., diameter) value that may be smaller than the average particle size in tobacco or botanical based effluent.

[0114] A vaporization device may be a device configured to extract for inhalation one or more active ingredients of plant material, tobacco, and/or a botanical, or other herbs or blends. A vaporization device may be used with pure chemicals and/or humectants that may or may not be mixed with plant material. Vaporization may be alternative to burning (smoking) that may avoid the inhalation of many irritating and/or toxic carcinogenic by-products which may result from the pyrolytic process of burning tobacco or botanical products above 300° C. The vaporization device may operate at a temperature at or below 300° C.

[0115] A vaporizer (e.g., vaporization device) may not have an atomizer or cartomizer. Instead the device may comprise an oven. The oven may be at least partially closed. The oven may have a closable opening. The oven may be wrapped with a heating element, alternatively the heating element may be in thermal communication with the oven through another mechanism. A vaporizable material may be placed directly in the oven or in a cartridge fitted in the oven. The heating element in thermal communication with the oven may heat a vaporizable

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material mass in order to create a gas phase vapor. The heating element may heat the vaporizable material through conductive, convective, and/or radiative heat transfer. The vapor may be released to a vaporization chamber where the gas phase vapor may condense, forming an aerosol cloud having typical liquid vapor particles with particles having a diameter of average mass of approximately 1 micron or greater. In some cases the diameter of average mass may be approximately 0.1-1 micron.

[0116] A used herein, the term "vapor" may generally refer to a substance in the gas phase at a temperature lower than its critical point. The vapor may be condensed to a liquid or to a solid by increasing its pressure without reducing the temperature.

[0117] As used herein, the term "aerosol" may generally refer to a colloid of fine solid particles or liquid droplets in air or another gas. Examples of aerosols may include clouds, haze, and smoke, including the smoke from tobacco or botanical products. The liquid or solid particles in an aerosol may have varying diameters of average mass that may range from monodisperse aerosols, producible in the laboratory, and containing particles of uniform size; to polydisperse colloidal systems, exhibiting a range of particle sizes. As the sizes of these particles become larger, they have a greater settling speed which causes them to settle out of the aerosol faster, making the appearance of the aerosol less dense and to shorten the time in which the aerosol will linger in air. Interestingly, an aerosol with smaller particles will appear thicker or denser because it has more particles. Particle number has a much bigger impact on light scattering than particle size (at least for the considered ranges of particle size), thus allowing for a vapor cloud with many more smaller particles to appear denser than a cloud having fewer, but larger particle sizes.

[0118] As used herein the term "humectant" may generally refer to as a substance that is used to keep things moist. A humectant may attract and retain moisture in the air by absorption, allowing the water to be used by other substances. Humectants are also commonly used in many tobaccos or botanicals and electronic vaporization products to keep products moist and as vapor-forming medium. Examples include propylene glycol, sugar polyols such as glycerol, glycerin, and honey.

[0119] Rapid Aeration

[0120] In some cases, the vaporization device may be configured to deliver an aerosol with a high particle density. The particle density of the aerosol may refer to the number of the aerosol droplets relative to the volume of air (or other dry gas) between the aerosol droplets. A dense

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aerosol may easily be visible to a user. In some cases the user may inhale the aerosol and at least a fraction of the aerosol particles may impinge on the lungs and/or mouth of the user. The user may exhale residual aerosol after inhaling the aerosol. When the aerosol is dense the residual aerosol may have sufficient particle density such that the exhaled aerosol is visible to the user. In some cases, a user may prefer the visual effect and/or mouth feel of a dense aerosol.

[0121] A vaporization device may comprise a vaporizable material. The vaporizable material may be contained in a cartridge or the vaporizable material may be loosely placed in one or more cavities the vaporization device. A heating element may be provided in the device to elevate the temperature of the vaporizable material such that at least a portion of the vaporizable material forms a vapor. The heating element may heat the vaporizable material by convective heat transfer, conductive heat transfer, and/or radiative heat transfer. The heating element may heat the cartridge and/or the cavity in which the vaporizable material is stored.

[0122] Vapor formed upon heating the vaporizable material may be delivered to the user. The vapor may be transported through the device from a first position in the device to a second position in the device. In some cases, the first position may be a location where at least a portion of the vapor was generated, for example, the cartridge or cavity or an area adjacent to the cartridge or cavity. The second position may be a mouthpiece. The user may suck on the mouthpiece to inhale the vapor.

[0123] At least a fraction of the vapor may condense after the vapor is generated and before the vapor is inhaled by the user. The vapor may condense in a condensation chamber. The condensation chamber may be a portion of the device that the vapor passes through before delivery to the user. In some cases, the device may include at least one aeration vent, placed in the condensation chamber of the vaporization device. The aeration vent may be configured to introduce ambient air (or other gas) into the vaporization chamber. The air introduced into the vaporization chamber may have a temperature lower than the temperature of a gas and/or gas/vapor mixture in the condensation chamber. Introduction of the relatively lower temperature gas into the vaporization chamber may provide rapid cooling of the heated gas vapor mixture that was generated by heating the vaporizable material. Rapid cooling of the gas vapor mixture may generate a dense aerosol comprising a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user.

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[0124] An aerosol with a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user may be formed in a two-step process. The first step may occur in the oven chamber where the vaporizable material (e.g., tobacco and/or botanical and humectant blend) may be heated to an elevated temperature. At the elevated temperature, evaporation may happen faster than at room temperature and the oven chamber may fill with the vapor phase of the humectants. The humectant may continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

[0125] In the second step, the gas (e.g., vapor and air) may exit the oven and enter a condenser or condensation chamber and begin to cool. As the gas phase vapor cools, the saturation pressure may decrease. As the saturation pressure decreases, the saturation ratio may increase and the vapor may begin to condense, forming droplets. In some devices, with the absence of added cooling aeration, the cooling may be relatively slower such that high saturation pressures may not be reached, and the droplets that form in the devices without added cooling aeration may be relatively larger and fewer in numbers. When cooler air is introduced, a temperature gradient may be formed between the cooler air and the relatively warmer gas in the device. Mixing between the cooler air and the relatively warmer gas in a confined space inside of the vaporization device may lead to rapid cooling. The rapid cooling may generate high saturation ratios, small particles, and high concentrations of smaller particles, forming a thicker, denser vapor cloud compared to particles generated in a device without the aeration vents.

[0126] For the purpose of this disclosure, when referring to ratios of humectants such as vegetable glycerol or propylene glycol, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0127] For the purpose of this disclosure, when referring to a diameter of average mass in particle sizes, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0128] A vaporization device configured to rapidly cool a vapor may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable

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aerosol; an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0129] In some embodiments, the oven is within a body of the device. The oven chamber may comprise an oven chamber inlet and an oven chamber outlet. The oven may further comprise a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0130] The oven may be contained within a device housing. In some cases the body of the device may comprise the aeration vent and/or the condenser. The body of the device may comprise one or more air inlets. The body of the device may comprise a housing that holds and/or at least partially contains one or more elements of the device.

[0131] The mouthpiece may be connected to the body. The mouthpiece may be connected to the oven. The mouthpiece may be connected to a housing that at least partially encloses the oven. In some cases, the mouthpiece may be separable from the oven, the body, and/or the housing that at least partially encloses the oven. The mouthpiece may comprise at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be integral to the body of the device. The body of the device may comprise the oven.

[0132] In some cases, the one or more aeration vents may comprise a valve. The valve may regulate a flow rate of air entering the device through the aeration vent. The valve may be controlled through a mechanical and/or electrical control system.

[0133] A vaporization device configured to rapidly cool a vapor may comprise: a body, a mouthpiece, an aerosol outlet, a condenser with a condensation chamber, a heater, an oven with an oven chamber, a primary airflow inlet, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0134] FIG. 1 shows an example of a vaporization device configured to rapidly cool a vapor. The device 100, may comprise a body 101. The body may house and/or integrate with one or more components of the device. The body may house and/or integrate with a mouthpiece 102. The mouthpiece 102 may have an aerosol outlet 122. A user may inhale the generated aerosol through the aerosol outlet 122 on the mouthpiece 102. The body may house and/or integrate

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with an oven region 104. The oven region 104 may comprise an oven chamber where vapor forming medium 106 may be placed. The vapor forming medium may include tobacco and/or botanicals, with or without a secondary humectant. In some cases the vapor forming medium may be contained in a removable and/or refillable cartridge.

[0135] Air may be drawn into the device through a primary air inlet 121. The primary air inlet 121 may be on an end of the device 100 opposite the mouthpiece 102. Alternatively, the primary air inlet 121 may be adjacent to the mouthpiece 102. In some cases, a pressure drop sufficient to pull air into the device through the primary air inlet 121 may be due to a user puffing on the mouthpiece 102.

[0136] The vapor forming medium (e.g., vaporizable material) may be heated in the oven chamber by a heater 105, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components. The heater 105 may transfer heat to the vapor forming medium through conductive, convective, and/or radiative heat transfer. The generated vapor may be drawn out of the oven region and into the condensation chamber of the condenser 103 where the vapors may begin to cool and condense into micro-particles or droplets suspended in air, thus creating the initial formation of an aerosol, before being drawn out of the mouthpiece through the aerosol outlet 122.

[0137] In some cases, relatively cooler air may be introduced into the condensation chamber , through an aeration vent 107 such that the vapor condenses more rapidly compared to a vapor in a device without the aeration vent 107. Rapidly cooling the vapor may create a denser aerosol cloud having particles with a diameter of average mass of less than or equal to about 1 micron, and depending on the mixture ratio of the vapor-forming humectant, particles with a diameter of average mass of less than or equal to about 0.5 micron

[0138] Also described herein are devices for generating an inhalable aerosol said device comprising a body with a mouthpiece at one end, an attached body at the other end comprising a condensation chamber, a heater, an oven, wherein the oven comprises a first valve in the airflow path at the primary airflow inlet of the oven chamber, and a second valve at the outlet end of the oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0139] FIG. 2 shows a diagram of an alternative embodiment of the vaporization device 200. The vaporization device may have a body 201. The body 201 may integrate with and/or contain

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one or more components of the device. The body may integrate with or be connected to a mouthpiece 202

[0140] The body may comprise an oven region 204, with an oven chamber having a first constricting valve 208 in the primary air inlet of the oven chamber and a second constricting valve 209 at the oven chamber outlet. The oven chamber may be sealed with a tobacco or botanical and/or humectant / vapor forming medium 206 therein. The seal may be an air tight and/or liquid tight seal. The heater may be provided to the oven chamber with a heater 205. The heater 205 may be in thermal communication with the oven, for example the heater may be surrounding the oven chamber during the vaporization process. Heater may contact the oven. The heater may be wrapped around the oven. Before inhalation and before air is drawn in through a primary air inlet 221, pressure may build in the sealed oven chamber as heat is continually added. The pressure may build due to a phase change of the vaporizable material. Elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components may be achieved by continually adding heat to the oven. This heated pressurization process may generate even higher saturation ratios when the valves 208, 209 are opened during inhalation. The higher saturation ratios may cause relatively higher particle concentrations of gas phase humectant in the resultant aerosol. When the vapor is drawn out of the oven region and into the condensation chamber of the condenser 203, for example by inhalation by the user, the gas phase humectant vapors may be exposed to additional air through an aeration vent 207, and the vapors may begin to cool and condense into droplets suspended in air. As described previously the aerosol may be drawn through the mouthpiece 222 by the user. This condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0141] FIG. 2 also illustrates an exemplary embodiment of the additional components which would be found in a vaporizing device, including a power source or battery 211, a printed circuit board 212, a temperature regulator 213, and operational switches (not shown), housed within an internal electronics housing 214, to isolate them from the damaging effects of the moisture in the vapor and/or aerosol. The additional components may be found in a vaporizing device that may or may not comprise an aeration vent as described above.

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[0142] In some embodiments of the vaporization device, components of the device are user serviceable, such as the power source or battery. These components may be replaceable or rechargeable.

[0143] Also described herein are devices for generating an inhalable aerosol said device comprising a first body, a mouthpiece having an aerosol outlet, a condensation chamber within a condenser and an airflow inlet and channel, an attached second body, comprising a heater and oven with an oven chamber, wherein said airflow channel is upstream of the oven and the mouthpiece outlet to provide airflow through the device, across the oven, and into the condensation chamber where an auxiliary aeration vent is provided.

[0144] FIG. 3 shows a section view of a vaporization device 300. The device 300 may comprise a body 301. The body may be connected to or integral with a mouthpiece 302 at one end. The mouthpiece may comprise a condensation chamber within a condenser section 303 and an airflow inlet 321 and air channel 323. The device body may comprise a proximally located oven 304 comprising an oven chamber. The oven chamber may be in the body of the device. A vapor forming medium 306 (e.g., vaporizable material) comprising tobacco or botanical and humectant vapor forming medium may be placed in the oven. The vapor forming medium may be in direct contact with an air channel 323 from the mouthpiece. The tobacco or botanical may be heated by heater 305 surrounding the oven chamber, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components and air drawn in through a primary air inlet 321, across the oven, and into the condensation chamber of the condenser region 303 due to a user puffing on the mouthpiece. Once in the condensation chamber where the gas phase humectant vapors begin to cool and condense into droplets suspended in air, additional air is allowed to enter through aeration vent 307, thus, once again creating a denser aerosol cloud having particles with a diameter of average mass of less than a typical vaporization device without an added aeration vent, before being drawn out of the mouthpiece through the aerosol outlet 322.

[0145] The device may comprises a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an aeration

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vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0146] The device may comprise a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user, as illustrated in exemplary FIG. 3.

[0147] The device may comprise a body 101 or 201 with one or more separable components. For example, the mouthpiece 102 or 202 may be separably attached to the body 101 or 201 comprising the condensation chamber 103 or 203, a heater 105 or 205, and an oven 104 or 204, as illustrated in exemplary FIGS. 1 or 2.

[0148] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body. The mouthpiece may comprise the condensation chamber, and may be attached to or immediately adjacent to the oven and which is separable from the body comprising a heater, and the oven, as illustrated in exemplary FIG. 3.

[0149] The at least one aeration vent may be located in the condensation chamber of the condenser, as illustrated in exemplary FIGS. 1, 2, or 3 . The at least one aeration vent may comprise a third valve in the airflow path of the at least one aeration vent, as illustrated in exemplary FIG. 2. The first, second and third valve is a check valve, a clack valve, a non-return valve, or a one-way valve. In any of the preceding variations, the first, second or third valve may be mechanically actuated, electronically actuated or manually actuated. One skilled in the art will recognize after reading this disclosure that this device may be modified in a way such that

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any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

[0150] The device may further comprise at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. Alternately, one skilled in the art would recognize that each configuration previously described will also accommodate said power source (battery), switch, printed circuit board, or temperature regulator as appropriate, in the body.

[0151] The device may be disposable when the supply of pre-packaged aerosol-forming media is exhausted. Alternatively, the device may be rechargeable such that the battery may be rechargeable or replaceable, and /or the aerosol-forming media may be refilled, by the user/operator of the device. Still further, the device may be rechargeable such that the battery may be rechargeable or replaceable, and/or the operator may also add or refill a tobacco or botanical component, in addition to a refillable or replaceable aerosol-forming media to the device.

[0152] As illustrated in FIGS. 1, 2 or 3, the vaporization device may comprise tobacco or a botanical heated in said oven chamber, wherein said tobacco or botanical further comprises humectants to produce an aerosol comprising gas phase components of the humectant and tobacco or botanical. The gas phase humectant and tobacco or botanical vapor produced by said heated aerosol forming media 106, 206, 306 may further be mixed with air from a special aeration vent 107, 207, 307 after exiting the oven area 104, 204, 304 and entering a condensation chamber 103a, 203a, 303a to cool and condense said gas phase vapors to produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0153] Each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0154] The possible variations and ranges of aerosol density are great in that the possible number of combinations of temperature, pressure, tobacco or botanical choices and humectant

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selections are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures ranges and the humectant ratios to those described herein, the inventor has demonstrated that this device will produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0155] The humectant may comprise glycerol or vegetable glycerol as a vapor-forming medium.

[0156] The humectant may comprise propylene glycol as a vapor-forming medium.

[0157] In preferred embodiments, the humectant may comprise a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio may vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of about 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0158] In a preferred embodiment the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0159] In a most preferred embodiment, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol.

[0160] In any of the preferred embodiments, the humectant may further comprise flavoring products. These flavorings may include enhancers comprising cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name but a few.

[0161] The tobacco or botanical may be heated in the oven up to its pyrolytic temperature, which as noted previously is most commonly measured in the range of 300 - 1000° C.

[0162] In preferred embodiments, the tobacco or botanical is heated to about 300° C at most. In other preferred embodiments, the tobacco or botanical is heated to about 200° C at most. In still other preferred embodiments, the tobacco or botanical is heated to about 160° C at most. It should be noted that in these lower temperature ranges (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components

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and flavoring products does occur. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0163] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant is mixed with air provided through an aeration vent.

[0164] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C at most, and even as low as 35° C before exiting the mouthpiece, depending on the air temperature being mixed into the condensation chamber. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0165] Also described herein are vaporization devices for generating an inhalable aerosol comprising a unique oven configuration, wherein said oven comprises an access lid and an auxiliary aeration vent located within the airflow channel immediately downstream of the oven and before the aeration chamber. In this configuration, the user may directly access the oven by removing the access lid, providing the user with the ability to recharge the device with vaporization material.

[0166] In addition, having the added aeration vent in the airflow channel immediately after the oven and ahead of the vaporization chamber provides the user with added control over the amount of air entering the aeration chamber downstream and the cooling rate of the aerosol before it enters the aeration chamber.

[0167] As noted in FIGS. 4A-4C, the device 400 may comprise a body 401, having an air inlet 421 allowing initial air for the heating process into the oven region 404. After heating the tobacco or botanical, and humectant (heater not shown), the gas phase humectant vapor generated may travel down the airflow channel 423, passing the added aeration vent 407 wherein the user may selectively increase airflow into the heated vapor. The user may selectively increase and/or decrease the airflow to the heated vapor by controlling a valve in communication with the aeration vent 407. In some cases, the device may not have an aeration vent. Airflow into the heated vapor through the aeration vent may decrease the vapor temperature before exiting the airflow channel at the outlet 422, and increase the condensation rate and vapor

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density by decreasing the diameter of the vapor particles within the aeration chamber (not shown), thus producing a thicker, denser vapor compared to the vapor generated by a device without the aeration vent.. The user may also access the oven chamber to recharge or reload the device 400, through an access lid 430 provided therein, making the device user serviceable. The access lid may be provided on a device with or without an aeration vent.

[0168] Provided herein is a method for generating an inhalable aerosol, the method comprising: providing an vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein the vapor is formed by heating a vapor forming medium in an oven chamber of the device to a first temperature below the pyrolytic temperature of the vapor forming medium, and cooling the vapor in a condensation chamber to a temperature below the first temperature, before exiting an aerosol outlet of said device.

[0169] In some embodiments the vapor may be cooled by mixing relatively cooler air with the vapor in the condensation chamber during the condensation phase, after leaving the oven, where condensation of the gas phase humectants occurs more rapidly due to high saturation ratios being achieved at the moment of aeration, producing a higher concentration of smaller particles, with fewer by-products, in a denser aerosol, than would normally occur in a standard vaporization or aerosol generating device.

[0170] In some embodiments, formation of an inhalable aerosol is a two-step process. The first step occurs in the oven where the tobacco or botanical and humectant blend is heated to an elevated temperature. At the elevated temperature, evaporation happens faster than at room temperature and the oven chamber fills with the vapor phase of the humectants. The humectant will continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

[0171] In the second step, the gas leaves the oven chamber, passes to a condensation chamber in a condenser and begins to cool. As the gas phase vapor cools, the saturation pressure also goes down, causing the saturation ratio to rise, and the vapor to condensate, forming droplets. When cooling air is introduced, the large temperature gradient between the two fluids mixing in a confined space leads to very rapid cooling, causing high saturation ratios, small particles, and higher concentrations of smaller particles, forming a thicker, denser vapor cloud.

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[0172] Provided herein is a method for generating an inhalable aerosol comprising: a vaporization device having a body with a mouthpiece at one end, and an attached body at the other end comprising; a condenser with a condensation chamber, a heater, an oven with an oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece, wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0173] As previously described, a vaporization device having an auxiliary aeration vent located in the condensation chamber capable of supplying cool air (relative to the heated gas components) to the gas phase vapors and tobacco or botanical components exiting the oven region, may be utilized to provide a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0174] In another aspect, provided herein is a method for generating an inhalable aerosol comprising: a vaporization device, having a body with a mouthpiece at one end, and an attached body at the other end comprising: a condenser with a condensation chamber, a heater, an oven with an oven chamber, wherein said oven chamber further comprises a first valve in the airflow path at the inlet end of the oven chamber, and a second valve at the outlet end of the oven chamber; and at least one aeration vent provided in said body, downstream of the oven, and upstream of the mouthpiece wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0175] As illustrated in exemplary FIG. 2, by sealing the oven chamber with a tobacco or botanical and humectant vapor forming medium 206 therein, and applying heat with the heater 205 during the vaporization process, before inhalation and air is drawn in through a primary air inlet 221, the pressure will build in the oven chamber as heat is continually added with an electronic heating circuit generated through the combination of the battery 211, printed circuit board 212, temperature regulator 213, and operator controlled switches (not shown), to generate even greater elevated temperature gas phase humectants (vapor) of the tobacco or botanical and humectant vapor forming components. This heated pressurization process generates even higher saturation ratios when the valves 208, 209 are opened during inhalation, which cause higher particle concentrations in the resultant aerosol, when the vapor is drawn out of the oven region and into the condensation chamber , where they are again exposed to additional air through an

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aeration vent 207, and the vapors begin to cool and condense into droplets suspended in air, as described previously before the aerosol is withdrawn through the mouthpiece 222. The inventor also notes that this condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0176] In some embodiments of any one of the inventive methods, the first, second and/or third valve is a one-way valve, a check valve, a clack valve, or a non-return valve. The first, second and/or third valve may be mechanically actuated. The first, second and/or third valve may be electronically actuated. The first, second and/or third valve may be automatically actuated. The first, second and/or third valve may be manually actuated either directly by a user or indirectly in response to an input command from a user to a control system that actuates the first, second and/or third valve.

[0177] In other aspects of the inventive methods, said device further comprises at least one of: a power source, a printed circuit board, or a temperature regulator.

[0178] In any of the preceding aspects of the inventive method, one skilled in the art will recognize after reading this disclosure that this method may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms or electronics as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

[0179] The possible variations and ranges of aerosol density are great in that the possible number of temperature, pressure, tobacco or botanical choices and humectant selections and combinations are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures to within the ranges and the humectant ratios described herein, the inventor has demonstrated a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to 1 micron.

[0180] In some embodiments of the inventive methods, the humectant comprises a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio will vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable

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glycerol to propylene glycol. However, more commonly said ratios would vary in increments of 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0181] Because vegetable glycerol is less volatile than propylene glycol, it will recondense in greater proportions. A humectant with higher concentrations of glycerol will generate a thicker aerosol. The addition of propylene glycol will lead to an aerosol with a reduced concentration of condensed phase particles and an increased concentration of vapor phase effluent. This vapor phase effluent is often perceived as a tickle or harshness in the throat when the aerosol is inhaled. To some consumers, varying degrees of this sensation may be desirable. The ratio of vegetable glycerol to propylene glycol may be manipulated to balance aerosol thickness with the right amount of "throat tickle."

[0182] In a preferred embodiment of the method, the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0183] In a most preferred embodiment of the method, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol. On will envision that there will be blends with varying ratios for consumers with varying preferences.

[0184] In any of the preferred embodiments of the method, the humectant further comprises flavoring products. These flavorings include enhancers such as cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name a few.

[0185] In some embodiments of the method, the tobacco or botanical is heated to its pyrolytic temperature.

[0186] In preferred embodiments of the method, the tobacco or botanical is heated to about 300° C at most.

[0187] In other preferred embodiments of the method, the tobacco or botanical is heated to about 200° C at most. In still other embodiments of the method, the tobacco or botanical is heated to about 160° C at most.

[0188] As noted previously, at these lower temperatures, (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. As may be inferred from the data supplied by Baker et al., an aerosol produced at these temperatures is also substantially free from Hoffman analytes or at

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least 70% less Hoffman analytes than a common tobacco or botanical cigarette and scores significantly better on the Ames test than a substance generated by burning a common cigarette. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0189] In any one of the preceding methods, said inhalable aerosol produced by tobacco or a botanical comprising a humectant and heated in said oven produces an aerosol comprising gas phase humectants is further mixed with air provided through an aeration vent.

[0190] In any one of the preceding methods, said aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C, and even as low as 35° C, before exiting the mouthpiece. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0191] In some embodiments of the method, the vapor comprising gas phase humectant may be mixed with air to produce an aerosol comprising particle diameters of average mass of less than or equal to about 1 micron.

[0192] In other embodiments of the method, each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0193] Cartridge Design and Vapor Generation from Material in Cartridge

[0194] In some cases, a vaporization device may be configured to generate an inhalable aerosol. A device may be a self-contained vaporization device. The device may comprise an elongated body which functions to complement aspects of a separable and recyclable cartridge with air inlet channels, air passages, multiple condensation chambers, flexible heater contacts, and multiple aerosol outlets. Additionally, the cartridge may be configured for ease of manufacture and assembly.

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[0195] Provided herein is a vaporization device for generating an inhalable aerosol. The device may comprise a device body, a separable cartridge assembly further comprising a heater, at least one condensation chamber, and a mouthpiece. The device provides for compact assembly and disassembly of components with detachable couplings; overheat shut-off protection for the resistive heating element; an air inlet passage (an enclosed channel) formed by the assembly of the device body and a separable cartridge; at least one condensation chamber within the separable cartridge assembly; heater contacts; and one or more refillable, reusable, and/or recyclable components.

[0196] Provided herein is a device for generating an inhalable aerosol comprising: a device body comprising a cartridge receptacle; a cartridge comprising: a storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle. The cartridge may be formed from a metal, plastic, ceramic, and/or composite material. The storage compartment may hold a vaporizable material. FIG. 7A shows an example of a cartridge 30 for use in the device. The vaporizable material may be a liquid at or near room temperature. In some cases the vaporizable material may be a liquid below room temperature. The channel may form a first side of the air inlet passage, and an internal surface of the cartridge receptacle may form a second side of the air inlet passage, as illustrated in various non-limiting aspects of FIGS. 5-6D, 7C, 8A, 8B, and 10A

[0197] Provided herein is a device for generating an inhalable aerosol. The device may comprise a body that houses, contains, and or integrates with one or more components of the device. The device body may comprise a cartridge receptacle. The cartridge receptacle may comprise a channel integral to an interior surface of the cartridge receptacle; and an air inlet passage formed by the channel and an external surface of the cartridge when the cartridge is inserted into the cartridge receptacle. A cartridge may be fitted and/or inserted into the cartridge receptacle. The cartridge may have a fluid storage compartment. The channel may form a first side of the air inlet passage, and an external surface of the cartridge forms a second side of the air inlet passage. The channel may comprise at least one of: a groove; a trough; a track; a depression; a dent; a furrow; a trench; a crease; and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The

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channel may have a round, oval, square, rectangular, or other shaped cross section. The channel may have a closed cross section. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm wide. The channel may be about 0.1 mm, 0.5 mm, 1 mm, 2 mm, or 5 mm deep. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm long. There may be at least 1 channel.

[0198] In some embodiments, the cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge.

[0199] FIGS. 5-7C show various views and aspects of a compact electronic device assembly 10 for generating an inhalable aerosol. The compact electronic device 10 may comprise a device body 20 with a cartridge receptacle 21 for receiving a cartridge 30. The device body may have a square or rectangular cross section. Alternatively, the cross section of the body may be any other regular or irregular shape. The cartridge receptacle may be shaped to receive an opened cartridge 30 or "pod" 30a. The cartridge may be opened when a protective cap is removed from a surface of the cartridge. In some cases, the cartridge may be opened when a hole or opening is formed on a surface of the cartridge. The pod 30a may be inserted into an open end of the cartridge receptacle 21 so that exposed first heater contact tips 33a on the heater contacts 33 of the pod make contact with the second heater contacts 22 of the device body, thus forming the device assembly 10.

[0200] Referring to FIG. 14C, it is apparent in the plan view that when the pod 30a is inserted into the notched body of the cartridge receptacle 21, the channel air inlet 50 is left exposed. The size of the channel air inlet 50 may be varied by altering the configuration of the notch in the cartridge receptacle 21.

[0201] The device body may further comprise a rechargeable battery, a printed circuit board (PCB) 24 containing a microcontroller with the operating logic and software instructions for the device, a pressure switch 27 for sensing the user's puffing action to activate the heater circuit (2830), an indicator light 26, charging contacts (not shown), and an optional charging magnet or magnetic contact (not shown). The cartridge may further comprise a heater 36. The heater may be powered by the rechargeable battery. The temperature of the heater may be controlled by the microcontroller. The heater may be attached to a first end of the cartridge.

[0202] In some embodiments, the heater may comprise a heater chamber 37, a first pair of heater contacts 33, 33', a fluid wick 34, and a resistive heating element 35 in contact with the

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wick. The first pair of heater contacts may comprise thin plates affixed about the sides of the heater chamber. The fluid wick and resistive heating element may be suspended between the heater contacts.

[0203] In some embodiments, there may be two or more resistive heating elements 35, 35' and two or more wicks 34, 34'. In some of the embodiments, the heater contact 33 may comprise: a flat plate; a male contact; a female receptacle, or both; a flexible contact and/or copper alloy or another electrically conductive material. The first pair of heater contacts may further comprise a formed shape that may comprise a tab (e.g., flange) having a flexible spring value that extends out of the heater to complete a circuit with the device body. The first pair of heater contact may be a heat sink that absorb and dissipate excessive heat produced by the resistive heating element. Alternatively, the first pair of heater contacts may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment.

[0204] As illustrated in the exploded assembly of FIG. 7B, a heater enclosure may comprises two or more heater contacts 33, each comprising a flat plate which may be machined or stamped from a copper alloy or similar electrically conductive material. The flexibility of the tip is provided by the cut-away clearance feature 33b created below the male contact point tip 33a which capitalizes on the inherent spring capacity of the metal sheet or plate material. Another advantage and improvement of this type of contact is the reduced space requirement, simplified construction of a spring contact point (versus a pogo pin) and the easy of assembly. The heater may comprise a first condensation chamber. The heater may comprise more one or more additional condensation chambers in addition to the first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0205] In some cases, the cartridge (e.g., pod) is configured for ease of manufacturing and assembly. The cartridge may comprise an enclosure. The enclosure may be a tank. The tank may comprise an interior fluid storage compartment 32. The interior fluid storage compartment 32 which is open at one or both ends and comprises raised rails on the side edges 45b and 46b. The cartridge may be formed from plastic, metal, composite, and/or a ceramic material. The cartridge may be rigid or flexible.

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[0206] The tank may further comprise a set of first heater contact plates 33 formed from copper alloy or another electrically conductive material, having a thin cut-out 33b below the contact tips 33a (to create a flexible tab) which are affixed to the sides of the first end of the tank and straddle the open-sided end 53 of the tank. The plates may affix to pins, or posts as shown in FIGS. 7B or 5, or may be attached by other common means such as compression beneath the enclosure 36. A fluid wick 34 having a resistive heating element 35 wrapped around it, is placed between the first heater contact plates 33, and attached thereto. A heater 36, comprising raised internal edges on the internal end (not shown), a thin mixing zone (not shown), and primary condensation channel covers 45a that slide over the rails 45b on the sides of the tank on the first half of the tank, creating a primary condensation channel / chamber 45. In addition, a small male snap feature 39b located at the end of the channel cover is configured fall into a female snap feature 39a, located mid-body on the side of the tank, creating a snap-fit assembly.

[0207] As will be further clarified below, the combination of the open-sided end 53, the protruding tips 33a of the contact plates 33, the fluid wick 34 having a resistive heating element 35, enclosed in the open end of the fluid storage tank, under the heater 36, with a thin mixing zone therein, creates an efficient heater system. In addition, the primary condensation channel covers 45a which slide over the rails 45b on the sides of the tank create an integrated, easily assembled, primary condensation chamber 45, all within the heater at the first end of the cartridge 30 or pod 30a.

[0208] In some embodiments of the device, as illustrated in FIGS. 9A-9L, the heater may encloses at least a first end of the cartridge. The enclosed first end of the cartridge may include the heater and the interior fluid storage compartment. In some embodiments, the heater further comprises at least one first condensation chamber 45.

[0209] FIGS. 9A-9L show diagramed steps that may be performed to assemble a cartomizer and/or mouthpiece. In A-B the fluid storage compartment 32a may be oriented such that the heater inlet 53 faces upward. The heater contacts 33 may be inserted into the fluid storage compartment. Flexible tabs 33a may be inserted into the heater contacts 33. In a step D the resistive heating element 35 may be wound on to the wick 34. In step E the wick 34 and heater 35 may be placed on the fluid storage compartment. One or more free ends of the heater may sit outside the heater contacts. The one or more free ends may be soldered in place, rested in a groove, or snapped into a fitted location. At least a fraction of the one or more free ends may be

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in communication with the heater contacts 33. In a step F the heater enclosure 36 may be snapped in place. The heater enclosure 36 may be fitted on the fluid storage compartment. Step G shows the heater enclosure 36 is in place on the fluid storage compartment. In step H the fluid storage compartment can be flipped over. In step I the mouthpiece 31 can be fitted on the fluid storage compartment. Step J shows the mouthpiece 31 in place on the fluid storage compartment. In step K an end 38 can be fitted on the fluid storage compartment opposite the mouthpiece. Step L shows a fully assembled cartridge 30. FIG. 7B shows an exploded view of the assembled cartridge 30.

[0210] Depending on the size of the heater and/or heater chamber, the heater may have more than one wick 34 and resistive heating element 35.

[0211] In some embodiments, the first pair of heater contacts 33 further comprises a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater. In some embodiments, the cartridge 30 comprises heater contacts 33 which are inserted into the cartridge receptacle 21 of the device body 20 wherein, the flexible tabs 33a insert into a second pair of heater contacts 22 to complete a circuit with the device body. The first pair of heater contacts 33 may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element 35. The first pair of heater contacts 33 may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element 35. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater 36 may enclose a first end of the cartridge and a first end of the fluid storage compartment 32a. The heater may comprise a first condensation chamber 45. The heater may comprise at least one additional condensation chamber 45, 45', 45", etc. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0212] In still other embodiments of the device, the cartridge may further comprise a mouthpiece 31, wherein the mouthpiece comprises at least one aerosol outlet channel / secondary condensation chamber 46; and at least one aerosol outlet 47.The mouthpiece may be attached to a second end of the cartridge. The second end of the cartridge with the mouthpiece may be exposed when the cartridge is inserted in the device. The mouthpiece may comprise more than one second condensation chamber 46, 46', 46", etc. The second condensation chamber is formed along an exterior wall of the cartridge.

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[0213] The mouthpiece 31 may enclose the second end of the cartridge and interior fluid storage compartment. The partially assembled (e.g., mouthpiece removed) unit may be inverted and filled with a vaporizable fluid through the opposite, remaining (second) open end. Once filled, a snap-on mouthpiece 31 that also closes and seals the second end of the tank is inserted over the end. It also comprises raised internal edges (not shown), and aerosol outlet channel covers 46a that may slide over the rails 46b located on the sides of the second half of the tank, creating aerosol outlet channels / secondary condensation chambers 46. The aerosol outlet channels / secondary condensation chambers 46 slide over the end of primary condensation chamber 45, at a transition area 57, to create a junction for the vapor leaving the primary chamber and proceed out through the aerosol outlets 47, at the end of the aerosol outlet channels 46 and user-end of the mouthpiece 31.

[0214] The cartridge may comprise a first condensation chamber and a second condensation chamber 45, 46. The cartridge may comprise more than one first condensation chamber and more than one second condensation chamber 45, 46, 45', 46', etc.

[0215] In some embodiments of the device, a first condensation chamber 45 may be formed along the outside of the cartridge fluid storage compartment 31. In some embodiments of the device an aerosol outlet 47 exists at the end of aerosol outlet chamber 46. In some embodiments of the device, a first and second condensation chamber 45, 46 may be formed along the outside of one side of the cartridge fluid storage compartment 32a. In some embodiments the second condensation chamber may be an aerosol outlet chamber. In some embodiments another pair of first and/or second condensation chambers 45', 46' is formed along the outside of the cartridge fluid storage compartment 32a on another side of the device. In some embodiments another aerosol outlet 47' will also exist at the end of the second pair of condensation chambers 45', 46'.

[0216] In any one of the embodiments, the first condensation chamber and the second condensation chamber may be in fluid communication as illustrated in FIG. 10C.

[0217] In some embodiments, the mouthpiece may comprise an aerosol outlet 47 in fluid communication with the second condensation chamber 46. The mouthpiece may comprise more than one aerosol outlet 47, 47' in fluid communication with more than one the second condensation chamber 46, 46'. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

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[0218] In each of the embodiments described herein, the cartridge may comprise an airflow path comprising: an air inlet passage; a heater; at least a first condensation chamber; an aerosol outlet chamber, and an outlet port. In some of the embodiments described herein, the cartridge comprises an airflow path comprising: an air inlet passage; a heater; a first condensation chamber; a secondary condensation chamber; and an outlet port.

[0219] In still other embodiments described herein the cartridge may comprise an airflow path comprising at least one air inlet passage; a heater; at least one first condensation chamber; at least one secondary condensation chamber; and at least one outlet port.

[0220] As illustrated in FIGS. 10A-10C, an airflow path is created when the user draws on the mouthpiece 31 to create a suction (e.g., a puff), which essentially pulls air through the channel air inlet opening 50, through the air inlet passage 51, and into the heater chamber 37 through the second air passage (tank air inlet hole) 41 at the tank air inlet 52, then into the heater inlet 53. At this point, the pressure sensor has sensed the user's puff, and activated the circuit to the resistive heating element 35, which in turn, begins to generate vapor from the vapor fluid (e-juice). As air enters the heater inlet 53, it begins to mix and circulate in a narrow chamber above and around the wick 34 and between the heater contacts 33, generating heat, and dense, concentrated vapor as it mixes in the flow path 54 created by the sealing structure obstacles 44. FIG. 8A shows a detailed view of the sealing structure obstacles 44. Ultimately the vapor may be drawn, out of the heater along an air path 55 near the shoulder of the heater and into the primary condensation chamber 45 where the vapor expands and begins to cool. As the expanding vapor moves along the airflow path, it makes a transition from the primary condensation chamber 45 through a transition area 57, creating a junction for the vapor leaving the primary chamber, and entering the second vapor chamber 46, and proceeds out through the aerosol outlets 47, at the end of the mouthpiece 31 to the user.

[0221] As illustrated in FIGS. 10A-10C, the device may have a dual set of air inlet passages 50-53, dual first condensation chambers 55/45, dual second condensation chambers and aeration channels 57/46, and/or dual aerosol outlet vents 47.

[0222] Alternatively, the device may have an airflow path comprising: an air inlet passage 50, 51; a second air passage 41; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and/or an aerosol outlet 47.

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[0223] In some cases, the devise may have an airflow path comprising: more than one air inlet passage; more than one second air passage; a heater chamber; more than one first condensation chamber; more than one second condensation chamber; and more than one aerosol outlet as clearly illustrated in FIGS. 10A-10C.

[0224] In any one of the embodiments described herein, the heater 36 may be in fluid communication with the internal fluid storage compartment 32a.

[0225] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater chamber 37, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid, as illustrated in FIGS. 10A, 10C and 14.

[0226] In some embodiments of the device, the condensed aerosol fluid may comprise a nicotine formulation. In some embodiments, the condensed aerosol fluid may comprise a humectant. In some embodiments, the humectant may comprise propylene glycol. In some embodiments, the humectant may comprise vegetable glycerin.

[0227] In some cases, the cartridge may be detachable from the device body. In some embodiments, the cartridge receptacle 21 and the detachable cartridge may form a separable coupling. In some embodiments the separable coupling may comprise a friction assembly. As illustrated in FIGS. 11-14, the device may have a press-fit (friction) assembly between the cartridge pod 30a and the device receptacle. Additionally, a dent / friction capture such as 43 may be utilized to capture the pod 30a to the device receptacle or to hold a protective cap 38 on the pod, as further illustrated in FIG. 8B.

[0228] In other embodiments, the separable coupling may comprise a snap-fit or snap-lock assembly. In still other embodiments the separable coupling may comprise a magnetic assembly.

[0229] In any one of the embodiments described herein, the cartridge components may comprise a snap-fit or snap-lock assembly, as illustrated in FIG. 5. In any one of the embodiments, the cartridge components may be reusable, refillable, and/or recyclable. The design of these cartridge components lend themselves to the use of such recyclable plastic materials as polypropylene, for the majority of components.

[0230] In some embodiments of the device 10, the cartridge 30 may comprise: a fluid storage compartment 32; a heater 36 affixed to a first end with a snap-fit coupling 39a, 39b; and a mouthpiece 31 affixed to a second end with a snap-fit coupling 39c, 39d (not shown – but similar to 39a and 39b). The heater 36 may be in fluid communication with the fluid storage

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compartment 32. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol and / or vegetable glycerin.

[0231] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage 51 when a cartridge comprising a channel integral 40 to an exterior surface is inserted into the cartridge receptacle 21, and wherein the channel forms a second side of the air inlet passage 51.

[0232] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage 51.

[0233] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a channel integral 40 to an exterior surface, wherein the channel forms a first side of an air inlet passage 51; and wherein an internal surface of a cartridge receptacle 21 in the device forms a second side of the air inlet passage 51 when the cartridge is inserted into the cartridge receptacle.

[0234] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32, wherein an exterior surface of the cartridge forms a first side of an air inlet channel 51 when inserted into a device body 10 comprising a cartridge receptacle 21, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage 51.

[0235] In some embodiments, the cartridge further comprises a second air passage 41 in fluid communication with the channel 40, wherein the second air passage 41 is formed through the material of the cartridge 32 from an exterior surface of the cartridge to the internal fluid storage compartment 32a.

[0236] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises at least one of: a groove; a trough; a depression; a dent; a furrow; a trench; a crease; and a gutter.

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[0237] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises walls that are either recessed into the surface or protrude from the surface where it is formed.

[0238] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the internal side walls of the channel 40 form additional sides of the air inlet passage 51.

[0239] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge 30 comprising; a fluid storage compartment 32a; a heater affixed to a first end comprising; a first heater contact 33, a resistive heating element 35 affixed to the first heater contact 33; a device body 20 comprising; a cartridge receptacle 21 for receiving the cartridge 30; a second heater contact 22 adapted to receive the first heater contact 33 and to complete a circuit; a power source 23 connected to the second heater contact 22; a printed circuit board (PCB) 24 connected to the power source 23 and the second heater contact 22; wherein the PCB 24 is configured to detect the absence of fluid based on the measured resistance of the resistive heating element 35, and turn off the device.

[0240] Referring now to FIGS. 13, 14A-C, and 15, in some embodiments, the device body further comprises at least one: second heater contact 22 (best shown in FIG. 6C detail); a battery 23; a printed circuit board 24; a pressure sensor 27; and an indicator light 26.

[0241] In some embodiments, the printed circuit board (PCB) further comprises: a microcontroller; switches; circuitry comprising a reference resistor; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0242] As illustrated in the basic block diagram of FIG. 17A, the device utilizes a proportional-integral-derivative controller or PID control law. A PID controller calculates an "error" value as the difference between a measured process variable and a desired SetPoint. When PID control is enabled, power to the coil is monitored to determine whether or not acceptable vaporization is occurring. With a given airflow over the coil, more power will be required to hold the coil at a given temperature if the device is producing vapor (heat is removed from the coil to form vapor). If power required to keep the coil at the set temperature drops below a threshold, the device indicates that it cannot currently produce vapor. Under normal

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operating conditions, this indicates that there is not enough liquid in the wick for normal vaporization to occur.

[0243] In some embodiments, the micro-controller instructs the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0244] In still other embodiments, the printed circuit board further comprises logic capable of detecting the presence of condensed aerosol fluid in the fluid storage compartment and is capable of turning off power to the heating contact(s) when the condensed aerosol fluid is not detected. When the microcontroller is running the PID temperature control algorithm 70, the difference between a set point and the coil temperature (error) is used to control power to the coil so that the coil quickly reaches the set point temperature, [between 200°C and 400°C]. When the over-temperature algorithm is used, power is constant until the coil reaches an over-temperature threshold, [between 200°C and 400°C]; (FIG. 17 A applies: set point temperature is over-temperature threshold; constant power until error reaches 0).

[0245] The essential components of the device used to control the resistive heating element coil temperature are further illustrated in the circuit diagram 71 of FIG. 17B. Wherein, BATT 23 is the battery; MCU 72 is the microcontroller; Q1 (76) and Q2 (77) are P-channel MOSFETs (switches); R_COIL 74 is the resistance of the coil. R_REF 75 is a fixed reference resistor used to measure R_COIL 74 through a voltage divider 73.

[0246] The battery powers the microcontroller. The microcontroller turns on Q2 for 1 ms every 100ms so that the voltage between R_REF and R_COIL (a voltage divider) may be measured by the MCU at V_MEAS. When Q2 is off, the control law controls Q1 with PWM (pulse width modulation) to power the coil (battery discharges through Q1 and R_COIL when Q1 is on).

[0247] In some embodiments of the device, the device body further comprises at least one: second heater contact; a power switch; a pressure sensor; and an indicator light.

[0248] In some embodiments of the device body, the second heater contact 22 may comprise: a female receptacle; or a male contact, or both, a flexible contact; or copper alloy or another electrically conductive material.

[0249] In some embodiments of the device body, the battery supplies power to the second heater contact, pressure sensor, indicator light and the printed circuit board. In some

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embodiments, the battery is rechargeable. In some embodiments, the indicator light 26 indicates the status of the device and / or the battery or both.

[0250] In some embodiments of the device, the first heater contact and the second heater contact complete a circuit that allows current to flow through the heating contacts when the device body and detachable cartridge are assembled, which may be controlled by an on / off switch. Alternatively, the device can be turned on an off by a puff sensor. The puff sensor may comprise a capacitive membrane. The capacitive membrane may be similar to a capacitive membrane used in a microphone.

[0251] In some embodiments of the device, there is also an auxiliary charging unit for recharging the battery 23 in the device body. As illustrated in FIGS. 16A-16C, the charging unit 60, may comprise a USB device with a plug for a power source 63 and protective cap 64, with a cradle 61 for capturing the device body 20 (with or without the cartridge installed). The cradle may further comprise either a magnet or a magnetic contact 62 to securely hold the device body in place during charging. As illustrated in FIG. 6B, the device body further comprises a mating charging contact 28 and a magnet or magnetic contact 29 for the auxiliary charging unit. FIG. 16C is an illustrative example of the device 20 being charged in a power source 65 (laptop computer or tablet).

[0252] In some cases the microcontroller on the PCB may be configured to monitor the temperature of the heater such that the vaporizable material is heated to a prescribed temperature. The prescribed temperature may be an input provided by the user. A temperature sensor may be in communication with the microcontroller to provide an input temperature to the microcontroller for temperature regulation. A temperature sensor may be a thermistor, thermocouple, thermometer, or any other temperature sensors. In some cases, the heating element may simultaneously perform as both a heater and a temperature sensor. The heating element may differ from a thermistor by having a resistance with a relatively lower dependence on temperature. The heating element may comprise a resistance temperature detector.

[0253] The resistance of the heating element may be an input to the microcontroller. In some cases, the resistance may be determined by the microcontroller based on a measurement from a circuit with a resistor with at least one known resistance, for example, a Wheatstone bridge. Alternatively, the resistance of the heating element may be measured with a resistive voltage divider in contact with the heating element and a resistor with a known and substantially constant

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resistance. The measurement of the resistance of the heating element may be amplified by an amplifier. The amplifier may be a standard op amp or instrumentation amplifier. The amplified signal may be substantially free of noise. In some cases, a charge time for a voltage divider between the heating element and a capacitor may be determined to calculate the resistance of the heating element. In some cases, the microcontroller must deactivate the heating element during resistance measurements. The resistance of the heating element may be directly proportional to the temperature of the heating element such that the temperature may be directly determine from the resistance measurement. Determining the temperature directly from the heating element resistance measurement rather than from an additional temperature sensor may generate a more accurate measurement because unknown contact thermal resistance between the temperature sensor and the heating element is eliminated. Additionally, the temperature measurement may be determined directly and therefore faster and without a time lag associated with attaining equilibrium between the heating element and a temperature sensor in contact with the heating element.

[0254] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge comprising a first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; and a single button interface; wherein the PCB is configured with circuitry and an algorithm comprising logic for a child safety feature.

[0255] In some embodiments, the algorithm requires a code provided by the user to activate the device. In some embodiments; the code is entered by the user with the single button interface. In still further embodiments the single button interface is the also the power switch.

[0256] Provided herein is a cartridge 30 for a device 10 for generating an inhalable aerosol comprising: a fluid storage compartment 32; a heater 36 affixed to a first end comprising: a heater chamber 37, a first pair of heater contacts 33, a fluid wick 34, and a resistive heating element 35 in contact with the wick; wherein the first pair of heater contacts 33 comprise thin plates affixed about the sides of the heater chamber 37, and wherein the fluid wick 34 and resistive heating element 35 are suspended there between.

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[0257] Depending on the size of the heater or heater chamber, the heater may have more than one wick 34, 34' and resistive heating element 35, 35'.

[0258] In some embodiments, the first pair of heater contacts further comprise a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater 36 to complete a circuit with the device body 20.

[0259] In some embodiments, the heater contacts 33 are configured to mate with a second pair of heater contacts 22 in a cartridge receptacle 21 of the device body 20 to complete a circuit.

[0260] In some embodiments, the first pair of heater contacts is also a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element.

[0261] In some embodiments, the first pair of heater contacts is a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element.

[0262] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a heater 36 comprising; a heater chamber 37, a pair of thin plate heater contacts 33 therein, a fluid wick 34 positioned between the heater contacts 33, and a resistive heating element 35 in contact with the wick; wherein the heater contacts 33 each comprise a fixation site 33c wherein the resistive heating element 35 is tensioned there between.

[0263] As will be obvious to one skilled in the art after reviewing the assembly method illustrated in FIGS. 9A-9L, the heater contacts 33 simply snap or rest on locator pins on either side of the air inlet 53 on the first end of the cartridge interior fluid storage compartment, creating a spacious vaporization chamber containing the at least one wick 34 and at least one heating element 35.

[0264] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a heater 36 attached to a first end of the cartridge.

[0265] In some embodiments, the heater encloses a first end of the cartridge and a first end of the fluid storage compartment 32, 32a.

[0266] In some embodiments, the heater comprises a first condensation chamber 45.

[0267] In some embodiments, the heater comprises more than one first condensation chamber 45, 45'.

[0268] In some embodiments, the condensation chamber is formed along an exterior wall of the cartridge 30.

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[0269] As noted previously, and described in FIGS. 10A, 10B and 10C, the airflow path through the heater and heater chamber generates vapor within the heater circulating air path 54, which then exits through the heater exits 55 into a first (primary) condensation chamber 45, which is formed by components of the tank body comprising the primary condensation channel/chamber rails 45b, the primary condensation channel cover 45a, (the outer side wall of the heater enclosure).

[0270] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32 and a mouthpiece 31, wherein the mouthpiece is attached to a second end of the cartridge and further comprises at least one aerosol outlet 47.

[0271] In some embodiments, the mouthpiece 31 encloses a second end of the cartridge 30 and a second end of the fluid storage compartment 32, 32a.

[0272] Additionally, as clearly illustrated in FIG. 10C in some embodiments the mouthpiece also contains a second condensation chamber 46 prior to the aerosol outlet 47, which is formed by components of the tank body 32 comprising the secondary condensation channel/chamber rails 46b, the second condensation channel cover 46a, (the outer side wall of the mouthpiece). Still further, the mouthpiece may contain yet another aerosol outlet 47' and another (second) condensation chamber 46' prior to the aerosol outlet, on another side of the cartridge.

[0273] In other embodiments, the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0274] In some preferred embodiments, the second condensation chamber is formed along an exterior wall of the cartridge 30.

[0275] In each of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; at least a first condensation chamber 45; and an outlet port 47. In some of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and an outlet port 47.

[0276] In still other embodiments described herein the cartridge 30 may comprise an airflow path comprising at least one air inlet channel and passage 40, 41, 42; a heater chamber 37; at least one first condensation chamber 45; at least one second condensation chamber 46; and at least one outlet port 47.

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[0277] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater 36, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid.

[0278] In some embodiments of the device, the condensed aerosol fluid comprises a nicotine formulation. In some embodiments, the condensed aerosol fluid comprises a humectant. In some embodiments, the humectant comprises propylene glycol. In some embodiments, the humectant comprises vegetable glycerin.

[0279] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a heater 36 affixed to a first end; and a mouthpiece 31 affixed to a second end; wherein the heater comprises a first condensation chamber 45 and the mouthpiece comprises a second condensation chamber 46.

[0280] In some embodiments, the heater comprises more than one first condensation chamber 45, 45' and the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0281] In some embodiments, the first condensation chamber and the second condensation chamber are in fluid communication. As illustrated in FIG. 10C, the first and second condensation chambers have a common transition area 57, 57', for fluid communication.

[0282] In some embodiments, the mouthpiece comprises an aerosol outlet 47 in fluid communication with the second condensation chamber 46.

[0283] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47'.

[0284] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47' in fluid communication with the two or more second condensation chambers 46, 46'.

[0285] In any one of the embodiments, the cartridge meets ISO recycling standards.

[0286] In any one of the embodiments, the cartridge meets ISO recycling standards for plastic waste.

[0287] And in still other embodiments, the plastic components of the cartridge are composed of polylactic acid (PLA), wherein the PLA components are compostable and or degradable.

[0288] Provided herein is a device for generating an inhalable aerosol 10 comprising a device body 20 comprising a cartridge receptacle 21; and a detachable cartridge 30; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, and wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

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[0289] In other embodiments of the device, the cartridge is a detachable assembly. In any one of the embodiments described herein, the cartridge components may comprise a snap-lock assembly such as illustrated by snap features 39a and 39b. In any one of the embodiments, the cartridge components are recyclable.

[0290] Provided herein is a method of fabricating a device for generating an inhalable aerosol comprising: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly when the cartridge is inserted into the cartridge receptacle.

[0291] Provided herein is a method of making a device 10 for generating an inhalable aerosol comprising: providing a device body 20 with a cartridge receptacle 21 comprising one or more interior coupling surfaces 21a, 21b, 21c…; and further providing a cartridge 30 comprising: one or more exterior coupling surfaces 36a, 36b, 36c,..., a second end and a first end; a tank 32 comprising an interior fluid storage compartment 32a; at least one channel 40 on at least one exterior coupling surface, wherein the at least one channel forms one side of at least one air inlet passage 51, and wherein at least one interior wall of the cartridge receptacle forms at least one side one side of at least one air inlet passage 51when the detachable cartridge is inserted into the cartridge receptacle.

[0292] FIGS. 9A-9L provide an illustrative example of a method of assembling such a device.

[0293] In some embodiments of the method, the cartridge 30 is assembled with a [protective] removable end cap 38 to protect the exposed heater contact tabs 33a protruding from the heater 36.

[0294] Provided herein is a method of fabricating a cartridge for a device for generating an inhalable aerosol comprising: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0295] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 with an airflow path comprising: a channel 50 comprising a portion of an air inlet passage 51; a second air passage 41 in fluid communication with the channel; a heater chamber 37 in fluid communication with the second air passage; a first condensation chamber 45 in fluid communication with the heater chamber; a second condensation chamber 46 in fluid

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communication with the first condensation chamber; and an aerosol outlet 47 in fluid communication with second condensation chamber.

[0296] Provided herein is a device 10 for generating an inhalable aerosol adapted to receive a removable cartridge 30, wherein the cartridge comprises a fluid storage compartment [or tank] 32; an air inlet 41; a heater 36, a [protective] removable end cap 38, and a mouthpiece 31.

[0297] Charging

[0298] In some cases, the vaporization device may comprise a power source. The power source may be configured to provide power to a control system, one or more heating elements, one or more sensors, one or more lights, one or more indicators, and/or any other system on the electronic cigarette that requires a power source. The power source may be an energy storage device. The power source may be a battery or a capacitor. In some cases, the power source may be a rechargeable battery.

[0299] The battery may be contained within a housing of the device. In some cases the battery may be removed from the housing for charging. Alternatively, the battery may remain in the housing while the battery is being charged. Two or more charge contact may be provided on an exterior surface of the device housing. The two or more charge contacts may be in electrical communication with the battery such that the battery may be charged by applying a charging source to the two or more charge contacts without removing the battery from the housing.

[0300] FIG. 18 shows a device 1800 with charge contacts 1801. The charge contacts 1801 may be accessible from an exterior surface of a device housing 1802. The charge contacts 1801 may be in electrical communication with an energy storage device (e.g., battery) inside of the device housing 1802. In some cases, the device housing may not comprise an opening through which the user may access components in the device housing. The user may not be able to remove the battery and/or other energy storage device from the housing. In order to open the device housing a user must destroy or permanently disengage the charge contacts. In some cases, the device may fail to function after a user breaks open the housing.

[0301] FIG. 19 shows an exploded view of a charging assembly 1900 in an electronic vaporization device. The housing (not shown) has been removed from the exploded view in FIG. 19. The charge contact pins 1901 may be visible on the exterior of the housing. The charge contact pins 1901 may be in electrical communication with a power storage device of the

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electronic vaporization device. When the device is connected to a power source (e.g., during charging of the device) the charging pins may facilitate electrical communication between the power storage device inside of the electronic vaporization device and the power source outside of the housing of the vaporization device. The charge contact pins 1901 may be held in place by a retaining bezel 1902. The charge contact pins 1901 may be in electrical communication with a charger flex 1903. The charging pins may contact the charger flex such that a need for soldering of the charger pins to an electrical connection to be in electrical communication with the power source may be eliminated. The charger flex may be soldered to a printed circuit board (PCB). The charger flex may be in electrical communication with the power storage device through the PCB. The charger flex may be held in place by a bent spring retainer 1904.

[0302] FIG. 20 shows the bent spring retainer in an initial position 2001 and a deflected position 2002. The bent spring retainer may hold the retaining bezel in a fixed location. The bent spring retainer may deflect only in one direction when the charging assembly is enclosed in the housing of the electronic vaporization device.

[0303] FIG. 21 shows a location of the charger pins 2101 when the electronic vaporization device is fully assembled with the charging pins 2101 contact the charging flex 2102. When the device is fully assembled at least a portion of the retaining bezel may be fitted in an indentation 2103 on the inside of the housing 2104. In some cases, disassembling the electronic vaporization device may destroy the bezel such that the device cannot be reassembled after disassembly.

[0304] A user may place the electronic smoking device in a charging cradle. The charging cradle may be a holder with charging contact configured to mate or couple with the charging pins on the electronic smoking device to provide charge to the energy storage device in the electronic vaporization device from a power source (e.g., wall outlet, generator, and/or external power storage device). FIG. 22 shows a device 2302 in a charging cradle 2301. The charging cable may be connected to a wall outlet, USB, or any other power source. The charging pins (not shown) on the device 2302 may be connected to charging contacts (not shown) on the charging cradle 2301. The device may be configured such that when the device is placed in the cradle for charging a first charging pin on the device may contact a first charging contact on the charging cradle and a second charging pin on the device may contact a second charging contact on the charging cradle or the first charging pin on the device may contact a second charging contact on the charging cradle and the second charging pin on the device may contact the first charging

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contact on the charging cradle. The charging pins on the device and the charging contacts on the cradle may be in contact in any orientation. The charging pins on the device and the charging contacts on the cradle may be agnostic as to whether they are current inlets or outlets. Each of the charging pins on the device and the charging contacts on the cradle may be negative or positive. The charging pins on the device may be reversible.

[0305] FIG. 23 shows a circuit 2400 that may permit the charging pins on the device to be reversible. The circuit 2400 may be provided on a PCB in electrical communication with the charging pins. The circuit 2400 may comprise a metal–oxide–semiconductor field-effect transistor (MOSFET) H bridge. The MOSFET H bridge may rectify a change in voltage across the charging pins when the charging pins are reversed from a first configuration where in a first configuration the device is placed in the cradle for charging with the first charging pin on the device in contact with the first charging contact on the charging cradle to a second charging pin on the device in contact with the second charging contact on the charging cradle to a second configuration where the first charging pin on the device is in contact with the second charging contact on the charging cradle and the second charging pin on the device is in contact with the first charging contact on the charging cradle. The MOSFET H bridge may rectify the change in voltage with an efficient current path.

[0306] As shown in FIG. 23 the MOSFET H bridge may comprise two or more n-channel MOSFETs and two or more p-channel MOSFETs. The n-channel and p-channel MOSFETs may be arranged in an H bridge. Sources of p-channels MOSFETs (Q1 and Q3) may be in electrical communication. Similarly, sources of n-channel FETs (Q2 and Q4) may be in electrical communication. Drains of pairs of n and p MOSFETs (Q1 with Q2 and Q3 with Q4) may be in electrical communication. A common drain from one n and p pair may be in electrical communication with one or more gates of the other n and p pair and/or vice versa. Charge contacts (CH1 and CH2) may be in electrical communication to common drains separately. A common source of the n MOSFETs may be in electrical communication to PCB ground (GND). The common source of the p MOSFETs may be in electrical communication with the PCB's charge controller input voltage (CH+). When CH1 voltage is greater than CH2 voltage by the MOSFET gate threshold voltages, Q1 and Q4 may be "on," connecting CH1 to CH+ and CH2 to GND. When CH2 voltage is greater than CH1 voltage by the FET gate threshold voltages, Q2 and Q3 may be "on," connecting CH1 to GND and CH2 to CH+. For example, whether there is

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9V or -9V across CH1 to CH2, CH+ will be 9V above GND. Alternatively, a diode bridge could be used, however the MOSFET bridge may be more efficient compared to the diode bridge.

[0307] In some cases the charging cradle may be configured to be a smart charger. The smart charger may put the battery of the device in series with a USB input to charge the device at a higher current compared to a typical charging current. In some cases, the device may charge at a rate up to about 2 amps (A), 4A, 5A, 6A, 7A, 10A, or 15A. In some cases, the smart charger may comprise a battery, power from the battery may be used to charge the device battery. When the battery in the smart charger has a charge below a predetermined threshold charge, the smart charger may simultaneously charge the battery in the smart charger and the battery in the device.

[0308] Blow discrimination

[0309] In any of the devices and system (e.g., vaporizers) described herein, a pressure sensor may be used and configured to detect blowing and to distinguish blowing from draw (sucking/inhaling). For example, a modified electret microphone may be used as a pressure sensor connected to the device's microcontroller so that pressure-dependent measurements can be made by the microcontroller. The microcontroller's draw detection algorithm, which uses measurements of pressure sensor's capacitance to determine the start and end of the draw, may be configured to include blow detection and/or blow discrimination.

[0310] As mentioned above, other types of pressures sensors may be used (e.g., microelectromechanical systems (MEMS) pressure sensors or any other differential pressure sensor). In such cases the output of the sensor (which may be converted by the sensor and/or associated circuitry into a pressure value (e.g., in mmHg, atm, etc.) or it may be a raw sensor output or value (e.g., reading) such as a capacitance value in the case of a pressure sensor using a capacitive membrane, electrical value (resistive, voltage, etc.), digital value, force and/or displacement value, etc. As described herein, this raw value may be used in the controls described (e.g., microcontrollers) without requiring conversion to an actual pressure reading. Although the examples described herein refer to a capacitive pressure sensor having a capacitive membrane (e.g., an electret microphone), any other differential pressure sensor may be used instead with the methods and apparatuses described herein, including controlling the baseline during a putative blow and/or draw through the mouthpiece as described in greater detail below.

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[0311] Thus, any pressure sensor that can distinguish positive and negative pressure may be used. For example a pressure sensor may comprise an electrically conductive diaphragm held in close proximity to a conductive static plate, forming an air capacitor, with both conductors connected to pins or pads on a circuit (e.g., PCB) opposite the static plate side of the sensor. FIGS. 24A-24D illustrate one example of a pressure sensor 2509 that is a capacitive pressure sensor. In this example, the diaphragm 2404 (shown in FIG. 24D) is mounted to a rigid thin wall tube (case 2403) that is a close fit within the outer conductive case 2407 of the sensor 2509 such that air cannot flow through the sensor 2509 around the diaphragm. Holes 2411 in the static plate on one side of a gasket and holes 2413 in the PCB 2401 on the opposite side of the diaphragm allow pressure differences between the two sides of the sensor 2509 to be seen by the diaphragm, which deflects with a pressure difference across it.

[0312] Within the vaporizer, the sensor 2509 may be included in a sealed air path 2520 so as to distinguish a difference between internal pressure and air pressure. In some variations, a gasket 2502 in the device forms an air-tight seal around the sensor's case such that the static plate side of the sensor sees gauge pressures in the device's air path 2530 when a user draws from or blows into the device, as shown in FIG. 25. Air flow restriction between the device's nominal air inlet 2505 and the pressure sensor 2509 along the sealed air path 2520 creates a pressure that the static plate side of the pressure registers. The PCB side 2511 of the pressure sensor 2509 stays at an external reference (e.g., 0 gauge) pressure during a draw or blow as the PCB side of the pressure sensor 2509 is not part of the sealed air path 2520 and is not sealed from ambient air. Pressure difference on either side of the sensor 2509 resolve onto either side of the diaphragm; negative gauge pressure in the sealed air path 2520 from a draw pulls the diaphragm towards the static plate, increasing the capacitance of the sensor, while positive gauge pressures in the sealed air path from a blow push the diaphragm away from the static plate, decreasing the sensor's capacitance.

[0313] Differences between the pressure on either side of the diaphragm 2404 and the back plate 2405 change the spacing between the diaphragm and back plate and therefore the capacitance of the sensor 2509. This different separation may be read as the capacitance of the sensor 2509 and compared to ambient. In some variations, capacitance is measured with an oscillating circuit that sources and sinks current to/from the sensor 2509 to charge and discharge the sensor repeatedly. The device's microcontroller counts the number of times the sensor's

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intrinsic capacitor is charged and discharged within a fixed time period (e.g., 0.5 ms, 1 ms, 1.5 ms, 2 ms, etc.) and uses this value in a draw detection algorithm. This measurement may be inversely related to the capacitance of the sensor 2509, since an increase in capacitance will make the capacitor charge slower, resulting in fewer charge and discharge cycles during the measurement period. So an increase in capacitance from negative air path gauge pressure, normally a draw, will result in a lower reading than when the user is not drawing from the device. Blowing into the nominal outlet 2550 of the sealed air path 2520 will result in an increase in this measured value. Actual capacitance and air path gauge pressure are not needed by the draw detection algorithm, so they are not calculated, though they could be approximated and used in a similar draw detection algorithm.

[0314] In any of the apparatuses described herein, a capacitive sensing module within the microcontroller may handle the oscillation and current sourcing/sinking needed for the measurement via a direct connection to the pressure sensor diaphragm. The pressure sensor's case may be tied to PCB ground.

[0315] Because the ambient pressure around the device may change, the 'baseline' capacitance of the sensor may also change. This may be incorporated into the control circuitry that determines draw (and may determine or reject blow). For example, the draw detection algorithm may respond to environmental changes (not including draw or blow) that may change the nominal pressure measurement by using a baseline pressure measurement value which normally follows live pressure measurements using a software low-pass filter. With a moving baseline, a threshold for detecting the start of a draw can be kept very close to the baseline and live readings for consistent sensitivity and maximum sensitivity without falsely detected draws. The draw detection algorithm may therefore detect the start of a draw when the live pressure measurement drops (indicating a pressure drop in the air path) to some threshold below the baseline value for some number of measurements. The algorithm detects end of draw when live pressure measurements rise above some threshold below the baseline. The baseline may be fixed during the draw so that end of draw detection does not happen prematurely, and so that subsequent draws don't require larger pressure drops for the algorithm to detect the start of a draw.

[0316] For example, see FIG. 26, which graphically illustrates the output of the pressure sensor over time and when draws are detected by the microcontroller (which is performing the

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control logic as described herein). In this example, the live reading is the pressure output (converted capacitance measurement in this example) from the sensor. The baseline is a low-pass filtered measure of the live reading. This baseline is fixed during the two draw events. Draw detection state is shown by the square wave, where the high state corresponds to a draw currently being detected. A first threshold is positioned at a fixed offset below the baseline; when the live reading from the sensor (the pressure measurement) crosses the threshold (e.g., exceeds this offset), it detects a draw event, and can again detect the end of the draw event when the pressure returns past the same threshold. These two thresholds may differ from each other in the draw detection logic (algorithm). A similar method may be applied to detect blowing; a second threshold or second offset (blow threshold/offset) maybe represented as a line on the opposite side of the baseline from the draw threshold/offset. In this example, draws are detected as downward pressure deflection and offset, whereas blowing is upward deflection relative to the baseline; if the orientation of the sensor is reversed, or if the raw sensor values, depending on the type of sensor, are used, the direction of blow and draw relative to the baseline may be different.

[0317] Blowing into the device may be detected and/or ignored using this algorithm. For example, when the live pressure measurement rises to values above the baseline value (e.g., in the more positive direction in the configuration shown in FIGS. 25, 26 and 27), which is usually caused by the user blowing into the air path outlet, the baseline may also stop following the live pressure measurements (e.g., remain at the last value) until the sensor output returns to below some threshold above the baseline value, as shown in FIG. 27. Holding the baseline during a blowing event may prevent the baseline from rising to a value at which draw start would be detected at the end of the blow. With this feature, users can hold the device with their lips and/or teeth without worrying about the device heating when they didn't intend for it to heat. Without this feature, it the device may apparently heat on its own. Thus, preventing false draw may save, battery life and vaporizable material by preventing detection of false draws which may occur, for example if the baseline during a blow event were reset to higher values so that the end of the blow would drop the sensor signal to beyond the threshold (which is an offset of the now-incorrect baseline) for detecting draw.

[0318] FIG. 28 is a flow diagram of a process 2800 for activating a heater. In general, the pressure sensor is configured to detect draw by comparing the instantaneous sensor output ("live reading" in FIGS. 26 and 27) to a baseline value which is a based on a filtered (e.g., low pass

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filtered, averaged, windowed, weighted averaged, etc.) version of the instantaneous sensor output (2810). Detection of draw is made more accurate by rejecting changes to the baseline during blowing (e.g., "blow rejection" or "blow discrimination"). This may be achieved by freezing the value of the baseline when the instantaneous sensor output is greater than the baseline or greater than some predetermined offset above or below (whichever direction corresponds to blowing based on the orientation of the sensor in the system) the baseline (2820). The baseline value may also be frozen when the instantaneous sensor crosses a threshold for detection of draw (e.g., above or below this threshold based on the orientation of the sensor in the system) (2820). The instantaneous sensor readings may be compared to the baseline and the heater may be activated to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0319] In an alternative embodiment, an oscillating circuit external to the microcontroller may be used to charge and discharge the pressure sensor's intrinsic capacitor. This circuit could be a multivibrator circuit, relaxation oscillator, or other oscillator that is self-resonant or excited by the microcontroller. The pressure sensor case may not be grounded. A microcontroller is still used to count charge and discharge cycles within a fixed interval.

[0320] In an alternative embodiment, a fixed resistance may be used to charge the pressure sensor's intrinsic capacitor. Charge time up to some voltage or discharge time down to some voltage is measured using a comparator internal or external to the microcontroller. In this case, readings will increase with increased sensor capacitance, as opposed to oscillator charge count readings which decrease with increased sensor capacitance, and the draw detection algorithm may be modified accordingly, with increased readings required for draw start detection and decreased readings required for blow detection.

[0321] In an alternative embodiment, the diaphragm is in between the static plate and the air path, such that negative pressure from a draw would decrease the capacitance of the sensor. If the sensor is still measured with an oscillator, the sensor output for reading deviations from baseline required for draw start detection and blow detection are switched.

[0322] In an alternative embodiment, the pressure sensor has solder pads and/or lead wires instead of pins on its PCB.

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[0323] In an alternative embodiment, the draw detection circuitry (e.g., algorithm) may not detect a draw start unless it has a "stable" baseline. When a blow is detected, a flag may be set that indicates that the baseline is not stable. When the end of blow is detected and pressure readings stabilize, the baseline is set conservatively below live pressure readings and the flag for unstable baseline is cleared, meaning drops in the reading will again be detected as draw start event, similar to what is shown in FIG. 27.

[0324] Any of the methods (including user interfaces) described herein may be implemented as software, hardware or firmware, and may be described as a non-transitory computer-readable storage medium storing a set of instructions capable of being executed by a processor (e.g., computer, tablet, smartphone, etc.), that when executed by the processor causes the processor to control perform any of the steps, including but not limited to: displaying, communicating with the user, analyzing, modifying parameters (including timing, frequency, intensity, etc.), determining, alerting, or the like.

[0325] When a feature or element is herein referred to as being "on" another feature or element, it can be directly on the other feature or element or intervening features and/or elements may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature may have portions that overlap or underlie the adjacent feature.

[0326] Terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. For example, as used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps,

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operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

[0327] Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal" and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

[0328] Although the terms "first" and "second" may be used herein to describe various features/elements (including steps), these features/elements should not be limited by these terms, unless the context indicates otherwise. These terms may be used to distinguish one feature/element from another feature/element. Thus, a first feature/element discussed below could be termed a second feature/element, and similarly, a second feature/element discussed below could be termed a first feature/element without departing from the teachings of the present invention.

[0329] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising" means various components can be co-jointly employed in the methods and articles (e.g., compositions and apparatuses including device and methods). For example, the term "comprising" will be understood to imply the inclusion of any stated elements or steps but not the exclusion of any other elements or steps.

[0330] In general, any of the apparatuses and methods described herein should be understood to be inclusive, but all or a sub-set of the components and/or steps may alternatively be

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exclusive, and may be expressed as "consisting of" or alternatively "consisting essentially of" the various components, steps, sub-components or sub-steps.

[0331] As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced by the word "about" or "approximately," even if the term does not expressly appear. The phrase "about" or "approximately" may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions. For example, a numeric value may have a value that is +/- 0.1% of the stated value (or range of values), +/- 1% of the stated value (or range of values), +/- 2% of the stated value (or range of values), +/- 5% of the stated value (or range of values), +/- 10% of the stated value (or range of values), etc. Any numerical values given herein should also be understood to include about or approximately that value, unless the context indicates otherwise. For example, if the value "10" is disclosed, then "about 10" is also disclosed. Any numerical range recited herein is intended to include all sub-ranges subsumed therein. It is also understood that when a value is disclosed that "less than or equal to" the value, "greater than or equal to the value" and possible ranges between values are also disclosed, as appropriately understood by the skilled artisan. For example, if the value "X" is disclosed the "less than or equal to X" as well as "greater than or equal to X" (e.g., where X is a numerical value) is also disclosed. It is also understood that the throughout the application, data is provided in a number of different formats, and that this data, represents endpoints and starting points, and ranges for any combination of the data points. For example, if a particular data point "10" and a particular data point "15" are disclosed, it is understood that greater than, greater than or equal to, less than, less than or equal to, and equal to 10 and 15 are considered disclosed as well as between 10 and 15. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0332] Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others.

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Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

[0333] The examples and illustrations included herein show, by way of illustration and not of limitation, specific embodiments in which the subject matter may be practiced. As mentioned, other embodiments may be utilized and derived there from, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. Such embodiments of the inventive subject matter may be referred to herein individually or collectively by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept, if more than one is, in fact, disclosed. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

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VAPORIZER DEVICES WITH BLOW DISCRIMINATION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. provisional patent application no. 62/294,271, titled "VAPORIZER DEVICES WITH BLOW DISCRIMINATION," filed on 2/11/2016 which is herein incorporated by reference in its entirety.

[0002] This patent application may be related to U.S. Patent Application No. 14/581,666, filed on 12/23/2014, and titled "VAPORIZATION DEVICE SYSTEMS AND METHODS", which claimed priority to U.S. Provisional Patent Application No. 61/920,225, filed 12/23/2013, U.S. Provisional Patent Application No. 61/936,593, filed 2/6/2014, and U.S. Provisional Patent Application No. 61/937,755, filed 2/10/2014.

[0003] This application may also be related to or may be used with the inventions in one or more of the following patent applications: U.S. Patent Application No. 14/578,193, filed on 12/19/2014, and titled "METHOD AND SYSTEM FOR VAPORIZATION OF A SUBSTANCE"; U.S. Patent Application No. 14/625,042, filed on 2/18/2015, and titled "AEROSOL DEVICES AND METHODS FOR INHALING A SUBSTANCE AND USES THEREOF"; U.S. Patent Application No. 13/837,438, filed on 3/15/2013, and titled "LOW TEMPERATURE ELECTRONIC VAPORIZATION DEVICE AND METHODS"; U.S. Patent Application No. 14/271,071, filed on 5/6/2014, and titled "NICOTINE SALT FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/304,847, filed on 6/13/2014, and titled "MULTIPLE HEATING ELEMENTS WITH SEPARATE VAPORIZABLE MATERIALS IN AN ELECTRIC VAPORIZATION DEVICE"; U.S. Patent Application No. 14/461,284, filed on 8/15/2014, and titled "METHODS AND DEVICES FOR DELIVERING AND MONITORING OF TOBACCO, NICOTINE, OR OTHER SUBSTANCES"; PCT Patent Application No. PCT/US2015/031152, filed on 5/15/2015, and titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL"; PCT Patent Application No. PCT/US2014/064690, filed on 11/7/2014, and titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/960,259, filed on 12/4/2015, and titled "CALIBRATED DOSE CONTROL"; U.S. patent application no. 15/257,748, titled

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"CARTRIDGE FOR USE WITH A VAPORIZER DEVICE," filed on 9/6/2016; U.S. patent application no. 15/257,760, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/257,768, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/379,898, titled "VAPORIZATION DEVICE SYSTEMS AND METHODS," filed on 12/15/2016; U.S. patent application no. 15/309,554, titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL," filed on 11/8/2016; U.S. patent application no. 15/101,303, titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF," filed on 6/2/2016; U.S. patent application no. 14/960,259, titled "CALIBRATED DOSE CONTROL," filed on 12/4/2015; U.S. patent application no. 15/396,584, titled "LEAK-RESISTANT VAPORIZER CARTRIDGES FOR USE WITH CANNABINOIDS," filed on 12/31/2016. Each of these applications is herein incorporated by reference in their entirety.

INCORPORATION BY REFERENCE

[0004] All publications and patent applications mentioned in this specification are herein incorporated by reference in their entirety to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

FIELD

[0005] Described herein are electronic inhalable aerosol devices, or electronic vaping devices, and particularly electronic aerosol devices which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.

BACKGROUND

[0006] Electronic cigarettes are typically battery-powered vaporizers that simulate the feeling of smoking, but without tobacco. Instead of cigarette smoke, the user inhales an aerosol, commonly called vapor, typically released by a heating element that atomizes a liquid solution (vaporizable material or solution). Typically, the user activates the e-cigarette by taking a puff or pressing a button. Some vaporizers look like traditional cigarettes, but they come in many variations.

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[0007] Many electronic cigarettes use a pressure sensor to determine when the device should be heating or not. This may allow for an intuitive user interface where the user simply draws from (sucks on) the device to power it. It is advantageous over powering the device with a button in that the device's heating element is only powered when there is airflow over it assuming the device's pressure sensor and microcontroller can accurately detect the start and end of a draw.

[0008] Unfortunately, the vast majority of electronic cigarettes described and currently in use have an unexpected failure mode which may reduce the life of the battery and the overall device. Specifically, such devices may inadvertently (and transiently) detect a draw or inhalation following blowing or exhalation through the device. A recent test of numerous pressure sensor-based electronic cigarettes currently on the market found that these devices can easily be turned on and apply power to the heating element by blowing rather than inhaling into the mouthpiece of the device as if the user had drawn from the device. Specifically, such devices falsely indicate a draw (inhalation) and activate the heater at the end of a blow into the device because they detect a pressure drop at the end of the blow, and falsely interpret this is the start of a draw. Depending on the controller for the vaporizer, this pressure drop at the end of a blow may power the heater for some amount of time, and potentially until a timeout for max draw time. This failure mode may result in the device heating without the user drawing on it, which pay provide a non-ideal user experience, may waste of battery life and vaporizable material, and in devices without temp control may overheat the vaporizable material, which can produce e-juice degradants that taste bad and are potentially more harmful when vaporized that the original contents of the e-juice formulation.

[0009] Many commercially available electronic cigarettes use pressure sensors that are mechanically similar to electret microphones, but packaged with an ASIC (application specific integrated circuit) instead of a standard electret microphone circuit. An electret microphone is an electrostatic capacitor-based microphone that does not require a polarizing power supply. Pressure sensors of this type typically accept two power signals and have one output signal to indicate whether or not a pressure drop was recently detected. For the pressure sensor's ASIC to accommodate changes in environment conditions (humidity and temperature), slight differences in mechanical assembly from sensor to sensor, and potential shifting of parts in the mechanical assembly from vibration or drop, the ASIC's output usually depends on changes in capacitance between the sensor's conductive diaphragm (which deflects with a pressure differential across it)

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and a conductive static plate in the sensor instead of depending on absolute measured capacitance crossing some threshold. Given that not all measured pressure drops indicate that the user is drawing from the device, this approach is not ideal.

[0010] In all electronic cigarettes tested (some of which may not use the standard modified electret microphone with ASIC), the device can be made to start heating at the end of a blow into the device's air/vapor outlet. In devices in which direct capacitance measurements may be made by the microcontroller, the same behavior can be produced, meaning there is no software actively handling blows into the device correctly.

[0011] This failure mode may be largely unnoticed, but it is relevant based on many user practices. For example, some electronic cigarette users hold devices in their mouths, resulting in blowing into the device. Devices that don't adequately distinguish between drawing and the end of a blowing into the mouthpiece may start heating after a user has exhaled onto the device.

[0012] Described herein are apparatuses (systems and devices) and methods that may address the problem identified above.

SUMMARY OF THE DISCLOSURE

[0013] The present invention relates generally to apparatuses, including systems and devices, for vaporizing material to form an inhalable aerosol. Specifically, these apparatuses may include vaporizers.

[0014] In particular, described herein are apparatuses including vaporizers that are adapted to prevent one or more failure modes that may result from blowing into the mouthpiece, which may be referred to herein as blow rejection or blow discrimination. In general, such vaporizers and methods of operating a vaporizer may include a pressure sensor that regulates the baseline pressure readings (which may be actual pressure readings or may be unconverted sensor readings, such as capacitance measurements) during a blow and/or a draw through the mouthpiece to prevent instability that may otherwise result from blowing into the mouthpiece.

[0015] For example, described herein are vaporizer devices comprising: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor comprising a differential pressure sensor (e.g., MEMS, capacitive membrane, etc.) configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a

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baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0016] A vaporizer device may include a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are below the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0017] A vaporizer device may include: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are above the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0018] The first side of the pressure sensor may be exposed to a first air path through the mouthpiece and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the pressure sensor. The third offset value may be the same as the second offset value or

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the third offset value may be the same as the first offset value. The first offset value may be zero, or the second offset value is zero.

[0019] The instantaneous pressure sensor output may be capacitance or pressure.

[0020] In general, the pressure sensors described herein may be any differential pressure sensor, such as MEMS, capacitive pressures sensors (e.g., including a capacitive membrane), or any force collector type pressure sensors that use a transducer to measure pressure or pressure differences (e.g., diaphragm, piston, etc.), ~~piezorestrictive~~piezoresistive, electromagnetic, piezoelectric, optical, potentiometric, resonant (including MEMS), etc. Differential pressure sensors may measure the distance between two pressures, one connected on different sides of the sensor. This includes pressure sensors in which one side is open/connected to ambient atmosphere (pressure).

[0021] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by low pass filtering the instantaneous sensor output.

[0022] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by taking a running average of the instantaneous sensor output.

[0023] The microcontroller may further be configured to stop activating the heater to generate vapor when the instantaneous sensor output is offset from the baseline by less than the third offset value.

[0024] Also described herein are methods of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device that include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by a second offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is offset from the baseline by more than a third offset value, indicating that suction is being applied to the mouthpiece.

[0025] A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device may include: taking instantaneous sensor readings from a

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pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by an offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is below the baseline by more than the offset value indicating that suction is being applied to the mouthpiece.

[0026] In some variations, the apparatuses described herein may include an inhalable aerosol comprising: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber to generate a vapor; a condenser comprising a condensation chamber in which at least a fraction of the vapor condenses to form the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0027] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The device may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0028] In some variations, the oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet. The aeration vent may comprise a third valve. The first valve, or said second valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The third valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The first or second valve may be mechanically actuated. The first or second valve may be electronically actuated. The first valve or second valve may be manually actuated. The third valve may be mechanically

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actuated. The third valve may be mechanically actuated. The third valve may be electronically actuated. The third valve may be manually actuated.

[0029] In some variations, the device may further comprise a body that comprises at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. The device may further comprise a temperature regulator in communication with a temperature sensor. The temperature sensor may be the heater. The power source may be rechargeable. The power source may be removable. The oven may further comprise an access lid. The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may be mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of about 1 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.9 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.8 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.7 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.6 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.5 micron.

[0030] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be

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about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0031] Also described herein are methods for generating an inhalable aerosol. Such a method may comprise: providing an inhalable aerosol generating device wherein the device comprises: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0032] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The method may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0033] The oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0034] The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may comprise particle diameters of average mass

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of about 1 micron. The vapor may comprise particle diameters of average mass of about 0.9 micron. The vapor may comprise particle diameters of average mass of about 0.8 micron. The vapor may comprise particle diameters of average mass of about 0.7 micron. The vapor may comprise particle diameters of average mass of about 0.6 micron. The vapor may comprise particle diameters of average mass of about 0.5 micron.

[0035] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0036] The device may be user serviceable. The device may not be user serviceable.

[0037] A method for generating an inhalable aerosol may include: providing a vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein said vapor is formed by heating a vapor forming medium in an oven chamber to a first temperature below the pyrolytic temperature of said vapor forming medium, and cooling said vapor in a condensation chamber to a second temperature below the first temperature, before exiting an aerosol outlet of said device.

[0038] A method of manufacturing a device for generating an inhalable aerosol may include: providing said device comprising a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the

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condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0039] The method may further comprise providing the device comprising a power source or battery, a printed circuit board, a temperature regulator or operational switches.

[0040] A device for generating an inhalable aerosol may comprise a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0041] A device for generating an inhalable aerosol may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; and a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user.

[0042] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

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[0043] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

[0044] The channel may comprise at least one of a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge. The cartridge may further comprise a heater. The heater may be attached to a first end of the cartridge.

[0045] The heater may comprise a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick, wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between. The first pair of heater contacts may further comprise a formed shape that comprises a tab having a flexible spring value that extends out of the heater to couple to complete a circuit with the device body. The first pair of heater contacts may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may contact a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise a first condensation chamber. The heater may comprise more than one first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge. The cartridge may further comprise a mouthpiece. The mouthpiece may be attached to a second end of the cartridge. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one

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second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0046] The cartridge may comprise a first condensation chamber and a second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise more than one aerosol outlet in fluid communication with more than one the second condensation chamber. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

[0047] The device may comprise an airflow path comprising an air inlet passage, a second air passage, a heater chamber, a first condensation chamber, a second condensation chamber, and an aerosol outlet. The airflow path may comprise more than one air inlet passage, a heater chamber, more than one first condensation chamber, more than one second condensation chamber, more than one second condensation chamber, and more than one aerosol outlet. The heater may be in fluid communication with the fluid storage compartment. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol. The humectant may comprise vegetable glycerin.

[0048] The cartridge may be detachable. The cartridge may be receptacle and the detachable cartridge forms a separable coupling. The separable coupling may comprise a friction assembly, a snap-fit assembly or a magnetic assembly. The cartridge may comprise a fluid storage compartment, a heater affixed to a first end with a snap-fit coupling, and a mouthpiece affixed to a second end with a snap-fit coupling.

[0049] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage when a cartridge comprising a channel integral to an exterior surface is inserted into the cartridge receptacle, and wherein the channel forms a second side of the air inlet passage.

[0050] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a

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cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage.

[0051] A cartridge for a device for generating an inhalable aerosol may include: a fluid storage compartment; a channel integral to an exterior surface, wherein the channel forms a first side of an air inlet passage; and wherein an internal surface of a cartridge receptacle in the device forms a second side of the air inlet passage when the cartridge is inserted into the cartridge receptacle.

[0052] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment, wherein an exterior surface of the cartridge forms a first side of an air inlet channel when inserted into a device body comprising a cartridge receptacle, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage.

[0053] The cartridge may further comprise a second air passage in fluid communication with the channel, wherein the second air passage is formed through the material of the cartridge from an exterior surface of the cartridge to the fluid storage compartment.

[0054] The cartridge may comprise at least one of: a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage.

[0055] A device for generating an inhalable aerosol may comprise: a cartridge comprising; a fluid storage compartment; a heater affixed to a first end comprising; a first heater contact, a resistive heating element affixed to the first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; wherein the PCB is configured to detect the absence of fluid based on the measured resistance of the resistive heating element, and turn off the device.

[0056] The printed circuit board (PCB) may comprise a microcontroller; switches; circuitry comprising a reference resister; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the

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resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0057] The micro-controller may instruct the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0058] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end comprising: a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick; wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between.

[0059] The first pair of heater contacts may further comprise: a formed shape that comprises a tab having a flexible spring value that extends out of the heater to complete a circuit with the device body. The heater contacts may be configured to mate with a second pair of heater contacts in a cartridge receptacle of the device body to complete a circuit. The first pair of heater contacts may also be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may be a heat shield that protect the heater chamber from excessive heat produced by the resistive heating element.

[0060] A cartridge for a device for generating an inhalable aerosol may comprise: a heater comprising; a heater chamber, a pair of thin plate heater contacts therein, a fluid wick positioned between the heater contacts, and a resistive heating element in contact with the wick; wherein the heater contacts each comprise a fixation site wherein the resistive heating element is tensioned therebetween.

[0061] A cartridge for a device for generating an inhalable aerosol may comprise a heater, wherein the heater is attached to a first end of the cartridge.

[0062] The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise more than one first condensation chamber. The heater may comprise a first condensation chamber. The condensation chamber may be formed along an exterior wall of the cartridge.

[0063] A cartridge for a device for generating an inhalable aerosol may comprise a fluid storage compartment; and a mouthpiece, wherein the mouthpiece is attached to a second end of the cartridge.

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[0064] The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0065] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein the heater comprises a first condensation chamber and the mouthpiece comprises a second condensation chamber.

[0066] The heater may comprise more than one first condensation chamber and the mouthpiece comprises more than one second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise two to more aerosol outlets. The cartridge may meet International Standards Organization (ISO) recycling standards. The cartridge may meet ISO recycling standards for plastic waste.

[0067] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; and a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

[0068] A method of fabricating a device for generating an inhalable aerosol may comprise: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly.

[0069] A method of fabricating a cartridge for a device for generating an inhalable aerosol may comprise: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0070] A cartridge for a device for generating an inhalable aerosol with an airflow path may include: a channel comprising a portion of an air inlet passage; a second air passage in fluid communication with the channel; a heater chamber in fluid communication with the second air passage; a first condensation chamber in fluid communication with the heater chamber; a second

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condensation chamber in fluid communication with the first condensation chamber; and an aerosol outlet in fluid communication with second condensation chamber.

[0071] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein said mouthpiece comprises two or more aerosol outlets.

[0072] A system for providing power to an electronic device for generating an inhalable vapor may comprise; a rechargeable power storage device housed within the electronic device for generating an inhalable vapor; two or more pins that are accessible from an exterior surface of the electronic device for generating an inhalable vapor, wherein the charging pins are in electrical communication with the rechargeable power storage device; a charging cradle comprising two or more charging contacts configured to provided power to the rechargeable storage device, wherein the device charging pins are reversible such that the device is charged in the charging cradle for charging with a first charging pin on the device in contact a first charging contact on the charging cradle and a second charging pin on the device in contact with second charging contact on the charging cradle and with the first charging pin on the device in contact with second charging contact on the charging cradle and the second charging pin on the device in contact with the first charging contact on the charging cradle.

[0073] The charging pins may be visible on an exterior housing of the device. The user may permanently disable the device by opening the housing. The user may permanently destroy the device by opening the housing.

[0074] Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only illustrative embodiments of the present disclosure are shown and described. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0075] FIG. 1 is an illustrative cross-sectional view of an exemplary vaporization device.

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[0076] FIG. 2 is an illustrative cross-sectional view of an exemplary vaporization device with various electronic features and valves.

[0077] FIG. 3 is an illustrative sectional view of another exemplary vaporization device comprising a condensation chamber, air inlet and aeration vent in the mouthpiece.

[0078] FIGS. 4A-4C is an illustrative example of an oven section of another exemplary vaporization device configuration with an access lid, comprising an oven having an air inlet, air outlet, and an additional aeration vent in the airflow pathway, after the oven.

[0079] FIG. 5 is an illustrative isometric view of an assembled inhalable aerosol device.

[0080] FIGS. 6A-6D are illustrative arrangements and section views of the device body and sub-components.

[0081] FIG. 7A is an illustrative isometric view of an assembled cartridge.

[0082] FIG. 7B is an illustrative exploded isometric view of a cartridge assembly

[0083] FIG. 7C is a side section view of Figure 3A illustrating the inlet channel, inlet hole and relative placement of the wick, resistive heating element, and heater contacts, and the heater chamber inside of the heater.

[0084] FIG. 8A is an illustrative end section view of an exemplary cartridge inside the heater.

[0085] FIG. 8B is an illustrative side view of the cartridge with the cap removed and heater shown in shadow / outline.

[0086] FIGS. 9A-9L is an illustrative sequence of the assembly method for the cartridge.

[0087] FIGS. 10A-10C are illustrative sequences showing the airflow / vapor path for the cartridge.

[0088] FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device.

[0089] FIG. 14A illustrates a cross-section view of the assembled inhaled aerosol device.

[0090] FIG. 14B illustrates ~~front,~~a side ~~and section views~~view of the assembled inhalable aerosol device.

~~**[0089]**~~**[0091]** FIG. 14C illustrates a top view of the assembled inhalable aerosol device.

~~**[0090]**~~**[0092]** FIG. 15 is an illustrative view of an activated, assembled inhalable aerosol device.

~~**[0091]**~~**[0093]** FIGS. 16A-16C are representative illustrations of a charging device for the aerosol device and the application of the charger with the device.

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~~[0092]~~[0094] FIGS. 17A and 17B are representative illustrations of a proportional-integral-derivative controller (PID) block diagram and circuit diagram representing the essential components in a device to control coil temperature.

~~[0093]~~[0095] FIG. 18 is a device with charging contacts visible from an exterior housing of the device.

~~[0094]~~[0096] FIG. 19 is an exploded view of a charging assembly of a device.

~~[0095]~~[0097] FIG. 20 is a detailed view of a charging assembly of a device.

~~[0096]~~[0098] FIG. 21 is a detailed view of charging pins in a charging assembly of a device.

~~[0097]~~[0099] FIG. 22 is a device in a charging cradle.

~~[0098]~~[0100] FIG. 23 is a circuit provided on a PCB configured to permit a device to comprise reversible charging contacts.

~~[0099]~~[0101] FIGS. 24A-24D illustrate schematics for one variation of a pressure sensor that may be used with any of the apparatuses described herein. FIGS. 24A-24C show dimensional drawings of the bottom, side and top, respectively, while FIG. 24D shows a section through the structure. In some variations pins may replace the solder pads labeled "gate" and "ground" in FIG. 24C.

~~[0100]~~[0102] FIG. 25 is a sectional view of a schematic illustration through one variation of a vaporizer device as described herein, showing an air path through the device.

~~[0101]~~[0103] FIG. 26 is a graph illustrating draw detection using an apparatus as described herein, illustrating tracking of multiple draws.

[0104] FIG. 27 is a graph illustrating blow detection (and rejection) and draw detection using an apparatus as described herein.

~~[0102]~~[0105] FIG. 28 is a flow diagram of a process for activating a heater.

DETAILED DESCRIPTION

~~[0103]~~[0106] Provided herein are systems and methods for generating a vapor from a material. The vapor may be delivered for inhalation by a user. The material may be a solid, liquid, powder, solution, paste, gel, or any a material with any other physical consistency. The vapor may be delivered to the user for inhalation by a vaporization device. The vaporization device may be a handheld vaporization device. The vaporization device may be held in one hand by the user.

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~~[0104]~~[0107] The vaporization device may comprise one or more heating elements the heating element may be a resistive heating element. The heating element may heat the material such that the temperature of the material increases. Vapor may be generated as a result of heating the material. Energy may be required to operate the heating element, the energy may be derived from a battery in electrical communication with the heating element. Alternatively a chemical reaction (e.g., combustion or other exothermic reaction) may provide energy to the heating element.

~~[0105]~~[0108] One or more aspects of the vaporization device may be designed and/or controlled in order to deliver a vapor with one or more specified properties to the user. For example, aspects of the vaporization device that may be designed and/or controlled to deliver the vapor with specified properties may comprise the heating temperature, heating mechanism, device air inlets, internal volume of the device, and/or composition of the material.

~~[0106]~~[0109] In some cases, a vaporization device may have an "atomizer" or "cartomizer" configured to heat an aerosol forming solution (e.g., vaporizable material). The aerosol forming solution may comprise glycerin and/or propylene glycol. The vaporizable material may be heated to a sufficient temperature such that it may vaporize.

~~[0107]~~[0110] An atomizer may be a device or system configured to generate an aerosol. The atomizer may comprise a small heating element configured to heat and/or vaporize at least a portion of the vaporizable material and a wicking material that may draw a liquid vaporizable material in to the atomizer. The wicking material may comprise silica fibers, cotton, ceramic, hemp, stainless steel mesh, and/or rope cables. The wicking material may be configured to draw the liquid vaporizable material in to the atomizer without a pump or other mechanical moving part. A resistance wire may be wrapped around the wicking material and then connected to a positive and negative pole of a current source (e.g., energy source). The resistance wire may be a coil. When the resistance wire is activated the resistance wire (or coil) may have a temperature increase as a result of the current flowing through the resistive wire to generate heat. The heat may be transferred to at least a portion of the vaporizable material through conductive, convective, and/or radiative heat transfer such that at least a portion of the vaporizable material vaporizes.

~~[0108]~~[0111] Alternatively or in addition to the atomizer, the vaporization device may comprise a "cartomizer" to generate an aerosol from the vaporizable material for inhalation by the user.

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The cartomizer may comprise a cartridge and an atomizer. The cartomizer may comprise a heating element surrounded by a liquid-soaked poly-foam that acts as holder for the ~~vaporiable~~ vaporizable material (e.g., the liquid). The cartomizer may be reusable, rebuildable, refillable, and/or disposable. The cartomizer may be used with a tank for extra storage of a vaporizable material.

~~[0109]~~[0112] Air may be drawn into the vaporization device to carry the vaporized aerosol away from the heating element, where it then cools and condenses to form liquid particles suspended in air, which may then be drawn out of the mouthpiece by the user.

~~[0110]~~[0113] The vaporization of at least a portion of the vaporizable material may occur at lower temperatures in the vaporization device compared to temperatures required to generate an inhalable vapor in a cigarette. A cigarette may be a device in which a smokable material is burned to generate an inhalable vapor. The lower temperature of the vaporization device may result in less decomposition and/or reaction of the vaporized material, and therefore produce an aerosol with many fewer chemical components compared to a cigarette. In some cases, the vaporization device may generate an aerosol with fewer chemical components that may be harmful to human health compared to a cigarette. Additionally, the vaporization device aerosol particles may undergo nearly complete evaporation in the heating process, the nearly complete evaporation may yield an average particle size (e.g., diameter) value that may be smaller than the average particle size in tobacco or botanical based effluent.

~~[0111]~~[0114] A vaporization device may be a device configured to extract for inhalation one or more active ingredients of plant material, tobacco, and/or a botanical, or other herbs or blends. A vaporization device may be used with pure chemicals and/or humectants that may or may not be mixed with plant material. Vaporization may be alternative to burning (smoking) that may avoid the inhalation of many irritating and/or toxic carcinogenic by-products which may result from the pyrolytic process of burning tobacco or botanical products above 300° C. The vaporization device may operate at a temperature at or below 300° C.

~~[0112]~~[0115] A vaporizer (e.g., vaporization device) may not have an atomizer or cartomizer. Instead the device may comprise an oven. The oven may be at least partially closed. The oven may have a closable opening. The oven may be wrapped with a heating element, alternatively the heating element may be in thermal communication with the oven through another mechanism. A vaporizable material may be placed directly in the oven or in a cartridge fitted in

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the oven. The heating element in thermal communication with the oven may heat a vaporizable material mass in order to create a gas phase vapor. The heating element may heat the vaporizable material through conductive, convective, and/or radiative heat transfer. The vapor may be released to a vaporization chamber where the gas phase vapor may condense, forming an aerosol cloud having typical liquid vapor particles with particles having a diameter of average mass of approximately 1 micron or greater. In some cases the diameter of average mass may be approximately 0.1-1 micron.

~~[0113]~~**[0116]** A used herein, the term "vapor" may generally refer to a substance in the gas phase at a temperature lower than its critical point. The vapor may be condensed to a liquid or to a solid by increasing its pressure without reducing the temperature.

~~[0114]~~**[0117]** As used herein, the term "aerosol" may generally refer to a colloid of fine solid particles or liquid droplets in air or another gas. Examples of aerosols may include clouds, haze, and smoke, including the smoke from tobacco or botanical products. The liquid or solid particles in an aerosol may have varying diameters of average mass that may range from monodisperse aerosols, producible in the laboratory, and containing particles of uniform size; to polydisperse colloidal systems, exhibiting a range of particle sizes. As the sizes of these particles become larger, they have a greater settling speed which causes them to settle out of the aerosol faster, making the appearance of the aerosol less dense and to shorten the time in which the aerosol will linger in air. Interestingly, an aerosol with smaller particles will appear thicker or denser because it has more particles. Particle number has a much bigger impact on light scattering than particle size (at least for the considered ranges of particle size), thus allowing for a vapor cloud with many more smaller particles to appear denser than a cloud having fewer, but larger particle sizes.

~~[0115]~~**[0118]** As used herein the term "humectant" may generally refer to as a substance that is used to keep things moist. A humectant may attract and retain moisture in the air by absorption, allowing the water to be used by other substances. Humectants are also commonly used in many tobaccos or botanicals and electronic vaporization products to keep products moist and as vapor-forming medium. Examples include propylene glycol, sugar polyols such as glycerol, glycerin, and honey.

~~[0116]~~**[0119]** Rapid Aeration

~~[0117]~~**[0120]** In some cases, the vaporization device may be configured to deliver an aerosol with a high particle density. The particle density of the aerosol may refer to the number of the

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aerosol droplets relative to the volume of air (or other dry gas) between the aerosol droplets. A dense aerosol may easily be visible to a user. In some cases the user may inhale the aerosol and at least a fraction of the aerosol particles may impinge on the lungs and/or mouth of the user. The user may exhale residual aerosol after inhaling the aerosol. When the aerosol is dense the residual aerosol may have sufficient particle density such that the exhaled aerosol is visible to the user. In some cases, a user may prefer the visual effect and/or mouth feel of a dense aerosol.

~~[0118]~~[0121] A vaporization device may comprise a vaporizable material. The vaporizable material may be contained in a cartridge or the vaporizable material may be loosely placed in one or more cavities the vaporization device. A heating element may be provided in the device to elevate the temperature of the vaporizable material such that at least a portion of the vaporizable material forms a vapor. The heating element may heat the vaporizable material by convective heat transfer, conductive heat transfer, and/or radiative heat transfer. The heating element may heat the cartridge and/or the cavity in which the vaporizable material is stored.

~~[0119]~~[0122] Vapor formed upon heating the vaporizable material may be delivered to the user. The vapor may be transported through the device from a first position in the device to a second position in the device. In some cases, the first position may be a location where at least a portion of the vapor was generated, for example, the cartridge or cavity or an area adjacent to the cartridge or cavity. The second position may be a mouthpiece. The user may suck on the mouthpiece to inhale the vapor.

~~[0120]~~[0123] At least a fraction of the vapor may condense after the vapor is generated and before the vapor is inhaled by the user. The vapor may condense in a condensation chamber. The condensation chamber may be a portion of the device that the vapor passes through before delivery to the user. In some cases, the device may include at least one aeration vent, placed in the condensation chamber of the vaporization device. The aeration vent may be configured to introduce ambient air (or other gas) into the vaporization chamber. The air introduced into the vaporization chamber may have a temperature lower than the temperature of a gas and/or gas/vapor mixture in the condensation chamber. Introduction of the relatively lower temperature gas into the vaporization chamber may provide rapid cooling of the heated gas vapor mixture that was generated by heating the vaporizable material. Rapid cooling of the gas vapor mixture may generate a dense aerosol comprising a high concentration of liquid droplets having a smaller

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diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user.

~~[0121]~~[0124] An aerosol with a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user may be formed in a two-step process. The first step may occur in the oven chamber where the vaporizable material (e.g., tobacco and/or botanical and humectant blend) may be heated to an elevated temperature. At the elevated temperature, evaporation may happen faster than at room temperature and the oven chamber may fill with the vapor phase of the humectants. The humectant may continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

~~[0122]~~[0125] In the second step, the gas (e.g., vapor and air) may exit the oven and enter a condenser or condensation chamber and begin to cool. As the gas phase vapor cools, the saturation pressure may decrease. As the saturation pressure decreases, the saturation ratio may increase and the vapor may begin to condense, forming droplets. In some devices, with the absence of added cooling aeration, the cooling may be relatively slower such that high saturation pressures may not be reached, and the droplets that form in the devices without added cooling aeration may be relatively larger and fewer in numbers. When cooler air is introduced, a temperature gradient may be formed between the cooler air and the relatively warmer gas in the device. Mixing between the cooler air and the relatively warmer gas in a confined space inside of the vaporization device may lead to rapid cooling. The rapid cooling may generate high saturation ratios, small particles, and high concentrations of smaller particles, forming a thicker, denser vapor cloud compared to particles generated in a device without the aeration vents.

~~[0123]~~[0126] For the purpose of this disclosure, when referring to ratios of humectants such as vegetable glycerol or propylene glycol, “about” means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

~~[0124]~~[0127] For the purpose of this disclosure, when referring to a diameter of average mass in particle sizes, “about” means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

~~[0125]~~[0128] A vaporization device configured to rapidly cool a vapor may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven

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chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

~~[0126]~~**[0129]** In some embodiments, the oven is within a body of the device. The oven chamber may comprise an oven chamber inlet and an oven chamber outlet. The oven may further comprise a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

~~[0127]~~**[0130]** The oven may be contained within a device housing. In some cases the body of the device may comprise the aeration vent and/or the condenser. The body of the device may comprise one or more air inlets. The body of the device may comprise a housing that holds and/or at least partially contains one or more elements of the device.

~~[0128]~~**[0131]** The mouthpiece may be connected to the body. The mouthpiece may be connected to the oven. The mouthpiece may be connected to a housing that at least partially encloses the oven. In some cases, the mouthpiece may be separable from the oven, the body, and/or the housing that at least partially encloses the oven. The mouthpiece may comprise at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be integral to the body of the device. The body of the device may comprise the oven.

~~[0129]~~**[0132]** In some cases, the one or more aeration vents may comprise a valve. The valve may regulate a flow rate of air entering the device through the aeration vent. The valve may be controlled through a mechanical and/or electrical control system.

~~[0130]~~**[0133]** A vaporization device configured to rapidly cool a vapor may comprise: a body, a mouthpiece, an aerosol outlet, a condenser with a condensation chamber, a heater, an oven with an oven chamber, a primary airflow inlet, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

~~[0131]~~**[0134]** FIG. 1 shows an example of a vaporization device configured to rapidly cool a vapor. The device 100, may comprise a body 101. The body may house and/or integrate with

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one or more components of the device. The body may house and/or integrate with a mouthpiece 102. The mouthpiece 102 may have an aerosol outlet 122. A user may inhale the generated aerosol through the aerosol outlet 122 on the mouthpiece 102. The body may house and/or integrate with an oven region 104. The oven region 104 may comprise an oven chamber where vapor forming medium 106 may be placed. The vapor forming medium may include tobacco and/or botanicals, with or without a secondary humectant. In some cases the vapor forming medium may be contained in a removable and/or refillable cartridge.

~~[0132]~~**[0135]** Air may be drawn into the device through a primary air inlet 121. The primary air inlet 121 may be on an end of the device 100 opposite the mouthpiece 102. Alternatively, the primary air inlet 121 may be adjacent to the mouthpiece 102. In some cases, a pressure drop sufficient to pull air into the device through the primary air inlet 121 may be due to a user puffing on the mouthpiece 102.

~~[0133]~~**[0136]** The vapor forming medium (e.g., vaporizable material) may be heated in the oven chamber by a heater 105, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components. The heater 105 may transfer heat to the vapor forming medium through conductive, convective, and/or radiative heat transfer. The generated vapor may be drawn out of the oven region and into the condensation chamber ~~103a,~~ of the condenser 103 where the vapors may begin to cool and condense into micro-particles or droplets suspended in air, thus creating the initial formation of an aerosol, before being drawn out of the mouthpiece through the aerosol outlet 122.

~~[0134]~~**[0137]** In some cases, relatively cooler air may be introduced into the condensation chamber ~~103a~~, through an aeration vent 107 such that the vapor condenses more rapidly compared to a vapor in a device without the aeration vent 107. Rapidly cooling the vapor may create a denser aerosol cloud having particles with a diameter of average mass of less than or equal to about 1 micron, and depending on the mixture ratio of the vapor-forming humectant, particles with a diameter of average mass of less than or equal to about 0.5 micron

~~[0135]~~**[0138]** Also described herein are devices for generating an inhalable aerosol said device comprising a body with a mouthpiece at one end, an attached body at the other end comprising a condensation chamber, a heater, an oven, wherein the oven comprises a first valve in the airflow path at the primary airflow inlet of the oven chamber, and a second valve at the outlet end of the

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oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

~~[0136]~~**[0139]** FIG. 2 shows a diagram of an alternative embodiment of the vaporization device 200. The vaporization device may have a body 201. The body 201 may integrate with and/or contain one or more components of the device. The body may integrate with or be connected to a mouthpiece 202

~~[0137]~~**[0140]** The body may comprise an oven region 204, with an oven chamber ~~204a~~ having a first constricting valve 208 in the primary air inlet of the oven chamber and a second constricting valve 209 at the oven chamber outlet. The oven chamber ~~204a~~ may be sealed with a tobacco or botanical and/or humectant / vapor forming medium 206 therein. The seal may be an air tight and/or liquid tight seal. The heater may be provided to the oven chamber with a heater 205. The heater 205 may be in thermal communication with the oven, for example the heater may be surrounding the oven chamber during the vaporization process. Heater may contact the oven. The heater may be wrapped around the oven. Before inhalation and before air is drawn in through a primary air inlet 221, pressure may build in the sealed oven chamber as heat is continually added. The pressure may build due to a phase change of the vaporizable material. Elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components may be achieved by continually adding heat to the oven. This heated pressurization process may generate even higher saturation ratios when the valves 208, 209 are opened during inhalation. The higher saturation ratios may cause relatively higher particle concentrations of gas phase humectant in the resultant aerosol. When the vapor is drawn out of the oven region and into the condensation chamber ~~203a~~ of the condenser 203, for example by inhalation by the user, the gas phase humectant vapors may be exposed to additional air through an aeration vent 207, and the vapors may begin to cool and condense into droplets suspended in air. As described previously the aerosol may be drawn through the mouthpiece 222 by the user. This condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

~~[0138]~~**[0141]** FIG. 2 also illustrates an exemplary embodiment of the additional components which would be found in a vaporizing device, including a power source or battery 211, a printed circuit board 212, a temperature regulator 213, and operational switches (not shown), housed within an internal electronics housing 214, to isolate them from the damaging effects of the

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moisture in the vapor and/or aerosol. The additional components may be found in a vaporizing device that may or may not comprise an aeration vent as described above.

~~[0139]~~[0142] In some embodiments of the vaporization device, components of the device are user serviceable, such as the power source or battery. These components may be replaceable or rechargeable.

~~[0140]~~[0143] Also described herein are devices for generating an inhalable aerosol said device comprising a first body, a mouthpiece having an aerosol outlet, a condensation chamber within a condenser and an airflow inlet and channel, an attached second body, comprising a heater and oven with an oven chamber, wherein said airflow channel is upstream of the oven and the mouthpiece outlet to provide airflow through the device, across the oven, and into the condensation chamber where an auxiliary aeration vent is provided.

~~[0141]~~[0144] FIG. 3 shows a section view of a vaporization device 300. The device 300 may comprise a body 301. The body may be connected to or integral with a mouthpiece 302 at one end. The mouthpiece may comprise a condensation chamber ~~303a~~ within a condenser section 303 and an airflow inlet 321 and air channel 323. The device body may comprise a proximally located oven 304 comprising an oven chamber ~~304a~~. The oven chamber may be in the body of the device. A vapor forming medium 306 (e.g., vaporizable material) comprising tobacco or botanical and humectant vapor forming medium may be placed in the oven. The vapor forming medium may be in direct contact with an air channel 323 from the mouthpiece. The tobacco or botanical may be heated by heater 305 surrounding the oven chamber, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components and air drawn in through a primary air inlet 321, across the oven, and into the condensation chamber ~~303a~~ of the condenser region 303 due to a user puffing on the mouthpiece. Once in the condensation chamber where the gas phase humectant vapors begin to cool and condense into droplets suspended in air, additional air is allowed to enter through aeration vent 307, thus, once again creating a denser aerosol cloud having particles with a diameter of average mass of less than a typical vaporization device without an added aeration vent, before being drawn out of the mouthpiece through the aerosol outlet 322.

~~[0142]~~[0145] The device may comprises a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a

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vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

~~[0143]~~[0146] The device may comprise a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user, as illustrated in exemplary FIG. 3.

~~[0144]~~[0147] The device may comprise a body 101 or 201 with one or more separable components. For example, the mouthpiece 102 or 202 may be separably attached to the body 101 or 201 comprising the condensation chamber 103 or 203, a heater 105 or 205, and an oven 104 or 204, as illustrated in exemplary FIGS. 1 or 2.

~~[0145]~~[0148] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body. The mouthpiece may comprise the condensation chamber, and may be attached to or immediately adjacent to the oven and which is separable from the body comprising a heater, and the oven, as illustrated in exemplary FIG. 3.

~~[0146]~~[0149] The at least one aeration vent may be located in the condensation chamber of the condenser, as illustrated in exemplary FIGS. 1, 2, or 3 . The at least one aeration vent may comprise a third valve in the airflow path of the at least one aeration vent, as illustrated in exemplary FIG. 2. The first, second and third valve is a check valve, a clack valve, a non-return valve, or a one-way valve. In any of the preceding variations, the first, second or third valve may

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be mechanically actuated, electronically actuated or manually actuated. One skilled in the art will recognize after reading this disclosure that this device may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

~~[0147]~~**[0150]** The device may further comprise at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. Alternately, one skilled in the art would recognize that each configuration previously described will also accommodate said power source (battery), switch, printed circuit board, or temperature regulator as appropriate, in the body.

~~[0148]~~**[0151]** The device may be disposable when the supply of pre-packaged aerosol-forming media is exhausted. Alternatively, the device may be rechargeable such that the battery may be rechargeable or replaceable, and /or the aerosol-forming media may be refilled, by the user/operator of the device. Still further, the device may be rechargeable such that the battery may be rechargeable or replaceable, and/or the operator may also add or refill a tobacco or botanical component, in addition to a refillable or replaceable aerosol-forming media to the device.

~~[0149]~~**[0152]** As illustrated in FIGS. 1, 2 or 3, the vaporization device may comprise tobacco or a botanical heated in said oven chamber, wherein said tobacco or botanical further comprises humectants to produce an aerosol comprising gas phase components of the humectant and tobacco or botanical. The gas phase humectant and tobacco or botanical vapor produced by said heated aerosol forming media 106, 206, 306 may further be mixed with air from a special aeration vent 107, 207, 307 after exiting the oven area 104, 204, 304 and entering a condensation chamber 103a, 203a, 303a to cool and condense said gas phase vapors to produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

~~[0150]~~**[0153]** Each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

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~~[0151]~~[0154] The possible variations and ranges of aerosol density are great in that the possible number of combinations of temperature, pressure, tobacco or botanical choices and humectant selections are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures ranges and the humectant ratios to those described herein, the inventor has demonstrated that this device will produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

~~[0152]~~[0155] The humectant may comprise glycerol or vegetable glycerol as a vapor-forming medium.

~~[0153]~~[0156] The humectant may comprise propylene glycol as a vapor-forming medium.

~~[0154]~~[0157] In preferred embodiments, the humectant may comprise a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio may vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of about 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

~~[0155]~~[0158] In a preferred embodiment the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

~~[0156]~~[0159] In a most preferred embodiment, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol.

~~[0157]~~[0160] In any of the preferred embodiments, the humectant may further comprise flavoring products. These flavorings may include enhancers comprising cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name but a few.

~~[0158]~~[0161] The tobacco or botanical may be heated in the oven up to its pyrolytic temperature, which as noted previously is most commonly measured in the range of 300 - 1000° C.

~~[0159]~~[0162] In preferred embodiments, the tobacco or botanical is heated to about 300° C at most. In other preferred embodiments, the tobacco or botanical is heated to about 200° C at

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most. In still other preferred embodiments, the tobacco or botanical is heated to about 160° C at most. It should be noted that in these lower temperature ranges (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

~~[0160]~~[0163] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant is mixed with air provided through an aeration vent.

~~[0161]~~[0164] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C at most, and even as low as 35° C before exiting the mouthpiece, depending on the air temperature being mixed into the condensation chamber. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

~~[0162]~~[0165] Also described herein are vaporization devices for generating an inhalable aerosol comprising a unique oven configuration, wherein said oven comprises an access lid and an auxiliary aeration vent located within the airflow channel immediately downstream of the oven and before the aeration chamber. In this configuration, the user may directly access the oven by removing the access lid, providing the user with the ability to recharge the device with vaporization material.

~~[0163]~~[0166] In addition, having the added aeration vent in the airflow channel immediately after the oven and ahead of the vaporization chamber provides the user with added control over the amount of air entering the aeration chamber downstream and the cooling rate of the aerosol before it enters the aeration chamber.

~~[0164]~~[0167] As noted in FIGS. 4A-4C, the device 400 may comprise a body 401, having an air inlet 421 allowing initial air for the heating process into the oven region 404. After heating the tobacco or botanical, and humectant (heater not shown), the gas phase humectant vapor generated may travel down the airflow channel 423, passing the added aeration vent 407 wherein the user may selectively increase airflow into the heated vapor. The user may selectively increase and/or decrease the airflow to the heated vapor by controlling a valve in communication

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with the aeration vent 407. In some cases, the device may not have an aeration vent. Airflow into the heated vapor through the aeration vent may decrease the vapor temperature before exiting the airflow channel at the outlet 422, and increase the condensation rate and vapor density by decreasing the diameter of the vapor particles within the aeration chamber (not shown), thus producing a thicker, denser vapor compared to the vapor generated by a device without the aeration vent.. The user may also access the oven chamber ~~404a~~ to recharge or reload the device 400, through an access lid 430 provided therein, making the device user serviceable. The access lid may be provided on a device with or without an aeration vent.

~~[0165]~~**[0168]** Provided herein is a method for generating an inhalable aerosol, the method comprising: providing an vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein the vapor is formed by heating a vapor forming medium in an oven chamber of the device to a first temperature below the pyrolytic temperature of the vapor forming medium, and cooling the vapor in a condensation chamber to a temperature below the first temperature, before exiting an aerosol outlet of said device.

~~[0166]~~**[0169]** In some embodiments the vapor may be cooled by mixing relatively cooler air with the vapor in the condensation chamber during the condensation phase, after leaving the oven, where condensation of the gas phase humectants occurs more rapidly due to high saturation ratios being achieved at the moment of aeration, producing a higher concentration of smaller particles, with fewer by-products, in a denser aerosol, than would normally occur in a standard vaporization or aerosol generating device.

~~[0167]~~**[0170]** In some embodiments, formation of an inhalable aerosol is a two-step process. The first step occurs in the oven where the tobacco or botanical and humectant blend is heated to an elevated temperature. At the elevated temperature, evaporation happens faster than at room temperature and the oven chamber fills with the vapor phase of the humectants. The humectant will continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

~~[0168]~~**[0171]** In the second step, the gas leaves the oven chamber, passes to a condensation chamber in a condenser and begins to cool. As the gas phase vapor cools, the saturation pressure also goes down, causing the saturation ratio to rise, and the vapor to condensate, forming droplets. When cooling air is introduced, the large temperature gradient between the two fluids

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mixing in a confined space leads to very rapid cooling, causing high saturation ratios, small particles, and higher concentrations of smaller particles, forming a thicker, denser vapor cloud.

~~[0169]~~[0172] Provided herein is a method for generating an inhalable aerosol comprising: a vaporization device having a body with a mouthpiece at one end, and an attached body at the other end comprising; a condenser with a condensation chamber, a heater, an oven with an oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece, wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

~~[0170]~~[0173] As previously described, a vaporization device having an auxiliary aeration vent located in the condensation chamber capable of supplying cool air (relative to the heated gas components) to the gas phase vapors and tobacco or botanical components exiting the oven region, may be utilized to provide a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

~~[0171]~~[0174] In another aspect, provided herein is a method for generating an inhalable aerosol comprising: a vaporization device, having a body with a mouthpiece at one end, and an attached body at the other end comprising: a condenser with a condensation chamber, a heater, an oven with an oven chamber, wherein said oven chamber further comprises a first valve in the airflow path at the inlet end of the oven chamber, and a second valve at the outlet end of the oven chamber; and at least one aeration vent provided in said body, downstream of the oven, and upstream of the mouthpiece wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

~~[0172]~~[0175] As illustrated in exemplary FIG. 2, by sealing the oven chamber ~~204a~~ with a tobacco or botanical and humectant vapor forming medium 206 therein, and applying heat with the heater 205 during the vaporization process, before inhalation and air is drawn in through a primary air inlet 221, the pressure will build in the oven chamber as heat is continually added with an electronic heating circuit generated through the combination of the battery 211, printed circuit board 212, temperature regulator 213, and operator controlled switches (not shown), to generate even greater elevated temperature gas phase humectants (vapor) of the tobacco or botanical and humectant vapor forming components. This heated pressurization process generates even higher saturation ratios when the valves 208, 209 are opened during inhalation,

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which cause higher particle concentrations in the resultant aerosol, when the vapor is drawn out of the oven region and into the condensation chamber ~~203a~~, where they are again exposed to additional air through an aeration vent 207, and the vapors begin to cool and condense into droplets suspended in air, as described previously before the aerosol is withdrawn through the mouthpiece 222. The inventor also notes that this condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

~~[0173]~~[0176] In some embodiments of any one of the inventive methods, the first, second and/or third valve is a one-way valve, a check valve, a clack valve, or a non-return valve. The first, second and/or third valve may be mechanically actuated. The first, second and/or third valve may be electronically actuated. The first, second and/or third valve may be automatically actuated. The first, second and/or third valve may be manually actuated either directly by a user or indirectly in response to an input command from a user to a control system that actuates the first, second and/or third valve.

~~[0174]~~[0177] In other aspects of the inventive methods, said device further comprises at least one of: a power source, a printed circuit board, or a temperature regulator.

~~[0175]~~[0178] In any of the preceding aspects of the inventive method, one skilled in the art will recognize after reading this disclosure that this method may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms or electronics as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

~~[0176]~~[0179] The possible variations and ranges of aerosol density are great in that the possible number of temperature, pressure, tobacco or botanical choices and humectant selections and combinations are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures to within the ranges and the humectant ratios described herein, the inventor has demonstrated a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to 1 micron.

~~[0177]~~[0180] In some embodiments of the inventive methods, the humectant comprises a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio

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will vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

~~[0178]~~[0181] Because vegetable glycerol is less volatile than propylene glycol, it will recondense in greater proportions. A humectant with higher concentrations of glycerol will generate a thicker aerosol. The addition of propylene glycol will lead to an aerosol with a reduced concentration of condensed phase particles and an increased concentration of vapor phase effluent. This vapor phase effluent is often perceived as a tickle or harshness in the throat when the aerosol is inhaled. To some consumers, varying degrees of this sensation may be desirable. The ratio of vegetable glycerol to propylene glycol may be manipulated to balance aerosol thickness with the right amount of "throat tickle."

~~[0179]~~[0182] In a preferred embodiment of the method, the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

~~[0180]~~[0183] In a most preferred embodiment of the method, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol. On will envision that there will be blends with varying ratios for consumers with varying preferences.

~~[0181]~~[0184] In any of the preferred embodiments of the method, the humectant further comprises flavoring products. These flavorings include enhancers such as cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name a few.

~~[0182]~~[0185] In some embodiments of the method, the tobacco or botanical is heated to its pyrolytic temperature.

~~[0183]~~[0186] In preferred embodiments of the method, the tobacco or botanical is heated to about 300° C at most.

~~[0184]~~[0187] In other preferred embodiments of the method, the tobacco or botanical is heated to about 200° C at most. In still other embodiments of the method, the tobacco or botanical is heated to about 160° C at most.

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~~[0185]~~[0188] As noted previously, at these lower temperatures, (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. As may be inferred from the data supplied by Baker et al., an aerosol produced at these temperatures is also substantially free from Hoffman analytes or at least 70% less Hoffman analytes than a common tobacco or botanical cigarette and scores significantly better on the Ames test than a substance generated by burning a common cigarette. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

~~[0186]~~[0189] In any one of the preceding methods, said inhalable aerosol produced by tobacco or a botanical comprising a humectant and heated in said oven produces an aerosol comprising gas phase humectants is further mixed with air provided through an aeration vent.

~~[0187]~~[0190] In any one of the preceding methods, said aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C, and even as low as 35° C, before exiting the mouthpiece. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

~~[0188]~~[0191] In some embodiments of the method, the vapor comprising gas phase humectant may be mixed with air to produce an aerosol comprising particle diameters of average mass of less than or equal to about 1 micron.

~~[0189]~~[0192] In other embodiments of the method, each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

~~[0190]~~[0193] Cartridge Design and Vapor Generation from Material in Cartridge

~~[0191]~~[0194] In some cases, a vaporization device may be configured to generate an inhalable aerosol. A device may be a self-contained vaporization device. The device may comprise an

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elongated body which functions to complement aspects of a separable and recyclable cartridge with air inlet channels, air passages, multiple condensation chambers, flexible heater contacts, and multiple aerosol outlets. Additionally, the cartridge may be configured for ease of manufacture and assembly.

~~[0192]~~[0195] Provided herein is a vaporization device for generating an inhalable aerosol. The device may comprise a device body, a separable cartridge assembly further comprising a heater, at least one condensation chamber, and a mouthpiece. The device provides for compact assembly and disassembly of components with detachable couplings; overheat shut-off protection for the resistive heating element; an air inlet passage (an enclosed channel) formed by the assembly of the device body and a separable cartridge; at least one condensation chamber within the separable cartridge assembly; heater contacts; and one or more refillable, reusable, and/or recyclable components.

~~[0193]~~[0196] Provided herein is a device for generating an inhalable aerosol comprising: a device body comprising a cartridge receptacle; a cartridge comprising: a storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle. The cartridge may be formed from a metal, plastic, ceramic, and/or composite material. The storage compartment may hold a vaporizable material. FIG. 7A shows an example of a cartridge 30 for use in the device. The vaporizable material may be a liquid at or near room temperature. In some cases the vaporizable material may be a liquid below room temperature. The channel may form a first side of the air inlet passage, and an internal surface of the cartridge receptacle may form a second side of the air inlet passage, as illustrated in various non-limiting aspects of FIGS. 5-6D, 7C, 8A, 8B, and 10A

~~[0194]~~[0197] Provided herein is a device for generating an inhalable aerosol. The device may comprise a body that houses, contains, and or integrates with one or more components of the device. The device body may comprise a cartridge receptacle. The cartridge receptacle may comprise a channel integral to an interior surface of the cartridge receptacle; and an air inlet passage formed by the channel and an external surface of the cartridge when the cartridge is inserted into the cartridge receptacle. A cartridge may be fitted and/or inserted into the cartridge receptacle. The cartridge may have a fluid storage compartment. The channel may form a first side of the air inlet passage, and an external surface of the cartridge forms a second side of the air

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inlet passage. The channel may comprise at least one of: a groove; a trough; a track; a depression; a dent; a furrow; a trench; a crease; and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The channel may have a round, oval, square, rectangular, or other shaped cross section. The channel may have a closed cross section. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm wide. The channel may be about 0.1 mm, 0.5 mm, 1 mm, 2 mm, or 5 mm deep. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm long. There may be at least 1 channel.

~~[0195]~~[0198] In some embodiments, the cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge.

~~[0196]~~[0199] FIGS. 5-7C show various views and aspects of a compact electronic device assembly 10 for generating an inhalable aerosol. The compact electronic device 10 may comprise a device body 20 with a cartridge receptacle 21 for receiving a cartridge 30. The device body may have a square or rectangular cross section. Alternatively, the cross section of the body may be any other regular or irregular shape. The cartridge receptacle may be shaped to receive an opened cartridge 30~~a~~ or "pod" 30a. The cartridge may be opened when a protective cap is removed from a surface of the cartridge. In some cases, the cartridge may be opened when a hole or opening is formed on a surface of the cartridge. The pod 30a may be inserted into an open end of the cartridge receptacle 21 so that ~~an~~ exposed first heater contact tips 33a on the heater contacts 33 of the pod make contact with the second heater contacts 22 of the device body, thus forming the device assembly 10.

~~[0197]~~[0200] Referring to FIG. 14C, it is apparent in the plan view that when the pod 30a is inserted into the notched body of the cartridge receptacle 21, the channel air inlet 50 is left exposed. The size of the channel air inlet 50 may be varied by altering the configuration of the notch in the cartridge receptacle 21.

~~[0198]~~[0201] The device body may further comprise a rechargeable battery, a printed circuit board (PCB) 24 containing a microcontroller with the operating logic and software instructions for the device, a pressure switch 27 for sensing the user's puffing action to activate the heater circuit (2830), an indicator light 26, charging contacts (not shown), and an optional charging magnet or magnetic contact (not shown). The cartridge may further comprise a heater 36. The

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heater may be powered by the rechargeable battery. The temperature of the heater may be controlled by the microcontroller. The heater may be attached to a first end of the cartridge.

~~[0199]~~[0202] In some embodiments, the heater may comprise a heater chamber 37, a first pair of heater contacts 33, 33', a fluid wick 34, and a resistive heating element 35 in contact with the wick. The first pair of heater contacts may comprise thin plates affixed about the sides of the heater chamber. The fluid wick and resistive heating element may be suspended between the heater contacts.

~~[0200]~~[0203] In some embodiments, there may be two or more resistive heating elements 35, 35' and two or more wicks 34, 34'. In some of the embodiments, the heater contact 33 may comprise: a flat plate; a male contact; a female receptacle, or both; a flexible contact and/or copper alloy or another electrically conductive material. The first pair of heater contacts may further comprise a formed shape that may comprise a tab (e.g., flange) having a flexible spring value that extends out of the heater to complete a circuit with the device body. The first pair of heater contact may be a heat sink that absorb and dissipate excessive heat produced by the resistive heating element. Alternatively, the first pair of heater contacts may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment.

~~[0201]~~[0204] As illustrated in the exploded assembly of FIG. 7B, a heater enclosure may comprises two or more heater contacts 33, each comprising a flat plate which may be machined or stamped from a copper alloy or similar electrically conductive material. The flexibility of the tip is provided by the cut-away clearance feature 33b created below the male contact point tip 33a which capitalizes on the inherent spring capacity of the metal sheet or plate material. Another advantage and improvement of this type of contact is the reduced space requirement, simplified construction of a spring contact point (versus a pogo pin) and the easy of assembly. The heater may comprise a first condensation chamber. The heater may comprise more one or more additional condensation chambers in addition to the first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge.

~~[0202]~~[0205] In some cases, the cartridge (e.g., pod) is configured for ease of manufacturing and assembly. The cartridge may comprise an enclosure. The enclosure may be a tank. The tank

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may comprise an interior fluid storage compartment 32. The interior fluid storage compartment 32 which is open at one or both ends and comprises raised rails on the side edges 45b and 46b. The cartridge may be formed from plastic, metal, composite, and/or a ceramic material. The cartridge may be rigid or flexible.

~~[0203]~~[0206] The tank may further comprise a set of first heater contact plates 33 formed from copper alloy or another electrically conductive material, having a thin cut-out 33b below the contact tips 33a (to create a flexible tab) which are affixed to the sides of the first end of the tank and straddle the open-sided end 53 of the tank. The plates may affix to pins, or posts as shown in FIGS. 7B or 5, or may be attached by other common means such as compression beneath the enclosure 36. A fluid wick 34 having a resistive heating element 35 wrapped around it, is placed between the first heater contact plates 33, and attached thereto. A heater 36, comprising raised internal edges on the internal end (not shown), a thin mixing zone (not shown), and primary condensation channel covers 45a that slide over the rails 45b on the sides of the tank on the first half of the tank, creating a primary condensation channel / chamber 45. In addition, a small male snap feature 39b located at the end of the channel cover is configured fall into a female snap feature 39a, located mid-body on the side of the tank, creating a snap-fit assembly.

~~[0204]~~[0207] As will be further clarified below, the combination of the open-sided end 53, the protruding tips 33a of the contact plates 33, the fluid wick 34 having a resistive heating element 35, enclosed in the open end of the fluid storage tank, under the heater 36, with a thin mixing zone therein, creates an efficient heater system. In addition, the primary condensation channel covers 45a which slide over the rails 45b on the sides of the tank create an integrated, easily assembled, primary condensation chamber 45, all within the heater at the first end of the cartridge 30 or pod 30a.

~~[0205]~~[0208] In some embodiments of the device, as illustrated in FIGS. 9A-9L, the heater may encloses at least a first end of the cartridge. The enclosed first end of the cartridge may include the heater and the interior fluid storage compartment. In some embodiments, the heater further comprises at least one first condensation chamber 45.

~~[0206]~~[0209] FIGS. 9A-9L show diagramed steps that ~~mat~~ may be performed to assemble a cartomizer and/or mouthpiece. In A-B the fluid storage compartment 32a may be oriented such that the heater inlet 53 faces upward. The heater contacts 33 may be inserted into the fluid storage compartment. Flexible tabs 33a may be inserted into the heater contacts 33. In a step D

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the resistive heating element 35 may be wound on to the wick 34. In step E the wick 34 and heater 35 may be placed on the fluid storage compartment. One or more free ends of the heater may sit outside the heater contacts. The one or more free ends may be soldered in place, rested in a groove, or snapped into a fitted location. At least a fraction of the one or more free ends may be in communication with the heater contacts 33. In a step F the heater enclosure 36 may be snapped in place. The heater enclosure 36 may be fitted on the fluid storage compartment. Step G shows the heater enclosure 36 is in place on the fluid storage compartment. In step H the fluid storage compartment can be flipped over. In step I the mouthpiece 31 can be fitted on the fluid storage compartment. Step J shows the mouthpiece 31 in place on the fluid storage compartment. In step K an end ~~49~~ 38 can be fitted on the fluid storage compartment opposite the mouthpiece. Step L shows a fully assembled cartridge 30. FIG. 7B shows an exploded view of the assembled cartridge 30.

~~[0207]~~[0210] Depending on the size of the heater and/or heater chamber, the heater may have more than one wick 34 and resistive heating element 35.

~~[0208]~~[0211] In some embodiments, the first pair of heater contacts 33 further comprises a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater. In some embodiments, the cartridge 30 comprises heater contacts 33 which are inserted into the cartridge receptacle 21 of the device body 20 wherein, the flexible tabs 33a insert into a second pair of heater contacts 22 to complete a circuit with the device body. The first pair of heater contacts 33 may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element 35. The first pair of heater contacts 33 may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element 35. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater 36 may enclose a first end of the cartridge and a first end of the fluid storage compartment 32a. The heater may comprise a first condensation chamber 45. The heater may comprise at least one additional condensation chamber 45, 45', 45", etc. The first condensation chamber may be formed along an exterior wall of the cartridge.

~~[0209]~~[0212] In still other embodiments of the device, the cartridge may further comprise a mouthpiece 31, wherein the mouthpiece comprises at least one aerosol outlet channel / secondary condensation chamber 46; and at least one aerosol outlet 47.The mouthpiece may be attached to a second end of the cartridge. The second end of the cartridge with the mouthpiece may be

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exposed when the cartridge is inserted in the device. The mouthpiece may comprise more than one second condensation chamber 46, 46', 46", etc. The second condensation chamber is formed along an exterior wall of the cartridge.

~~[0210]~~[0213] The mouthpiece 31 may enclose the second end of the cartridge and interior fluid storage compartment. The partially assembled (e.g., mouthpiece removed) unit may be inverted and filled with a vaporizable fluid through the opposite, remaining (second) open end. Once filled, a snap-on mouthpiece 31 that also closes and seals the second end of the tank is inserted over the end. It also comprises raised internal edges (not shown), and aerosol outlet channel covers 46a that may slide over the rails 46b located on the sides of the second half of the tank, creating aerosol outlet channels / secondary condensation chambers 46. The aerosol outlet channels / secondary condensation chambers 46 slide over the end of primary condensation chamber 45, at a transition area 57, to create a junction for the vapor leaving the primary chamber and proceed out through the aerosol outlets 47, at the end of the aerosol outlet channels 46 and user-end of the mouthpiece 31.

~~[0211]~~[0214] The cartridge may comprise a first condensation chamber and a second condensation chamber 45, 46. The cartridge may comprise more than one first condensation chamber and more than one second condensation chamber 45, 46, 45', 46', etc.

~~[0212]~~[0215] In some embodiments of the device, a first condensation chamber 45 may be formed along the outside of the cartridge fluid storage compartment 31. In some embodiments of the device an aerosol outlet 47 exists at the end of aerosol outlet chamber 46. In some embodiments of the device, a first and second condensation chamber 45, 46 may be formed along the outside of one side of the cartridge fluid storage compartment ~~31~~32a. In some embodiments the second condensation chamber may be an aerosol outlet chamber. In some embodiments another pair of first and/or second condensation chambers 45', 46' is formed along the outside of the cartridge fluid storage compartment ~~31~~ 32a on another side of the device. In some embodiments another aerosol outlet 47' will also exist at the end of the second pair of condensation chambers 45', 46'.

~~[0213]~~[0216] In any one of the embodiments, the first condensation chamber and the second condensation chamber may be in fluid communication as illustrated in FIG. 10C.

~~[0214]~~[0217] In some embodiments, the mouthpiece may comprise an aerosol outlet 47 in fluid communication with the second condensation chamber 46. The mouthpiece may comprise more

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than one aerosol outlet 47, 47' in fluid communication with more than one the second condensation chamber 46, 46'._The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

~~[0215]~~**[0218]** In each of the embodiments described herein, the cartridge may comprise an airflow path comprising: an air inlet passage; a heater; at least a first condensation chamber; an aerosol outlet chamber, and an outlet port. In some of the embodiments described herein, the cartridge comprises an airflow path comprising: an air inlet passage; a heater; a first condensation chamber; a secondary condensation chamber; and an outlet port.

~~[0216]~~**[0219]** In still other embodiments described herein the cartridge may comprise an airflow path comprising at least one air inlet passage; a heater; at least one first condensation chamber; at least one secondary condensation chamber; and at least one outlet port.

~~[0217]~~**[0220]** As illustrated in FIGS. 10A-10C, an airflow path is created when the user draws on the mouthpiece 31 to create a suction (e.g., a puff), which essentially pulls air through the channel air inlet opening 50, through the air inlet passage 51, and into the heater chamber 37 through the second air passage (tank air inlet hole) 41 at the tank air inlet 52, then into the heater inlet 53. At this point, the pressure sensor has sensed the user's puff, and activated the circuit to the resistive heating element 35, which in turn, begins to generate vapor from the vapor fluid (e-juice). As air enters the heater inlet 53, it begins to mix and circulate in a narrow chamber above and around the wick 34 and between the heater contacts 33, generating heat, and dense, concentrated vapor as it mixes in the flow path 54 created by the sealing structure obstacles 44. FIG. 8A shows a detailed view of the sealing structure obstacles 44. Ultimately the vapor may be drawn, out of the heater along an air path 55 near the shoulder of the heater and into the primary condensation chamber 45 where the vapor expands and begins to cool. As the expanding vapor moves along the airflow path, it makes a transition from the primary condensation chamber 45 through a transition area 57, creating a junction for the vapor leaving the primary chamber, and entering the second vapor chamber 46, and proceeds out through the aerosol outlets 47, at the end of the mouthpiece 31 to the user.

~~[0218]~~**[0221]** As illustrated in FIGS. 10A-10C, the device may have a dual set of air inlet passages 50-53, dual first condensation chambers 55/45, dual second condensation chambers and aeration channels 57/46, and/or dual aerosol outlet vents 47.

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~~[0219]~~[0222] Alternatively, the device may have an airflow path comprising: an air inlet passage 50, 51; a second air passage 41; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and/or an aerosol outlet 47.

~~[0220]~~[0223] In some cases, the devise may have an airflow path comprising: more than one air inlet passage; more than one second air passage; a heater chamber; more than one first condensation chamber; more than one second condensation chamber; and more than one aerosol outlet as clearly illustrated in FIGS. 10A-10C.

~~[0221]~~[0224] In any one of the embodiments described herein, the heater 36 may be in fluid communication with the internal fluid storage compartment 32a.

~~[0222]~~[0225] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater chamber 37, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid, as illustrated in FIGS. 10A, 10C and 14.

~~[0223]~~[0226] In some embodiments of the device, the condensed aerosol fluid may comprise a nicotine formulation. In some embodiments, the condensed aerosol fluid may comprise a humectant. In some embodiments, the humectant may comprise propylene glycol. In some embodiments, the humectant may comprise vegetable glycerin.

~~[0224]~~[0227] In some cases, the cartridge may be detachable from the device body. In some embodiments, the cartridge receptacle 21 and the detachable cartridge may form a separable coupling. In some embodiments the separable coupling may comprise a friction assembly. As illustrated in FIGS. 11-14, the device may have a press-fit (friction) assembly between the cartridge pod 30a and the device receptacle. Additionally, a dent / friction capture such as 43 may be utilized to capture the pod 30a to the device receptacle or to hold a protective cap 38 on the pod, as further illustrated in FIG. 8B.

~~[0225]~~[0228] In other embodiments, the separable coupling may comprise a snap-fit or snap-lock assembly. In still other embodiments the separable coupling may comprise a magnetic assembly.

~~[0226]~~[0229] In any one of the embodiments described herein, the cartridge components may comprise a snap-fit or snap-lock assembly, as illustrated in FIG. 5. In any one of the embodiments, the cartridge components may be reusable, refillable, and/or recyclable. The design of these cartridge components lend themselves to the use of such recyclable plastic materials as polypropylene, for the majority of components.

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~~[0227]~~[0230] In some embodiments of the device 10, the cartridge 30 may comprise: a fluid storage compartment 32; a heater 36 affixed to a first end with a snap-fit coupling 39a, 39b; and a mouthpiece 31 affixed to a second end with a snap-fit coupling 39c, 39d (not shown – but similar to 39a and 39b). The heater 36 may be in fluid communication with the fluid storage compartment 32. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol and / or vegetable glycerin.

~~[0228]~~[0231] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage 51 when a cartridge comprising a channel integral 40 to an exterior surface is inserted into the cartridge receptacle 21, and wherein the channel forms a second side of the air inlet passage 51.

~~[0229]~~[0232] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage 51.

~~[0230]~~[0233] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a channel integral 40 to an exterior surface, wherein the channel forms a first side of an air inlet passage 51; and wherein an internal surface of a cartridge receptacle 21 in the device forms a second side of the air inlet passage 51 when the cartridge is inserted into the cartridge receptacle.

~~[0231]~~[0234] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32, wherein an exterior surface of the cartridge forms a first side of an air inlet channel 51 when inserted into a device body 10 comprising a cartridge receptacle 21, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage 51.

~~[0232]~~[0235] In some embodiments, the cartridge further comprises a second air passage 41 in fluid communication with the channel 40, wherein the second air passage 41 is formed through

the material of the cartridge 32 from an exterior surface of the cartridge to the internal fluid storage compartment 32a.

~~[0233]~~[0236] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises at least one of: a groove; a trough; a depression; a dent; a furrow; a trench; a crease; and a gutter.

~~[0234]~~[0237] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises walls that are either recessed into the surface or protrude from the surface where it is formed.

~~[0235]~~[0238] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the internal side walls of the channel 40 form additional sides of the air inlet passage 51.

~~[0236]~~[0239] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge 30 comprising; a fluid storage compartment 32a; a heater affixed to a first end comprising; a first heater contact 33, a resistive heating element 35 affixed to the first heater contact 33; a device body 20 comprising; a cartridge receptacle 21 for receiving the cartridge 30; a second heater contact 22 adapted to receive the first heater contact 33 and to complete a circuit; a power source 23 connected to the second heater contact 22; a printed circuit board (PCB) 24 connected to the power source 23 and the second heater contact 22; wherein the PCB 24 is configured to detect the absence of fluid based on the measured resistance of the resistive heating element 35, and turn off the device.

~~[0237]~~[0240] Referring now to FIGS. 13, 14A-C, and 15, in some embodiments, the device body further comprises at least one: second heater contact 22 (best shown in FIG. 6C detail); a battery 23;~~,~~ a printed circuit board 24; a pressure sensor 27; and an indicator light 26.

~~[0238]~~[0241] In some embodiments, the printed circuit board (PCB) further comprises: a microcontroller; switches; circuitry comprising a reference ~~resister~~resistor; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

~~[0239]~~[0242] As illustrated in the basic block diagram of FIG. 17A, the device utilizes a proportional-integral-derivative controller or PID control law. A PID controller calculates an "error" value as the difference between a measured process variable and a desired SetPoint.

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When PID control is enabled, power to the coil is monitored to determine whether or not acceptable vaporization is occurring. With a given airflow over the coil, more power will be required to hold the coil at a given temperature if the device is producing vapor (heat is removed from the coil to form vapor). If power required to keep the coil at the set temperature drops below a threshold, the device indicates that it cannot currently produce vapor. Under normal operating conditions, this indicates that there is not enough liquid in the wick for normal vaporization to occur.

~~[0240]~~[0243] In some embodiments, the micro-controller instructs the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

~~[0241]~~[0244] In still other embodiments, the printed circuit board further comprises logic capable of detecting the presence of condensed aerosol fluid in the fluid storage compartment and is capable of turning off power to the heating contact(s) when the condensed aerosol fluid is not detected. When the microcontroller is running the PID temperature control algorithm 70, the difference between a set point and the coil temperature (error) is used to control power to the coil so that the coil quickly reaches the set point temperature, [between 200°C and 400°C]. When the over-temperature algorithm is used, power is constant until the coil reaches an over-temperature threshold, [between 200°C and 400°C]; (FIG. 17 A applies: set point temperature is over-temperature threshold; constant power until error reaches 0).

~~[0242]~~[0245] The essential components of the device used to control the resistive heating element coil temperature are further illustrated in the circuit diagram 71 of FIG. 17B. Wherein, BATT 23 is the battery; MCU 72 is the microcontroller; Q1 (76) and Q2 (77) are P-channel MOSFETs (switches); R_COIL 74 is the resistance of the coil. R_REF 75 is a fixed reference resistor used to measure R_COIL 74 through a voltage divider 73.

~~[0243]~~[0246] The battery powers the microcontroller. The microcontroller turns on Q2 for 1 ms every 100ms so that the voltage between R_REF and R_COIL (a voltage divider) may be measured by the MCU at V_MEAS. When Q2 is off, the control law controls Q1 with PWM (pulse width modulation) to power the coil (battery discharges through Q1 and R_COIL when Q1 is on).

~~[0244]~~[0247] In some embodiments of the device, the device body further comprises at least one: second heater contact; a power switch; a pressure sensor; and an indicator light.

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~~[0245]~~[0248] In some embodiments of the device body, the second heater contact 22 may comprise: a female receptacle; or a male contact, or both, a flexible contact; or copper alloy or another electrically conductive material.

~~[0246]~~[0249] In some embodiments of the device body, the battery supplies power to the second heater contact, pressure sensor, indicator light and the printed circuit board. In some embodiments, the battery is rechargeable. In some embodiments, the indicator light 26 indicates the status of the device and / or the battery or both.

~~[0247]~~[0250] In some embodiments of the device, the first heater contact and the second heater contact complete a circuit that allows current to flow through the heating contacts when the device body and detachable cartridge are assembled, which may be controlled by an on / off switch. Alternatively, the device can be turned on an off by a puff sensor. The puff sensor may comprise a capacitive membrane. The capacitive membrane may be similar to a capacitive membrane used in a microphone.

~~[0248]~~[0251] In some embodiments of the device, there is also an auxiliary charging unit for recharging the battery 23 in the device body. As illustrated in FIGS. 16A-16C, the charging unit 60, may comprise a USB device with a plug for a power source 63 and protective cap 64, with a cradle 61 for capturing the device body 20 (with or without the cartridge installed). The cradle may further comprise either a magnet or a magnetic contact 62 to securely hold the device body in place during charging. As illustrated in FIG. 6B, the device body further comprises a mating charging contact 28 and a magnet or magnetic contact 29 for the auxiliary charging unit. FIG. 16C is an illustrative example of the device 20 being charged in a power source 65 (laptop computer or tablet).

~~[0249]~~[0252] In some cases the microcontroller on the PCB may be configured to monitor the temperature of the heater such that the vaporizable material is heated to a prescribed temperature. The prescribed temperature may be an input provided by the user. A temperature sensor may be in communication with the microcontroller to provide an input temperature to the microcontroller for temperature regulation. A temperature sensor may be a thermistor, thermocouple, thermometer, or any other temperature sensors. In some cases, the heating element may simultaneously perform as both a heater and a temperature sensor. The heating element may differ from a thermistor by having a resistance with a relatively lower dependence on temperature. The heating element may comprise a resistance temperature detector.

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~~[0250]~~[0253] The resistance of the heating element may be an input to the microcontroller. In some cases, the resistance may be determined by the microcontroller based on a measurement from a circuit with a resistor with at least one known resistance, for example, a Wheatstone bridge. Alternatively, the resistance of the heating element may be measured with a resistive voltage divider in contact with the heating element and a resistor with a known and substantially constant resistance. The measurement of the resistance of the heating element may be amplified by an amplifier. The amplifier may be a standard op amp or instrumentation amplifier. The amplified signal may be substantially free of noise. In some cases, a charge time for a voltage divider between the heating element and a capacitor may be determined to calculate the resistance of the heating element. In some cases, the microcontroller must deactivate the heating element during resistance measurements. The resistance of the heating element may be directly proportional to the temperature of the heating element such that the temperature may be directly determine from the resistance measurement. Determining the temperature directly from the heating element resistance measurement rather than from an additional temperature sensor may generate a more accurate measurement because unknown contact thermal resistance between the temperature sensor and the heating element is eliminated. Additionally, the temperature measurement may be determined directly and therefore faster and without a time lag associated with attaining equilibrium between the heating element and a temperature sensor in contact with the heating element.

~~[0251]~~[0254] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge comprising a first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; and a single button interface; wherein the PCB is configured with circuitry and an algorithm comprising logic for a child safety feature.

~~[0252]~~[0255] In some embodiments, the algorithm requires a code provided by the user to activate the device. In some embodiments; the code is entered by the user with the single button interface. In still further embodiments the single button interface is the also the power switch.

~~[0253]~~[0256] Provided herein is a cartridge 30 for a device 10 for generating an inhalable aerosol comprising: a fluid storage compartment 32; a heater 36 affixed to a first end comprising:

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a heater chamber 37, a first pair of heater contacts 33, a fluid wick 34, and a resistive heating element 35 in contact with the wick; wherein the first pair of heater contacts 33 comprise thin plates affixed about the sides of the heater chamber 37, and wherein the fluid wick 34 and resistive heating element 35 are suspended there between.

~~[0254]~~[0257] Depending on the size of the heater or heater chamber, the heater may have more than one wick 34, 34' and resistive heating element 35, 35'.

~~[0255]~~[0258] In some embodiments, the first pair of heater contacts further comprise a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater 36 to complete a circuit with the device body 20.

~~[0256]~~[0259] In some embodiments, the heater contacts 33 are configured to mate with a second pair of heater contacts 22 in a cartridge receptacle 21 of the device body 20 to complete a circuit.

~~[0257]~~[0260] In some embodiments, the first pair of heater contacts is also a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element.

~~[0258]~~[0261] In some embodiments, the first pair of heater contacts is a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element.

~~[0259]~~[0262] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a heater 36 comprising; a heater chamber 37, a pair of thin plate heater contacts 33 therein, a fluid wick 34 positioned between the heater contacts 33, and a resistive heating element 35 in contact with the wick; wherein the heater contacts 33 each comprise a fixation site 33c wherein the resistive heating element 35 is tensioned there between.

~~[0260]~~[0263] As will be obvious to one skilled in the art after reviewing the assembly method illustrated in FIGS. 9A-9L, the heater contacts 33 simply snap or rest on locator pins on either side of the air inlet 53 on the first end of the cartridge interior fluid storage compartment, creating a spacious vaporization chamber containing the at least one wick 34 and at least one heating element 35.

~~[0261]~~[0264] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a heater 36 attached to a first end of the cartridge.

~~[0262]~~[0265] In some embodiments, the heater encloses a first end of the cartridge and a first end of the fluid storage compartment 32, 32a.

~~[0263]~~[0266] In some embodiments, the heater comprises a first condensation chamber 45.

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~~[0264]~~[0267] In some embodiments, the heater comprises more than one first condensation chamber 45, 45'.

~~[0265]~~[0268] In some embodiments, the condensation chamber is formed along an exterior wall of the cartridge ~~45b~~30.

~~[0266]~~[0269] As noted previously, and described in FIGS. 10A, 10B and 10C, the airflow path through the heater and heater chamber generates vapor within the heater circulating air path 54, which then exits through the heater exits 55 into a first (primary) condensation chamber 45, which is formed by components of the tank body comprising the primary condensation channel/chamber rails 45b, the primary condensation channel cover 45a, (the outer side wall of the heater enclosure).

~~[0267]~~[0270] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32 and a mouthpiece 31, wherein the mouthpiece is attached to a second end of the cartridge and further comprises at least one aerosol outlet 47.

~~[0268]~~[0271] In some embodiments, the mouthpiece 31 encloses a second end of the cartridge 30 and a second end of the fluid storage compartment 32, 32a.

~~[0269]~~[0272] Additionally, as clearly illustrated in FIG. 10C in some embodiments the mouthpiece also contains a second condensation chamber 46 prior to the aerosol outlet 47, which is formed by components of the tank body 32 comprising the secondary condensation channel/chamber rails 46b, the second condensation channel cover 46a, (the outer side wall of the mouthpiece). Still further, the mouthpiece may contain yet another aerosol outlet 47' and another (second) condensation chamber 46' prior to the aerosol outlet, on another side of the cartridge.

~~[0270]~~[0273] In other embodiments, the mouthpiece comprises more than one second condensation chamber 46, 46'.

~~[0271]~~[0274] In some preferred embodiments, the second condensation chamber is formed along an exterior wall of the cartridge ~~46b~~30.

~~[0272]~~[0275] In each of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; at least a first condensation chamber 45; and an outlet port 47. In some of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and

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passage 40, 41, 42; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and an outlet port 47.

~~[0273]~~[0276] In still other embodiments described herein the cartridge 30 may comprise an airflow path comprising at least one air inlet channel and passage 40, 41, 42; a heater chamber 37; at least one first condensation chamber 45; at least one second condensation chamber 46; and at least one outlet port 47.

~~[0274]~~[0277] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater 36, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid.

~~[0275]~~[0278] In some embodiments of the device, the condensed aerosol fluid comprises a nicotine formulation. In some embodiments, the condensed aerosol fluid comprises a humectant. In some embodiments, the humectant comprises propylene glycol. In some embodiments, the humectant comprises vegetable glycerin.

~~[0276]~~[0279] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a heater 36 affixed to a first end; and a mouthpiece 31 affixed to a second end; wherein the heater comprises a first condensation chamber 45 and the mouthpiece comprises a second condensation chamber 46.

~~[0277]~~[0280] In some embodiments, the heater comprises more than one first condensation chamber 45, 45' and the mouthpiece comprises more than one second condensation chamber 46, 46'.

~~[0278]~~[0281] In some embodiments, the first condensation chamber and the second condensation chamber are in fluid communication. As illustrated in FIG. 10C, the first and second condensation chambers have a common transition area 57, 57', for fluid communication.

~~[0279]~~[0282] In some embodiments, the mouthpiece comprises an aerosol outlet 47 in fluid communication with the second condensation chamber 46.

~~[0280]~~[0283] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47'.

~~[0281]~~[0284] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47' in fluid communication with the two or more second condensation chambers 46, 46'.

~~[0282]~~[0285] In any one of the embodiments, the cartridge meets ISO recycling standards.

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~~[0283]~~[0286] In any one of the embodiments, the cartridge meets ISO recycling standards for plastic waste.

~~[0284]~~[0287] And in still other embodiments, the plastic components of the cartridge are composed of polylactic acid (PLA), wherein the PLA components are compostable and or degradable.

~~[0285]~~[0288] Provided herein is a device for generating an inhalable aerosol 10 comprising a device body 20 comprising a cartridge receptacle 21; and a detachable cartridge 30; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, and wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

~~[0286]~~[0289] In other embodiments of the device, the cartridge is a detachable assembly. In any one of the embodiments described herein, the cartridge components may comprise a snap-lock assembly such as illustrated by snap features 39a and 39b. In any one of the embodiments, the cartridge components are recyclable.

~~[0287]~~[0290] Provided herein is a method of fabricating a device for generating an inhalable aerosol comprising: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly when the cartridge is inserted into the cartridge receptacle.

~~[0288]~~[0291] Provided herein is a method of making a device 10 for generating an inhalable aerosol comprising: providing a device body 20 with a cartridge receptacle 21 comprising one or more interior coupling surfaces 21a, 21b, 21c…; and further providing a cartridge 30 comprising: one or more exterior coupling surfaces 36a, 36b, 36c,..., a second end and a first end; a tank 32 comprising an interior fluid storage compartment 32a; at least one channel 40 on at least one exterior coupling surface, wherein the at least one channel forms one side of at least one air inlet passage 51, and wherein at least one interior wall of the cartridge receptacle forms at least one side one side of at least one air inlet passage 51when the detachable cartridge is inserted into the cartridge receptacle.

~~[0289]~~[0292] FIGS. 9A-9L provide an illustrative example of a method of assembling such a device.

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~~[0290]~~[0293] In some embodiments of the method, the cartridge 30 is assembled with a [protective] removable end cap 38 to protect the exposed heater contact tabs 33a protruding from the heater 36.

~~[0291]~~[0294] Provided herein is a method of fabricating a cartridge for a device for generating an inhalable aerosol comprising: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

~~[0292]~~[0295] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 with an airflow path comprising: a channel 50 comprising a portion of an air inlet passage 51; a second air passage 41 in fluid communication with the channel; a heater chamber 37 in fluid communication with the second air passage; a first condensation chamber 45 in fluid communication with the heater chamber; a second condensation chamber 46 in fluid communication with the first condensation chamber; and an aerosol outlet 47 in fluid communication with second condensation chamber.

~~[0293]~~[0296] Provided herein is a device 10 for generating an inhalable aerosol adapted to receive a removable cartridge 30, wherein the cartridge comprises a fluid storage compartment [or tank] 32; an air inlet 41; a heater 36, a [protective] removable end cap 38, and a mouthpiece 31.

~~[0294]~~[0297] Charging

~~[0295]~~[0298] In some cases, the vaporization device may comprise a power source. The power source may be configured to provide power to a control system, one or more heating elements, one or more sensors, one or more lights, one or more indicators, and/or any other system on the electronic cigarette that requires a power source. The power source may be an energy storage device. The power source may be a battery or a capacitor. In some cases, the power source may be a rechargeable battery.

~~[0296]~~[0299] The battery may be contained within a housing of the device. In some cases the battery may be removed from the housing for charging. Alternatively, the battery may remain in the housing while the battery is being charged. Two or more charge contact may be provided on an exterior surface of the device housing. The two or more charge contacts may be in electrical

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communication with the battery such that the battery may be charged by applying a charging source to the two or more charge contacts without removing the battery from the housing.

~~[0297]~~[0300] FIG. 18 shows a device 1800 with charge contacts 1801. The charge contacts 1801 may be accessible from an exterior surface of a device housing 1802. The charge contacts 1801 may be in electrical communication with an energy storage device (e.g., battery) inside of the device housing 1802. In some cases, the device housing may not comprise an opening through which the user may access components in the device housing. The user may not be able to remove the battery and/or other energy storage device from the housing. In order to open the device housing a user must destroy or permanently disengage the charge contacts. In some cases, the device may fail to function after a user breaks open the housing.

~~[0298]~~[0301] FIG. 19 shows an exploded view of a charging assembly 1900 in an electronic vaporization device. The housing (not shown) has been removed from the exploded view in FIG. 19. The charge contact pins 1901 may be visible on the exterior of the housing. The charge contact pins 1901 may be in electrical communication with a power storage device of the electronic vaporization device. When the device is connected to a power source (e.g., during charging of the device) the charging pins may facilitate electrical communication between the power storage device inside of the electronic vaporization device and the power source outside of the housing of the vaporization device. The charge contact pins 1901 may be held in place by a retaining bezel 1902. The charge contact pins 1901 may be in electrical communication with a charger flex 1903. The charging pins may contact the charger flex such that a need for soldering of the charger pins to an electrical connection to be in electrical communication with the power source may be eliminated. The charger flex may be soldered to a printed circuit board (PCB). The charger flex may be in electrical communication with the power storage device through the PCB. The charger flex may be held in place by a bent spring retainer 1904.

~~[0299]~~[0302] FIG. 20 shows the bent spring retainer in an initial position 2001 and a deflected position 2002. The bent spring retainer may hold the retaining bezel in a fixed location. The bent spring retainer may deflect only in one direction when the charging assembly is enclosed in the housing of the electronic vaporization device.

~~[0300]~~[0303] FIG. 21 shows a location of the charger pins 2101 when the electronic vaporization device is fully assembled with the charging pins 2101 contact the charging flex 2102. When the device is fully assembled at least a portion of the retaining bezel may be fitted

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in an indentation 2103 on the inside of the housing 2104. In some cases, disassembling the electronic vaporization device may destroy the bezel such that the device cannot be reassembled after disassembly.

~~[0301]~~[0304] A user may place the electronic smoking device in a charging cradle. The charging cradle may be a holder with charging contact configured to mate or couple with the charging pins on the electronic smoking device to provide charge to the energy storage device in the electronic vaporization device from a power source (e.g., wall outlet, generator, and/or external power storage device). FIG. 22 shows a device 2302 in a charging cradle 2301. The charging cable may be connected to a wall outlet, USB, or any other power source. The charging pins (not shown) on the device 2302 may be connected to charging contacts (not shown) on the charging cradle 2301. The device may be configured such that when the device is placed in the cradle for charging a first charging pin on the device may contact a first charging contact on the charging cradle and a second charging pin on the device may contact a second charging contact on the charging cradle or the first charging pin on the device may contact a second charging contact on the charging cradle and the second charging pin on the device may contact the first charging contact on the charging cradle. The charging pins on the device and the charging contacts on the cradle may be in contact in any orientation. The charging pins on the device and the charging contacts on the cradle may be agnostic as to whether they are current inlets or outlets. Each of the charging pins on the device and the charging contacts on the cradle may be negative or positive. The charging pins on the device may be reversible.

~~[0302]~~[0305] FIG. 23 shows a circuit 2400 that may permit the charging pins on the device to be reversible. The circuit 2400 may be provided on a PCB in electrical communication with the charging pins. The circuit 2400 may comprise a metal–oxide–semiconductor field-effect transistor (MOSFET) H bridge. The MOSFET H bridge may rectify a change in voltage across the charging pins when the charging pins are reversed from a first configuration where in a first configuration the device is placed in the cradle for charging with the first charging pin on the device in contact with the first charging contact on the charging cradle to a second charging pin on the device in contact with the second charging contact on the charging cradle to a second configuration where the first charging pin on the device is in contact with the second charging contact on the charging cradle and the second charging pin on the device is in contact with the

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first charging contact on the charging cradle. The MOSFET H bridge may rectify the change in voltage with an efficient current path.

~~[0303]~~[0306] As shown in FIG. 23 the MOSFET H bridge may comprise two or more n-channel MOSFETs and two or more p-channel MOSFETs. The n-channel and p-channel MOSFETs may be arranged in an H bridge. Sources of p-channels MOSFETs (Q1 and Q3) may be in electrical communication. Similarly, sources of n-channel FETs (Q2 and Q4) may be in electrical communication. Drains of pairs of n and p MOSFETs (Q1 with Q2 and Q3 with Q4) may be in electrical communication. ~~T~~A common drain from one n and p pair may be in electrical communication with one or more gates of the other n and p pair and/or vice versa. Charge contacts (CH1 and CH2) may be in electrical communication to common drains separately. A common source of the n MOSFETs may be in electrical communication to PCB ground (GND). The common source of the p MOSFETs may be in electrical communication with the PCB's charge controller input voltage (CH+). When CH1 voltage is greater than CH2 voltage by the MOSFET gate threshold voltages, Q1 and Q4 may be "on," connecting CH1 to CH+ and CH2 to GND. When CH2 voltage is greater than CH1 voltage by the FET gate threshold voltages, Q2 and Q3 may be "on," connecting CH1 to GND and CH2 to CH+. For example, whether there is 9V or -9V across CH1 to CH2, CH+ will be 9V above GND. Alternatively, a diode bridge could be used, however the MOSFET bridge may be more efficient compared to the diode bridge.

~~[0304]~~[0307] In some cases the charging cradle may be configured to be a smart charger. The smart charger may put the battery of the device in series with a USB input to charge the device at a higher current compared to a typical charging current. In some cases, the device may charge at a rate up to about 2 amps (A), 4A, 5A, 6A, 7A, 10A, or 15A. In some cases, the smart charger may comprise a battery, power from the battery may be used to charge the device battery. When the battery in the smart charger has a charge below a predetermined threshold charge, the smart charger may simultaneously charge the battery in the smart charger and the battery in the device.

~~[0305]~~[0308] Blow discrimination

~~[0306]~~[0309] In any of the devices and system (e.g., vaporizers) described herein, a pressure sensor may be used and configured to detect blowing and to distinguish blowing from draw (sucking/inhaling). For example, a modified electret microphone may be used as a pressure

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sensor connected to the device's microcontroller so that pressure-dependent measurements can be made by the microcontroller. The microcontroller's draw detection algorithm, which uses measurements of pressure sensor's capacitance to determine the start and end of the draw, may be configured to include blow detection and/or blow discrimination.

~~[0307]~~[0310] As mentioned above, other types of pressures sensors may be used (e.g., microelectromechanical systems (MEMS) pressure sensors or any other differential pressure sensor). In such cases the output of the sensor (which may be converted by the sensor and/or associated circuitry into a pressure value (e.g., in mmHg, atm, etc.) or it may be a raw sensor output or value (e.g., reading) such as a capacitance value in the case of a pressure sensor using a capacitive membrane, electrical value (resistive, voltage, etc.), digital value, force and/or displacement value, etc. As described herein, this raw value may be used in the controls described (e.g., microcontrollers) without requiring conversion to an actual pressure reading. Although the examples described herein refer to a capacitive pressure sensor having a capacitive membrane (e.g., an electret microphone), any other differential pressure sensor may be used instead with the methods and apparatuses described herein, including controlling the baseline during a putative blow and/or draw through the mouthpiece as described in greater detail below.

~~[0308]~~[0311] Thus, any pressure sensor that can distinguish positive and negative pressure may be used. For example a pressure sensor may comprise an electrically conductive diaphragm held in close proximity to a conductive static plate, forming an air capacitor, with both conductors connected to pins or pads on a circuit (e.g., PCB) opposite the static plate side of the sensor. FIGS. 24A-24D illustrate one example of a pressure sensor 2509 that is a capacitive pressure sensor. In this example, the diaphragm 2404 (shown in FIG. 24D) is mounted to a rigid thin wall tube (case 2403) that is a close fit within the outer conductive case 2407 of the sensor 2509 such that air cannot flow through the sensor 2509 around the diaphragm. Holes 2411 in the static plate on one side of a gasket and holes 2413 in the PCB 2401 on the opposite side of the diaphragm allow pressure differences between the two sides of the sensor 2509 to ~~been~~ be seen by the diaphragm, which deflects with a pressure difference across it.

~~[0309]~~[0312] Within the vaporizer, the sensor 2509 may be included in a sealed air path 2520 so as to distinguish a difference between internal pressure and air pressure. In some variations, a gasket 2502 in the device forms an air-tight seal around the sensor's case such that the static plate side of the sensor sees gauge pressures in the device's air path 2530 when a user draws

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from or blows into the device, as shown in FIG. 25. Air flow restriction between the device's nominal air inlet 2505 and the pressure sensor 2509 along the sealed air path 2520 creates a pressure that the static plate side of the pressure registers. The PCB ~~2511~~ side 2511 of the pressure sensor 2509 stays at an external reference (e.g., 0 gauge) pressure during a draw or blow as the PCB side of the pressure sensor 2509 is not part of the sealed air path 2520 and is not sealed from ambient air. Pressure difference on either side of the sensor 2509 resolve onto either side of the diaphragm; negative gauge pressure in the sealed air path 2520 from a draw pulls the diaphragm towards the static plate, increasing the capacitance of the sensor, while positive gauge pressures in the sealed air path from a blow push the diaphragm away from the static plate, decreasing the sensor's capacitance.

~~[0310]~~[0313] Differences between the pressure on either side of the diaphragm 2404 and the back plate ~~2404~~ 2405 change the spacing between the diaphragm and back plate and therefore the capacitance of the sensor 2509. This different separation may be read as the capacitance of the sensor 2509 and compared to ambient. In some variations, capacitance is measured with an oscillating circuit that sources and sinks current to/from the sensor 2509 to charge and discharge the sensor repeatedly. The device's microcontroller counts the number of times the sensor's intrinsic capacitor is charged and discharged within a fixed time period (e.g., 0.5 ms, 1 ms, 1.5 ms, 2 ms, etc.) and uses this value in a draw detection algorithm. This measurement may be inversely related to the capacitance of the sensor 2509, since an increase in capacitance will make the capacitor charge slower, resulting in fewer charge and discharge cycles during the measurement period. So an increase in capacitance from negative air path gauge pressure, normally a draw, will result in a lower reading than when the user is not drawing from the device. Blowing into the nominal outlet 2550 of the sealed air path 2520 will result in an increase in this measured value. Actual capacitance and air path gauge pressure are not needed by the draw detection algorithm, so they are not calculated, though they could be approximated and used in a similar draw detection algorithm.

~~[0311]~~[0314] In any of the apparatuses described herein, a capacitive sensing module within the microcontroller may handle the oscillation and current sourcing/sinking needed for the measurement via a direct connection to the pressure sensor diaphragm. The pressure sensor's case may be tied to PCB ground.

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~~[0312]~~[0315] Because the ambient pressure around the device may change, the 'baseline' capacitance of the sensor may also change. This may be incorporated into the control circuitry that determines draw (and may determine or reject blow). For example, the draw detection algorithm may respond to environmental changes (not including draw or blow) that may change the nominal pressure measurement by using a baseline pressure measurement value which normally follows live pressure measurements using a software low-pass filter. With a moving baseline, a threshold for detecting the start of a draw can be kept very close to the baseline and live readings for consistent sensitivity and maximum sensitivity without falsely detected draws. The draw detection algorithm may therefore detect the start of a draw when the live pressure measurement drops (indicating a pressure drop in the air path) to some threshold below the baseline value for some number of measurements. The algorithm detects end of draw when live pressure measurements rise above some threshold below the baseline. The baseline may be fixed during the draw so that end of draw detection does not happen prematurely, and so that subsequent draws don't require larger pressure drops for the algorithm to detect the start of a draw.

~~[0313]~~[0316] For example, see FIG. 26, which graphically illustrates the output of the pressure sensor over time and when draws are detected by the microcontroller (which is performing the control logic as described herein). In this example, the live reading is the pressure output (converted capacitance measurement in this example) from the sensor. The baseline is a low-pass filtered measure of the live reading. This baseline is fixed during the two draw events. Draw detection state is shown by the square wave, where the high state corresponds to a draw currently being detected. A first threshold is positioned at a fixed offset below the baseline; when the live reading from the sensor (the pressure measurement) crosses the threshold (e.g., exceeds this offset), it detects a draw event, and can again detect the end of the draw event when the pressure returns past the same threshold. These two thresholds may differ from each other in the draw detection logic (algorithm). A similar method may be applied to detect blowing; a second threshold or second offset (blow threshold/offset) maybe represented as a line on the opposite side of the baseline from the draw threshold/offset. In this example, draws are detected as downward pressure deflection and offset, whereas blowing is upward deflection relative to the baseline; if the orientation of the sensor is reversed, or if the raw sensor values, depending on the type of sensor, are used, the direction of blow and draw relative to the baseline may be different.

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~~[0314]~~[0317] Blowing into the device may be detected and/or ignored using this algorithm. For example, when the live pressure measurement rises to values above the baseline value (e.g., in the more positive direction in the configuration shown in FIGS. 25, 26 and 27), which is usually caused by the user blowing into the air path outlet, the baseline may also stop following the live pressure measurements (e.g., remain at the last value) until the sensor output returns to below some threshold above the baseline value, as shown in FIG. 27. Holding the baseline during a blowing event may prevent the baseline from rising to a value at which draw start would be detected at the end of the blow. With this feature, users can hold the device with their lips and/or teeth without worrying about the device heating when they didn't intend for it to heat. Without this feature, it the device may apparently heat on its own. Thus, preventing false draw may save, battery life and vaporizable material by preventing detection of false draws which may occur, for example if the baseline during a blow event were reset to higher values so that the end of the blow would drop the sensor signal to beyond the threshold (which is an offset of the now-incorrect baseline) for detecting draw.

~~[0315]~~[0318] FIG. 28 is a flow diagram of a process 2800 for activating a heater. ~~Thus, in~~In general, the pressure sensor is configured to detect draw by comparing the instantaneous sensor output ("live reading" in FIGS. 26 and 27) to a baseline value which is a based on a filtered (e.g., low pass filtered, averaged, windowed, weighted averaged, etc.) version of the instantaneous sensor output (2810). Detection of draw is made more accurate by rejecting changes to the baseline during blowing (e.g., "blow rejection" or "blow discrimination"). This may be achieved by freezing the value of the baseline when the instantaneous sensor output is greater than the baseline or greater than some predetermined offset above or below (whichever direction corresponds to blowing based on the orientation of the sensor in the system) the baseline (2820). The baseline value may also be frozen when the instantaneous sensor crosses a threshold for detection of draw (e.g., above or below this threshold based on the orientation of the sensor in the system) (2820). The instantaneous sensor readings may be compared to the baseline and the heater may be activated to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

~~[0316]~~[0319] In an alternative embodiment, an oscillating circuit external to the microcontroller may be used to charge and discharge the pressure sensor's intrinsic capacitor. This circuit could

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be a multivibrator circuit, relaxation oscillator, or other oscillator that is self-resonant or excited by the microcontroller. The pressure sensor case may not be grounded. A microcontroller is still used to count charge and discharge cycles within a fixed interval.

~~[0317]~~[0320] In an alternative embodiment, a fixed resistance may be used to charge the pressure sensor's intrinsic capacitor. Charge time up to some voltage or discharge time down to some voltage is measured using a comparator internal or external to the microcontroller. In this case, readings will increase with increased sensor capacitance, as opposed to oscillator charge count readings which decrease with increased sensor capacitance, and the draw detection algorithm may be modified accordingly, with increased readings required for draw start detection and decreased readings required for blow detection.

~~[0318]~~[0321] In an alternative embodiment, the diaphragm is in between the static plate and the air path, such that negative pressure from a draw would decrease the capacitance of the sensor. If the sensor is still measured with an oscillator, the sensor output for reading deviations from baseline required for draw start detection and blow detection are switched.

~~[0319]~~[0322] In an alternative embodiment, the pressure sensor has solder pads and/or lead wires instead of pins on its PCB.

~~[0320]~~[0323] In an alternative embodiment, the draw detection circuitry (e.g., algorithm) may not detect a draw start unless it has a "stable" baseline. When a blow is detected, a flag may be set that indicates that the baseline is not stable. When the end of blow is detected and pressure readings stabilize, the baseline is set conservatively below live pressure readings and the flag for unstable baseline is cleared, meaning drops in the reading will again be detected as draw start event, similar to what is shown in FIG. 27.

~~[0321]~~[0324] Any of the methods (including user interfaces) described herein may be implemented as software, hardware or firmware, and may be described as a non-transitory computer-readable storage medium storing a set of instructions capable of being executed by a processor (e.g., computer, tablet, smartphone, etc.), that when executed by the processor causes the processor to control perform any of the steps, including but not limited to: displaying, communicating with the user, analyzing, modifying parameters (including timing, frequency, intensity, etc.), determining, alerting, or the like.

~~[0322]~~[0325] When a feature or element is herein referred to as being "on" another feature or element, it can be directly on the other feature or element or intervening features and/or elements

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may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature may have portions that overlap or underlie the adjacent feature.

~~[0323]~~**[0326]** Terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. For example, as used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

~~[0324]~~**[0327]** Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal"

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and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

~~[0325]~~[0328] Although the terms "first" and "second" may be used herein to describe various features/elements (including steps), these features/elements should not be limited by these terms, unless the context indicates otherwise. These terms may be used to distinguish one feature/element from another feature/element. Thus, a first feature/element discussed below could be termed a second feature/element, and similarly, a second feature/element discussed below could be termed a first feature/element without departing from the teachings of the present invention.

~~[0326]~~[0329] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising" means various components can be co-jointly employed in the methods and articles (e.g., compositions and apparatuses including device and methods). For example, the term "comprising" will be understood to imply the inclusion of any stated elements or steps but not the exclusion of any other elements or steps.

~~[0327]~~[0330] In general, any of the apparatuses and methods described herein should be understood to be inclusive, but all or a sub-set of the components and/or steps may alternatively be exclusive, and may be expressed as "consisting of" or alternatively "consisting essentially of" the various components, steps, sub-components or sub-steps.

~~[0328]~~[0331] As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced by the word "about" or "approximately," even if the term does not expressly appear. The phrase "about" or "approximately" may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions. For example, a numeric value may have a value that is +/- 0.1% of the stated value (or range of values), +/- 1% of the stated value (or range of values), +/- 2% of the stated value (or range of values), +/- 5% of the stated value (or range of values), +/- 10% of the stated value (or range of values), etc. Any numerical values given herein should also be understood to include about or approximately that value, unless the context indicates otherwise. For example, if the value "10" is disclosed, then "about 10" is also disclosed. Any numerical range recited herein is intended to include all sub-ranges subsumed therein. It is also understood that when a value is disclosed that

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"less than or equal to" the value, "greater than or equal to the value" and possible ranges between values are also disclosed, as appropriately understood by the skilled artisan. For example, if the value "X" is disclosed the "less than or equal to X" as well as "greater than or equal to X" (e.g., where X is a numerical value) is also disclosed. It is also understood that the throughout the application, data is provided in a number of different formats, and that this data, represents endpoints and starting points, and ranges for any combination of the data points. For example, if a particular data point "10" and a particular data point "15" are disclosed, it is understood that greater than, greater than or equal to, less than, less than or equal to, and equal to 10 and 15 are considered disclosed as well as between 10 and 15. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

~~[0329]~~**[0332]** Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others. Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

~~[0330]~~**[0333]** The examples and illustrations included herein show, by way of illustration and not of limitation, specific embodiments in which the subject matter may be practiced. As mentioned, other embodiments may be utilized and derived there from, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. Such embodiments of the inventive subject matter may be referred to herein individually or collectively by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept, if more than one is, in fact, disclosed. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and

other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

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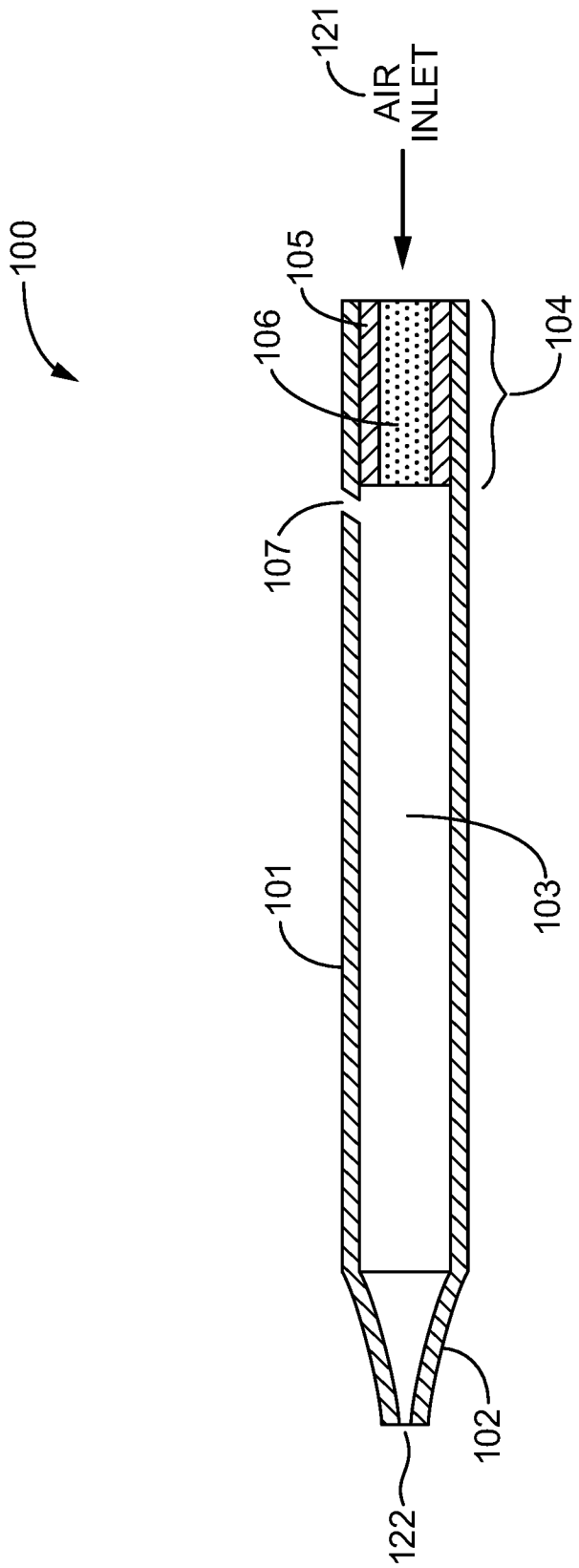


FIG. 1

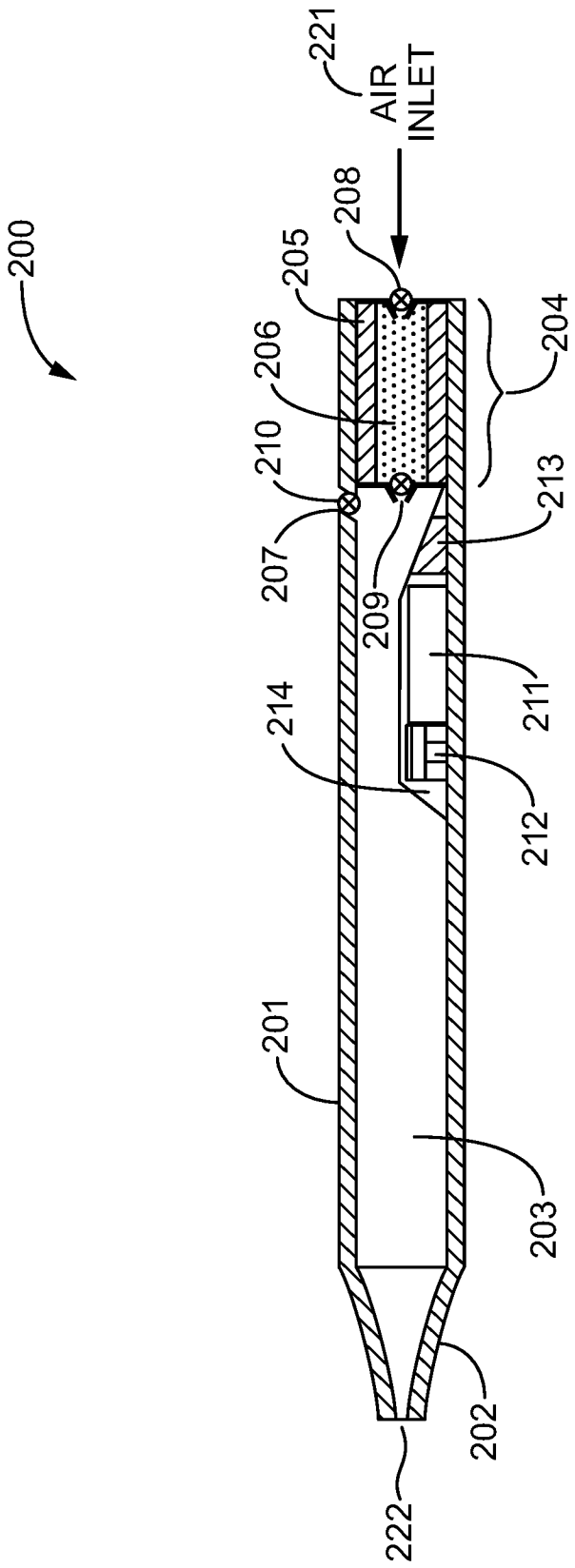

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FIG. 2

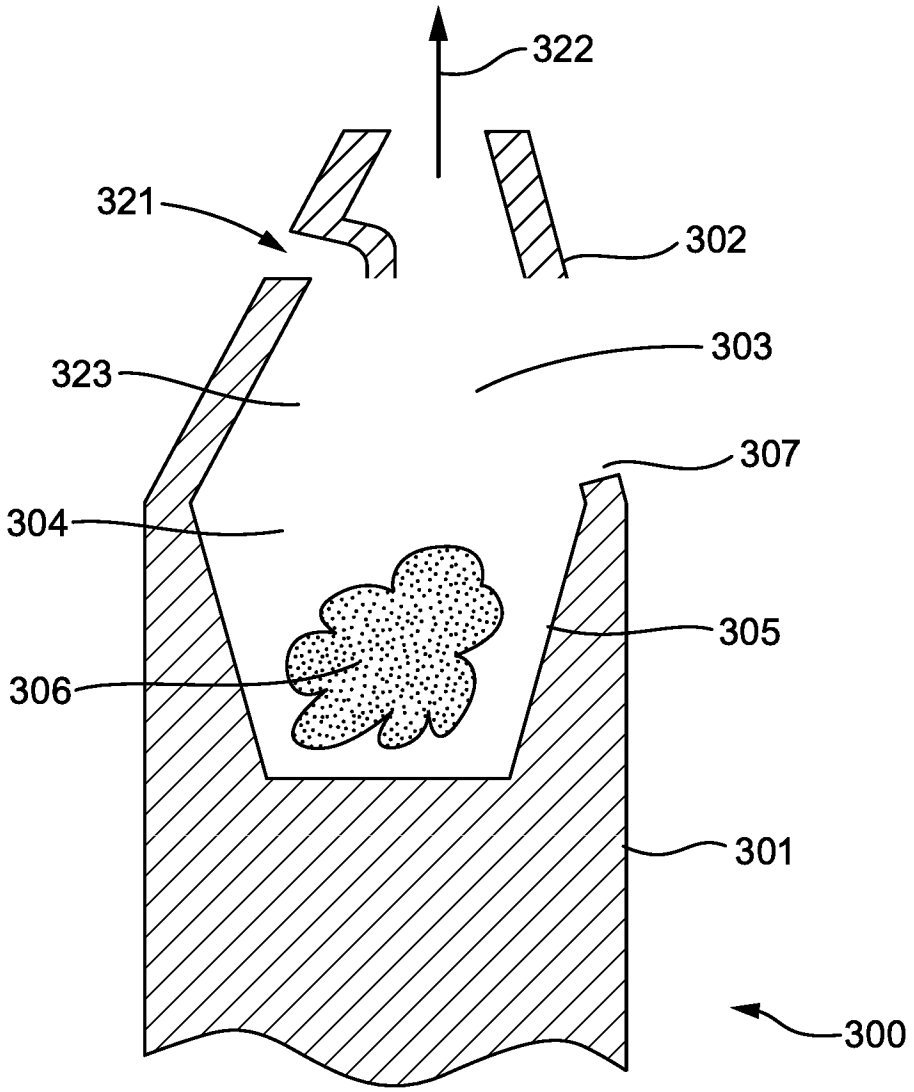


FIG. 3

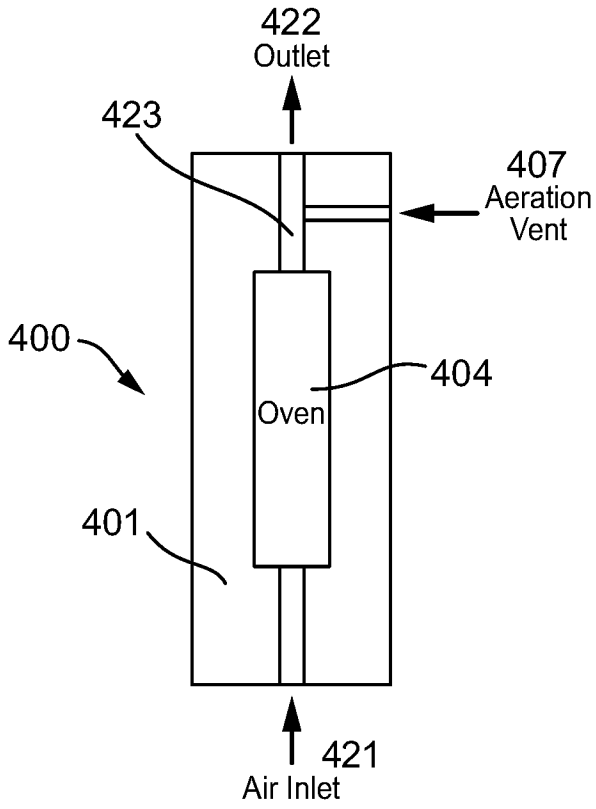


FIG. 4A

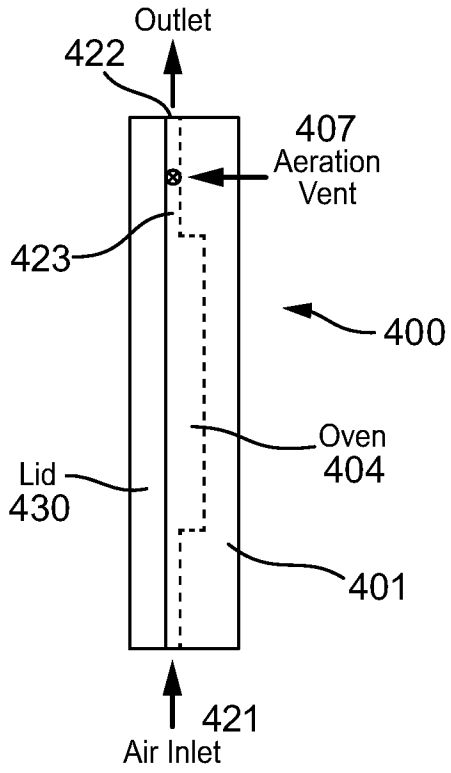


FIG. 4B

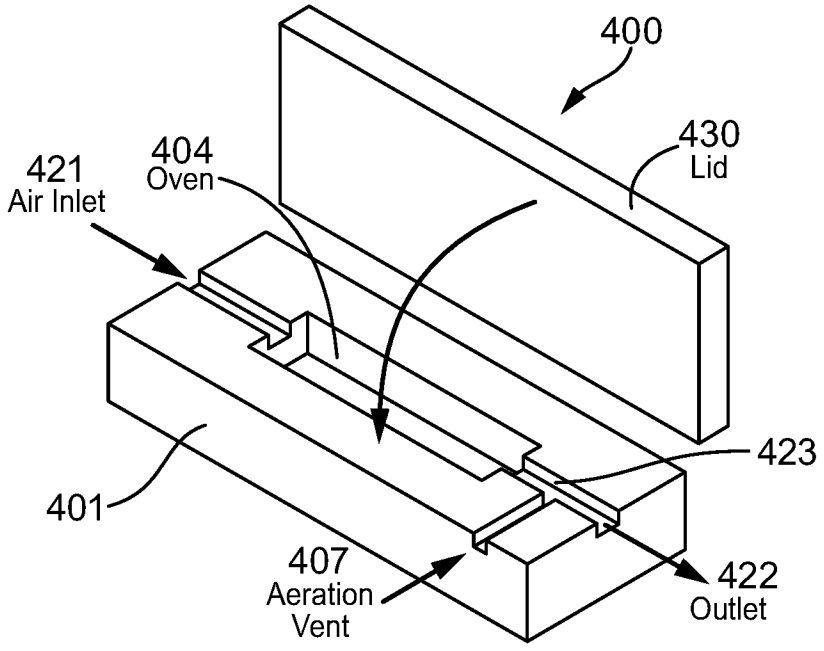


FIG. 4C

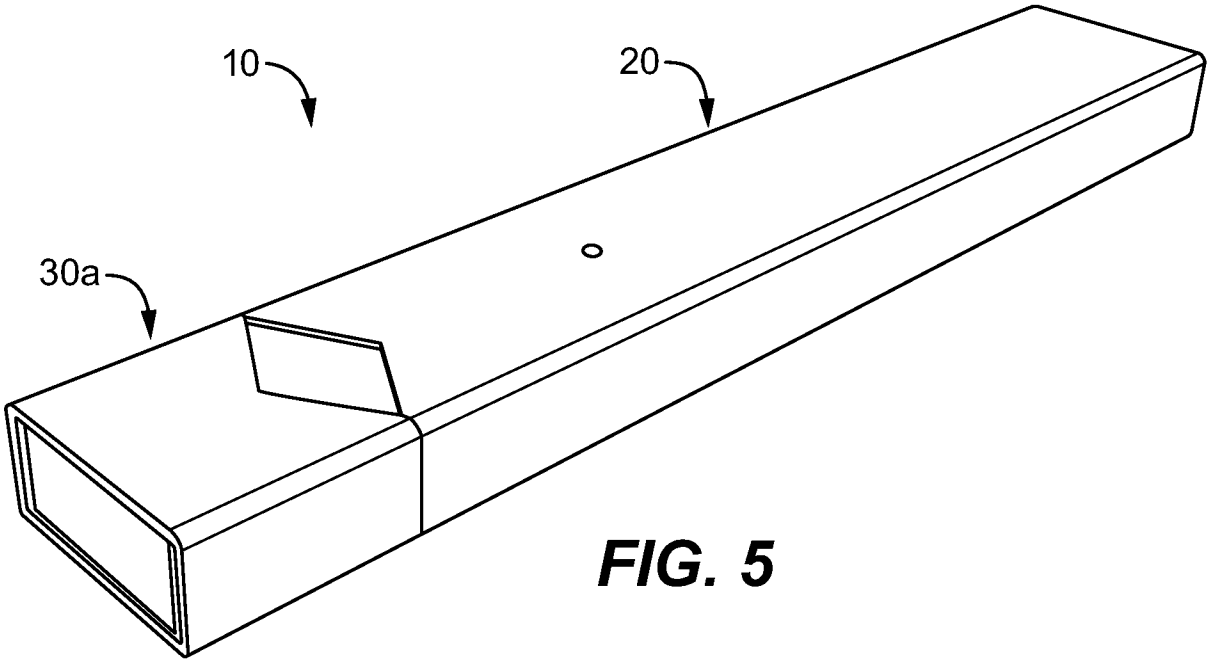


FIG. 5

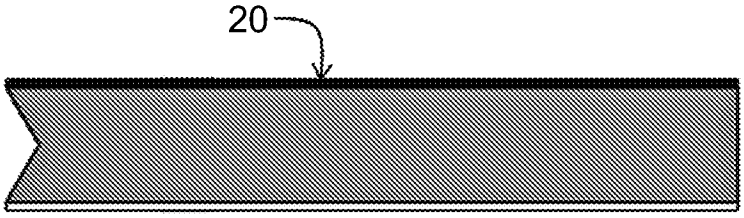


FIG. 6A

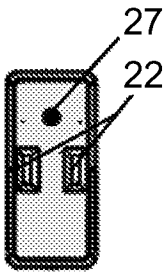


FIG. 6C

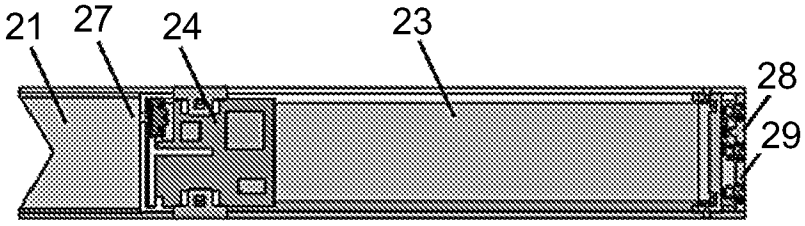
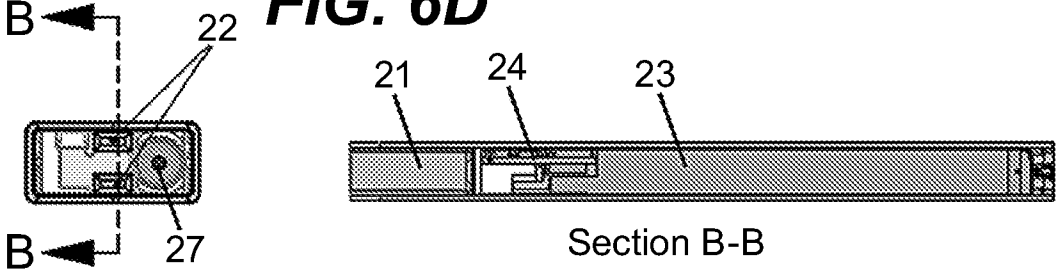


FIG. 6B

FIG. 6D



Section B-B

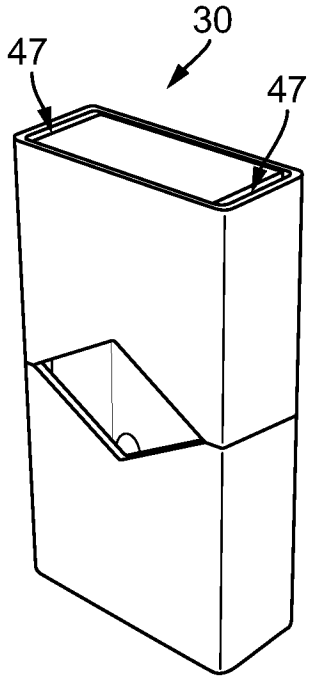


FIG. 7A

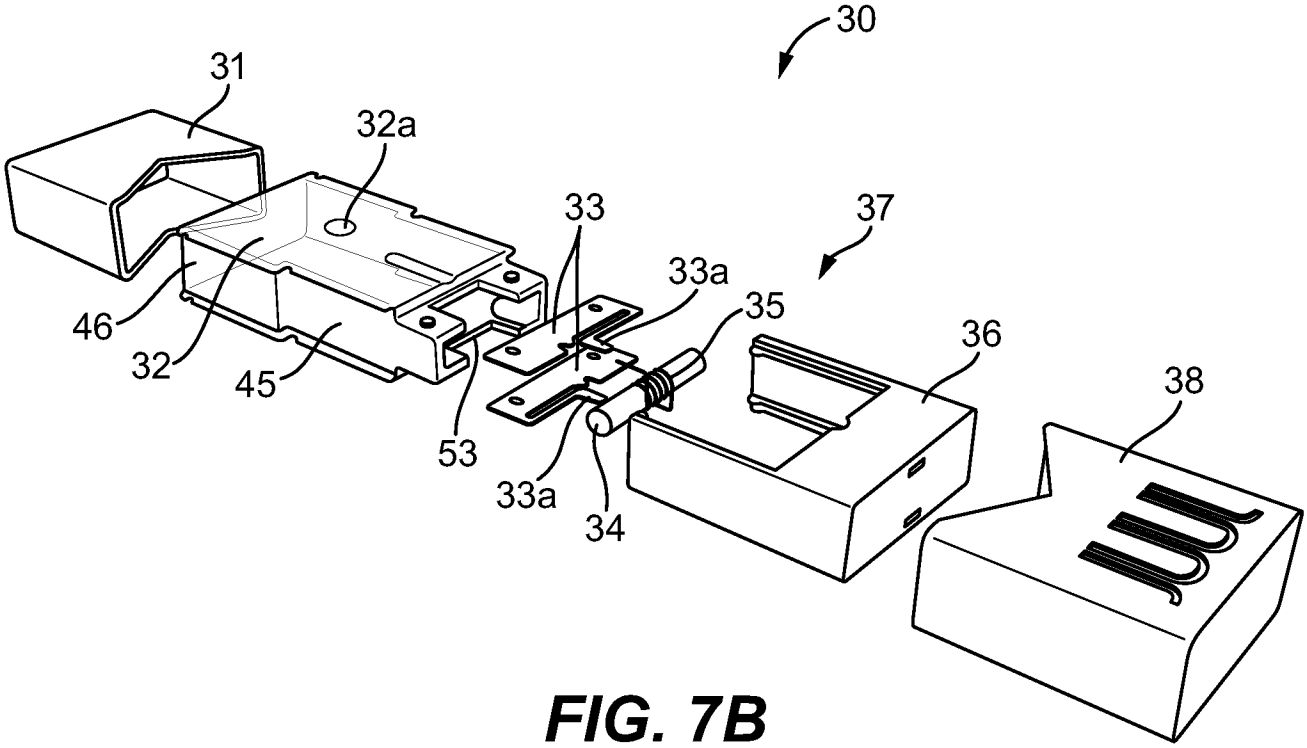


FIG. 7B

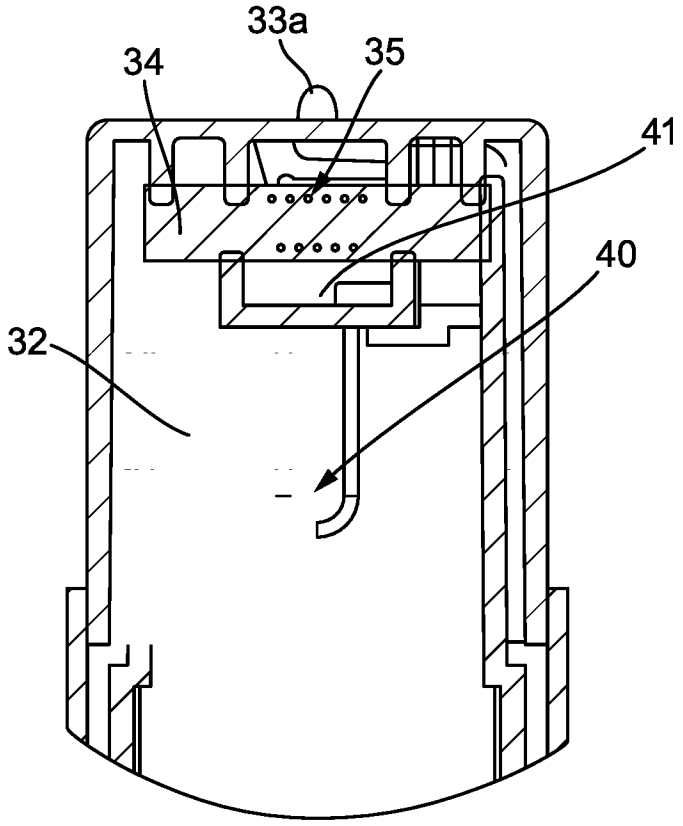


FIG. 7C

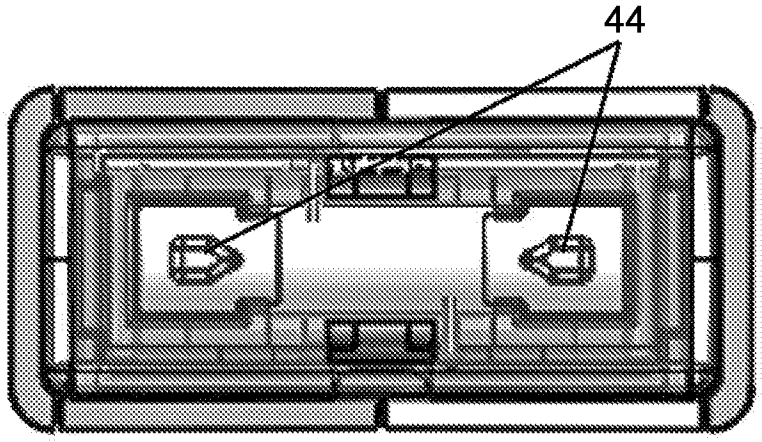


FIG. 8A

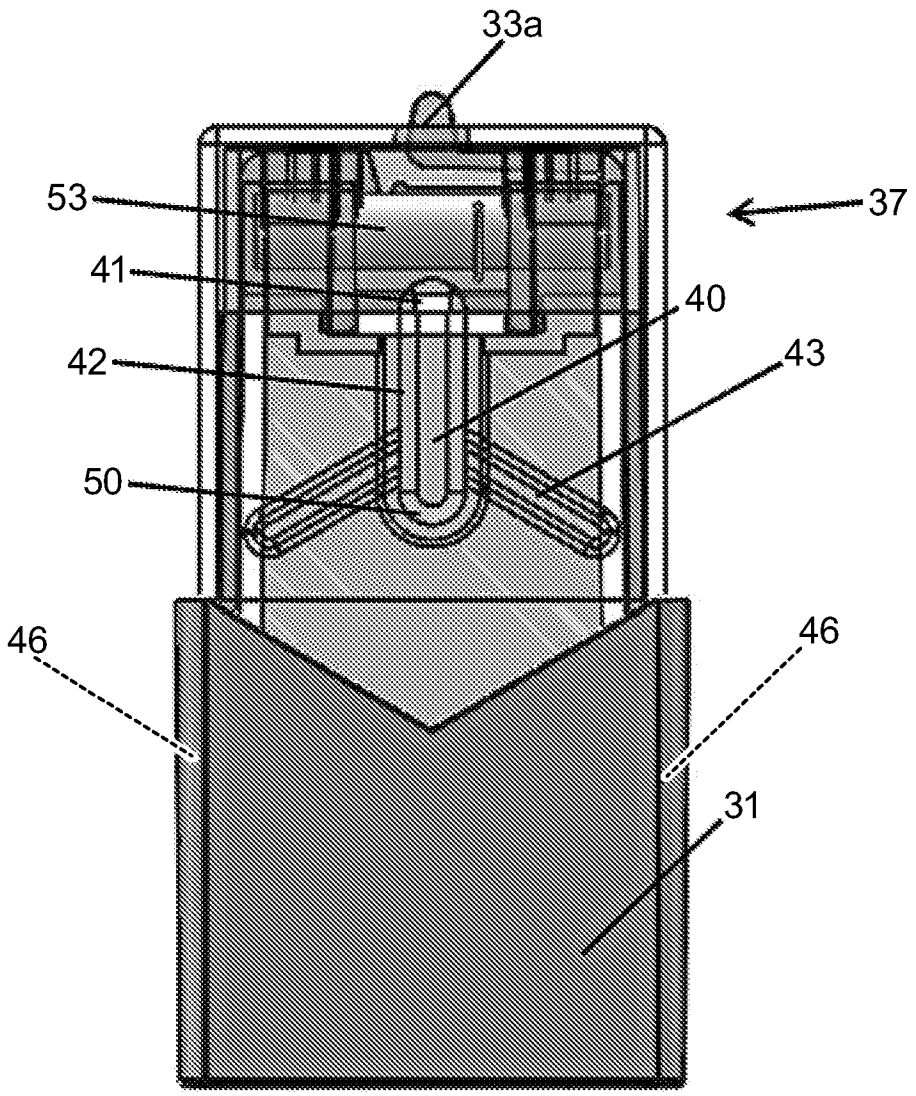


FIG. 8B

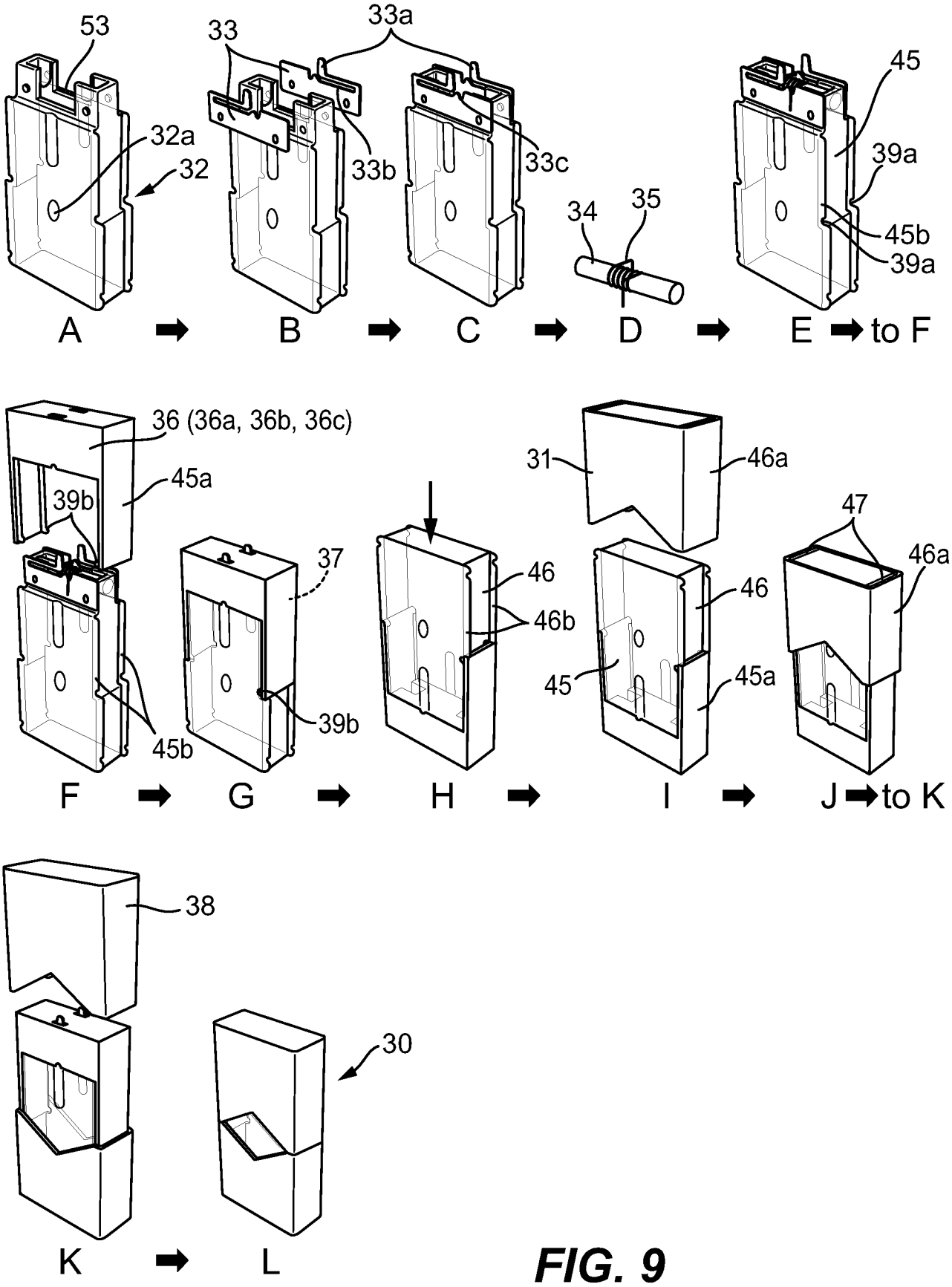

53
33
33a
32a
32
33b
33c
34
35
45
39a
45b
39a
A
B
C
D
E
to F
36 (36a, 36b, 36c)
45a
39b
37
45b
39b
31
46a
46
46b
45
45a
47
46a
F
G
H
I
J
to K
38
30
K
L

FIG. 9

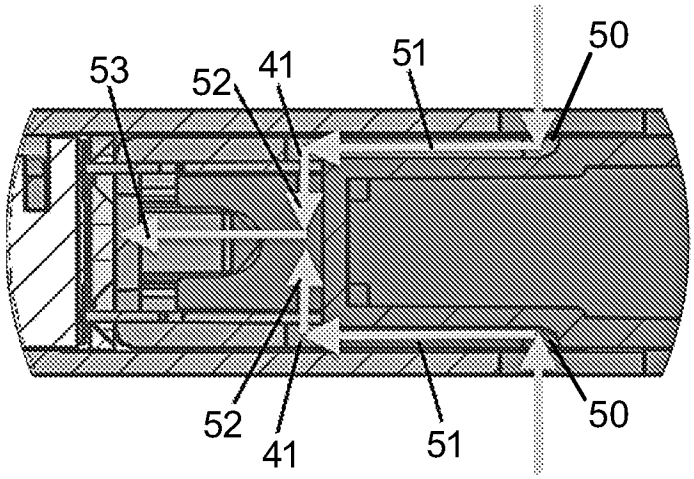


FIG. 10A

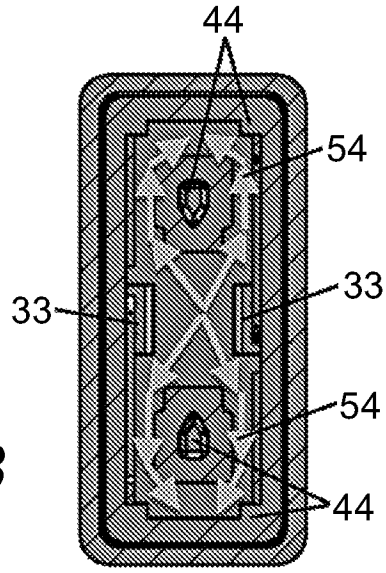


FIG. 10B

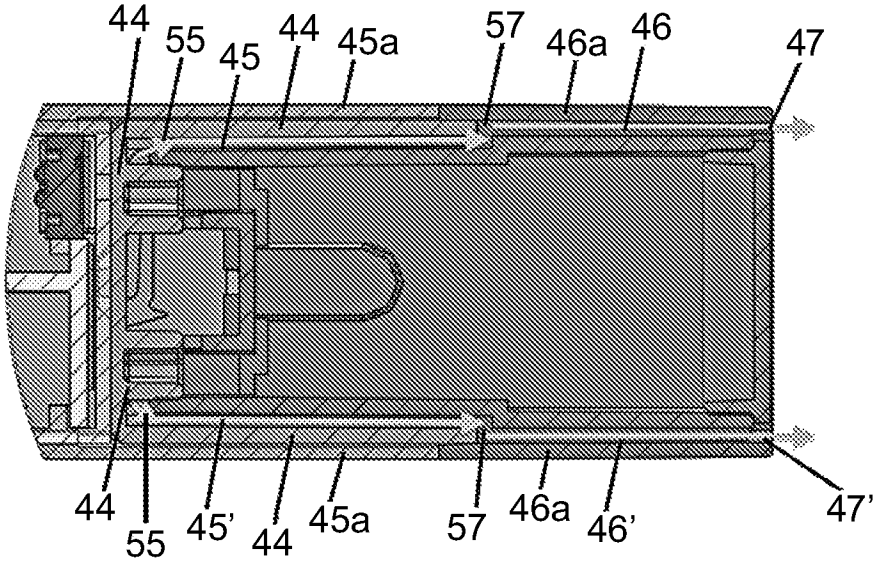


FIG. 10C

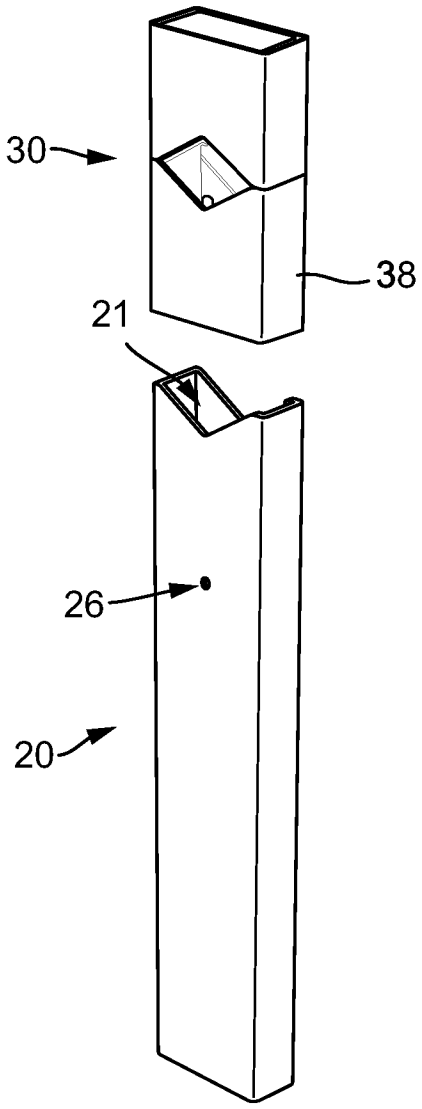


FIG. 11

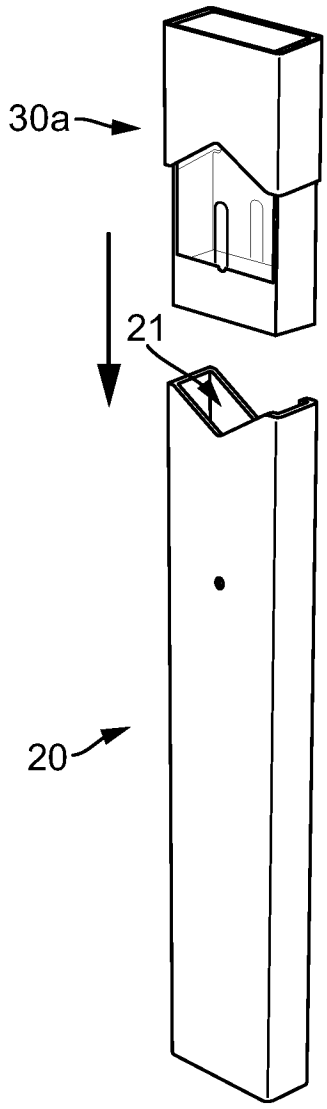


FIG. 12

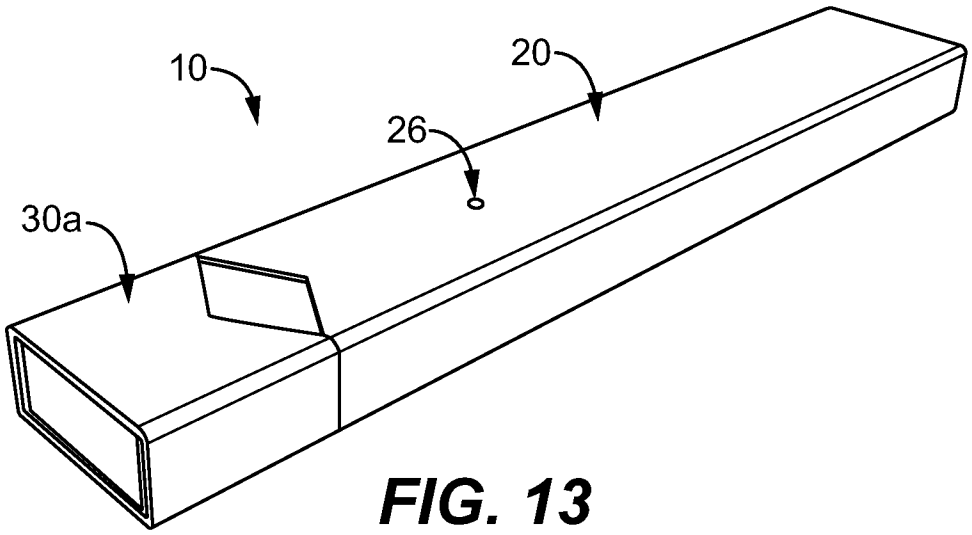


FIG. 13

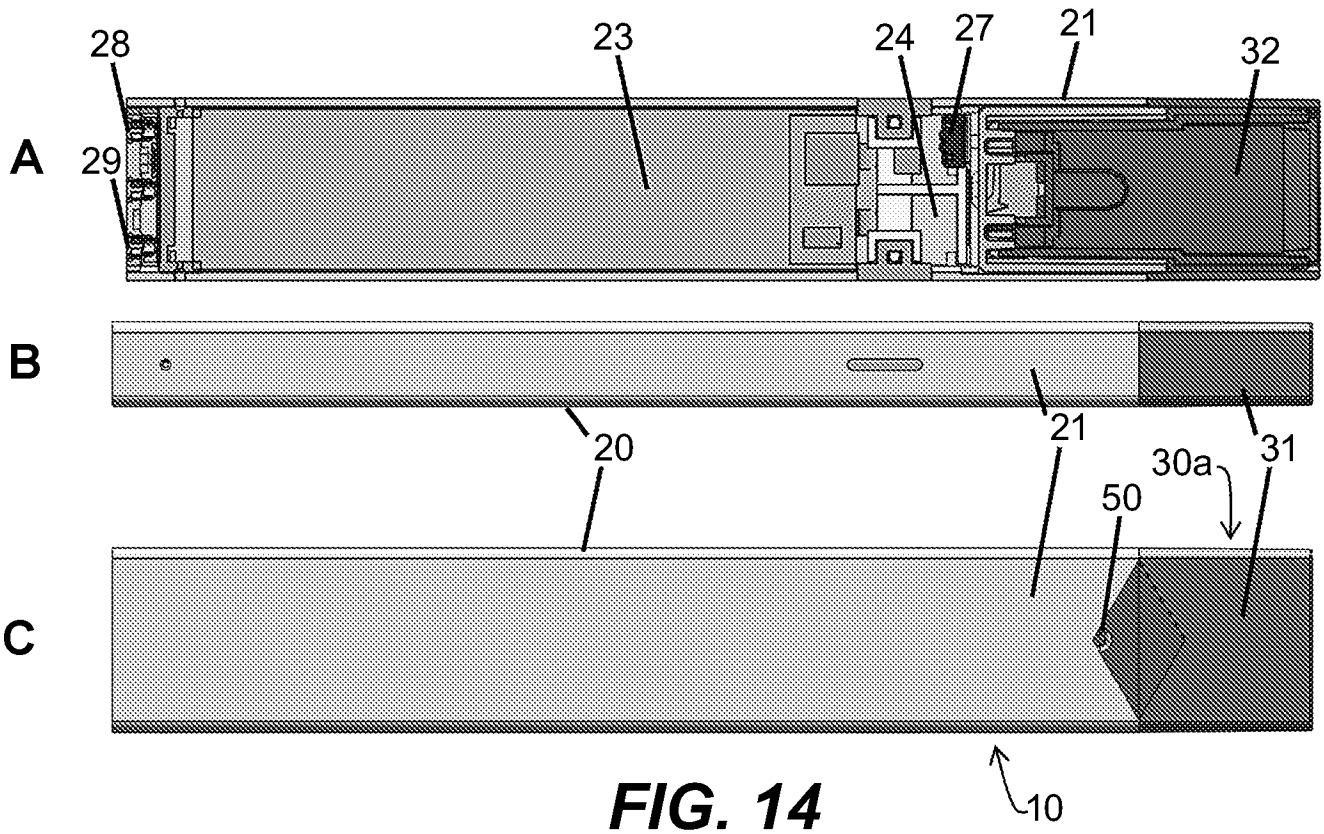


FIG. 14

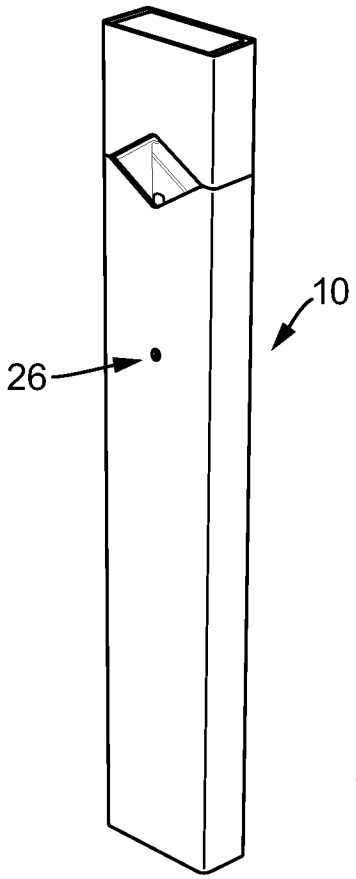


FIG. 15

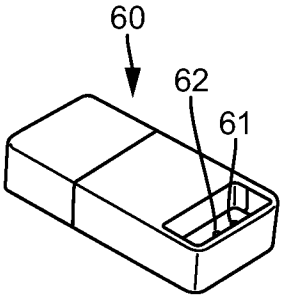


FIG. 16A

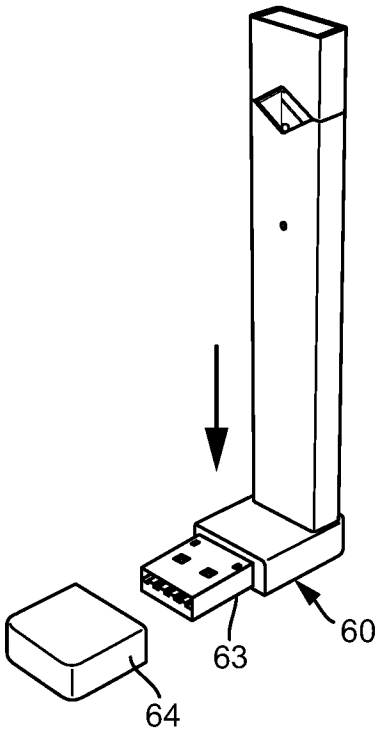


FIG. 16B

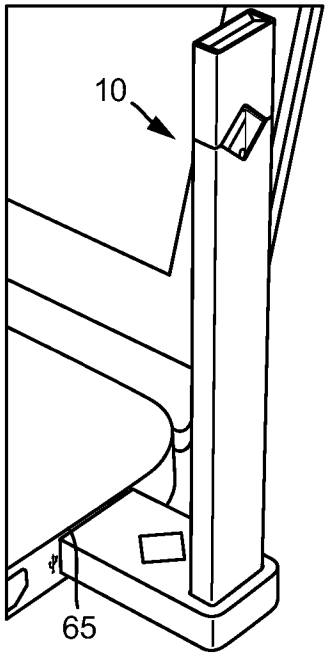


FIG. 16C

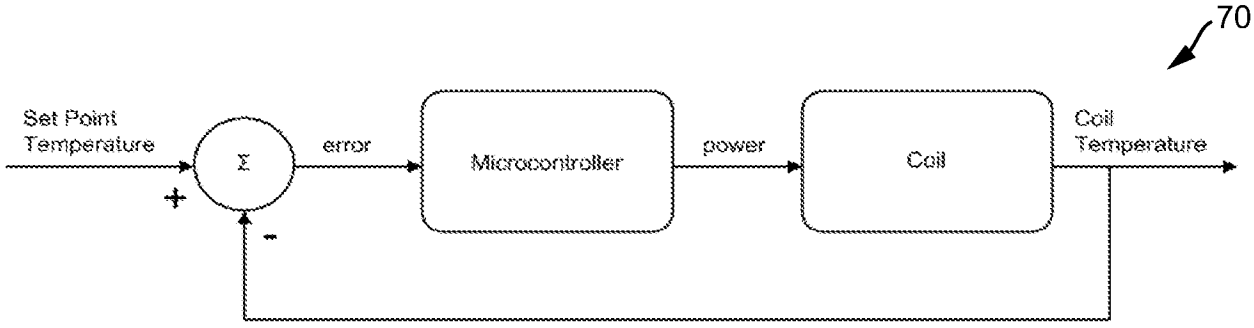


FIG. 17A

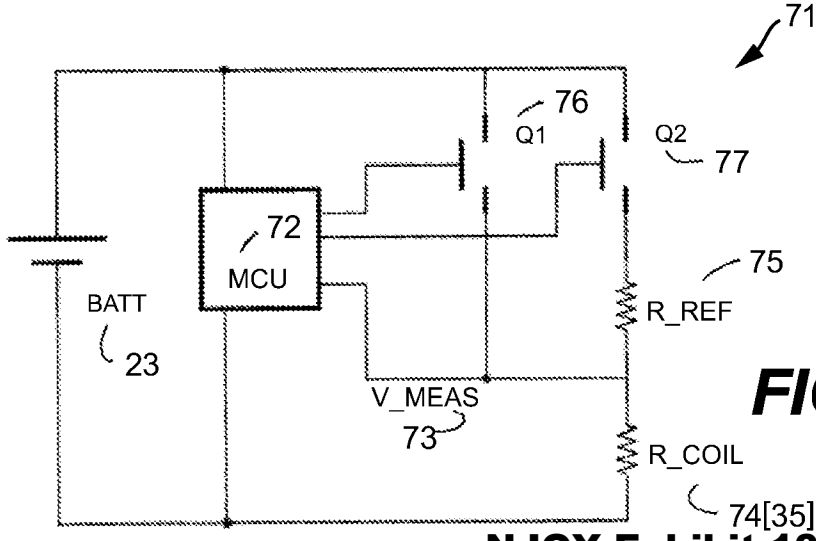


FIG. 17B

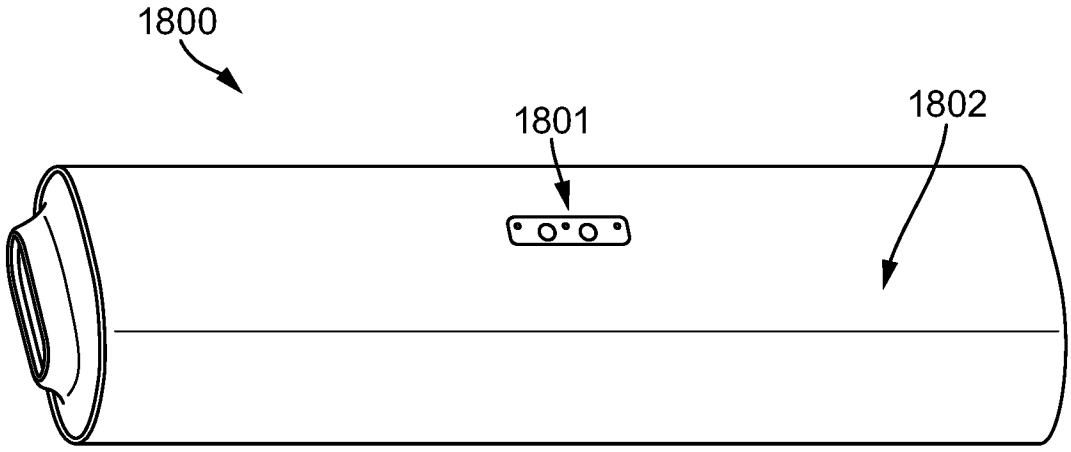


FIG. 18

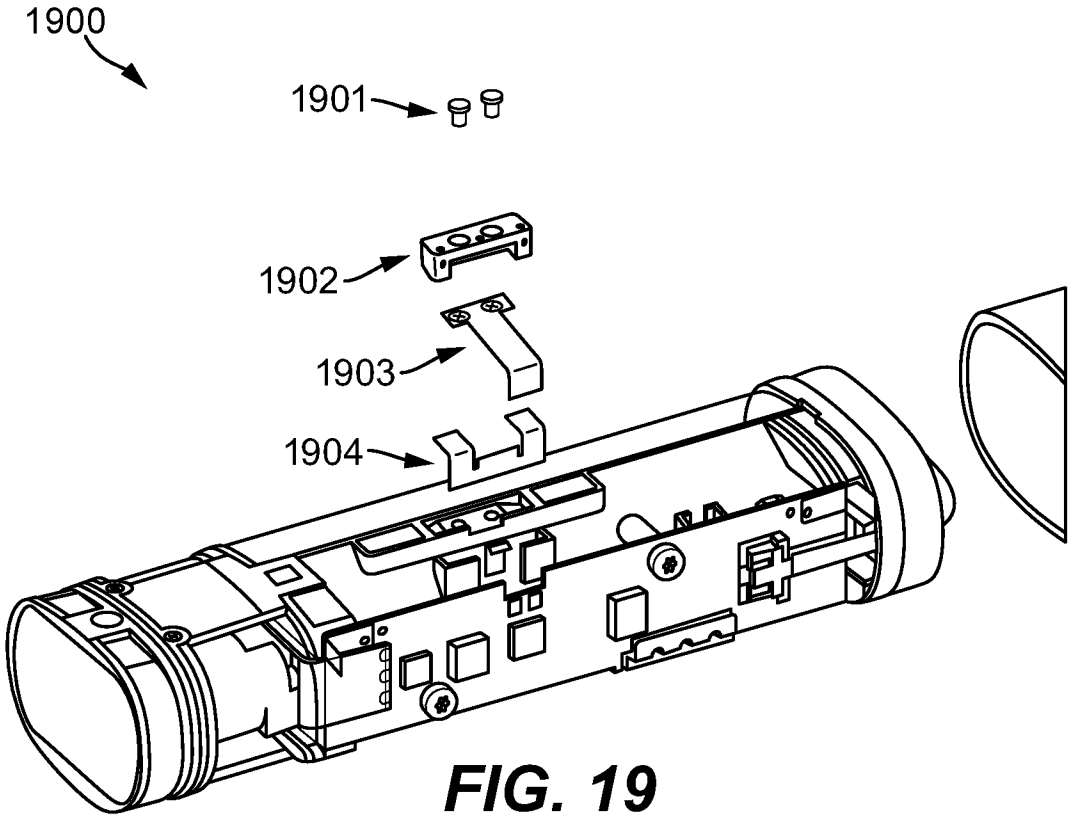


FIG. 19

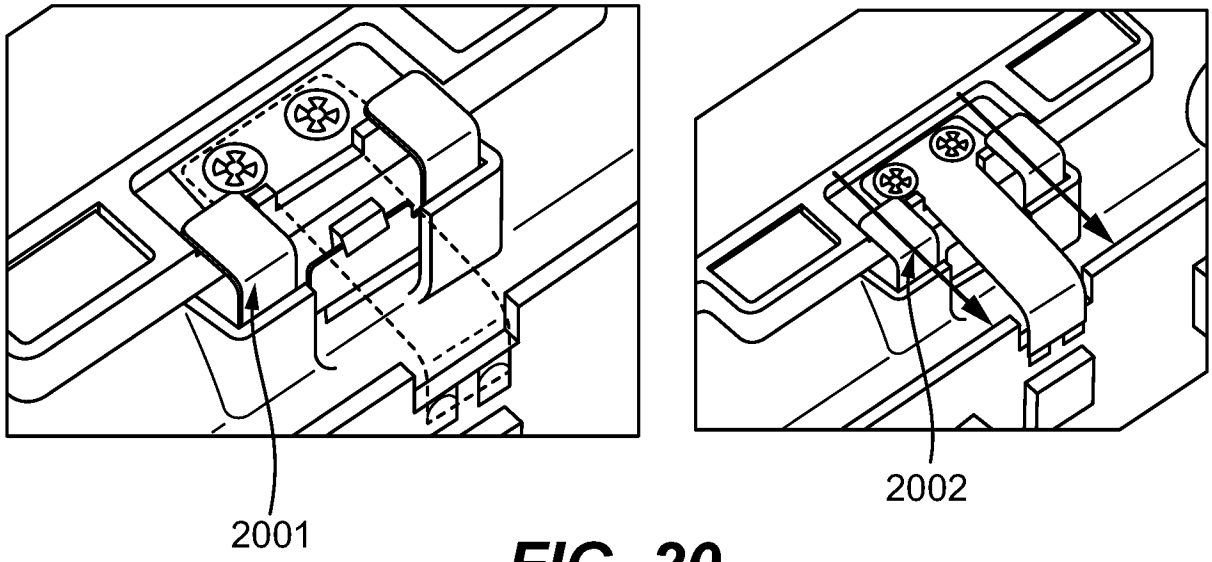


FIG. 20

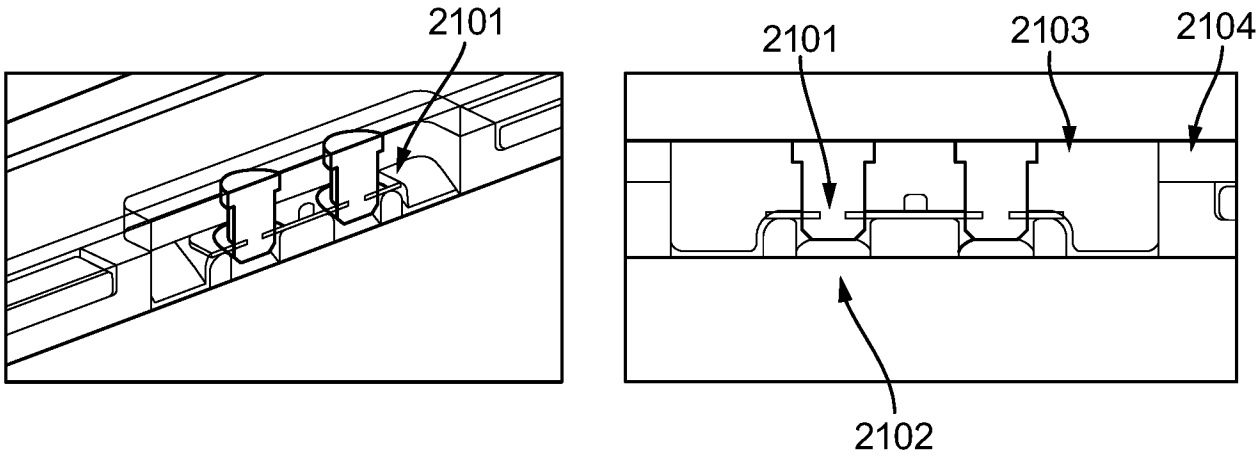


FIG. 21

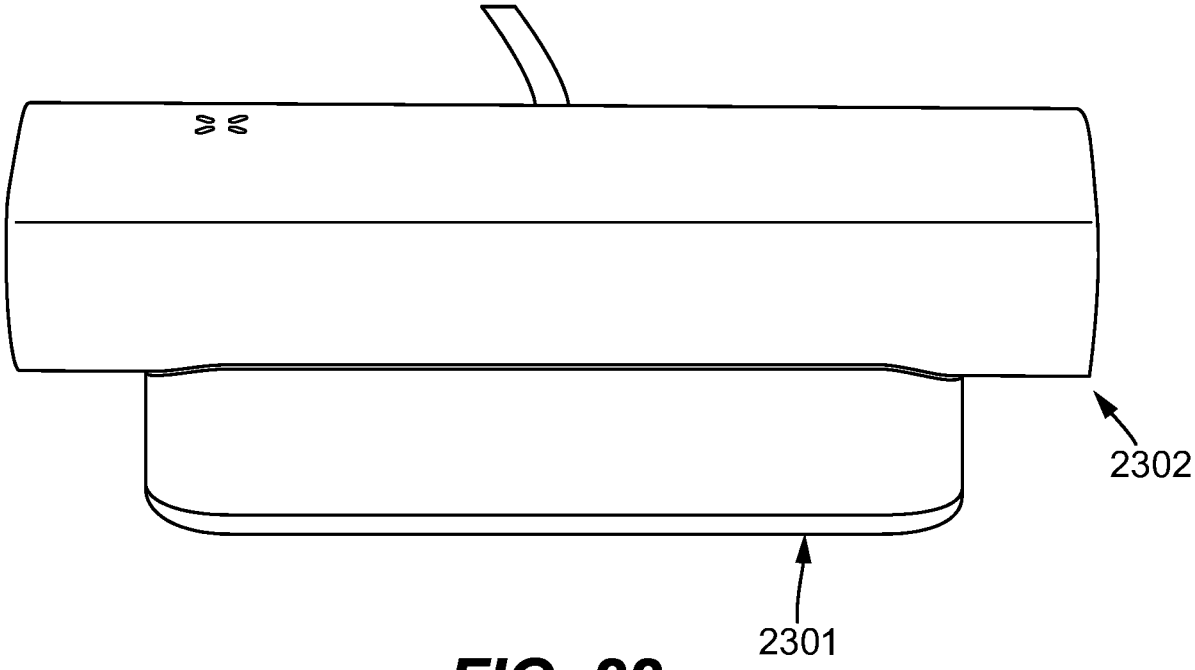


FIG. 22

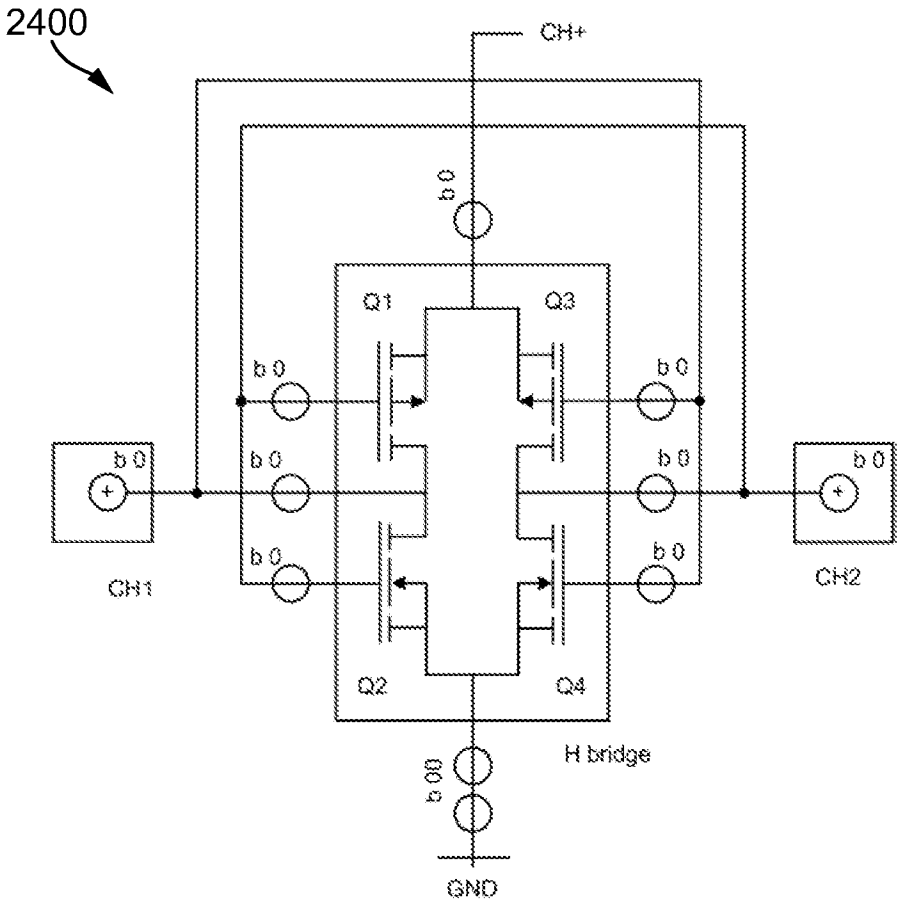


FIG. 23

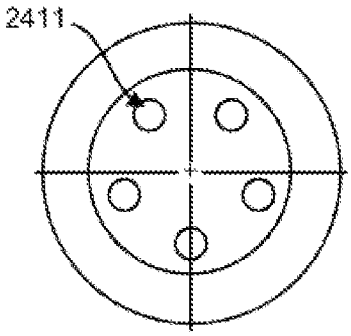


FIG. 24A

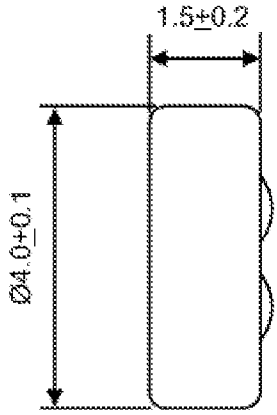


FIG. 24B

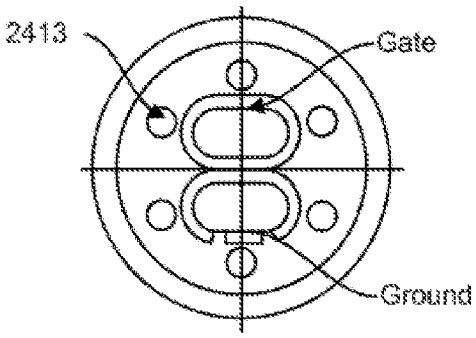


FIG. 24C

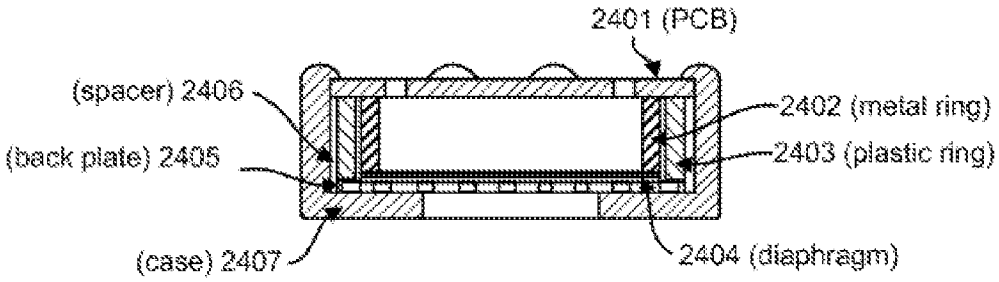


FIG. 24D

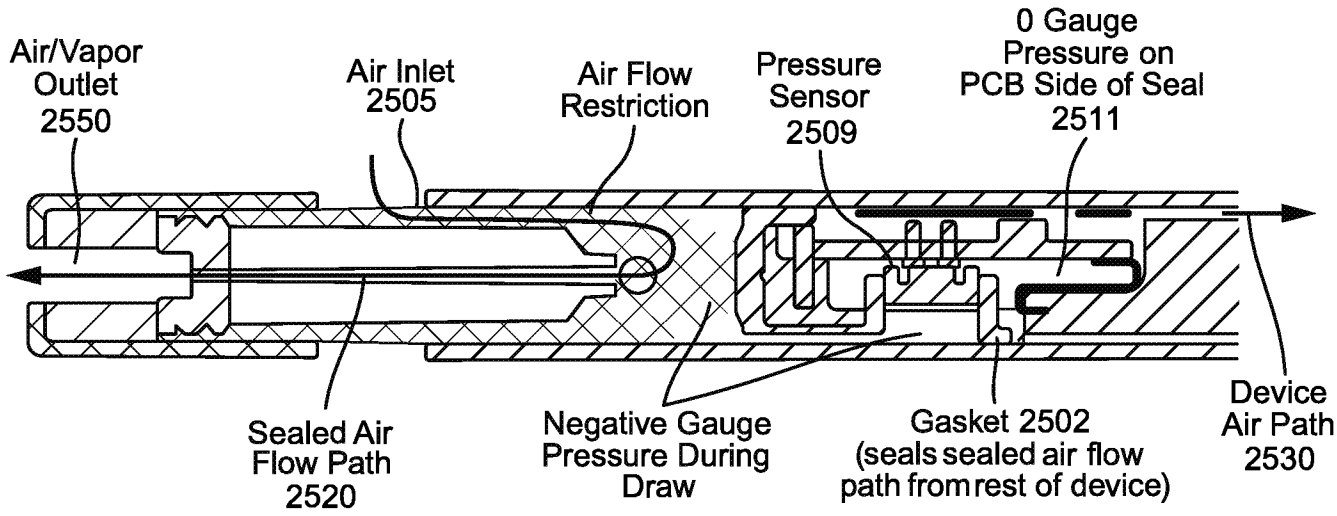


FIG. 25

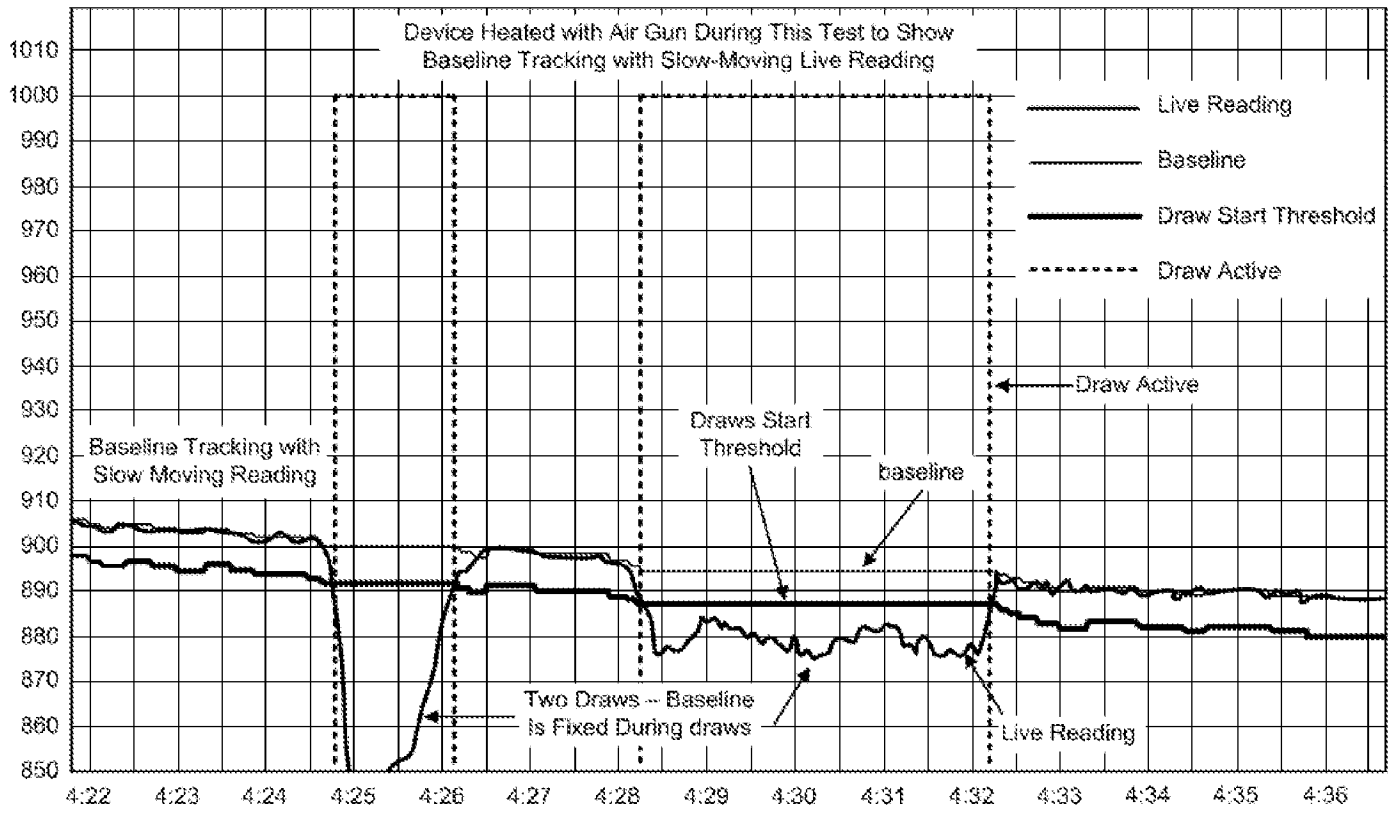

Device Heated with Air Gun During This Test to Show
Baseline Tracking with Slow-Moving Live Reading
Live Reading
Baseline
Draw Start Threshold
Draw Active
Draw Active
Baseline Tracking with
Slow Moving Reading
Draws Start
Threshold
baseline
Two Draws – Baseline
Is Fixed During draws
Live Reading
1010
1000
990
980
970
960
950
940
930
920
910
900
890
880
870
860
850
4:22
4:23
4:24
4:25
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4:36

FIG. 26

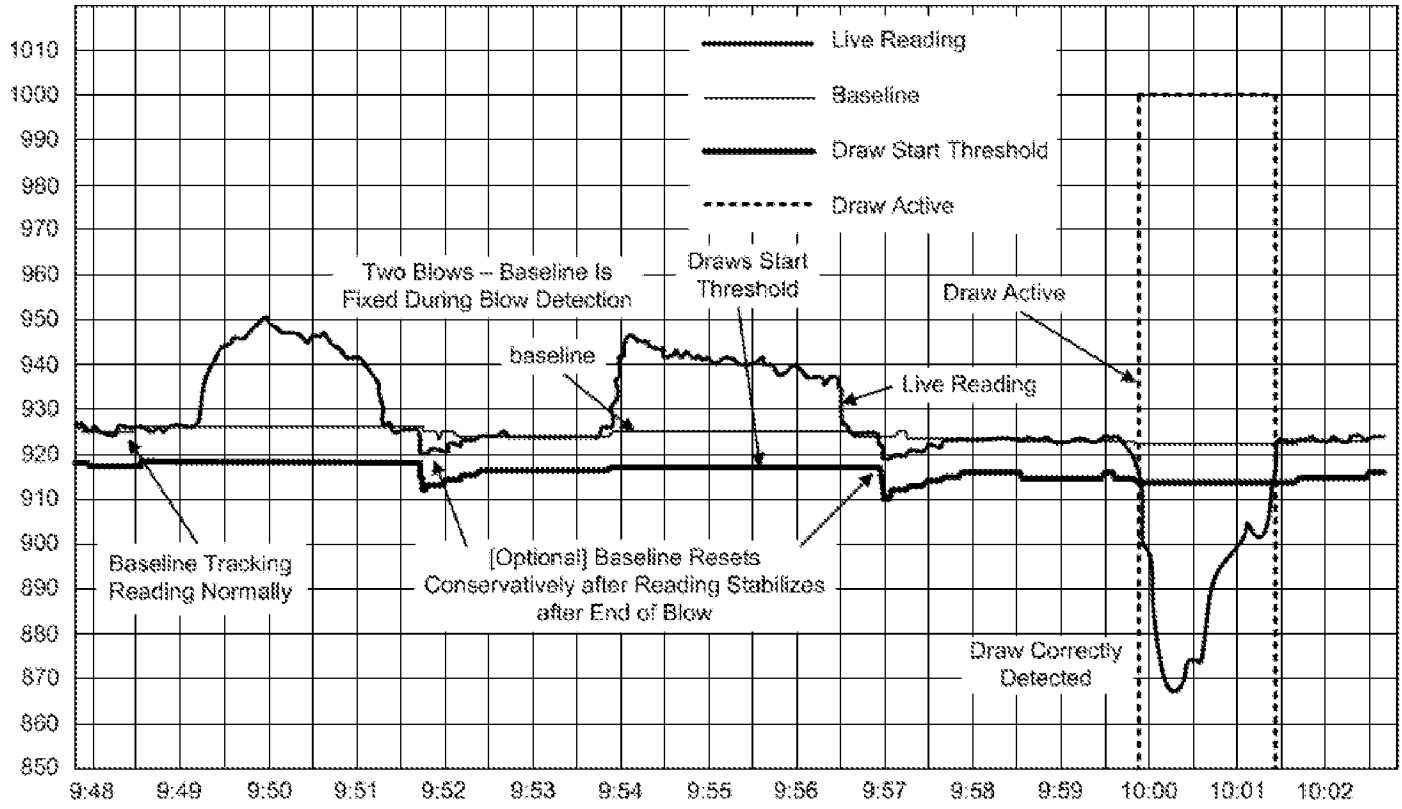

Live Reading
Baseline
Draw Start Threshold
Draw Active
Two Blows – Baseline Is
Fixed During Blow Detection
Draws Start
Threshold
Draw Active
baseline
Live Reading
Baseline Tracking
Reading Normally
[Optional] Baseline Resets
Conservatively after Reading Stabilizes
after End of Blow
Draw Correctly
Detected
1010
1000
990
980
970
960
950
940
930
920
910
900
890
880
870
860
850
9:48
9:49
9:50
9:51
9:52
9:53
9:54
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9:59
10:00
10:01
10:02

FIG. 27

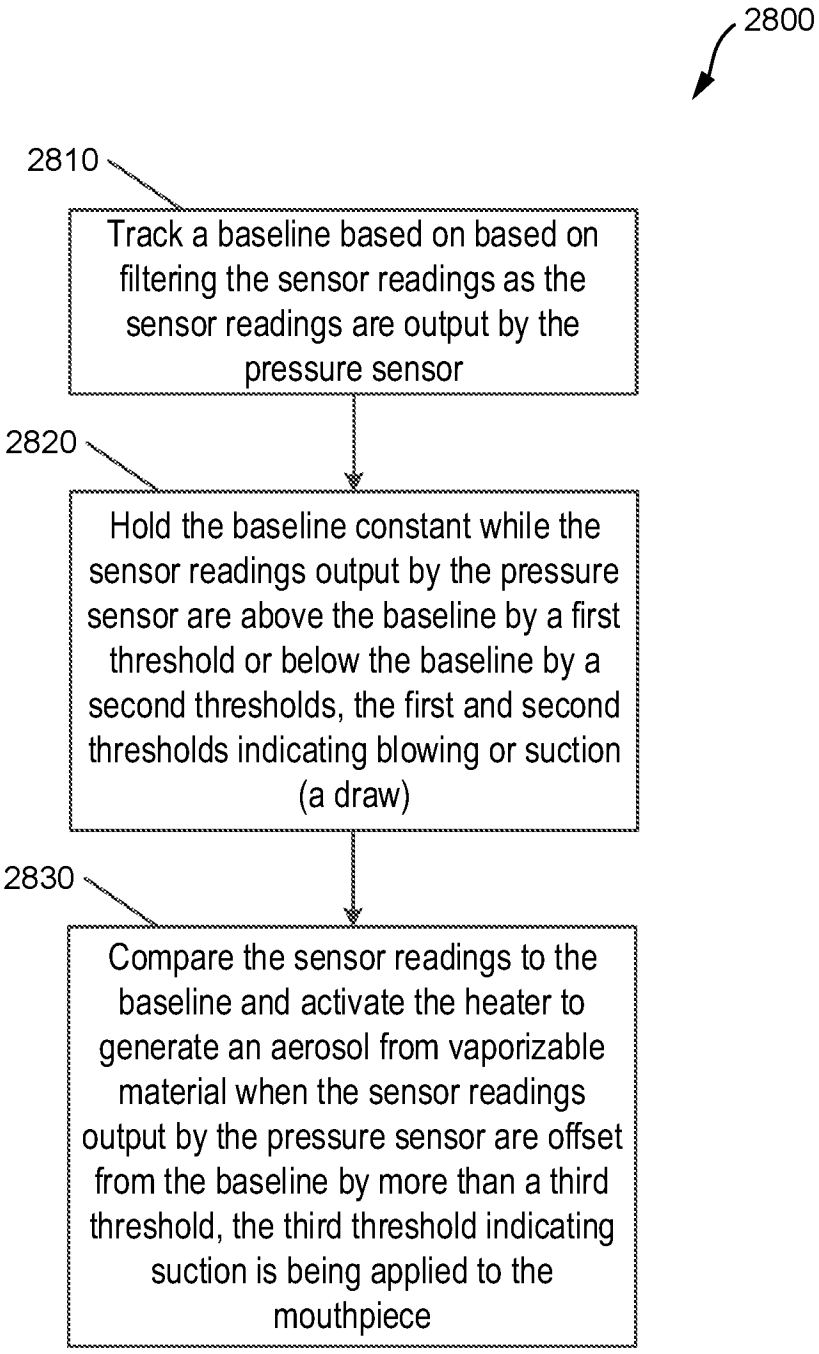

2800
2810
Track a baseline based on based on filtering the sensor readings as the sensor readings are output by the pressure sensor
2820
Hold the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second thresholds, the first and second thresholds indicating blowing or suction (a draw)
2830
Compare the sensor readings to the baseline and activate the heater to generate an aerosol from vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece

FIG. 28

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 15430317 Document Date: 05/30/2018

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

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- Drawing

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Form Revision Date: August 26, 2013

NJOY Exhibit 1002.333

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/430,317	Filing Date 02/10/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	05/30/2018	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 25	= 6	X $50 =	300
	Independent (37 CFR 1.16(h))	* 6	Minus	***4	= 2	X $230 =	460
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**760**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

SLIE
ADRIENE SELLMAN

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Document code: WFEE

United States Patent and Trademark Office
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NJOY Exhibit 1002.335

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

148514 7590 06/11/2018

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER	
GIRARDI, VANESSA MARY	

ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
06/11/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketingBOS@mintz.com
IPFileroombos@mintz.com

NJOY Exhibit 1002.336

Notice of Abandonment	Application No.	Applicant(s)
	15/430,317	HATTON ET AL.
	Examiner	Art Unit
	VANESSA GIRARDI	2833

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

This application is abandoned in view of:

1. ☒ Applicant's failure to timely file a proper reply to the Office letter mailed on *27 November 2017*.
   (a) ☒ A reply was received on *20 May 2018* (with a Certificate of Mailing or Transmission dated *30 May 2018*), which is after the expiration of the period for reply (including a total extension of time of *3* month(s)) which expired on *29 May 2018*.
   (b) ☐ A proposed reply was received on _____, but it does not constitute a proper reply under 37 CFR 1.113 to the final rejection.
   (A proper reply under 37 CFR 1.113 to a final rejection consists only of: (1) a timely filed amendment which places the application in condition for allowance; (2) a timely filed Notice of Appeal (with appeal fee); or (3) if this is utility or plant application, a timely filed Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. Note that RCEs are not permitted in design applications.)
   (c) ☐ A reply was received on _____ but it does not constitute a proper reply, or a bona fide attempt at a proper reply, to the non-final rejection. See 37 CFR 1.85(a) and 1.111. (See explanation in box 7 below).
   (d) ☐ No reply has been received.

2. ☐ Applicant's failure to timely pay the required issue fee and publication fee, if applicable, within the statutory period of three months from the mailing date of the Notice of Allowance (PTOL-85).
   (a) ☐ The issue fee and publication fee, if applicable, was received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the statutory period for payment of the issue fee (and publication fee) set in the Notice of Allowance (PTOL-85).
   (b) ☐ The submitted fee of $_____ is insufficient. A balance of $_____ is due.
   The issue fee required by 37 CFR 1.18 is $_____. The publication fee, if required by 37 CFR 1.18(d), is $_____.
   (c) ☐ The issue fee and publication fee, if applicable, has not been received.

3. ☐ Applicant's failure to timely file corrected drawings as required by, and within the three-month period set in, the Notice of Allowability (PTO-37).
   (a) ☐ Proposed corrected drawings were received on _____ (with a Certificate of Mailing or Transmission dated _____), which is after the expiration of the period for reply.
   (b) ☐ No corrected drawings have been received.

4. ☐ The letter of express abandonment which is signed by the attorney or agent of record or other party authorized under 37 CFR 1.33(b). See 37 CFR 1.138(b).

5. ☐ The letter of express abandonment which is signed by an attorney or agent (acting in a representative capacity under 37 CFR 1.34) upon the filing of a continuing application.

6. ☐ The decision by the Board of Patent Appeals and Interference rendered on _____ and because the period for seeking court review of the decision has expired and there are no allowed claims.

7. ☐ The reason(s) below:

/VANESSA GIRARDI/
Primary Examiner, Art Unit 2833

Petitions to revive under 37 CFR 1.137, or requests to withdraw the holding of abandonment under 37 CFR 1.181, should be promptly filed to minimize any negative effects on patent term.

NJOY Exhibit 1002.337

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFS-Web	PTO/SB/64 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**PETITION FOR REVIVAL OF AN APPLICATION FOR PATENT ABANDONED UNINTENTIONALLY UNDER 37 CFR 1.137(a)**
Application Number	15430317
Filing Date	10-Feb-2017
First Named Inventor	Nicholas HATTON
Attorney Docket Number	52210-515001US/736.200
Title	VAPORIZER DEVICES WITH BLOW DISCRIMINATION

The above-identified application became abandoned for failure to file a timely and proper reply to a notice or action by the United States Patent and Trademark Office. The date of abandonment is the day after the expiration date of the period set for reply in the office notice or action plus any extensions of time actually obtained.

APPLICANT HEREBY PETITIONS FOR REVIVAL OF THIS APPLICATION

NOTE: A grantable petition requires the following items:
(1) Petition fee;
(2) Reply and/or issue fee;
(3) Terminal disclaimer with disclaimer fee - required for all utility and plant applications filed before June 8, 1995; and for all design applications; and
(4) Statement that the entire delay was unintentional

Petition Fee

- (◉) Small Entity
- ( ) Micro Entity
- ( ) Regular Undiscounted

2. Reply and/or fee

(◉) I certify, in accordance with 37 CFR 1.4(d)(4) that the amendment and response have already been filed in the above-identified application on 05-30-2018

( ) Amendment and response are attached

RCE request,submission, and fee.

( ) I certify, in accordance with 37 CFR 1.4(d)(4) that the RCE Request, Submission, and Fee have already been filed in the above-identified application on

( ) RCE Request, Submission, and Fee are attached

Notice of Appeal

( ) I certify, in accordance with 37 CFR 1.4(d)(4) that the Notice of Appeal and Fee have already been filed in the above-identified application on

NJOY Exhibit 1002.338

○ Notice of Appeal and Fee are attached 3. Terminal Disclaimer is not required, since the Electronic Petition format is not support for Design applications and applications filed before June 8, 1995. Please file using regular petition format for review by the Office of Petitions. ☒ STATEMENT: The entire delay in filing the required reply from the due date for the required reply until the filing of a grantable petition under 37 CFR 1.137(a) was unintentional.
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who has been given power of attorney in this application. ○ An attorney or agent registered to practice before the Patent and Trademark Office, acting in a representative capacity. ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this e-petition

Signature	/npm/
Name	Nicholas P. Mouton
Registration Number	75306

Electronic Patent Application Fee Transmittal

Application Number:	15430317
Filing Date:	10-Feb-2017
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Filer:	Nicholas Paul Mouton/Matthew Tupper
Attorney Docket Number:	52210-515001US/736.200

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PET. REVIVE ABANDON APP, DELAY PYMT-RESP	2453	1	1000	1000
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

NJOY Exhibit 1002.340

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date June 13, 2018

In re Application of Nicholas HATTON

Application No. 15430317

Filed: 10-Feb-2017

Attorney Docket No. 52210-515001U

DECISION ON PETITION

UNDER CFR 1.137(a)

This is an electronic decision on the petition under 37 CFR 1.137(a), June 13, 2018 , to revive the above-identified application.

The petition is **GRANTED**.

The above-identified application became abandoned for failure to reply in a timely manner to the outstanding Office communication. The date of abandonment is the day after the last day of the period set for reply in the Office action plus any applicable extensions of time properly requested.

The electronic petition satisfies the conditions for revival pursuant to the provisions of 37 CFR 1.137(a) in that (1) the reply in the form of aresponse; (2) the petition fee as set forth in 37 CFR 1.17 (m); and (3) the required statement of unintentional delay have been received. Accordingly, the response is accepted as having been unintentionally delayed.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

This application file is being directed to the Technology Center.

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	32892710
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Nicholas Paul Mouton/Matthew Tupper
Filer Authorized By:	Nicholas Paul Mouton
Attorney Docket Number:	52210-515001US/736.200
Receipt Date:	13-JUN-2018
Filing Date:	10-FEB-2017
Time Stamp:	20:44:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1000
RAM confirmation Number	061418INTEFSW00006086500311
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

NJOY Exhibit 1002.343

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	33880 6f95ea9f6b4680cc46cd0aa627b5f23a122e19e9	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30512 6fd0e5d5d5bdb8bbe1b38b263abc537d8b5252d4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	64392		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Used in Lieu of PTO/SB/08A/B
(Based on PTO 11-07 version)

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	1	of	2

Complete if Known	
Application Number	15/430,317
Filing Date	February 10, 2017
First Named Inventor	Nicholas Jay Hatton
Art Unit	2833
Examiner Name	V. M. Girardi
Attorney Docket Number	052210-515001US/736.200

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A	US-20140261487-A1	09-18-2014	Chapman et al.	
	B	US-20150090278-A1	04-02-2015	Schiff et al.	
	C	US-20150208726-A1	07-30-2015	Liu	
	D	US-20150208729-A1	07-30-2015	Monsees et al.	
	E	US-20150245658-A1	09-03-2015	Worm et al.	
	F	US-20160192705-A1	07-07-2016	BORKOVEC et al.	
	G	US-20160198767-A1	07-14-2016	Verleur	
	H	US-20160262453-A1	09-15-2016	Ampolini et al.	
	I	US-20170023952-A1	01-26-2017	Henry, JR. et al.	
	J	US-20170042227-A1	02-16-2017	GAVRIELOV et al.	
	K	US-20170245547-A1	08-31-2017	LIPOWICZ	
	L	US-20170273355-A1	09-28-2017	Rogers et al.	
	M	US-4,947,874	08-14-1990	Brooks et al.	
	N	US-8,499,766-B1	08-06-2013	Newton	
	O	US-8,910,639-B2	12-16-2014	Chang et al.	
	P	US-9,022,026-B2	05-05-2015	Fang	
	Q	US-9,642,397	05-09-2017	Dai et al.	
	R	US-9,714,878	07-25-2017	Powers et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	A	WO-2014144678-A2	09-18-2014	Lewis, Michael		
	B	WO-2015149368-A1	10-08-2015	Liu, Shuigen		
	C	WO-2017001817-A1	01-05-2017	Nicoventures Holdings Ltd		
	D	WO-2017113845-A1	07-06-2017	Lin, Guangrong		
	E	WO-2017143865-A1	08-31-2017	Changzhou Jwei Intelligent Tech Co Ltd		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Used in Lieu of PTO/SB/08A/B
(Based on PTO 11-07 version)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	15/430,317
				Filing Date	February 10, 2017
				First Named Inventor	Nicholas Jay Hatton
				Art Unit	2833
(Use as many sheets as necessary)				Examiner Name	V. M. Girardi
Sheet	2	of	2	Attorney Docket Number	052210-515001US/736.200

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

Docket No.: 52210-515001US/736.200
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Nicholas Jay Hatton et al.

Application No.: 15/430,317 | Confirmation No.: 8844

Filed: February 10, 2017 | Art Unit: 2833

For: VAPORIZER DEVICES WITH BLOW DISCRIMINATION | Examiner: V. M. Girardi

INFORMATION DISCLOSURE STATEMENT (IDS)

FILED VIA EFS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98, the attention of the United States Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed more than three months after the filing date of this application, OR more than three months after the date of entry of the national stage in the international application, AND after the mailing date of a first Office Action on the merits, but before the mailing date of any of a Final Action under 37 C.F.R. § 1.113, a Notice of Allowance under 37 C.F.R. § 1.311 or an action that otherwise closes prosecution in this application (37 C.F.R. § 1.97(c)).

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), copies of U.S. patents and U.S. patent application publications are not submitted. Submitted herewith are copies of the foreign patents in accordance with 37 C.F.R. § 1.98(a)(2).

In accordance with 37 C.F.R. § 1.97(g), the filing of this Information Disclosure Statement shall not be construed as a representation that a search has been made. In accordance with 37 C.F.R. § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that the information cited in this Information Disclosure Statement is, or is considered to be, material to the patentability as defined in 37 C.F.R. § 1.56(b).

It is submitted that the Information Disclosure Statement is in compliance with 37 C.F.R. § 1.98, and the Examiner is respectfully requested to consider the listed references.

Please charge our Deposit Account No. 50-0311 in the amount of $120.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0311, under Order No. 52210-515001US/736.200.

Respectfully submitted,

Dated: August 14, 2018

/npm/

Nicholas P. Mouton, Esq.
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(858) 314-1501 (Fax)
Attorney for Applicant

NJOY Exhibit 1002.348

Electronic Patent Application Fee Transmittal

Application Number:	15430317
Filing Date:	10-Feb-2017
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Filer:	Nicholas Paul Mouton/shae jackson
Attorney Docket Number:	52210-515001US/736.200

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

NJOY Exhibit 1002.349

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**120**

Electronic Acknowledgement Receipt

EFS ID:	33469574
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Nicholas Paul Mouton
Filer Authorized By:	
Attorney Docket Number:	52210-515001US/736.200
Receipt Date:	14-AUG-2018
Filing Date:	10-FEB-2017
Time Stamp:	23:38:50
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$120
RAM confirmation Number	081518INTEFSW00006802500311
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

NJOY Exhibit 1002.351

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Foreign Reference	WO2014144678A2.pdf	2802047 5dd500ab6ed64f0fc5eca68065caeaa0e326755b	no	54
Warnings:					
Information:					
2	Foreign Reference	WO2015149368A1.pdf	1018613 c9ff455eaa7512c6d657cac0191036d12cf79e6c	no	22
Warnings:					
Information:					
3	Foreign Reference	WO2017001817A1.pdf	1845140 69e71a25818e823e5d79327e7f2a02be2f675570	no	33
Warnings:					
Information:					
4	Foreign Reference	WO2017113845A1.pdf	858004 d6c2cd4fde374a35a2bddccb67276565f5df90e9	no	20
Warnings:					
Information:					
5	Foreign Reference	WO2017143865A1.pdf	835437 4f4877016fdfd5f185872d4525da92164f7c5275	no	22
Warnings:					
Information:					
6		052210-515001US-Information_Disclosure_Statement_Sb08.pdf	257459 f3fc2e80716522c1b54b648518068c9d1aa079f6	yes	4
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	

NJOY Exhibit 1002.352

	Information Disclosure Statement (IDS) Form (SB08)		3		4
	Transmittal Letter		1		2
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	30478 181bbdd1057d96f14b8b1c077d91243c5dde3047	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	7647178		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 September 2014 (18.09.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/144678 A2

(51) International Patent Classification:
A24F 47/00 (2006.01)

(21) International Application Number:
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(22) International Filing Date:
14 March 2014 (14.03.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/802,204 15 March 2013 (15.03.2013) US

(72) Inventor; and
(71) Applicant : **LEWIS, Michael, W.** [US/US]; 944 Calle Amanecer, Suite F, San Clemente, CA 92673 (US).

(74) Agent: **WHITE, Kevin, S.**; Haynes and Boone, LLP., 2323 Victory Avenue, Suite 700, Dallas, TX 95219 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, 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).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) **Title**: ELECTRONIC SMOKING DEVICE SYSTEMS AND METHODS

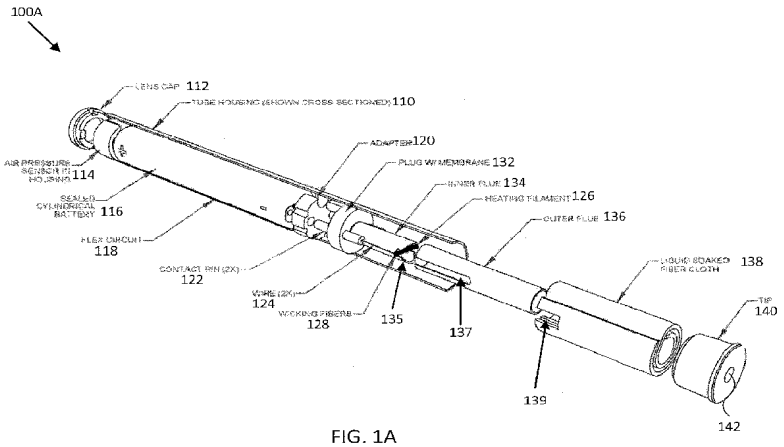


FIG. 1A

(57) **Abstract**: Provided are systems and methods for implementing an electronic smoking device. One embodiment of the present disclosure is directed to the implementation of an electronic smoking device including various artwork, structure, inhale response circuitry and/or sensors, variable visible feedback components, and/or other components adapted to reproduce the burning ember end of various conventional cigarettes and/or cigars. One embodiment of the present disclosure is directed to the implementation of a process to form an electronic smoking device and/or assembly utilizing various stiffness thermoplastic polyurethane compounds and/or an adhesive process adapted to provide a reliable, sealed, and at least partially flexible interface between various structures of an electronic smoking device. One embodiment of the present disclosure is directed to the implementation of an electronic smoking device including a sealed flue assembly adapted to substantially reduce a risk of a user coming in contact with fluid in the electronic smoking device.

WO 2014/144678 A2

NJOY Exhibit 1002.354

ELECTRONIC SMOKING DEVICE SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to and the benefit of U.S. Provisional Application 61/802,204, filed on March 15, 2013 and entitled "Electronic Smoking Device Systems and Methods," the entire contents of which are hereby expressly incorporated by reference.

BACKGROUND

Field of the Invention

[0002] The present disclosure generally relates to electronic smoking devices and more particularly to systems and methods for manufacturing electronic smoking devices.

Related Art

[0003] Conventional cigarette smoking has been on the decline for a number of years. Many jurisdictions have enacted laws banning conventional cigarettes and cigars in almost every public venue, and smoking in general has subsequently become more and more of a solitary endeavor. In addition, smoke from conventional cigarettes and cigars typically includes a number of substances generally detrimental to the health of the smoking individual.

[0004] Various electronic smoking devices have been developed to provide a substitute method for the mechanical and/or chemical physical interactions associated with smoking, both to provide an avenue for social interaction and to provide a healthier alternative for the smoker and those around him or her. However, many such devices are expensive to manufacture and are relative fragile and prone to mechanical damage. Chemical leaks and mechanical damage related to unreliable inner construction can cause harm to a user. Thus, there is a need in the art for electronic smoking devices that are more reliable, safer to use, and easier to manufacture.

SUMMARY

[0005] Techniques are disclosed for systems and methods to provide safe and reliable electronic smoking devices. An electronic smoking device may include a number of

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modular elements including a multi-piece flue assembly, a tube for housing the active compound (e.g., the e-liquid), and an inhalation tip that, with the multi-piece flue assembly, helps to seal the active compound within the tube and away from undesirable contact with a user. The multi-piece flue assembly may be configured to support a heating filament and to passively meter the active compound to the heating element during operation of the electronic smoking device. The device may additionally include a patterned lens cap, one or more coatings, labeling, compounds, and materials, and/or other features configured to simulate the look and feel of a lit cigarette, cigar, and/or other smoking implement. The resulting device may be held and used by a user to replicate similar operation of a tobacco-based smoking implement.

[0006] In various embodiments, an electronic smoking device may include a single or multi-piece tube, a multi-piece flue assembly, an inhalation tip, a heating filament, a battery, one or more flexible gas permeable membranes, an air pressure sensor, a flexible circuit, a light emitting diode (LED), a matrix to physically stabilize the active compound, and/or one or more other modular elements mounted to or in proximity to the tube housing of the electronic smoking device. One or more elements of the device (e.g., the air pressure sensor, LED, battery, and/or flexible circuit) may be implemented with an electronic switch, charge storage device, and/or logic device configured to selectively electrically couple the battery to the heating element and/or LED when a user inhales through the inhalation tip.

[0007] One embodiment of the present disclosure is directed to the implementation of an electronic smoking device including various artwork, structure, inhale response circuitry and/or sensors, variable visible feedback components (e.g., variable brightness LEDs, and/or other feedback components), and or other features adapted to reproduce the burning ember end of various conventional cigarettes and/or cigars.

[0008] One embodiment of the present disclosure is directed to the implementation of a process to form an electronic smoking device and/or assembly utilizing various stiffness thermoplastic polyurethane (TPU) compounds and/or a glue process adapted to provide a reliable, sealed, and at least partially flexible interface between various structures of an electronic smoking device.

[0009] One embodiment of the present disclosure is directed to the implementation of an electronic smoking device including a sealed multi-piece flue assembly configured to substantially reduce a risk of a user coming in contact with the bulk of an active compound (e.g., e-liquid, and/or other types of nicotine, flavoring, and/or other stimulants

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and/or pharmaceutical containing substances, for example) in the electronic smoking device.

[0010] One embodiment of the present disclosure is directed to the implementation of an alternative to a liquid based active compound in an electronic smoking device, such as a paste and/or gel based active compound. In some embodiments, the flue assembly may be adapted to be permeable to the active substance in an aerosol form. In various embodiments, the multi-piece flue assembly and/or electronic smoking device may be reusable.

[0011] One embodiment of the present disclosure is directed to the implementation of a system for assembling a plurality of electronic smoking devices, implemented according to various embodiments described herein, in an automated fashion, and/or including various sensors, actuators, logic devices, controllers, memory devices, hoppers, manipulators, stations, and/or other devices and/or systems.

[0012] In one embodiment, an electronic smoking device includes a tube configured to house an active compound; an inhalation tip coupled to a first end of the tube; and a multi-piece flue assembly disposed within the tube, wherein the multi-piece flue assembly is configured to seal a bulk of the active compound from a second end of the tube and from exiting the inhalation tip .

[0013] In another embodiment, a method for assembling an electronic smoking device includes providing an inhalation tip, a multi-piece flue assembly, and a tube configured to house an active compound; inserting at least a portion of the multi-piece flue assembly into the tube; adding a bulk of the active compound to an interior of the tube defined, at least in part, by the portion of the multi-piece flue assembly; and coupling the inhalation tip to the tube and/or the multi-piece flue assembly to seal the bulk of the active compound within the tube.

[0014] In a further embodiment, a method for assembling an electronic smoking device includes providing a tube, wherein the tube is adapted to house an active compound and comprises polycarbonate, polyester terephthalate, acrylic, and/or one or more other flexible tube materials; providing an inhalation tip comprising silicon, thermoplastic polyurethane, and/or one or more other flexible tip materials; and binding the inhalation tip to the tube using an ultra-violet (UV) cured flexible glue.

[0015] The scope of the invention is defined by the claims, which are incorporated into this section by reference. These and other features and advantages of the present

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disclosure will be more readily apparent from the detailed description of the embodiments set forth below taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

[0016] The various figures and text attached herein illustrate various processes, devices, and systems for implementing one or more electronic smoking devices and/or assemblies, processes to make, sell and/or use such devices and/or assemblies, and/or systems embodying such processes, devices, and/or assemblies, for example, in accordance with embodiments of the disclosure.

[0017] Figs. 1A-D illustrate various diagrams and views of an electronic smoking device in accordance with embodiments of the disclosure.

[0018] Figs. 2A-E illustrate various diagrams and views of an electronic smoking device in accordance with embodiments of the disclosure.

[0019] Figs. 3A-D illustrate various diagrams and views of an electronic smoking device in accordance with embodiments of the disclosure.

[0020] Figs. 4A-C illustrate various diagrams and views of an electronic smoking device in accordance with embodiments of the disclosure.

[0021] Fig. 5A illustrates various diagrams and views of a lens cap for an electronic smoking device in accordance with embodiments of the disclosure.

[0022] Fig. 5B illustrates progressive views of the formation of a lens cap for an electronic smoking device in accordance with embodiments of the disclosure.

[0023] Fig. 6 illustrates an electronic smoking device assembly system in accordance with an embodiment of the disclosure.

[0024] Fig. 7 illustrates various label designs for an electronic smoking device in accordance with an embodiment of the disclosure.

[0025] Fig. 8 illustrates silicon caps for use with an electronic smoking device assembly system in accordance with an embodiment of the disclosure.

[0026] Fig. 9 illustrates a flow diagram of various operations to assemble an electronic smoking device in accordance with an embodiment of the disclosure.

[0027] Embodiments of the present disclosure and their advantages are best understood by referring to the detailed description that follows. It should be appreciated that like reference numerals are used to identify like elements illustrated in one or more of the figures, wherein showings therein are for purposes of illustrating embodiments of the present disclosure and not for purposes of limiting the same.

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DETAILED DESCRIPTION

[0028] In accordance with various embodiments of the present disclosure, safe and reliable electronic smoking devices, systems, and methods may advantageously include a number of modular elements including a multi-piece flue assembly, a tube for housing an active compound (e.g., e-liquid, and/or other types of nicotine, flavoring, and/or other stimulants and/or pharmaceutical containing substances, for example), and an inhalation tip that, with the multi-piece flue assembly, helps to seal the active compound within the tube and away from undesirable contact with a user. For example, the multi-piece flue assembly may be configured to support a heating filament and to passively meter the active compound to the heating element during operation of the electronic smoking device. The device may additionally include a patterned lens cap, one or more coatings, labeling, compounds, and materials, and/or other features configured to simulate the look and feel of a lit cigarette, cigar, and/or other smoking implement. The resulting device may be held and used to simulate operation of a tobacco-based smoking implement without requiring the actual burning of tobacco.

[0029] In one embodiment, an electronic smoking device includes a multi-piece flue assembly including a breathable and/or flexible membrane (e.g., is gas permeable but not fluid permeable) that is secured to the multi-piece flue assembly on one end to an inhalation tip on the other end, with a long slot on the sides of a portion of the multi-piece flue assembly to slip over the heating element leads and wicking fibers to form a small flue inlet for the active compound. This embodiment virtually eliminates the potential for active compound leakage, and its modular implementation is beneficial for automated assembly.

[0030] In another embodiment, an electronic smoking device includes an inhalation tip with multiple (e.g., five) vapor orifices and a breathable flexible membrane disc glued in place to the inhalation tip. In one embodiment, an electronic smoking device may include a breathable flexible membrane disc integrated with the multi-piece flue assembly that allows air into the flue and active compound housing area but prevents the bulk active compound from leaking into the battery compartment. In some embodiments, an electronic smoking device may include a modular, press-fit, and/or crimp based design configured to eliminate a need for soldered electrical connections. In various embodiments, an electronic smoking device may include an IC sensor, a specialized sealed and/or rechargeable battery, and/or a flat flexible wiring harness or circuit.

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[0031] Fig. 1A illustrates an exploded view of electronic smoking device 100A in accordance with an embodiment of the disclosure. In various embodiments, device 100A may be configured to vaporize a metered portion of an active compound housed within device 100A when a user inhales through device 100A. In some embodiments, device 100A may be implemented in modular form and assembled by an automated process that minimizes human interaction.

[0032] In the embodiment shown in Fig. 1, device 100A may be implemented as a monolithic assembly that is entirely disposable after its supply of active compound and/or its power source is exhausted, for example, and that can be adapted to simulate operation of a conventional smoking implement. In one embodiment, device 100A may include a tube 110 configured to house an active compound (e.g., physically stabilized by fiber matrix 138), a multi-piece flue assembly (e.g., including at least a plug 132, an inner flue 134, and an outer flue 136) configured to facilitate safe and metered vaporization of the active compound, an inhalation tip 140 that may be coupled to one end of tube 110, and one or more other elements described herein. As shown in Fig. 1A, air may be drawn through tube 110 (e.g., by a user inhaling through inhalation tip 140 and/or orifice 142), and the pressure differential caused by the inhalation may be sensed by air pressure sensor 114. Air pressure sensor 114 and/or other electronic elements (e.g., one or more logic devices, timers, switches, charge storage devices, and/or other electronic devices) integrated with air pressure sensor 114 and/or flexible circuit 118 may couple sealed battery/power source 116 to contact pins 122, leads 124, and/or heating filament 126 to vaporize a metered portion of the active compound wicked into heating filament 126 by wicking fibers 128.

[0033] In some embodiments, heating filament 126 may be energized while air pressure sensor 114 is detecting an inhalation. In other embodiments, heating filament 126 may be energized for a predetermined duration once inhalation is detected and/or for a maximum aggregate duration over multiple detected inhalations. In further embodiments, air pressure sensor 114 and/or other electronic elements of device 100A may be configured to detect when heating filament 126 is at risk of damage and/or no longer in contact with active compound (e.g., if the active compound is exhausted, wicking fibers 128 are malfunctioning, and/or other elements of device 100A are malfunctioning) and de-energize heating filament 126. For example, such electronic elements may be configured to monitor a voltage across heating filament 126, a power output and/or charge level of sealed battery 116, and/or other operational characteristics of device 100A and determine

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whether heating filament 125 is in contact with active compound (e.g., and thereby thermally stabilized) and/or is otherwise at risk of damage. In addition to controlling operation of heating filament 126, air pressure sensor 114 and/or other electronic elements of device 100A may be configured to energize and/or de-energize an LED (e.g., LED 115 in Fig. 1B) under lens cap 112 upon detection of an inhalation, for example, to simulate a burning ember.

[0034] Tube 110 may be implemented as a cylinder, an n-sided prism, and/or other shapes to ease automated mechanical assembly, for example, and in some embodiments may be made of a rigid material (e.g., stainless steel) for durability, may be made of a flexible material (e.g., medical grade polycarbonate, polyester terephthalate, acrylic, and/or other flexible polymers or materials) to simulate the feel of a conventional smoking implement, or may be made of a combination of rigid and flexible materials. In embodiments where tube 110 is implemented from polycarbonate or other materials that are substantially transparent to ultraviolet (UV) light, assembly of device 100A may benefit from use of a UV-cured adhesive, such as within sealed portions of device 100A. In similar embodiments, transparency to various spectra, including infrared and UV, may benefit assembly of device 100A by providing for automated camera/imaging inspection of bonded, press fit, and/or otherwise sealed portions of device 100A for quality control. In some embodiments, tube 110 may be implemented from extruded and/or visibly clear or colored material, for example, and/or a material selected to be substantially inert with respect to a particular active compound. Tube 110 may be sized to simulate a conventional cigarette or cigar, for example, and/or implemented with a diameter and/or wall thickness that are sufficient to allow for press-fit and/or adhesive bonding of lens cap 112, air pressure sensor 114, adapter 120, plug 132, fiber matrix 138, and/or inhalation tip 140.

[0035] Inhalation tip 140 may be implemented from food or medical grade thermoplastic urethane (TPU), silicone, and/or other thermoplastic elastomers (TPEs) such as styrenic or olefinic TPEs, for example, or may be implemented from one or more rigid materials, such as stainless steel. In embodiments where inhalation tip 140 is made from TPU or other TPEs, inhalation tip 140 may be configured to form a reliable and flexible bond with a polycarbonate embodiment of tube 110, using a flexible adhesive for example, and inhalation tip 140 may be injection moulded to speed and lower the cost of manufacture as compared to compression moulding and/or the use of silicone. In various embodiments, inhalation tip 140 may be implemented according to a pliability (e.g., 60A,

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70A, 80A, 90A, and/or other hardness on the durometer scale) selected to simulate a conventional smoking implement, to match a flexibility of tube 110 (e.g., to lower a risk of rupturing a seal with tube 110 during operation of device 100A), and/or to adjust durability and/or ease of assembly. As shown in Fig. 1A, inhalation tip 140 may in some embodiments include a single orifice 142 configured to mate with a corresponding inner diameter of outer flue 136, as described herein.

[0036] When assembled as shown in view 101C of Fig. 1C, plug 132, inner flue 134, and outer flue 136 form multi-piece flue assembly 130. Plug 132 may be implemented from a relatively soft or pliable elastomer polymer and/or may be configured to form an air-tight or liquid tight seal with an interior surface of tube 110. Plug 132 may include a central through hole that is sealed by an integrated breathable membrane (e.g., membrane 133 of Fig. 1B), and the membrane (flexible or rigid) and the seal with tube 110 may be configured to prevent bulk active compound from passing through plug 120 and/or into contact with adapter 120, flexible circuit 118, and/or sealed battery 116. Inner flue 134 and outer flue 136 may be made from the same material as plug 132, for example, or may be made from a material selected to be resistant to degradation caused by high temperatures (e.g., produced by heating filament 126), such as polycarbonate, polyester terephthalate, various TPEs, acrylics, ceramics, metals, and/or other materials. Inner flue 134 and outer flue 136 may each include a center through hole, substantially aligned with the through hole of plug 132, such that air traveling through multi-piece flue assembly 130 travels through each of plug 132, inner flue 134, and outer flue 136.

[0037] As shown in Fig. 1A, inner flue 134 may be press fit and/or bonded to plug 132 to form a stable structure upon which to mount heating filament 126. As is also shown in Fig. 1A, plug 132 may be configured to physically support one or more conductive contact pins 122, for example, that are press fit and/or adhesively bonded to plug 132. Conductive pins 122 may be configured to electrically couple leads 124 to sealed battery 116 without requiring solder and without risk of damaging the liquid-tight seal provided by plug 132. For example, each of conductive pins 122 may include blind hollow portions and/or blunt portions that may be crimped to leads 124 and/or pressed against or crimped to positive and negative contact pads of flexible circuit 118 and/or sealed battery 116. Leads 124 may in turn be crimped to opposing sides of heating filament 126, thereby completing the electrical circuit from flexible circuit 118 to heating filament 126.

[0038] Heating filament 126 may be implemented as a conductive cylinder or coil of wire that is configured to vaporize active compound in contact with heating filament 126 when

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energized by sealed battery 116. As shown in Fig. 1A, heating filament 126 may be supported by notch 135 of inner flue 134 such that heating filament 126 is positioned substantially within or across the central through hole of inner flue 134. Outer flue 136 may be implemented with slot 137 allowing outer flue 136 to be fitted over and mated with inner flue 134 without disturbing heating filament 126, leads 124, and/or contact pins 122, for example, and/or to secure heating filament 126 in notch 135. In some embodiments, notch 135 and slot 137 may be configured to form a flue inlet (e.g., flue inlet 130c of Fig. 1C) that allows the bulk of the active compound (e.g., bound to fiber matrix 138) to enter and/or contact the heating filament at a predetermined rate related to the shape and/or diameter of the flue inlet. In various embodiments, wicking fibers 128, which may be glass or another type of heat resistant material, may be press fit within heating filament 126 and configured to wick active compound into heating filament 126 (e.g., from fiber matrix 138) and/or help stabilize the predetermined rate or metering of active compound provided by the flue inlet.

[0039] In some embodiments, device 100A may include fiber matrix 138, for example, which may be configured to physically stabilize an active compound housed by tube 110. Fiber matrix 138 may be implemented as a cloth or other relatively inexpensive fibrous material, for example, and may include slot 139 allowing fiber matrix 138 to be fitted over or mated with outer flue 136 without disturbing heating filament 126, leads 124, and/or contact pins 122. In embodiments where the active compound is liquid, fiber matrix 138 may be configured to prevent formation of bubbles and to help provide/wick the active compound to wicking fibers 128. In other embodiments, fiber matrix 138 may be configured to provide a wicking surface area for a liquid, paste, or gel based active compound. In still further embodiments, device 100A may omit fiber matrix 138.

[0040] As shown in Fig. 1A, adapter 120 and air pressure sensor 114 may be press fit and/or bonded to tube 110 and be configured to mechanically press contact pads of flexible circuit 118 against corresponding terminals of sealed battery 116. Flexible circuit 118 may be implemented as one or more flexible insulated conductors, conductive traces, printed circuit boards, conductive ribbons, and/or other circuitry, for example, that may be configured to electrically couple terminals of sealed battery 116 to various other components of device 100A, including air pressure sensor 114. For example, flexible circuit 118 may be implemented as a flexible insulated conductive ribbon with a number of isolated conductive traces and corresponding exposed contact pads configured to

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electrically couple to terminals of sealed battery 116, contact pins 122, and/or air pressure sensor 114.

[0041] Air pressure sensor 114, which may be formed within a polymer housing similar to the material used to form plug 132, may be implemented as one or more logic devices, switches, charge storage devices (e.g., capacitors), and/or other analog or digital electronic components configured to detect inhalation through inhalation tip 140 and energize heating filament 126 and/or other elements of device 100A. For example, air pressure sensor 114 may be configured to detect an air pressure differential within tube 110 caused by inhalation through inhalation tip 140 mechanically by sensing actuation of a spring loaded airflow switch within air pressure sensor 114. In other embodiments, air pressure sensor 114 may be configured to detect inhalation electromechanically using an air wheel and a hall effect sensor, for example, or a piezoelectric film configured to distend in the presence of airflow. In general, air pressure sensor 114 may be configured to detect inhalation using mechanical, electrical, or electromechanical flow and/or pressure sensors. In various embodiments, air pressure sensor 114 and/or flexible circuit 118 may be integrated with one or more logic devices, switches, charge storage devices (e.g., capacitors), and/or other analog or digital electronic components that may be arranged, adapted, and/or configured to implement any of the methods described herein, including providing a voltage of sealed battery 116, and/or a modulated and/or attenuated form of that voltage, across an element of device 100A.

[0042] Sealed battery 116 may be used to power each of the elements of device 100A, including air pressure sensor 114 and heating filament 126. Advantageously, sealed battery 116 may be implemented so as to stay sealed against leakage of electrolyte when subjected to prolonged periods of discharge, multiple recharging cycles, contact with active compound vapor and/or moisture, and/or other detrimental environmental conditions, thereby increasing user safety. In some embodiments, sealed battery 116 may be sized to slide freely within tube 110, for example, and electrical contact with flexible circuit 118 may be maintained by press fit and/or adhesive bonding of air pressure sensor 114, plug 132, and/or adapter 120 at positions within tube 110 configured to provide contact pressure between contact pads of flexible circuit 118 and terminals of sealed battery 116. Such arrangement eliminates a need to solder sealed battery 116 to other elements of device 100A, which would slow assembly and risk damage to sealed battery 116 and other elements of device 100A. Adapter 120 may be implemented from the same materials used to form plug 132 and/or a housing for air pressure sensor 114, for example,

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and may be implemented with one or more notches, slots, through holes, and/or other features configured to allow contact pins 122 and air to pass through adapter 120.

[0043] Also shown in Fig. 1A is lens cap 112. Lens cap 112 may be implemented from an at least partially optically transparent material, including any of the materials used to form tube 110, adapter 120, multi-piece flue assembly 130, and/or inhalation tip 140. In some embodiments, lens cap 112 may include one or more air inlets (e.g., inlets 586 in Fig. 5A) and/or legs (e.g., legs 584 in Fig. 5A) configured to allow air to pass through lens cap 112 into tube 110 and/or to facilitate press fit mounting and/or adhesive bonding of lens cap 112 to an end of tube 110. In various embodiments, air pressure sensor 114 may include one or more LEDs of various colors (e.g., red) configured to illuminate lens cap 112 to simulate a burning ember in response to a detected inhalation. In such embodiments, lens cap 112 may be partially optically opaque to simulate the glow effect of a burning ember. In further embodiments, lens cap 112 may include a raised pattern (e.g., raised pattern 582 in Fig. 5A) configured to simulate the shape of a burning ember of a conventional smoking implement.

[0044] Fig. 1B illustrates a different exploded view 100B of electronic smoking device 100A of Fig. 1A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 1B, and described above with reference to elements of Fig. 1A, device 100A may include one or more LEDs/light sources 115 physically and/or electrically coupled to air pressure sensor 114 and adjacent lens cap 112, and plug 132 may include breathable membrane 133. In some embodiments, LEDs 115 may be configured to emit one or more illuminated colors, such as varying shades of red, orange, and/or yellow, to simulate a burning ember in the presence of varying airflow. For example, in embodiments where air pressure sensor 114 is configured to detect an airflow velocity of a detected inhalation, the airflow velocity may be used to vary the intensity and/or shade of an illuminated color emitted by LED 115. Breathable membrane 133 may be integrated with and/or configured to seal a central through hole through plug 132, for example, and may be selected to be flexible or rigid to more closely match a flexibility of plug 132 and/or tube 110 to reduce a risk of damage to tube 110, plug 132, and/or membrane 133 in the presence of physical stress, such as clamping and/or bending.

[0045] Fig. 1C illustrates a side exploded view 100C and an assembled side view 101C of electronic smoking device 100A of Fig. 1A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in view 101C, and described above with reference to elements of Figs. 1A-B, plug 132, inner flue 134, and outer flue 136

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may be assembled into multi-piece flue assembly 130 including flue inlet 130c. Also shown in view 101C, air pressure sensor 113 and adapter 120 may be fitted within tube 110 to press contact pads 118a, 118b of flexible circuit 118 against terminals of sealed battery 116. Furthermore, views 100C and 101C shows plug 132 of multi-piece flue assembly 130 fitted within tube 110 to press contact pins 122 against contact pads 118b of flexible circuit 118.

[0046] Fig. 1D illustrates a side detailed view 100D of multi-piece flue assembly 130 and inhalation tip 140 of electronic smoking device 100A of Fig. 1A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in view 100D, and described above with reference to elements of Figs. 1A-C, plug 132 may include first and second plug portions 132a, 132b disposed on either side of breathable membrane 133. In some embodiments, first and second plug portions 132a, 132b may be held and/or bonded together by contact pins 122, which may in turn be supported by the resulting plug 132. For example, contact pins 122 may be press fit and/or otherwise inserted into first and second plug portions 132a, 132b to form the displaced assembly shown in view 100D, membrane 133 may be placed between first and second plug portions 132a, 132b, and first and second plug portions 132a, 132b may be pressed together and/or adhesively bonded to form plug 132. As shown, first plug portion 132a may be coupled to inner flue 134 (e.g., by press fit and/or adhesive coupling), and plug 132 including membrane 133 may be configured to allow air through plug 132 and block bulk active compound from passing through plug 132, as described herein.

[0047] Also shown in view 100D, in some embodiments, inhalation tip 140 may include an internal riser/nipple 144 that is aligned with orifice 148 and/or a central through hole of multi-piece flue assembly 130, for example, and that is configured to couple to multi-piece flue assembly 130, at an end of outer flue 136, such as by press fit and/or adhesive bonding. In such embodiments, internal riser 144 is configured to form a seal 146 with the multi-piece flue assembly to allow active compound vapor (e.g., produced by heating filament 126) to pass through orifice 142 of inhalation tip 140. In some embodiments, orifice 142 and/or a central through hole of multi-piece flue assembly 130 may be partially or completely filled with filter material 148, for example, to help ensure bulk active compound and/or other fluids and/or particles do not reach the mouth of a user. In one embodiment, filter material 148 may be formed of the same material used to form membrane 133. Although internal riser 144 is shown in Fig. 1D as being disposed about

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an external surface of outer flue 136, in other embodiments, internal riser 144 may be inserted into an inner surface/central through hole of outer flue 136.

[0048] By providing a modular assembly of an electronic smoking device, including the various features configured to remove a need for soldering elements of the electronic smoking device to one another for electrical connection, embodiments of the present disclosure facilitate high volume automated machine assembly of reliable and safe electronic smoking products across a varied product line, as described herein.

[0049] Fig. 2A illustrates an exploded view of electronic smoking device 200A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 2A, device 200A includes many of the same features of device 100A of Fig. 1A, except inhalation tip 140 of device 100A is replaced with inhalation tip 250, and device 200A includes flexible tip membrane 254. In some embodiments, flexible tip membrane 254 may be formed from the same material used to form membrane 133, for example, and may be configured to be gas or vapor permeable, but liquid impermeable. In related embodiments, the degree of flexibility of flexible tip membrane 254 and/or inhalation tip 250 may be selected to substantially match each other, to substantially match that of tube 110, and/or to simulate the feel of a conventional smoking implement. In various embodiments, flexible tip membrane 254 may be bonded to an interior surface of inhalation tip 250, for example, and configured to form a seal with inhalation tip 250 to allow active compound vapor through orifices 252 of inhalation tip 250 and to block bulk active compound from exiting inhalation tip 250 through orifices 252. In such embodiments, inhalation tip 250 may not couple to multi-piece flue assembly 130, for example, and device 200A may be configured for higher vapor flow than capable with device 100A.

[0050] Fig. 2B illustrates a different exploded view 200B of electronic smoking device 200A of Fig. 2A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 2B, inhalation tip 250 lacks an internal riser such as internal riser 144 of inhalation tip 140, and instead relies on the seal provided by flexible tip membrane 254. This is illustrated more clearly in Fig. 2C, which includes a side exploded view 200C and an assembled side view 201C of electronic smoking device 200A of Fig. 2A in accordance with an embodiment of the disclosure. As shown by the embodiments presented in views 200C and 201C, and described above with reference to elements of Figs. 2A-B, inhalation tip 250 includes multiple orifices 252, lacks an internal riser, and flexible tip membrane 254 may be disposed within inhalation tip 250 to cover

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all orifices 252. Also, in some embodiments, such as the one illustrated in view 201C, multi-piece flue assembly 130 may not extend far enough into inhalation tip 250 to seal against a surface of inhalation tip 250. In such embodiments, bulk active compound wicked to heating filament 126 but not vaporized (e.g., due to high volume flow rate, for example) may be reintroduced to the remaining bulk active compound (e.g., in fiber matrix 138). In other embodiments, multi-piece flue assembly 130 and/or inhalation tip 250 may be configured to contact each other and form a relatively wide bore seal (e.g., as compared to device 100A) to allow a high volume vapor flow of the active compound through orifices 252 of inhalation tip 250, where excess bulk active compound is not allowed to recombine in fiber matrix 138.

[0051] Fig. 2D illustrates perspective detailed views 200D, 201D of multi-piece flue assembly 130 and inhalation tip 250 of electronic smoking device 200A of Fig. 2A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in views 200D, 201D, and described above with reference to elements of Figs. 2A-C, plug 132 may include first and second plug portions 132a, 132b disposed on either side of breathable membrane 133, and first plug portion 132a may include internal riser/nipple 232c that is configured to couple to inner flue 134. In some embodiments, first plug portion 132a and inner flue 134 may be press fit and/or adhesively bonded together prior to or after forming plug 133 (e.g., using contact pins 122 as described herein).

[0052] Also shown in view 200D, in some embodiments, inhalation tip 250 may be bonded to flexible tip membrane 254 using adhesive/glue bead 256 to form a flexible seal. In some embodiments, adhesive bead 256 may be formed by a flexible adhesive configured to retain flexibility after curing, as described herein. This is illustrated more clearly in Fig. 2E, which includes an exploded view 200E and an assembled view 201E of inhalation tip 250 and flexible tip membrane 254 in accordance with an embodiment of the disclosure. As shown by the embodiments presented in views 200E and 201E, and described above with reference to elements of Figs. 2A-D, in some embodiments, flexible tip membrane 254 may include a washer edge 255 configured to accept adhesive bead 256 and form a flexible seal with inhalation tip 250 without damaging or obstructing the membrane portion of flexible tip membrane 254. The final assembly shown in view 201E is configured to provide a high volume vapor flow through orifices 252.

[0053] By providing a modular assembly of an electronic smoking device, including the various features configured to increase vapor flow rate without risking active compound

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leakage to a user, embodiments of the present disclosure facilitate automated machine assembly of reliable and safe electronic smoking products across product lines that can be easily tailored to customer desires, as described herein.

[0054] Fig. 3A illustrates an exploded view of electronic smoking device 300A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 3A, device 300A includes many of the same features of devices 100A of Fig. 1A and 200A of Fig. 2A, except tube 110/device 300A is split into battery tube portion 310 and cartridge (also referred to as "cartomizer") tube portion 360, which may be physically and electrically coupled together to form tube 110/device 300A without soldering using threaded bushings 362, 364 and terminals 366, 368. For example, multi-piece flue assembly 130 and/or the bulk active compound may be disposed substantially within cartridge tube portion 360, and sealed battery 116 may be disposed substantially within battery tube portion 310. Also, contact pins 322, plug 332, and/or various other elements of device 300A are modified versions of similar elements of device 100A configured to facilitate the physical and electrical coupling and recharging of sealed battery 116. For example, in the embodiment shown in Fig. 3A, air pressure sensor 114, flexible circuit 118, and/or other electronic components of device 300A may be configured to detect a low charge state of sealed battery 116 and indicate the low charge state to a user using one or more pulses of light (e.g., provided by LED 115, for example) that are not coincident with a detected inhalation.

[0055] As shown in Fig. 3A, threaded bushings 362, 364 may be press fit and/or adhesively bonded within respective tubes 360, 310. Threaded bushings 362, 364 may be electrically conductive and configured to couple one terminal of sealed battery 316 to heating filament 126, as described herein. Terminals 366, 368 may also be electrically conductive and configured to couple the other terminal of sealed battery 316 to heating filament 126, as described herein. In some embodiments, terminals 366, 368 may be disposed within respective threaded bushings 362, 364 and/or within an insulating coating or housing configured to press fit and/or adhesively bond to respective threaded bushings 362, 364 without shorting the terminals of sealed battery 316. In various embodiments, terminals 366, 368 and threaded bushings 362, 364 may be configured and/or arranged to provide contact pressure between contact pads of flexible circuit 118 and terminals of sealed battery 116 while threaded bushings 362, 364 are securely coupled together. This is illustrated more clearly in Figs. 3B-D.

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[0056] Fig. 3B illustrates a different exploded view 300Bof electronic smoking device 300A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 3B, device 300A includes modified plug 332 and integrated membrane 333, both of which are configured to allow air through plug 332 and to block bulk active compound from passing through plug 332, similar to plug 132 and membrane 133, but adapted to facilitate the physical and electrical coupling provided by threaded bushings 362, 364 and terminals 366, 368. Fig. 3C illustrates side exploded view 300C of battery tube portion 310, side exploded view and 301C of cartridge tube portion 360, and assembled side view 302C of electronic smoking device 300A in accordance with embodiments of the disclosure. As shown by the embodiments presented in Fig. 3C, plug 332 supports offset contact pins 322a, 322b, which in final assembly (shown in view 302C) are electrically coupled to the terminals of sealed battery 116 over flexible circuit 118, threaded bushings 362, 364, and terminals 366, 368. Also, as shown, air pressure sensor 114 and terminal 368 may be configured to supply contact pressure (e.g., when assembled) between contact pads of flexible circuit 218 and terminals of sealed battery 114.

[0057] Fig. 3D illustrates a side cross section detail 300D of electronic smoking device 300A with assembled battery tube portion 310 separated from assembled cartridge tube portion 360, in accordance with embodiments of the disclosure. As shown by the embodiments presented in Fig. 3D, plug 332 supports offset contact pins 322a, 322b so that contact pin 322a is electrically coupled to threaded bushing 362 and contact pin 322b may be electrically coupled to terminal 366 (e.g., depending on the positions of threaded bushing 362 and terminal 366 and/or whether sufficient contact pressure is supplied to terminal 366 by threaded bushings 362, 364 and terminal 368). Also shown in Fig. 3D, terminal 368 may be electrically coupled to contact pad 370 of flexible circuit 118 (e.g., which is in turn coupled to a positive terminal of sealed battery 116), and threaded bushing 364 is electrically coupled to contact pad 371 of flexible circuit 118 and/or a negative terminal of sealed battery 116. Each terminal 366, 368 is disposed within but electrically isolated from its respective threaded bushing 362, 364 by respective insulating portions (e.g., coatings, washers, housings) 367, 369. Thus, when threaded bushings 362, 364 are securely coupled to each other, heating filament 126 may be electrically coupled to sealed battery 116, at least in part, through threaded bushings 362, 364 and terminals 366, 368, without resorting to soldering, as shown.

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[0058] Fig. 4A illustrates an exploded view of electronic smoking device 400A in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 4A, device 400A includes many of the same features of devices 100A of Fig. 1A, 200A of Fig. 2A, and 300A of Fig. 3A, arranged as a modification of device 300A according to elements (e.g., inhalation tip 250 and flexible tip membrane 254) of device 200A.

[0059] Fig. 4B illustrates a different exploded view 400B of electronic smoking device 300A in accordance with an embodiment of the disclosure. Fig. 4C illustrates side exploded view 400C of battery tube portion 310, side exploded view 401C of cartridge tube portion 360, and assembled side view 402C of electronic smoking device 400A in accordance with embodiments of the disclosure. As shown by the embodiments presented in Fig. 3C, multi-piece flue assembly 130 may be configured, in some embodiments, to not extend into any portion of inhalation tip 250. Fig. 4D illustrates an assembled view of battery tube portion 310 physically and electrically coupled to recharging power source 416d using threaded bushings 362, 364 and terminals 366, 368. In one embodiment, air pressure sensor 114, flexible circuit 118, and/or or one or more logic devices integrated with various elements of device 400A may be configured to detect when recharging power source 416d is attached to battery tube portion 310 (e.g., as opposed to a cartridge tube portion) and couple sealed battery 116 to recharging power source 416d during a charge cycle. In other embodiments, battery tube portion 310 may be configured to enter a charge cycle whenever a sufficient charge voltage is supplied across threaded bushings 362, 364 and terminals 366, 368. In various embodiments, recharging power source 416d may be implemented as one or more rechargeable batteries, voltage regulators, voltage and/or current sensors, AC to DC converters, transformers, mains interfaces, photovoltaic panels, logic devices, and/or other analog or digital power supply components.

[0060] Fig. 5A illustrates a top view 500A, perspective views 501A, and plan views 502A of lens cap 580 in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 5A, lens cap 580 may be implemented with a raised pattern 582 configured to simulate a burning ember when lit from within, such as by LED 115 of device 110A. Lens cap 580 may also be implemented with one or more air inlets 586 that are configured to allow air to be drawn within tube 110 when a user inhales through an inhalation tip. In some embodiments, air inlets 586 and/or lens cap 580 may be configured to meter the air allowed into tube 110, using a number, shape, and/or size

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of air inlets 586 and/or lens cap 580 for example, to set a particular vapor flow rate, such as a maximum vapor flow rate for an electronic smoking device. In other embodiments, air inlets 586 and/or lens cap 580 may be configured to direct a flow of air to air pressure sensor 114 to facilitate more accurate detection of inhalation and/or an airflow velocity of an inhalation. In one embodiment, lens cap 580 may include one or more legs 584 configured to facilitate press fit and/or adhesive bonding with tube 110 without risking obstruction to the air flow metered by air inlets 586.

[0061] Fig. 5A illustrates a top view 500A, perspective views 501A, and plan views 502A of lens cap 580 in accordance with an embodiment of the disclosure. As shown by the embodiment presented in Fig. 5A, lens cap 580 may be implemented with a raised pattern 582 configured to simulate a burning ember when lit from within, such as by LED 115 of device 110A. Lens cap 580 may also be implemented with one or more air inlets 586 that are configured to allow air to be drawn within tube 110 when a user inhales through an inhalation tip. In some embodiments, air inlets 586 and/or lens cap 580 may be configured to meter the air allowed into tube 110, using a number, shape, and/or size of air inlets 586 and/or lens cap 580 for example, to set a particular vapor flow rate, such as a maximum vapor flow rate for an electronic smoking device. In other embodiments, air inlets 586 and/or lens cap 580 may be configured to direct a flow of air to air pressure sensor 114 to facilitate more accurate detection of inhalation and/or an airflow velocity of an inhalation. In one embodiment, lens cap 580 may include one or more legs 584 configured to facilitate press fit and/or adhesive bonding with tube 110 without risking obstruction to the air flow metered by air inlets 586.

[0062] Fig. 5B illustrates a flowchart for and progressive views of the formation of lens cap 580 for an electronic smoking device in accordance with embodiments of the disclosure. For example, to form raised pattern 582 shown in Fig. 5A, an assembly apparatus may be configured to provide a blank lens cap insert 580a, press an indent pattern onto a top surface of blank lens cap insert 580a to form a relief pattern 582b in the top surface and produce lens cap insert 580b, paint (e.g., by roller, stamp, and/or other surface painting method) a raised portion of the relief pattern of lens cap insert 580b to produce raised pattern 582c of lens cap insert 580c, and then illuminate an interior of lens cap insert 580c to produce a simulated ember pattern 582d of lens cap insert 580d.

[0063] Fig. 6 illustrates a block diagram of an assembly system 600 in accordance with an embodiment of the disclosure. In various embodiments, system 600 may be configured to assemble electronic smoking devices (e.g., electronic smoking devices

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100A, 200A, 300A, and/or 400A, for example) according to an automated process, as disclosed herein. As shown in Fig. 6, system 600 may include a variety of hoppers, material supply drums, stations, substations, and controllers, where assembly lines 601 represent one or two way conduits for materials and/or data, and where data line 602 represents a two way data conduit to controller 608.

[0064] Controller 608 may be implemented as any appropriate logic device (e.g., processing device, microcontroller, processor, application specific integrated circuit (ASIC), field programmable gate array (FPGA), memory storage device, memory reader, network interface, or other device or combinations of devices) that may be adapted to execute, store, and/or receive appropriate instructions, such as software instructions implementing a control loop for controlling various operations of system 600, as described herein. Such software instructions may also implement methods for processing sensor signals, determining sensor information, providing user feedback (e.g., through a user interface), querying devices for operational parameters, selecting operational parameters for devices, or performing any of the various operations described herein. For example, in an initialization state, controller 608 may be configured to poll various stations to determine if any materials are low or expect to be required to complete an assembly run.

[0065] Dial machine may be implemented as a central feed through and control node for assembly system 600 that is configured to facilitate continuous operation of system 600. For example, dial machine 610 may include a number of tube grippers, arms, actuators, and/or other mechanical devices adapted to exchange tubes across assembly lines 601 with any of the coupled stations substantially simultaneously.

[0066] Tube hopper 612 may be configured to receive and/or store a number of partially assembled electronic smoking device tubes, such as tube 110 and/or cartridge tube portion 360. In one embodiment, each of the partially assembled tubes may lack active compound, an inhalation tip, an outer coating or label, and/or various packaging covers, such as silicone caps used to limit evaporation of the active compound. Tube hopper 612 may be configured to serve tubes to discriminator station 614, which may be configured to select only a particular type of tube for a particular assembly run and serve the particular type of tube to dial machine 610. In some embodiments, tube hopper 612 and/or discriminator station 614 may also be configured to orient tubes consistently before serving them to dial machine 610. In other embodiments, dial machine 610 may be configured to orient supplied tubes consistently.

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[0067] Filling station 620 may be configured to accept tubes from dial machine 610 and dispense a predetermined amount of active compound (e.g., liquid, past, or gel) from drum 622 into the tubes using positive displacement pump 624. After filling and/or partially filling the tubes with active compound, filling station 620 may be configured to serve the filled tubes back to dial machine 610 for delivery to tip assembly station 630. In alterantive embodiments, filling station 620 and tip assembly station 630 may be physically linked by an assembly line 601 so as to bypass dial machine 610.

[0068] Tip assembly station 630 may be configured to accept filled tubes from dial machine 610 and/or filling station 620 and press fit and/or adhesively bond an inhalation tip to an end of each tube. In some embodiments, the inhalation tips may be formed from hard/rigid plastic and may be press fit only. In such embodiments, tip assembly station 630 may be configured to receive tips from tip hopper 632 (e.g., which may be configured to orient them properly), place them in the appropriate end of corresponding tubes, and press fit them into the tubes. In other embodiments, the inhalation tips may be formed from relatively flexible material, for example, and/or may be adhesively bonded only or both press fit and adhesively bonded. In such embodiments, tip assembly station 630 may be configured to serve tips from tip hopper 632 and tubes from dial machine 610 to adhesive station 634. Alternatively, adhesive station 634 may be physically linked by an assembly line 601 to adhesive station 634 and the tips may be served directly.

[0069] Adhesive station 634 may be configured to receive tips and tubes and adhesive (e.g., from adhesive drum 636) and use the adhesive to glue the tips to the ends of the tubes. For example, in one embodiment, adhesive station 634 may be configured to apply adhesive to an outer diameter of a tip and/or an inner diameter of a tube, spin the tip and/or tube to distribute the adhesive evenly, press the tip into the tube, and/or process the assembled tip and tube according to a particular curing procedure. For example, where the adhesive may be cured by UV light, adhesive station 634 may be configured to pass the tip/tube assembly through a UV light tunnel and/or spinning the assembly within a UV light source configured to cure the adhesive. In such embodiments, the tube may be made of polycarbonate, for example, which is substantially transparent to UV light and allows the UV light to thoroughly cure the adhesive across the full width of the adhering surface. In some embodiments, the adhesive may be selected/configured to form a flexible bond between the tip and tube, for example, that is cured by UV light. In additional embodiments, adhesive station 634 may be configured to apply adhesive around a perimeter of a tip and/or tube using positioning sensors, actuators (e.g., a robotic

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arm and/or a tip/tube rotator), and a dispensing needle, for example. In various embodiments, the adhesive may be implemented as a cyanoacrylate, and epoxy, and/or other adhesives, for example, and the same or similar adhesives may be used throughout assembly of an electronic smoking device.

[0070] In some embodiments, system 600 may include one or more inspection stations, such as inspection station 680 linked to tip assembly station 630 in Fig. 6. In such embodiments, each inspection station may be configured to inspect a tip, tube, and/or tip/tube assembly at any stage of the assembly process, using any one of a variety of spectra and/or other sensing mechanisms, and to accept or reject the inspected element based on predetermined quality control criteria. For example, in the embodiment shown in Fig. 6, tip assembly station 630 may be configured to serve filled and cured tip/tube assemblies to inspection station 680, and inspection station 680 may be configured to receive the assemblies and inspect their fill levels and/or an adhesive bond between the tip and tube, using a high speed camera sensitive to visible and/or UV light, for example. In some embodiments, inspection station 680 may be configured accept or reject each tube based on whether the fill level is within a predetermined range and/or whether the adhesive bond traverses the circumference of the tip/tube assembly. In related embodiments, inspection station 680 may be configured to serve rejected assemblies to rejection hopper 682 for later manual inspection and/or to notify controller 608 of the circumstances of the rejection. For example, inspection station 680 may be configured to halt system 600 and notify controller 608 when a predetermined number of consecutive rejections and/or percentage of rejections (e.g., 5, or 5%) is detected.

[0071] In various embodiments, tip assembly station 630 may be configured to serve filled tip/tube assemblies (e.g., accepted and/or uninspected) to dial machine 610, which may be configured to serve the filled tip/tube assemblies to labeling/coating station 640. As shown in Fig. 6, labeling/coating station 640 may be configured to receive coating material (e.g., powder coating material, paint, inking, and/or other coating material) from coating drum 644 and/or labels (e.g., adhesive labels) from label hopper 642 and apply either or both to an outer surface of received filled tip/tube assemblies. In some embodiments, the outer coating and/or label may be configured to simulate, at least in part, a cigarette, a cigar, and/or a burning ash end. Examples of such outer coatings and/or labels are provided in views 700-703 of Fig. 7. For example, view 700 illustrates a full label for tube 110, including portion 710 corresponding to battery tube portion 310, portion 760 corresponding to cartridge tube portion 360, and burning ash end 711. View

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701 illustrates a similar design, but with two separate labels corresponding to portions 710 and 760. View 702 illustrates a different design, but still with two separate labels corresponding to portions 710 and 760. View 703 illustrates a close up view of burning ash end 711 and corresponding burning ember lens cap 780.

[0072] After each filled tip/tube assembly is labeled, labeling/coating station 640 may be configured to serve the labeled assemblies to dial machine 610, which may then pass the labeled assemblies to cap station 650. As shown, cap station 650 may be configured to receive caps (e.g., silicone and/or other sealing caps, such as caps 805 shown in Fig. 8 with tube 110, inhalation tips 240, and cartridge tube portion 860) from cap hopper 652, place the caps on corresponding tip ends of the labeled assemblies, and then press the caps onto the tip ends. In some embodiments, such as when the labeled assemblies correspond to cartridge tube portions for example, cap station 650 may be configured to reposition the labeled assemblies after the first caps are pressed onto the tip ends, place second caps on the opposing ends of the labeled assemblies, and/or press the second caps onto the opposing ends to seal both ends of the labeled assemblies. After capping is completed, cap station 650 may serve the capped assemblies to dial machine 610, which may then pass the capped assemblies to discharge station 660. Discharge station 660 may be implemented as an inspection station, a discharge hopper, a wrapping station, and/or a discriminator and/or tally station, for example, and be configured to update controller 608 with an ongoing status of the productivity of system 600.

[0073] Also shown in Fig. 6 is other stations 690. Other stations 690 may be implemented as one or more pre-assembly stations, for example, and/or one or more post assembly stations, such as a mailing station configured to package discharged assemblies and ready the packages for mailing according to addresses and/or delivery methods supplied by controller 608. In some embodiments, other stations 609 may be implemented as a pre-assembly station configured to provide an inhalation tip (e.g., by injection and/or compression moulding), to provide tube 110 (e.g., by extrusion, moulding, and/or machining), to assemble multi-piece flue assembly 130 and/or insert multi-piece flue assembly 130 into tube 110 and/or tube portion 360, to cut tube 110 into tube portions 310 and 360, to press fit and/or adhesively bond threaded bushings to appropriate ends of tube portions 310 and 360, to insert sealed battery 116 into tube 110 and/or tube portion 310, to print one or more labels for application to tube 110 and/or tube portion 360, to provide a lens cap and press fit and/or adhesively couple the lens cap to tube 110 and/or tube portion 310, and/or to provide any of the elements of an electronic

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smoking device, as described herein. Such pre-assembly stations may be configured to provide pre-assembled tubes to tube hopper 612.

[0074] Fig. 9 illustrates a flow diagram of process 900 to assemble an electronic smoking device in accordance with an embodiment of the disclosure. In some embodiments, the operations of Fig. 9 may be implemented as software instructions executed by one or more logic devices associated with corresponding electronic devices, sensors, and/or structures depicted in Fig. 6. More generally, the operations of Fig. 9 may be implemented with any combination of software instructions and/or electronic hardware (e.g., inductors, capacitors, amplifiers, actuators, assembly lines, or other analog and/or digital components).

[0075] It should be appreciated that any step, sub-step, sub-process, or block of process 900 may be performed in an order or arrangement different from the embodiment illustrated by Fig. 9. For example, in other embodiments, one or more blocks may be omitted, and other blocks may be included. Furthermore, block inputs, block outputs, and/or other operational parameters may be stored to one or more memories (e.g., of system 600) prior to moving to a following portion of process 900. Although process 900 is described with reference to devices 100A, 200A, 300A, and/r 400A, and system 600, process 900 may be performed by other systems different from system 900 and including a different selection of electronic devices, sensors, assemblies, stations, and/or system attributes.

[0076] Process 900 represents a method for assembling an electronic smoking device using system 600 in accordance with embodiments of the disclosure. At the initiation of process 900, various system parameters and/or pre-assembled materials may be populated by prior execution of a process similar to process 900, for example.

[0077] In block 902, an assembly system provides an inhalation tip, a multi-piece flue assembly, and a tube configured to house an active compound. For example controller 608 of system 600 may be configured to control one or more hoppers, stations, and or dial machine 610 to provide inhalation tip 240, multi-piece flue assembly 130, and tube 110 to an assembly station (e.g., other stations 690) and/or other devices of system 110.

[0078] In block 904, an assembly system inserts a portion of the multi-piece flue assembly into the tube. For example controller 608 may be configured to control the assembly station that received the various elements in block 902 to insert at least a portion of multi-piece flue assembly 130 into tube 110. For example, an assembly station similar to tip assembly station 630 may be adapted to receive plug 132 and inner flue 134

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of multi-piece flue assembly 130 from a corresponding hopper, and tube 110 from dial machine 610, and insert plug 132 and inner flue 134 and/or multi-piece flue assembly 130 into tube 110.

[0079] In block 906, an assembly system dispenses a bulk of the active compound into the tube. For example controller 608 may be configured to control filling station 620 to receive partially assembled tube 110 provided in block 904 and dispense a predetermined bulk amount of active compound (e.g., from drum 622) into partially assembled tube 110.

[0080] In block 908, an assembly system couples the inhalation tip to the tube to seal the bulk of the active compound within the tube. For example controller 608 may be configured to control tip assembly station 630 to couple inhalation tip 240, provided in block 902, to filled and partially assembled tube 110 provided in block 906.

[0081] Embodiments of the present disclosure can thus provide inexpensive, feature-filled, reliable, and accurate sonar systems, data and/or imagery. Such embodiments may be used to provide sonar data to assist in navigation and/or mapping for a mobile structure and/or to assist in the operation of other systems, devices, and/or sensors coupled to the mobile structure.

[0082] One or more processors, logic devices, and other components of the various systems described herein perform specific operations by executing sequences of instructions contained in one or more memories. Logic may be encoded in a computer readable medium, which may refer to any medium that participates in providing instructions to processors for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. In various implementations, non-volatile media includes optical or magnetic disks, volatile media includes dynamic memory, and transmission media includes coaxial cables, copper wire, and fiber optics. In one embodiment, logic may be encoded in non-transitory computer readable medium. In one example, transmission media may take the form of acoustic or light waves, such as those generated during radio wave, optical, and infrared data communications.

[0083] Some common forms of computer readable media includes, for example, floppy disk, flexible disk, hard disk, magnetic tape, any other magnetic medium, CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, RAM, PROM, EEPROM, FLASH-EEPROM, any other memory chip or cartridge, or any other medium from which a computer is adapted to read.

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[0084] In various embodiments of the present disclosure, execution of instruction sequences to practice the present disclosure may be performed by one or more elements of any of the systems described herein. In various other embodiments of the present disclosure, a plurality of systems coupled to a network (e.g., such as a LAN, WLAN, PTSN, and/or various other wired or wireless networks, including telecommunications, mobile, and cellular phone networks) may perform instruction sequences to practice the present disclosure in coordination with one another.

[0085] Where applicable, various embodiments provided by the present disclosure may be implemented using hardware, software, or combinations of hardware and software. Also, where applicable, the various hardware components and/or software components set forth herein may be combined into composite components comprising software, hardware, and/or both without departing from the spirit of the present disclosure. Where applicable, the various hardware components and/or software components set forth herein may be separated into sub-components comprising software, hardware, or both without departing from the scope of the present disclosure. In addition, where applicable, it is contemplated that software components may be implemented as hardware components and vice-versa.

[0086] Software, in accordance with the present disclosure, such as program code and/or data, may be stored on one or more computer readable mediums. It is also contemplated that software identified herein may be implemented using one or more general purpose or specific purpose computers and/or computer systems, networked and/or otherwise. Where applicable, the ordering of various steps described herein may be changed, combined into composite steps, and/or separated into sub-steps to provide features described herein.

[0087] The foregoing disclosure is not intended to limit the present disclosure to the precise forms or particular fields of use disclosed. As such, it is contemplated that various alternate embodiments and/or modifications to the present disclosure, whether explicitly described or implied herein, are possible in light of the disclosure. Having thus described embodiments of the present disclosure, persons of ordinary skill in the art will recognize that changes may be made in form and detail without departing from the scope of the present disclosure. Thus, the present disclosure is limited only by the claims.

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WHAT IS CLAIMED IS:

1. A device comprising:

a tube configured to house an active compound;

an inhalation tip coupled to a first end of the tube; and

a multi-piece flue assembly disposed within the tube, wherein the multi-piece flue assembly is configured to seal a bulk of the active compound from a second end of the tube and from exiting the inhalation tip.

2. The device of claim 1, wherein the multi-piece flue assembly comprises:

an inner flue comprising a notch configured to support a heating filament;

an outer flue comprising a slot, wherein the outer flue and the slot are configured to mate with the inner flue and the notch to form a flue inlet, and wherein the flue inlet is configured allow the bulk of the active compound to contact the heating filament at a predetermined rate; and

a plug comprising first and second plug portions and a flexible plug membrane disposed therebetween, wherein the first portion is coupled to the inner flue, and wherein the plug and/or the flexible plug membrane are configured to allow air through the plug and to block the bulk of the active compound from passing through the plug.

3. The device of claim 2, wherein:

the first and second plug portions are configured to support one or more contact pins; and

the one or more contact pins are configured to provide electrical coupling to the heating filament through the plug.

4. The device of claim 1, wherein the inhalation tip comprises an internal riser coupled to the multi-piece flue assembly, and wherein the internal riser is configured to form a seal with the multi-piece flue assembly to allow a vapor of the active compound through an orifice of the inhalation tip.

5. The device of claim 1, further comprising a flexible tip membrane bonded to an interior surface of the inhalation tip, wherein the flexible tip membrane is

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configured to form a seal with the inhalation tip to allow a vapor of the active compound through the inhalation tip and to block the bulk of the active compound from exiting the inhalation tip.

6. The device of claim 1, wherein:

the tube is substantially cylindrical and comprises polycarbonate, polyester terephthalate, acrylic, and/or one or more other flexible tube materials, and;

the inhalation tip comprises silicon, thermoplastic polyurethane, and/or one or more other flexible tip materials; and

the inhalation tip is bonded to the tube using a flexible adhesive.

7. The device of claim 1, further comprising:

a sealed battery disposed within the tube;

a heating filament disposed substantially within the multi-part flue assembly; and

an air pressure sensor disposed within the tube and electrically coupled to the sealed battery and the heating filament, at least in part, by a flexible circuit, wherein the air pressure sensor and/or the flexible circuit are configured to detect an inhalation through the inhalation tip and energize the heating filament in response to a detected inhalation.

8. The device of claim 7, further comprising a lens cap disposed opposite the inhalation tip with respect to the tube, wherein the air pressure sensor and/or the flexible circuit are configured to energize a light source adjacent the lens cap in response to the detected inhalation.

9. The device of claim 8, wherein:

the lens cap comprises a raised pattern configured to simulate a burning ember; and

the tube comprises an outer coating and/or label configured to simulate, at least in part, a cigarette, a cigar, and/or a burning ash end.

10. The device of claim 1, wherein:

the tube comprises first and second tube portions coupled to each other using corresponding first and second bushings and/or first and second insulated terminals;

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the multi-piece flue assembly and/or the bulk of the active compound are disposed substantially within the first tube portion; and

a sealed battery is disposed substantially within the second tube portion and is electrically coupled to a heating filament disposed substantially within the multi-part flue assembly, at least in part, by the first and second bushings and/or the first and second insulated terminals.

11. A method comprising:

providing an inhalation tip, a multi-piece flue assembly, and a tube configured to house an active compound;

inserting at least a portion of the multi-piece flue assembly into the tube;

dispensing a bulk of the active compound into an interior of the tube defined, at least in part, by the portion of the multi-piece flue assembly; and

coupling the inhalation tip to the tube and/or the multi-piece flue assembly to seal the bulk of the active compound within the tube.

12. The method of claim 11, wherein the multi-piece flue assembly comprises:

an inner flue comprising a notch configured to support a heating filament;

an outer flue comprising a slot, wherein the outer flue and the slot are configured to mate with the inner flue and the notch to form a flue inlet, and wherein the flue inlet is configured allow the bulk of the active compound to contact the heating filament at a predetermined rate; and

a plug comprising first and second plug portions and a flexible plug membrane disposed therebetween, wherein the first portion is coupled to the inner flue, the first and second plug portions are configured to support one or more contact pins, and the one or more contact pins are configured to provide electrical coupling to the heating filament through the plug.

13. The method of claim 11, further comprising coupling an internal riser of the inhalation tip to the multi-piece flue assembly, wherein the internal riser is configured to form a seal with the multi-piece flue assembly to allow a vapor of the active compound through an orifice of the inhalation tip.

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14. The method of claim 11, further comprising bonding a flexible tip membrane to an interior surface of the inhalation tip, wherein the flexible tip membrane is configured to form a seal with the inhalation tip to allow a vapor of the active compound through the inhalation tip and to block the bulk of the active compound from exiting the inhalation tip.

15. The method of claim 11, further comprising:

providing a sealed battery disposed within the tube;

providing a heating filament disposed substantially within the multi-part flue assembly;

providing an air pressure sensor disposed within the tube; and

electrically coupling the air pressure sensor to the sealed battery and the heating filament, at least in part, using a flexible circuit, wherein the air pressure sensor and/or the flexible circuit are configured to detect an inhalation through the inhalation tip and energize the heating filament in response to a detected inhalation.

16. The method of claim 15, further comprising providing a lens cap disposed opposite the inhalation tip with respect to the tube, wherein the air pressure sensor and/or the flexible circuit are configured to energize a light source adjacent the lens cap in response to the detected inhalation.

17. The method of claim 16, further comprising:

providing, to the lens cap, a raised pattern configured to simulate a burning ember; and

providing, to the tube, an outer coating and/or label configured to simulate, at least in part, a cigarette, a cigar, and/or a burning ash end.

18. The method of claim 11, wherein:

the tube comprises first and second tube portions coupled to each other using corresponding first and second bushings and/or first and second insulated terminals;

the multi-piece flue assembly and/or the bulk of the active compound are disposed substantially within the first tube portion; and

a sealed battery is disposed substantially within the second tube portion and is electrically coupled to a heating filament disposed substantially within the multi-part flue

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assembly, at least in part, by the first and second bushings and/or the first and second insulated terminals.

19. A method comprising:

providing a tube, wherein the tube is adapted to house an active compound and comprises polycarbonate, polyester terephthalate, acrylic, and/or one or more other flexible tube materials;

dispensing a predetermined amount of the active compound into the tube;

providing an inhalation tip comprising silicon, thermoplastic polyurethane, and/or one or more other flexible tip materials; and

bonding the inhalation tip to the tube using an ultra-violet (UV) cured flexible adhesive.

20. The method of claim 19, further comprising:

providing a lens cap, wherein the lens cap comprises a raised pattern configured to simulate a burning ember;

coupling the lens cap to the tube; and

applying an outer coating and/or label to the tube, wherein the coating and/or labeling is configured to simulate, at least in part, a cigarette, a cigar, and/or a burning ash end.

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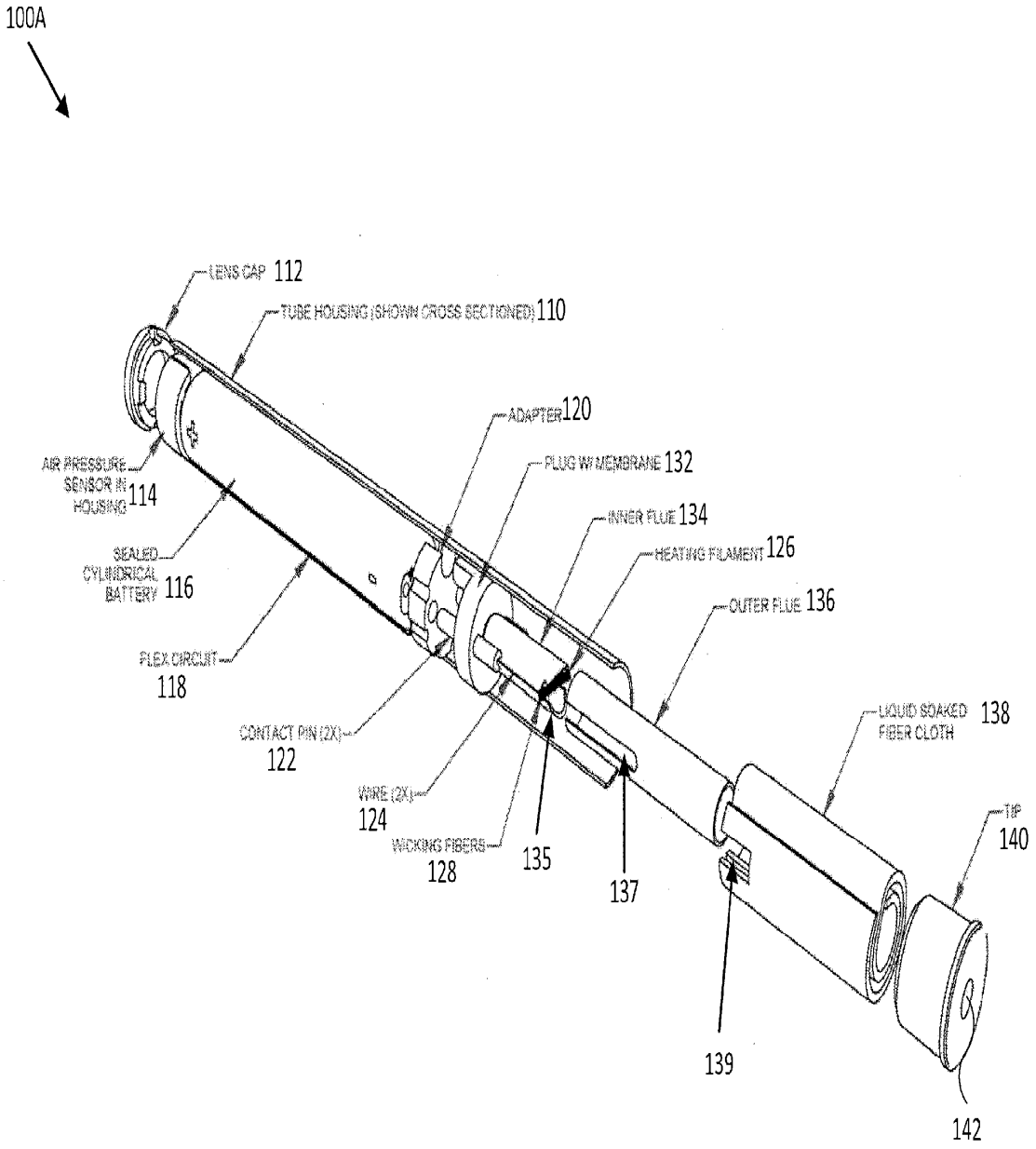


FIG. 1A

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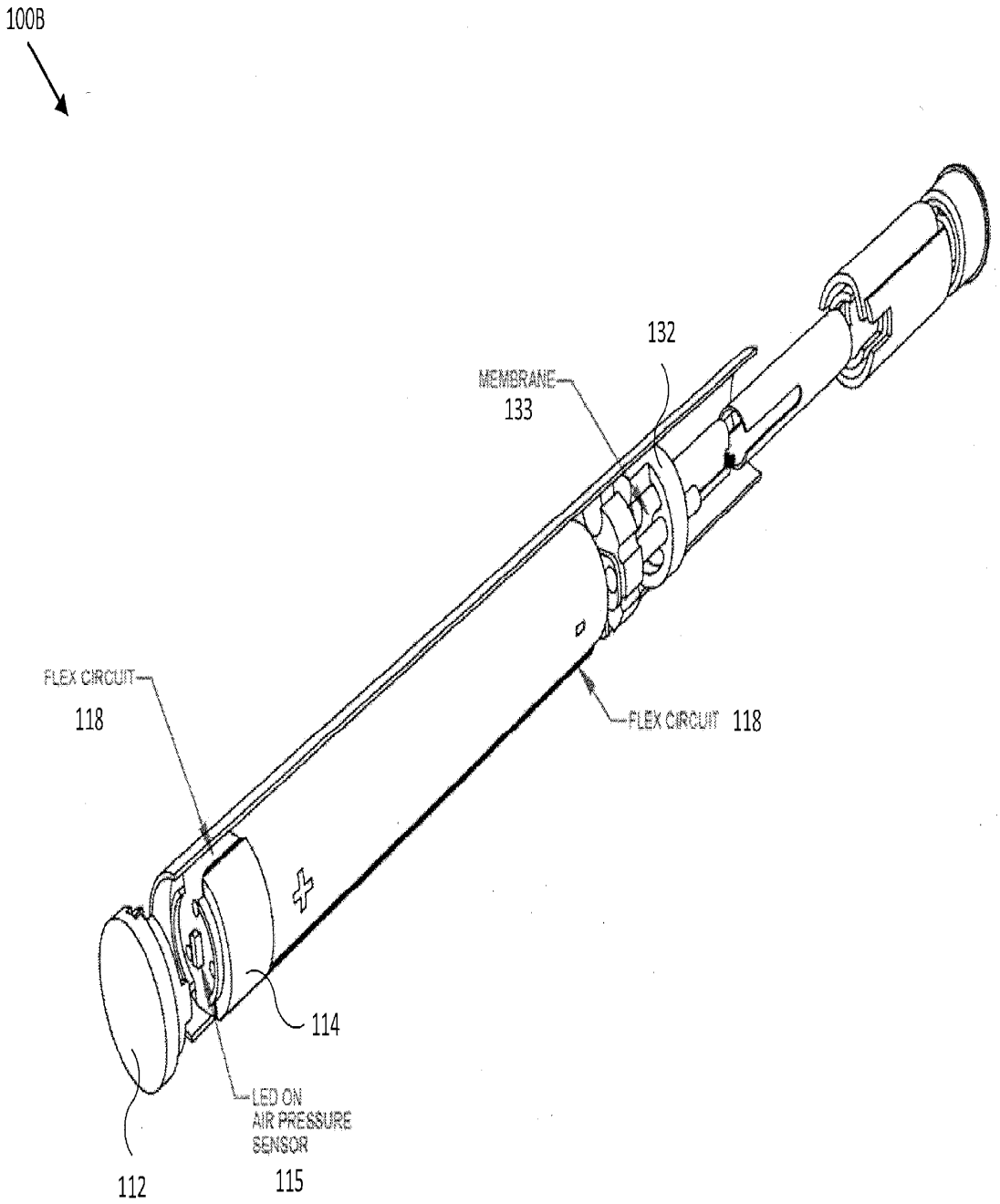
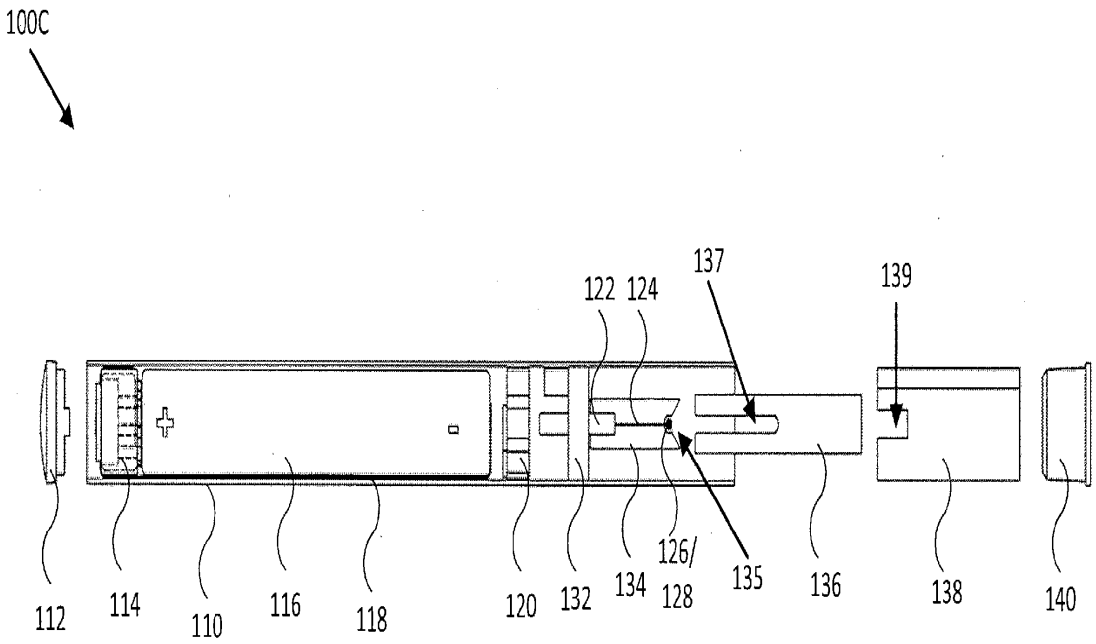


FIG. 1B

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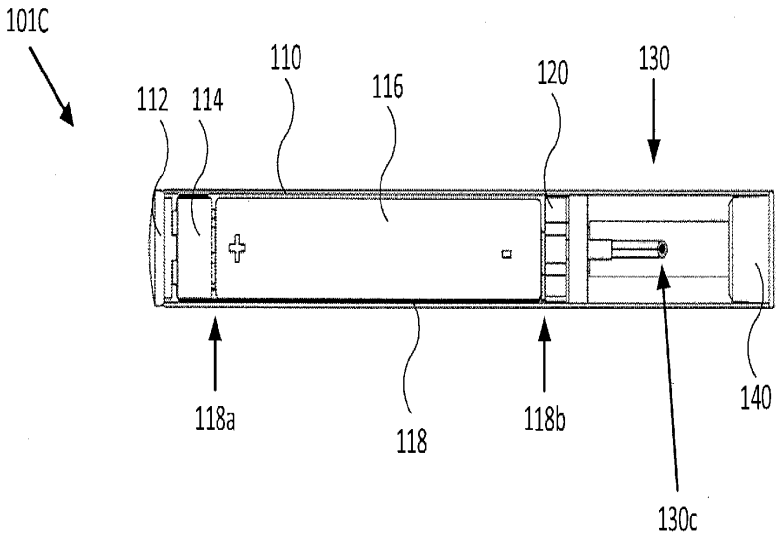


FIG. 1C

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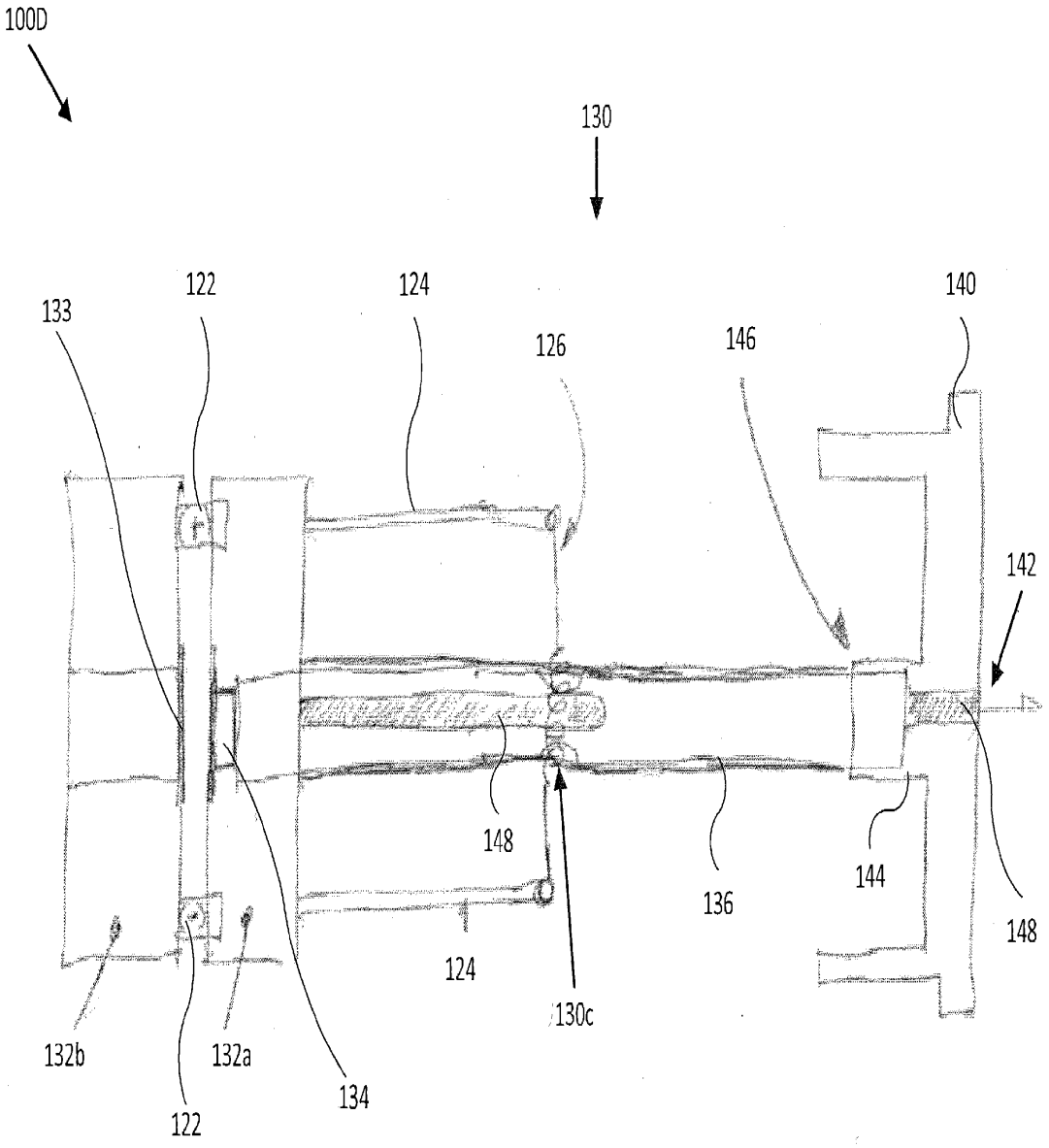


FIG. 1D

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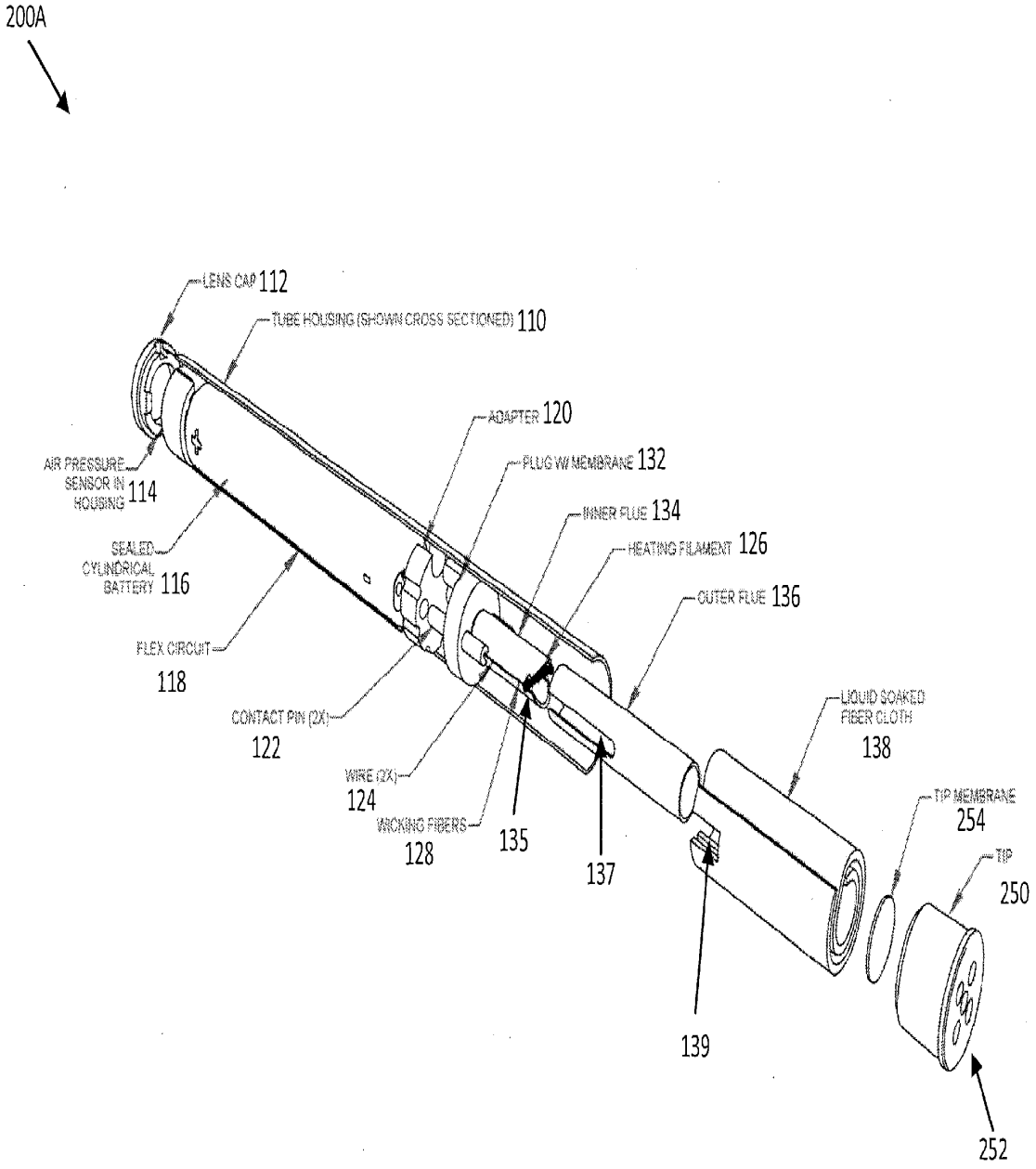


FIG. 2A

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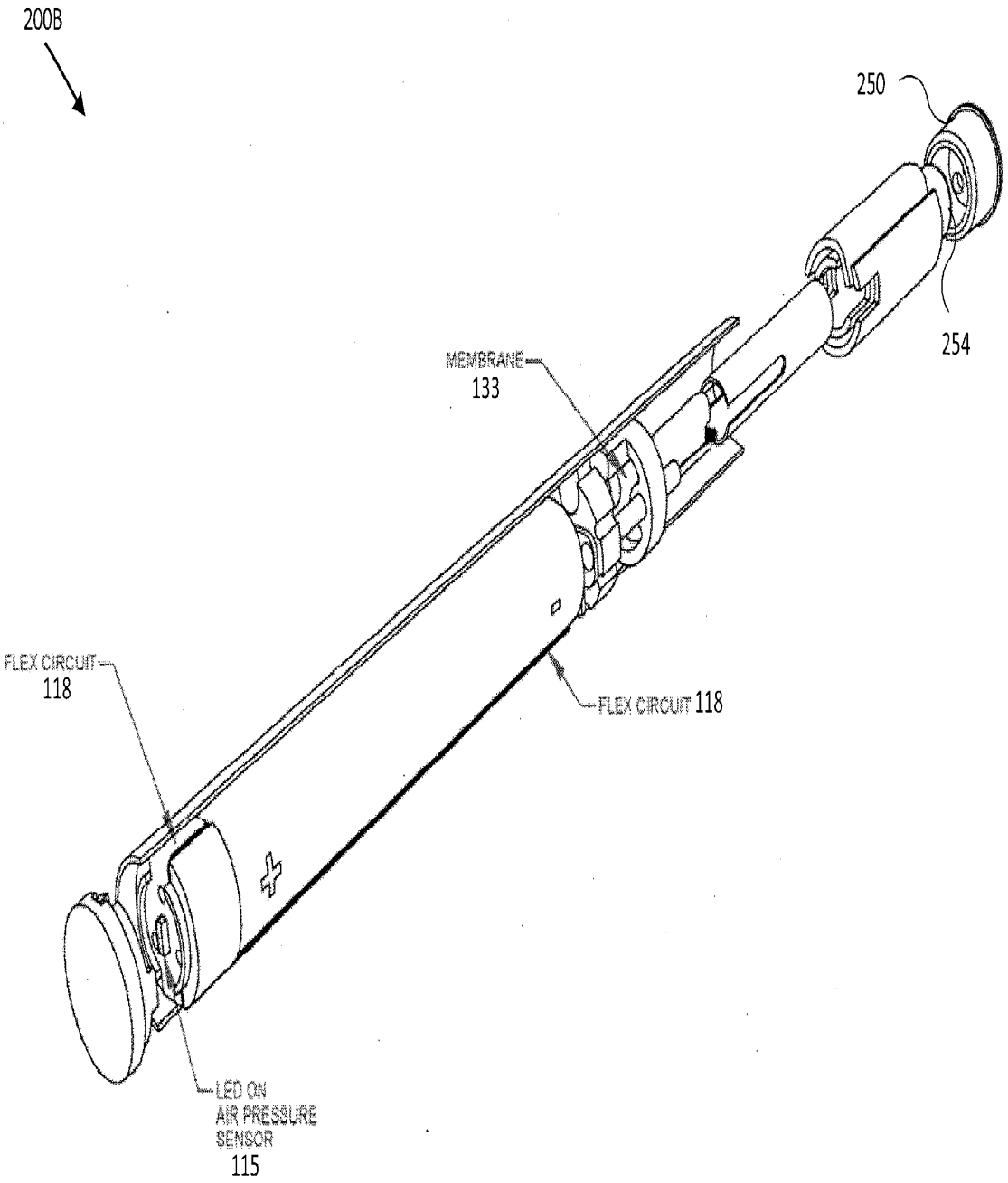


FIG. 2B

NJOY Exhibit 1002.390

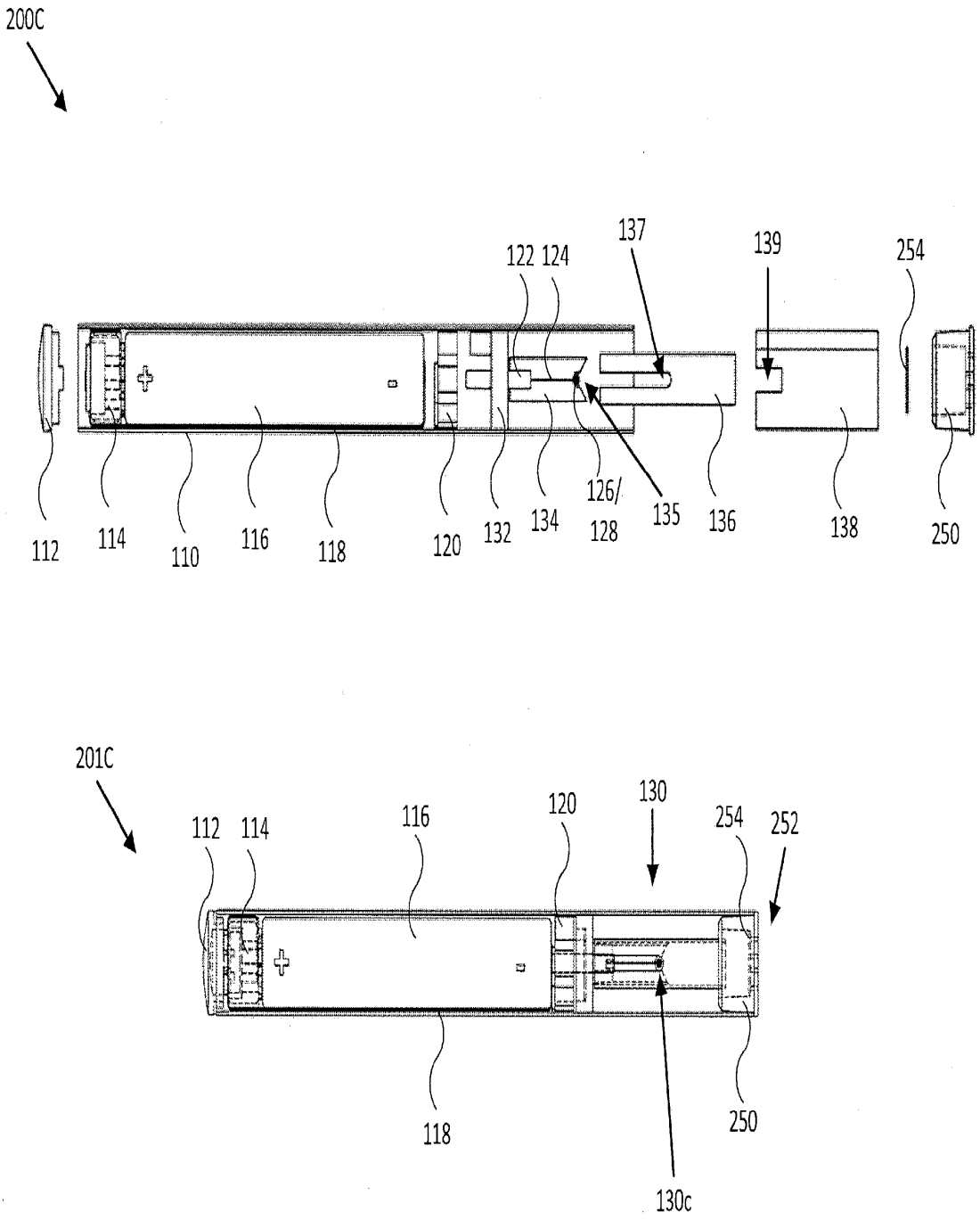
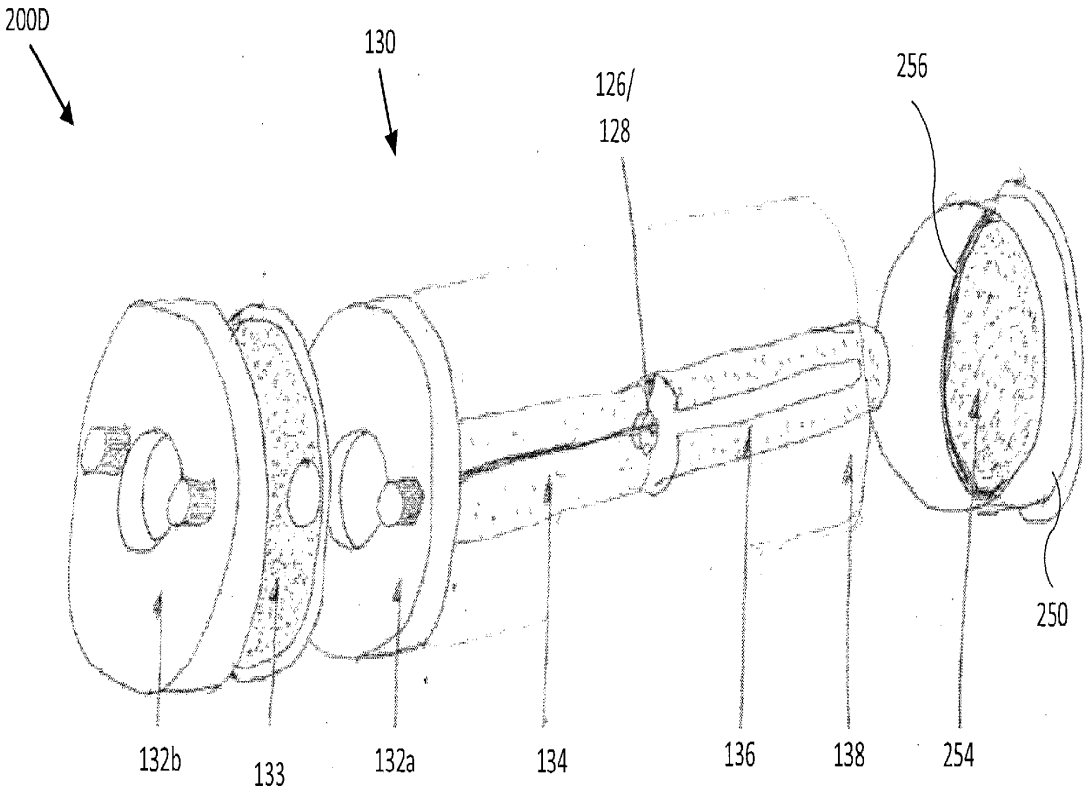


FIG. 2C

NJOY Exhibit 1002.391



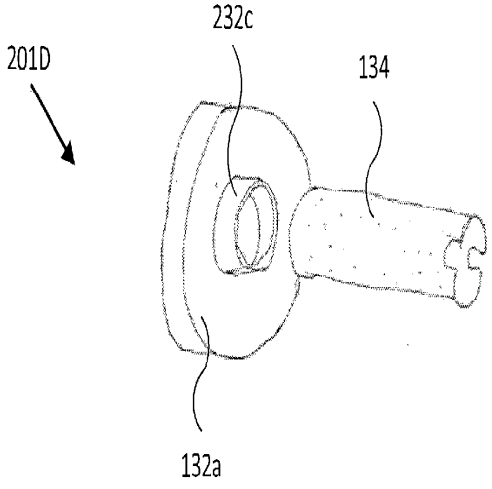


FIG. 2D

NJOY Exhibit 1002.392

FIG. 2E

NJOY Exhibit 1002.393

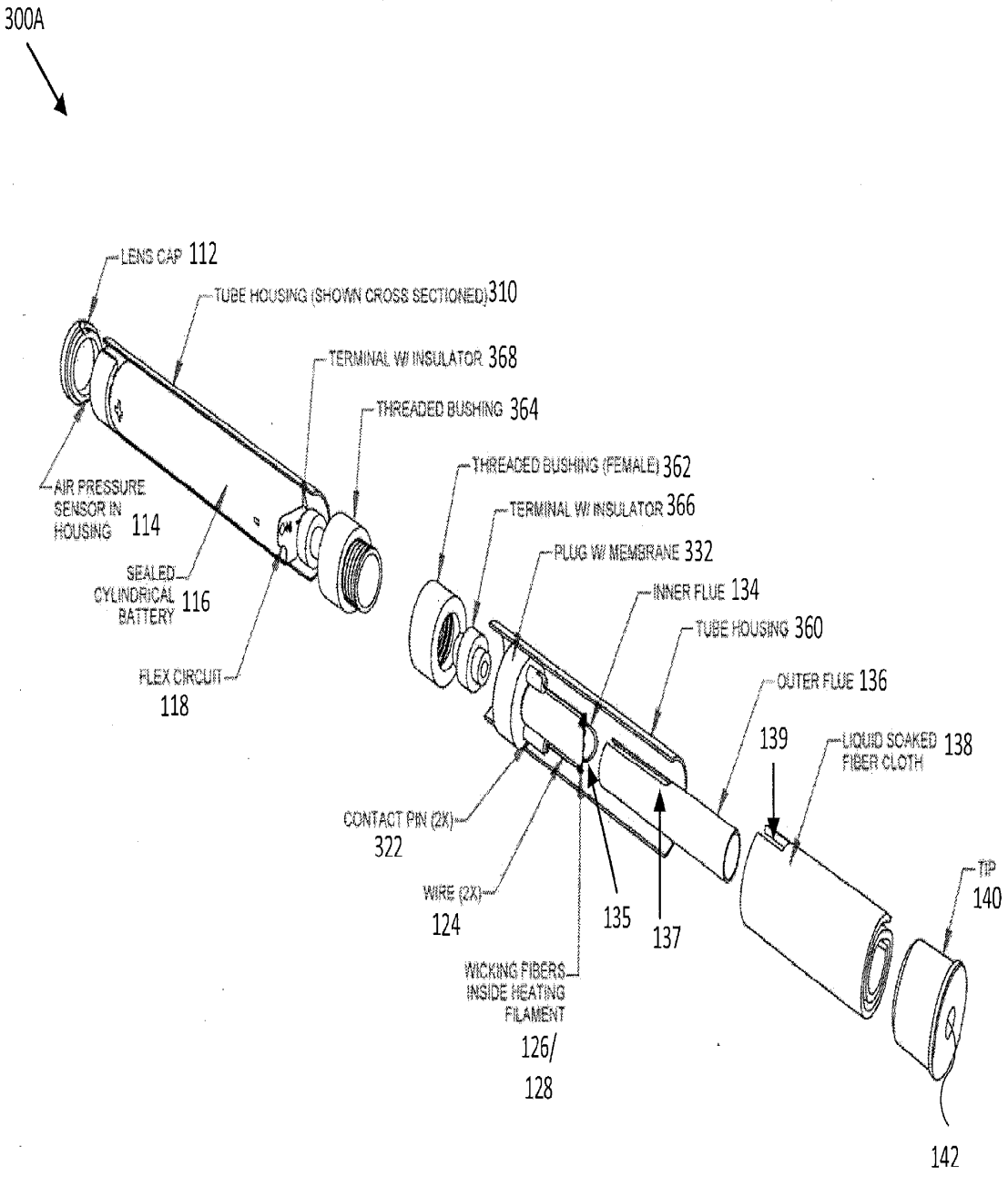


FIG. 3A

NJOY Exhibit 1002.394

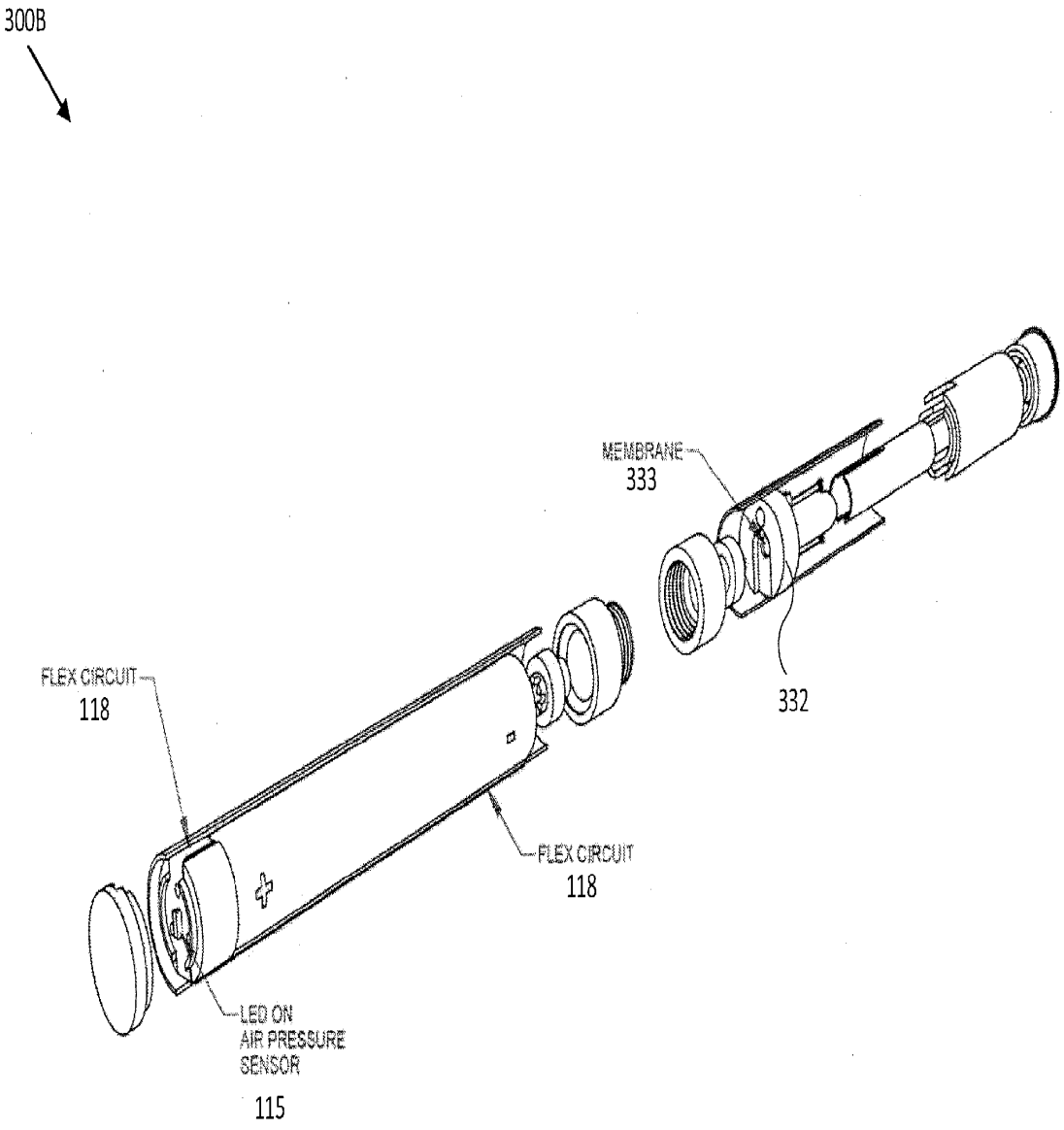


FIG. 3B

NJOY Exhibit 1002.395

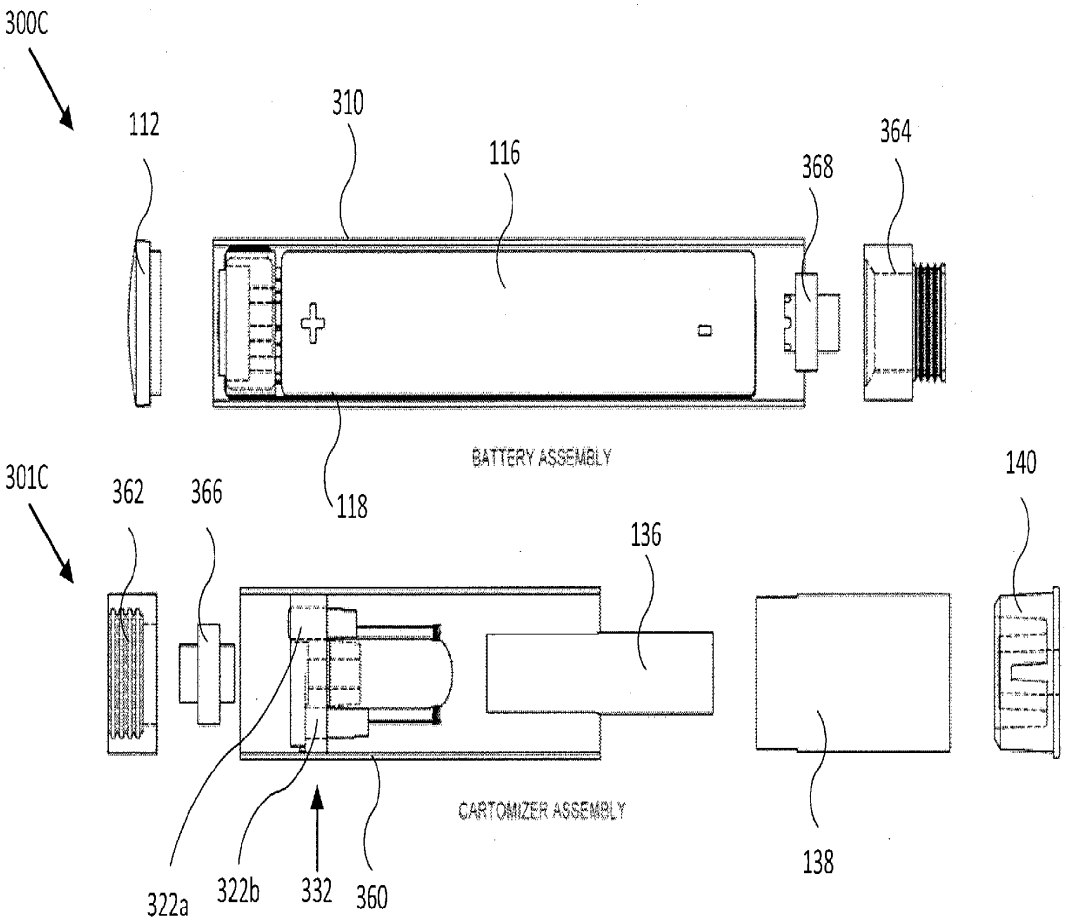


FIG. 3C

NJOY Exhibit 1002.396

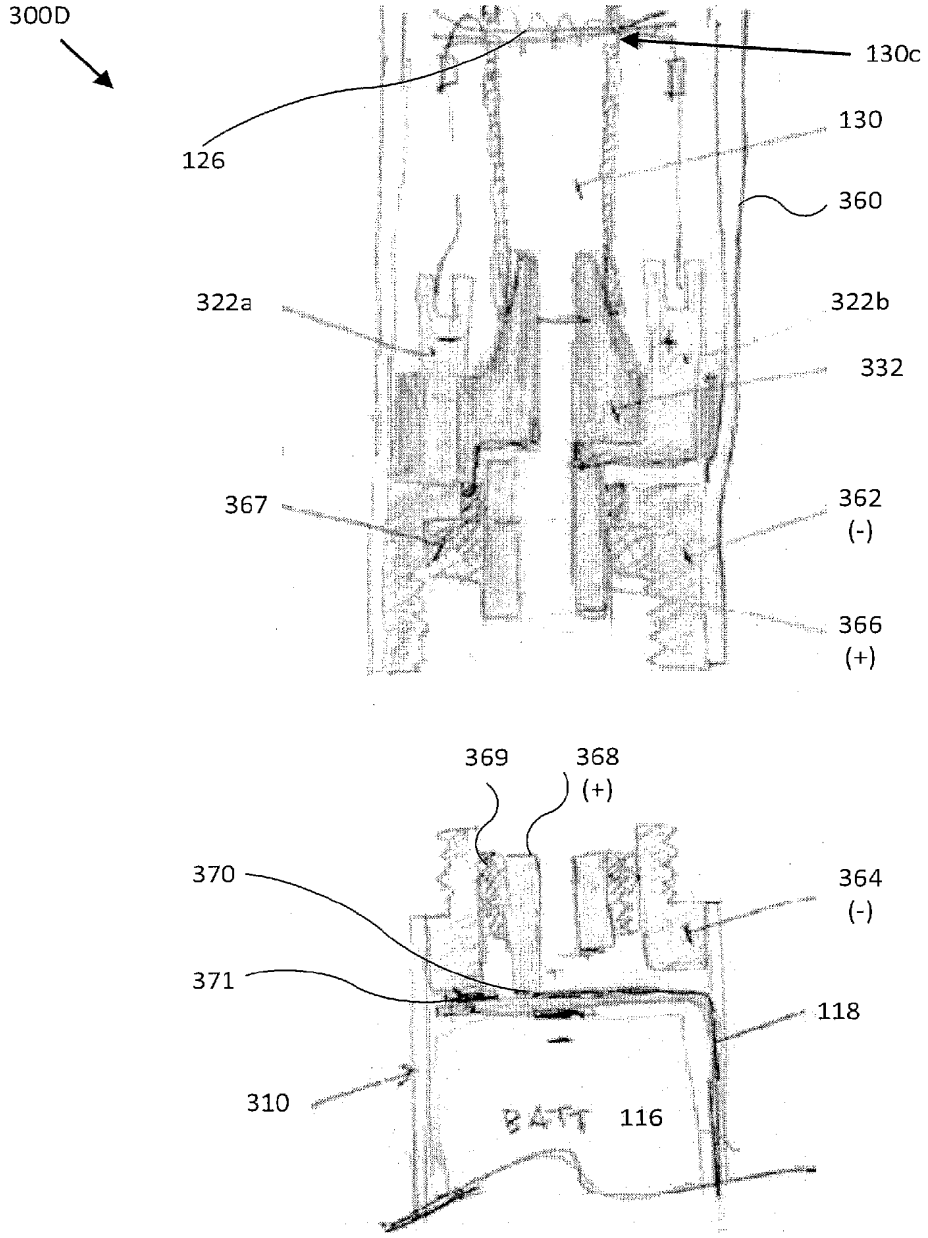

300D
126
130c
130
360
322a
322b
332
367
362
(-)
366
(+)
369
368
(+)
370
364
(-)
371
118
310
BATT
116

FIG. 3D

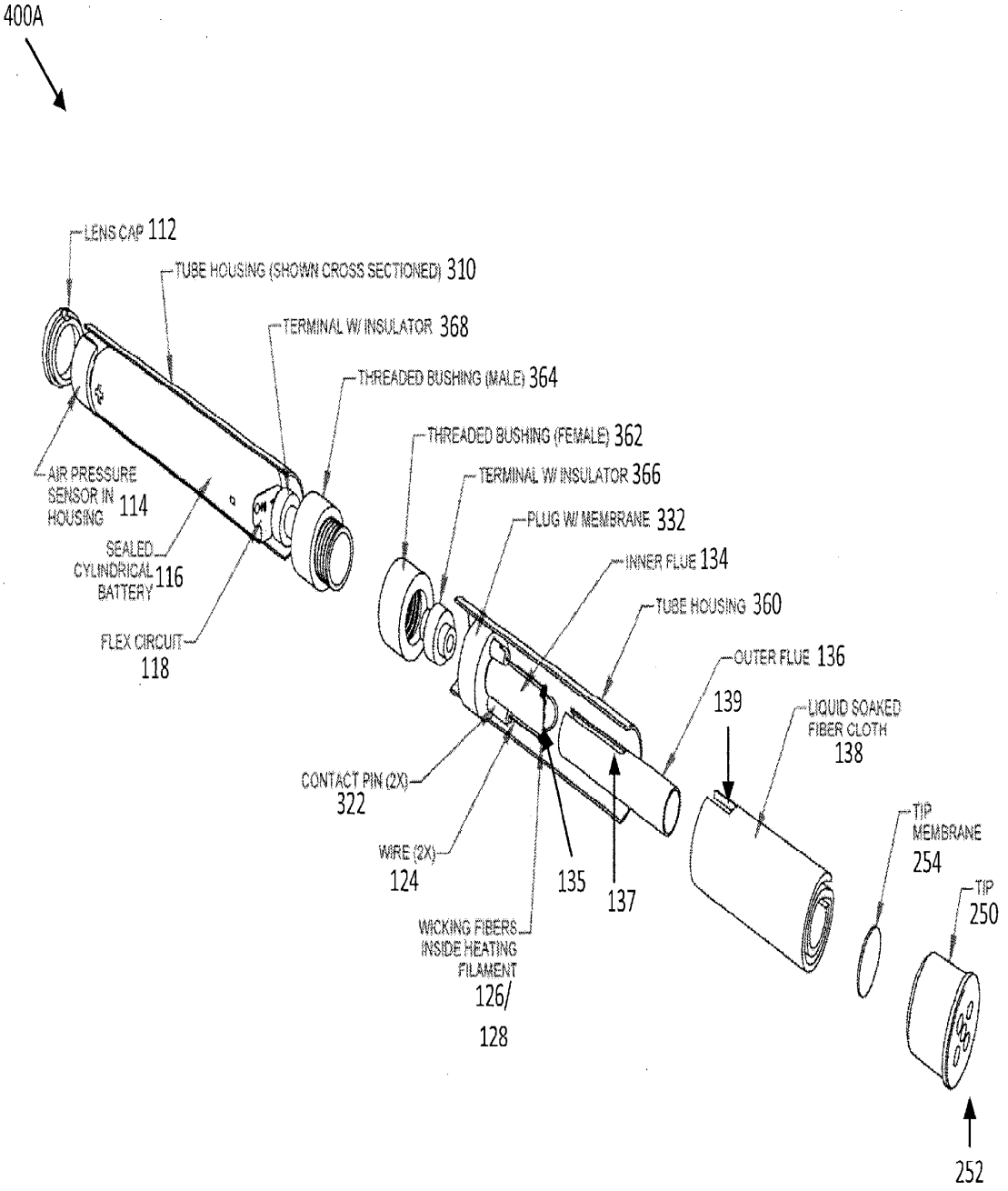

400A
LENS CAP 112
TUBE HOUSING (SHOWN CROSS SECTIONED) 310
TERMINAL W/ INSULATOR 368
THREADED BUSHING (MALE) 364
THREADED BUSHING (FEMALE) 362
TERMINAL W/ INSULATOR 366
PLUG W/ MEMBRANE 332
INNER FLUE 134
TUBE HOUSING 360
OUTER FLUE 136
139
LIQUID SOAKED FIBER CLOTH 138
TIP MEMBRANE 254
TIP 250
252
AIR PRESSURE SENSOR IN HOUSING 114
SEALED CYLINDRICAL BATTERY 116
FLEX CIRCUIT 118
CONTACT PIN (2X) 322
WIRE (2X) 124
135
137
WICKING FIBERS INSIDE HEATING FILAMENT 126/128

FIG. 4A

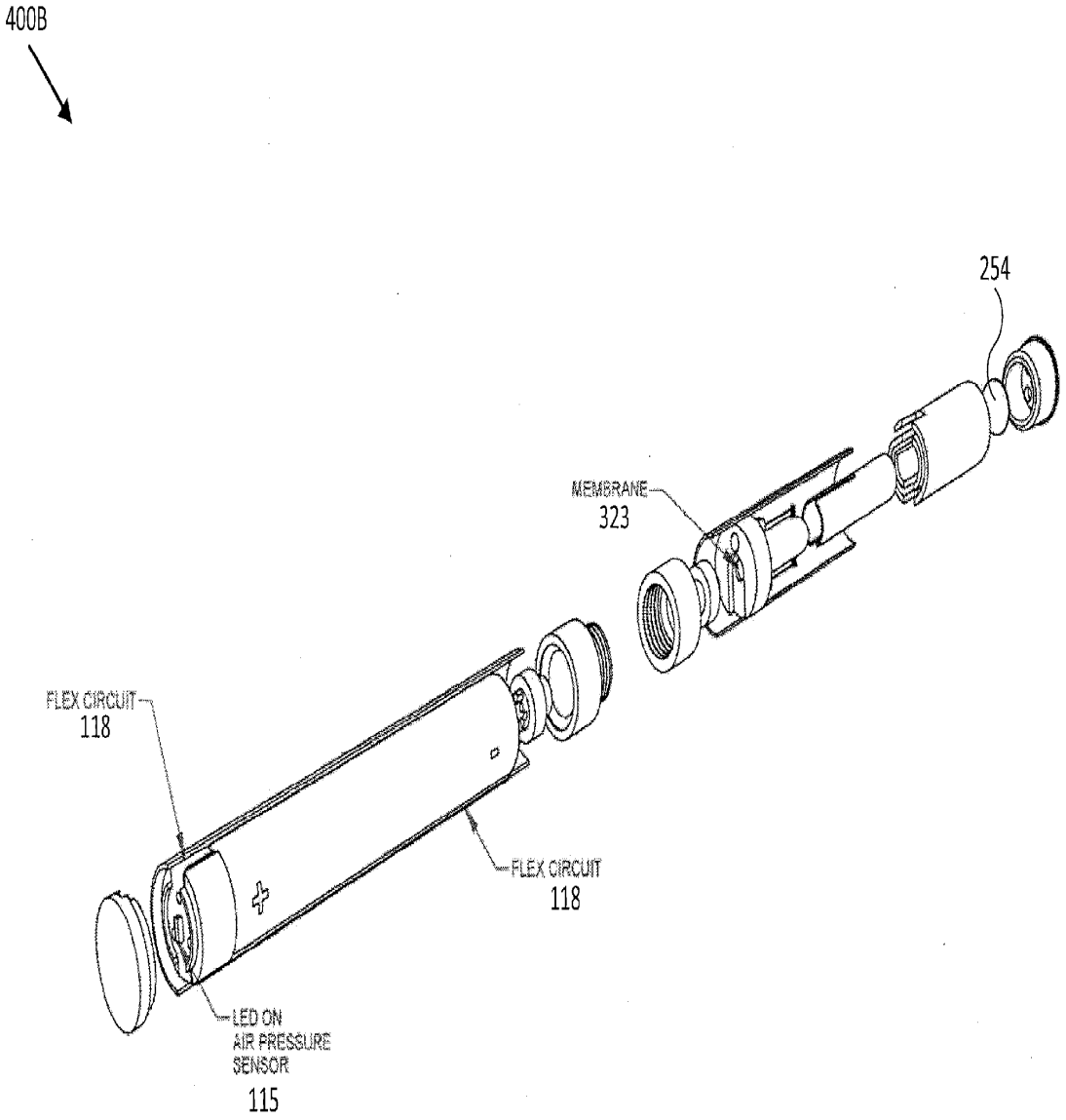


FIG. 4B

NJOY Exhibit 1002.399

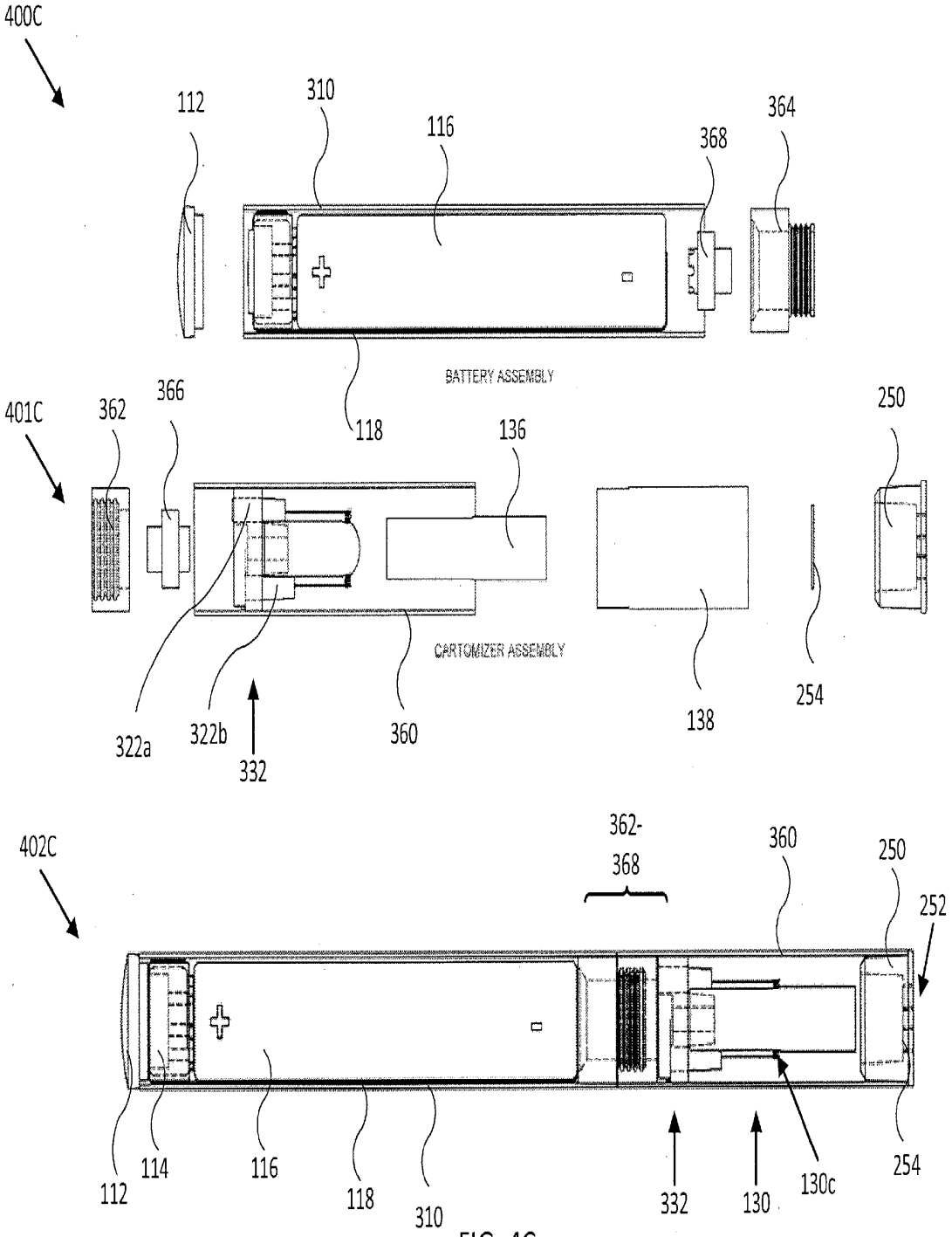

400C
112
310
116
364
368
BATTERY ASSEMBLY
118
401C
362
366
136
250
CARTOMIZER ASSEMBLY
322a
322b
332
360
138
254
402C
362-
368
360
250
252
112
114
116
118
310
332
130
130c
254

FIG. 4C

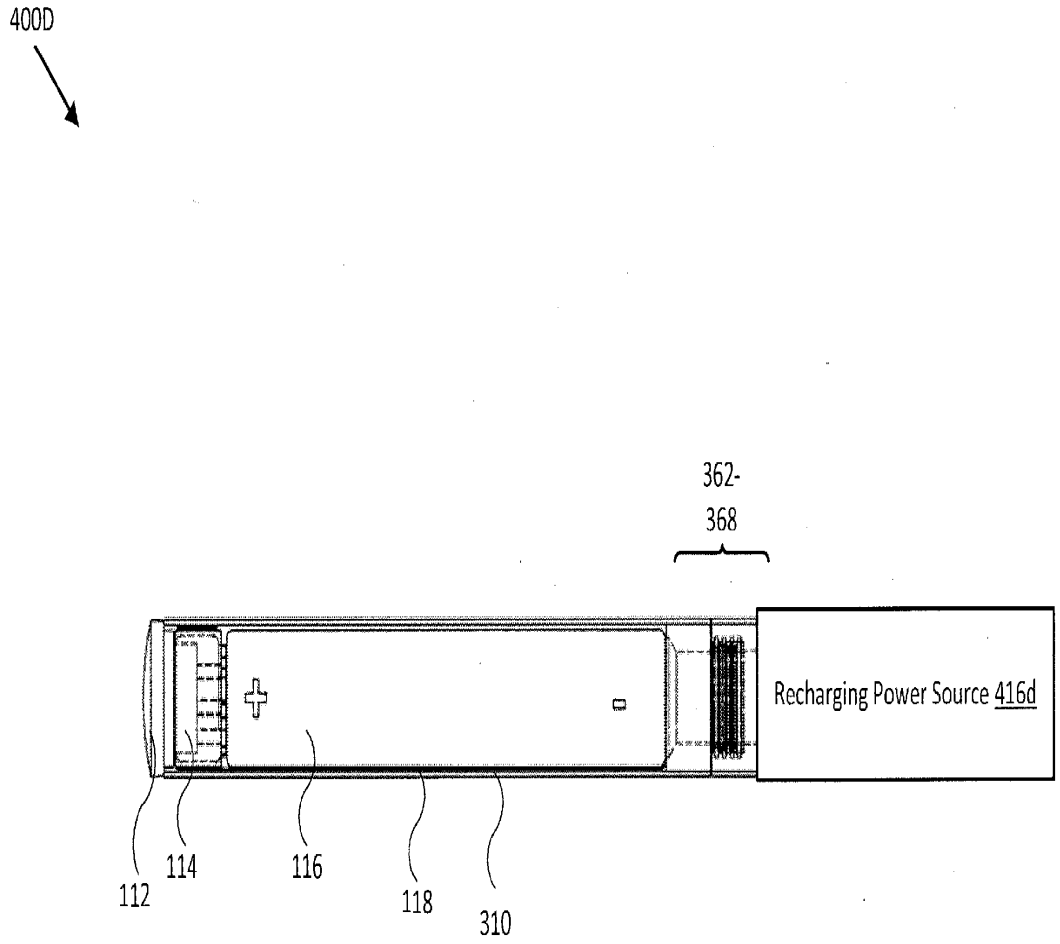


FIG. 4D

NJOY Exhibit 1002.401

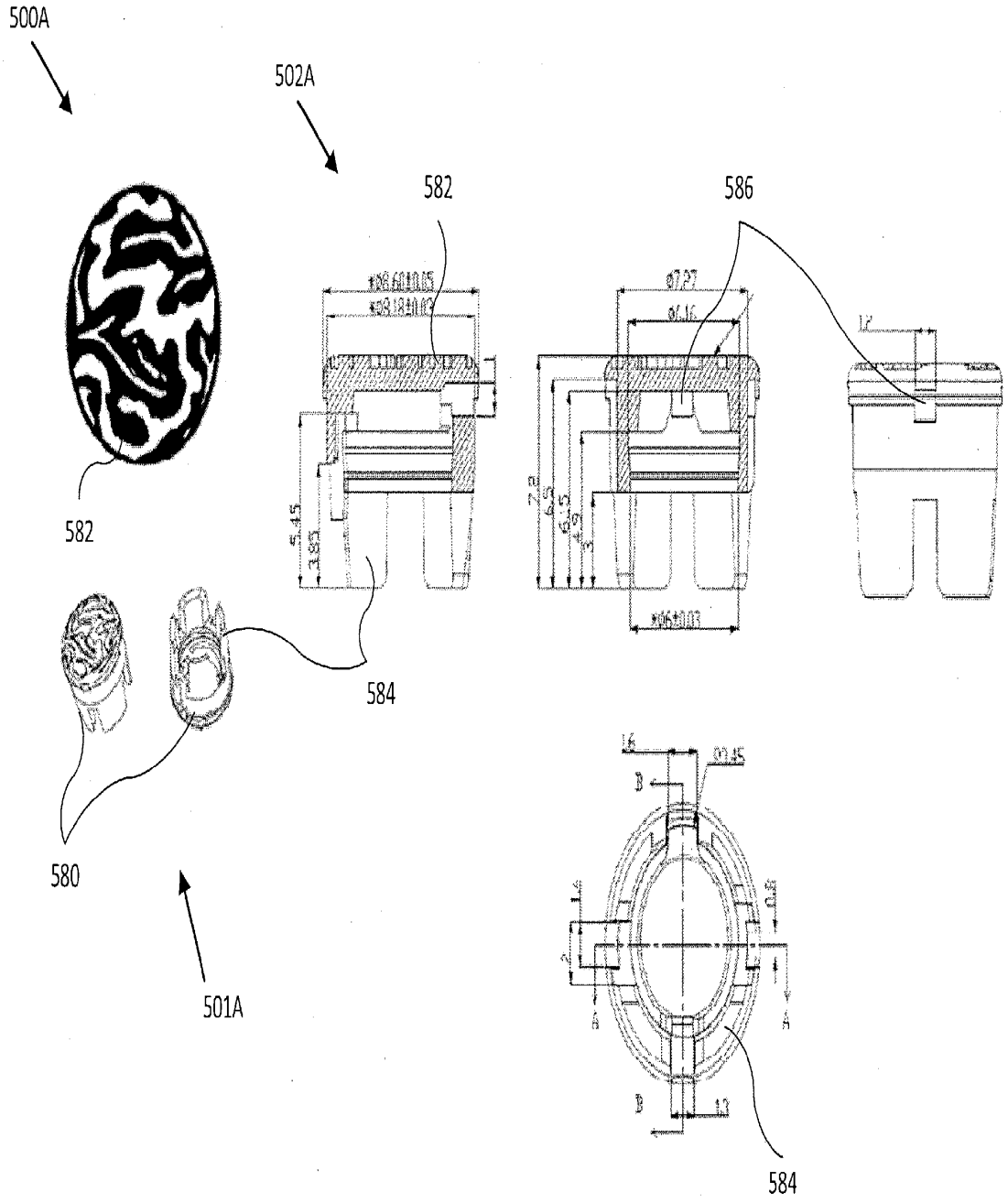


FIG. 5A

NJOY Exhibit 1002.402

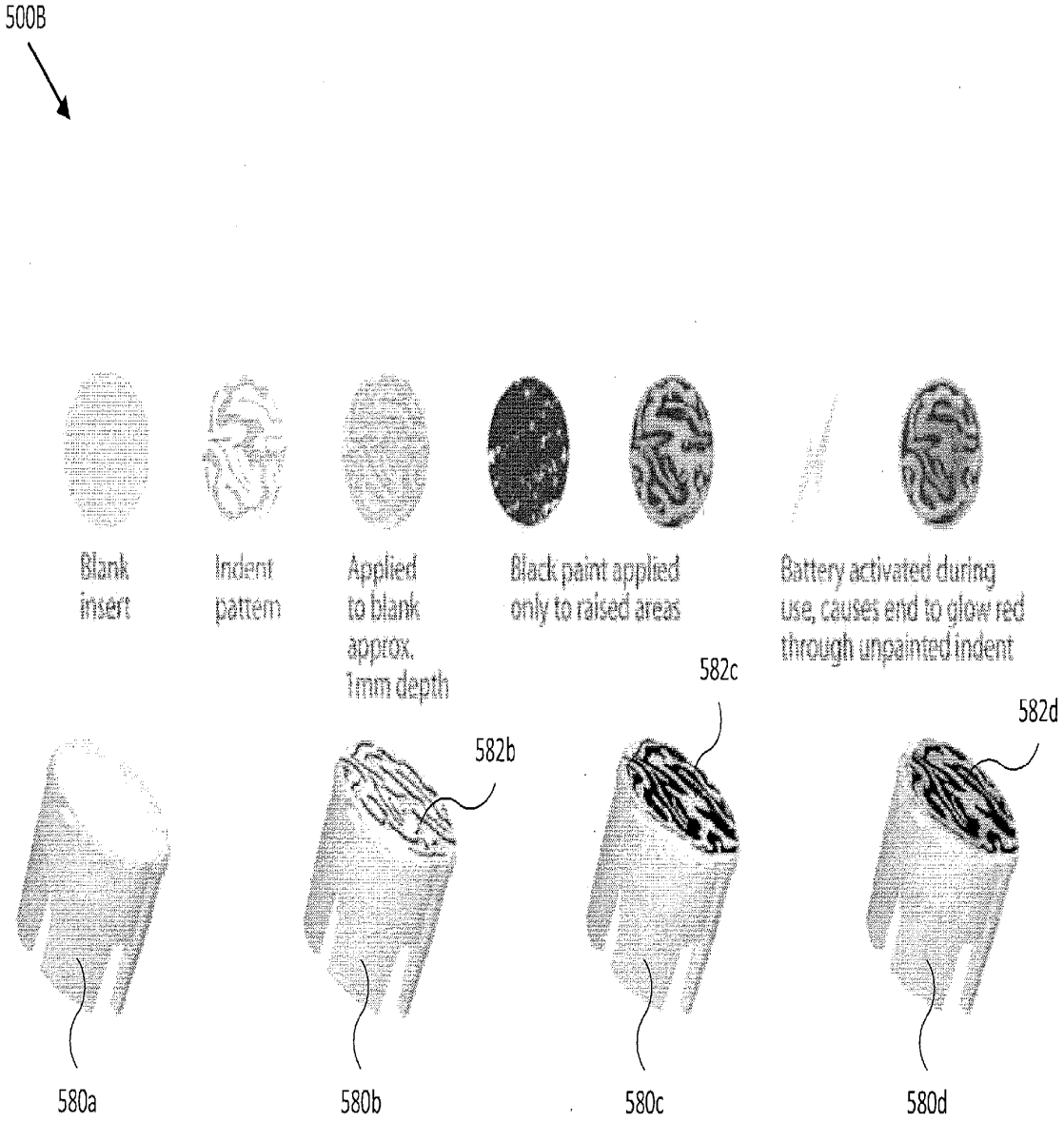


FIG. 5B

NJOY Exhibit 1002.403

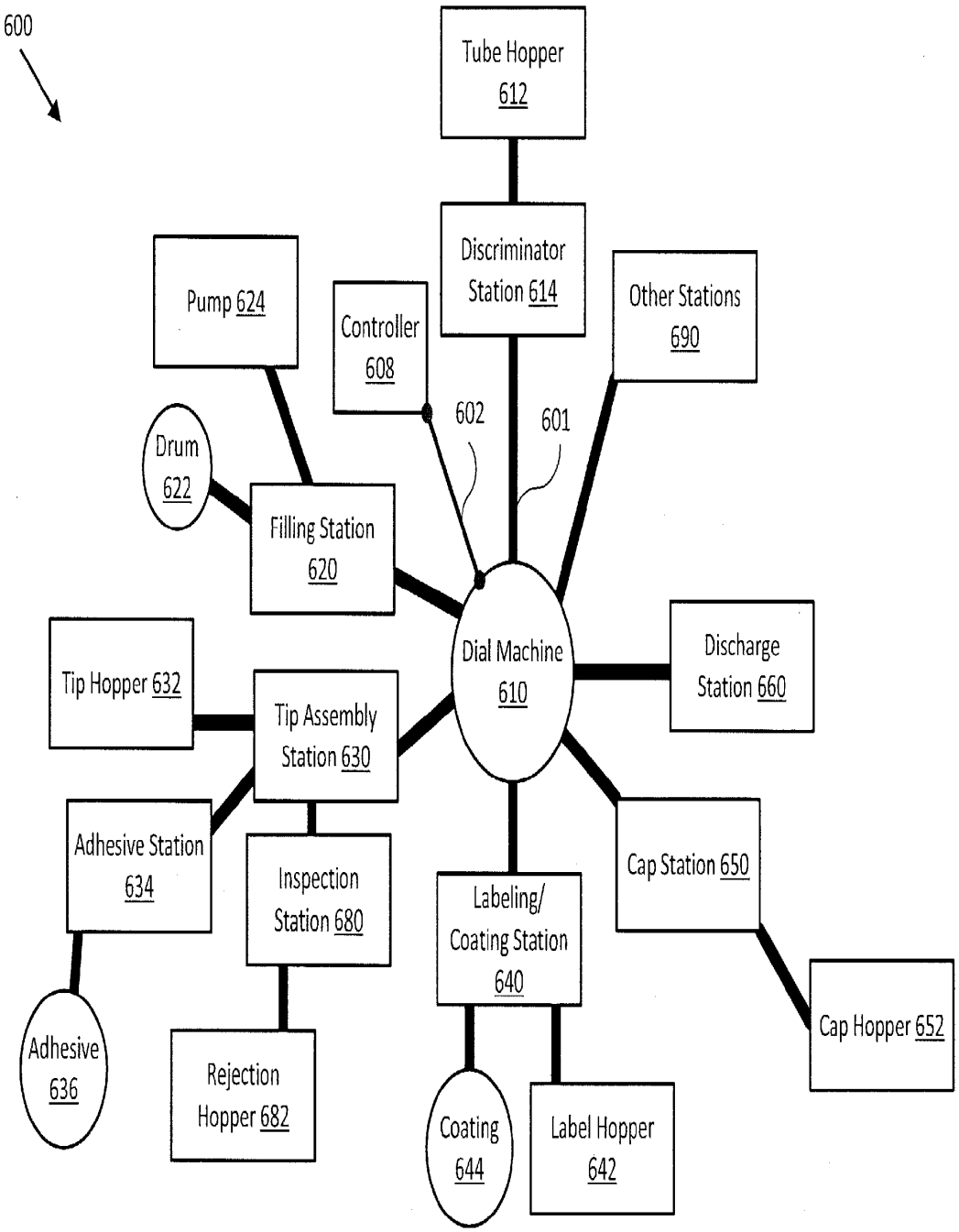


FIG. 6

NJOY Exhibit 1002.404

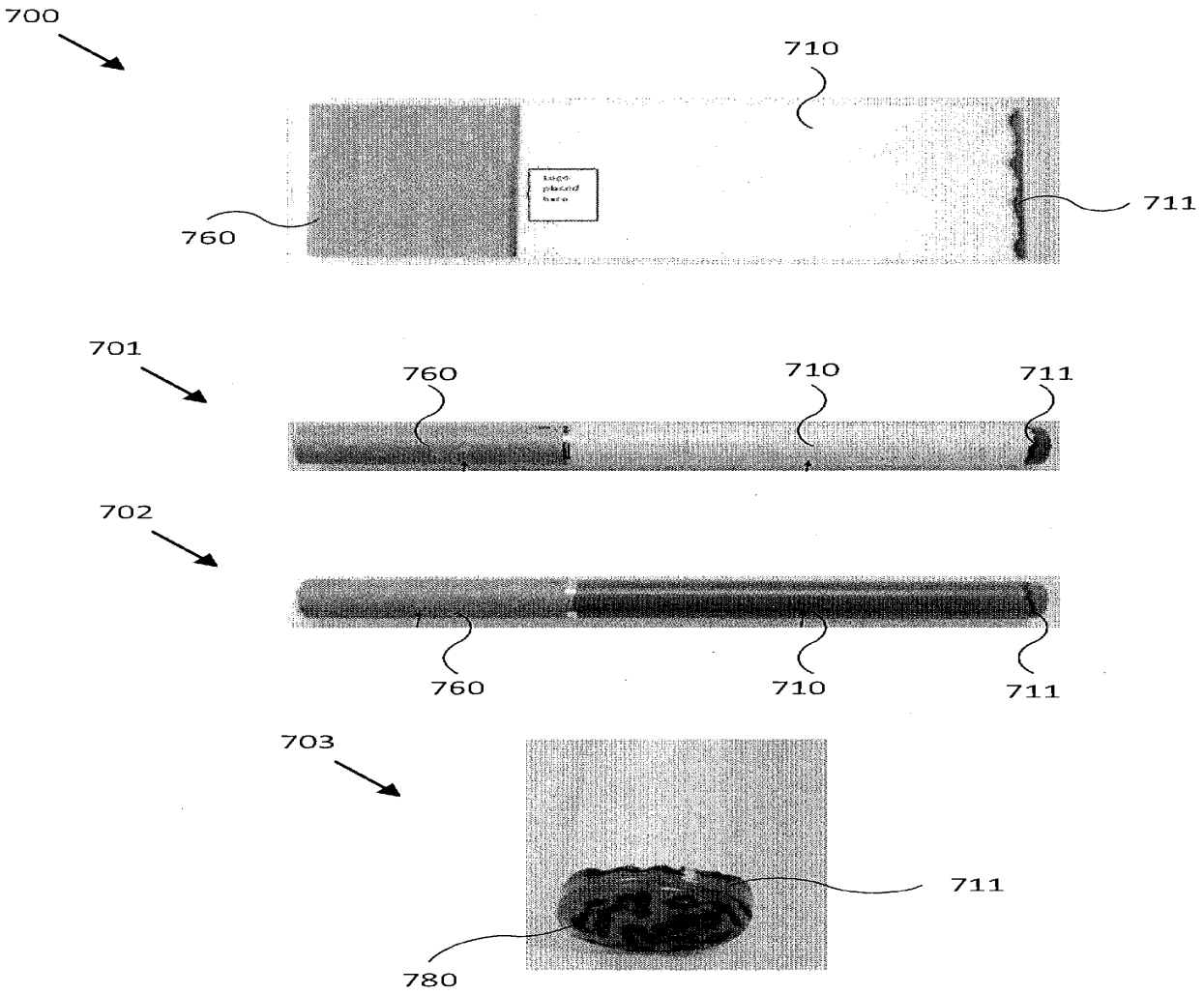


FIG. 7

NJOY Exhibit 1002.405

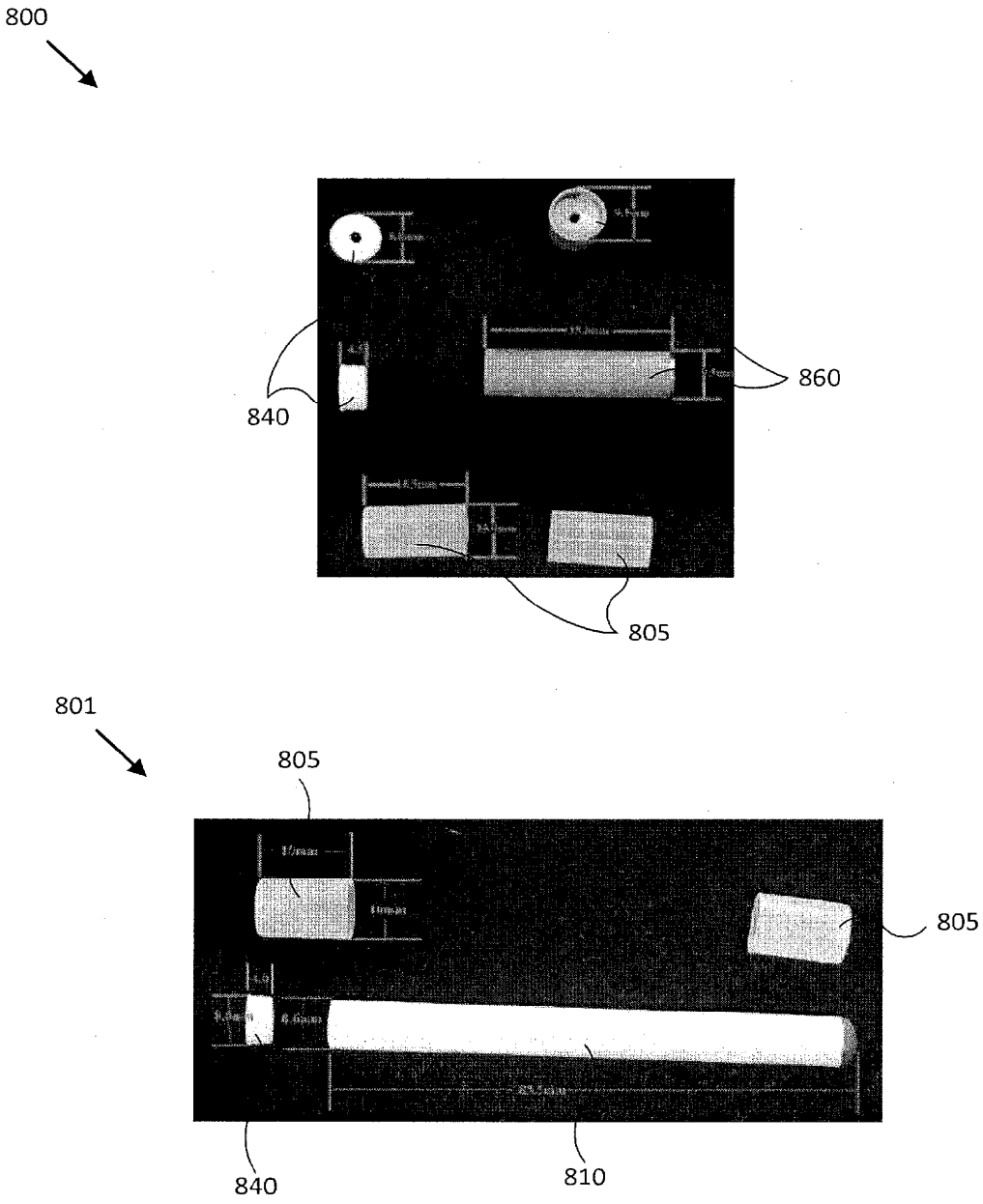


FIG. 8

NJOY Exhibit 1002.406

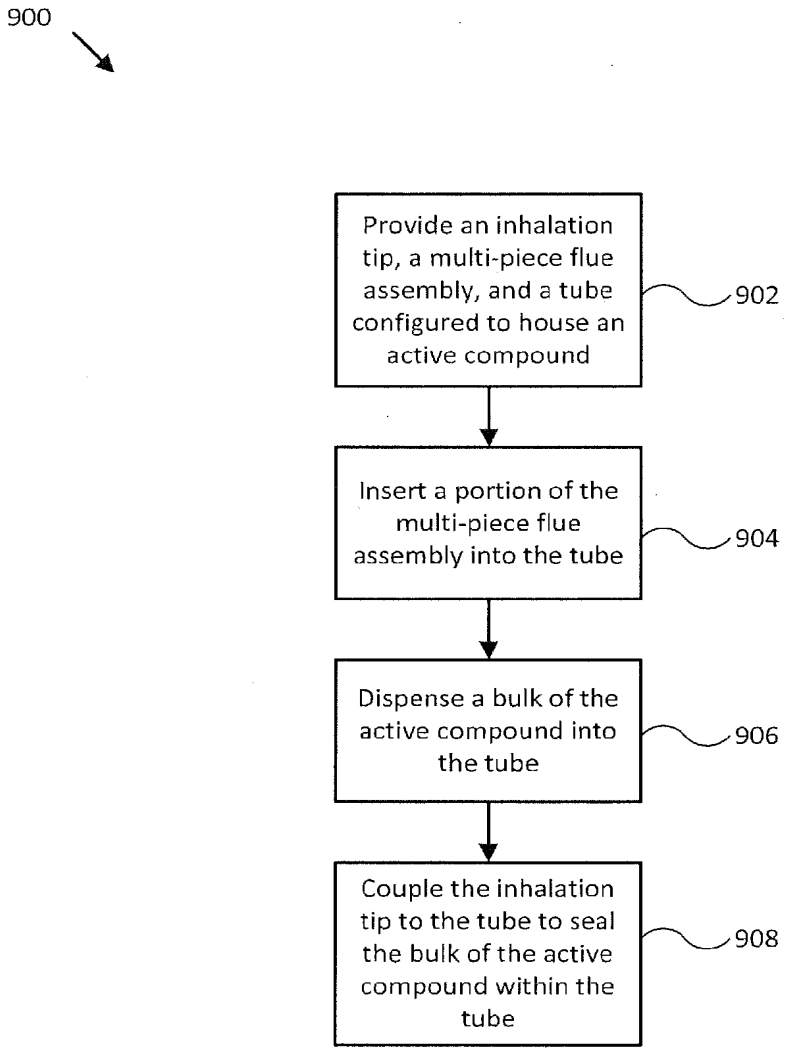

900
Provide an inhalation tip, a multi-piece flue assembly, and a tube configured to house an active compound
902
Insert a portion of the multi-piece flue assembly into the tube
904
Dispense a bulk of the active compound into the tube
906
Couple the inhalation tip to the tube to seal the bulk of the active compound within the tube
908

FIG. 9

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国 际 局

(43) 国际公布日
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(26) 公布语言: 中文

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本国际公布:
— 包括国际检索报告(条约第 21 条(3))。

(54) **Title**: AIR FLOW SENSING ASSEMBLY OF ELECTRONIC CIGARETTE AND ELECTRONIC CIGARETTE

(54) **发明名称** : 一种电子烟用气流传感组件及电子烟

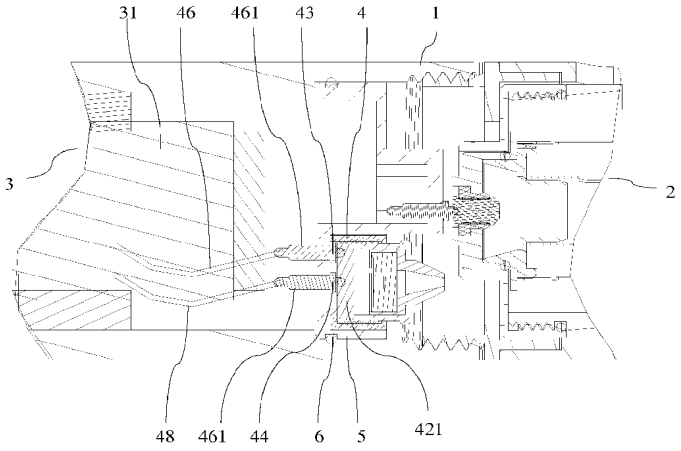


图 1 / Fig. 1

(57) **Abstract**: An air flow sensing assembly of an electronic cigarette and an electronic cigarette; the air flow sensing assembly comprises an air flow sensor (42) for sensing air flow pressure and further comprises a casing (41), the air flow sensor (42) being installed in the casing (41); and the casing (41) has a detachable structure detachably installed in the electronic cigarette. The air flow sensing assembly is detachably installed in the electronic cigarette, and is easy to replace. When the air flow sensor is abnormal or damaged, the electronic cigarette can still be used by merely replacing the air flow sensing assembly with a new assembly, thus saving cost, being safe for assembly and disassembly in production, simplifying operation, and improving production efficiency.

(57) **摘要**: 一种电子烟用气流传感组件及电子烟，气流传感组件包括用于感应气流压力的气流传感器（42），气流传感组件还包括壳体（41），气流传感器（42）安装在壳体（41）内，壳体（41）具有可拆卸安装于电子烟内的可拆卸结构。该气流传感组件可拆卸地安装在电子烟内，方便更换，当气流传感器出现异常或损坏时，更换新的气流传感组件即可，电子烟仍可继续使用，节约成本，且生产时方便安装与拆卸，使生产操作简化，提高生产效率。

WO 2015/149368 A1

NJOY Exhibit 1002.408

说明书

发明名称：一种电子烟用气流传感组件及电子烟

技术领域

[1] 本发明涉及电子产品领域，尤其是涉及一种电子烟用气流传感组件及电子烟。

背景技术

[2] 电子烟是一种新型电子产品，它有着与香烟一样的外观，常用做尼古丁替代疗法，帮助戒烟者戒烟，因此电子烟正越来越被广泛应用。

[3] 现有的电子烟中一般包括气流传感器，通过电导线与电池电连接，基本上是固定安装在电子烟内，其主要作用是当用户吸烟过程中的气流传到气流传感器的感应膜片产生压力时，电子烟就会开始工作，但在使用过程中，当气流传感器有烟油或其它液体进入时，会堵塞气流传感器的气孔或粘附在感应膜片上，影响气流传感器正常工作，也就会影响电子烟工作，即一旦气流传感器损坏，整个电子烟就会报废，不能再使用，造成浪费，且气流传感器较小，生产安装也存在难度。

发明内容

[4] 本发明的目的是提供一种电子烟用气流传感组件及电子烟，解决上述气流传感器一旦损坏导致电子烟不能再使用以及生产时安装气流传感器存在难度的问题。

[5] 本发明解决技术问题所采用的技术方案是：一种电子烟用气流传感组件，包括用于感应气流压力的气流传感器，所述气流传感组件还包括壳体，所述气流传感器安装在所述壳体内，所述壳体具有可拆卸安装于电子烟内的可拆卸结构。

[6] 在本发明的电子烟用气流传感组件中，所述可拆卸结构包括在所述壳体外周形成的用于螺纹连接的外螺纹。

[7] 在本发明的电子烟用气流传感组件中，所述可拆卸结构包括在所述壳体外周形成的用于增加摩擦力的滚花结构或过盈配合套设在所述壳体外周的硅胶套圈。

[8] 在本发明的电子烟用气流传感组件中，所述可拆卸结构还包括在所述壳体一端凸设的耳机插针体。

NJOY Exhibit 1002.409

[9] 在本发明的电子烟用气流传感组件中，所述气流传感组件包括分别与所述气流传感器电连接的用于导电的第一电源电极和第二电源电极。

[10] 在本发明的电子烟用气流传感组件中，所述气流传感组件还包括与所述气流传感器电连接的用于输出所述气流传感器感应的气流传感信号的输出电极。

[11] 在本发明的电子烟用气流传感组件中，所述壳体的一端开口且连接有一用于保护所述气流传感器的气嘴，所述气嘴上开设有与所述气流传感器相通的透气口。

[12] 在本发明的电子烟用气流传感组件中，所述透气口开设在所述气嘴远离所述壳体的一端端部，所述气嘴沿轴向从所述壳体端部向外逐渐缩径形成所述透气口。

[13] 在本发明的电子烟用气流传感组件中，所述透气口开设在所述气嘴的侧壁上。

[14] 在本发明的电子烟用气流传感组件中，所述壳体连接所述气嘴的端部径向向内形成有凸沿，所述气嘴连接所述壳体的端部沿径向向外形成有凸出部，所述凸沿与所述气流传感器之间形成有与所述凸出部相适配的间隙空间，所述凸出部插装于所述间隙空间内。

[15] 本发明还提供一种电子烟，包括气流传感组件，所述气流传感组件包括气流传感器，所述气流传感组件还包括壳体，所述气流传感器安装在所述壳体内，所述壳体具有可拆卸安装于所述电子烟内的可拆卸结构。

[16] 在本发明的电子烟中，所述电子烟包括相互组合的电池组件和雾化组件，所述电池组件和所述雾化组件之间设置有一安装座，所述安装座形成有用于容纳所述壳体的容纳空间，所述壳体可拆卸安装在所述容纳空间内。

[17] 在本发明的电子烟中，所述壳体的可拆卸结构包括在所述壳体外周形成的外螺纹，所述容纳空间对应的侧壁内形成有相应的内螺纹或所述容纳空间对应的侧壁内固定连接有一相应的内螺纹套圈，所述壳体通过螺纹连接可拆卸地安装在所述容纳空间内。

[18] 在本发明的电子烟中，所述壳体的可拆卸结构包括在所述壳体外周形成的用于增加摩擦力的滚花结构或过盈配合套设在所述壳体外周的硅胶套圈，所述壳体可拆卸地插入安装在所述容纳空间内。

NJOY Exhibit 1002.410

[19] 在本发明的电子烟中，所述可拆卸结构还包括在所述壳体一端凸设的耳机插针体，所述支架上安装有与所述耳机插针体相对应的耳机插座，所述耳机插针体可拆卸地插装于所述耳机插座内。

[20] 在本发明的电子烟中，所述气流传感组件包括分别与所述气流传感器电连接的用于导电的第一电源电极和第二电源电极，所述电池组件上分别连接有用于为所述气流传感器传导供电的第一导线和第二导线，所述第一导线远离所述电池组件的一端通过导接件与所述第一电源电极可分离电连接，所述第二导线远离所述电池组件的一端通过导接件与所述第二电源电极可分离电连接。

[21] 在本发明的电子烟中，所述气流传感组件还包括与所述气流传感器电连接的用于输出所述气流传感器感应的气流传感信号的输出电极，所述电池组件上连接有用于将所述气流传感信号传导给所述电池组件的第三导线，所述第三导线远离所述电池组件的一端通过导接件与所述输出电极可分离电连接。

[22] 在本发明的电子烟中，所述电子烟内具有用于气流和烟雾流通的气流通道，所述壳体的一端开口且连接有一用于保护所述气流传感器的气嘴，所述气嘴上开设有用于将所述气流传感器和所述气流通道相连通的透气口。

[23] 在本发明的电子烟中，所述壳体连接所述气嘴的端部径向向内形成有凸沿，所述气嘴连接所述壳体的端部沿径向向外形成有凸出部，所述凸沿与所述气流传感器之间形成有与所述凸出部相适配的间隙空间，所述凸出部插装于所述间隙空间内。

[24] 在本发明的电子烟中，所述电子烟包括相互组合的电池组件和雾化组件，所述电池组件远离所述雾化组件的一端设置有一安装座，所述安装座形成有用于容纳所述壳体的容纳空间，所述壳体可拆卸安装在所述容纳空间内。

[25] 实施本发明的 电子烟用气流传感组件及电子烟 ，具有以下有益效果： 本发明将传统的气流传感器设计成一个独立的气流传感组件结构，且可拆卸地安装在电子烟内，方便更换，当气流传感器出现异常、损坏时，用户就可以自己仅更换气流传感组件即可，而不是整个电子烟都报废了，当换成新的气流传感组件，电子烟仍可继续使用，使电子烟可以进行反复利用，节约成本，提高了用户的体验度，同时生产时直接将气流传感组件与电子烟通过螺纹连接或直接插接

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等可拆卸连接的方式，方便安装与拆卸，使生产操作简化，提高生产效率。

附图说明

[26] 图 1 为本发明第一实施例的电子烟的剖视示意图；

[27] 图 2 为本发明第一实施例的电子烟用气流传感组件的剖视示意图；

[28] 图 3 为本发明第二实施例的电子烟的剖视示意图；

[29] 图 4 为本发明第二实施例的电子烟用气流传感组件的剖视示意图；

[30] 图 5 为本发明第三实施例的电子烟的剖视示意图；

[31] 图 6 为本发明第三实施例的电子烟用气流传感组件的剖视示意图；

[32] 图 7 为本发明第四实施例的电子烟的剖视示意图；

[33] 图 8 为本发明第四实施例的电子烟用气流传感组件的剖视示意图。

具体实施方式

[34] 下面结合附图和实施例，对本发明气流传感组件及电子烟的结构原理和具体实现作进一步说明：

[35] 本发明将传统的气流传感器设计成一个独立的气流传感组件结构，且可拆卸地安装在电子烟内，方便更换使用，同时气流传感组件与电池组件之间采用可分离电连接的方式，结构新颖稳定，电传导效果优良，不会因为是可分离电连接而导致电传导过程接触不良的情况。

[36] 如图 1 所示， 一种电子烟，包括外套管 1 ，外套管 1 内设置有相互组装的雾化组件 2 、电池组件 3 和气流传感组件 4 ，外套管 1 内具有用于气流和烟雾流通的气流通道（图中未标示）。

[37] 如图 2 所示，气流传感组件 4 在本发明中是一个独立的组件，可拆卸地安装在电子烟内。气流传感组件 4 包括壳体 41 和安装在壳体 41 内的气流传感器 42 ，其中壳体 41 具有可拆卸安装于电子烟内的可拆卸结构。

[38] 如图 1 所示，在外套管 1 内雾化组件 2 和电池组件 3 之间设置有一用于支撑容纳气流传感组件 4 的支架 5 ，支架 5 可以固定在外套管 1 的内壁上，优选地，在支架 5 外壁与外套管 1 的内壁之间设有密封圈 6 ，避免雾化组件 2 内的烟油等流至电池组件 3 上。另外，可以理解的是，该用于支撑容纳气流传感组件 4 的支架 5 的安装位置不限于此，支架 5 还可以设置在电池组件 3 远离雾化组件 2

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的一端。在支架 5 上形成有用于容纳壳体 41 的容纳空间（图中未标示），通过将壳体 41 可拆卸地安装在容纳空间内，进而使整个气流传感组件 4 可拆卸地安装在容纳空间内。通过这样设计，气流传感组件 4 可以进行更换，当出现异常，气流传感组件 4 损坏，仅需重新更换气流传感组件 4 后电子烟就可以继续工作，节约成本，电子烟可以反复利用，方便使用，提高用户体验度，同时生产时直接将气流传感组件 4 通过螺纹连接或直接插接等可拆卸连接的方式，方便安装与拆卸，使生产操作简化，提高生产效率。另外，当将支架 5 设置在雾化组件 2 和电池组件 3 之间时，即相当于将气流传感组件 4 设置在雾化组件 2 和电池组件 3 之间，则雾化组件 2 和电池组件 3 之间也优选为可拆卸结构，以方便更换气流传感组件 4。

[39] 需要说明的是，本发明中提到的气流传感器 42，在本技术领域内也俗称'咪头'，因此气流传感组件 4 也可称为'咪头组件'。

[40] 下面通过多个实施例进行具体说明。

[41] 实施例 1：

[42] 如图 2 所示，壳体 41 具有的可拆卸结构为在壳体 41 外周形成外螺纹 401，支架 5 内容纳空间对应的侧壁内形成有相应的内螺纹或设置一具有内螺纹的内螺纹套圈（图中未标示），壳体 41 通过螺纹连接可拆卸地安装在支架 5 的容纳空间内。

[43] 如图 1 所示，气流传感组件 4 包括 PCB 板 421 （PCB 电路控制板），在 PCB 板 421 上焊接有与气流传感器 42 电连接的片状的第一电源电极 43 和第二电源电极 44，也可以是直接 PCB 板 421 上裸露出的铜作为第一电源电极 43 和第二电源电极 44，第一电源电极 43 和第二电源电极 44 朝向电池组件 3，方便第一电源电极 43 和第二电源电极 44 与电池组件 3 电连接。

[44] 第一电源电极 43 和第二电源电极 44 分别从壳体 41 上的开孔内裸露出来。电池组件 3 包括电池 31，电池 31 的正负极上分别对应电连接有第一导线 46 和第二导线 48，第一导线 46 和第二导线 48 远离电池 31 的一端分别各自对应连接有电接触头 461，该电接触头 461 作为导接件，呈弹片式或弹针式结构，第一导线 46 通过电接触头 461 （即导接件）与裸露出的第一电源电极 43 接触式电

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连接，第二导线 48 通过另一个电接触头 461 （即导接件）与裸露出的第二电源电极 44 也为接触式电连接，进而实现可分离式电连接。

[45] 在 PCB 板上还设置有控制单元（图中未标示），用于气流传感器 42 在感应到气流压力变化后产生吸烟开始信号或者吸烟结束信号，进一步将吸烟开始信号和吸烟结束信号发送给控制单元，通过控制单元来控制电池 31 是否供电给雾化组件 2 进而使雾化组件 2 是否雾化烟油。

[46] 如图 2 所示，在壳体 41 的一端开口且连接有一用于保护气流传感器 42 的气嘴 50，气嘴 50 沿轴向从壳体 41 端部向外逐渐缩径形成透气口 501，该透气口 501 使气流传感器 42 与气流通道相连通，气嘴 50 主要用于保护气流传感器 42，由于气嘴 50 沿轴向从壳体 41 端部向外逐渐缩径形成透气口 501，这样可以防止雾化组件 2 内的烟油或其它液体进入到壳体 41 内粘附在气流传感器 42 的感应膜上而影响气流传感器 42 的正常工作。

[47] 如图 3 所示，壳体 41 连接气嘴 50 的端部径向向内形成有凸沿 411，气嘴 50 连接壳体 41 的端部沿径向向外形成有凸出部 502，凸沿 411 与气流传感器 42 之间形成有与凸出部 502 相适配的间隙空间，凸出部 502 插装于间隙空间内，进而将气嘴 50 与壳体 41 间相固定，其中气嘴 50 可以由硅胶、橡胶或其它软塑材质制成，这时气嘴 50 的凸出部 502 在气流传感器 42 与壳体 41 之间还起到缓冲作用力的作用，当然气嘴 50 也可以主要由金属制成，仅凸出部 502 由硅胶、橡胶或其它软塑材质制成即可。

[48] 实施例 2：

[49] 与实施例 1 不同之处如下所述，其它内容相同不再赘述。

[50] 如图 3-4 所示，壳体 41 具有的可拆卸结构为在壳体 41 外周形成用于增加摩擦力的滚花结构或过盈配合套设在壳体 41 外周的 O 型的硅胶套圈 403，这样将壳体 41 以插接的方式可拆卸地安装在支架 5 的容纳空间内。当需要更换气流传感组件 4 时只需稍微用力将壳体 41 从容纳空间中取出，再插入新的气流传感组件 4 即可，另外由于硅胶套圈 403 或壳体 41 外周的滚花结构具有一定摩擦力，在不用力时壳体 41 可以较稳固定地固定在容纳空间内，而不会出现滑动的现象。

[51] 第一电源电极 43 和第二电源电极 44 呈柱状，分别从壳体 41 的开孔中凸出，

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第一导线 46 和第二导线 48 远离电池 31 的一端分别连接有具有插孔的插孔头 481，作为导接件，第一电源电极 43 插接进插孔头 481 （即导接件）的插孔内，第二电源电极 44 插接进另一个插孔头 481 （即导接件）的插孔内，进而实现可分离式电连接。

[52] 实施例 3

[53] 与实施例 1 和实施例 2 不同之处如下所述，其它内容与实施例 1 或实施例 2 相同，不再赘述。

[54] 用于控制电池 31 是否供电给雾化组件 2 进而使雾化组件 2 是否雾化烟油的控制单元在本实施例中不是设置在气流传感器 42 的 PCB 板上，而是设置在电池 31 的一端，即电池组件 3 包括电池 31 和控制单元。如图 5 所示，气流传感器 42 和控制单元之间电连接有用于将气流传感器 42 感应的气流传感信号传导给控制单元的第三导线 45，气流传感组件 4 包括与气流传感器 42 电连接的用于输出气流传感器 42 感应的气流传感信号的输出电极（在本实施例的图中未标示），在本实施例中输出电极即为壳体 41，壳体 41 由导电金属制成，在壳体 41 朝向电池组件 3 的一端设置有电触弹性件 451，作为导接件，可以为弹片或弹针，第三导线 45 远离控制单元的一端与电触弹性件 451 （即导接件）接触式电连接，进而通过电触弹性件 451 （即导接件）与与输出电极实现可分离电连接。

[55] 如图 6 所示，在本实施例中，壳体 41 具有的可拆卸结构也是在壳体 41 外周形成用于增加摩擦力的滚花结构或过盈配合套设在壳体 41 外周的 O 型的硅胶套圈 403。另外，在本实施例中，气嘴 50 呈柱状，气嘴 50 远离壳体 41 的一端是封闭的，用于使气流通道与气流传感器 42 相通的透气口 501 开设在气嘴 50 的侧壁上，这样同样可以防止雾化组件 2 内的烟油或其它液体进入到壳体 41 内粘附在气流传感器 42 的感应膜上而影响气流传感器 42 的正常工作。

[56] 实施例 4：

[57] 如图 7-8 所示，气流传感组件 4 包括壳体 41 和安装在壳体 41 内的气流传感器 42，壳体 41 所具有的可拆卸结构包括外周设置的硅胶套圈 403 以及从壳体 41 的一端凸设出一耳机插针体 404，在支架 5 上除了具有用于安装壳体 41 的容纳空间外，还安装有与耳机插针体 404 相对应的耳机插座 405，耳机插针体 404

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可以插装在耳机插座 405 内，因此在本实施例中，不仅通过硅胶套圈 403 将壳体 41 可拆卸地插入安装在容纳空间内，同时也通过耳机插针体 404 可拆卸地插装在耳机插座 405 内，进一步增强结构的稳定性。

[58] 在耳机插针体 404 的外周侧上分别焊接与气流传感器 42 电连接的呈环状的第一电源电极 43 、第二电源电极 44 和输出电极 47 ； 电池组件 3 和耳机插座 405 之间电连接有第一导线 46 、第二导线 48 和第三导线 45 ， 这里的耳机插座 405 还同时作为导接件， 耳机插座 405 内具有分别与第一导线 46 、第二导线 48 和第三导线 45 电连接的三个导接电极（图中未标示） ， 该三个导接电极分别与第一电源电极 43 、第二电源电极 44 和输出电极 47 相互对应， 当将耳机插针体 404 与耳机插座 405 之间实现可拆卸结构的同时， 也实现了耳机插座 405 （即导接件）内的三个导接电极分别与第一电源电极 43 、第二电源电极 44 和输出电极 47 之间的可分离电连接。 其中电池组件 3 包括电池 31 和控制单元， 即控制单元设置在电池 31 的一端， 第一导线 46 和第二导线 48 与电池 31 电连接， 用于导电给气流传感器 42 ， 第三导线 45 与控制单元电连接， 用于将气流传感器 42 感应的气流传感信号传递给控制单元， 进而控制是否给雾化组件 2 供电以雾化烟油， 开始工作。

[59] 需要说明的是， 如果控制单元设置在气流传感组件 4 内， 则耳机插针体 404 的外周侧上仅焊接与气流传感器 42 电连接的第一电源电极 43 和第二电源电极 44 ， 耳机插座 405 （即导接件）与电池 31 之间电连接有第一导线 46 和第二导线 48 ， 耳机插座 405 内也仅具有分别与第一导线 46 和第二导线 48 电连接的两个导接电极， 当耳机插针体 404 插装进耳机插座 405 内时， 两个导接电极分别与第一电源电极 43 和第二电源电极 44 相互对应电连接， 实现供电给气流传感器 42 。

[60] 另外， 在本实施例中， 气嘴 50 呈柱状且远离壳体 41 的一端封闭， 透气口 501 开设在气嘴 50 的侧壁上， 这样同样可以防止雾化组件 2 内的烟油或其它液体进入到壳体 41 内粘附在气流传感器 42 的感应膜上而影响气流传感器 42 的正常工作。

[61] 本发明将传统的气流传感器设计成一个独立的气流传感组件结构， 且可拆卸地

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安装在电子烟内，方便更换，当气流传感器出现异常、损坏时，用户就可以自己仅更换气流传感组件即可，而不是整个电子烟都报废了，当换成新的气流传感组件，电子烟仍可继续使用，使电子烟可以进行反复利用，节约成本，提高了用户的体验度，同时生产时直接将气流传感组件与电子烟通过螺纹连接或直接插接等可拆卸连接的方式，方便安装与拆卸，使生产操作简化，提高生产效率。

[62] 应当理解的是，对本领域普通技术人员来说，可以根据上述说明加以改进或变换，所有这些改进或变换都应属于本发明所附权利要求的保护范围之内。

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权利要求书

[权利要求 1] 一种电子烟用气流传感组件，包括用于感应气流压力的气流传感器（42），其特征在于，所述气流传感组件还包括壳体（41），所述气流传感器（42）安装在所述壳体（41）内，所述壳体（41）具有可拆卸安装于电子烟内的可拆卸结构。

[权利要求 2] 根据权利要求 1 所述的电子烟用气流传感组件，其特征在于，所述可拆卸结构包括在所述壳体（41）外周形成的用于螺纹连接的外螺纹（401）。

[权利要求 3] 根据权利要求 1 所述的电子烟用气流传感组件，其特征在于，所述可拆卸结构包括在所述壳体（41）外周形成的用于增加摩擦力的滚花结构或过盈配合套设在所述壳体（41）外周的硅胶套圈（403）。

[权利要求 4] 根据权利要求 3 所述的电子烟用气流传感组件，其特征在于，所述可拆卸结构还包括在所述壳体（41）一端凸设的耳机插针体（404）。

[权利要求 5] 根据权利要求 1 所述的电子烟用气流传感组件，其特征在于，所述气流传感组件包括分别与所述气流传感器（42）电连接的用于导电的第一电源电极（43）和第二电源电极（44）。

[权利要求 6] 根据权利要求 5 所述的电子烟用气流传感组件，其特征在于，所述气流传感组件还包括与所述气流传感器（42）电连接的用于输出所述气流传感器（42）感应的气流传感信号的输出电极（47）。

[权利要求 7] 根据权利要求 1 所述的电子烟用气流传感组件，其特征在于，所述壳体（41）的一端开口且连接有一用于保护所述气流传感器（42）的气嘴（50），所述气嘴（50）上开设有与所述气流传感器（42）相通的透气口（501）。

[权利要求 8] 根据权利要求 7 所述的电子烟用气流传感组件，其特征在于，所述透气口（501）开设在所述气嘴（50）远离所述壳体（41）

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的一端端部，所述气嘴（50）沿轴向从所述壳体（41）端部向外逐渐缩径形成所述透气口（501）。

[权利要求 9] 根据权利要求 7 所述的电子烟用气流传感组件，其特征在于，所述透气口（501）开设在所述气嘴（50）的侧壁上。

[权利要求 10] 根据权利要求 7 所述的电子烟用气流传感组件，其特征在于，所述壳体（41）连接所述气嘴（50）的端部径向向内形成有凸沿（411），所述气嘴（50）连接所述壳体（41）的端部沿径向向外形成有凸出部（502），所述凸沿（411）与所述气流传感器（42）之间形成有与所述凸出部（502）相适配的间隙空间，所述凸出部（502）插装于所述间隙空间内。

[权利要求 11] 一种电子烟，包括气流传感组件（4），所述气流传感组件（4）包括气流传感器（42），其特征在于，所述气流传感组件（4）还包括壳体（41），所述气流传感器（42）安装在所述壳体（41）内，所述壳体（41）具有可拆卸安装于所述电子烟内的可拆卸结构。

[权利要求 12] 根据权利要求 11 所述的电子烟，其特征在于，所述电子烟包括相互组合的电池组件（3）和雾化组件（2），所述电池组件（3）和所述雾化组件（2）之间设置有一安装座（5），所述安装座（5）形成有用于容纳所述壳体（41）的容纳空间，所述壳体（41）可拆卸安装在所述容纳空间内。

[权利要求 13] 根据权利要求 12 所述的电子烟，其特征在于，所述壳体（41）的可拆卸结构包括在所述壳体（41）外周形成的外螺纹（401），所述容纳空间对应的侧壁内形成有相应的内螺纹或所述容纳空间对应的侧壁内固定连接有一相应的内螺纹套圈，所述壳体（41）通过螺纹连接可拆卸地安装在所述容纳空间内。

[权利要求 14] 根据权利要求 12 所述的电子烟，其特征在于，所述壳体（41）的可拆卸结构包括在所述壳体（41）外周形成的用于增加摩擦力的滚花结构或过盈配合套设在所述壳体（41）外周的硅胶套圈（

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403），所述壳体（41）可拆卸地插入安装在所述容纳空间内。

[权利要求 15] 根据权利要求 14 所述的电子烟，其特征在于，所述可拆卸结构还包括在所述壳体（41）一端凸设的耳机插针体（404），所述支架（5）上安装有与所述耳机插针体（404）相对应的耳机插座（405），所述耳机插针体（404）可拆卸地插装于所述耳机插座（405）内。

[权利要求 16] 根据权利要求 12 所述的电子烟，其特征在于，所述气流传感组件（4）包括分别与所述气流传感器（42）电连接的用于导电的第一电源电极（43）和第二电源电极（44），所述电池组件（3）上分别连接有用于为所述气流传感器（42）传导供电的第一导线（46）和第二导线（48），所述第一导线（46）远离所述电池组件（3）的一端通过导接件与所述第一电源电极（43）可分离电连接，所述第二导线（48）远离所述电池组件（3）的一端通过导接件与所述第二电源电极（44）可分离电连接。

[权利要求 17] 根据权利要求 16 所述的电子烟，其特征在于，所述气流传感组件（4）还包括与所述气流传感器（42）电连接的用于输出所述气流传感器（42）感应的气流传感信号的输出电极（47），所述电池组件（3）上连接有用于将所述气流传感信号传导给所述电池组件（3）的第三导线（45），所述第三导线（45）远离所述电池组件（3）的一端通过导接件与所述输出电极（47）可分离电连接。

[权利要求 18] 根据权利要求 12 所述的电子烟，其特征在于，所述电子烟内具有用于气流和烟雾流通的气流通道，所述壳体（41）的一端开口且连接有一用于保护所述气流传感器（42）的气嘴（50），所述气嘴（50）上开设有用于将所述气流传感器（42）和所述气流通道相连通的透气口（501）。

[权利要求 19] 根据权利要求 18 所述的电子烟，其特征在于，所述壳体（41）连接所述气嘴（50）的端部径向向内形成有凸沿（411），所述

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气嘴（50）连接所述壳体（41）的端部沿径向向外形成有凸出部（502），所述凸沿（411）与所述气流传感器（42）之间形成有与所述凸出部（502）相适配的间隙空间，所述凸出部（502）插装于所述间隙空间内。

[权利要求 20] 根据权利要求 11 所述的电子烟，其特征在于，所述电子烟包括相互组合的电池组件（3）和雾化组件（2），所述电池组件（3）远离所述雾化组件（2）的一端设置有一安装座（5），所述安装座（5）形成有用于容纳所述壳体（41）的容纳空间，所述壳体（41）可拆卸安装在所述容纳空间内。

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说 明 书 附 图

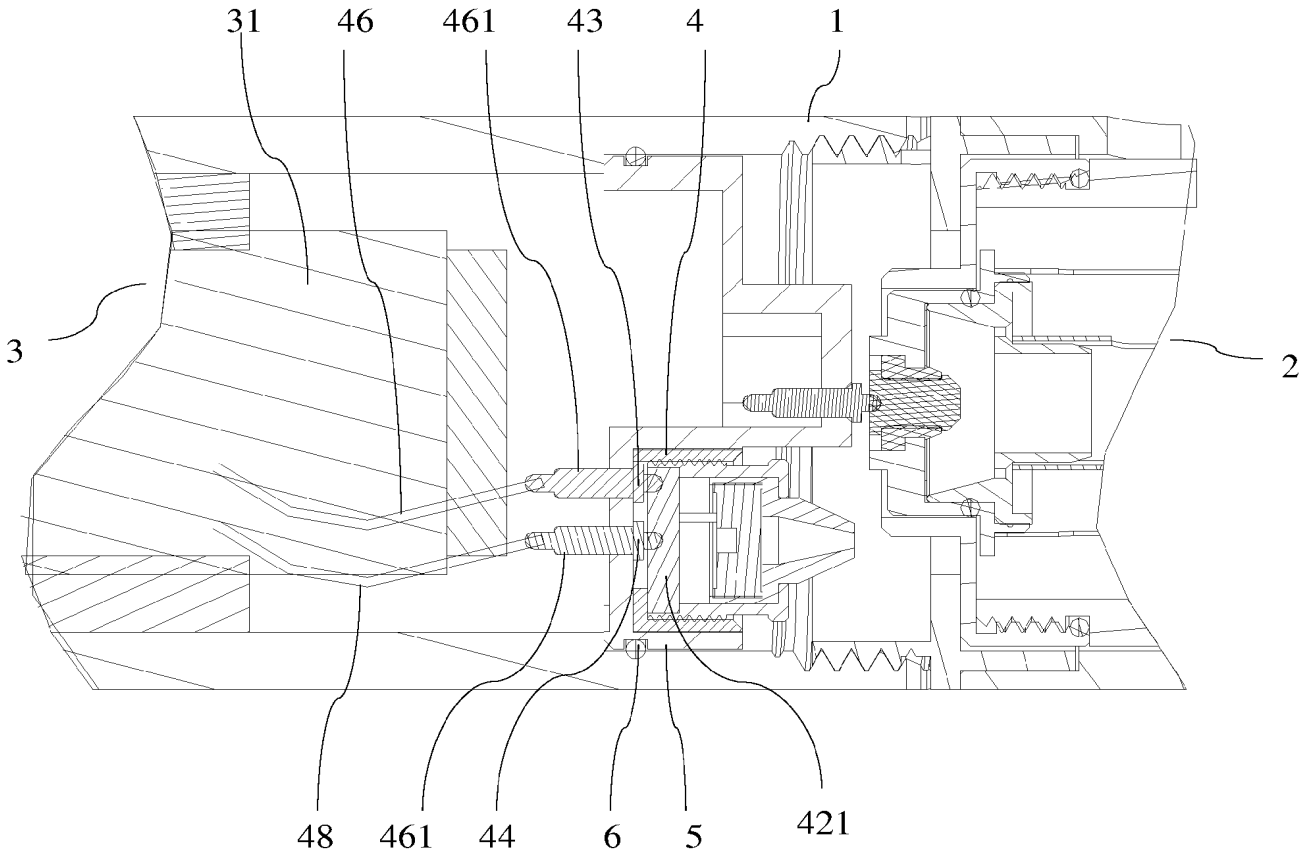


图 1

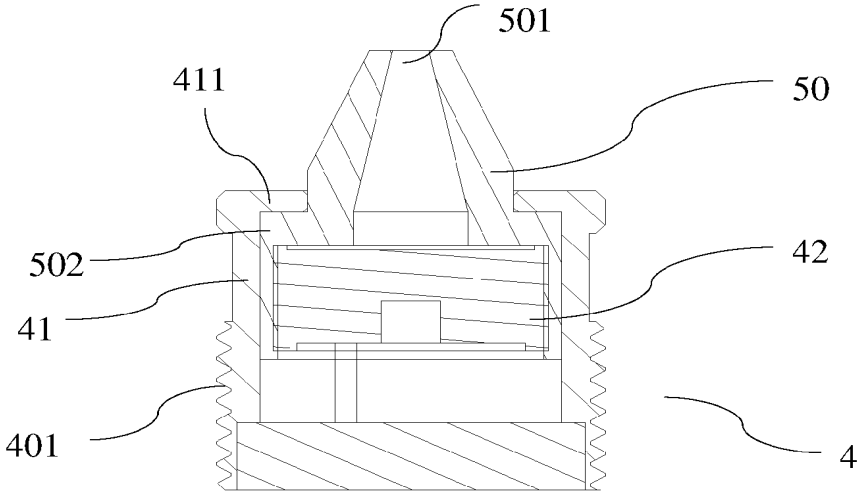


图 2

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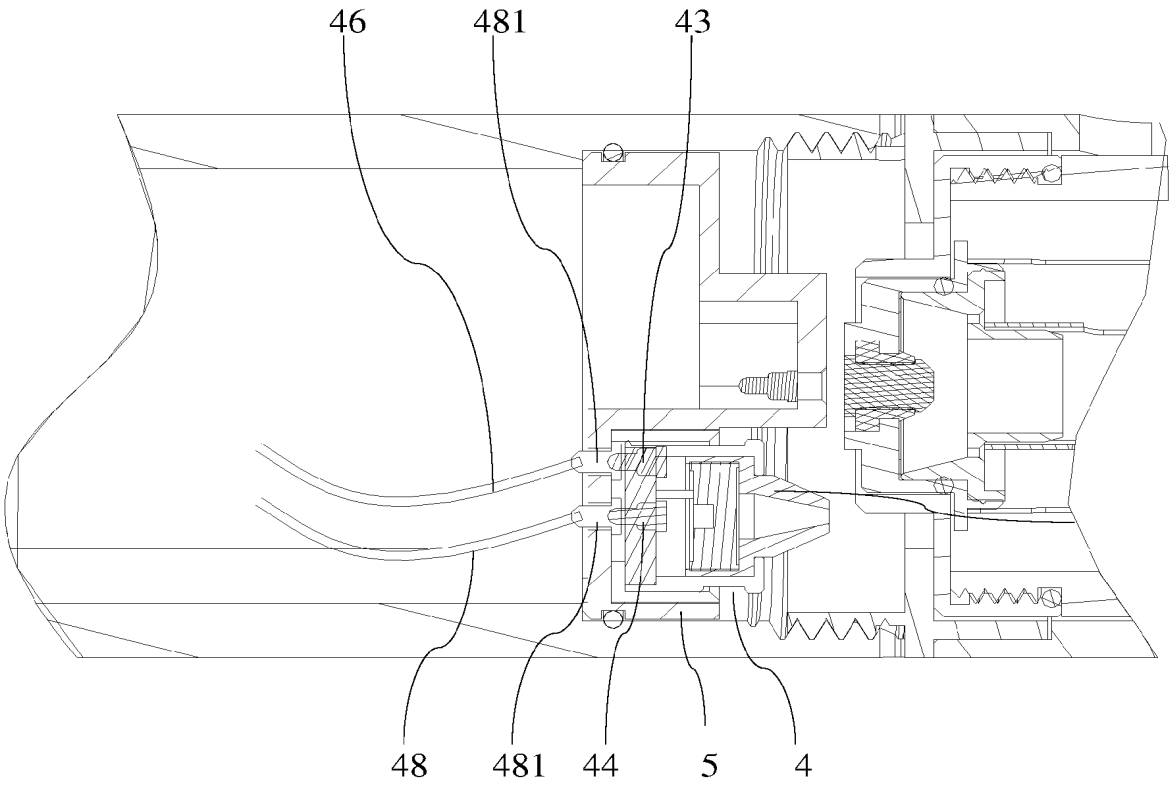


图 3

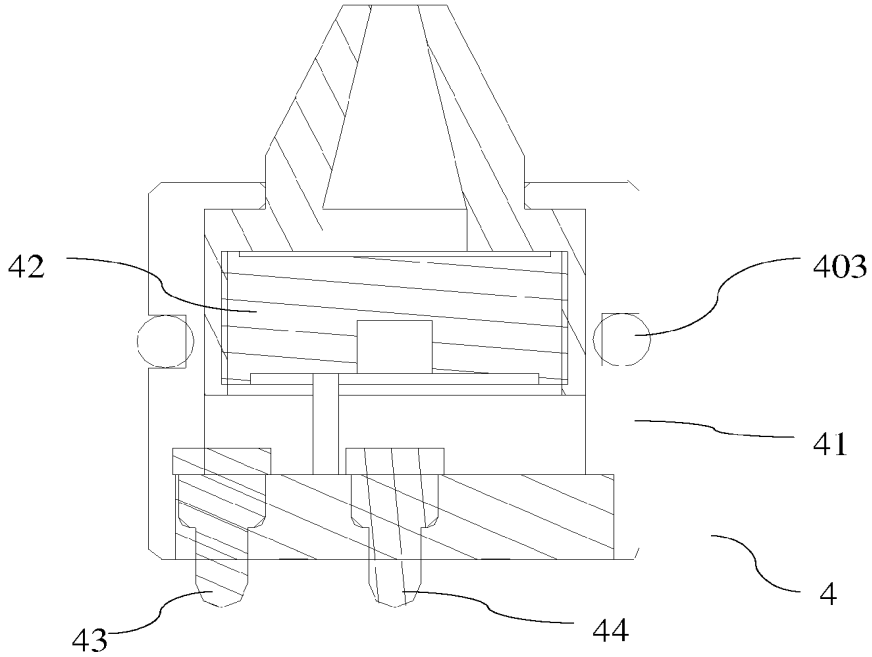


图 4

NJOY Exhibit 1002.423

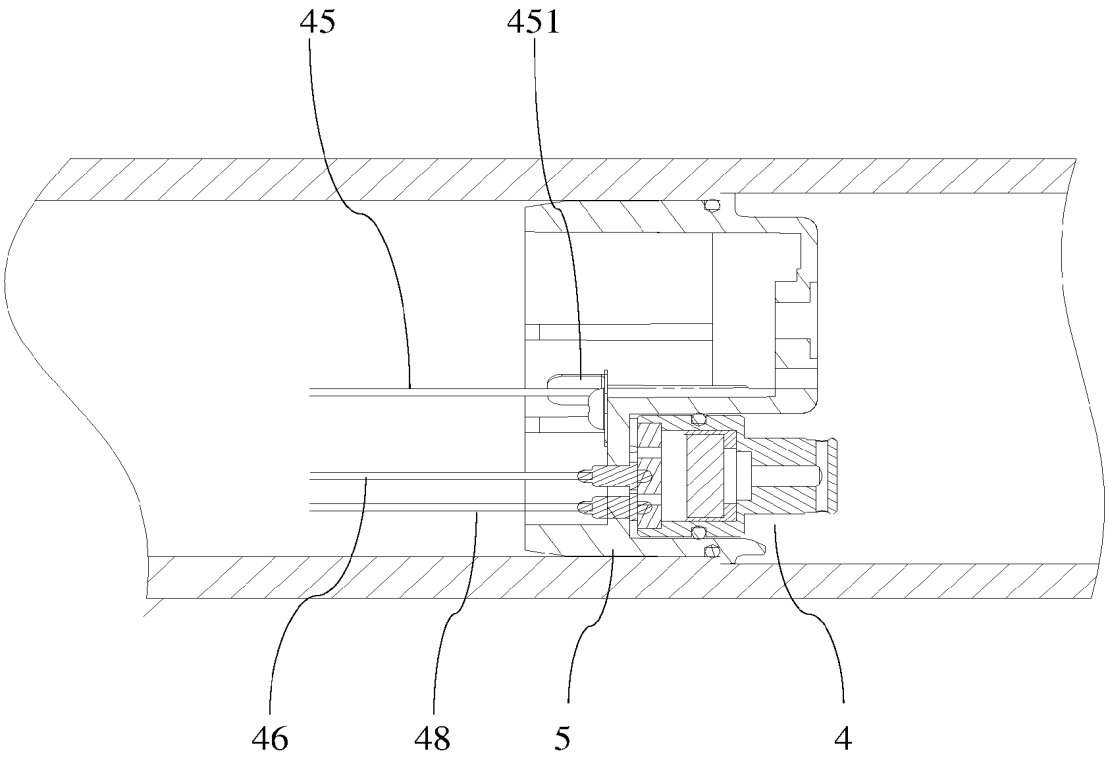


图 5

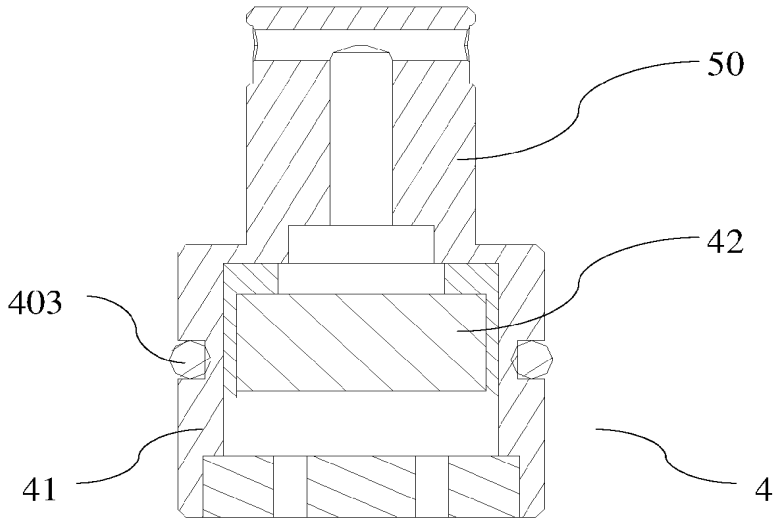


图 6

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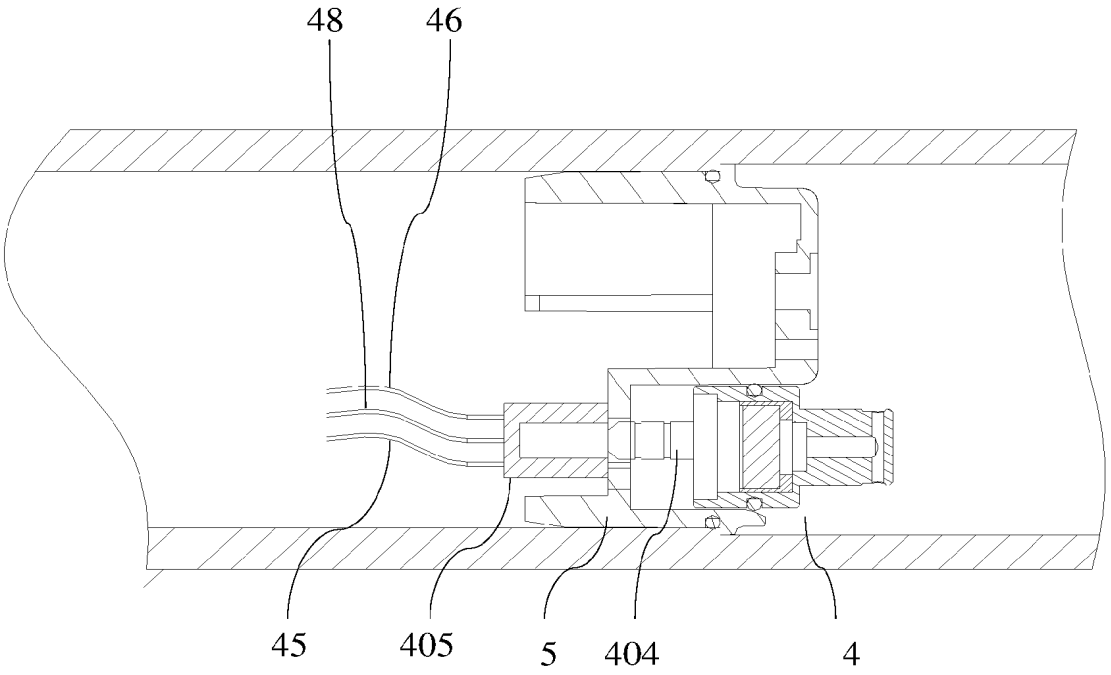


图 7

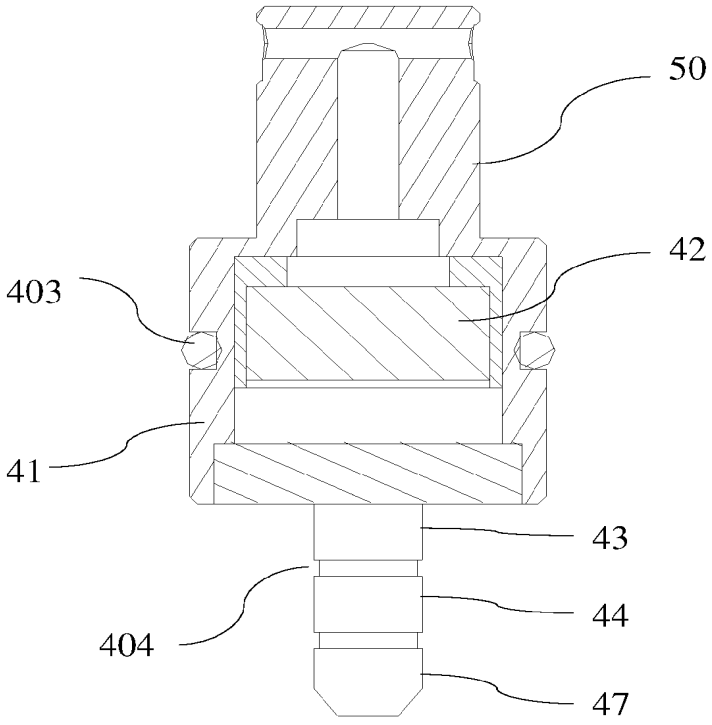


图 8

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2014/074842

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00 (2006.01) i

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; G01N

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)

VEN & CNABS: atomize, detachable, electronic, electrical, substitute, imitate, simulate, cigar, cigarette, tobacco, sensor, transducer, press, pressure, knock-down

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 203952419 U (LIU, Shuigen), 26 November 2014 (26.11.2014), description, pages 3-6, and figures 1-8	1-20
Y	CN 202999300 U (LIU, Qiuming), 19 June 2013 (19.06.2013), description, pages 2-6, and figures 1, 3 and 4	1-20
Y	CN 201379072 Y (HAN, Li), 13 January 2010 (13.01.2010), description, pages 4-7, and figures 1, 2, 5 and 6	1-20
Y	CN 101366554 A (WANG, Shanhong), 18 February 2009 (18.02.2009), description, pages 2-5, and figures 1 and 2	1-20
Y	KR 20120051570 A (EBACO CO., LTD.), 22 May 2012 (22.05.2012), abstract, and the figure accompanying the abstract	1-20
Y	US 2013319989 A1 (LIU, Qiuming), 05 December 2013 (05.12.2013), abstract, and the figure accompanying the abstract	1-20
A	CN 201888252 U (LUO, Qing), 06 July 2011 (06.07.2011), the whole document	1-20

☐ 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	Date of mailing of the international search report
31 December 2014 (31.12.2014)	**09 January 2015 (09.01.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **ZHANG, Yucui** Telephone No.: (86-10) **62084123**

Form PCT/ISA/210 (second sheet) (July 2009)

NJOY Exhibit 1002.426

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2014/074842

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203952419 U	26 November 2014	None	
CN 202999300 U	19 June 2013	None	
CN 201379072 Y	13 January 2010	SG 174233 A1	28 October 2011
		KR 20120012961 A	13 February 2012
		EA 201171031 A1	30 January 2012
		EG 26588 A	17 March 2014
		JP 2012517229 A	02 August 2012
		NZ 595117 A	20 December 2013
		AU 2010213270 B2	08 May 2014
		IL 214538 D0	27 September 2011
		US 8689805 B2	08 April 2014
		EP 2404515 A4	13 November 2013
		CA 2752255 A1	19 August 2010
		US 2014305453 A1	16 October 2014
		AU 2010213270 A1	06 October 2011
		EP 2772149 A2	03 September 2014
		MX 2011008503 A	30 January 2012
		CN 102387719 A	21 March 2012
		WO 2010091593 A1	19 August 2010
		EP 2404515 A1	11 January 2012
		US 2012279512 A1	08 November 2012
		US 2012111347 A1	10 May 2012
CN 101366554 A	18 February 2009	None	
KR 20120051570 A	22 May 2012	KR 101233985 B1	25 February 2013
US 2013319989 A1	05 December 2013	WO 2013181789 A1	12 December 2013
		CN 203952417 U	26 November 2014
CN 201888252 U	06 July 2011	None	

NJOY Exhibit 1002.427

国际检索报告

国际申请号
PCT/CN2014/074842

A. 主题的分类

A24F 47/00(2006.01)i

按照国际专利分类(IPC)或者同时按照国家分类和IPC两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

A24F; A61M; G01N

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用））

VEN&CNABS:电子，雾化，替代，模拟，仿真，烟，传感器，压力，可拆卸的，electronic, electrical, substitute, imitate, simulate, cigar, cigarette, tobacco, sensor, transducer,press, pressure, knock-down

C. 相关文件

类 型*	引用文件，必要时，指明相关段落	相关的权利要求
E	CN 203952419 U (刘水根) 2014年 11月 26日 (2014-11-26) 说明书第3-6页，附图1-8	1-20
Y	CN 202999300 U (刘秋明) 2013年 6月 19日 (2013-06-19) 说明书第2-6页，附图1，3，4	1-20
Y	CN 201379072 Y (韩力) 2010年 1月 13日 (2010-01-13) 说明书第4-7页，附图1，2，5，6	1-20
Y	CN 101366554 A (王山红) 2009年 2月 18日 (2009-02-18) 说明书第2-5页，附图1，2	1-20
Y	KR 20120051570 A (EBACO CO LTD) 2012年 5月 22日 (2012-05-22) 摘要，摘要附图	1-20
Y	US 2013319989 A1 (LIU QIUMING) 2013年 12月 05日 (2013-12-05) 摘要，摘要附图	1-20
A	CN 201888252 U (岁青) 2011年 7月 06日 (2011-07-06) 全文	1-20

☐ 其余文件在C栏的续页中列出。

☑ 见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
2014年 12月 31日	2015年 1月 09日

ISA/CN的名称和邮寄地址	受权官员
中华人民共和国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路6号 100088 中国 传真号 (86-10)62019451	张羽毳 电话号码 (86-10)62084123

表 PCT/ISA/210 (第2页) (2009年7月)

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国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2014/074842

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	203952419	U	2014年 11月 26日	无			
CN	202999300	U	2013年 6月 19日	无			
CN	201379072	Y	2010年 1月 13日	SG	174233	A1	2011年 10月 28日
				KR	20120012961	A	2012年 2月 13日
				EA	201171031	A1	2012年 1月 30日
				EG	26588	A	2014年 3月 17日
				JP	2012517229	A	2012年 8月 02日
				NZ	595117	A	2013年 12月 20日
				AU	2010213270	B2	2014年 5月 08日
				IL	214538	D0	2011年 9月 27日
				US	8689805	B2	2014年 4月 08日
				EP	2404515	A4	2013年 11月 13日
				CA	2752255	A1	2010年 8月 19日
				US	2014305453	A1	2014年 10月 16日
				AU	2010213270	A1	2011年 10月 06日
				EP	2772149	A2	2014年 9月 03日
				MX	2011008503	A	2012年 1月 30日
				CN	102387719	A	2012年 3月 21日
				WO	2010091593	A1	2010年 8月 19日
				EP	2404515	A1	2012年 1月 11日
				US	2012279512	A1	2012年 11月 08日
				US	2012111347	A1	2012年 5月 10日
CN	101366554	A	2009年 2月 18日	无			
KR	20120051570	A	2012年 5月 22日	KR	101233985	B1	2013年 2月 25日
US	2013319989	A1	2013年 12月 05日	WO	2013181789	A1	2013年 12月 12日
				CN	203952417	U	2014年 11月 26日
CN	201888252	U	2011年 7月 06日	无			

NJOY Exhibit 1002.429

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

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5 January 2017 (05.01.2017)

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(10) International Publication Number
WO 2017/001817 A1

(51) International Patent Classification:
A24F 47/00 (2006.01) *A61M 16/00* (2006.01)
A61M 15/06 (2006.01)

(21) International Application Number:
PCT/GB2016/051729

(22) International Filing Date:
10 June 2016 (10.06.2016)

(25) Filing Language: English

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(30) Priority Data:
1511566.0 1 July 2015 (01.07.2015) GB

(71) Applicant: **NICOVENTURES HOLDINGS LIMITED** [—/GB]; Globe House, 1 Water Street, London WC2R 3LA (GB).

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(74) Agent: **LEWIS, Darren**; D Young & Co LLP, 120 Holborn, London EC1N 2DY (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, 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).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: ELECTRONIC AEROSOL PROVISION SYSTEM

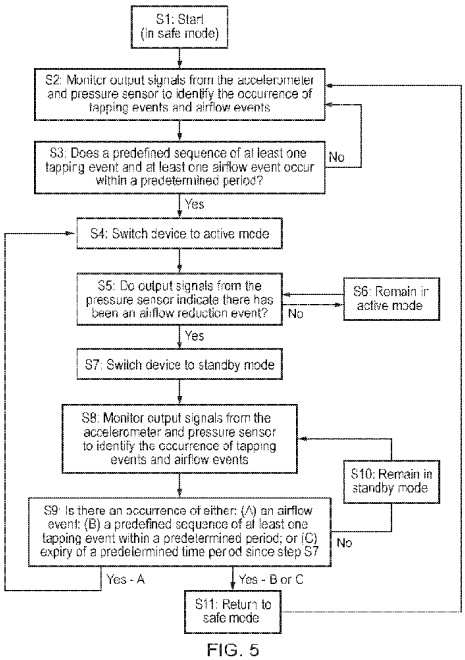


FIG. 5

(57) **Abstract**: An aerosol delivery device (10) comprising: control circuitry (550) for controlling an operating mode of the device; a motion sensor (560) arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry; and an airflow sensor (215) arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry; wherein the control circuitry is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event corresponding a flow of air in the device, and wherein the control circuitry is configured to control the device to switch from a first operating mode to a second operating mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event.

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ELECTRONIC AEROSOL PROVISION SYSTEM

Field

The present disclosure relates to electronic aerosol provision systems such as nicotine delivery systems (e.g. electronic cigarettes and the like).

Background

Electronic aerosol provision systems such as electronic cigarettes (e-cigarettes) generally contain a reservoir of a source liquid containing a formulation, typically including nicotine, from which an aerosol is generated, e.g. through heat vaporisation. An aerosol source for an aerosol provision system may thus comprise a heater having a heating element arranged to receive source liquid from the reservoir, for example through wicking / capillary action. While a user inhales on the device, electrical power is supplied to the heating element to vaporise source liquid in the vicinity of the heating element to generate an aerosol for inhalation by the user. Such devices are usually provided with one or more air inlet holes located away from a mouthpiece end of the system. When a user sucks on a mouthpiece connected to the mouthpiece end of the system, air is drawn in through the inlet holes and past the aerosol source. There is a flow path connecting between the aerosol source and an opening in the mouthpiece so that air drawn past the aerosol source continues along the flow path to the mouthpiece opening, carrying some of the aerosol from the aerosol source with it. The aerosol-carrying air exits the aerosol provision system through the mouthpiece opening for inhalation by the user.

Electronic cigarettes will include a mechanism for activating the heater to vaporise the source liquid during use. One approach is to provide a manual activation mechanism, such as a button, which the user presses to activate the heater. In such devices, the heater may be activated (i.e. supplied with electrical power) while the user is pressing the button, and deactivated when the user releases the button. Another approach is to provide an automatic activation mechanism, such as a pressure sensor arranged to detect when a user is drawing air through the device by inhaling on the mouthpiece. In such devices, the heater may be activated when it is detected the user is inhaling through the device and deactivated when it is detected the user has stopped inhaling through the device.

One consideration is for electronic cigarettes to seek to avoid accidental or unintended activation of the heater, which could happen for a number of reasons. For example, with an activation mechanism based on a button, there is a risk the button will be pressed accidentally while the device is in a user's pocket. As another example, with an activation mechanism based on a pressure sensor, there is a risk of ambient pressure changes activating the heater, for example when entering or exiting a tunnel when travelling, or when changing altitude (e.g. on a plane). There is also a potential risk of the heater (and

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hence vapour generation) being activated by someone who is not an intended user but who picks up the e-cigarette and simply mimics the action of inhalation.

Accidental / unintended heater activation can be undesirable for a number of reasons, for example it can waste battery power, and in more serious cases may result in damage to the electronic cigarette and / or injury to a user, or allow the supply of vapour to an unintended user.

Various approaches are described which seek to help address some of these issues.

Summary

In accordance with some embodiments described herein, there is provided an aerosol delivery device comprising: control circuitry for controlling an operating mode of the device; a motion sensor arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry; and an airflow sensor arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry; wherein the control circuitry is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event corresponding a flow of air in the device, and wherein the control circuitry is configured to control the device to switch from a first operating mode to a second operating mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event.

In accordance with some embodiments described herein, there is provided a method of operating an aerosol delivery device to control an operating mode comprising: detecting, using a motion sensor arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry and an airflow sensor arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry, when there is a predefined sequence of events comprising at least one tapping event and at least one airflow event, and in response thereto, switching the device from a first operating mode to a second operating mode.

In accordance with some embodiments described herein, there is provided an aerosol delivery device comprising: control means for controlling an operating mode of the device; motion sensor means for detecting motion of the device and for outputting corresponding motion detection signals to the control means; and airflow sensor means for detecting a flow of air in the device and for outputting corresponding airflow detection signals to the control means; wherein the control means is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event corresponding a flow of air in the device, and wherein the control means is configured to

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control the device to switch from a first operating mode to a second operating mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event, for example within a predetermined period of time.

In accordance with some embodiments described herein, there is provided an aerosol delivery device comprising: a control element for controlling the operation of the device; a motion sensor for detecting when a user taps the device and outputting a motion detection signal to the control element in response thereto; and an airflow sensor for detecting when a user inhales or blows through the device and outputting an airflow detection signal to the control element in response thereto, wherein the control element is configured to control an operating characteristic of the device in response to a predefined sequence of detection signals comprising at least one motion detection signal and at least one airflow detection signal being received by the control element, for example within a predetermined period of time.

The approaches described herein are not restricted to specific embodiments such as set out below, but include and contemplate any appropriate combinations of features presented herein. For example, an electronic aerosol provision system may be provided in accordance with the approach described herein which includes any one or more of the various features described below as appropriate.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic (exploded) diagram of an electronic aerosol provision system such as an e-cigarette in accordance with some embodiments;

Figure 2 is a schematic diagram of a main body portion of the e-cigarette of Figure 1 in accordance with some embodiments;

Figure 3 is a schematic diagram of an aerosol source portion of the e-cigarette of Figure 1 in accordance with some embodiments;

Figure 4 is a schematic diagram showing certain aspects of one end of the main body portion of the e-cigarette of Figure 1 in accordance with some embodiments; and

Figure 5 is a schematic flow diagram representing operation of an electronic aerosol provision system such as an e-cigarette in accordance with some embodiments.

Detailed Description

Aspects and features of certain examples and embodiments are discussed / described herein. Some aspects and features of certain examples and embodiments may be implemented conventionally and these are not discussed / described in detail in the interests of brevity. It will thus be appreciated that aspects and features of apparatus and methods

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discussed herein which are not described in detail may be implemented in accordance with any conventional techniques for implementing such aspects and features.

As described above, the present disclosure relates to an aerosol provision system, such as an e-cigarette. Throughout the following description the term "e-cigarette" is sometimes used but this term may be used interchangeably with aerosol (vapour) provision system.

Figure 1 is a schematic diagram of an aerosol / vapour provision system in the form of an e-cigarette 10 in accordance with some embodiments (not to scale). Certain embodiments of the invention are described herein in connection with some example e-cigarette configurations (e.g. in terms of the devices' overall appearance and general operating characteristics, e.g. the underlying vapour generation technology). However, it will be appreciated the same principles can equally be applied for aerosol delivery system having different overall configurations (e.g. having different overall appearance, structure and / or vapour generation technology).

The e-cigarette 10 in this example has a generally cylindrical shape, extending along a longitudinal axis indicated by dashed line LA, and comprising two main components, namely a body 20 and a cartomiser 30. The cartomiser includes an internal chamber containing a reservoir of a source liquid comprising a liquid formulation from which an aerosol is to be generated, a heating element, and a liquid transport element (in this example a wicking element) for transporting source liquid to the vicinity of the heating element. In some example implementations the heating element may itself provide the liquid transport function. The heating element and the element providing the liquid transport function may sometimes be collectively referred to as an aerosol generator / aerosol source / aerosol forming member / vaporiser / atomiser / distiller. The cartomiser 30 further includes a mouthpiece 35 having an opening through which a user may inhale the aerosol from the aerosol generator. The source liquid may be of a conventional kind used in e-cigarettes, for example comprising 0 to 5% nicotine dissolved in a solvent comprising glycerol, water, and / or propylene glycol. The source liquid may also comprise flavourings. The reservoir for the source liquid may comprise a porous matrix or any other structure within a housing for retaining the source liquid until such time that it is required to be delivered to the aerosol generator / vaporiser. In some examples the reservoir may comprise a housing defining a chamber containing free liquid (i.e. there may not be a porous matrix).

As discussed further below, the body 20 includes a re-chargeable cell or battery to provide power for the e-cigarette 10 and a circuit board including control circuitry for generally controlling the e-cigarette. The circuit board also includes a motion sensor (e.g. an accelerometer) for detecting motion of the electronic cigarette 10 and outputting corresponding motion detection signals to the control circuitry. It will be appreciated the

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motion sensor need not necessarily be mounted on the circuit board but could equally be mounted elsewhere in the electronic cigarette 10 with appropriate wiring for communicating motion detection signals to the control circuitry.

In active use, i.e. when the heating element receives power from the battery, as controlled by the control circuitry, the heating element vaporises source liquid in the vicinity of the heating element to generate an aerosol. The aerosol is inhaled by a user through the opening in the mouthpiece. During user inhalation the aerosol is carried from the aerosol source to the mouthpiece opening along an air channel that connects between them.

In this particular example, the body 20 and cartomiser 30 are detachable from one another by separating in a direction parallel to the longitudinal axis LA, as shown in Figure 1, but are joined together when the device 10 is in use by a connection, indicated schematically in Figure 1 as 25A and 25B, to provide mechanical and electrical connectivity between the body 20 and the cartomiser 30. The electrical connector on the body 20 that is used to connect to the cartomiser also serves as a socket for connecting a charging device (not shown) when the body is detached from the cartomiser 30. The other end of the charging device can be plugged into an external power supply, for example a USB socket, to charge or to re-charge the cell / battery in the body 20 of the e-cigarette. In other implementations, a cable may be provided for direct connection between the electrical connector on the body and the external power supply and / or the device may be provided with a separate charging port, for example a port conforming to one of the USB formats.

The e-cigarette 10 is provided with one or more holes (not shown in Figure 1) for air inlet. These holes connect to an air running passage (airflow path) through the e-cigarette 10 to the mouthpiece 35. The air passage includes a region around the aerosol source and a section comprising an air channel connecting from the aerosol source to the opening in the mouthpiece.

When a user inhales through the mouthpiece 35, air is drawn into this air passage through the one or more air inlet holes, which are suitably located on the outside of the e-cigarette. This airflow (or the resulting change in pressure) is detected by an airflow sensor 215, in this case a pressure sensor, for detecting airflow in electronic cigarette 10 and outputting corresponding airflow detection signals to the control circuitry. The airflow sensor 560 may operate in accordance with conventional techniques in terms of how it is arranged within the electronic cigarette to generate airflow detection signals indicating when there is a flow of air through the electronic cigarette (e.g. when a user inhales or blows on the mouthpiece).

When a user inhales (sucks / puffs) on the mouthpiece in use, the airflow passes through the air passage (airflow path) through the electronic cigarette and combines / mixes with the vapour in the region around the aerosol source to generate the aerosol. The

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resulting combination of airflow and vapour continues along the airflow path connecting from the aerosol source to the mouthpiece for inhalation by a user. The cartomiser 30 may be detached from the body 20 and disposed of when the supply of source liquid is exhausted (and replaced with another cartomiser if so desired). Alternatively, the cartomiser may be refillable.

Generally, the construction and operation of the e-cigarette may follow established techniques in the field of aerosol provision systems except where modified to provide functionality in accordance with the methods and apparatus described herein. It will therefore be appreciated the e-cigarette 10 shown in Figure 1 is presented as one example implementation of an aerosol provision system according to the present disclosure, and various other implementations can be adopted in the context of other configurations of aerosol provision system. For example, in some embodiments, the cartomiser 30 may be provided as two separable components, namely a cartridge comprising the source liquid reservoir and mouthpiece (which can be replaced when the source liquid from the reservoir is exhausted), and a vaporiser / aerosol generator comprising a heating element (which is generally retained). As another example, the charging facility and/ or the heating element itself may connect to an additional or alternative power source, such as a car cigarette lighter socket. More generally, it will be appreciated that embodiments of the disclosure described herein may be implemented in conjunction with any design of electronic aerosol provision system that is based on vaporising / aerosolising a source liquid and the underlying operating principles and structural design of other aspects of the aerosol provision system are not significant to the principles of operation in accordance with the embodiments described herein.

Figure 2 is a schematic diagram of the body 20 of the e-cigarette of Figure 1. Figure 2 can generally be regarded as a cross-section in a plane through the longitudinal axis LA of the e-cigarette. Note that various components and details of the body, e.g. such as wiring and more complex shaping, have been omitted from Figure 2 for reasons of clarity.

As shown in Figure 2, the body 20 includes a battery or cell 210 for powering the e-cigarette 10, as well as the circuit board 555 comprising the control circuitry 550 and motion sensor 560. In this example the control circuitry 550 is in the form of a chip, such as an application specific integrated circuit (ASIC) or microcontroller, for controlling the e-cigarette 10. The circuit board 555 comprising the control circuitry 550 may be arranged alongside or at one end of the battery 210. The control circuitry 550 may be provided as a single element or a number of discrete elements.

The motion sensor 560 in this example is a conventional solid-state accelerometer, for example a three-axis MEMS accelerometer of the kind frequently used in handheld electronic devices, such as smart phones and games console controllers. The motion sensor

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560 may operate in accordance with conventional techniques in terms of how it is arranged to generate motion detection signals indicating when the device undergoes acceleration. More generally, the motion sensor 560 may comprise any form of motion detecting technology for detecting motion of an object. It will furthermore be appreciated the term acceleration is used herein to encompasses both acceleration and deceleration, that is to say, the acceleration may be positive or negative along any given direction.

The control circuitry 550 is connected to the pressure sensor 215 to detect an inhalation on mouthpiece 35 and, as mentioned above, this aspect of detecting when there is an airflow in the electronic cigarette and generating corresponding airflow detection signals may be conventional.

In addition to being configured to support the conventional operating aspects of the e-cigarette in accordance with generally established techniques, the control circuitry 550 is further configured in accordance with embodiments of the disclosure as described herein to control an operating mode of the e-cigarette, and in particular to control when the e-cigarette switches between different operating (use) modes, based on signals received from the motion sensor 560 and or the airflow sensor 215, as discussed further below.

The body 20 further includes a cap 225 to seal and protect the far (distal) end of the e-cigarette. There is an air inlet hole provided in or adjacent to the cap 225 to allow air to enter the body and flow past the sensor unit 215 when a user inhales on the mouthpiece 35.

At the opposite end of the body 20 from the cap 225 is the connector 25B for joining the body 20 to the cartomiser 30. The connector 25B provides mechanical and electrical connectivity between the body 20 and the cartomiser 30. The connector 25B includes a body connector 240, which is metallic (silver-plated in some embodiments) to serve as one terminal for electrical connection (positive or negative) to the cartomiser 30. The connector 25B further includes an electrical contact 250 to provide a second terminal for electrical connection to the cartomiser 30 of opposite polarity to the first terminal, namely body connector 240. The electrical contact 250 is mounted on a coil spring 255. When the body 20 is attached to the cartomiser 30, the connector 25A on the cartomiser pushes against the electrical contact 250 in such a manner as to compress the coil spring in an axial direction, i.e. in a direction parallel to (co-aligned with) the longitudinal axis LA. In view of the resilient nature of the spring 255, this compression biases the spring 255 to expand, which has the effect of pushing the electrical contact 250 firmly against connector 25A, thereby helping to ensure good electrical connectivity between the body 20 and the cartomiser 30. The body connector 240 and the electrical contact 250 are separated by a spacer 260, which is made of a non-conductor (such as plastic) to provide good insulation between the two electrical terminals. The spacer 260 is shaped to assist with the mutual mechanical engagement of connectors 25A and 25B.

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Figure 3 is a schematic diagram of the cartomiser 30 of the e-cigarette of Figure 1 in accordance with some embodiments. Figure 3 can generally be regarded as a cross-section in a plane through the longitudinal axis LA of the e-cigarette. Note that as with the other figures, various components and details of the device, e.g. such as wiring and more complex shaping, have been omitted for reasons of clarity.

The cartomiser 30 includes an aerosol source 365; 368 arranged in an air passage 355 extending along the central (longitudinal) axis of the cartomiser 30 from the mouthpiece 35 to the connector 25A for joining the cartomiser to the body 20. The aerosol source comprises a resistive heating element 365 adjacent a wicking element (liquid transport element) 368 which is arranged to transport source liquid from a reservoir of source liquid 360 to the vicinity of the heating element 365 for heating.

The reservoir of source liquid 360 in this example is provided around the air passage 335 and may be implemented, for example, by providing cotton or foam soaked in source liquid. Ends of the wicking element 365 are in contact with the source liquid in the reservoir 360 so that the liquid is drawn along the wicking element to locations adjacent the extent of the heating element 365.

The general configuration of the wicking element 368 and the heating element 365 may follow conventional techniques. For example, in some implementations the wicking element and the heating element may comprise separate elements, e.g. a metal heating wire wound around / wrapped over a cylindrical wick, the wick, for instance, consisting of a bundle, thread or yarn of glass fibres. In other implementations, the functionality of the wicking element and the heating element may be provided by a single element. That is to say, the heating element itself may provide the wicking function. Thus, in various example implementations, the heating element / wicking element may comprise one or more of: a metal composite structure, such as porous sintered metal fibre media (Bekipor® ST) from Bakaert, a metal foam structure, e.g. of the kind available from Mitsubishi Materials; a multi-layer sintered metal wire mesh, or a folded single-layer metal wire mesh, such as from Bopp; a metal braid; or glass-fibre or carbon-fibre tissue entwined with metal wires. The “metal” may be any metallic material having an appropriate electric resistivity to be used in connection / combination with a battery. The resultant electric resistance of the heating element will typically be in the range 0.5 - 5 Ohm. Values below 0.5 Ohm could be used but could potentially overstress the battery. The “metal” could, for example, be a NiCr alloy (e.g. NiCr8020) or a FeCrAl alloy (e.g. “Kanthal”) or stainless steel (e.g. AISI 304 or AISI 316).

The heating element 365 is powered through lines 366 and 367, which are in turn connectable to opposing polarities (positive and negative, or vice versa) of the battery 210 via connector 25A and under the control of the control circuitry 355 (the details of the wiring

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between the power lines 366 and 367 and connector 25A are omitted from Figure 3 for simplicity of representation).

The connector 25A includes an inner electrode 375, which may be silver-plated or made of some other suitable metal. When the cartomiser 30 is connected to the body 20, the inner electrode 375 contacts the electrical contact 250 of the body 20 to provide a first electrical path between the cartomiser and the body. In particular, as the connectors 25A and 25B are engaged, the inner electrode 375 pushes against the electrical contact 250 so as to compress the coil spring 255, thereby helping to ensure good electrical contact between the inner electrode 375 and the electrical contact 250.

The inner electrode 375 is surrounded by an insulating ring 372, which may be made of plastic, rubber, silicone, or any other suitable material. The insulating ring is surrounded by the cartomiser connector 370, which may be silver-plated or made of some other suitable metal or conducting material. When the cartomiser 30 is connected to the body 20, the cartomiser connector 370 contacts the body connector 240 of the body 20 to provide a second electrical path between the cartomiser and the body. In other words, the inner electrode 375 and the cartomiser connector 370 serve as positive and negative terminals (or vice versa) for supplying power from the battery 210 in the body to the heating element 365 in the cartomiser via supply lines 366 and 367 under the control of the control circuitry 550.

The cartomiser connector 370 is provided with two lugs or tabs 380A, 380B, which extend in opposite directions away from the longitudinal axis of the e-cigarette. These tabs are used to provide a bayonet fitting in conjunction with the body connector 240 for connecting the cartomiser 30 to the body 20. This bayonet fitting provides a secure and robust connection between the cartomiser 30 and the body 20, so that the cartomiser and body are held in a fixed position relative to one another, without wobble or flexing, and the likelihood of any accidental disconnection is very small. At the same time, the bayonet fitting provides simple and rapid connection and disconnection by an insertion followed by a rotation for connection, and a rotation (in the reverse direction) followed by withdrawal for disconnection. It will be appreciated that other embodiments may use a different form of connection between the body 20 and the cartomiser 30, such as a snap fit or a screw connection.

Figure 4 is a schematic diagram of certain details of the connector 25B at the end of the body 20 in accordance with some embodiments (but omitting for clarity most of the internal structure of the connector as shown in Figure 2, such as spacer 260). In particular, Figure 4 shows the external housing 201 of the body 20, which generally has the form of a cylindrical tube. This external housing 201 may comprise, for example, an inner tube of metal with an outer covering of paper or similar.

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The body connector 240 extends from this external housing 201 of the body 20. The body connector as shown in Figure 4 comprises two main portions, a shaft portion 241 in the shape of a hollow cylindrical tube, which is sized to fit just inside the external housing 201 of the body 20, and a lip portion 242 which is directed in a radially outward direction, away from the main longitudinal axis (LA) of the e-cigarette. Surrounding the shaft portion 241 of the body connector 240, where the shaft portion does not overlap with the external housing 201, is a collar or sleeve 290, which is again in a shape of a cylindrical tube. The collar 290 is retained between the lip portion 242 of the body connector 240 and the external housing 201 of the body, which together prevent movement of the collar 290 in an axial direction (i.e. parallel to axis LA). However, collar 290 is free to rotate around the shaft portion 241 (and hence also axis LA).

As mentioned above, the cap 225 is provided with an air inlet hole to allow air to flow past sensor 215 when a user inhales on the mouthpiece 35. However, for this particular example aerosol provision system, the majority of air that enters the device when a user inhales flows through collar 290 and body connector 240 as indicated by the two arrows in Figure 4.

As noted above, some example aerosol delivery devices in accordance with some embodiments of the present disclosure seek to help address or reduce some of the issues associated with accidental / unintended activation of an aerosol delivery device. This is done in some example implementations by the control circuitry controlling when an aerosol delivery device switches between different operating modes (use modes) based on signalling received from a motion sensor (e.g. an accelerometer) and an airflow sensor (e.g. a pressure sensor).

The electronic cigarette 10 represented in Figures 1 to 4 can operate in a number of different modes. In one operating mode, which may be referred to as an active mode or vapour generation mode, the control circuitry 550 is configured to cause power to be supplied from the battery 210 to the heating element 365 (e.g. by driving an appropriately configured transistor switch) to cause liquid in the vicinity of the heating element to be vaporised for inhalation by a user. In another operating mode, which may be referred to as a standby mode or ready mode, the control circuitry 550 may be configured to cut the supply of power to the heating element 365 so that no vapour is generated, but to automatically switch to the active mode (and hence supply power to the heating element) when it is determined that a user is inhaling on the mouthpiece of the electronic cigarette based on information / signalling received from the pressure sensor 215. In another mode, which may be referred to as a safe mode or an off mode, the control circuitry 550 is configured to prevent the supply of power to the heating element 365 so that no vapour is generated, but unlike the standby mode, in the safe mode the control circuitry is not configured to

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automatically switch to the active mode simply in response to a user inhaling on the device. Rather, in the safe mode the control circuitry is configured to switch to the active mode in response to a predefined combination of signals being received from the accelerometer 560 and the pressure sensor 215, for example, within a predefined period of time.

Thus, in accordance with certain example implementations in accordance with some embodiments of the disclosure, the control circuitry is configured to (1) determine from motion detection signals received from the accelerometer when there is a tapping event corresponding to the electronic cigarette being tapped by a user, and (2) to determine from airflow detection signals received from the airflow sensor when there is an airflow event corresponding to a flow of air being detected in the device (e.g. because a user inhales on the mouthpiece). The control circuitry is furthermore configured to control the device to switch from the safe (off) mode to the active (in use) mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event within a predefined period of time. In one particular example the predefined sequence of events may comprise two tapping events followed by an airflow event and the predefined period of time may be three seconds. Thus, to switch the electronic cigarette from the safe mode to the active mode, a user taps the device twice and begins inhaling within a three second period. This switches the device to the active mode in which power is supplied to the heating element, so that as the user continues to inhale on the device, vapour generated by the heating element may be inhaled. It will of course be appreciated the predefined period of time can be different in different implementations. For example, in some cases the predefined period of time could be five seconds, rather than three seconds.

A tapping event may, for example, correspond with a user tapping the electronic cigarette on a surface, or tapping the device with his or her finger. Such a tap will generate a relatively brief acceleration of the electronic cigarette which is reflected in the motion detection signals from the accelerometer. Thus, the control circuitry may be configured to process the motion detection signals received from the accelerometer to determine when there has been a tapping event by identifying when the motion detection signals indicate the occurrence of an acceleration of the electronic cigarette which is greater than a threshold acceleration amount. An appropriate threshold acceleration amount for a given configuration of electronic cigarette may, for example, be determined empirically during a design phase of that particular electronic cigarette. Appropriate values to use will depend on a number of factors, for example the intended activation force to give rise to a tap detection and the mass of the device. For example, in one implementation, it may be determined that a tapping event has occurred if the control circuitry determines the electronic cigarette has undergone an acceleration of greater than around 5 m/s^2 (0.5g) for less than 50 ms (0.05 s).

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An airflow event may, for example, correspond with a user inhaling on the electronic cigarette. This will generate an airflow in the device which is reflected in the airflow detection signals from the pressure sensor in accordance with conventional techniques. Thus, the control circuitry may be configured to process the signals received from the pressure sensor to determine when there is an airflow event by identifying when the airflow detection signals indicate there is a change in pressure in the airflow path of the device which is more than a threshold pressure change amount. The pressure change may, for example, be measured by comparing a current pressure measurement with a running average of pressure measurements over a preceding period, for example over 1, 2, 3 ,4, 5, or 10 seconds. In another implementation the control circuitry may be configured to process the signals received from the pressure sensor to determine when there is an airflow event by identifying when the airflow detection signals indicate a pressure in the airflow path of the device has passed (e.g. fallen below) a threshold pressure level. In any event, an appropriate threshold level may again be determined empirically during a design phase of the particular electronic cigarette. Appropriate values to use will depend on a number of factors, for example the intended inhalation effort and corresponding air flow rate intended to give rise to an airflow detection event, as well as how the pressure sensor is coupled to the device's flow path (which will determine the pressure drop at the sensor for a given inhalation effort). In one particular example implementation, the control circuitry 550 may be configured to determine an airflow event has started if the pressure sensor indicates a change (e.g. a drop) in pressure measured relative to a previous pressure measurement (or average of a number of previous pressure measurements) that is greater than 30 Pascals.

When the device is in the active mode, the control circuitry monitors for when the user is deemed to have stopped inhaling on the device. When the control circuitry determines the user has stopped inhaling on the device, the control circuitry controls the device to switch from the active mode to the standby mode. The determination of when the user has stopped inhaling on the device may be based on signalling received from the pressure sensor in accordance with conventional techniques. Thus, the control circuitry may, when in the active mode, be configured to process the signals received from the pressure sensor to determine when there is an airflow reduction event by identifying when the airflow detection signals indicate there is a change in pressure that is more than a threshold pressure change amount. In this regard, the process of detecting an airflow reduction event (when a user stops inhaling on the device) may follow the same general principles as the process for detecting an airflow event (when a user begins inhaling on the device), except the pressure change will be in a different direction. Thus, an airflow reduction event may be deemed to occur when the pressure sensor signals indicate at least a threshold pressure change relative to a running average of pressure measurements over a preceding period, for

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example over 0.5, 1 or 2 seconds. In another implementation the control circuitry may be configured to process the signals received from the pressure sensor to determine when there is an airflow reduction event by identifying when the airflow detection signals indicate a pressure in the airflow path of the device has passed (e.g. risen above) a threshold pressure level. In any event, an appropriate threshold level for identifying an airflow reduction event may again be determined empirically during a design phase of the particular electronic cigarette. Appropriate values to use will again depend on a number of factors, for example the magnitude of the drop in air flow rate intended to give rise to an airflow reduction event, as well as how the pressure sensor is coupled to the device's flow path. In one particular example implementation, the control circuitry 550 may be configured to identify an airflow reduction event has occurred if the pressure sensor indicates a change (e.g. an increase) in pressure measured relative to a previous pressure measurement (or average of a number of previous pressure measurements) that is greater than 30 Pascals.

When the device is in the standby mode the control circuitry is configured to monitor for an airflow event correspond with a user inhaling on the electronic cigarette and to switch back into active mode if this is detected. That is to say, the process of switching from standby mode to active mode is different from the process of switching from safe mode to active mode. In particular, switching from safe mode to active mode is based on detecting a predefined sequence of at least one tapping event (acceleration event) and at least one airflow event (inhalation event) within a predefined period of time, whereas switching from standby mode to active mode is based simply on detecting an airflow event (inhalation event).

When the device is in standby mode, in addition to monitoring for an airflow event to determine whether to switch back to active mode, the control circuitry also monitors for a further predefined sequence of events, for example comprising a plurality of tapping events, for example two tapping events, occurring within a predefined period of time, for example within one or two seconds. If such a predefined sequence of events is identified, the control circuitry is configured to switch the electronic cigarette from the standby mode back to the safe mode. This provides a user with a convenient way of returning the device to safe mode once a session of use is completed (i.e. after the user has taken a plurality of puffs spread over a number of minutes during which the electronic cigarette automatically switches between active mode and standby mode according to when the user is inhaling on the device). Alternatively, or in addition, the control circuitry may be configured to switch from the standby mode to the safe mode if it is determined the by the control circuitry that the electronic cigarette has remained in standby mode for longer than a predetermined threshold duration of time (that is to say, no airflow events have been detected within the predetermined threshold duration of time). For example, the control circuitry may be

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configured to switch the electronic cigarette from standby mode to safe mode if the device has remained in standby mode for greater than 5, 10, 15 or 20 minutes, or another period depending on how the device has been configured. This, as with other aspects of the operation (such as the predefined sequence of events for switching from safe mode to active mode), may in some example implementations be user configurable.

Figure 5 is a flow diagram schematically representing steps of a method of operating an electronic vapour provision system in accordance with certain embodiments of the disclosure in accordance with the principles described herein. Thus, in the context of the example e-cigarette represented in Figures 1 to 4, the control circuitry 550 is configured to provide functionality in accordance with the method represented in Figure 5.

The processing begins in step S1 in which the device is assumed to be in safe mode. This might, for example, be the default operating mode when the body 20 and cartomiser 30 are first connected and / or the control circuitry is first powered up.

In step S2, the control circuitry monitors output signals from the accelerometer 560 and pressure sensor 215 to identify when tapping events and airflow events occur as discussed above.

In step S3, the control circuitry determines whether or not a predefined sequence of at least one tapping event and at least one airflow event has occurred within a predetermined period. As noted above, in this example implementation the predefined sequence corresponds with two tapping events followed by an airflow event within a 3 second period.

In this case step S3 may be implemented in practice by the control circuitry recording when tapping events occur, and then for each airflow event checking whether there have been two tapping events in the preceding 3 seconds. In this particular example it is assumed the predefined sequence comprises two, and only two, tapping events in the relevant period. That is to say, three (or more) tapping events followed by an airflow event within the predefined period would not be considered to correspond with the predefined sequence and would not cause the control circuitry to switch the electronic cigarette from safe mode to active mode. However, in another implementation the occurrence of two tapping events followed by an airflow event within the predefined period may switch the electronic cigarette from safe mode to active mode regardless of whether there were additional tapping or airflow events in the predefined period prior to this sequence occurring. That is to say, three (or more) tapping events followed by an airflow event within a three second period may in some implementations also switch the device from safe mode to active mode. Similarly, an airflow event followed by two tapping events followed by another airflow event may in some implementations switch the device from safe mode to active mode.

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In some other examples, step S3 may be implemented in practice by the control circuitry identifying when there is an occurrence of the relevant number of tapping events associated with the predefined sequence and then monitoring for an airflow detection event within the predefined time. If an airflow detection event is detected within the relevant period of time, it is determined the predefined sequence of event has occurred, and if an airflow detection event is not detected within the period of time, it is determined the predefined sequence of events for switching the device out of safe mode has not occurred (although as discussed below may be taken as an instruction to switch the device into safe mode it is not already in safe mode). In this sense it will be appreciated the predefined period of time in which the sequence of events is to be detected may be associated with the time from the last tapping event of the sequence to a following airflow detection event, rather than the time in which all the tapping events and airflow events occur. That is to say, the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event within a predefined period of time should be interpreted as the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event occurring in association with a predefined period of time.

If it is determined in step S3 that the predefined sequence of events has not occurred within the predetermined period of time, processing follows the branch marked "No" from step S3 back to step S2 in which the control circuitry continues to monitor the output signals from the accelerometer and pressure sensor to identify when tapping events and airflow events occur.

If, on the other hand, it is determined in step S3 that the predefined sequence of events has occurred within the predetermined period of time, processing follows the branch marked "Yes" from step S3 to step S4.

In step S4 the control circuitry acts to switch the electronic cigarette from safe mode to active mode. Thus, in this example, the control circuitry causes power to be supplied to the heating element of the electronic cigarette so that vapour is generated and may be inhaled by a user.

Whilst the electronic cigarette remains in active mode, the control circuitry continues to monitor the pressure sensor signals to determine when the user stops inhaling on the electronic cigarette (i.e. when there is an airflow reduction event), as schematically represented in step S5.

If it is determined in step S5 there has not been an airflow reduction event (i.e. the user is still inhaling on the electronic cigarette), the control circuitry maintains the supply of power to the heating element while continuing to monitor for when there is an airflow reduction event, as schematically indicated in Figure 5 by step S6.

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If, on the other hand, it is determined in step S5 that there has been an airflow reduction event, that is to say it is determined the user has stopped inhaling on the electronic cigarette, processing follows the branch marked "Yes" from step S5 to step S7.

In step S7 the control circuitry acts to switch the electronic cigarette from active mode to standby mode, i.e., the control circuitry cuts power to the heating element.

In step S8, while in the standby mode, the control circuitry monitors output signals from the accelerometer 560 and pressure sensor 215 to identify when tapping events and airflow events occur.

In step S9, the control circuitry determines from the monitoring in step S8 whether any of the following occurs:

(A) an airflow event is detected (i.e. a user inhales on the electronic cigarette);

(B) a predefined sequence comprising at least one tapping event within a predefined period of time is detected. This predefined sequence is different from the predefined sequence for switching the device from safe mode to active mode, for example it may be a sequence of two tapping events within one second;

(c) a predefined period of time passes with the electronic cigarette remaining in standby mode, for example 15 minutes,.

If none of these situations occur, the control circuitry is configured to maintain the electronic cigarette in standby mode as schematically indicated in Figure 5 in step S10.

If, on the other hand, it is determined that situation (A) has occurred, i.e. an airflow event is detected while the electronic cigarette is in standby mode, the control circuitry is configured to follow the branch marked "Yes - A" from step S9 to return to step S4 in which the electronic cigarette returns to active mode (vapour generation mode).

If, on the other hand, it is determined that situation (B) or situation (C) has occurred, i.e. two tapping events are detected within one second or the electronic cigarette remains in standby mode for more than 15 minutes, the control circuitry is configured to cause the electronic cigarette to switch from standby mode back to safe mode by following the branch marked "Yes - B or C" from step S9 to step S11. Processing may then return to step S2 and continue as discussed above.

Accordingly, the processing of step S9 allows a user to readily return the electronic cigarette from standby mode to active mode during an ongoing session of use by simply inhaling on the device. Alternatively, the user may manually return the electronic cigarette to safe mode by performing the predefined deactivation sequence within the relevant time (i.e. in this particular example two taps within one second) when the user has finished a session of use. If the user takes no action, for example because the user has finished an ongoing session of use but does not manually return the electronic cigarette to the safe mode, the electronic cigarette automatically returns to safe mode after the predetermined time period

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spent continuously in standby mode has elapsed (which in this example implementation is 15 minutes).

In some implementations, the predefined sequence of events for switching the device out of safe mode (e.g. in association with step S3 in Figure 5) comprises a given number of tapping events followed by an airflow event within a period of time, and the predefined sequence of events for switching the device back to safe mode (e.g. in association with situation (B) in step S9 in Figure 5) comprises the same given number of tapping events, but without being followed by an airflow event within a period of time (which may or may not be the same as the period of time associated with switching the device out of safe mode).

Thus, in accordance with some of the principles described above, approaches are provided that help reduce a risk of unintended / accidental activation of an aerosol generation operating mode of an aerosol provision system while the devices in a safe mode. This is achieved by relying on the occurrence of a predefined sequence of at least one tapping event and at least one airflow event within a predetermined period to cause the device to switch from the safe mode to the active mode. The device may then automatically switch from the active mode to a standby mode when a user stops inhaling on the device. Furthermore, approaches in accordance with certain embodiments allow for a user to conveniently switch between the active mode and the standby mode during an ongoing session of use by switching between these modes automatically in dependence on whether or not air is being drawn through the device. Furthermore still, once a user has finished a session of use, the user can readily return the device to the safe mode by performing the predefined sequence of at least one tapping event within the corresponding period of time (e.g. two taps in one second in this example). If the device remains in standby mode without use for more than a predetermined period of time, the device may automatically return to safe mode.

In the context of an electronic cigarette, approaches in accordance with the principles described herein may be especially convenient for users since the process of tapping a device before use mimics a common user behaviour associated with conventional cigarettes, which users will often tap, for example to help pack loose tobacco in the end of the cigarette, before use.

It will be appreciated various modifications to the apparatus and methods described above may be implemented in accordance with certain embodiments of the disclosure.

For example, it will be appreciated that various different predefined sequences may be defined for causing the device to switch between different operating votes. For example, rather than rely a sequence of two tapping events and an airflow event within three seconds to activate the device (i.e. to switch from safe mode to active mode), different implementations may adopt different activation sequences. Furthermore, in some examples

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a user may be provided with the ability to select their own preferred activation sequence and / or there may be multiple different activation sequences for switching the device from safe mode to active mode.

It will further be appreciated that in addition to the various example operating modes discussed above (safe mode, active mode and standby mode), a device in accordance with some embodiments may also support other modes of operation.

For example, a device may additionally support what may be referred to as a lock mode. The lock mode may be broadly similar to the safe mode in terms of how the device is configured to prevent the supply of power to the heating element, but unlike the safe mode, in the locked mode the device does not switch to the active mode in response to the predefined sequence of tapping and airflow events that switches the device from safe mode to active mode. Instead, a different process is required to switch the device out of lock mode, for example a more complex sequence of tapping and airflow events that may be user defined, or some other user input, for example entry of a Personal Identification Number (PIN) on a device, such as a smart phone, that is communicatively coupled to the device. Thus the locked mode provides what might be seen as an even deeper level of protection against unintended activation of the heater than the safe mode in having a deactivation mechanism that is more complex.

In the examples described above, it is assumed the accelerometer is a three axis accelerometer and a tapping event may be considered to occur whenever there is a threshold amount of acceleration along any direction. However, in other example implementations the control circuitry may be configured to detect tapping events only in response to acceleration along a given direction, for example along a longitudinal axis of the electronic cigarette. This may be because, for example, the accelerometer is only configured to measure acceleration along this axis, or because the control circuitry is configured to process the outputs from a multi-axis accelerometer to determine the component along this axis. Furthermore, the control circuitry may be configured to process the signals from a multi-axis accelerometer and separately detect tapping events in different directions. For example, the control circuitry be configured to distinguish longitudinal tapping events (acceleration along the longitudinal axis of the device) and sideways tapping events (acceleration perpendicular to the longitudinal axis of the device). In this case the a predefined sequence for switching between operating modes may comprise a combination of tapping events along different directions, for example two longitudinal (end-on) taps followed by one sideways (side-on) tap.

Furthermore, whilst in the examples described above the airflow event has primarily corresponded to a user inhaling on the electronic cigarette, in principle, the airflow event could equally correspond a user blowing on an electronic cigarette. For example, the

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activation sequence for switching the electronic cigarette from safe mode to active mode might comprise a user tapping the device a number of times and then blowing through the device, before sucking to inhale a generated aerosol.

In some cases the control circuitry may be configured to switch the device from a safe mode to a standby mode, rather than directly to an active mode in response to detecting the predefined sequence of tapping and / or airflow events. In some cases the predefined signals may comprise only tapping events. For example, the control circuitry may be configured to switch the device from a safe mode to a standby mode or to an active mode in response to detecting a predefined sequence of tapping events occurring within a predefined period, with or without an associated airflow event.

It will further be appreciated that the timings presented above are examples in accordance with certain implementations, but may be different, and may furthermore be user configurable, in other implementations. For example, the predefined period of time for the predefined sequence of events for switching from the safe mode (first operating mode) to the active mode (second operating mode) may, instead of being 3 seconds, be a different period of time, for example it may be a period of time in a range selected from the group comprising: 1 second to 1.5 seconds; 1.5 seconds to 2 seconds; 2 seconds to 2.5 seconds; 2.5 seconds to 3 seconds; 3 seconds to 3.5 seconds; 3.5 second to 4 seconds; less than 5 seconds and less than 10 seconds. Similarly, the predetermined period of time after which the device will automatically switch from the standby mode (third operating mode) to the safe mode (first operating mode) may instead of being 15 minutes, be a different time, for example it may be a time in a range selected from the group comprising: 1 minute to 1.5 minutes; 1.5 minutes to 2 minutes; 2 minutes to 2.5 minutes; 2.5 minutes to 3 minutes; 3 minutes to 3.5 minutes; 3.5 minute to 4 minutes; 5 minutes to 10 minutes; and 10 minutes to 20 minutes.

Thus, there has been described an aerosol delivery device comprises control circuitry for controlling an operating mode of the device, a motion sensor arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry, and an airflow sensor arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry. The control circuitry is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event corresponding a flow of air being detected in the device. The control circuitry is further configured to control the device to switch from a first operating mode, such as standby mode, to a second operating mode, such as an active mode, in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event within a predefined period of time.

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While the above described embodiments have in some respects focussed on some specific example aerosol provision systems, it will be appreciated the same principles can be applied for aerosol provision systems using other technologies. That is to say, the specific manner in which various aspects of the aerosol provision system which are not directly relevant to establishing whether a fault condition has arisen for a heating element in accordance with the approaches described herein is not significant to the principles underlying certain embodiments. For example, configurations based on the systems disclosed in US 2011/0226236 [1], could be used in other implementations.

In order to address various issues and advance the art, this disclosure shows by way of illustration various embodiments in which the claimed invention(s) may be practiced. The advantages and features of the disclosure are of a representative sample of embodiments only, and are not exhaustive and/or exclusive. They are presented only to assist in understanding and to teach the claimed invention(s). It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects of the disclosure are not to be considered limitations on the disclosure as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope of the claims. Various embodiments may suitably comprise, consist of, or consist essentially of, various combinations of the disclosed elements, components, features, parts, steps, means, etc. other than those specifically described herein, and it will thus be appreciated that features of the dependent claims may be combined with features of the independent claims in combinations other than those explicitly set out in the claims. The disclosure may include other inventions not presently claimed, but which may be claimed in future.

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CLAIMS

1. An aerosol delivery device comprising:

control circuitry for controlling an operating mode of the device;

a motion sensor arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry; and

an airflow sensor arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry;

wherein the control circuitry is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event corresponding a flow of air in the device, and wherein the control circuitry is configured to control the device to switch from a first operating mode to a second operating mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event.

2. The aerosol delivery device of claim 1, wherein the predefined sequence of events comprises at least one tapping event followed by at least one airflow event.

3. The aerosol delivery device of any of claims 1 and 2, wherein the predefined sequence of events comprises a plurality of tapping events.

4. The aerosol delivery device of any of claims 1 to 3, wherein the predefined sequence of events consists of two tapping events followed by one airflow event.

5. The aerosol delivery device of claim 1, wherein the predefined sequence of events comprises the at least one tapping event and the at least one airflow event occurring in association with a predefined period of time.

6. The aerosol delivery device of any of claims 5, wherein the predefined period of time is within a range selected from the group comprising: 1 second to 1.5 seconds; 1.5 seconds to 2 seconds; 2 seconds to 2.5 seconds; 2.5 seconds to 3 seconds; 3 seconds to 3.5 seconds; 3.5 second to 4 seconds; less than 5 seconds and less than 10 seconds.

7. The aerosol delivery device of any of claims 1 to 6, wherein the device comprises a heating element and wherein the switch from the first operating mode to the second

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operating mode comprises the control circuitry activating a supply of power to the heating element.

8. The aerosol delivery device of any of claims 1 to 7, wherein the control circuitry is further configured to determine from the airflow detection signals when there is an airflow reduction event corresponding to a reduction in the flow of air in the device when the device is in the second operation mode and, in response thereto, to control the device to switch from the second operating mode to a third operating mode in which the control circuitry is configured to control the device to switch back to the second operating mode in response to the detection of an airflow event.

9. The aerosol delivery device of any of claims 1 to 8, wherein the motion sensor is an accelerometer.

10. The aerosol delivery device of claim 9, wherein the control circuitry is configured to determine a tapping event has occurred when the motion detection signals indicate the device has undergone an acceleration that exceeds a threshold acceleration.

11. The aerosol delivery device of any of claims 1 to 10, wherein the airflow sensor comprises a pressure sensor configured to measure air pressure in an airflow path of the device.

12. The aerosol delivery device of claim 11 wherein the control circuitry is configured to determine an airflow event has occurred when the airflow detection signals indicate there has been a change in pressure in the airflow path of the device that is more than a threshold pressure change and / or when the airflow detection signals indicate the pressure in the airflow path has crossed a threshold pressure level.

13. The aerosol delivery device of any of claims 1 to 12, wherein the control circuitry is further configured to control the device to switch from the second operating mode to the first operating mode in response to the detection of a second predefined sequence of events which is different from the predefined sequence of events for switching the device from the first operating mode to the second operating mode.

14. The aerosol delivery device of claims 13, wherein the second predefined sequence of events comprises at least one tapping event which is not followed by an airflow event within a defined period of time.

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15. The aerosol delivery device of any of claims 1 to 14, wherein the control circuitry is further configured to control the device to switch from the second operating mode to the first operating mode in response to no airflow events being detected within a predetermined period of time.

16. The aerosol delivery device of claim 15, wherein the predetermined period of time is within a range selected from the group comprising: 1 minute to 1.5 minutes; 1.5 minutes to 2 minutes; 2 minutes to 2.5 minutes; 2.5 minutes to 3 minutes; 3 minutes to 3.5 minutes; 3.5 minute to 4 minutes; 5 minutes to 10 minutes; and 10 minutes to 20 minutes.

17. The aerosol delivery device of any of claims 15 and 16, wherein the control circuitry is configured to adjust the predetermined period of time in response to receiving configuration setting information.

18. The aerosol delivery device of any of claims 1 to 17, further comprising a power supply, a heating element and a reservoir of source liquid, wherein the control circuitry is configured to control a supply of power from the power supply to the heating element to selectively generate an aerosol from source liquid in the vicinity of the heating element.

19. A method of operating an aerosol delivery device to control an operating mode comprising: detecting, using a motion sensor arranged to detect motion of the device and to output corresponding motion detection signals to the control circuitry and an airflow sensor arranged to detect a flow of air in the device and to output corresponding airflow detection signals to the control circuitry, when there is a predefined sequence of events comprising at least one tapping event and at least one airflow event, and in response thereto, switching the device from a first operating mode to a second operating mode

20. An aerosol delivery device comprising:

control means for controlling an operating mode of the device;

motion sensor means for detecting motion of the device and for outputting corresponding motion detection signals to the control means; and

airflow sensor means for detecting a flow of air in the device and for outputting corresponding airflow detection signals to the control means;

wherein the control means is configured to determine from the motion detection signals when there is a tapping event corresponding to the device being tapped by a user and to determine from the airflow detection signals when there is an airflow event

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corresponding a flow of air in the device, and wherein the control means is configured to control the device to switch from a first operating mode to a second operating mode in response to the detection of a predefined sequence of events comprising at least one tapping event and at least one airflow event.

21. An aerosol delivery device comprising:

a control element for controlling the operation of the device;

a motion sensor for detecting when a user taps the device and outputting a motion detection signal to the control element in response thereto; and

an airflow sensor for detecting when a user inhales or blows through the device and outputting an airflow detection signal to the control element in response thereto,

wherein the control element is configured to control an operating characteristic of the device in response to a predefined sequence of detection signals comprising at least one motion detection signal and at least one airflow detection signal being received by the control element.

22. An aerosol delivery device substantially as described herein with reference to the accompanying drawings.

23. A method of operating an aerosol delivery device substantially as described herein with reference to the accompanying drawings.

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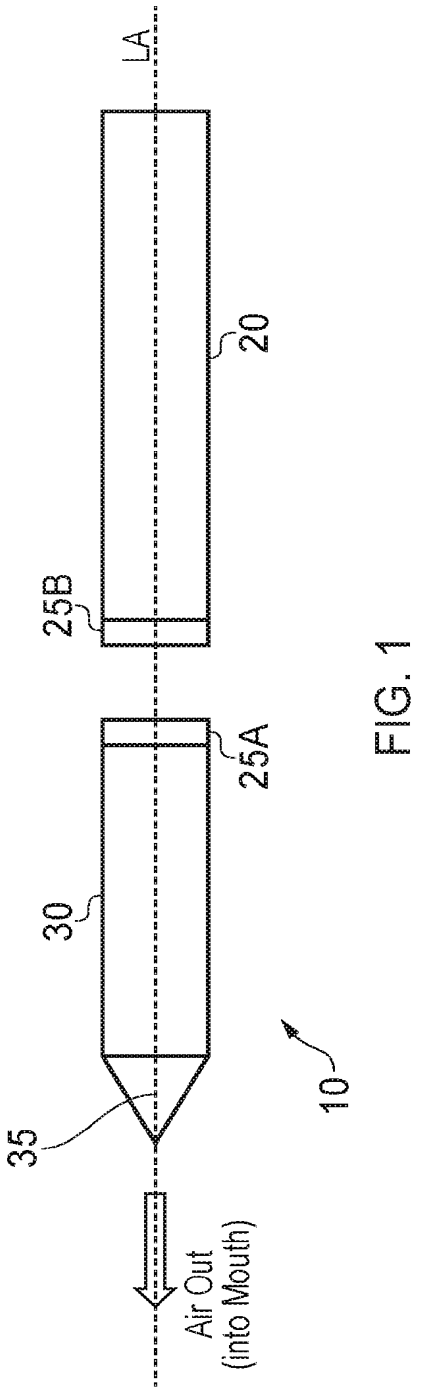


FIG. 1

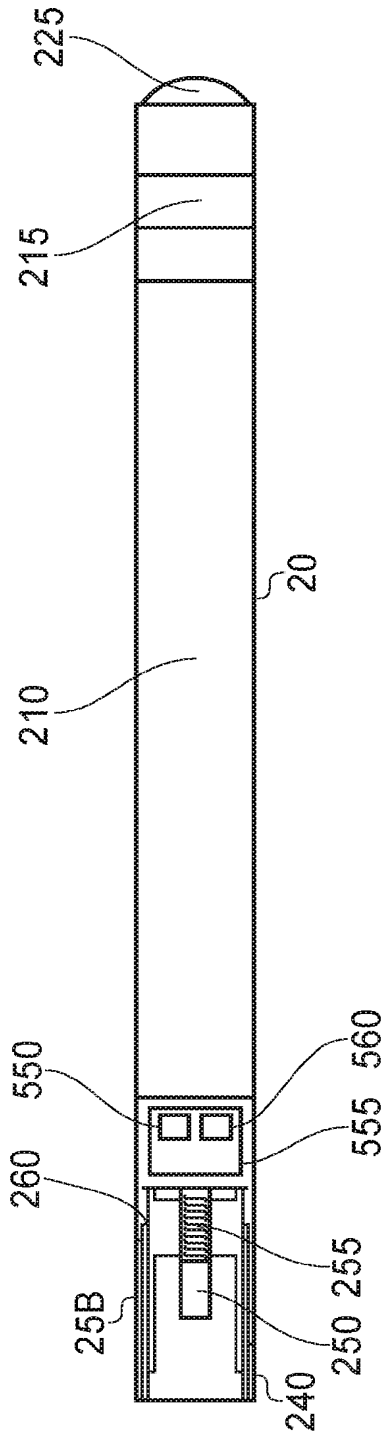


FIG. 2

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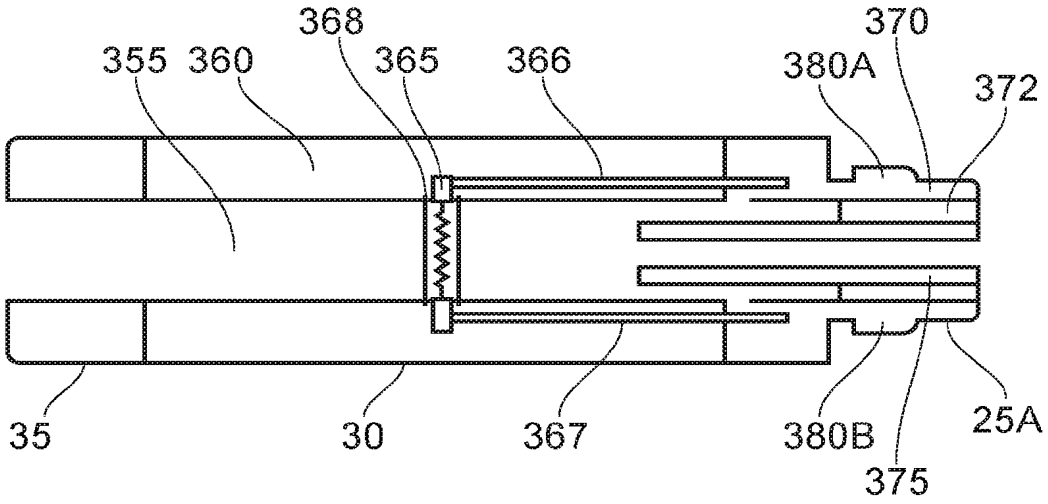


FIG. 3

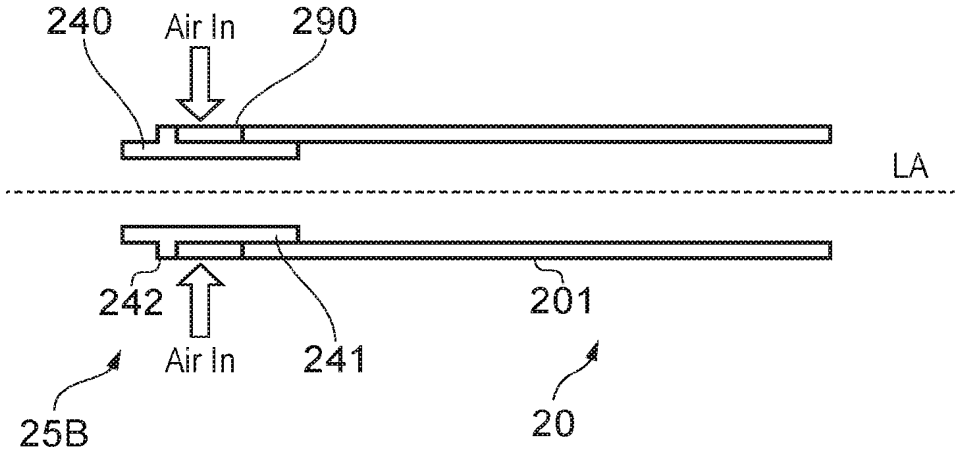


FIG. 4

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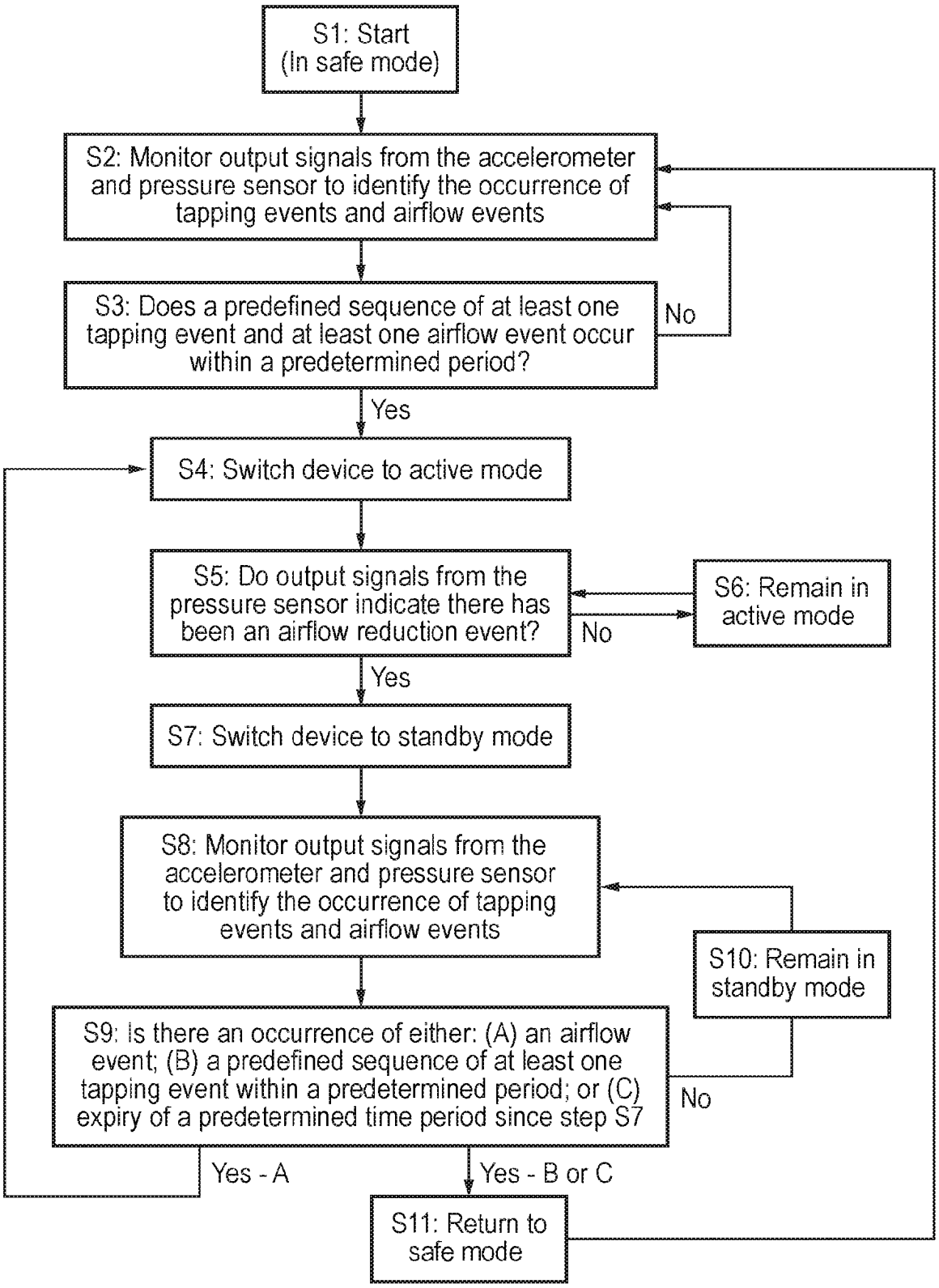


FIG. 5

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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2016/051729

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24F47/00 A61M15/06
ADD. A61M16/00

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 G05F A63B

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	US 2011/036346 A1 (COHEN SCOTT A [US] ET AL) 17 February 2011 (2011-02-17) paragraph [0002] - paragraph [0007] paragraph [0017] - paragraph [0054] figures 1, 9 -----	1-18, 20-22 1-18
X Y	CA 2 876 267 A1 (TREMBLAY MARTIN [CA]) 30 June 2015 (2015-06-30) page 1, line 11 - page 9, line 31 page 11, line 19 - page 15, line 2 page 22, line 5 - page 24, line 6 page 26, line 13 - page 27, line 26 page 41, line 16 - page 44, line 27 page 45, line 23 - page 52, line 19 figures 1-6, 11, 23, 26 -----	22 1-18,20, 21
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[X] Further documents are listed in the continuation of Box C.

[X] 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

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"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	Date of mailing of the international search report
9 August 2016	22/08/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Aguado, Miguel

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Form PCT/ISA/210 (second sheet) (April 2005)

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2012/117376 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; DIJK ESKO OLAVI [NL]; JANSSEN JOR) 7 September 2012 (2012-09-07) page 1, line 1 - page 6, line 15 page 6, line 30 - page 15, line 20 figures 1-10	1-18,20, 21
X	US 2014/060554 A1 (COLLETT WILLIAM ROBERT [US] ET AL) 6 March 2014 (2014-03-06)	22
Y	paragraph [0001] - paragraph [0003] paragraph [0008] - paragraph [0023] paragraph [0035] - paragraph [0066] paragraph [0079] - paragraph [0086]	1-18,20, 21
X	CN 204 335 831 U (HUIZHOU KIMREE TECHNOLOGY CO LTD) 20 May 2015 (2015-05-20)	22
A	paragraph [0001] - paragraph [0038] paragraph [0046] - paragraph [0119] figure 1	1-18,20, 21
X,P	WO 2015/138589 A1 (REYNOLDS TOBACCO CO R [US]) 17 September 2015 (2015-09-17) page 1, line 1 - page 6, line 25 page 8, line 7 - page 28, line 26 figures 1-7	1-5, 7-15,17, 18,20-22
X,P	WO 2015/192084 A1 (EVOLV LLC [US]) 17 December 2015 (2015-12-17) paragraph [0002] - paragraph [0008] paragraph [0026] - paragraph [0052] figures 1, 2	1,2,5, 7-10,13, 15,17, 18,20-22

1

NJOY Exhibit 1002.459

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2016/051729

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. [X] Claims Nos.: 19, 23
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.

NJOY Exhibit 1002.460

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 19, 23

Pursuant to Article 17(2)(a)(i) and (b) PCT, no search report has been established for claims 19 and 23, because these claims are directed to methods for treatment of the human or animal body by therapy in the sense of Rule 39.1(iv) PCT. This is because: - Claim 19 defines a method of operating an aerosol delivery device to control an operating mode, comprising the step of detecting a flow of air in the device. In the context of the application, however, said flow of air in the device can be caused by the user inhaling on the aerosol delivery device, whereby a therapeutic substance (e.g. nicotine, see page 1, lines 3-8 of the description) is delivered to the airways of a user (see page 12, lines 1-3; page 13, lines 14-16; compare with page 18, line 35 to page 19, line 3 of the description). Said method, therefore, encompasses methods of treatment of the human body by therapy. - Claim 23 defines a method of operating an aerosol delivery device "substantially as described herein with reference to the accompanying drawings". Irrespective of the lack of clarity caused by this general reference to the description and drawings, it is considered that the scope of claim 23 encompasses methods as defined in claim 19 and therefore encompasses methods for the treatment of the human body by therapy. The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been serached. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2016/051729

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		WO 2015192084 A1	17-12-2015

NJOY Exhibit 1002.462

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国 际 局

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(81) 指定国 (除另有指明，要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

(84) 指定国 (除另有指明，要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (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)。

[见续页]

(54) **Title**: BATTERY ROD FOR ELECTRONIC CIGARETTE

(54) **发明名称** : 电子烟的电池杆

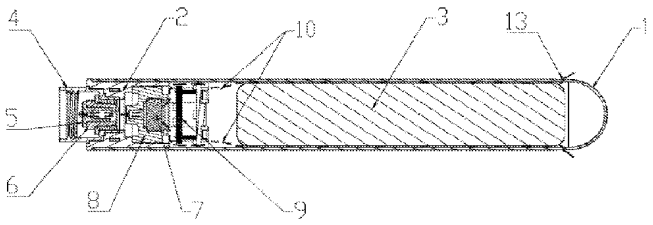


图 2

(57) **Abstract**: A battery rod for an electronic cigarette, comprising an outer tube with one closed end and one open end (1) and a connection sleeve tube (2). The outer tube (1) is provided with a battery (3) therein and air inlets (13) are disposed on the tube wall. The inner wall at the open end of the outer tube (1) is sleeve-connected to the outer wall of the connection sleeve tube (2). The connection sleeve tube (2) is sleeve-connected to an external electrode (4) at an inner wall of one side of the open end of the outer tube (1), and the inner wall of the other side is sleeved with an airflow switch (7), airflow switch seal (8) and program board (9). The external electrode (4) has a connection device having internally an internal electrode (5). An insulation sleeve (6) is provided between and separates the internal electrode (5) from the external electrode (4). The program board (9) is disposed between the electrode and the battery (3) on the battery rod to reduce the length and number of leads, and reduce circuit heating, short circuits or circuit breaks and other failures, facilitating wiring and assembly inside the battery rod and enhancing productivity. The light indicator (92) on the program board (9) can light up to indicate an operating status through a projection (23) on the connection sleeve tube (2) to facilitate observation and improve user experience, while the airflow switch seal (8) can prevent smoke from flowing backwards.

(57) **摘要**:

[见续页]

WO 2017/113845 A1

NJOY Exhibit 1002.463

根据细则 4.17 的声明:

— 发明人资格(细则 4.17(iv))

本国际公布:

— 包括国际检索报告(条约第 21 条(3))。

一种电子烟的电池杆，包括一端封闭一端开口的外管（1）和连接套管（2），外管（1）内部装有电池（3）及管壁上设有进气小孔（13），外管（1）开口端内壁套接连接套管（2）外壁，连接套管（2）在外管（1）开口端一侧的内壁套接有外电极（4），另一侧内壁套装有气流开关（7）、气流开关密封件（8）和方案板（9），外电极（4）设有连接装置及其内部设有内电极（5），内电极（5）和外电极（4）之间设有绝缘套（6）相隔。本发明的方案板（9）设置在电池杆的电池（3）与电极之间，减少了导电线的长度和数量，降低了电路发热、短路或断路等故障率，便于电池杆内的布线和装配而提高生产效率；方案板（9）上的发光指示灯（92）通过可导光的连接套管（2）上的凸肩（23）发出亮光指示工作状态，便于观察及获得更好的使用体验；气流开关密封件（8）可防止烟雾倒流。

NJOY Exhibit 1002.464

说明书

发明名称: 电子烟的电池杆

技术领域

[0001] 本发明涉及电子烟技术领域，更具体的说，本发明涉及一种电子烟的电池杆。

背景技术

[0002] 电子烟由于其烟液中不含有烟草中的烟焦油，避免了对人体产生危害，故电子烟获得了人们的青睐。目前市场上销售的可添加烟液的电子烟，一般包括电池杆、雾化杆和吸嘴，雾化杆一般包括雾化器，雾化器包括储液装置和雾化单元，雾化单元又包括导液绳和电热丝，而电池杆一般包括方案板即电路控制板、气流开关即气流传感器、电池等，电池可为雾化器中的电热丝提供电源，电热丝通电后可对导液绳中的电子烟烟液进行加热，烟液因而雾化，使电子烟产生烟雾。

[0003] 现有电子烟的电池杆，一般设有灯帽端和连接端，方案板一般设于电池杆设有灯帽的一端，电性连接用的导电线自电池引出到方案板，又从方案板引出返回经电池再到连接端的电极，路线较长，导电线较多而繁杂，不仅容易发热或因焊接不牢发生短路、断路等故障，且使得装配不方便而降低生产效率。现有电子烟的灯帽，安装在电子烟电池杆的前端部，吸烟者吸烟时不易观察到其发光状态。又现有电子烟的电池杆，因不具有防止烟雾从雾化杆倒流至电池杆内部的功能，容易使得烟雾中水汽在气流开关、方案板、电池上集结而造成腐蚀损坏导致电子烟故障。

技术问题

[0004] 本发明的目的在于克服上述现有技术的不足而提供一种电子烟的电子杆，该电池杆内方案板设置在电池杆的电池与电极之间，减小了导电线的长度，取消了电池杆上的灯帽，设计了气流开关密封件防止烟雾倒流。

问题的解决方案

技术解决方案

[0005] 本发明的技术方案是这样实现的，该电子烟的电池杆，包括一端封闭一端开口

的外管和连接套管，所述外管内部装有电池及管壁上设有进气小孔，所述外管开口端的内壁套接所述连接套管外壁，所述连接套管在外管开口端一侧的内壁套接有外电极，另一侧的内壁套装有气流开关、气流开关密封件和方案板，所述外电极设有连接装置及其内部设有内电极，所述内电极和外电极之间设有绝缘套相隔。

[0006] 优选地，所述气流开关密封件和方案板从里向外依次套装在所述连接套管内，所述气流开关套装在所述气流开关密封件内。

[0007] 优选地，所述连接套管的管壁在套装所述方案板的位置设有截面为矩形的缺口，所述方案板的边沿部分延伸设有凸伸部与所述缺口对应扣合，所述连接套管在有缺口一端的内壁上设有凸部以卡住方案板。

[0008] 优选地，所述连接套管在外电极一端径向设有一圈凸肩，所述凸肩外径等于外管外径或两者相差±2毫米以内。

[0009] 优选地，所述连接套管由可导光的塑胶材料制成，所述方案板上设有LED指示灯，所述LED 指示灯在电子烟用户吸烟时发出亮光并经所述连接套管管壁传导至所述凸肩使其发光。

[0010] 优选地，所述外电极包括连接端和固接端，所述连接端呈管状露出于所述连接套管，其外径小于所述连接套管外径，所述连接装置为所述连接端内壁上设有的内螺纹；所述固接端与所述连接套管一端内壁固定连接，其内径沿连接端延伸后突变缩小，所述内电极套设绝缘套后插设在所述固接端缩小的内壁上。

[0011] 优选地，所述外电极的固接端外壁设有一圈环槽，所述连接套管内壁设有与所述环槽可对应啮合的内凸肩，所述外电极固接端与所述连接套管以模内一体成型的方式相互啮合连接。

[0012] 优选地，所述外电极与所述绝缘套之间还设有金属套。

[0013] 优选地，所述气流开关密封件的外壁径向设有凸环、轴向设有通线凹槽，其一端内部设有容腔以恰好容纳所述气流开关，所述容腔的口部径向设有内凸环以卡住所述气流开关；所述气流开关密封件的另一端外圈设有凹环槽，中间设有凸起的空心圆台，所述圆台上表面设有中心小孔与圆台空心部及所述容腔相通。

[0014] 优选地，所述气流开关密封件由软性塑胶材料、硅胶或橡胶材料制成。

发明的有益效果

有益效果

[0015] 本发明将方案板设置在电池杆的电池与电极之间，减少了导电线的长度和数量，降低了电子烟电路发热、断路或断路等故障率，便于电池杆内的布线和装配而提高生产效率；使方案板上的发光指示灯无需从电池杆上设有的灯帽透光，而可通过可导光的连接套管上的凸肩发出亮光指示工作状态，便于电子烟用户在吸烟时观察到电子烟的工作状态，同时也获得更好的使用体验；气流开关密封件的设计，可防止烟雾倒流至气流开关、方案板及电池而发生腐蚀损害。

对附图的简要说明

附图说明

[0016] 图1 为本发明电子烟的电池杆结构分解图；

[0017] 图2 为本发明电子烟的电池杆结构剖视图；

[0018] 图3 为本发明的内电极立体视图；

[0019] 图4 为本发明的外电极立体视图；

[0020] 图5 为本发明的连接套管及内外电极的结构剖视图；

[0021] 图6 为本发明的连接套管及内外电极的立体局部剖视图；

[0022] 图7 为本发明的连接套管及其内部部件结构分解图；

[0023] 图8 为本发明的连接套管及其内部部件结构局部分解图；

[0024] 图9 为本发明的方案板及气流开关的立体结构图；

[0025] 图10 为本发明的方案板及气流开关的侧视图；

[0026] 图11 为本发明的气流开关密封件的剖视图；

[0027] 图12 为本发明的气流开关密封件的立体局部剖视图；

[0028] 图13 为本发明的连接套管及其内部部件剖视图。

[0029] 其中，主要组件符号说明：

[0030] 1 外管；11 开口端；12 封闭端；13 进气小孔；2 连接套管；21 缺口；22 凸部；23 凸肩；3 电池；4 外电极；41 连接端；42 固接端；43 内螺纹；44 外电极通孔；45 环槽；46 金属套；5 内电极；51 内电极通孔；6 绝缘套；7 气流开关；8

气流开关密封件；81 凸环；82 通线凹槽；83 容腔；84 内凸环；85 凹环槽；86 圆台；87 中心小孔；88 空腔；9 方案板；91 凸伸部；92 LED 指示灯；10 气流通道。

实施该发明的最佳实施例

本发明的最佳实施方式

[0031] 下面将结合附图对本发明进行详细说明。

[0032] 如图1～3所示，本发明实施例的电子烟的电池杆，由一端封闭一端开口的外管1、连接套管2、外电极4连接而成，外管1的管壁上设有进气小孔13以便电子烟用户吸烟时检测吸烟动作的空气进入外管1的管内。外管1的内部装有电池3，该电池3自开口端11装入。连接套管2一端的头部设有径向凸起的一圈环状的凸肩23，凸肩23的外径等于外管1 的外径。外管1 的开口端11内壁套接连接套管2的外壁，即连接套管2套装入外管1的开口端11而止位于凸肩23，连接套管2装入外管1后，凸肩23与外管1外径相等，故两者外周表面平齐而成为一体（作为其他实施方式，凸肩23与外管1两者的外径也可相差±2毫米以内，相差太大则影响美观及有碍手感）。连接套管2朝外管开口端11一侧的内壁套接有外电极4、连接套管2的另一侧即朝外管封闭端12一侧的内壁套装有气流开关7、气流开关密封件8和方案板9，外电极4内设有连接装置即内螺纹41和内电极5，内电极5和外电极4之间设有绝缘套6。气流开关7也称气流传感器，具有检测空气流动信号的功能，即能检测出电子烟用户吸烟时空气被吸入并流经气流开关7的信号，实际上检测的是电子烟用户嘴部吸烟的动作；方案板9为一电路控制板，通过导电线（图中未示）分别与电池3、外电极4、内电极5、气流开关7进行电性连接，其上设有控制电路、LED和芯片及其它电子元件（图中未示），具有信号判断、电源控制、电路保护等功能；外电极 4、内电极5 分别与方案板9 的电路进行电性连接。当本发明电子烟的电池杆与电子烟的雾化杆（图中未示）连接时，外电极4、内电极5还可分别与雾化杆的外电极、内电极连接，将电池3提供的电源传送给雾化杆中的雾化单元。当电池电量用完时，本发明电子烟的电池杆还可与充电器相连接，即外电极4、内电极5可分别与充电器的正负电极相连接，充电器提供的电源可为电池进行充电。外电极4可连接电池3的正极或负极，同时内电极5

连接电池3的负极或正极。

[0033] 如上所述，本发明实施例的电子烟的电池杆，将方案板9的位置自通常在原外管封闭端灯帽内的设计改在了内外电极4、5与电池3之间，这样可使电池3与方案板9、方案板9与内外电极4、5之间连接的导电线长度缩短、数量减少、布线简化，可降低导电线线路复杂易引起的短路或断路或发热等故障、提高工作的可靠性，同时方便生产中的装配及提高生产效率。

[0034] 如图3～图7所示，本实施例中，外电极4既作为电极显然是由可导电的金属材料制造，也作为连接件设有连接装置，通常地，外电极4设有的连接装置属于可拆卸连接装置，具体可以为螺纹连接、卡扣连接、插拔式连接、磁性连接等方式，其中螺纹连接也包括内螺纹连接及外螺纹连接。本实施例中，外电极4包括连接端41和固接端42。连接端41呈管状露出于连接套管2（即朝外管开口端11）一端，其外径小于连接套管2的外径，其内壁设有内螺纹43作为连接装置与电子烟的雾化杆外螺纹（图中未示）连接组成一支完整的电子烟；连接端41的管壁上，径向设有至少一个外电极通孔44,该外电极通孔44用于电子烟用户吸烟时，作为给雾化杆的雾化室提供空气的入口。固接端42与连接套管2的一端内壁固定连接，其内径沿连接端41延伸后呈阶梯状缩小。内电极5呈T 字形，其套设绝缘套6后插接在固接端42缩小的内壁上，其轴向设有内电极通孔51作为气流通道的一部分。

[0035] 如图4所示，本实施例中，外电极4的固接端42的外壁设有一圈环槽45，连接套管2的内壁设有与环槽45可对应啮合的内凸肩（图中未示），即外电极固接端42与连接套管2内壁的固定连接，采用模内一体成型的方式相互啮合连接，即在连接套管注塑时将外电极4的固接端42放入模内一起注塑、一体成型，故该连接方式非常牢固，不会发生松脱现象。

[0036] 如图5～8 所示，本实施例中，外电极4与绝缘套6之间还设有金属套46。

[0037] 该金属套46用于焊接其与方案板9之间的导电线，然后再与外电极4进行接触式连接，避免导电线直接在外电极上焊接产生的高温导致烧焦一体成型的连接套管或导致其变形。另外，先在金属套46上焊接导电线，再将金属套46装配于外电极4内，也方便了生产中的装配和提高生产效率。

[0038] 如图7～12 所示，本发明实施例的该电子烟的电池杆，气流开关密封件8和方案板9从里向外依次套装在连接套管2的内壁，气流开关7套装在气流开关密封件8内。本发明电子烟的电池杆，其外壁上不设接通雾化单元电源所需的手动吸烟开关，而是设置气流开关7 取代。当电子烟用户吸烟时，因吸气使电子烟吸嘴中产生负压，电池杆中因而发生空气流动，气流开关7即可检测到是否有空气流过，从而可以自动发出吸烟开关的信号并接通雾化单元的电源。连接套管2的管壁在套装方案板9的位置设有截面为矩形的缺口21，该缺口21 的数量可为1个或1个以上。方案板9的边沿部分延伸设有对应的凸伸部91与缺口21对应扣合，即凸伸部91与缺口21的位置及数量均相对应，且凸伸部91的宽度与缺口21的宽度相同，凸伸部91可以扣合在缺口21中，这样即可防止方案板9在在连接套管2周向的转动，也便于方案板9在连接套管2上的安装；连接套管2在缺口21一端的端部内壁上设有凸部22以卡住方案板9，防止方案板9在轴向上向连接套管2 外移动。

[0039] 如图9～13所示，为具备更好的密封性能，气流开关密封件8由软性塑胶材料、硅胶或橡胶材料制成，其外壁径向设有多道凸环81用以增强其与连接套管内壁之间的密封性、轴向设有通线凹槽82用以让方案板9至内外电极的导电线通过。气流开关密封件8的一端内部设有容腔83以恰好容纳气流开关7，容腔83口部径向设有内凸环84以卡住气流开关7防止其脱落；气流开关密封件8的另一端外圈设有凹环槽85，中间设有凸起的空心的圆台86，圆台86的上表面设有中心小孔87与圆台86的空心部及容腔83相通。

[0040] 如图11～13所示，气流开关密封件8设有圆台86的一端套装入连接套管2的内部后，内电极5和绝缘套6的底部、连接套管2内壁及凹环槽85之间形成了一个空腔88，当电子烟用户吸烟时，其产生的烟雾即有可能在雾化杆中倒流，传导至电池杆的连接端41，经内电极5的内电极通孔51倒流入空腔88，倒流进来的烟雾在空腔88中可以得到缓冲，其中含有的水汽可以在圆台86的外壁上回旋和凝结，避免烟雾携带水汽直接冲入气流开关7、方案板8、电池3，时间长了就容易给气流开关7、方案板8、电池3上设有的电路和电子元件等造成腐蚀损坏。

[0041] 如图2、图13所示，本发明实施例的电子烟的电池杆，其连接套管2由可导光的塑胶材料制成，方案板9上设有LED指示灯92，LED 指示灯92在电子烟用户吸烟

时发出亮光并经连接套管2的管壁传导至凸肩23使其发光，图13 示出了凸肩23的发光示意。本发明实施例的该电子烟的电池杆，由于方案板9 的位置是在电子烟的中间部位，故取消了在电池杆外管前端部设置的灯帽，将灯帽的发光指示功能转移到电子烟侧面的连接套管2的凸肩23上，这样有利于吸烟者自己观察到电子烟的发光工作状态，且这种侧面传导出的亮光经衰减而不会刺眼，给人以温和高雅的视觉享受，使电子烟用户获得更好的使用体验。

[0042] 如上所述，连接套管2由可导光的塑胶材料制成、LED指示灯92的光线从凸肩23发出时，则连接套管2的缺口21的另外一个作用在于：便于LED指示灯92布置在方案板9的凸伸部91上，使其发出的亮光光线可以轴向直射至连接套管2的管壁位于缺口21处的径向截面上，有利于更多的光线通过连接套管2的管壁轴向传导至凸肩23。

[0043] 如图2所示，本实施例的电子烟的电池杆，与电子烟的雾化杆连接成电子烟后，其工作原理是这样的：电子烟用户口部吸烟时，吸嘴及雾化杆中产生的负压传导至电池杆内，外界空气经进气小孔13被吸入，然后流经电池3与外管1内壁之间的缝隙、连接套管2的缺口21、气流开关7、气流开关密封件8的中心小孔87、内电极通孔51，这样就形成了空气流通的气流通道10，气流通道10如图2中箭头所示，箭头方向为空气流动方向。当空气流经气流开关7时，气流开关7 即可检测到电子烟用户的吸气动作并产生电信号传送给方案板9，方案板9判断后发出控制信号使雾化杆中的雾化单元或电热丝接通电池的电源，电热丝或雾化单元发热后加热电子烟烟液进行雾化从而产生烟雾，同时，方案板9上的LED指示灯92发出亮光并传导至连接套管2的内壁，内壁再传导至凸肩23，凸肩23即可发出一圈亮光指示电子烟工作状态。

工业实用性

[0044] 以上所描述的仅为本发明的较佳实施例，上述具体实施例不是对本发明的限制。在本发明的技术思想范畴内，可以出现各种变形及修改，凡本领域的普通技术人员根据以上描述所做的润饰、修改或等同替换，均属于本发明所保护的范围。

权利要求书

[权利要求 1] 一种电子烟的电池杆，其特征在于：包括一端封闭一端开口的外管和连接套管，所述外管内部装有电池及管壁上设有进气小孔，所述外管开口端的内壁套接所述连接套管外壁，所述连接套管在外管开口端一侧的内壁套接有外电极，另一侧的内壁套装有气流开关、气流开关密封件和方案板，所述外电极设有连接装置及其内部设有内电极，所述内电极和外电极之间设有绝缘套相隔。

[权利要求 2] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述气流开关密封件和方案板从里向外依次套装在所述连接套管内，所述气流开关套装在所述气流开关密封件内。

[权利要求 3] 根据权利要求2所述的电子烟的电池杆，其特征在于：所述连接套管的管壁在套装所述方案板的位置设有截面为矩形的缺口，所述方案板的边沿部分延伸设有凸伸部与所述缺口对应扣合，所述连接套管在有缺口一端的内壁上设有凸部以卡住方案板。

[权利要求 4] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述连接套管在外电极一端径向设有一圈凸肩，所述凸肩外径等于外管外径或两者相差±2毫米以内。

[权利要求 5] 根据权利要求4所述的电子烟的电池杆，其特征在于：所述连接套管由可导光的塑胶材料制成，所述方案板上设有LED指示灯，所述LED指示灯在电子烟用户吸烟时发出亮光并经所述连接套管管壁传导至所述凸肩使其发光。

[权利要求 6] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述外电极包括连接端和固接端，所述连接端呈管状露出于所述连接套管，其外径小于所述连接套管外径，所述连接装置为所述连接端内壁上设有的内螺纹；所述固接端与所述连接套管一端内壁固定连接，其内径沿连接端延伸后突变缩小，所述内电极套设绝缘套后插设在所述固接端缩小的内壁上。

[权利要求 7] 根据权利要求6所述的电子烟的电池杆，其特征在于：所述外电极的

固接端外壁设有一圈环槽，所述连接套管内壁设有与所述环槽可对应啮合的内凸肩，所述外电极固接端与所述连接套管以模内一体成型的方式相互啮合连接。

[权利要求 8] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述外电极与所述绝缘套之间还设有金属套。

[权利要求 9] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述气流开关密封件的外壁径向设有凸环、轴向设有通线凹槽，其一端内部设有容腔以恰好容纳所述气流开关，所述容腔的口部径向设有内凸环以卡住所述气流开关；所述气流开关密封件的另一端外圈设有凹环槽，中间设有凸起的空心圆台，所述圆台上表面设有中心小孔与圆台空心部及所述容腔相通。

[权利要求 10] 根据权利要求1所述的电子烟的电池杆，其特征在于：所述气流开关密封件由软性塑胶材料、硅胶或橡胶材料制成。

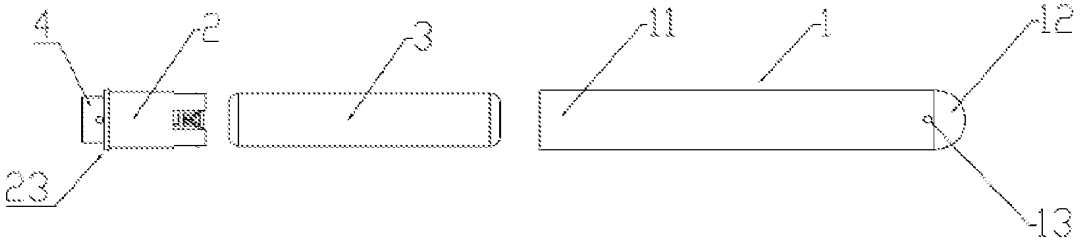


图 1

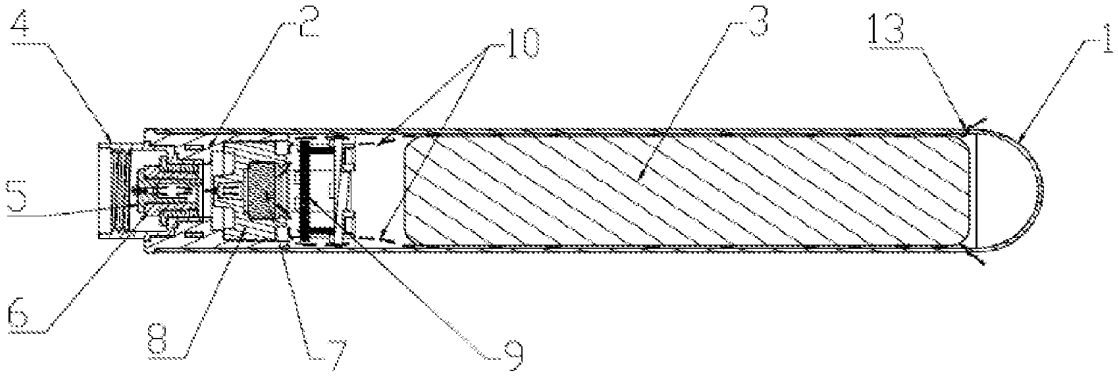


图 2

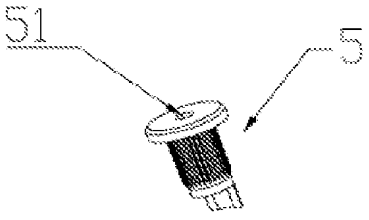


图 3

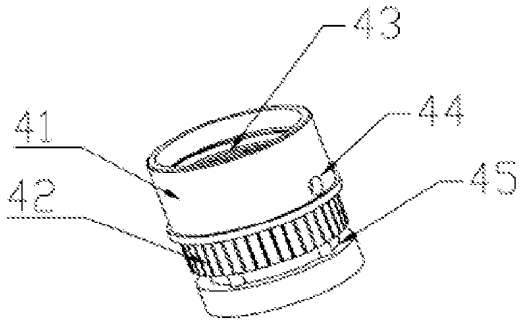


图 4

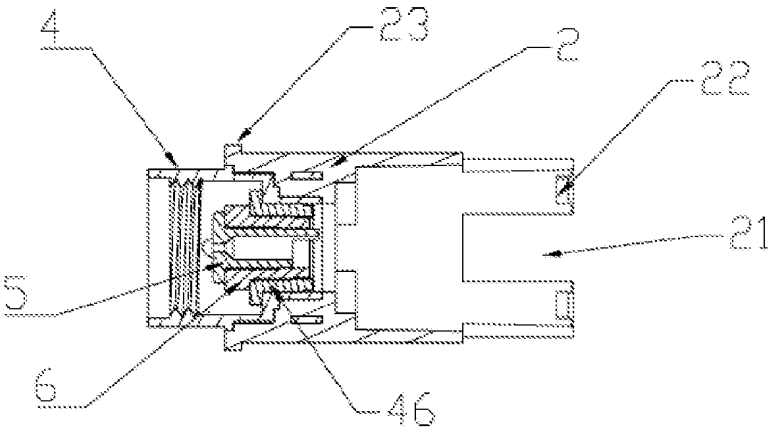


图 5

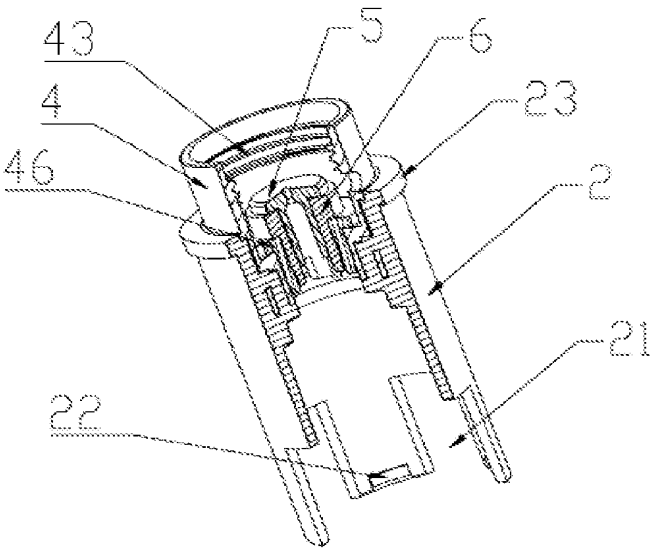


图 6

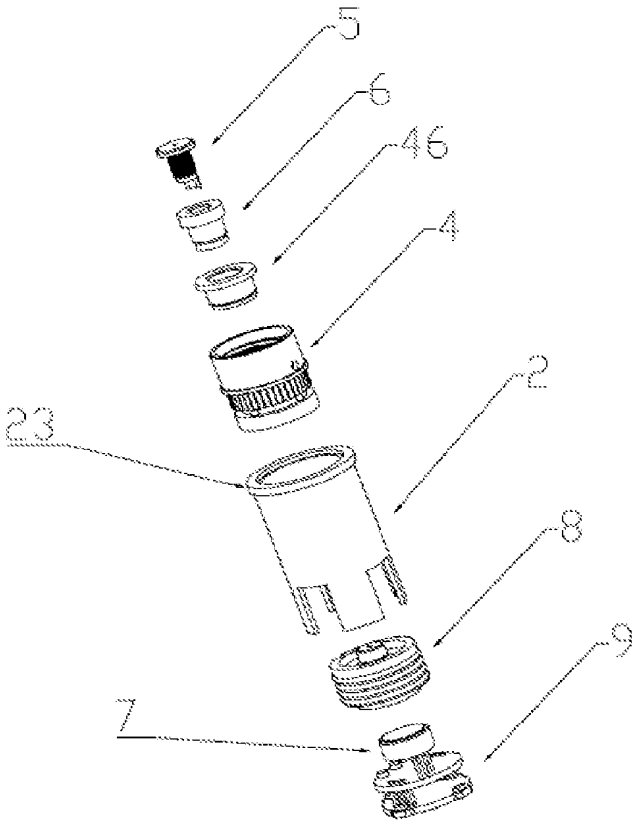


图 7

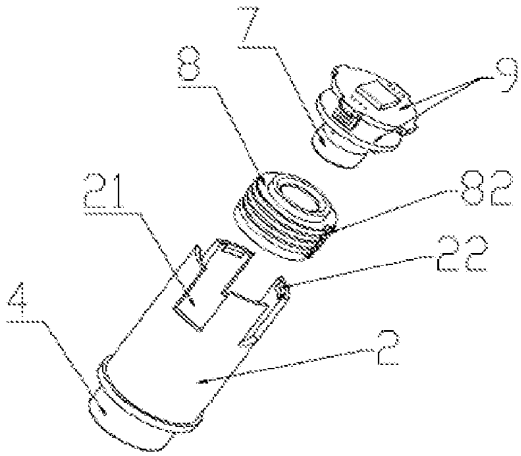


图 8

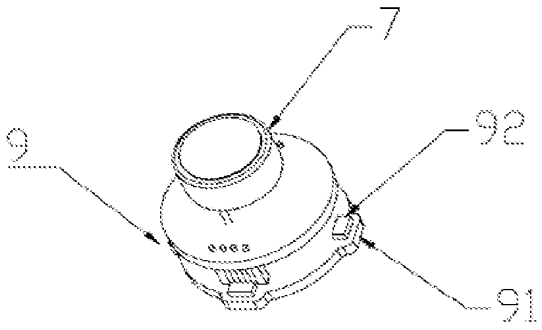


图 9

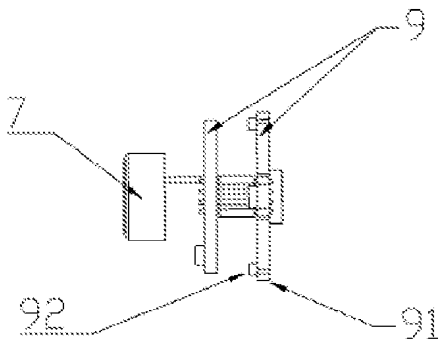


图 10

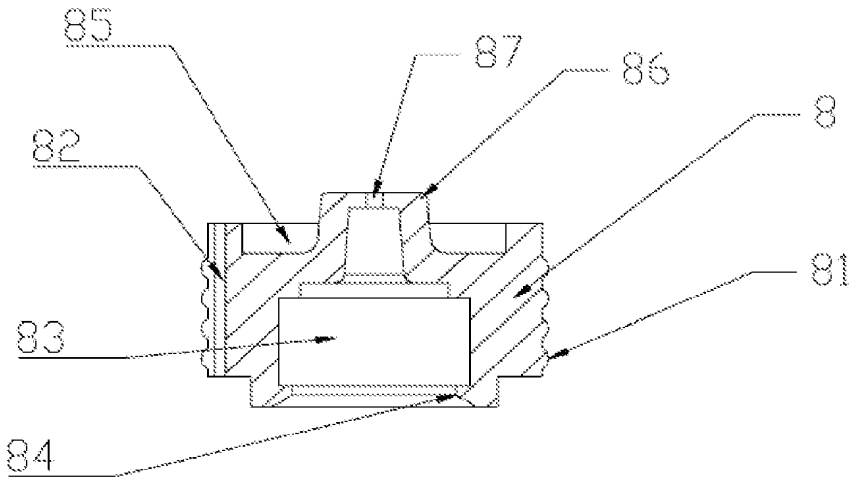


图 11

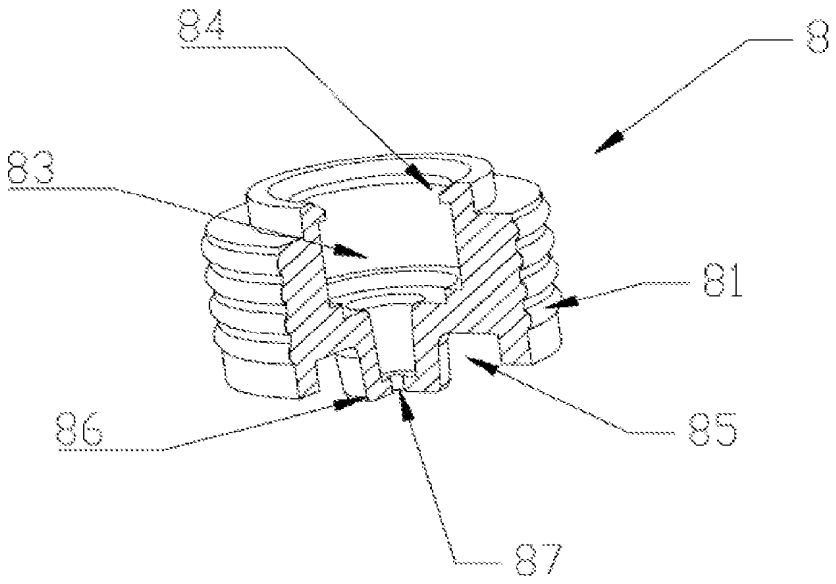


图 12

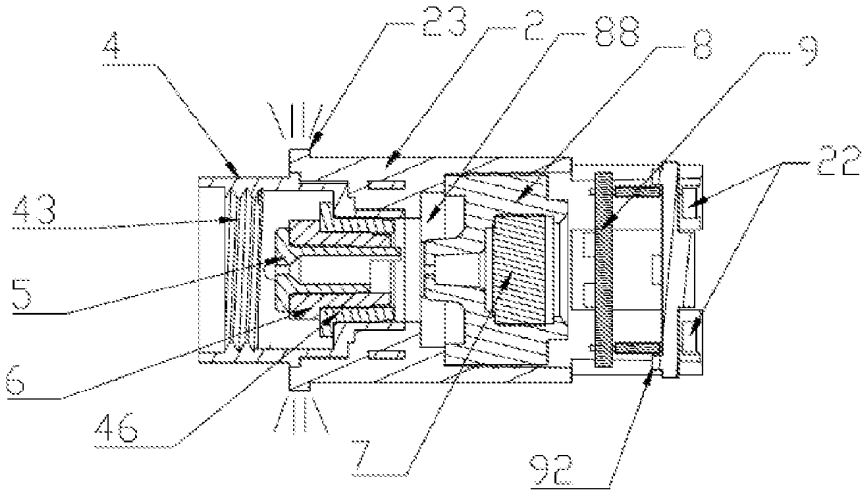


图 13

NJOY Exhibit 1002.478

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/097436

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00 (2006.01) i

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)

CNTXT, CNABS, VEN: plan board, circuit board, control board, PCB, printed circuit board

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105455198 A (LIN, Guangrong), 06 April 2016 (06.04.2016), claims 1-10	1-10
PX	CN 205337611 U (LIN, Guangrong), 29 June 2016 (29.06.2016), claims 1-10	1-10
X	CN 203388267 U (LIU, Qiuming), 15 January 2014 (15.01.2014), description, pages 4-7, and figures 3-8	1-10
X	CN 203676127 U (SHENZHEN RELAXO TECHNOLOGY CO., LTD.), 02 July 2014 (02.07.2014), description, pages 1-2, and figures 1-2	1-10
A	US 2015077981 A1 (CORMACK CAMERON LANNING), 19 March 2015 (19.03.2015), the whole document	1-10
A	US 2015296883 A1 (WU, C.M. et al.), 22 October 2015 (22.10.2015), the whole document	1-10

☐ 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	Date of mailing of the international search report
18 November 2016 (18.11.2016)	**05 December 2016 (05.12.2016)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **HE, Wenjing** Telephone No.: (86-10) **62085686**

Form PCT/ISA/210 (second sheet) (July 2009)

NJOY Exhibit 1002.479

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/097436

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 105455198 A	06 April 2016	None	
CN 205337611 U	29 June 2016	None	
CN 203388267 U	15 January 2014	None	
CN 203676127 U	02 July 2014	None	
US 2015077981 A1	19 March 2015	None	
US 2015296883 A1	22 October 2015	WO 2014101100 A1	03 July 2014

NJOY Exhibit 1002.480

国际检索报告

国际申请号
PCT/CN2016/097436

A. 主题的分类

A24F 47/00(2006.01)i

按照国际专利分类(IPC)或者同时按照国家分类和IPC两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

A24F

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNTXT, CNABS, VEN: 方案板, 电路板, 控制板, PCB, printed circuit board

C. 相关文件

类 型*	引用文件，必要时，指明相关段落	相关的权利要求
PX	CN 105455198 A (林光榕) 2016年 4月 6日 (2016-04-06) 权利要求1-10	1-10
PX	CN 205337611 U (林光榕) 2016年 6月 29日 (2016-06-29) 权利要求1-10	1-10
X	CN 203388267 U (刘秋明) 2014年 1月 15日 (2014-01-15) 说明书第4-7页以及附图3-8	1-10
X	CN 203676127 U (深圳市瑞莱克斯科技有限公司) 2014年 7月 2日 (2014-07-02) 说明书第1-2页以及附图1-2	1-10
A	US 2015077981 A1 (CORMACK CAMERON LANNING) 2015年 3月 19日 (2015-03-19) 全文	1-10
A	US 2015296883 A1 (WU CHANGMING等) 2015年 10月 22日 (2015-10-22) 全文	1-10

☐ 其余文件在C栏的续页中列出。

☑ 见同族专利附件。

* 引用文件的具体类型：

“A” 认为不特别相关的表示了现有技术一般状态的文件

“E” 在国际申请日的当天或之后公布的在先申请或专利

“L” 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

“O” 涉及口头公开、使用、展览或其他方式公开的文件

“P” 公布日先于国际申请日但迟于所要求的优先权日的文件

“T” 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

“X” 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

“Y” 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

“&” 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
2016年 11月 18日	2016年 12月 5日
ISA/CN的名称和邮寄地址 中华人民共和国国家知识产权局(ISA/CN) 中国北京市海淀区蓟门桥西土城路6号 100088 传真号 (86-10)62019451	受权官员 贺文晶 电话号码 (86-10)62085686

表 PCT/ISA/210 (第2页) (2009年7月)

NJOY Exhibit 1002.481

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2016/097436

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	105455198	A	2016年 4月 6日		无		
CN	205337611	U	2016年 6月 29日		无		
CN	203388267	U	2014年 1月 15日		无		
CN	203676127	U	2014年 7月 2日		无		
US	2015077981	A1	2015年 3月 19日		无		
US	2015296883	A1	2015年 10月 22日	WO	2014101100	A1	2014年 7月 3日

NJOY Exhibit 1002.482

(12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织
国 际 局

(43) 国际公布日
2017 年 8 月 31 日 (31.08.2017)

WIPO | PCT

(10) 国际公布号
WO 2017/143865 A1

(51) 国际专利分类号:
A24F 47/00 (2006.01)

(21) 国际申请号: PCT/CN2016/113446

(22) 国际申请日: 2016 年 12 月 30 日 (30.12.2016)

(25) 申请语言: 中文

(26) 公布语言: 中文

(30) 优先权:
201610109408.1 2016 年 2 月 27 日 (27.02.2016) CN

(71) 申请人: **常州聚为智能科技有限公司 (CHANGZHOU JWEI INTELLIGENT TECHNOLOGY CO., LTD.)** [CN/CN]; 中国江苏省常州市新北区薛家凤翔路 7 号 401 室, Jiangsu 213125 (CN)。 **卓尔悦欧洲控股有限公司 (JOYETECH EUROPE HOLDING GMBH)** [CH/CH]; 瑞士楚格市古依森上将大街 6 号, Zug 6303 (CH)。

(72) 发明人: **邱伟华 (QIU, Weihua)**; 中国江苏省常州市新北区凤翔路 7 号, Jiangsu 213125 (CN)。

(74) 代理人: **北京同立钧成知识产权代理有限公司 (LEADER PATENT & TRADEMARK FIRM)**; 中国北京市海淀区西直门北大街 32 号枫蓝国际 A 座 8F-6, Beijing 100082 (CN)。

(81) 指定国 (除另有指明，要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

(84) 指定国 (除另有指明，要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (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)。

(54) **Title**: CIGARETTE CARTRIDGE AND ELECTRONIC CIGARETTE USING SAME

(54) **发明名称** : 烟弹及应用其的电子烟

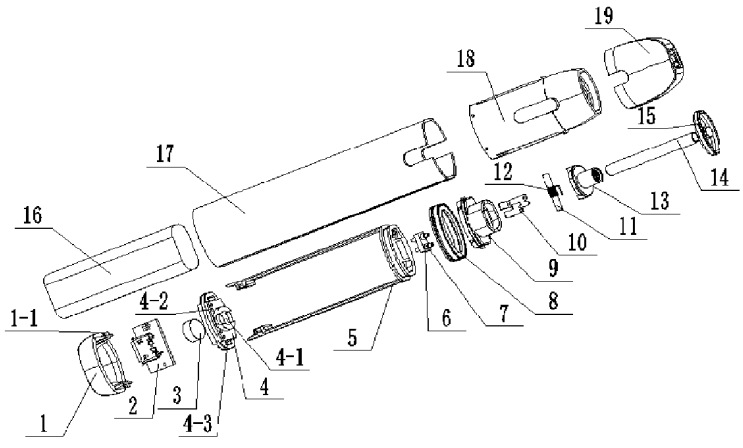


图 5

(57) **Abstract**: Provided are a cigarette cartridge (21) and an electronic cigarette (100) using same; said cigarette cartridge (21) comprises a liquid-storage assembly and a vaporization assembly; the vaporization assembly is disposed in the liquid-storage assembly; the liquid-storage assembly comprises a top cover (19) having a smoke outlet hole (19-2), and an outer housing (18); the vaporization assembly comprises a heat-generating device (111) a vaporization base (9), and a ventilation pipe (14); the heat-generating device (111) is disposed on the vaporization base (9); the vaporization base (9) is sealingly arranged on one end of the outer housing (18), and the top cover (19) is arranged on the other end of the outer housing (18) opposite to the vaporization base (9); the ventilation pipe (14) is in communication with the heat-generating device (111) and the smoke outlet hole (19-2); the space between the ventilation pipe (14), the outer housing (18), the vaporizatin base (9), and the top cover (19) is a liquid-storage chamber (18-5). The liquid-storage assembly and vaporization assembly of the cigarette cartridge (21) are assembled separately, then assembled together to form the complete cigarette cartridge (21).

(57) **摘要**:

[见续页]

WO 2017/143865 A1

NJOY Exhibit 1002.483

本国际公布:

— 包括国际检索报告(条约第 21 条(3))。

一种烟弹（21）以及应用其的电子烟（100），其中烟弹（21）包括储液组件和雾化组件，雾化组件置于储液组件之中，储液组件包括带有出烟孔（19-2）的顶盖（19）以及外壳（18），雾化组件包括发热装置（111）、雾化底座（9）以及通气管（14），发热装置（111）置于雾化底座（9）之上，雾化底座（9）密封设置在外壳（18）的一端，顶盖（19）设置在外壳（18）上相对雾化底座（9）的另一端，通气管（14）连通发热装置（111）和出烟孔（19-2），通气管（14）、外壳（18）、雾化底座（9）以及顶盖（19）之间的空间为储液腔（18-5）。烟弹（21）的储液组件和雾化组件分开装配，然后再组装到一起形成完整的烟弹（21）。

NJOY Exhibit 1002.484

烟弹及应用其的电子烟

技术领域

本发明涉及电子烟技术领域，具体涉及一种烟弹及应用其的电子烟。

背景技术

目前，电子烟已经成为市场上一种比较成熟的吸烟替代品，电子烟从大小方面可以分为两类，一类是小烟，另一类是大烟。其中，小烟通常是指一次性烟和可充电小烟。一次性烟按字面意思是只能使用一次的烟，不同厂家一般按最大可抽吸口数进行设置，有 300 口、500 口、800 口等等。

目前一次性烟的烟弹大多不可替换，而产品的质量参差不齐，有些一次性烟即使装配完成，也可能会因烟弹的问题，而使得用户无法进行抽吸，限于装配方式，该烟弹又无法更换，导致用户使用体验度不高。另外一方面，现有技术的一次性烟的烟弹装配比较复杂，尤其是烟液注入的步骤比较繁琐，生产效率低。

发明内容

鉴于以上所述，为了非常适合市场的需求，本发明提供一种改进的烟弹以及应用其的电子烟。

本发明采用的技术方案为： 一种烟弹，该烟弹包括储液组件和雾化组件，其中，所述雾化组件置于所述储液组件之中，所述储液组件包括带有出烟孔的顶盖以及外壳，所述雾化组件包括发热装置、雾化底座以及通气管，所述发热装置置于所述雾化底座之上，所述雾化底座密封设置在所述外壳的一端，所述顶盖设置在所述外壳上相对所述雾化底座的另一端，所述通气管连通所述发热装置和出烟孔，所述通气管、外壳、雾化底座以及顶盖之间的空间为储液腔。

进一步的，所述雾化组件还包括雾化上盖，所述发热装置固定在所述雾化上盖和所述雾化底座之间，所述雾化上盖设有通孔，所述通气管的一端穿过所述通孔与所述发热装置连通。

NJOY Exhibit 1002.485

进一步的，所述顶盖与外壳之间还设置有密封盖，所述通气管的另一端穿过所述密封盖与所述出烟孔连通。

进一步的，所述外壳的内壁还设置有卡持部，所述通气管通过所述卡持部进行定位。

进一步的，所述发热装置包括吸液件以及配合设置的发热件，所述雾化组件还包括一对电极接触片，所述发热件的正、负极连接至对应的所述电极接触片，所述电极接触片固定在所述雾化底座上。

进一步的，所述电极接触片的一端设置有电极卡槽，所述发热件的正、负极卡入对应的所述电极卡槽，所述电极接触片的另一端穿过设置在所述雾化底座上的通槽，并被折弯而使得所述电极接触片被固定在所述雾化底座上。

进一步的，所述外壳的下端周侧设置有卡接槽/卡扣，对应所述雾化底座的周侧设置有卡扣/卡接槽，所述卡扣与所述卡接槽扣接使得所述雾化底座固定在所述外壳的下端。

本发明还提供一种电子烟，包括前述任一项的烟弹及与所述烟弹连接的电池组件，所述烟弹的外壳的外侧壁设置有接合部，所述接合部用于将所述烟弹与所述电池组件连接。

进一步地，所述电池组件包括电池外壳、电池支架以及电池本体，所述电池支架夹持所述电池本体并置于所述电池外壳之中，所述电池外壳的内侧壁设置有连接部，所述接合部与所述连接部相互配合使得所述烟弹与所述电池组件固定连接。

进一步地，所述电池支架的上端设置有电池正负极接触件，所述电池正负极接触件用于与所述发热装置的正、负极对应连接，所述电池支架的上端与所述电池外壳之间还设置有密封圈。

相较于现有技术，本发明所述的烟弹通过将雾化组件和储液组件独立装配，二者之间装配变得更加简单，从而简化了装配步骤，提高了烟弹的生产效率。

本发明的优选实施方案及其有益效果，将结合具体实施方式进一步详细说明。

NJOY Exhibit 1002.486

附图说明

附图是用来提供对本发明的进一步理解，并构成说明书的一部分，与下面的具体实施方式一起用于解释本发明，但不应构成对本发明的限制。在附图中，

图 1：本发明的电子烟的主视图。

图 2：图 1 所示的电子烟的侧视图。

图 3：根据图 2 所示的电子烟沿 A-A 剖视图。

图 4：本发明的电子烟的烟弹与电池组件分解图。

图 5：图 1 所示的电子烟的爆炸图。

图 6：根据图 5 所示的电子烟的截面图。

图 7：根据图 6 所示的 B 处局部放大图。

图 8：本发明的雾化底座的截面图。

图 9：本发明的外壳的截面图。

各部件名称及其标号

电池盖：1	电池支架固定槽：5-4	吸液件：11	接合部：18-2
电池盖卡扣：1-1	电池支架密封圈安装槽：5-5	发热件：12	顶盖限位扣：18-3
控制板：2	电池正负极接触件：6	雾化上盖：13	卡持部：18-4
气压感应器：3	探针：7	通孔：13-1	储液腔：18-5
气压感应器支架：4	密封圈：8	通气管：14	顶盖：19
气压感应器安装孔：4-1	密封圈卡槽：8-1	密封盖：15	顶盖限位槽：19-1
导线安装孔：4-2	雾化底座：9	电池本体：16	出烟孔：19-2

NJOY Exhibit 1002.487

安装槽：4-3	卡扣/卡接槽：9-1	电池外壳：17	电池组件：20
电池支架：5	雾化底座通气孔：9-2	连接部：17-1	烟弹：21
气压感应器支架安装槽：5-1	通槽：9-3	电池支架限位凸台：17-2	发热装置：111
电池支架卡槽：5-2	电极接触片：10	外壳：18	电子烟：100
电池支架通气孔：5-3	电极卡槽：10-1	卡接槽/卡扣：18-1	

具体实施方式

以下结合附图对本发明的具体实施方式进行详细说明。应当理解的是，此处所描述的具体实施方式仅用于说明和解释本发明，并不用于限制本发明。

请参阅图 1-图 6，本发明的一个较佳实施例提供一种烟弹 21，该烟弹 21 包括储液组件和雾化组件，而雾化组件置于储液组件之中，储液组件包括带有出烟孔 19-2 的顶盖 19 以及带有储液腔 18-5 的外壳 18，该雾化组件包括发热装置 111、雾化底座 9 以及通气管 14，发热装置 111 置于雾化底座 9 之上，雾化底座 9 密封设置在外壳 18 的一端，而顶盖 19 则设置在外壳 18 上相对雾化底座 9 所在的另一端，出烟孔 19-2 开设在顶盖 19 相对外壳 18 的另一端，通气管 14 连通发热装置 111 和出烟孔 19-2，通气管 14、外壳 18、雾化底座 9 以及顶盖 19 之间的空间则为储液腔 18-5。本实施例当中，发热装置 111 用于从储液腔 18-5 当中吸取并加热烟液，使烟液雾化，形成的烟雾通过通气管 14 以及出烟孔 19-2 而被用户所吸食。发热装置 111 可以包括吸液件 11 以及配合设置的发热件 12，本实施例当中，吸液件 11 可以是棉花、玻纤、棉布、泡沫金属、多孔陶瓷、泡沫石墨当中的一种或

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者多种，发热件 12 则可以是发热丝、发热片、发热膜、发热盘、发热管或者发热块等等，在此不做限定。雾化组件还包括一对电极接触片 10，发热件 12 的正、负极连接至对应的电极接触片 10，从而使得当烟弹 21 与电池组件 20 相接时，电池组件 20 可以通过电极接触片 10 为发热件 12 提供电源输出。电极接触片 10 固定在雾化底座 9 之上，具体的，本实施例之中，电极接触片 10 的一端设置有电极卡槽 10-1，发热件 12 的正极或者负极卡入相应的电极卡槽 10-1 中，而两个电极接触片 10 之间是相互电性绝缘的，此外，参见图 8，通过在雾化底座 9 上开设相应的通槽 9-3，将电极接触片 10 的另一端穿过该通槽 9-3，然后再折弯该电极接触片 10 的另一端即可将电极接触片 10 固定在雾化底座 9 之上。雾化底座 9 的下端还设置有雾化底座通气孔 9-2，当使用电子烟时，将外部进入到电子烟内的气体经过该雾化底座通气孔 9-2 进入到发热装置 111 当中，发热装置 111 加热烟液使其雾化，该气体混合雾化的烟液自通气管 14 以及出烟孔 19-2 流出而被用户所吸食。

参见图 6 和图 9，装配外壳 18 与雾化底座 9 时，可以通过在外壳 18 的下端周侧设置卡接槽/卡扣 18-1，而在雾化底座 9 的对应周侧位置设置卡扣/卡接槽 9-1，这样卡扣与卡接槽相互扣接即可使得雾化底座 9 能够比较可靠的固定在外壳 18 的下端。卡扣与卡接槽的分布可以是多样化的，既可以是外壳 18 的下端周侧全部设置为卡接槽，而雾化底座 9 的对应周侧全部设置为卡扣，也可以是外壳 18 的下端周侧全部设置为卡扣，而雾化底座 9 的对应周侧全部设置为卡接槽，还可以是外壳 18 的下端周侧同时设置有卡接槽和卡扣，而雾化底座 9 的对应周侧同时设置有卡扣和卡接槽。

通过以上的描述可以看出，本发明的烟弹 21 通过将雾化组件和储液组件分别设置，发热装置 111、雾化底座 9 以及通气管 14 形成了雾化组件，而储液组件则包括顶盖 19 和外壳 18，将装配好的雾化组件再与外壳 18 装配，然后在外壳 18 的上端套设顶盖 19，即可完成烟弹 21 的装配过程，装配过程得以简化。

根据本实施例的其中一个优选实施方式，雾化组件还包括雾化上盖 13，发热装置 111 固定在雾化上盖 13 和雾化底座 9 之间，雾化上盖 13 上

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设置有通孔 13-1，通气管 14 的一端穿过该通孔 13-1 与发热装置 111 连通。通孔 13-1 的口径大小与通气管 14 的外径相匹配，使得烟雾不会从通孔 13-1 和通气管 14 之间的缝隙外泄即可。进一步的，在前述的顶盖 19 和外壳 18 之间还设置有密封盖 15，前述当中提到，通气管 14 的一端穿过该通孔 13-1 与发热装置 111 连通，而通气管 14 的另一端则穿过该密封盖 15 与出烟孔 19-2 连通。密封盖 15 的作用在于，因储液腔 18-5 之中存储的都是烟液，密封盖 15 可以密封储液腔 18-5，防止烟液在运输或者使用过程中的泄漏，对电子烟本身起到了一定的防护作用。进一步的，在外壳 18 的内壁上还设置有卡持部 18-4，通气管 14 通过该卡持部 18-4 进行卡固定位。

电极接触片 10 的一端安装于通槽 9-3 内，将吸液件 11 穿过发热件 12，之后将发热件 12 两端卡在电极卡槽 10-1 上。雾化上盖 13 压在雾化底座 9 上，将通气管 14 固定在卡持部 18-4 上，将安装有通气管 14 的外壳 18 通过卡接槽/卡扣 18-1 与卡扣/卡接槽 9-1 固定。密封盖 15 套于储液腔 18-5 的上方，顶盖 19 通过顶盖限位槽 19-1 与顶盖限位扣 18-3 固定在外壳 18 的上端，顶盖限位扣 18-3 设置在外壳 18 的上端外侧，则此时烟弹 21 安装完毕。

参见图 1-图 6，本发明提供的电子烟 100 包括烟弹 21 以及与烟弹 21 相连接的电池组件 20，该烟弹 21 为前述任一项实施例中的烟弹 21，其中烟弹 21 的外壳 18 的外侧壁上设置有接合部 18-2，而在电池外壳 17 的内侧壁上则设置有连接部 17-1，该连接部 17-1 与接合部 18-2 相互配合，使得通过接合部 18-2 可以将烟弹 21 与电池组件 20 相对固定连接，具体到本实施例，接合部 18-2 与连接部 17-1 可以是相互配合的凸起与凹槽。本实施例当中，接合部 18-2 可以是凹槽，这样设置即可使烟弹 21 与电池组件 20 之间形成过盈配合，本领域技术人员可以知晓的是，该接合部 18-2 也可以是螺纹、卡扣等其他具有等同技术效果的实施方式。

参见图 5 和图 6，电池组件 20 还包括气压感应器 3，气压感应器 3 用于检测感知当用户使用电子烟 100 进行抽吸动作时，吸气产生的压力变化，进而反馈到与之信号连接的控制板 2，控制板 2 根据该信号判断出用户是否抽吸或抽吸时的力度大小，即可对烟弹 21 进行电能输出或者调节对烟弹 21 的电能输出大小，具体装配时，电池组件 20 还包括气压感应器支架

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4，气压感应器支架 4 上设置有气压感应器安装孔 4-1 以及导线安装孔 4-2，将气压感应器 3 安装于气压感应器安装孔 4-1 中，用导线与控制板 2 电信号连接。从控制板 2 中引出导线，将引出的导线从导线安装孔 4-2 穿出与电池本体 16 连接，之后将电池正负极接触件 6 安装电池支架 5 上，电池正负极接触件 6 与电池本体 16 用导线连接，电池正负极接触件 6 还包括两组探针 7，两组探针 7 将发热件 12 的正、负接触接线端分别与电池的正极、负极连接。将密封圈 8 通过密封圈卡槽 8-1 安装于电池支架密封圈安装槽 5-5 上，气压感应器支架 4 通过安装槽 4-3 与电池支架 5 上的气压感应器支架安装槽 5-1 固定。电池盖 1 通过电池盖卡扣 1-1 与电池支架卡槽 5-2 固定。将电池本体 16 安装于电池支架 5 内。此时将电池外壳 17 套在已经安装有电池本体 16 的电池支架 5 上，使得电池支架固定槽 5-4 与电池支架限位凸台 17-2 固定，至此，电池组件 20 安装完毕。电池支架 5 的上端还设置有电池支架通气孔 5-3，该电池支架通气孔 5-3 使得用户吸入的气流的一部分可带走电池本体 16 因工作而产生的热量，进而使得电池本体 16 保持在一个相对正常的温度，对电池本体 16 具有一定的保护作用。

因烟弹 21 与电池组件 20 之间通过接合部 18-2 和连接部 17-1 相连接，当出现因烟弹 21 本身的问题而导致电子烟 100 无法正常使用时，可以通过接合部 18-2 和连接部 17-1 拆分电池组件 20 与烟弹 21，更换新的烟弹 21 变得更加方便。

只要不违背本发明创造的思想，对本发明的各种不同实施例进行任意组合，均应当视为本发明公开的内容；在本发明的技术构思范围内，对技术方案进行多种简单的变型及不同实施例进行的不违背本发明创造的思想的任意组合，均应在本发明的保护范围之内。

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权 利 要 求 书

1、一种烟弹，所述烟弹包括储液组件和雾化组件，其特征在于：所述雾化组件置于所述储液组件之中，所述储液组件包括带有出烟孔的顶盖以及外壳，所述雾化组件包括发热装置、雾化底座以及通气管，所述发热装置置于所述雾化底座之上，所述雾化底座密封设置在所述外壳的一端，所述顶盖设置在所述外壳上相对所述雾化底座的另一端，所述通气管连通所述发热装置和出烟孔，所述通气管、外壳、雾化底座以及顶盖之间的空间为储液腔。

2、根据权利要求 1 所述的烟弹，其特征在于：所述雾化组件还包括雾化上盖，所述发热装置固定在所述雾化上盖和所述雾化底座之间，所述雾化上盖设有通孔，所述通气管的一端穿过所述通孔与所述发热装置连通。

3、根据权利要求 2 所述的烟弹，其特征在于：所述顶盖与外壳之间还设置有密封盖，所述通气管的另一端穿过所述密封盖与所述出烟孔连通。

4、根据权利要求 1 至 3 任一项所述的烟弹，其特征在于：所述外壳的内壁还设置有卡持部，所述通气管通过所述卡持部进行定位。

5、根据权利要求 1 所述的烟弹，其特征在于：所述发热装置包括吸液件以及配合设置的发热件，所述雾化组件还包括一对电极接触片，所述发热件的正、负极连接至对应的所述电极接触片，所述电极接触片固定在所述雾化底座上。

6、根据权利要求 5 所述的烟弹，其特征在于：所述电极接触片的一端设置有电极卡槽，所述发热件的正、负极卡入对应的所述电极卡槽，所述雾化底座上设有通槽，所述电极接触片的另一端穿过设置在所述雾化底座上的通槽，并被折弯而使得所述电极接触片被固定在所述雾化底座上。

7、根据权利要求 1 所述的烟弹，其特征在于：所述外壳的下端周侧设置有卡接槽/卡扣，对应所述雾化底座的周侧设置有卡扣/卡接槽，所述卡扣与所述卡接槽扣接使得所述雾化底座固定在所述外壳的下端。

8、一种电子烟，包括烟弹以及与所述烟弹连接的电池组件，其特征在于：所述烟弹为权利要求 1-7 任一项所述的烟弹，所述烟弹的外壳的外

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侧壁设置有接合部，所述接合部用于将所述烟弹与所述电池组件连接。

9、根据权利要求 8 所述的电子烟，其特征在于：所述电池组件包括电池外壳、电池支架以及电池本体，所述电池支架夹持所述电池本体并置于所述电池外壳之中，所述电池外壳的内侧壁设置有连接部，所述接合部与所述连接部相互配合使得所述烟弹与所述电池组件固定连接。

10、根据权利要求 9 所述的电子烟，其特征在于：所述电池支架的上端设置有电池正负极接触件，所述电池正负极接触件用于与所述发热装置的正、负极对应连接，所述电池支架的上端与所述电池外壳之间还设置有密封圈。

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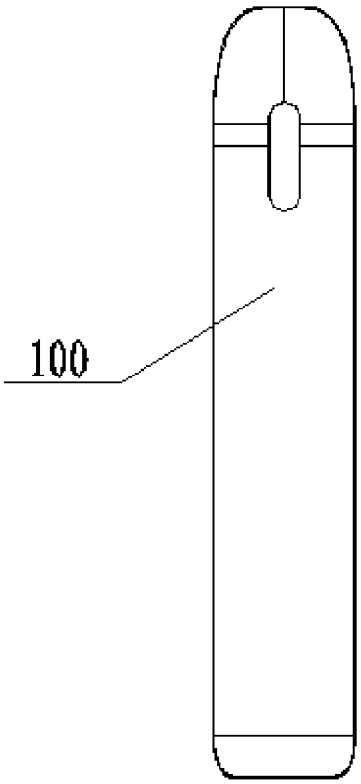


图 1

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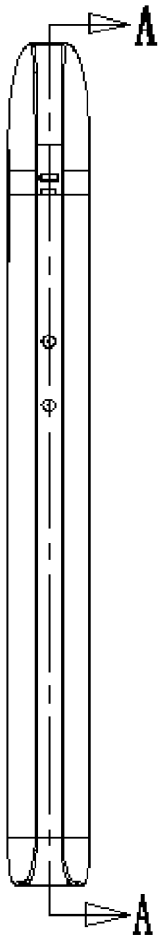


图 2

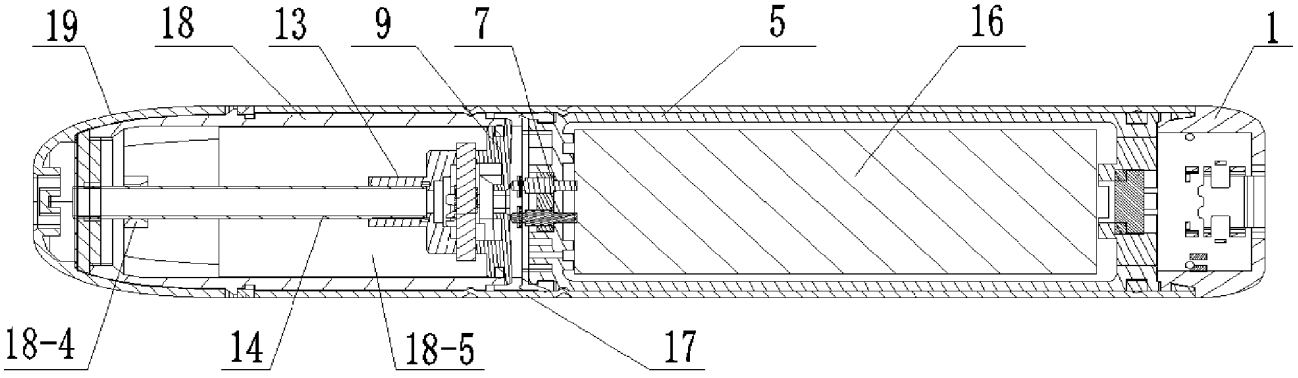


图 3

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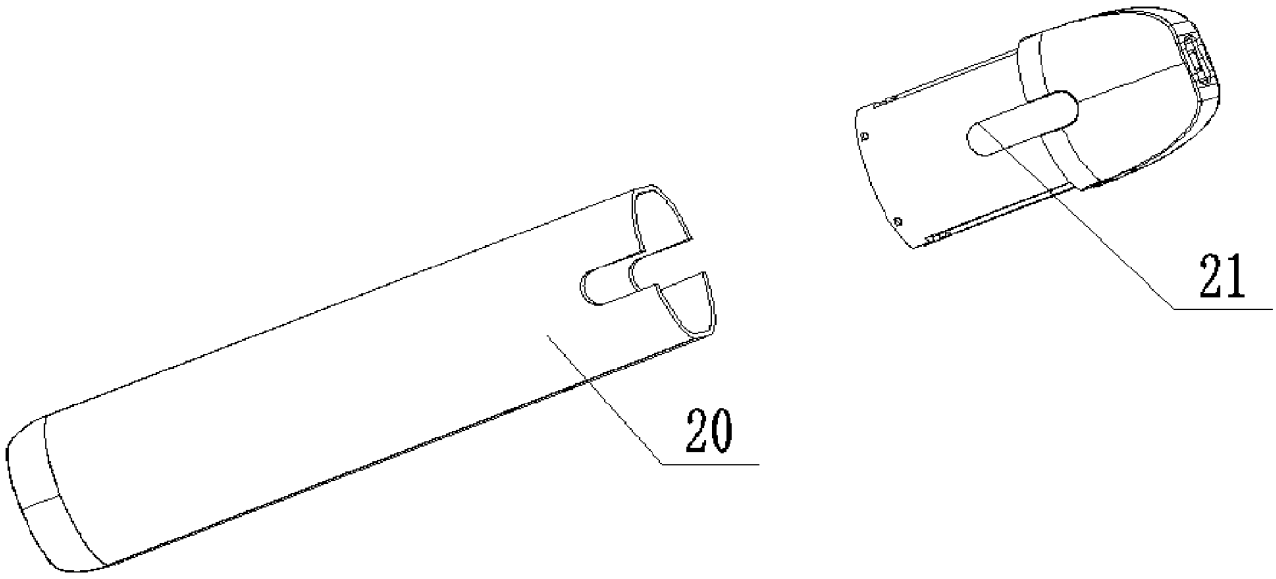


图 4

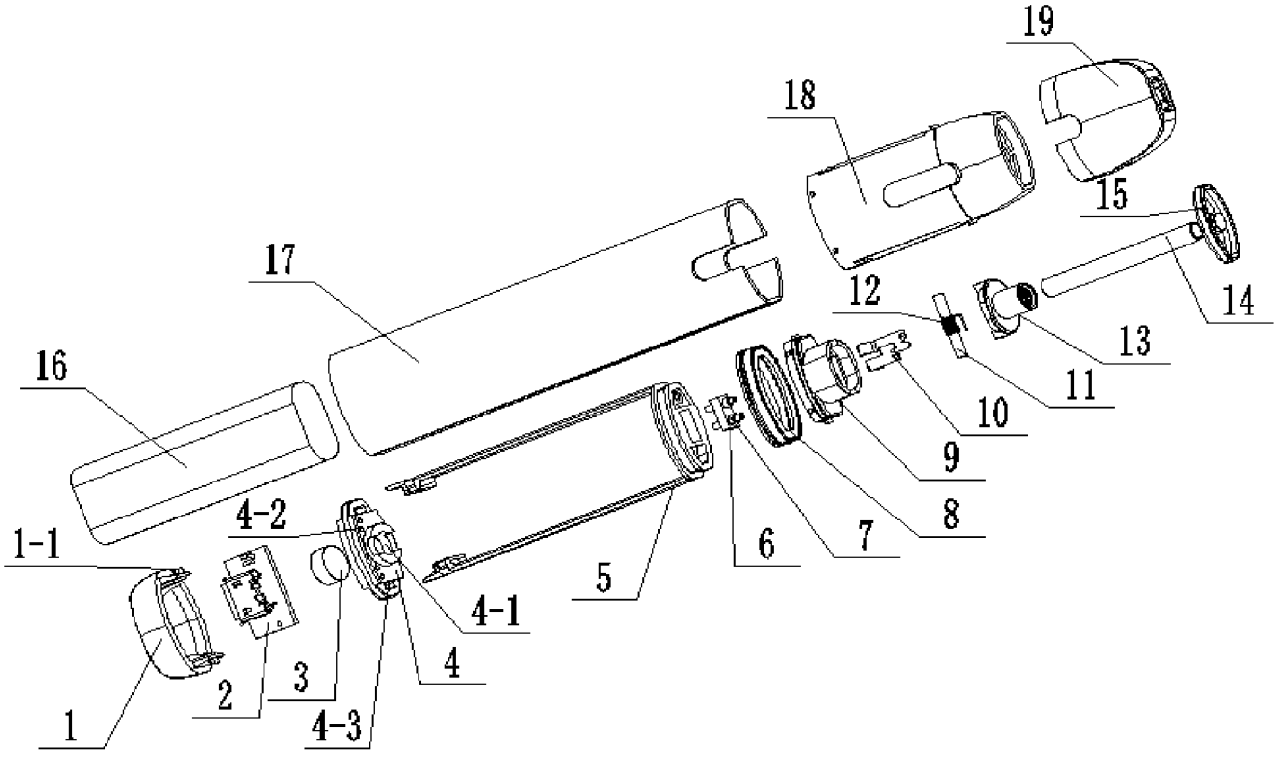


图 5

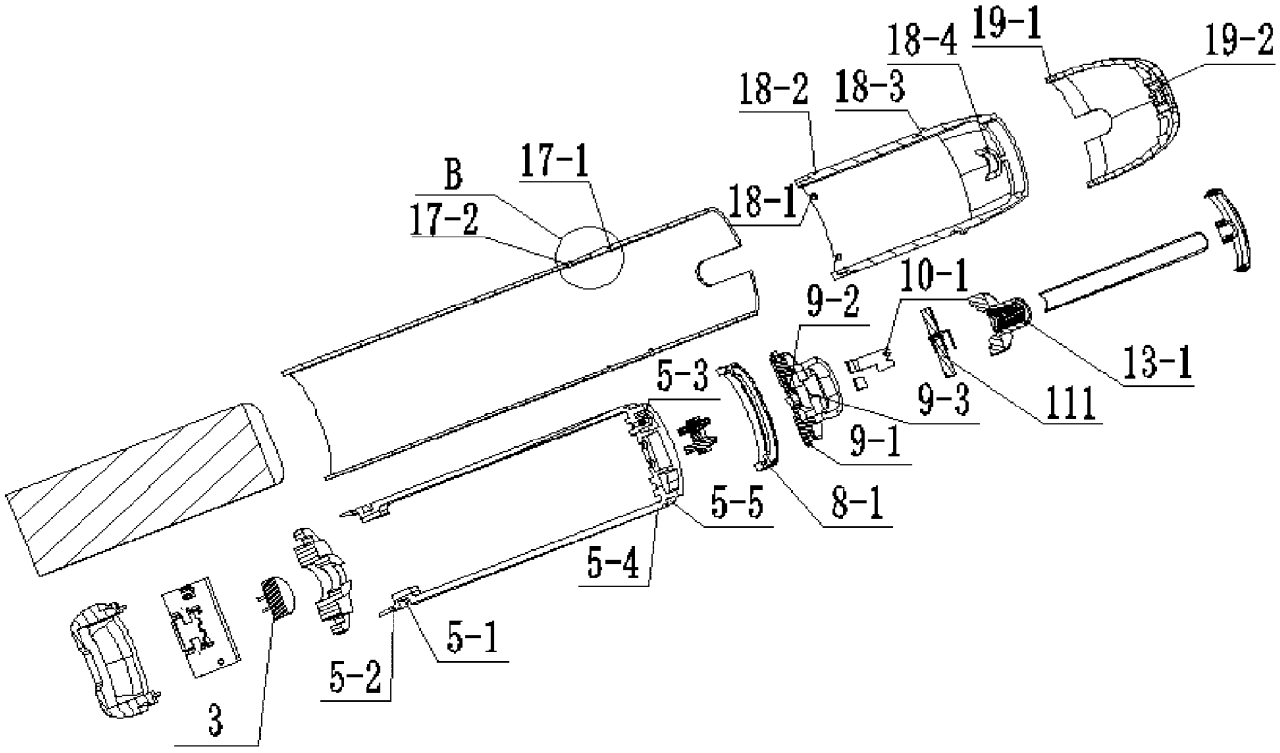

18-4
19-1
19-2
18-2
18-3
B
17-1
17-2
18-1
10-1
9-2
13-1
5-3
9-3
111
9-1
5-5
8-1
5-4
5-1
5-2
3

图 6

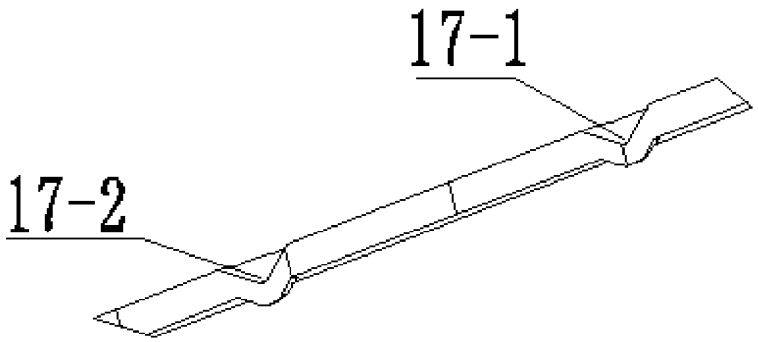

17-1
17-2

图 7

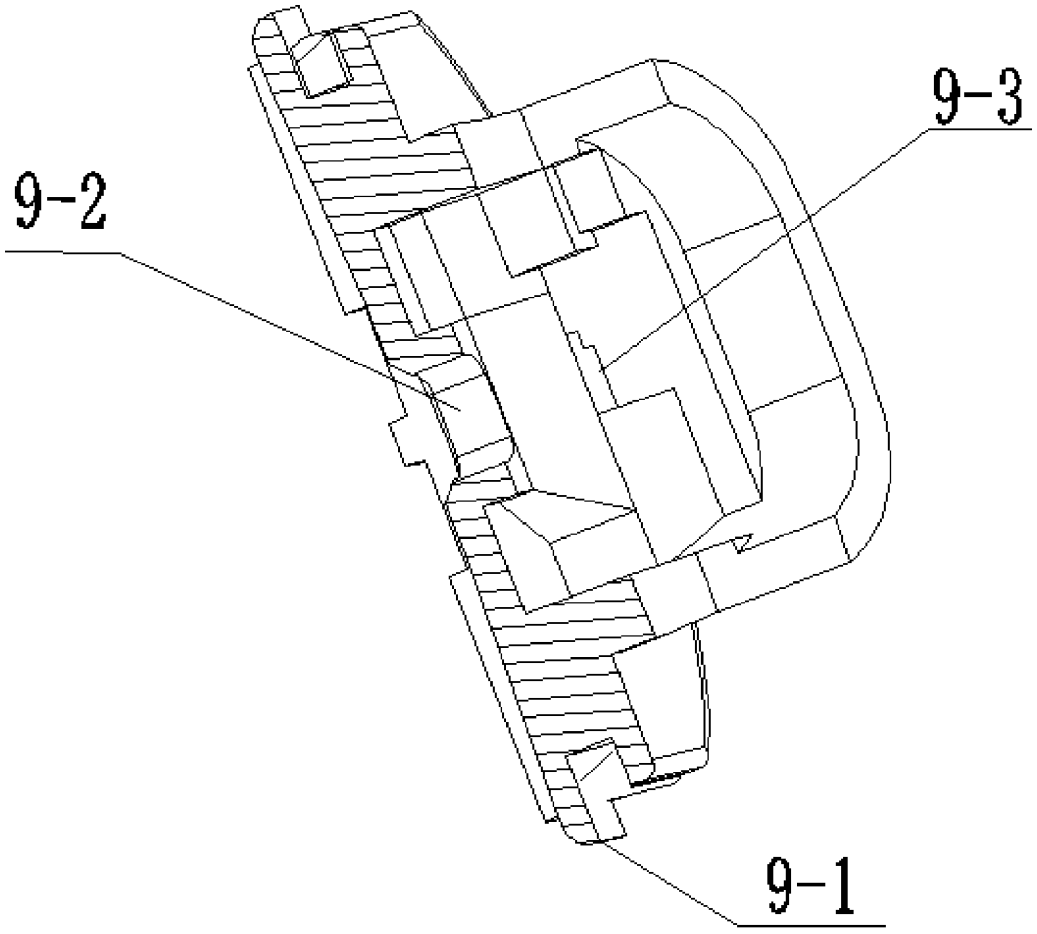


图 8

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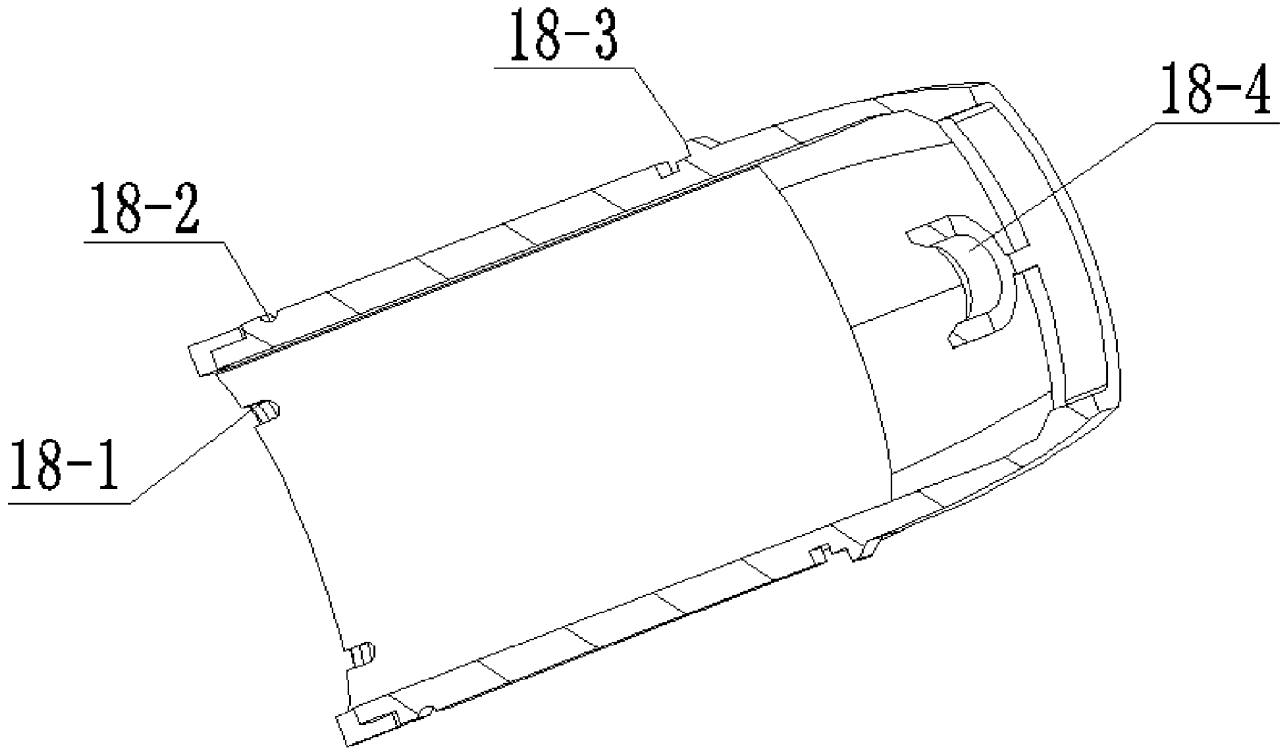


图 9

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/113446

A. CLASSIFICATION OF SUBJECT MATTER

A24F 47/00 (2006.01) i

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 47/-

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)

CNABS, TWABS, CNTXT, TWTXT, CNKI, WPI, EPODOC, EPTXT, USTXT, WOTXT: CHANGZHOU JUWEI TECHNOLOGY CO., LTD., electronic, cigarette, gap, air+, hole, battery, passage, atomizer, electrode, cartridge, drip tip, storage liquid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 204217907 U (HUIZHOU KIMREE TECHNOLOGY CO., LTD.) 25 March 2015 (25.03.2015) description, paragraphs [0029]-[0038], [0046] and [0054], and figures 1 and 3	1-10
PX	CN 105768225 A (JOYETECH (CHANGZHOU) ELECTRONIC TECHNOLOGY CO., LTD.) 20 July 2016 (20.07.2016) claims 1-10	1-10
X	CN 204120231 U (HUANG, Jinzhen) 28 January 2015 (28.01.2015) description, paragraphs [0018]-[0023], and figures 1 and 2	1-10
A	CN 104366695 A (SHENZHEN SMOORE TECHNOLOGY LTD.) 25 February 2015 (25.02.2015) the whole document	1-10
A	US 4171000 A (UHLE, KLAUS P.) 16 October 1979 (16.10.1979) the whole document	1-10

☒ 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	Date of mailing of the international search report
06 March 2017	28 March 2017
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer YUAN, Ye Telephone No. (86-10) 62414485

Form PCT/ISA /210 (second sheet) (July 2009)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/113446

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008257367 A1 (PATERNO, GREG et al.) 23 October 2008 (23.10.2008) the whole document	1-10
A	US 2014283858 A1 (LIU, Qiuming) 25 September 2014 (25.09.2014) the whole document	1-10

NJOY Exhibit 1002.501

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/113446

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 204217907 U	25 March 2015	None	
CN 105768225 A	20 July 2016	None	
CN 204120231 U	28 January 2015	None	
CN 104366695 A	25 February 2015	US 2016121058 A1	05 May 2016
		CN 205658370 U	26 October 2016
		WO 2016065926 A1	06 May 2016
		EP 3015010 A1	04 May 2016
US 4171000 A	16 October 1979	None	
US 2008257367 A1	23 October 2008	WO 2008130813 A1	30 October 2008
US 2014283858 A1	25 September 2014	US 9526272 B2	27 December 2016
		WO 2014146297 A1	25 September 2014

NJOY Exhibit 1002.502

国际检索报告

国际申请号
PCT/CN2016/113446

A. 主题的分类

A24F 47/00(2006.01)i

按照国际专利分类(IPC)或者同时按照国家分类和IPC两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

A24F47/-

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNABS,TWABS,CNTXT,TWTXT,CNKI,WPI,EPODOC,EPTXT,USTXT,WOTXT:常州聚为智能科技，雾化，电子烟，烟弹，储液，吸嘴，electronic，cigarette，gap，air+，hole，battery，passage，atomizer，electrode

C. 相关文件

类 型*	引用文件，必要时，指明相关段落	相关的权利要求
X	CN 204217907 U (惠州市吉瑞科技有限公司) 2015年 3月 25日 (2015-03-25) 说明书第[0029]-[0038]、[0046]、[0054]段，附图1、3	1-10
PX	CN 105768225 A (卓尔悦常州电子科技有限公司) 2016年 7月 20日 (2016-07-20) 权利要求1-10	1-10
X	CN 204120231 U (黄金珍) 2015年 1月 28日 (2015-01-28) 说明书第[0018]-[0023]段，附图1-2	1-10
A	CN 104366695 A (深圳市麦克韦尔科技有限公司) 2015年 2月 25日 (2015-02-25) 全文	1-10
A	US 4171000 A (UHLE, KLAUS P.) 1979年 10月 16日 (1979-10-16) 全文	1-10
A	US 2008257367 A1 (PATERNO, GREG等) 2008年 10月 23日 (2008-10-23) 全文	1-10
A	US 2014283858 A1 (LIU, QIUMING) 2014年 9月 25日 (2014-09-25) 全文	1-10

☐ 其余文件在C栏的续页中列出。

☑ 见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
2017年 3月 6日	2017年 3月 28日
ISA/CN的名称和邮寄地址 中华人民共和国国家知识产权局(ISA/CN) 中国北京市海淀区蓟门桥西土城路6号 100088 传真号 (86-10)62019451	受权官员 袁野 电话号码 (86-10)62414485

表 PCT/ISA/210 (第2页) (2009年7月)

NJOY Exhibit 1002.503

国际检索报告
关于同族专利的信息

国际申请号
PCT/CN2016/113446

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	204217907	U	2015年 3月 25日	无			
CN	105768225	A	2016年 7月 20日	无			
CN	204120231	U	2015年 1月 28日	无			
CN	104366695	A	2015年 2月 25日	US	2016121058	A1	2016年 5月 5日
				CN	205658370	U	2016年 10月 26日
				WO	2016065926	A1	2016年 5月 6日
				EP	3015010	A1	2016年 5月 4日
US	4171000	A	1979年 10月 16日	无			
US	2008257367	A1	2008年 10月 23日	WO	2008130813	A1	2008年 10月 30日
US	2014283858	A1	2014年 9月 25日	US	9526272	B2	2016年 12月 27日
				WO	2014146297	A1	2014年 9月 25日

NJOY Exhibit 1002.504

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/430,317	Filing Date 02/10/2017	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	08/29/2018	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 52	Minus	** 31	= 21		x $50 =	1050
	Independent (37 CFR 1.16(h))	* 5	Minus	*** 6	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	1050

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	Tina M Bell
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Document code: WFEE

United States Patent and Trademark Office
Sales Receipt for Accounting Date: 09/17/2018

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01 FC : 2202 1,050.00 DA

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

148514 7590 09/19/2018

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER
GIRARDI, VANESSA MARY

ART UNIT	PAPER NUMBER
2833	

DATE MAILED: 09/19/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

TITLE OF INVENTION: VAPORIZER DEVICES WITH BLOW DISCRIMINATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	12/19/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

NJOY Exhibit 1002.507

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

148514 7590 09/19/2018
Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

TITLE OF INVENTION: VAPORIZER DEVICES WITH BLOW DISCRIMINATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	12/19/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
GIRARDI, VANESSA MARY	2833	131-328000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

NJOY Exhibit 1002.508

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

148514 7590 09/19/2018

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER	
GIRARDI, VANESSA MARY	

ART UNIT	PAPER NUMBER
2833	

DATE MAILED: 09/19/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

NJOY Exhibit 1002.509

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/430,317	Applicant(s) HATTON ET AL.	
	Examiner VANESSA GIRARDI	Art Unit 2833	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *revived abandonment - amdmt filed May 30 2018*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,3-13 and 15-54*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☒ Other *Sub Spec*.

/VANESSA GIRARDI/
Primary Examiner, Art Unit 2833

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The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

1. During a conversation conducted on September 3, 2018, Nicholas P. Mouton authorized the Director to charge Deposit Account No. 50-0311, Reference No. 52210-51500US/735 200 the required fee of $ 1050 for the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Examiner's Amendment

2. An Examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to the Applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this Examiner's Amendment was given in a telephone interview with Nicholas P. Mouton on August 9, 2018.

The amended application filed May 30, 2018 has been entered per the granted petition to revive the unintentional abandonment of this application. The amended claims filed May 30, 2018 have been further amended to delete claim 14 which did not contain novel or unobvious subject matter. Claims 1, 9-13, 15, 20, 21, 25-27, 29 and 31 have been amended to more clearly distinguish attributes which does not affect the scope of these claims as previously presented. Applicant chose to add claims 33-54, all in the following manner:

For ease of understanding, the entire claim set is presented below.

1. (**Currently Amended**) A vaporizer device comprising:

a reservoir configured to hold a vaporizable material;

a heater configured to heat the vaporizable material;

a mouthpiece in fluid communication with the heater via a sealed air flow path, the sealed air flow path passing from an air inlet, to the heater, and to an outlet formed in the mouthpiece;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to the sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure;

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path; and

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold ~~thresholds~~ respectively indicating blowing or suction is being applied to the mouthpiece; and

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

2. (Canceled)

3. (Previously Presented) The vaporizer device of claim 1, wherein the third threshold is the same as the second threshold.

4. (Previously Presented) The vaporizer device of claim 1, wherein the third threshold is the same as the first threshold.

5. (Previously Presented) The vaporizer device of claim 1, wherein the first threshold is zero.

6. (Previously Presented) The vaporizer device of claim 1, wherein the second threshold is zero.

7. (Previously Presented) The vaporizer device of claim 1, wherein the pressure sensor comprises a capacitive membrane.

8. (Previously Presented) The vaporizer device of claim 1, wherein the pressure sensor comprises a MEMS pressure sensor.

9. (**Currently Amended**) The vaporizer device of claim 1, wherein the sensor readings output by the pressure sensor ~~output is a~~ comprise capacitance values.

10. (**Currently Amended**) The vaporizer device of claim 1, wherein the sensor readings output by the pressure sensor ~~output is a~~ comprise pressure values.

11. (**Currently Amended**) The vaporizer device of claim 1, wherein the ~~operations performed by the~~ microcontroller is further configured to perform operations comprising: ~~comprise~~

tracking the baseline based on filtering the sensor readings via ~~output by~~ low pass filtering the sensor readings ~~output~~.

12. (**Currently Amended**) The vaporizer device of claim 1, wherein the ~~operations performed by the~~ microcontroller is further configured to perform operations comprising: ~~comprise~~

tracking the baseline based on filtering the sensor readings via output by taking a running average of the sensor readings ~~output~~.

13. (**Currently Amended**) The vaporizer device of claim 1, wherein the ~~operations performed by the~~ microcontroller is further configured to perform operations comprising: ~~comprise~~

stopping activating of the heater to generate vapor when the sensor readings are ~~output is~~ offset from the baseline by less than the third threshold ~~offset value~~.

14. (**Canceled**)

15. (**Currently Amended**) A method of controlling a vaporizer device to prevent heating of a heater after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a differential pressure sensor, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, wherein the sealed air flow path passes from an air inlet, to the heater, and to an outlet formed in the mouthpiece, and wherein the second ~~device~~ air path is sealed from the sealed air flow path by a gasket around the pressure sensor;

tracking a baseline by filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold ~~thresholds~~ indicating blowing or suction is being applied to the mouthpiece;

holding the baseline at a prior value of the baseline while the sensor readings are below the baseline by the [[a]] second threshold; and

comparing the sensor readings to the baseline and activating the [[a]] heater in the vaporizer device to generate an aerosol from a vaporizable material when the sensor readings output by the pressure sensor is offset from the baseline by more than a third threshold, the third threshold indicating that suction is being applied to the mouthpiece.

16. (Previously Presented) The method of claim 15, wherein the third threshold is the same as the second threshold.

17. (Previously Presented) The method of claim 15, wherein the third threshold is the same as the first threshold.

18. (Previously Presented) The method of claim 15, wherein the first threshold is zero.

19. (Previously Presented) The method of claim 15, wherein the second threshold is zero.

20. (**Currently Amended**) The method of claim 15, wherein the sensor readings output by the pressure sensor ~~reading is a~~ comprise capacitance values.

21. (**Currently Amended**) The method of claim 15, wherein the sensor readings output by the pressure sensor ~~reading is a~~ comprise pressure values.

22. (Previously Presented) The method of claim 15, wherein tracking the baseline comprises low pass filtering the sensor readings.

23. (Previously Presented) The method of claim 15, wherein tracking the baseline comprises taking a running average of the sensor readings.

24. (Previously Presented) The method of claim 15, further comprising stopping activating the heater to generate vapor when the sensor readings are offset from the baseline by less than the third threshold.

25. (**Currently Amended**) A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device, the method comprising:

taking sensor readings from a MEMS pressure sensor in the vaporizer device;

tracking a baseline by filtering the sensor readings;

holding the baseline constant while the sensor readings are above the baseline;

holding the baseline constant while the sensor readings are below the baseline by a threshold;

comparing the sensor readings to the baseline and activating a heater in the vaporizer device to generate an aerosol from a vaporizable material when the sensor readings are ~~output is~~ below the baseline by more than the threshold, the threshold indicating that suction is being applied to the mouthpiece.

26. (**Currently Amended**) The vaporizer device of claim 1, further comprising a cartridge and a device body having a cartridge receptacle configured to insertably receive the cartridge, wherein the cartridge comprises the reservoir, the heater, the mouthpiece, and an exterior surface, wherein the device body comprises the pressure sensor, the gasket, and the microcontroller, and wherein the sealed air flow path passes from the air inlet through a channel formed between the exterior surface of the cartridge and an interior surface of the cartridge receptacle when the cartridge is insertably received within the cartridge receptacle.

27. (**Currently Amended**) The method of claim 15, wherein the vaporizer device comprises a cartridge and a device body having a cartridge receptacle configured to insertably receive the cartridge, wherein the cartridge comprises a [[the]] reservoir, the heater, the mouthpiece, and an exterior surface, wherein the device body comprises the pressure sensor, the gasket, and a [[the]] microcontroller, and wherein the sealed air flow path passes from the air inlet through a channel formed between the exterior surface of the cartridge and an interior surface of the cartridge receptacle when the cartridge is insertably received within the cartridge receptacle.

28. (Previously Presented) The method of claim 25, wherein a first side of the MEMS pressure sensor is exposed to a first air path through the mouthpiece and a second side of the MEMS pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the MEMS pressure sensor.

29. (**Currently Amended**) A vaporizer device body comprising:

a cartridge receptacle configured to insertably receive a cartridge containing a vaporizable material;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air flow path comprising a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge; and

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

30. (**Currently Amended**) The vaporizer device body of claim 29, further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold ~~thresholds~~ respectively indicating blowing or suction is being applied to the mouthpiece; and

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

31. (**Currently Amended**) A vaporizer device comprising:

a cartridge comprising a reservoir configured to hold a vaporizable material, a heater configured to heat the vaporizable material, and a mouthpiece in fluid communication with the heater; and

a device body comprising:

a cartridge receptacle configured to insertably receive the cartridge;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air flow path comprising a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet, through the channel and to the heater and an outlet in the mouthpiece of the cartridge; and

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

32. (**Currently Amended**) The vaporizer device body of claim 31 [[29]], further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold ~~thresholds~~ respectively indicating blowing or suction is being applied to the mouthpiece; and

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

33. (**New**) The vaporizer device of claim 29, wherein the pressure sensor comprises a capacitive membrane.

34. (**New**) The vaporizer device of claim 29, wherein the pressure sensor comprises a MEMS pressure sensor.

35. (**New**) The vaporizer device of claim 29, wherein the sensor readings output by the pressure sensor comprise capacitance values.

36. (**New**) The vaporizer device of claim 29, wherein the sensor readings output by the pressure sensor comprise pressure values.

37. (**New**) The vaporizer device of claim 30, wherein the third threshold is the same as the second threshold.

38. (**New**) The vaporizer device of claim 30, wherein the third threshold is the same as the first threshold.

39. (**New**) The vaporizer device of claim 30, wherein the first threshold is zero.

40. (**New**) The vaporizer device of claim 30, wherein the second threshold is zero.

41. (**New**) The vaporizer device of claim 30, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via low pass filtering the sensor readings.

42. (**New**) The vaporizer device of claim 30, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via output by taking a running average of the sensor readings.

43. (**New**) The vaporizer device of claim 30, wherein the microcontroller is further configured to perform operations comprising:

stopping activating of the heater to generate vapor when the sensor readings are offset from the baseline by less than the third threshold.

44. (**New**) The vaporizer device of claim 31, wherein the pressure sensor comprises a capacitive membrane.

45. (**New**) The vaporizer device of claim 31, wherein the pressure sensor comprises a MEMS pressure sensor.

46. (**New**) The vaporizer device of claim 31, wherein the sensor readings output by the pressure sensor comprise capacitance values.

47. (**New**) The vaporizer device of claim 31, wherein the sensor readings output by the pressure sensor comprise pressure values.

48. (**New**) The vaporizer device of claim 32, wherein the third threshold is the same as the second threshold.

49. (**New**) The vaporizer device of claim 32, wherein the third threshold is the same as the first threshold.

50. (**New**) The vaporizer device of claim 32, wherein the first threshold is zero.

51. (**New**) The vaporizer device of claim 32, wherein the second threshold is zero.

52. (**New**) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via low pass filtering the sensor readings.

53. (**New**) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via output by taking a running average of the sensor readings.

54. (**New**) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

stopping activating of the heater to generate vapor when the sensor readings are offset from the baseline by less than the third threshold.

Reasons for Allowance

2. Claims 1, 3-13, 15-54 are allowed.

Regarding claims 1, 15, 29 and 31; allowability resides, at least in part, with the prior art not showing or fairly teaching a vaporizer device comprising a pressure sensor which on one side is exposed to a sealed airflow path and on a second side is exposed to a device air path open to ambient pressure, where a gasket around the pressure sensor seals the device air path from the sealed air flow path in conjunction with ***ALL*** the remaining limitations within respective claims 1, 15, 29 and 31; where it is understood the method of controlling the claimed components within an operative device is inseparable from the device.

Regarding claim 25; allowability resides, at least in part, with the prior art not showing or fairly teaching a method of controlling a vaporizer device which prevents heating after *blowing* on a mouthpiece in conjunction with ***ALL*** the remaining limitations within respective claim 25.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning communications from the examiner should be directed to Vanessa Girardi: OFFICE PHONE 571.272.5924
Vanessa.Girardi@USPTO.Gov

Interviews are available Monday - Thursday preferably prior to 1 p.m. (EST).

If attempts to reach the examiner are unsuccessful, the Examiner's supervisor, Amy C. Johnson can be reached at 571.272.2238.

The central fax phone number for the organization is 571.273.8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://portal.uspto.gov/pair/PublicPair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ VANESSA GIRARDI /
PRIMARY EXAMINER
ART UNIT 2833

OK TO ENTER: /VG/

08/01/2018

VAPORIZER DEVICES WITH BLOW DISCRIMINATION

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. provisional patent application no. 62/294,271, titled "VAPORIZER DEVICES WITH BLOW DISCRIMINATION," filed on 2/11/2016 which is herein incorporated by reference in its entirety.

[0002] This patent application may be related to U.S. Patent Application No. 14/581,666, filed on 12/23/2014, and titled "VAPORIZATION DEVICE SYSTEMS AND METHODS", which claimed priority to U.S. Provisional Patent Application No. 61/920,225, filed 12/23/2013, U.S. Provisional Patent Application No. 61/936,593, filed 2/6/2014, and U.S. Provisional Patent Application No. 61/937,755, filed 2/10/2014.

[0003] This application may also be related to or may be used with the inventions in one or more of the following patent applications: U.S. Patent Application No. 14/578,193, filed on 12/19/2014, and titled "METHOD AND SYSTEM FOR VAPORIZATION OF A SUBSTANCE"; U.S. Patent Application No. 14/625,042, filed on 2/18/2015, and titled "AEROSOL DEVICES AND METHODS FOR INHALING A SUBSTANCE AND USES THEREOF"; U.S. Patent Application No. 13/837,438, filed on 3/15/2013, and titled "LOW TEMPERATURE ELECTRONIC VAPORIZATION DEVICE AND METHODS"; U.S. Patent Application No. 14/271,071, filed on 5/6/2014, and titled "NICOTINE SALT FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/304,847, filed on 6/13/2014, and titled "MULTIPLE HEATING ELEMENTS WITH SEPARATE VAPORIZABLE MATERIALS IN AN ELECTRIC VAPORIZATION DEVICE"; U.S. Patent Application No. 14/461,284, filed on 8/15/2014, and titled "METHODS AND DEVICES FOR DELIVERING AND MONITORING OF TOBACCO, NICOTINE, OR OTHER SUBSTANCES"; PCT Patent Application No. PCT/US2015/031152, filed on 5/15/2015, and titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL"; PCT Patent Application No. PCT/US2014/064690, filed on 11/7/2014, and titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF"; U.S. Patent Application No. 14/960,259, filed on 12/4/2015, and titled "CALIBRATED DOSE CONTROL"; U.S. patent application no. 15/257,748, titled

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"CARTRIDGE FOR USE WITH A VAPORIZER DEVICE," filed on 9/6/2016; U.S. patent application no. 15/257,760, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/257,768, titled "VAPORIZER APPARATUS," filed on 9/6/2016; U.S. patent application no. 15/379,898, titled "VAPORIZATION DEVICE SYSTEMS AND METHODS," filed on 12/15/2016; U.S. patent application no. 15/309,554, titled "SYSTEMS AND METHODS FOR AEROSOLIZING A SMOKEABLE MATERIAL," filed on 11/8/2016; U.S. patent application no. 15/101,303, titled "NICOTINE LIQUID FORMULATIONS FOR AEROSOL DEVICES AND METHODS THEREOF," filed on 6/2/2016; U.S. patent application no. 14/960,259, titled "CALIBRATED DOSE CONTROL," filed on 12/4/2015; U.S. patent application no. 15/396,584, titled "LEAK-RESISTANT VAPORIZER CARTRIDGES FOR USE WITH CANNABINOIDS," filed on 12/31/2016. Each of these applications is herein incorporated by reference in their entirety.

INCORPORATION BY REFERENCE

[0004] All publications and patent applications mentioned in this specification are herein incorporated by reference in their entirety to the same extent as if each individual publication or patent application was specifically and individually indicated to be incorporated by reference.

FIELD

[0005] Described herein are electronic inhalable aerosol devices, or electronic vaping devices, and particularly electronic aerosol devices which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.

BACKGROUND

[0006] Electronic cigarettes are typically battery-powered vaporizers that simulate the feeling of smoking, but without tobacco. Instead of cigarette smoke, the user inhales an aerosol, commonly called vapor, typically released by a heating element that atomizes a liquid solution (vaporizable material or solution). Typically, the user activates the e-cigarette by taking a puff or pressing a button. Some vaporizers look like traditional cigarettes, but they come in many variations.

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[0007] Many electronic cigarettes use a pressure sensor to determine when the device should be heating or not. This may allow for an intuitive user interface where the user simply draws from (sucks on) the device to power it. It is advantageous over powering the device with a button in that the device's heating element is only powered when there is airflow over it assuming the device's pressure sensor and microcontroller can accurately detect the start and end of a draw.

[0008] Unfortunately, the vast majority of electronic cigarettes described and currently in use have an unexpected failure mode which may reduce the life of the battery and the overall device. Specifically, such devices may inadvertently (and transiently) detect a draw or inhalation following blowing or exhalation through the device. A recent test of numerous pressure sensor-based electronic cigarettes currently on the market found that these devices can easily be turned on and apply power to the heating element by blowing rather than inhaling into the mouthpiece of the device as if the user had drawn from the device. Specifically, such devices falsely indicate a draw (inhalation) and activate the heater at the end of a blow into the device because they detect a pressure drop at the end of the blow, and falsely interpret this is the start of a draw. Depending on the controller for the vaporizer, this pressure drop at the end of a blow may power the heater for some amount of time, and potentially until a timeout for max draw time. This failure mode may result in the device heating without the user drawing on it, which pay provide a non-ideal user experience, may waste of battery life and vaporizable material, and in devices without temp control may overheat the vaporizable material, which can produce e-juice degradants that taste bad and are potentially more harmful when vaporized that the original contents of the e-juice formulation.

[0009] Many commercially available electronic cigarettes use pressure sensors that are mechanically similar to electret microphones, but packaged with an ASIC (application specific integrated circuit) instead of a standard electret microphone circuit. An electret microphone is an electrostatic capacitor-based microphone that does not require a polarizing power supply. Pressure sensors of this type typically accept two power signals and have one output signal to indicate whether or not a pressure drop was recently detected. For the pressure sensor's ASIC to accommodate changes in environment conditions (humidity and temperature), slight differences in mechanical assembly from sensor to sensor, and potential shifting of parts in the mechanical assembly from vibration or drop, the ASIC's output usually depends on changes in capacitance between the sensor's conductive diaphragm (which deflects with a pressure differential across it)

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and a conductive static plate in the sensor instead of depending on absolute measured capacitance crossing some threshold. Given that not all measured pressure drops indicate that the user is drawing from the device, this approach is not ideal.

[0010] In all electronic cigarettes tested (some of which may not use the standard modified electret microphone with ASIC), the device can be made to start heating at the end of a blow into the device's air/vapor outlet. In devices in which direct capacitance measurements may be made by the microcontroller, the same behavior can be produced, meaning there is no software actively handling blows into the device correctly.

[0011] This failure mode may be largely unnoticed, but it is relevant based on many user practices. For example, some electronic cigarette users hold devices in their mouths, resulting in blowing into the device. Devices that don't adequately distinguish between drawing and the end of a blowing into the mouthpiece may start heating after a user has exhaled onto the device.

[0012] Described herein are apparatuses (systems and devices) and methods that may address the problem identified above.

SUMMARY OF THE DISCLOSURE

[0013] The present invention relates generally to apparatuses, including systems and devices, for vaporizing material to form an inhalable aerosol. Specifically, these apparatuses may include vaporizers.

[0014] In particular, described herein are apparatuses including vaporizers that are adapted to prevent one or more failure modes that may result from blowing into the mouthpiece, which may be referred to herein as blow rejection or blow discrimination. In general, such vaporizers and methods of operating a vaporizer may include a pressure sensor that regulates the baseline pressure readings (which may be actual pressure readings or may be unconverted sensor readings, such as capacitance measurements) during a blow and/or a draw through the mouthpiece to prevent instability that may otherwise result from blowing into the mouthpiece.

[0015] For example, described herein are vaporizer devices comprising: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor comprising a differential pressure sensor (e.g., MEMS, capacitive membrane, etc.) configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a

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baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0016] A vaporizer device may include a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are below the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0017] A vaporizer device may include: a reservoir configured to hold a vaporizable material; a heater configured to heat the vaporizable material; a mouthpiece in communication with the reservoir; a pressure sensor configured to output instantaneous sensor readings; and a microcontroller, wherein the microcontroller is configured to: determine a baseline based on filtering the instantaneous sensor readings (2810); hold the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value or below the baseline by a second offset value (2820); compare the instantaneous sensor readings to the baseline and activate the heater to generate vapor from the vaporizable material when the instantaneous sensor readings are above the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0018] The first side of the pressure sensor may be exposed to a first air path through the mouthpiece and a second side of the pressure sensor is exposed to a second air path open to ambient pressure, and wherein the second air path is sealed from the first air path by a gasket around the pressure sensor. The third offset value may be the same as the second offset value or

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the third offset value may be the same as the first offset value. The first offset value may be zero, or the second offset value is zero.

[0019] The instantaneous pressure sensor output may be capacitance or pressure.

[0020] In general, the pressure sensors described herein may be any differential pressure sensor, such as MEMS, capacitive pressures sensors (e.g., including a capacitive membrane), or any force collector type pressure sensors that use a transducer to measure pressure or pressure differences (e.g., diaphragm, piston, etc.), piezoresistive, electromagnetic, piezoelectric, optical, potentiometric, resonant (including MEMS), etc. Differential pressure sensors may measure the distance between two pressures, one connected on different sides of the sensor. This includes pressure sensors in which one side is open/connected to ambient atmosphere (pressure).

[0021] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by low pass filtering the instantaneous sensor output.

[0022] The microcontroller may be configured to determine the baseline based on filtering the instantaneous sensor output by taking a running average of the instantaneous sensor output.

[0023] The microcontroller may further be configured to stop activating the heater to generate vapor when the instantaneous sensor output is offset from the baseline by less than the third offset value.

[0024] Also described herein are methods of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device that include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline by a first offset value; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by a second offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is offset from the baseline by more than a third offset value, indicating that suction is being applied to the mouthpiece.

[0025] A method of controlling a vaporizer device to prevent heating after blowing on a mouthpiece of the vaporizer device may include: taking instantaneous sensor readings from a pressure sensor in the vaporizer device, wherein the pressure sensor comprises a capacitive

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membrane; determining a baseline by filtering the instantaneous sensor readings; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are above the baseline; holding the baseline at a prior value of the baseline while the instantaneous sensor readings are below the baseline by an offset value; comparing the instantaneous sensor readings to the baseline and activating a heater in the vaporizer to generate vapor from a vaporizable material when the instantaneous sensor output is below the baseline by more than the offset value indicating that suction is being applied to the mouthpiece.

[0026] In some variations, the apparatuses described herein may include an inhalable aerosol comprising: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber to generate a vapor; a condenser comprising a condensation chamber in which at least a fraction of the vapor condenses to form the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0027] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The device may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0028] In some variations, the oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet. The aeration vent may comprise a third valve. The first valve, or said second valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The third valve may be chosen from the group of a check valve, a clack valve, a non-return valve, and a one-way valve. The first or second valve may be mechanically actuated. The first or second valve may be electronically actuated. The first valve or second valve may be manually actuated. The third valve may be mechanically

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actuated. The third valve may be mechanically actuated. The third valve may be electronically actuated. The third valve may be manually actuated.

[0029] In some variations, the device may further comprise a body that comprises at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. The device may further comprise a temperature regulator in communication with a temperature sensor. The temperature sensor may be the heater. The power source may be rechargeable. The power source may be removable. The oven may further comprise an access lid. The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may be mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of about 1 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.9 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.8 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.7 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.6 micron. The vapor forming medium may be heated in the oven chamber, wherein the vapor is mixed in the condensation chamber with air from the aeration vent to produce the inhalable aerosol comprising particle diameters of average size of less than or equal to 0.5 micron.

[0030] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be

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about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0031] Also described herein are methods for generating an inhalable aerosol. Such a method may comprise: providing an inhalable aerosol generating device wherein the device comprises: an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; an air inlet that originates a first airflow path that includes the oven chamber; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber to a user.

[0032] The oven may be within a body of the device. The device may further comprise a mouthpiece, wherein the mouthpiece comprises at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be separable from the oven. The mouthpiece may be integral to a body of the device, wherein the body comprises the oven. The method may further comprise a body that comprises the oven, the condenser, the air inlet, and the aeration vent. The mouthpiece may be separable from the body.

[0033] The oven chamber may comprise an oven chamber inlet and an oven chamber outlet, and the oven further comprises a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0034] The vapor forming medium may comprise tobacco. The vapor forming medium may comprise a botanical. The vapor forming medium may be heated in the oven chamber wherein the vapor forming medium may comprise a humectant to produce the vapor, wherein the vapor comprises a gas phase humectant. The vapor may comprise particle diameters of average mass

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of about 1 micron. The vapor may comprise particle diameters of average mass of about 0.9 micron. The vapor may comprise particle diameters of average mass of about 0.8 micron. The vapor may comprise particle diameters of average mass of about 0.7 micron. The vapor may comprise particle diameters of average mass of about 0.6 micron. The vapor may comprise particle diameters of average mass of about 0.5 micron.

[0035] In some variations, the humectant may comprise glycerol as a vapor-forming medium. The humectant may comprise vegetable glycerol. The humectant may comprise propylene glycol. The humectant may comprise a ratio of vegetable glycerol to propylene glycol. The ratio may be about 100:0 vegetable glycerol to propylene glycol. The ratio may be about 90:10 vegetable glycerol to propylene glycol. The ratio may be about 80:20 vegetable glycerol to propylene glycol. The ratio may be about 70:30 vegetable glycerol to propylene glycol. The ratio may be about 60:40 vegetable glycerol to propylene glycol. The ratio may be about 50:50 vegetable glycerol to propylene glycol. The humectant may comprise a flavorant. The vapor forming medium may be heated to its pyrolytic temperature. The vapor forming medium may heated to 200° C at most. The vapor forming medium may be heated to 160° C at most. The inhalable aerosol may be cooled to a temperature of about 50° - 70° C at most, before exiting the aerosol outlet of the mouthpiece.

[0036] The device may be user serviceable. The device may not be user serviceable.

[0037] A method for generating an inhalable aerosol may include: providing a vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein said vapor is formed by heating a vapor forming medium in an oven chamber to a first temperature below the pyrolytic temperature of said vapor forming medium, and cooling said vapor in a condensation chamber to a second temperature below the first temperature, before exiting an aerosol outlet of said device.

[0038] A method of manufacturing a device for generating an inhalable aerosol may include: providing said device comprising a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the

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condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0039] The method may further comprise providing the device comprising a power source or battery, a printed circuit board, a temperature regulator or operational switches.

[0040] A device for generating an inhalable aerosol may comprise a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol; and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0041] A device for generating an inhalable aerosol may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; and a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user.

[0042] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

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[0043] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; a cartridge comprising: a fluid storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle; wherein the channel forms a first side of the air inlet passage, and an internal surface of the cartridge receptacle forms a second side of the air inlet passage.

[0044] The channel may comprise at least one of a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge. The cartridge may further comprise a heater. The heater may be attached to a first end of the cartridge.

[0045] The heater may comprise a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick, wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between. The first pair of heater contacts may further comprise a formed shape that comprises a tab having a flexible spring value that extends out of the heater to couple to complete a circuit with the device body. The first pair of heater contacts may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may contact a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise a first condensation chamber. The heater may comprise more than one first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge. The cartridge may further comprise a mouthpiece. The mouthpiece may be attached to a second end of the cartridge. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one

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second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0046] The cartridge may comprise a first condensation chamber and a second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise more than one aerosol outlet in fluid communication with more than one the second condensation chamber. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

[0047] The device may comprise an airflow path comprising an air inlet passage, a second air passage, a heater chamber, a first condensation chamber, a second condensation chamber, and an aerosol outlet. The airflow path may comprise more than one air inlet passage, a heater chamber, more than one first condensation chamber, more than one second condensation chamber, more than one second condensation chamber, and more than one aerosol outlet. The heater may be in fluid communication with the fluid storage compartment. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol. The humectant may comprise vegetable glycerin.

[0048] The cartridge may be detachable. The cartridge may be receptacle and the detachable cartridge forms a separable coupling. The separable coupling may comprise a friction assembly, a snap-fit assembly or a magnetic assembly. The cartridge may comprise a fluid storage compartment, a heater affixed to a first end with a snap-fit coupling, and a mouthpiece affixed to a second end with a snap-fit coupling.

[0049] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage when a cartridge comprising a channel integral to an exterior surface is inserted into the cartridge receptacle, and wherein the channel forms a second side of the air inlet passage.

[0050] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle for receiving a cartridge; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a

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cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage.

[0051] A cartridge for a device for generating an inhalable aerosol may include: a fluid storage compartment; a channel integral to an exterior surface, wherein the channel forms a first side of an air inlet passage; and wherein an internal surface of a cartridge receptacle in the device forms a second side of the air inlet passage when the cartridge is inserted into the cartridge receptacle.

[0052] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment, wherein an exterior surface of the cartridge forms a first side of an air inlet channel when inserted into a device body comprising a cartridge receptacle, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage.

[0053] The cartridge may further comprise a second air passage in fluid communication with the channel, wherein the second air passage is formed through the material of the cartridge from an exterior surface of the cartridge to the fluid storage compartment.

[0054] The cartridge may comprise at least one of: a groove, a trough, a depression, a dent, a furrow, a trench, a crease, and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage.

[0055] A device for generating an inhalable aerosol may comprise: a cartridge comprising; a fluid storage compartment; a heater affixed to a first end comprising; a first heater contact, a resistive heating element affixed to the first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; wherein the PCB is configured to detect the absence of fluid based on the measured resistance of the resistive heating element, and turn off the device.

[0056] The printed circuit board (PCB) may comprise a microcontroller; switches; circuitry comprising a reference resister; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the

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resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0057] The micro-controller may instruct the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0058] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end comprising: a heater chamber, a first pair of heater contacts, a fluid wick, and a resistive heating element in contact with the wick; wherein the first pair of heater contacts comprise thin plates affixed about the sides of the heater chamber, and wherein the fluid wick and resistive heating element are suspended there between.

[0059] The first pair of heater contacts may further comprise: a formed shape that comprises a tab having a flexible spring value that extends out of the heater to complete a circuit with the device body. The heater contacts may be configured to mate with a second pair of heater contacts in a cartridge receptacle of the device body to complete a circuit. The first pair of heater contacts may also be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element. The first pair of heater contacts may be a heat shield that protect the heater chamber from excessive heat produced by the resistive heating element.

[0060] A cartridge for a device for generating an inhalable aerosol may comprise: a heater comprising; a heater chamber, a pair of thin plate heater contacts therein, a fluid wick positioned between the heater contacts, and a resistive heating element in contact with the wick; wherein the heater contacts each comprise a fixation site wherein the resistive heating element is tensioned therebetween.

[0061] A cartridge for a device for generating an inhalable aerosol may comprise a heater, wherein the heater is attached to a first end of the cartridge.

[0062] The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment. The heater may comprise more than one first condensation chamber. The heater may comprise a first condensation chamber. The condensation chamber may be formed along an exterior wall of the cartridge.

[0063] A cartridge for a device for generating an inhalable aerosol may comprise a fluid storage compartment; and a mouthpiece, wherein the mouthpiece is attached to a second end of the cartridge.

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[0064] The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment. The mouthpiece may comprise a second condensation chamber. The mouthpiece may comprise more than one second condensation chamber. The second condensation chamber may be formed along an exterior wall of the cartridge.

[0065] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein the heater comprises a first condensation chamber and the mouthpiece comprises a second condensation chamber.

[0066] The heater may comprise more than one first condensation chamber and the mouthpiece comprises more than one second condensation chamber. The first condensation chamber and the second condensation chamber may be in fluid communication. The mouthpiece may comprise an aerosol outlet in fluid communication with the second condensation chamber. The mouthpiece may comprise two to more aerosol outlets. The cartridge may meet International Standards Organization (ISO) recycling standards. The cartridge may meet ISO recycling standards for plastic waste.

[0067] A device for generating an inhalable aerosol may comprise: a device body comprising a cartridge receptacle; and a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

[0068] A method of fabricating a device for generating an inhalable aerosol may comprise: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly.

[0069] A method of fabricating a cartridge for a device for generating an inhalable aerosol may comprise: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0070] A cartridge for a device for generating an inhalable aerosol with an airflow path may include: a channel comprising a portion of an air inlet passage; a second air passage in fluid communication with the channel; a heater chamber in fluid communication with the second air passage; a first condensation chamber in fluid communication with the heater chamber; a second

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condensation chamber in fluid communication with the first condensation chamber; and an aerosol outlet in fluid communication with second condensation chamber.

[0071] A cartridge for a device for generating an inhalable aerosol may comprise: a fluid storage compartment; a heater affixed to a first end; and a mouthpiece affixed to a second end; wherein said mouthpiece comprises two or more aerosol outlets.

[0072] A system for providing power to an electronic device for generating an inhalable vapor may comprise; a rechargeable power storage device housed within the electronic device for generating an inhalable vapor; two or more pins that are accessible from an exterior surface of the electronic device for generating an inhalable vapor, wherein the charging pins are in electrical communication with the rechargeable power storage device; a charging cradle comprising two or more charging contacts configured to provided power to the rechargeable storage device, wherein the device charging pins are reversible such that the device is charged in the charging cradle for charging with a first charging pin on the device in contact a first charging contact on the charging cradle and a second charging pin on the device in contact with second charging contact on the charging cradle and with the first charging pin on the device in contact with second charging contact on the charging cradle and the second charging pin on the device in contact with the first charging contact on the charging cradle.

[0073] The charging pins may be visible on an exterior housing of the device. The user may permanently disable the device by opening the housing. The user may permanently destroy the device by opening the housing.

[0074] Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only illustrative embodiments of the present disclosure are shown and described. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0075] FIG. 1 is an illustrative cross-sectional view of an exemplary vaporization device.

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[0076] FIG. 2 is an illustrative cross-sectional view of an exemplary vaporization device with various electronic features and valves.

[0077] FIG. 3 is an illustrative sectional view of another exemplary vaporization device comprising a condensation chamber, air inlet and aeration vent in the mouthpiece.

[0078] FIGS. 4A-4C is an illustrative example of an oven section of another exemplary vaporization device configuration with an access lid, comprising an oven having an air inlet, air outlet, and an additional aeration vent in the airflow pathway, after the oven.

[0079] FIG. 5 is an illustrative isometric view of an assembled inhalable aerosol device.

[0080] FIGS. 6A-6D are illustrative arrangements and section views of the device body and sub-components.

[0081] FIG. 7A is an illustrative isometric view of an assembled cartridge.

[0082] FIG. 7B is an illustrative exploded isometric view of a cartridge assembly

[0083] FIG. 7C is a side section view of Figure 3A illustrating the inlet channel, inlet hole and relative placement of the wick, resistive heating element, and heater contacts, and the heater chamber inside of the heater.

[0084] FIG. 8A is an illustrative end section view of an exemplary cartridge inside the heater.

[0085] FIG. 8B is an illustrative side view of the cartridge with the cap removed and heater shown in shadow / outline.

[0086] FIGS. 9A-9L is an illustrative sequence of the assembly method for the cartridge.

[0087] FIGS. 10A-10C are illustrative sequences showing the airflow / vapor path for the cartridge.

[0088] FIGS. 11-13 represent an illustrative assembly sequence for assembling the main components of the device.

[0089] FIG. 14A illustrates a cross-section view of the assembled inhaled aerosol device.

[0090] FIG. 14B illustrates a side view of the assembled inhalable aerosol device.

[0091] FIG. 14C illustrates a top view of the assembled inhalable aerosol device.

[0092] FIG. 15 is an illustrative view of an activated, assembled inhalable aerosol device.

[0093] FIGS. 16A-16C are representative illustrations of a charging device for the aerosol device and the application of the charger with the device.

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[0094] FIGS. 17A and 17B are representative illustrations of a proportional-integral-derivative controller (PID) block diagram and circuit diagram representing the essential components in a device to control coil temperature.

[0095] FIG. 18 is a device with charging contacts visible from an exterior housing of the device.

[0096] FIG. 19 is an exploded view of a charging assembly of a device.

[0097] FIG. 20 is a detailed view of a charging assembly of a device.

[0098] FIG. 21 is a detailed view of charging pins in a charging assembly of a device.

[0099] FIG. 22 is a device in a charging cradle.

[0100] FIG. 23 is a circuit provided on a PCB configured to permit a device to comprise reversible charging contacts.

[0101] FIGS. 24A-24D illustrate schematics for one variation of a pressure sensor that may be used with any of the apparatuses described herein. FIGS. 24A-24C show dimensional drawings of the bottom, side and top, respectively, while FIG. 24D shows a section through the structure. In some variations pins may replace the solder pads labeled "gate" and "ground" in FIG. 24C.

[0102] FIG. 25 is a sectional view of a schematic illustration through one variation of a vaporizer device as described herein, showing an air path through the device.

[0103] FIG. 26 is a graph illustrating draw detection using an apparatus as described herein, illustrating tracking of multiple draws.

[0104] FIG. 27 is a graph illustrating blow detection (and rejection) and draw detection using an apparatus as described herein.

[0105] FIG. 28 is a flow diagram of a process for activating a heater.

DETAILED DESCRIPTION

[0106] Provided herein are systems and methods for generating a vapor from a material. The vapor may be delivered for inhalation by a user. The material may be a solid, liquid, powder, solution, paste, gel, or any a material with any other physical consistency. The vapor may be delivered to the user for inhalation by a vaporization device. The vaporization device may be a handheld vaporization device. The vaporization device may be held in one hand by the user.

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[0107] The vaporization device may comprise one or more heating elements the heating element may be a resistive heating element. The heating element may heat the material such that the temperature of the material increases. Vapor may be generated as a result of heating the material. Energy may be required to operate the heating element, the energy may be derived from a battery in electrical communication with the heating element. Alternatively a chemical reaction (e.g., combustion or other exothermic reaction) may provide energy to the heating element.

[0108] One or more aspects of the vaporization device may be designed and/or controlled in order to deliver a vapor with one or more specified properties to the user. For example, aspects of the vaporization device that may be designed and/or controlled to deliver the vapor with specified properties may comprise the heating temperature, heating mechanism, device air inlets, internal volume of the device, and/or composition of the material.

[0109] In some cases, a vaporization device may have an "atomizer" or "cartomizer" configured to heat an aerosol forming solution (e.g., vaporizable material). The aerosol forming solution may comprise glycerin and/or propylene glycol. The vaporizable material may be heated to a sufficient temperature such that it may vaporize.

[0110] An atomizer may be a device or system configured to generate an aerosol. The atomizer may comprise a small heating element configured to heat and/or vaporize at least a portion of the vaporizable material and a wicking material that may draw a liquid vaporizable material in to the atomizer. The wicking material may comprise silica fibers, cotton, ceramic, hemp, stainless steel mesh, and/or rope cables. The wicking material may be configured to draw the liquid vaporizable material in to the atomizer without a pump or other mechanical moving part. A resistance wire may be wrapped around the wicking material and then connected to a positive and negative pole of a current source (e.g., energy source). The resistance wire may be a coil. When the resistance wire is activated the resistance wire (or coil) may have a temperature increase as a result of the current flowing through the resistive wire to generate heat. The heat may be transferred to at least a portion of the vaporizable material through conductive, convective, and/or radiative heat transfer such that at least a portion of the vaporizable material vaporizes.

[0111] Alternatively or in addition to the atomizer, the vaporization device may comprise a "cartomizer" to generate an aerosol from the vaporizable material for inhalation by the user. The

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cartomizer may comprise a cartridge and an atomizer. The cartomizer may comprise a heating element surrounded by a liquid-soaked poly-foam that acts as holder for the vaporizable material (e.g., the liquid). The cartomizer may be reusable, rebuildable, refillable, and/or disposable. The cartomizer may be used with a tank for extra storage of a vaporizable material.

[0112] Air may be drawn into the vaporization device to carry the vaporized aerosol away from the heating element, where it then cools and condenses to form liquid particles suspended in air, which may then be drawn out of the mouthpiece by the user.

[0113] The vaporization of at least a portion of the vaporizable material may occur at lower temperatures in the vaporization device compared to temperatures required to generate an inhalable vapor in a cigarette. A cigarette may be a device in which a smokable material is burned to generate an inhalable vapor. The lower temperature of the vaporization device may result in less decomposition and/or reaction of the vaporized material, and therefore produce an aerosol with many fewer chemical components compared to a cigarette. In some cases, the vaporization device may generate an aerosol with fewer chemical components that may be harmful to human health compared to a cigarette. Additionally, the vaporization device aerosol particles may undergo nearly complete evaporation in the heating process, the nearly complete evaporation may yield an average particle size (e.g., diameter) value that may be smaller than the average particle size in tobacco or botanical based effluent.

[0114] A vaporization device may be a device configured to extract for inhalation one or more active ingredients of plant material, tobacco, and/or a botanical, or other herbs or blends. A vaporization device may be used with pure chemicals and/or humectants that may or may not be mixed with plant material. Vaporization may be alternative to burning (smoking) that may avoid the inhalation of many irritating and/or toxic carcinogenic by-products which may result from the pyrolytic process of burning tobacco or botanical products above 300° C. The vaporization device may operate at a temperature at or below 300° C.

[0115] A vaporizer (e.g., vaporization device) may not have an atomizer or cartomizer. Instead the device may comprise an oven. The oven may be at least partially closed. The oven may have a closable opening. The oven may be wrapped with a heating element, alternatively the heating element may be in thermal communication with the oven through another mechanism. A vaporizable material may be placed directly in the oven or in a cartridge fitted in the oven. The heating element in thermal communication with the oven may heat a vaporizable

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material mass in order to create a gas phase vapor. The heating element may heat the vaporizable material through conductive, convective, and/or radiative heat transfer. The vapor may be released to a vaporization chamber where the gas phase vapor may condense, forming an aerosol cloud having typical liquid vapor particles with particles having a diameter of average mass of approximately 1 micron or greater. In some cases the diameter of average mass may be approximately 0.1-1 micron.

[0116] A used herein, the term "vapor" may generally refer to a substance in the gas phase at a temperature lower than its critical point. The vapor may be condensed to a liquid or to a solid by increasing its pressure without reducing the temperature.

[0117] As used herein, the term "aerosol" may generally refer to a colloid of fine solid particles or liquid droplets in air or another gas. Examples of aerosols may include clouds, haze, and smoke, including the smoke from tobacco or botanical products. The liquid or solid particles in an aerosol may have varying diameters of average mass that may range from monodisperse aerosols, producible in the laboratory, and containing particles of uniform size; to polydisperse colloidal systems, exhibiting a range of particle sizes. As the sizes of these particles become larger, they have a greater settling speed which causes them to settle out of the aerosol faster, making the appearance of the aerosol less dense and to shorten the time in which the aerosol will linger in air. Interestingly, an aerosol with smaller particles will appear thicker or denser because it has more particles. Particle number has a much bigger impact on light scattering than particle size (at least for the considered ranges of particle size), thus allowing for a vapor cloud with many more smaller particles to appear denser than a cloud having fewer, but larger particle sizes.

[0118] As used herein the term "humectant" may generally refer to as a substance that is used to keep things moist. A humectant may attract and retain moisture in the air by absorption, allowing the water to be used by other substances. Humectants are also commonly used in many tobaccos or botanicals and electronic vaporization products to keep products moist and as vapor-forming medium. Examples include propylene glycol, sugar polyols such as glycerol, glycerin, and honey.

[0119] Rapid Aeration

[0120] In some cases, the vaporization device may be configured to deliver an aerosol with a high particle density. The particle density of the aerosol may refer to the number of the aerosol droplets relative to the volume of air (or other dry gas) between the aerosol droplets. A dense

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aerosol may easily be visible to a user. In some cases the user may inhale the aerosol and at least a fraction of the aerosol particles may impinge on the lungs and/or mouth of the user. The user may exhale residual aerosol after inhaling the aerosol. When the aerosol is dense the residual aerosol may have sufficient particle density such that the exhaled aerosol is visible to the user. In some cases, a user may prefer the visual effect and/or mouth feel of a dense aerosol.

[0121] A vaporization device may comprise a vaporizable material. The vaporizable material may be contained in a cartridge or the vaporizable material may be loosely placed in one or more cavities the vaporization device. A heating element may be provided in the device to elevate the temperature of the vaporizable material such that at least a portion of the vaporizable material forms a vapor. The heating element may heat the vaporizable material by convective heat transfer, conductive heat transfer, and/or radiative heat transfer. The heating element may heat the cartridge and/or the cavity in which the vaporizable material is stored.

[0122] Vapor formed upon heating the vaporizable material may be delivered to the user. The vapor may be transported through the device from a first position in the device to a second position in the device. In some cases, the first position may be a location where at least a portion of the vapor was generated, for example, the cartridge or cavity or an area adjacent to the cartridge or cavity. The second position may be a mouthpiece. The user may suck on the mouthpiece to inhale the vapor.

[0123] At least a fraction of the vapor may condense after the vapor is generated and before the vapor is inhaled by the user. The vapor may condense in a condensation chamber. The condensation chamber may be a portion of the device that the vapor passes through before delivery to the user. In some cases, the device may include at least one aeration vent, placed in the condensation chamber of the vaporization device. The aeration vent may be configured to introduce ambient air (or other gas) into the vaporization chamber. The air introduced into the vaporization chamber may have a temperature lower than the temperature of a gas and/or gas/vapor mixture in the condensation chamber. Introduction of the relatively lower temperature gas into the vaporization chamber may provide rapid cooling of the heated gas vapor mixture that was generated by heating the vaporizable material. Rapid cooling of the gas vapor mixture may generate a dense aerosol comprising a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user.

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[0124] An aerosol with a high concentration of liquid droplets having a smaller diameter and/or smaller average mass compared to an aerosol that is not rapidly cooled prior to inhalation by the user may be formed in a two-step process. The first step may occur in the oven chamber where the vaporizable material (e.g., tobacco and/or botanical and humectant blend) may be heated to an elevated temperature. At the elevated temperature, evaporation may happen faster than at room temperature and the oven chamber may fill with the vapor phase of the humectants. The humectant may continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

[0125] In the second step, the gas (e.g., vapor and air) may exit the oven and enter a condenser or condensation chamber and begin to cool. As the gas phase vapor cools, the saturation pressure may decrease. As the saturation pressure decreases, the saturation ratio may increase and the vapor may begin to condense, forming droplets. In some devices, with the absence of added cooling aeration, the cooling may be relatively slower such that high saturation pressures may not be reached, and the droplets that form in the devices without added cooling aeration may be relatively larger and fewer in numbers. When cooler air is introduced, a temperature gradient may be formed between the cooler air and the relatively warmer gas in the device. Mixing between the cooler air and the relatively warmer gas in a confined space inside of the vaporization device may lead to rapid cooling. The rapid cooling may generate high saturation ratios, small particles, and high concentrations of smaller particles, forming a thicker, denser vapor cloud compared to particles generated in a device without the aeration vents.

[0126] For the purpose of this disclosure, when referring to ratios of humectants such as vegetable glycerol or propylene glycol, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0127] For the purpose of this disclosure, when referring to a diameter of average mass in particle sizes, "about" means a variation of 5%, 10%, 20% or 25% depending on the embodiment.

[0128] A vaporization device configured to rapidly cool a vapor may comprise: a mouthpiece comprising an aerosol outlet at a first end of the device; an oven comprising an oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein; a condenser comprising a condensation chamber in which the vapor forms the inhalable

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aerosol; an air inlet that originates a first airflow path that includes the oven chamber and then the condensation chamber, an aeration vent that originates a second airflow path that joins the first airflow path prior to or within the condensation chamber after the vapor is formed in the oven chamber, wherein the joined first airflow path and second airflow path are configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0129] In some embodiments, the oven is within a body of the device. The oven chamber may comprise an oven chamber inlet and an oven chamber outlet. The oven may further comprise a first valve at the oven chamber inlet, and a second valve at the oven chamber outlet.

[0130] The oven may be contained within a device housing. In some cases the body of the device may comprise the aeration vent and/or the condenser. The body of the device may comprise one or more air inlets. The body of the device may comprise a housing that holds and/or at least partially contains one or more elements of the device.

[0131] The mouthpiece may be connected to the body. The mouthpiece may be connected to the oven. The mouthpiece may be connected to a housing that at least partially encloses the oven. In some cases, the mouthpiece may be separable from the oven, the body, and/or the housing that at least partially encloses the oven. The mouthpiece may comprise at least one of the air inlet, the aeration vent, and the condenser. The mouthpiece may be integral to the body of the device. The body of the device may comprise the oven.

[0132] In some cases, the one or more aeration vents may comprise a valve. The valve may regulate a flow rate of air entering the device through the aeration vent. The valve may be controlled through a mechanical and/or electrical control system.

[0133] A vaporization device configured to rapidly cool a vapor may comprise: a body, a mouthpiece, an aerosol outlet, a condenser with a condensation chamber, a heater, an oven with an oven chamber, a primary airflow inlet, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0134] FIG. 1 shows an example of a vaporization device configured to rapidly cool a vapor. The device 100, may comprise a body 101. The body may house and/or integrate with one or more components of the device. The body may house and/or integrate with a mouthpiece 102. The mouthpiece 102 may have an aerosol outlet 122. A user may inhale the generated aerosol through the aerosol outlet 122 on the mouthpiece 102. The body may house and/or integrate

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with an oven region 104. The oven region 104 may comprise an oven chamber where vapor forming medium 106 may be placed. The vapor forming medium may include tobacco and/or botanicals, with or without a secondary humectant. In some cases the vapor forming medium may be contained in a removable and/or refillable cartridge.

[0135] Air may be drawn into the device through a primary air inlet 121. The primary air inlet 121 may be on an end of the device 100 opposite the mouthpiece 102. Alternatively, the primary air inlet 121 may be adjacent to the mouthpiece 102. In some cases, a pressure drop sufficient to pull air into the device through the primary air inlet 121 may be due to a user puffing on the mouthpiece 102.

[0136] The vapor forming medium (e.g., vaporizable material) may be heated in the oven chamber by a heater 105, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components. The heater 105 may transfer heat to the vapor forming medium through conductive, convective, and/or radiative heat transfer. The generated vapor may be drawn out of the oven region and into the condensation chamber of the condenser 103 where the vapors may begin to cool and condense into micro-particles or droplets suspended in air, thus creating the initial formation of an aerosol, before being drawn out of the mouthpiece through the aerosol outlet 122.

[0137] In some cases, relatively cooler air may be introduced into the condensation chamber , through an aeration vent 107 such that the vapor condenses more rapidly compared to a vapor in a device without the aeration vent 107. Rapidly cooling the vapor may create a denser aerosol cloud having particles with a diameter of average mass of less than or equal to about 1 micron, and depending on the mixture ratio of the vapor-forming humectant, particles with a diameter of average mass of less than or equal to about 0.5 micron

[0138] Also described herein are devices for generating an inhalable aerosol said device comprising a body with a mouthpiece at one end, an attached body at the other end comprising a condensation chamber, a heater, an oven, wherein the oven comprises a first valve in the airflow path at the primary airflow inlet of the oven chamber, and a second valve at the outlet end of the oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece.

[0139] FIG. 2 shows a diagram of an alternative embodiment of the vaporization device 200. The vaporization device may have a body 201. The body 201 may integrate with and/or contain

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one or more components of the device. The body may integrate with or be connected to a mouthpiece 202

[0140] The body may comprise an oven region 204, with an oven chamber having a first constricting valve 208 in the primary air inlet of the oven chamber and a second constricting valve 209 at the oven chamber outlet. The oven chamber may be sealed with a tobacco or botanical and/or humectant / vapor forming medium 206 therein. The seal may be an air tight and/or liquid tight seal. The heater may be provided to the oven chamber with a heater 205. The heater 205 may be in thermal communication with the oven, for example the heater may be surrounding the oven chamber during the vaporization process. Heater may contact the oven. The heater may be wrapped around the oven. Before inhalation and before air is drawn in through a primary air inlet 221, pressure may build in the sealed oven chamber as heat is continually added. The pressure may build due to a phase change of the vaporizable material. Elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components may be achieved by continually adding heat to the oven. This heated pressurization process may generate even higher saturation ratios when the valves 208, 209 are opened during inhalation. The higher saturation ratios may cause relatively higher particle concentrations of gas phase humectant in the resultant aerosol. When the vapor is drawn out of the oven region and into the condensation chamber of the condenser 203, for example by inhalation by the user, the gas phase humectant vapors may be exposed to additional air through an aeration vent 207, and the vapors may begin to cool and condense into droplets suspended in air. As described previously the aerosol may be drawn through the mouthpiece 222 by the user. This condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0141] FIG. 2 also illustrates an exemplary embodiment of the additional components which would be found in a vaporizing device, including a power source or battery 211, a printed circuit board 212, a temperature regulator 213, and operational switches (not shown), housed within an internal electronics housing 214, to isolate them from the damaging effects of the moisture in the vapor and/or aerosol. The additional components may be found in a vaporizing device that may or may not comprise an aeration vent as described above.

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[0142] In some embodiments of the vaporization device, components of the device are user serviceable, such as the power source or battery. These components may be replaceable or rechargeable.

[0143] Also described herein are devices for generating an inhalable aerosol said device comprising a first body, a mouthpiece having an aerosol outlet, a condensation chamber within a condenser and an airflow inlet and channel, an attached second body, comprising a heater and oven with an oven chamber, wherein said airflow channel is upstream of the oven and the mouthpiece outlet to provide airflow through the device, across the oven, and into the condensation chamber where an auxiliary aeration vent is provided.

[0144] FIG. 3 shows a section view of a vaporization device 300. The device 300 may comprise a body 301. The body may be connected to or integral with a mouthpiece 302 at one end. The mouthpiece may comprise a condensation chamber within a condenser section 303 and an airflow inlet 321 and air channel 323. The device body may comprise a proximally located oven 304 comprising an oven chamber. The oven chamber may be in the body of the device. A vapor forming medium 306 (e.g., vaporizable material) comprising tobacco or botanical and humectant vapor forming medium may be placed in the oven. The vapor forming medium may be in direct contact with an air channel 323 from the mouthpiece. The tobacco or botanical may be heated by heater 305 surrounding the oven chamber, to generate elevated temperature gas phases (vapor) of the tobacco or botanical and humectant / vapor forming components and air drawn in through a primary air inlet 321, across the oven, and into the condensation chamber of the condenser region 303 due to a user puffing on the mouthpiece. Once in the condensation chamber where the gas phase humectant vapors begin to cool and condense into droplets suspended in air, additional air is allowed to enter through aeration vent 307, thus, once again creating a denser aerosol cloud having particles with a diameter of average mass of less than a typical vaporization device without an added aeration vent, before being drawn out of the mouthpiece through the aerosol outlet 322.

[0145] The device may comprises a mouthpiece comprising an aerosol outlet at a first end of the device and an air inlet that originates a first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol, an aeration

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vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol formed in the condensation chamber through the aerosol outlet of the mouthpiece to a user.

[0146] The device may comprise a mouthpiece comprising an aerosol outlet at a first end of the device, an air inlet that originates a first airflow path, and an aeration vent that originates a second airflow path that allows air from the aeration vent to join the first airflow path; an oven comprising an oven chamber that is in the first airflow path and includes the oven chamber and a heater for heating a vapor forming medium in the oven chamber and for forming a vapor therein, a condenser comprising a condensation chamber in which the vapor forms the inhalable aerosol and wherein air from the aeration vent joins the first airflow path prior to or within the condensation chamber and downstream from the oven chamber thereby forming a joined path, wherein the joined path is configured to deliver the inhalable aerosol through the aerosol outlet of the mouthpiece to a user, as illustrated in exemplary FIG. 3.

[0147] The device may comprise a body 101 or 201 with one or more separable components. For example, the mouthpiece 102 or 202 may be separably attached to the body 101 or 201 comprising the condensation chamber 103 or 203, a heater 105 or 205, and an oven 104 or 204, as illustrated in exemplary FIGS. 1 or 2.

[0148] The device may comprise a body with one or more separable components. For example, the mouthpiece may be separably attached to the body. The mouthpiece may comprise the condensation chamber, and may be attached to or immediately adjacent to the oven and which is separable from the body comprising a heater, and the oven, as illustrated in exemplary FIG. 3.

[0149] The at least one aeration vent may be located in the condensation chamber of the condenser, as illustrated in exemplary FIGS. 1, 2, or 3 . The at least one aeration vent may comprise a third valve in the airflow path of the at least one aeration vent, as illustrated in exemplary FIG. 2. The first, second and third valve is a check valve, a clack valve, a non-return valve, or a one-way valve. In any of the preceding variations, the first, second or third valve may be mechanically actuated, electronically actuated or manually actuated. One skilled in the art will recognize after reading this disclosure that this device may be modified in a way such that

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any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

[0150] The device may further comprise at least one of: a power source, a printed circuit board, a switch, and a temperature regulator. Alternately, one skilled in the art would recognize that each configuration previously described will also accommodate said power source (battery), switch, printed circuit board, or temperature regulator as appropriate, in the body.

[0151] The device may be disposable when the supply of pre-packaged aerosol-forming media is exhausted. Alternatively, the device may be rechargeable such that the battery may be rechargeable or replaceable, and /or the aerosol-forming media may be refilled, by the user/operator of the device. Still further, the device may be rechargeable such that the battery may be rechargeable or replaceable, and/or the operator may also add or refill a tobacco or botanical component, in addition to a refillable or replaceable aerosol-forming media to the device.

[0152] As illustrated in FIGS. 1, 2 or 3, the vaporization device may comprise tobacco or a botanical heated in said oven chamber, wherein said tobacco or botanical further comprises humectants to produce an aerosol comprising gas phase components of the humectant and tobacco or botanical. The gas phase humectant and tobacco or botanical vapor produced by said heated aerosol forming media 106, 206, 306 may further be mixed with air from a special aeration vent 107, 207, 307 after exiting the oven area 104, 204, 304 and entering a condensation chamber 103a, 203a, 303a to cool and condense said gas phase vapors to produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0153] Each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0154] The possible variations and ranges of aerosol density are great in that the possible number of combinations of temperature, pressure, tobacco or botanical choices and humectant

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selections are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures ranges and the humectant ratios to those described herein, the inventor has demonstrated that this device will produce a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0155] The humectant may comprise glycerol or vegetable glycerol as a vapor-forming medium.

[0156] The humectant may comprise propylene glycol as a vapor-forming medium.

[0157] In preferred embodiments, the humectant may comprise a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio may vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable glycerol to propylene glycol. However, more commonly said ratios would vary in increments of about 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0158] In a preferred embodiment the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0159] In a most preferred embodiment, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol.

[0160] In any of the preferred embodiments, the humectant may further comprise flavoring products. These flavorings may include enhancers comprising cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name but a few.

[0161] The tobacco or botanical may be heated in the oven up to its pyrolytic temperature, which as noted previously is most commonly measured in the range of 300 - 1000° C.

[0162] In preferred embodiments, the tobacco or botanical is heated to about 300° C at most. In other preferred embodiments, the tobacco or botanical is heated to about 200° C at most. In still other preferred embodiments, the tobacco or botanical is heated to about 160° C at most. It should be noted that in these lower temperature ranges (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components

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and flavoring products does occur. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0163] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant is mixed with air provided through an aeration vent.

[0164] In still other preferred embodiments, the aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C at most, and even as low as 35° C before exiting the mouthpiece, depending on the air temperature being mixed into the condensation chamber. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0165] Also described herein are vaporization devices for generating an inhalable aerosol comprising a unique oven configuration, wherein said oven comprises an access lid and an auxiliary aeration vent located within the airflow channel immediately downstream of the oven and before the aeration chamber. In this configuration, the user may directly access the oven by removing the access lid, providing the user with the ability to recharge the device with vaporization material.

[0166] In addition, having the added aeration vent in the airflow channel immediately after the oven and ahead of the vaporization chamber provides the user with added control over the amount of air entering the aeration chamber downstream and the cooling rate of the aerosol before it enters the aeration chamber.

[0167] As noted in FIGS. 4A-4C, the device 400 may comprise a body 401, having an air inlet 421 allowing initial air for the heating process into the oven region 404. After heating the tobacco or botanical, and humectant (heater not shown), the gas phase humectant vapor generated may travel down the airflow channel 423, passing the added aeration vent 407 wherein the user may selectively increase airflow into the heated vapor. The user may selectively increase and/or decrease the airflow to the heated vapor by controlling a valve in communication with the aeration vent 407. In some cases, the device may not have an aeration vent. Airflow into the heated vapor through the aeration vent may decrease the vapor temperature before exiting the airflow channel at the outlet 422, and increase the condensation rate and vapor

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density by decreasing the diameter of the vapor particles within the aeration chamber (not shown), thus producing a thicker, denser vapor compared to the vapor generated by a device without the aeration vent.. The user may also access the oven chamber to recharge or reload the device 400, through an access lid 430 provided therein, making the device user serviceable. The access lid may be provided on a device with or without an aeration vent.

[0168] Provided herein is a method for generating an inhalable aerosol, the method comprising: providing an vaporization device, wherein said device produces a vapor comprising particle diameters of average mass of about 1 micron or less, wherein the vapor is formed by heating a vapor forming medium in an oven chamber of the device to a first temperature below the pyrolytic temperature of the vapor forming medium, and cooling the vapor in a condensation chamber to a temperature below the first temperature, before exiting an aerosol outlet of said device.

[0169] In some embodiments the vapor may be cooled by mixing relatively cooler air with the vapor in the condensation chamber during the condensation phase, after leaving the oven, where condensation of the gas phase humectants occurs more rapidly due to high saturation ratios being achieved at the moment of aeration, producing a higher concentration of smaller particles, with fewer by-products, in a denser aerosol, than would normally occur in a standard vaporization or aerosol generating device.

[0170] In some embodiments, formation of an inhalable aerosol is a two-step process. The first step occurs in the oven where the tobacco or botanical and humectant blend is heated to an elevated temperature. At the elevated temperature, evaporation happens faster than at room temperature and the oven chamber fills with the vapor phase of the humectants. The humectant will continue to evaporate until the partial pressure of the humectant is equal to the saturation pressure. At this point, the gas is said to have a saturation ratio of 1 ($S = P_{partial}/P_{sat}$).

[0171] In the second step, the gas leaves the oven chamber, passes to a condensation chamber in a condenser and begins to cool. As the gas phase vapor cools, the saturation pressure also goes down, causing the saturation ratio to rise, and the vapor to condensate, forming droplets. When cooling air is introduced, the large temperature gradient between the two fluids mixing in a confined space leads to very rapid cooling, causing high saturation ratios, small particles, and higher concentrations of smaller particles, forming a thicker, denser vapor cloud.

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[0172] Provided herein is a method for generating an inhalable aerosol comprising: a vaporization device having a body with a mouthpiece at one end, and an attached body at the other end comprising; a condenser with a condensation chamber, a heater, an oven with an oven chamber, and at least one aeration vent provided in the body, downstream of the oven, and upstream of the mouthpiece, wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0173] As previously described, a vaporization device having an auxiliary aeration vent located in the condensation chamber capable of supplying cool air (relative to the heated gas components) to the gas phase vapors and tobacco or botanical components exiting the oven region, may be utilized to provide a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to about 1 micron.

[0174] In another aspect, provided herein is a method for generating an inhalable aerosol comprising: a vaporization device, having a body with a mouthpiece at one end, and an attached body at the other end comprising: a condenser with a condensation chamber, a heater, an oven with an oven chamber, wherein said oven chamber further comprises a first valve in the airflow path at the inlet end of the oven chamber, and a second valve at the outlet end of the oven chamber; and at least one aeration vent provided in said body, downstream of the oven, and upstream of the mouthpiece wherein tobacco or botanical comprising a humectant is heated in said oven chamber to produce a vapor comprising gas phase humectants.

[0175] As illustrated in exemplary FIG. 2, by sealing the oven chamber with a tobacco or botanical and humectant vapor forming medium 206 therein, and applying heat with the heater 205 during the vaporization process, before inhalation and air is drawn in through a primary air inlet 221, the pressure will build in the oven chamber as heat is continually added with an electronic heating circuit generated through the combination of the battery 211, printed circuit board 212, temperature regulator 213, and operator controlled switches (not shown), to generate even greater elevated temperature gas phase humectants (vapor) of the tobacco or botanical and humectant vapor forming components. This heated pressurization process generates even higher saturation ratios when the valves 208, 209 are opened during inhalation, which cause higher particle concentrations in the resultant aerosol, when the vapor is drawn out of the oven region and into the condensation chamber , where they are again exposed to additional air through an

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aeration vent 207, and the vapors begin to cool and condense into droplets suspended in air, as described previously before the aerosol is withdrawn through the mouthpiece 222. The inventor also notes that this condensation process may be further refined by adding an additional valve 210, to the aeration vent 207 to further control the air-vapor mixture process.

[0176] In some embodiments of any one of the inventive methods, the first, second and/or third valve is a one-way valve, a check valve, a clack valve, or a non-return valve. The first, second and/or third valve may be mechanically actuated. The first, second and/or third valve may be electronically actuated. The first, second and/or third valve may be automatically actuated. The first, second and/or third valve may be manually actuated either directly by a user or indirectly in response to an input command from a user to a control system that actuates the first, second and/or third valve.

[0177] In other aspects of the inventive methods, said device further comprises at least one of: a power source, a printed circuit board, or a temperature regulator.

[0178] In any of the preceding aspects of the inventive method, one skilled in the art will recognize after reading this disclosure that this method may be modified in a way such that any one, or each of these openings or vents could be configured to have a different combination or variation of mechanisms or electronics as described to control airflow, pressure and temperature of the vapor created and aerosol being generated by these device configurations, including a manually operated opening or vent with or without a valve.

[0179] The possible variations and ranges of aerosol density are great in that the possible number of temperature, pressure, tobacco or botanical choices and humectant selections and combinations are numerous. However, by excluding the tobacco or botanical choices and limiting the temperatures to within the ranges and the humectant ratios described herein, the inventor has demonstrated a method for generating a far denser, thicker aerosol comprising more particles than would have otherwise been produced without the extra cooling air, with a diameter of average mass of less than or equal to 1 micron.

[0180] In some embodiments of the inventive methods, the humectant comprises a ratio of vegetable glycerol to propylene glycol as a vapor-forming medium. The ranges of said ratio will vary between a ratio of about 100:0 vegetable glycerol to propylene glycol and a ratio of about 50:50 vegetable glycerol to propylene glycol. The difference in preferred ratios within the above stated range may vary by as little as 1, for example, said ratio may be about 99:1 vegetable

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glycerol to propylene glycol. However, more commonly said ratios would vary in increments of 5, for example, about 95:5 vegetable glycerol to propylene glycol; or about 85:15 vegetable glycerol to propylene glycol; or about 55:45 vegetable glycerol to propylene glycol.

[0181] Because vegetable glycerol is less volatile than propylene glycol, it will recondense in greater proportions. A humectant with higher concentrations of glycerol will generate a thicker aerosol. The addition of propylene glycol will lead to an aerosol with a reduced concentration of condensed phase particles and an increased concentration of vapor phase effluent. This vapor phase effluent is often perceived as a tickle or harshness in the throat when the aerosol is inhaled. To some consumers, varying degrees of this sensation may be desirable. The ratio of vegetable glycerol to propylene glycol may be manipulated to balance aerosol thickness with the right amount of "throat tickle."

[0182] In a preferred embodiment of the method, the ratio for the vapor forming medium will be between the ratios of about 80:20 vegetable glycerol to propylene glycol, and about 60:40 vegetable glycerol to propylene glycol.

[0183] In a most preferred embodiment of the method, the ratio for the vapor forming medium will be about 70:30 vegetable glycerol to propylene glycol. On will envision that there will be blends with varying ratios for consumers with varying preferences.

[0184] In any of the preferred embodiments of the method, the humectant further comprises flavoring products. These flavorings include enhancers such as cocoa solids, licorice, tobacco or botanical extracts, and various sugars, to name a few.

[0185] In some embodiments of the method, the tobacco or botanical is heated to its pyrolytic temperature.

[0186] In preferred embodiments of the method, the tobacco or botanical is heated to about 300° C at most.

[0187] In other preferred embodiments of the method, the tobacco or botanical is heated to about 200° C at most. In still other embodiments of the method, the tobacco or botanical is heated to about 160° C at most.

[0188] As noted previously, at these lower temperatures, (< 300° C), pyrolysis of tobacco or botanical does not typically occur, yet vapor formation of the tobacco or botanical components and flavoring products does occur. As may be inferred from the data supplied by Baker et al., an aerosol produced at these temperatures is also substantially free from Hoffman analytes or at

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least 70% less Hoffman analytes than a common tobacco or botanical cigarette and scores significantly better on the Ames test than a substance generated by burning a common cigarette. In addition, vapor formation of the components of the humectant, mixed at various ratios will also occur, resulting in nearly complete vaporization, depending on the temperature, since propylene glycol has a boiling point of about 180° - 190° C and vegetable glycerin will boil at approximately 280° - 290° C.

[0189] In any one of the preceding methods, said inhalable aerosol produced by tobacco or a botanical comprising a humectant and heated in said oven produces an aerosol comprising gas phase humectants is further mixed with air provided through an aeration vent.

[0190] In any one of the preceding methods, said aerosol produced by said heated tobacco or botanical and humectant mixed with air, is cooled to a temperature of about 50° - 70° C, and even as low as 35° C, before exiting the mouthpiece. In some embodiments, the temperature is cooled to about 35° - 55° C at most, and may have a fluctuating range of ± about 10° C or more within the overall range of about 35° - 70° C.

[0191] In some embodiments of the method, the vapor comprising gas phase humectant may be mixed with air to produce an aerosol comprising particle diameters of average mass of less than or equal to about 1 micron.

[0192] In other embodiments of the method, each aerosol configuration produced by mixing the gas phase vapors with the cool air may comprise a different range of particles, for example; with a diameter of average mass of less than or equal to about 0.9 micron; less than or equal to about 0.8 micron; less than or equal to about 0.7 micron; less than or equal to about 0.6 micron; and even an aerosol comprising particle diameters of average mass of less than or equal to about 0.5 micron.

[0193] Cartridge Design and Vapor Generation from Material in Cartridge

[0194] In some cases, a vaporization device may be configured to generate an inhalable aerosol. A device may be a self-contained vaporization device. The device may comprise an elongated body which functions to complement aspects of a separable and recyclable cartridge with air inlet channels, air passages, multiple condensation chambers, flexible heater contacts, and multiple aerosol outlets. Additionally, the cartridge may be configured for ease of manufacture and assembly.

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[0195] Provided herein is a vaporization device for generating an inhalable aerosol. The device may comprise a device body, a separable cartridge assembly further comprising a heater, at least one condensation chamber, and a mouthpiece. The device provides for compact assembly and disassembly of components with detachable couplings; overheat shut-off protection for the resistive heating element; an air inlet passage (an enclosed channel) formed by the assembly of the device body and a separable cartridge; at least one condensation chamber within the separable cartridge assembly; heater contacts; and one or more refillable, reusable, and/or recyclable components.

[0196] Provided herein is a device for generating an inhalable aerosol comprising: a device body comprising a cartridge receptacle; a cartridge comprising: a storage compartment, and a channel integral to an exterior surface of the cartridge, and an air inlet passage formed by the channel and an internal surface of the cartridge receptacle when the cartridge is inserted into the cartridge receptacle. The cartridge may be formed from a metal, plastic, ceramic, and/or composite material. The storage compartment may hold a vaporizable material. FIG. 7A shows an example of a cartridge 30 for use in the device. The vaporizable material may be a liquid at or near room temperature. In some cases the vaporizable material may be a liquid below room temperature. The channel may form a first side of the air inlet passage, and an internal surface of the cartridge receptacle may form a second side of the air inlet passage, as illustrated in various non-limiting aspects of FIGS. 5-6D, 7C, 8A, 8B, and 10A

[0197] Provided herein is a device for generating an inhalable aerosol. The device may comprise a body that houses, contains, and or integrates with one or more components of the device. The device body may comprise a cartridge receptacle. The cartridge receptacle may comprise a channel integral to an interior surface of the cartridge receptacle; and an air inlet passage formed by the channel and an external surface of the cartridge when the cartridge is inserted into the cartridge receptacle. A cartridge may be fitted and/or inserted into the cartridge receptacle. The cartridge may have a fluid storage compartment. The channel may form a first side of the air inlet passage, and an external surface of the cartridge forms a second side of the air inlet passage. The channel may comprise at least one of: a groove; a trough; a track; a depression; a dent; a furrow; a trench; a crease; and a gutter. The integral channel may comprise walls that are either recessed into the surface or protrude from the surface where it is formed. The internal side walls of the channel may form additional sides of the air inlet passage. The

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channel may have a round, oval, square, rectangular, or other shaped cross section. The channel may have a closed cross section. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm wide. The channel may be about 0.1 mm, 0.5 mm, 1 mm, 2 mm, or 5 mm deep. The channel may be about 0.1 cm, 0.5 cm, 1 cm, 2 cm, or 5 cm long. There may be at least 1 channel.

[0198] In some embodiments, the cartridge may further comprise a second air passage in fluid communication with the air inlet passage to the fluid storage compartment, wherein the second air passage is formed through the material of the cartridge.

[0199] FIGS. 5-7C show various views and aspects of a compact electronic device assembly 10 for generating an inhalable aerosol. The compact electronic device 10 may comprise a device body 20 with a cartridge receptacle 21 for receiving a cartridge 30. The device body may have a square or rectangular cross section. Alternatively, the cross section of the body may be any other regular or irregular shape. The cartridge receptacle may be shaped to receive an opened cartridge 30 or "pod" 30a. The cartridge may be opened when a protective cap is removed from a surface of the cartridge. In some cases, the cartridge may be opened when a hole or opening is formed on a surface of the cartridge. The pod 30a may be inserted into an open end of the cartridge receptacle 21 so that exposed first heater contact tips 33a on the heater contacts 33 of the pod make contact with the second heater contacts 22 of the device body, thus forming the device assembly 10.

[0200] Referring to FIG. 14C, it is apparent in the plan view that when the pod 30a is inserted into the notched body of the cartridge receptacle 21, the channel air inlet 50 is left exposed. The size of the channel air inlet 50 may be varied by altering the configuration of the notch in the cartridge receptacle 21.

[0201] The device body may further comprise a rechargeable battery, a printed circuit board (PCB) 24 containing a microcontroller with the operating logic and software instructions for the device, a pressure switch 27 for sensing the user's puffing action to activate the heater circuit (2830), an indicator light 26, charging contacts (not shown), and an optional charging magnet or magnetic contact (not shown). The cartridge may further comprise a heater 36. The heater may be powered by the rechargeable battery. The temperature of the heater may be controlled by the microcontroller. The heater may be attached to a first end of the cartridge.

[0202] In some embodiments, the heater may comprise a heater chamber 37, a first pair of heater contacts 33, 33', a fluid wick 34, and a resistive heating element 35 in contact with the

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wick. The first pair of heater contacts may comprise thin plates affixed about the sides of the heater chamber. The fluid wick and resistive heating element may be suspended between the heater contacts.

[0203] In some embodiments, there may be two or more resistive heating elements 35, 35' and two or more wicks 34, 34'. In some of the embodiments, the heater contact 33 may comprise: a flat plate; a male contact; a female receptacle, or both; a flexible contact and/or copper alloy or another electrically conductive material. The first pair of heater contacts may further comprise a formed shape that may comprise a tab (e.g., flange) having a flexible spring value that extends out of the heater to complete a circuit with the device body. The first pair of heater contact may be a heat sink that absorb and dissipate excessive heat produced by the resistive heating element. Alternatively, the first pair of heater contacts may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater may enclose a first end of the cartridge and a first end of the fluid storage compartment.

[0204] As illustrated in the exploded assembly of FIG. 7B, a heater enclosure may comprises two or more heater contacts 33, each comprising a flat plate which may be machined or stamped from a copper alloy or similar electrically conductive material. The flexibility of the tip is provided by the cut-away clearance feature 33b created below the male contact point tip 33a which capitalizes on the inherent spring capacity of the metal sheet or plate material. Another advantage and improvement of this type of contact is the reduced space requirement, simplified construction of a spring contact point (versus a pogo pin) and the easy of assembly. The heater may comprise a first condensation chamber. The heater may comprise more one or more additional condensation chambers in addition to the first condensation chamber. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0205] In some cases, the cartridge (e.g., pod) is configured for ease of manufacturing and assembly. The cartridge may comprise an enclosure. The enclosure may be a tank. The tank may comprise an interior fluid storage compartment 32. The interior fluid storage compartment 32 which is open at one or both ends and comprises raised rails on the side edges 45b and 46b. The cartridge may be formed from plastic, metal, composite, and/or a ceramic material. The cartridge may be rigid or flexible.

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[0206] The tank may further comprise a set of first heater contact plates 33 formed from copper alloy or another electrically conductive material, having a thin cut-out 33b below the contact tips 33a (to create a flexible tab) which are affixed to the sides of the first end of the tank and straddle the open-sided end 53 of the tank. The plates may affix to pins, or posts as shown in FIGS. 7B or 5, or may be attached by other common means such as compression beneath the enclosure 36. A fluid wick 34 having a resistive heating element 35 wrapped around it, is placed between the first heater contact plates 33, and attached thereto. A heater 36, comprising raised internal edges on the internal end (not shown), a thin mixing zone (not shown), and primary condensation channel covers 45a that slide over the rails 45b on the sides of the tank on the first half of the tank, creating a primary condensation channel / chamber 45. In addition, a small male snap feature 39b located at the end of the channel cover is configured fall into a female snap feature 39a, located mid-body on the side of the tank, creating a snap-fit assembly.

[0207] As will be further clarified below, the combination of the open-sided end 53, the protruding tips 33a of the contact plates 33, the fluid wick 34 having a resistive heating element 35, enclosed in the open end of the fluid storage tank, under the heater 36, with a thin mixing zone therein, creates an efficient heater system. In addition, the primary condensation channel covers 45a which slide over the rails 45b on the sides of the tank create an integrated, easily assembled, primary condensation chamber 45, all within the heater at the first end of the cartridge 30 or pod 30a.

[0208] In some embodiments of the device, as illustrated in FIGS. 9A-9L, the heater may encloses at least a first end of the cartridge. The enclosed first end of the cartridge may include the heater and the interior fluid storage compartment. In some embodiments, the heater further comprises at least one first condensation chamber 45.

[0209] FIGS. 9A-9L show diagramed steps that may be performed to assemble a cartomizer and/or mouthpiece. In A-B the fluid storage compartment 32a may be oriented such that the heater inlet 53 faces upward. The heater contacts 33 may be inserted into the fluid storage compartment. Flexible tabs 33a may be inserted into the heater contacts 33. In a step D the resistive heating element 35 may be wound on to the wick 34. In step E the wick 34 and heater 35 may be placed on the fluid storage compartment. One or more free ends of the heater may sit outside the heater contacts. The one or more free ends may be soldered in place, rested in a groove, or snapped into a fitted location. At least a fraction of the one or more free ends may be

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in communication with the heater contacts 33. In a step F the heater enclosure 36 may be snapped in place. The heater enclosure 36 may be fitted on the fluid storage compartment. Step G shows the heater enclosure 36 is in place on the fluid storage compartment. In step H the fluid storage compartment can be flipped over. In step I the mouthpiece 31 can be fitted on the fluid storage compartment. Step J shows the mouthpiece 31 in place on the fluid storage compartment. In step K an end 38 can be fitted on the fluid storage compartment opposite the mouthpiece. Step L shows a fully assembled cartridge 30. FIG. 7B shows an exploded view of the assembled cartridge 30.

[0210] Depending on the size of the heater and/or heater chamber, the heater may have more than one wick 34 and resistive heating element 35.

[0211] In some embodiments, the first pair of heater contacts 33 further comprises a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater. In some embodiments, the cartridge 30 comprises heater contacts 33 which are inserted into the cartridge receptacle 21 of the device body 20 wherein, the flexible tabs 33a insert into a second pair of heater contacts 22 to complete a circuit with the device body. The first pair of heater contacts 33 may be a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element 35. The first pair of heater contacts 33 may be a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element 35. The first pair of heater contacts may be press-fit to an attachment feature on the exterior wall of the first end of the cartridge. The heater 36 may enclose a first end of the cartridge and a first end of the fluid storage compartment 32a. The heater may comprise a first condensation chamber 45. The heater may comprise at least one additional condensation chamber 45, 45', 45", etc. The first condensation chamber may be formed along an exterior wall of the cartridge.

[0212] In still other embodiments of the device, the cartridge may further comprise a mouthpiece 31, wherein the mouthpiece comprises at least one aerosol outlet channel / secondary condensation chamber 46; and at least one aerosol outlet 47.The mouthpiece may be attached to a second end of the cartridge. The second end of the cartridge with the mouthpiece may be exposed when the cartridge is inserted in the device. The mouthpiece may comprise more than one second condensation chamber 46, 46', 46", etc. The second condensation chamber is formed along an exterior wall of the cartridge.

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[0213] The mouthpiece 31 may enclose the second end of the cartridge and interior fluid storage compartment. The partially assembled (e.g., mouthpiece removed) unit may be inverted and filled with a vaporizable fluid through the opposite, remaining (second) open end. Once filled, a snap-on mouthpiece 31 that also closes and seals the second end of the tank is inserted over the end. It also comprises raised internal edges (not shown), and aerosol outlet channel covers 46a that may slide over the rails 46b located on the sides of the second half of the tank, creating aerosol outlet channels / secondary condensation chambers 46. The aerosol outlet channels / secondary condensation chambers 46 slide over the end of primary condensation chamber 45, at a transition area 57, to create a junction for the vapor leaving the primary chamber and proceed out through the aerosol outlets 47, at the end of the aerosol outlet channels 46 and user-end of the mouthpiece 31.

[0214] The cartridge may comprise a first condensation chamber and a second condensation chamber 45, 46. The cartridge may comprise more than one first condensation chamber and more than one second condensation chamber 45, 46, 45', 46', etc.

[0215] In some embodiments of the device, a first condensation chamber 45 may be formed along the outside of the cartridge fluid storage compartment 31. In some embodiments of the device an aerosol outlet 47 exists at the end of aerosol outlet chamber 46. In some embodiments of the device, a first and second condensation chamber 45, 46 may be formed along the outside of one side of the cartridge fluid storage compartment 32a. In some embodiments the second condensation chamber may be an aerosol outlet chamber. In some embodiments another pair of first and/or second condensation chambers 45', 46' is formed along the outside of the cartridge fluid storage compartment 32a on another side of the device. In some embodiments another aerosol outlet 47' will also exist at the end of the second pair of condensation chambers 45', 46'.

[0216] In any one of the embodiments, the first condensation chamber and the second condensation chamber may be in fluid communication as illustrated in FIG. 10C.

[0217] In some embodiments, the mouthpiece may comprise an aerosol outlet 47 in fluid communication with the second condensation chamber 46. The mouthpiece may comprise more than one aerosol outlet 47, 47' in fluid communication with more than one the second condensation chamber 46, 46'. The mouthpiece may enclose a second end of the cartridge and a second end of the fluid storage compartment.

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[0218] In each of the embodiments described herein, the cartridge may comprise an airflow path comprising: an air inlet passage; a heater; at least a first condensation chamber; an aerosol outlet chamber, and an outlet port. In some of the embodiments described herein, the cartridge comprises an airflow path comprising: an air inlet passage; a heater; a first condensation chamber; a secondary condensation chamber; and an outlet port.

[0219] In still other embodiments described herein the cartridge may comprise an airflow path comprising at least one air inlet passage; a heater; at least one first condensation chamber; at least one secondary condensation chamber; and at least one outlet port.

[0220] As illustrated in FIGS. 10A-10C, an airflow path is created when the user draws on the mouthpiece 31 to create a suction (e.g., a puff), which essentially pulls air through the channel air inlet opening 50, through the air inlet passage 51, and into the heater chamber 37 through the second air passage (tank air inlet hole) 41 at the tank air inlet 52, then into the heater inlet 53. At this point, the pressure sensor has sensed the user's puff, and activated the circuit to the resistive heating element 35, which in turn, begins to generate vapor from the vapor fluid (e-juice). As air enters the heater inlet 53, it begins to mix and circulate in a narrow chamber above and around the wick 34 and between the heater contacts 33, generating heat, and dense, concentrated vapor as it mixes in the flow path 54 created by the sealing structure obstacles 44. FIG. 8A shows a detailed view of the sealing structure obstacles 44. Ultimately the vapor may be drawn, out of the heater along an air path 55 near the shoulder of the heater and into the primary condensation chamber 45 where the vapor expands and begins to cool. As the expanding vapor moves along the airflow path, it makes a transition from the primary condensation chamber 45 through a transition area 57, creating a junction for the vapor leaving the primary chamber, and entering the second vapor chamber 46, and proceeds out through the aerosol outlets 47, at the end of the mouthpiece 31 to the user.

[0221] As illustrated in FIGS. 10A-10C, the device may have a dual set of air inlet passages 50-53, dual first condensation chambers 55/45, dual second condensation chambers and aeration channels 57/46, and/or dual aerosol outlet vents 47.

[0222] Alternatively, the device may have an airflow path comprising: an air inlet passage 50, 51; a second air passage 41; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and/or an aerosol outlet 47.

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[0223] In some cases, the devise may have an airflow path comprising: more than one air inlet passage; more than one second air passage; a heater chamber; more than one first condensation chamber; more than one second condensation chamber; and more than one aerosol outlet as clearly illustrated in FIGS. 10A-10C.

[0224] In any one of the embodiments described herein, the heater 36 may be in fluid communication with the internal fluid storage compartment 32a.

[0225] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater chamber 37, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid, as illustrated in FIGS. 10A, 10C and 14.

[0226] In some embodiments of the device, the condensed aerosol fluid may comprise a nicotine formulation. In some embodiments, the condensed aerosol fluid may comprise a humectant. In some embodiments, the humectant may comprise propylene glycol. In some embodiments, the humectant may comprise vegetable glycerin.

[0227] In some cases, the cartridge may be detachable from the device body. In some embodiments, the cartridge receptacle 21 and the detachable cartridge may form a separable coupling. In some embodiments the separable coupling may comprise a friction assembly. As illustrated in FIGS. 11-14, the device may have a press-fit (friction) assembly between the cartridge pod 30a and the device receptacle. Additionally, a dent / friction capture such as 43 may be utilized to capture the pod 30a to the device receptacle or to hold a protective cap 38 on the pod, as further illustrated in FIG. 8B.

[0228] In other embodiments, the separable coupling may comprise a snap-fit or snap-lock assembly. In still other embodiments the separable coupling may comprise a magnetic assembly.

[0229] In any one of the embodiments described herein, the cartridge components may comprise a snap-fit or snap-lock assembly, as illustrated in FIG. 5. In any one of the embodiments, the cartridge components may be reusable, refillable, and/or recyclable. The design of these cartridge components lend themselves to the use of such recyclable plastic materials as polypropylene, for the majority of components.

[0230] In some embodiments of the device 10, the cartridge 30 may comprise: a fluid storage compartment 32; a heater 36 affixed to a first end with a snap-fit coupling 39a, 39b; and a mouthpiece 31 affixed to a second end with a snap-fit coupling 39c, 39d (not shown – but similar to 39a and 39b). The heater 36 may be in fluid communication with the fluid storage

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compartment 32. The fluid storage compartment may be capable of retaining condensed aerosol fluid. The condensed aerosol fluid may comprise a nicotine formulation. The condensed aerosol fluid may comprise a humectant. The humectant may comprise propylene glycol and / or vegetable glycerin.

[0231] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein an interior surface of the cartridge receptacle forms a first side of an air inlet passage 51 when a cartridge comprising a channel integral 40 to an exterior surface is inserted into the cartridge receptacle 21, and wherein the channel forms a second side of the air inlet passage 51.

[0232] Provided herein is a device for generating an inhalable aerosol comprising: a device body 20 comprising a cartridge receptacle 21 for receiving a cartridge 30; wherein the cartridge receptacle comprises a channel integral to an interior surface and forms a first side of an air inlet passage when a cartridge is inserted into the cartridge receptacle, and wherein an exterior surface of the cartridge forms a second side of the air inlet passage 51.

[0233] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a channel integral 40 to an exterior surface, wherein the channel forms a first side of an air inlet passage 51; and wherein an internal surface of a cartridge receptacle 21 in the device forms a second side of the air inlet passage 51 when the cartridge is inserted into the cartridge receptacle.

[0234] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32, wherein an exterior surface of the cartridge forms a first side of an air inlet channel 51 when inserted into a device body 10 comprising a cartridge receptacle 21, and wherein the cartridge receptacle further comprises a channel integral to an interior surface, and wherein the channel forms a second side of the air inlet passage 51.

[0235] In some embodiments, the cartridge further comprises a second air passage 41 in fluid communication with the channel 40, wherein the second air passage 41 is formed through the material of the cartridge 32 from an exterior surface of the cartridge to the internal fluid storage compartment 32a.

[0236] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises at least one of: a groove; a trough; a depression; a dent; a furrow; a trench; a crease; and a gutter.

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[0237] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the integral channel 40 comprises walls that are either recessed into the surface or protrude from the surface where it is formed.

[0238] In some embodiments of the device body cartridge receptacle 21 or the cartridge 30, the internal side walls of the channel 40 form additional sides of the air inlet passage 51.

[0239] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge 30 comprising; a fluid storage compartment 32a; a heater affixed to a first end comprising; a first heater contact 33, a resistive heating element 35 affixed to the first heater contact 33; a device body 20 comprising; a cartridge receptacle 21 for receiving the cartridge 30; a second heater contact 22 adapted to receive the first heater contact 33 and to complete a circuit; a power source 23 connected to the second heater contact 22; a printed circuit board (PCB) 24 connected to the power source 23 and the second heater contact 22; wherein the PCB 24 is configured to detect the absence of fluid based on the measured resistance of the resistive heating element 35, and turn off the device.

[0240] Referring now to FIGS. 13, 14A-C, and 15, in some embodiments, the device body further comprises at least one: second heater contact 22 (best shown in FIG. 6C detail); a battery 23; a printed circuit board 24; a pressure sensor 27; and an indicator light 26.

[0241] In some embodiments, the printed circuit board (PCB) further comprises: a microcontroller; switches; circuitry comprising a reference resistor; and an algorithm comprising logic for control parameters; wherein the microcontroller cycles the switches at fixed intervals to measure the resistance of the resistive heating element relative to the reference resistor, and applies the algorithm control parameters to control the temperature of the resistive heating element.

[0242] As illustrated in the basic block diagram of FIG. 17A, the device utilizes a proportional-integral-derivative controller or PID control law. A PID controller calculates an "error" value as the difference between a measured process variable and a desired SetPoint. When PID control is enabled, power to the coil is monitored to determine whether or not acceptable vaporization is occurring. With a given airflow over the coil, more power will be required to hold the coil at a given temperature if the device is producing vapor (heat is removed from the coil to form vapor). If power required to keep the coil at the set temperature drops below a threshold, the device indicates that it cannot currently produce vapor. Under normal

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operating conditions, this indicates that there is not enough liquid in the wick for normal vaporization to occur.

[0243] In some embodiments, the micro-controller instructs the device to turn itself off when the resistance exceeds the control parameter threshold indicating that the resistive heating element is dry.

[0244] In still other embodiments, the printed circuit board further comprises logic capable of detecting the presence of condensed aerosol fluid in the fluid storage compartment and is capable of turning off power to the heating contact(s) when the condensed aerosol fluid is not detected. When the microcontroller is running the PID temperature control algorithm 70, the difference between a set point and the coil temperature (error) is used to control power to the coil so that the coil quickly reaches the set point temperature, [between 200°C and 400°C]. When the over-temperature algorithm is used, power is constant until the coil reaches an over-temperature threshold, [between 200°C and 400°C]; (FIG. 17 A applies: set point temperature is over-temperature threshold; constant power until error reaches 0).

[0245] The essential components of the device used to control the resistive heating element coil temperature are further illustrated in the circuit diagram 71 of FIG. 17B. Wherein, BATT 23 is the battery; MCU 72 is the microcontroller; Q1 (76) and Q2 (77) are P-channel MOSFETs (switches); R_COIL 74 is the resistance of the coil. R_REF 75 is a fixed reference resistor used to measure R_COIL 74 through a voltage divider 73.

[0246] The battery powers the microcontroller. The microcontroller turns on Q2 for 1 ms every 100ms so that the voltage between R_REF and R_COIL (a voltage divider) may be measured by the MCU at V_MEAS. When Q2 is off, the control law controls Q1 with PWM (pulse width modulation) to power the coil (battery discharges through Q1 and R_COIL when Q1 is on).

[0247] In some embodiments of the device, the device body further comprises at least one: second heater contact; a power switch; a pressure sensor; and an indicator light.

[0248] In some embodiments of the device body, the second heater contact 22 may comprise: a female receptacle; or a male contact, or both, a flexible contact; or copper alloy or another electrically conductive material.

[0249] In some embodiments of the device body, the battery supplies power to the second heater contact, pressure sensor, indicator light and the printed circuit board. In some

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embodiments, the battery is rechargeable. In some embodiments, the indicator light 26 indicates the status of the device and / or the battery or both.

[0250] In some embodiments of the device, the first heater contact and the second heater contact complete a circuit that allows current to flow through the heating contacts when the device body and detachable cartridge are assembled, which may be controlled by an on / off switch. Alternatively, the device can be turned on an off by a puff sensor. The puff sensor may comprise a capacitive membrane. The capacitive membrane may be similar to a capacitive membrane used in a microphone.

[0251] In some embodiments of the device, there is also an auxiliary charging unit for recharging the battery 23 in the device body. As illustrated in FIGS. 16A-16C, the charging unit 60, may comprise a USB device with a plug for a power source 63 and protective cap 64, with a cradle 61 for capturing the device body 20 (with or without the cartridge installed). The cradle may further comprise either a magnet or a magnetic contact 62 to securely hold the device body in place during charging. As illustrated in FIG. 6B, the device body further comprises a mating charging contact 28 and a magnet or magnetic contact 29 for the auxiliary charging unit. FIG. 16C is an illustrative example of the device 20 being charged in a power source 65 (laptop computer or tablet).

[0252] In some cases the microcontroller on the PCB may be configured to monitor the temperature of the heater such that the vaporizable material is heated to a prescribed temperature. The prescribed temperature may be an input provided by the user. A temperature sensor may be in communication with the microcontroller to provide an input temperature to the microcontroller for temperature regulation. A temperature sensor may be a thermistor, thermocouple, thermometer, or any other temperature sensors. In some cases, the heating element may simultaneously perform as both a heater and a temperature sensor. The heating element may differ from a thermistor by having a resistance with a relatively lower dependence on temperature. The heating element may comprise a resistance temperature detector.

[0253] The resistance of the heating element may be an input to the microcontroller. In some cases, the resistance may be determined by the microcontroller based on a measurement from a circuit with a resistor with at least one known resistance, for example, a Wheatstone bridge. Alternatively, the resistance of the heating element may be measured with a resistive voltage divider in contact with the heating element and a resistor with a known and substantially constant

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resistance. The measurement of the resistance of the heating element may be amplified by an amplifier. The amplifier may be a standard op amp or instrumentation amplifier. The amplified signal may be substantially free of noise. In some cases, a charge time for a voltage divider between the heating element and a capacitor may be determined to calculate the resistance of the heating element. In some cases, the microcontroller must deactivate the heating element during resistance measurements. The resistance of the heating element may be directly proportional to the temperature of the heating element such that the temperature may be directly determine from the resistance measurement. Determining the temperature directly from the heating element resistance measurement rather than from an additional temperature sensor may generate a more accurate measurement because unknown contact thermal resistance between the temperature sensor and the heating element is eliminated. Additionally, the temperature measurement may be determined directly and therefore faster and without a time lag associated with attaining equilibrium between the heating element and a temperature sensor in contact with the heating element.

[0254] Provided herein is a device for generating an inhalable aerosol comprising: a cartridge comprising a first heater contact; a device body comprising; a cartridge receptacle for receiving the cartridge; a second heater contact adapted to receive the first heater contact and to complete a circuit; a power source connected to the second heater contact; a printed circuit board (PCB) connected to the power source and the second heater contact; and a single button interface; wherein the PCB is configured with circuitry and an algorithm comprising logic for a child safety feature.

[0255] In some embodiments, the algorithm requires a code provided by the user to activate the device. In some embodiments; the code is entered by the user with the single button interface. In still further embodiments the single button interface is the also the power switch.

[0256] Provided herein is a cartridge 30 for a device 10 for generating an inhalable aerosol comprising: a fluid storage compartment 32; a heater 36 affixed to a first end comprising: a heater chamber 37, a first pair of heater contacts 33, a fluid wick 34, and a resistive heating element 35 in contact with the wick; wherein the first pair of heater contacts 33 comprise thin plates affixed about the sides of the heater chamber 37, and wherein the fluid wick 34 and resistive heating element 35 are suspended there between.

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[0257] Depending on the size of the heater or heater chamber, the heater may have more than one wick 34, 34' and resistive heating element 35, 35'.

[0258] In some embodiments, the first pair of heater contacts further comprise a formed shape that comprises a tab 33a having a flexible spring value that extends out of the heater 36 to complete a circuit with the device body 20.

[0259] In some embodiments, the heater contacts 33 are configured to mate with a second pair of heater contacts 22 in a cartridge receptacle 21 of the device body 20 to complete a circuit.

[0260] In some embodiments, the first pair of heater contacts is also a heat sink that absorbs and dissipates excessive heat produced by the resistive heating element.

[0261] In some embodiments, the first pair of heater contacts is a heat shield that protects the heater chamber from excessive heat produced by the resistive heating element.

[0262] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a heater 36 comprising; a heater chamber 37, a pair of thin plate heater contacts 33 therein, a fluid wick 34 positioned between the heater contacts 33, and a resistive heating element 35 in contact with the wick; wherein the heater contacts 33 each comprise a fixation site 33c wherein the resistive heating element 35 is tensioned there between.

[0263] As will be obvious to one skilled in the art after reviewing the assembly method illustrated in FIGS. 9A-9L, the heater contacts 33 simply snap or rest on locator pins on either side of the air inlet 53 on the first end of the cartridge interior fluid storage compartment, creating a spacious vaporization chamber containing the at least one wick 34 and at least one heating element 35.

[0264] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a heater 36 attached to a first end of the cartridge.

[0265] In some embodiments, the heater encloses a first end of the cartridge and a first end of the fluid storage compartment 32, 32a.

[0266] In some embodiments, the heater comprises a first condensation chamber 45.

[0267] In some embodiments, the heater comprises more than one first condensation chamber 45, 45'.

[0268] In some embodiments, the condensation chamber is formed along an exterior wall of the cartridge 30.

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[0269] As noted previously, and described in FIGS. 10A, 10B and 10C, the airflow path through the heater and heater chamber generates vapor within the heater circulating air path 54, which then exits through the heater exits 55 into a first (primary) condensation chamber 45, which is formed by components of the tank body comprising the primary condensation channel/chamber rails 45b, the primary condensation channel cover 45a, (the outer side wall of the heater enclosure).

[0270] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising a fluid storage compartment 32 and a mouthpiece 31, wherein the mouthpiece is attached to a second end of the cartridge and further comprises at least one aerosol outlet 47.

[0271] In some embodiments, the mouthpiece 31 encloses a second end of the cartridge 30 and a second end of the fluid storage compartment 32, 32a.

[0272] Additionally, as clearly illustrated in FIG. 10C in some embodiments the mouthpiece also contains a second condensation chamber 46 prior to the aerosol outlet 47, which is formed by components of the tank body 32 comprising the secondary condensation channel/chamber rails 46b, the second condensation channel cover 46a, (the outer side wall of the mouthpiece). Still further, the mouthpiece may contain yet another aerosol outlet 47' and another (second) condensation chamber 46' prior to the aerosol outlet, on another side of the cartridge.

[0273] In other embodiments, the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0274] In some preferred embodiments, the second condensation chamber is formed along an exterior wall of the cartridge 30.

[0275] In each of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; at least a first condensation chamber 45; and an outlet port 47. In some of the embodiments described herein, the cartridge 30 comprises an airflow path comprising: an air inlet channel and passage 40, 41, 42; a heater chamber 37; a first condensation chamber 45; a second condensation chamber 46; and an outlet port 47.

[0276] In still other embodiments described herein the cartridge 30 may comprise an airflow path comprising at least one air inlet channel and passage 40, 41, 42; a heater chamber 37; at least one first condensation chamber 45; at least one second condensation chamber 46; and at least one outlet port 47.

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[0277] In each of the embodiments described herein, the fluid storage compartment 32 is in fluid communication with the heater 36, wherein the fluid storage compartment is capable of retaining condensed aerosol fluid.

[0278] In some embodiments of the device, the condensed aerosol fluid comprises a nicotine formulation. In some embodiments, the condensed aerosol fluid comprises a humectant. In some embodiments, the humectant comprises propylene glycol. In some embodiments, the humectant comprises vegetable glycerin.

[0279] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 comprising: a fluid storage compartment 32; a heater 36 affixed to a first end; and a mouthpiece 31 affixed to a second end; wherein the heater comprises a first condensation chamber 45 and the mouthpiece comprises a second condensation chamber 46.

[0280] In some embodiments, the heater comprises more than one first condensation chamber 45, 45' and the mouthpiece comprises more than one second condensation chamber 46, 46'.

[0281] In some embodiments, the first condensation chamber and the second condensation chamber are in fluid communication. As illustrated in FIG. 10C, the first and second condensation chambers have a common transition area 57, 57', for fluid communication.

[0282] In some embodiments, the mouthpiece comprises an aerosol outlet 47 in fluid communication with the second condensation chamber 46.

[0283] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47'.

[0284] In some embodiments, the mouthpiece comprises two or more aerosol outlets 47, 47' in fluid communication with the two or more second condensation chambers 46, 46'.

[0285] In any one of the embodiments, the cartridge meets ISO recycling standards.

[0286] In any one of the embodiments, the cartridge meets ISO recycling standards for plastic waste.

[0287] And in still other embodiments, the plastic components of the cartridge are composed of polylactic acid (PLA), wherein the PLA components are compostable and or degradable.

[0288] Provided herein is a device for generating an inhalable aerosol 10 comprising a device body 20 comprising a cartridge receptacle 21; and a detachable cartridge 30; wherein the cartridge receptacle and the detachable cartridge form a separable coupling, and wherein the separable coupling comprises a friction assembly, a snap-fit assembly or a magnetic assembly.

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[0289] In other embodiments of the device, the cartridge is a detachable assembly. In any one of the embodiments described herein, the cartridge components may comprise a snap-lock assembly such as illustrated by snap features 39a and 39b. In any one of the embodiments, the cartridge components are recyclable.

[0290] Provided herein is a method of fabricating a device for generating an inhalable aerosol comprising: providing a device body comprising a cartridge receptacle; and providing a detachable cartridge; wherein the cartridge receptacle and the detachable cartridge form a separable coupling comprising a friction assembly, a snap-fit assembly or a magnetic assembly when the cartridge is inserted into the cartridge receptacle.

[0291] Provided herein is a method of making a device 10 for generating an inhalable aerosol comprising: providing a device body 20 with a cartridge receptacle 21 comprising one or more interior coupling surfaces 21a, 21b, 21c…; and further providing a cartridge 30 comprising: one or more exterior coupling surfaces 36a, 36b, 36c,..., a second end and a first end; a tank 32 comprising an interior fluid storage compartment 32a; at least one channel 40 on at least one exterior coupling surface, wherein the at least one channel forms one side of at least one air inlet passage 51, and wherein at least one interior wall of the cartridge receptacle forms at least one side one side of at least one air inlet passage 51when the detachable cartridge is inserted into the cartridge receptacle.

[0292] FIGS. 9A-9L provide an illustrative example of a method of assembling such a device.

[0293] In some embodiments of the method, the cartridge 30 is assembled with a [protective] removable end cap 38 to protect the exposed heater contact tabs 33a protruding from the heater 36.

[0294] Provided herein is a method of fabricating a cartridge for a device for generating an inhalable aerosol comprising: providing a fluid storage compartment; affixing a heater to a first end with a snap-fit coupling; and affixing a mouthpiece to a second end with a snap-fit coupling.

[0295] Provided herein is a cartridge 30 for a device for generating an inhalable aerosol 10 with an airflow path comprising: a channel 50 comprising a portion of an air inlet passage 51; a second air passage 41 in fluid communication with the channel; a heater chamber 37 in fluid communication with the second air passage; a first condensation chamber 45 in fluid communication with the heater chamber; a second condensation chamber 46 in fluid

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communication with the first condensation chamber; and an aerosol outlet 47 in fluid communication with second condensation chamber.

[0296] Provided herein is a device 10 for generating an inhalable aerosol adapted to receive a removable cartridge 30, wherein the cartridge comprises a fluid storage compartment [or tank] 32; an air inlet 41; a heater 36, a [protective] removable end cap 38, and a mouthpiece 31.

[0297] Charging

[0298] In some cases, the vaporization device may comprise a power source. The power source may be configured to provide power to a control system, one or more heating elements, one or more sensors, one or more lights, one or more indicators, and/or any other system on the electronic cigarette that requires a power source. The power source may be an energy storage device. The power source may be a battery or a capacitor. In some cases, the power source may be a rechargeable battery.

[0299] The battery may be contained within a housing of the device. In some cases the battery may be removed from the housing for charging. Alternatively, the battery may remain in the housing while the battery is being charged. Two or more charge contact may be provided on an exterior surface of the device housing. The two or more charge contacts may be in electrical communication with the battery such that the battery may be charged by applying a charging source to the two or more charge contacts without removing the battery from the housing.

[0300] FIG. 18 shows a device 1800 with charge contacts 1801. The charge contacts 1801 may be accessible from an exterior surface of a device housing 1802. The charge contacts 1801 may be in electrical communication with an energy storage device (e.g., battery) inside of the device housing 1802. In some cases, the device housing may not comprise an opening through which the user may access components in the device housing. The user may not be able to remove the battery and/or other energy storage device from the housing. In order to open the device housing a user must destroy or permanently disengage the charge contacts. In some cases, the device may fail to function after a user breaks open the housing.

[0301] FIG. 19 shows an exploded view of a charging assembly 1900 in an electronic vaporization device. The housing (not shown) has been removed from the exploded view in FIG. 19. The charge contact pins 1901 may be visible on the exterior of the housing. The charge contact pins 1901 may be in electrical communication with a power storage device of the

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electronic vaporization device. When the device is connected to a power source (e.g., during charging of the device) the charging pins may facilitate electrical communication between the power storage device inside of the electronic vaporization device and the power source outside of the housing of the vaporization device. The charge contact pins 1901 may be held in place by a retaining bezel 1902. The charge contact pins 1901 may be in electrical communication with a charger flex 1903. The charging pins may contact the charger flex such that a need for soldering of the charger pins to an electrical connection to be in electrical communication with the power source may be eliminated. The charger flex may be soldered to a printed circuit board (PCB). The charger flex may be in electrical communication with the power storage device through the PCB. The charger flex may be held in place by a bent spring retainer 1904.

[0302] FIG. 20 shows the bent spring retainer in an initial position 2001 and a deflected position 2002. The bent spring retainer may hold the retaining bezel in a fixed location. The bent spring retainer may deflect only in one direction when the charging assembly is enclosed in the housing of the electronic vaporization device.

[0303] FIG. 21 shows a location of the charger pins 2101 when the electronic vaporization device is fully assembled with the charging pins 2101 contact the charging flex 2102. When the device is fully assembled at least a portion of the retaining bezel may be fitted in an indentation 2103 on the inside of the housing 2104. In some cases, disassembling the electronic vaporization device may destroy the bezel such that the device cannot be reassembled after disassembly.

[0304] A user may place the electronic smoking device in a charging cradle. The charging cradle may be a holder with charging contact configured to mate or couple with the charging pins on the electronic smoking device to provide charge to the energy storage device in the electronic vaporization device from a power source (e.g., wall outlet, generator, and/or external power storage device). FIG. 22 shows a device 2302 in a charging cradle 2301. The charging cable may be connected to a wall outlet, USB, or any other power source. The charging pins (not shown) on the device 2302 may be connected to charging contacts (not shown) on the charging cradle 2301. The device may be configured such that when the device is placed in the cradle for charging a first charging pin on the device may contact a first charging contact on the charging cradle and a second charging pin on the device may contact a second charging contact on the charging cradle or the first charging pin on the device may contact a second charging contact on the charging cradle and the second charging pin on the device may contact the first charging

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contact on the charging cradle. The charging pins on the device and the charging contacts on the cradle may be in contact in any orientation. The charging pins on the device and the charging contacts on the cradle may be agnostic as to whether they are current inlets or outlets. Each of the charging pins on the device and the charging contacts on the cradle may be negative or positive. The charging pins on the device may be reversible.

[0305] FIG. 23 shows a circuit 2400 that may permit the charging pins on the device to be reversible. The circuit 2400 may be provided on a PCB in electrical communication with the charging pins. The circuit 2400 may comprise a metal–oxide–semiconductor field-effect transistor (MOSFET) H bridge. The MOSFET H bridge may rectify a change in voltage across the charging pins when the charging pins are reversed from a first configuration where in a first configuration the device is placed in the cradle for charging with the first charging pin on the device in contact with the first charging contact on the charging cradle to a second charging pin on the device in contact with the second charging contact on the charging cradle to a second configuration where the first charging pin on the device is in contact with the second charging contact on the charging cradle and the second charging pin on the device is in contact with the first charging contact on the charging cradle. The MOSFET H bridge may rectify the change in voltage with an efficient current path.

[0306] As shown in FIG. 23 the MOSFET H bridge may comprise two or more n-channel MOSFETs and two or more p-channel MOSFETs. The n-channel and p-channel MOSFETs may be arranged in an H bridge. Sources of p-channels MOSFETs (Q1 and Q3) may be in electrical communication. Similarly, sources of n-channel FETs (Q2 and Q4) may be in electrical communication. Drains of pairs of n and p MOSFETs (Q1 with Q2 and Q3 with Q4) may be in electrical communication. A common drain from one n and p pair may be in electrical communication with one or more gates of the other n and p pair and/or vice versa. Charge contacts (CH1 and CH2) may be in electrical communication to common drains separately. A common source of the n MOSFETs may be in electrical communication to PCB ground (GND). The common source of the p MOSFETs may be in electrical communication with the PCB's charge controller input voltage (CH+). When CH1 voltage is greater than CH2 voltage by the MOSFET gate threshold voltages, Q1 and Q4 may be "on," connecting CH1 to CH+ and CH2 to GND. When CH2 voltage is greater than CH1 voltage by the FET gate threshold voltages, Q2 and Q3 may be "on," connecting CH1 to GND and CH2 to CH+. For example, whether there is

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9V or -9V across CH1 to CH2, CH+ will be 9V above GND. Alternatively, a diode bridge could be used, however the MOSFET bridge may be more efficient compared to the diode bridge.

[0307] In some cases the charging cradle may be configured to be a smart charger. The smart charger may put the battery of the device in series with a USB input to charge the device at a higher current compared to a typical charging current. In some cases, the device may charge at a rate up to about 2 amps (A), 4A, 5A, 6A, 7A, 10A, or 15A. In some cases, the smart charger may comprise a battery, power from the battery may be used to charge the device battery. When the battery in the smart charger has a charge below a predetermined threshold charge, the smart charger may simultaneously charge the battery in the smart charger and the battery in the device.

[0308] Blow discrimination

[0309] In any of the devices and system (e.g., vaporizers) described herein, a pressure sensor may be used and configured to detect blowing and to distinguish blowing from draw (sucking/inhaling). For example, a modified electret microphone may be used as a pressure sensor connected to the device's microcontroller so that pressure-dependent measurements can be made by the microcontroller. The microcontroller's draw detection algorithm, which uses measurements of pressure sensor's capacitance to determine the start and end of the draw, may be configured to include blow detection and/or blow discrimination.

[0310] As mentioned above, other types of pressures sensors may be used (e.g., microelectromechanical systems (MEMS) pressure sensors or any other differential pressure sensor). In such cases the output of the sensor (which may be converted by the sensor and/or associated circuitry into a pressure value (e.g., in mmHg, atm, etc.) or it may be a raw sensor output or value (e.g., reading) such as a capacitance value in the case of a pressure sensor using a capacitive membrane, electrical value (resistive, voltage, etc.), digital value, force and/or displacement value, etc. As described herein, this raw value may be used in the controls described (e.g., microcontrollers) without requiring conversion to an actual pressure reading. Although the examples described herein refer to a capacitive pressure sensor having a capacitive membrane (e.g., an electret microphone), any other differential pressure sensor may be used instead with the methods and apparatuses described herein, including controlling the baseline during a putative blow and/or draw through the mouthpiece as described in greater detail below.

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[0311] Thus, any pressure sensor that can distinguish positive and negative pressure may be used. For example a pressure sensor may comprise an electrically conductive diaphragm held in close proximity to a conductive static plate, forming an air capacitor, with both conductors connected to pins or pads on a circuit (e.g., PCB) opposite the static plate side of the sensor. FIGS. 24A-24D illustrate one example of a pressure sensor 2509 that is a capacitive pressure sensor. In this example, the diaphragm 2404 (shown in FIG. 24D) is mounted to a rigid thin wall tube (case 2403) that is a close fit within the outer conductive case 2407 of the sensor 2509 such that air cannot flow through the sensor 2509 around the diaphragm. Holes 2411 in the static plate on one side of a gasket and holes 2413 in the PCB 2401 on the opposite side of the diaphragm allow pressure differences between the two sides of the sensor 2509 to be seen by the diaphragm, which deflects with a pressure difference across it.

[0312] Within the vaporizer, the sensor 2509 may be included in a sealed air path 2520 so as to distinguish a difference between internal pressure and air pressure. In some variations, a gasket 2502 in the device forms an air-tight seal around the sensor's case such that the static plate side of the sensor sees gauge pressures in the device's air path 2530 when a user draws from or blows into the device, as shown in FIG. 25. Air flow restriction between the device's nominal air inlet 2505 and the pressure sensor 2509 along the sealed air path 2520 creates a pressure that the static plate side of the pressure registers. The PCB side 2511 of the pressure sensor 2509 stays at an external reference (e.g., 0 gauge) pressure during a draw or blow as the PCB side of the pressure sensor 2509 is not part of the sealed air path 2520 and is not sealed from ambient air. Pressure difference on either side of the sensor 2509 resolve onto either side of the diaphragm; negative gauge pressure in the sealed air path 2520 from a draw pulls the diaphragm towards the static plate, increasing the capacitance of the sensor, while positive gauge pressures in the sealed air path from a blow push the diaphragm away from the static plate, decreasing the sensor's capacitance.

[0313] Differences between the pressure on either side of the diaphragm 2404 and the back plate 2405 change the spacing between the diaphragm and back plate and therefore the capacitance of the sensor 2509. This different separation may be read as the capacitance of the sensor 2509 and compared to ambient. In some variations, capacitance is measured with an oscillating circuit that sources and sinks current to/from the sensor 2509 to charge and discharge the sensor repeatedly. The device's microcontroller counts the number of times the sensor's

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intrinsic capacitor is charged and discharged within a fixed time period (e.g., 0.5 ms, 1 ms, 1.5 ms, 2 ms, etc.) and uses this value in a draw detection algorithm. This measurement may be inversely related to the capacitance of the sensor 2509, since an increase in capacitance will make the capacitor charge slower, resulting in fewer charge and discharge cycles during the measurement period. So an increase in capacitance from negative air path gauge pressure, normally a draw, will result in a lower reading than when the user is not drawing from the device. Blowing into the nominal outlet 2550 of the sealed air path 2520 will result in an increase in this measured value. Actual capacitance and air path gauge pressure are not needed by the draw detection algorithm, so they are not calculated, though they could be approximated and used in a similar draw detection algorithm.

[0314] In any of the apparatuses described herein, a capacitive sensing module within the microcontroller may handle the oscillation and current sourcing/sinking needed for the measurement via a direct connection to the pressure sensor diaphragm. The pressure sensor's case may be tied to PCB ground.

[0315] Because the ambient pressure around the device may change, the 'baseline' capacitance of the sensor may also change. This may be incorporated into the control circuitry that determines draw (and may determine or reject blow). For example, the draw detection algorithm may respond to environmental changes (not including draw or blow) that may change the nominal pressure measurement by using a baseline pressure measurement value which normally follows live pressure measurements using a software low-pass filter. With a moving baseline, a threshold for detecting the start of a draw can be kept very close to the baseline and live readings for consistent sensitivity and maximum sensitivity without falsely detected draws. The draw detection algorithm may therefore detect the start of a draw when the live pressure measurement drops (indicating a pressure drop in the air path) to some threshold below the baseline value for some number of measurements. The algorithm detects end of draw when live pressure measurements rise above some threshold below the baseline. The baseline may be fixed during the draw so that end of draw detection does not happen prematurely, and so that subsequent draws don't require larger pressure drops for the algorithm to detect the start of a draw.

[0316] For example, see FIG. 26, which graphically illustrates the output of the pressure sensor over time and when draws are detected by the microcontroller (which is performing the

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control logic as described herein). In this example, the live reading is the pressure output (converted capacitance measurement in this example) from the sensor. The baseline is a low-pass filtered measure of the live reading. This baseline is fixed during the two draw events. Draw detection state is shown by the square wave, where the high state corresponds to a draw currently being detected. A first threshold is positioned at a fixed offset below the baseline; when the live reading from the sensor (the pressure measurement) crosses the threshold (e.g., exceeds this offset), it detects a draw event, and can again detect the end of the draw event when the pressure returns past the same threshold. These two thresholds may differ from each other in the draw detection logic (algorithm). A similar method may be applied to detect blowing; a second threshold or second offset (blow threshold/offset) maybe represented as a line on the opposite side of the baseline from the draw threshold/offset. In this example, draws are detected as downward pressure deflection and offset, whereas blowing is upward deflection relative to the baseline; if the orientation of the sensor is reversed, or if the raw sensor values, depending on the type of sensor, are used, the direction of blow and draw relative to the baseline may be different.

[0317] Blowing into the device may be detected and/or ignored using this algorithm. For example, when the live pressure measurement rises to values above the baseline value (e.g., in the more positive direction in the configuration shown in FIGS. 25, 26 and 27), which is usually caused by the user blowing into the air path outlet, the baseline may also stop following the live pressure measurements (e.g., remain at the last value) until the sensor output returns to below some threshold above the baseline value, as shown in FIG. 27. Holding the baseline during a blowing event may prevent the baseline from rising to a value at which draw start would be detected at the end of the blow. With this feature, users can hold the device with their lips and/or teeth without worrying about the device heating when they didn't intend for it to heat. Without this feature, it the device may apparently heat on its own. Thus, preventing false draw may save, battery life and vaporizable material by preventing detection of false draws which may occur, for example if the baseline during a blow event were reset to higher values so that the end of the blow would drop the sensor signal to beyond the threshold (which is an offset of the now-incorrect baseline) for detecting draw.

[0318] FIG. 28 is a flow diagram of a process 2800 for activating a heater. In general, the pressure sensor is configured to detect draw by comparing the instantaneous sensor output ("live reading" in FIGS. 26 and 27) to a baseline value which is a based on a filtered (e.g., low pass

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filtered, averaged, windowed, weighted averaged, etc.) version of the instantaneous sensor output (2810). Detection of draw is made more accurate by rejecting changes to the baseline during blowing (e.g., "blow rejection" or "blow discrimination"). This may be achieved by freezing the value of the baseline when the instantaneous sensor output is greater than the baseline or greater than some predetermined offset above or below (whichever direction corresponds to blowing based on the orientation of the sensor in the system) the baseline (2820). The baseline value may also be frozen when the instantaneous sensor crosses a threshold for detection of draw (e.g., above or below this threshold based on the orientation of the sensor in the system) (2820). The instantaneous sensor readings may be compared to the baseline and the heater may be activated to generate vapor from the vaporizable material when the instantaneous sensor readings are offset from the baseline by more than a third offset value indicating suction is being applied to the mouthpiece (2830).

[0319] In an alternative embodiment, an oscillating circuit external to the microcontroller may be used to charge and discharge the pressure sensor's intrinsic capacitor. This circuit could be a multivibrator circuit, relaxation oscillator, or other oscillator that is self-resonant or excited by the microcontroller. The pressure sensor case may not be grounded. A microcontroller is still used to count charge and discharge cycles within a fixed interval.

[0320] In an alternative embodiment, a fixed resistance may be used to charge the pressure sensor's intrinsic capacitor. Charge time up to some voltage or discharge time down to some voltage is measured using a comparator internal or external to the microcontroller. In this case, readings will increase with increased sensor capacitance, as opposed to oscillator charge count readings which decrease with increased sensor capacitance, and the draw detection algorithm may be modified accordingly, with increased readings required for draw start detection and decreased readings required for blow detection.

[0321] In an alternative embodiment, the diaphragm is in between the static plate and the air path, such that negative pressure from a draw would decrease the capacitance of the sensor. If the sensor is still measured with an oscillator, the sensor output for reading deviations from baseline required for draw start detection and blow detection are switched.

[0322] In an alternative embodiment, the pressure sensor has solder pads and/or lead wires instead of pins on its PCB.

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[0323] In an alternative embodiment, the draw detection circuitry (e.g., algorithm) may not detect a draw start unless it has a "stable" baseline. When a blow is detected, a flag may be set that indicates that the baseline is not stable. When the end of blow is detected and pressure readings stabilize, the baseline is set conservatively below live pressure readings and the flag for unstable baseline is cleared, meaning drops in the reading will again be detected as draw start event, similar to what is shown in FIG. 27.

[0324] Any of the methods (including user interfaces) described herein may be implemented as software, hardware or firmware, and may be described as a non-transitory computer-readable storage medium storing a set of instructions capable of being executed by a processor (e.g., computer, tablet, smartphone, etc.), that when executed by the processor causes the processor to control perform any of the steps, including but not limited to: displaying, communicating with the user, analyzing, modifying parameters (including timing, frequency, intensity, etc.), determining, alerting, or the like.

[0325] When a feature or element is herein referred to as being "on" another feature or element, it can be directly on the other feature or element or intervening features and/or elements may also be present. In contrast, when a feature or element is referred to as being "directly on" another feature or element, there are no intervening features or elements present. It will also be understood that, when a feature or element is referred to as being "connected", "attached" or "coupled" to another feature or element, it can be directly connected, attached or coupled to the other feature or element or intervening features or elements may be present. In contrast, when a feature or element is referred to as being "directly connected", "directly attached" or "directly coupled" to another feature or element, there are no intervening features or elements present. Although described or shown with respect to one embodiment, the features and elements so described or shown can apply to other embodiments. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature may have portions that overlap or underlie the adjacent feature.

[0326] Terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. For example, as used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, steps,

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operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items and may be abbreviated as "/".

[0327] Spatially relative terms, such as "under", "below", "lower", "over", "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if a device in the figures is inverted, elements described as "under" or "beneath" other elements or features would then be oriented "over" the other elements or features. Thus, the exemplary term "under" can encompass both an orientation of over and under. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly. Similarly, the terms "upwardly", "downwardly", "vertical", "horizontal" and the like are used herein for the purpose of explanation only unless specifically indicated otherwise.

[0328] Although the terms "first" and "second" may be used herein to describe various features/elements (including steps), these features/elements should not be limited by these terms, unless the context indicates otherwise. These terms may be used to distinguish one feature/element from another feature/element. Thus, a first feature/element discussed below could be termed a second feature/element, and similarly, a second feature/element discussed below could be termed a first feature/element without departing from the teachings of the present invention.

[0329] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising" means various components can be co-jointly employed in the methods and articles (e.g., compositions and apparatuses including device and methods). For example, the term "comprising" will be understood to imply the inclusion of any stated elements or steps but not the exclusion of any other elements or steps.

[0330] In general, any of the apparatuses and methods described herein should be understood to be inclusive, but all or a sub-set of the components and/or steps may alternatively be

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exclusive, and may be expressed as "consisting of" or alternatively "consisting essentially of" the various components, steps, sub-components or sub-steps.

[0331] As used herein in the specification and claims, including as used in the examples and unless otherwise expressly specified, all numbers may be read as if prefaced by the word "about" or "approximately," even if the term does not expressly appear. The phrase "about" or "approximately" may be used when describing magnitude and/or position to indicate that the value and/or position described is within a reasonable expected range of values and/or positions. For example, a numeric value may have a value that is +/- 0.1% of the stated value (or range of values), +/- 1% of the stated value (or range of values), +/- 2% of the stated value (or range of values), +/- 5% of the stated value (or range of values), +/- 10% of the stated value (or range of values), etc. Any numerical values given herein should also be understood to include about or approximately that value, unless the context indicates otherwise. For example, if the value "10" is disclosed, then "about 10" is also disclosed. Any numerical range recited herein is intended to include all sub-ranges subsumed therein. It is also understood that when a value is disclosed that "less than or equal to" the value, "greater than or equal to the value" and possible ranges between values are also disclosed, as appropriately understood by the skilled artisan. For example, if the value "X" is disclosed the "less than or equal to X" as well as "greater than or equal to X" (e.g., where X is a numerical value) is also disclosed. It is also understood that the throughout the application, data is provided in a number of different formats, and that this data, represents endpoints and starting points, and ranges for any combination of the data points. For example, if a particular data point "10" and a particular data point "15" are disclosed, it is understood that greater than, greater than or equal to, less than, less than or equal to, and equal to 10 and 15 are considered disclosed as well as between 10 and 15. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0332] Although various illustrative embodiments are described above, any of a number of changes may be made to various embodiments without departing from the scope of the invention as described by the claims. For example, the order in which various described method steps are performed may often be changed in alternative embodiments, and in other alternative embodiments one or more method steps may be skipped altogether. Optional features of various device and system embodiments may be included in some embodiments and not in others.

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Therefore, the foregoing description is provided primarily for exemplary purposes and should not be interpreted to limit the scope of the invention as it is set forth in the claims.

[0333] The examples and illustrations included herein show, by way of illustration and not of limitation, specific embodiments in which the subject matter may be practiced. As mentioned, other embodiments may be utilized and derived there from, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. Such embodiments of the inventive subject matter may be referred to herein individually or collectively by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any single invention or inventive concept, if more than one is, in fact, disclosed. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

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Receipt date: 08/14/2018

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	15/430,317
Filing Date	February 10, 2017
First Named Inventor	Nicholas Jay Hatton
Art Unit	2833
Examiner Name	V. M. Girardi
Attorney Docket Number	052210-515001US/736.200

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A	US-20140261487-A1	09-18-2014	Chapman et al.	
	B	US-20150090278-A1	04-02-2015	Schiff et al.	
	C	US-20150208726-A1	07-30-2015	Liu	
	D	US-20150208729-A1	07-30-2015	Monsees et al.	
	E	US-20150245658-A1	09-03-2015	Worm et al.	
	F	US-20160192705-A1	07-07-2016	BORKOVEC et al.	
	G	US-20160198767-A1	07-14-2016	Verleur	
	H	US-20160262453-A1	09-15-2016	Ampolini et al.	
	I	US-20170023952-A1	01-26-2017	Henry, JR. et al.	
	J	US-20170042227-A1	02-16-2017	GAVRIELOV et al.	
	K	US-20170245547-A1	08-31-2017	LIPOWICZ	
	L	US-20170273355-A1	09-28-2017	Rogers et al.	
	M	US-4,947,874	08-14-1990	Brooks et al.	
	N	US-8,499,766-B1	08-06-2013	Newton	
	O	US-8,910,639-B2	12-16-2014	Chang et al.	
	P	US-9,022,026-B2	05-05-2015	Fang	
	Q	US-9,642,397	05-09-2017	Dai et al.	
	R	US-9,714,878	07-25-2017	Powers et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	A	WO-2014144678-A2	09-18-2014	Lewis, Michael		
	B	WO-2015149368-A1	10-08-2015	Liu, Shuigen		
	C	WO-2017001817-A1	01-05-2017	Nicoventures Holdings Ltd		
	D	WO-2017113845-A1	07-06-2017	Lin, Guangrong		
	E	WO-2017143865-A1	08-31-2017	Changzhou Jwei Intelligent Tech Co Ltd		

Examiner Signature	/VANESSA GIRARDI/	Date Considered	08/30/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /VG/

Receipt date: 08/14/2018

Used in Lieu of PTO/SB/08A/B
(Based on PTO 11-07 version)

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	15/430,317
				Filing Date	February 10, 2017
				First Named Inventor	Nicholas Jay Hatton
				Art Unit	2833
(Use as many sheets as necessary)				Examiner Name	V. M. Girardi
Sheet	2	of	2	Attorney Docket Number	052210-515001US/736.200

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature	/VANESSA GIRARDI/	Date Considered	08/30/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /VG/

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BIB DATA SHEET

CONFIRMATION NO. 8844

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/430,317	02/10/2017	131	2833	52210-515001US/736.200

APPLICANTS
JUUL LABS, INC., San Francisco, CA;

INVENTORS
Nicholas Jay HATTON, San Francisco, CA;
Steven CHRISTENSEN, San Francisco, CA;

**** CONTINUING DATA ***************************
This appln claims benefit of 62/294,271 02/11/2016

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
02/21/2017

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /VANESSA GIRARDI/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	18	25	4

ADDRESS
Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111
UNITED STATES

TITLE
VAPORIZER DEVICES WITH BLOW DISCRIMINATION

FILING FEE RECEIVED		
1970	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

NJOY Exhibit 1002.592

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	Art Unit
	VANESSA GIRARDI	2833

CPC- SEARCHED		
Symbol	Date	Examiner
A24F 47 / 008	NOV 9 2017	VG
.		
H05B 1 / 0244 -- 3 / 03	NOV 9 2017	VG
.		
ABOVE UPDATED	AUG 1 2018	VG

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
131	328, 273, 329	NOV 9 2017	VG
.			
ABOVE	UPDATED	AUG 1 2018	VG

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST search strategy attached	AUG 10 2018	VG
.		
Inventor name search in EAST and PALM	NOV 9 2017	VG

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
ALL	((vapor vaporize$1) and heat$3 and pressure and (microcontroller control$3) and ((first and second) near2 (value reading setpoint point set$4))).clm.	NOV 9 2017	VG
.			
ABOVE	UPDATED	AUG 1 2018	VG

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

CPC						
Symbol					**Type**	**Version**
A24F		47	/	008	F	2013-01-01
H05B		1	/	0244	I	2013-01-01
G01L		9	/	12	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	52	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Aug 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.595

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		A	2	4	F	47 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	52	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Aug 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	42	17	15	33	34	49								
-	2	43	18	16	34	35	50								
2	3	44	19	17	35	36	51								
3	4	45	20	18	36	37	52								
4	5	46	21	20	37	38	53								
5	6	47	22	21	38	39	54								
6	7	48	23	22	39										
7	8	49	24	23	40										
8	9	51	25	24	41										
9	10	13	26	25	42										
10	11	50	27	26	43										
11	12	52	28	28	44										
12	13	14	29	29	45										
-	14	19	30	30	46										
40	15	27	31	31	47										
41	16	32	32	33	48										

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	52	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Aug 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.597

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S25	0	WO2013060784	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 13:35
S26	5	"2013060784"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 13:36
S27	209	(electrically adj operated adj aerosol)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 13:39
S30	20	S27 and Flick	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 13:42
S31	202185	((vapor vaporize$1 ecigarette (electronic adj cigarette))).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 16:40
S32	11438	S31 and ((suction puff draw pressure) near2 sensor)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 16:40
S33	518	S32 and (PID)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 16:40
S34	445	S33 and @AD<="20160211"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/08/01 16:40

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S35	420	((vapor vaporize$1) and heat$3 and pressure and (microcontroller control$3) and ((first and second) near2 (value reading setpoint point set$4))).clm.	US-PGPUB; USPAT	OR	ON	2018/08/01 16:41
S36	397	S35 and @AD<="20160211"	US-PGPUB; USPAT	OR	ON	2018/08/01 16:41

8/10/2018 3:20:33 PM
C:\Users\vgirardi\Documents\EAST\Workspaces\(1195) 15-430 317 - VAPORIZER w BLOW DISCRIMINATION.wsp

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Docket No.: 52210-515001US/736.200
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of: Nicholas Jay HATTON et al.	Allowed: September 19, 2018
Application No.: 15/430,317	Confirmation No.: 8844
Filed: February 10, 2017	Art Unit: 2833
For: VAPORIZER DEVICES WITH BLOW DISCRIMINATION	Examiner: GIRARDI, VANESSA MARY

AMENDMENT AFTER ALLOWANCE UNDER 37 C.F.R. § 1.312

FILED VIA EFS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir or Madam:

After receipt of the Notice of Allowance mailed September 19, 2018 ("Notice of Allowance") but prior to issuance of the patent, applicant respectfully requests entry of this amendment under 37 C.F.R. 1.312 for the above-captioned patent application.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of the claims beginning on page 3 of this paper.

Remarks/Arguments begin on page 8 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please substitute the following paragraph(s) for the abstract appearing in the pending specification. A clean copy of the substitute Abstract is submitted herewith.

~~Methods and apparatuses for discriminating between user blowing and drawing (sucking) in an electronic vaporization device. Described herein are electronic aerosol devices and methods of controlling or operating them which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly.~~ Vaporizer devices and apparatuses are provided. In some implementations, a vaporizer device body comprises a cartridge receptacle, a pressure sensor, and a gasket around the pressure sensor. The cartridge receptacle is configured to insertably receive a cartridge containing vaporizable material. The pressure sensor is configured to output sensor readings. A first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure. The sealed air flow path comprises a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge. The sealed air flow path passes from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge. The gasket is configured to seal the device air path from the sealed air flow path.

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AMENDMENTS TO THE CLAIMS

Please amend the claims as set forth below. This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims:

1.-28. **(Canceled)**

29. (Previously Presented) A vaporizer device body comprising:

a cartridge receptacle configured to insertably receive a cartridge containing a vaporizable material;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air flow path comprising a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge; and

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

30. (Previously Presented) The vaporizer device body of claim 29, further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold respectively indicating blowing or suction is being applied to the mouthpiece; and

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by

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the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

31. (Previously Presented) A vaporizer device comprising:

a cartridge comprising a reservoir configured to hold a vaporizable material, a heater configured to heat the vaporizable material, and a mouthpiece in fluid communication with the heater; and

a device body comprising:

a cartridge receptacle configured to insertably receive the cartridge;

a pressure sensor configured to output sensor readings, wherein a first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure, the sealed air flow path comprising a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge, the sealed air flow path passing from an air inlet, through the channel and to the heater and an outlet in the mouthpiece of the cartridge; and

a gasket around the pressure sensor, the gasket configured to seal the device air path from the sealed air flow path.

32. (**Currently Amended**) The vaporizer device [[body]] of claim 31, further comprising:

a microcontroller configured to perform operations comprising:

tracking a baseline based on filtering the sensor readings as the sensor readings are output by the pressure sensor;

holding the baseline constant while the sensor readings output by the pressure sensor are above the baseline by a first threshold or below the baseline by a second threshold, the first threshold and the second threshold respectively indicating blowing or suction is being applied to the mouthpiece; and

comparing the sensor readings to the baseline and activating the heater to generate an aerosol from the vaporizable material when the sensor readings output by

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the pressure sensor are offset from the baseline by more than a third threshold, the third threshold indicating suction is being applied to the mouthpiece.

33. (**Currently Amended**) The vaporizer device body of claim 29, wherein the pressure sensor comprises a capacitive membrane.

34. (**Currently Amended**) The vaporizer device body of claim 29, wherein the pressure sensor comprises a MEMS pressure sensor.

35. (**Currently Amended**) The vaporizer device body of claim 29, wherein the sensor readings output by the pressure sensor comprise capacitance values.

36. (**Currently Amended**) The vaporizer device body of claim 29, wherein the sensor readings output by the pressure sensor comprise pressure values.

37. (**Currently Amended**) The vaporizer device body of claim 30, wherein the third threshold is the same as the second threshold.

38. (**Currently Amended**) The vaporizer device body of claim 30, wherein the third threshold is the same as the first threshold.

39. (**Currently Amended**) The vaporizer device body of claim 30, wherein the first threshold is zero.

40. (**Currently Amended**) The vaporizer device body of claim 30, wherein the second threshold is zero.

41. (**Currently Amended**) The vaporizer device body of claim 30, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via low pass filtering the sensor readings.

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42. (**Currently Amended**) The vaporizer device body of claim 30, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via output by taking a running average of the sensor readings.

43. (**Currently Amended**) The vaporizer device body of claim 30, wherein the microcontroller is further configured to perform operations comprising:

stopping activating of the heater to generate vapor when the sensor readings are offset from the baseline by less than the third threshold.

44. (Previously Presented) The vaporizer device of claim 31, wherein the pressure sensor comprises a capacitive membrane.

45. (Previously Presented) The vaporizer device of claim 31, wherein the pressure sensor comprises a MEMS pressure sensor.

46. (Previously Presented) The vaporizer device of claim 31, wherein the sensor readings output by the pressure sensor comprise capacitance values.

47. (Previously Presented) The vaporizer device of claim 31, wherein the sensor readings output by the pressure sensor comprise pressure values.

48. (Previously Presented) The vaporizer device of claim 32, wherein the third threshold is the same as the second threshold.

49. (Previously Presented) The vaporizer device of claim 32, wherein the third threshold is the same as the first threshold.

50. (Previously Presented) The vaporizer device of claim 32, wherein the first threshold is zero.

51. (Previously Presented) The vaporizer device of claim 32, wherein the second threshold is zero.

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52. (Previously Presented) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via low pass filtering the sensor readings.

53. (Previously Presented) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

tracking the baseline based on filtering the sensor readings via output by taking a running average of the sensor readings.

54. (Previously Presented) The vaporizer device of claim 32, wherein the microcontroller is further configured to perform operations comprising:

stopping activating of the heater to generate vapor when the sensor readings are offset from the baseline by less than the third threshold.

55. (**New**) The vaporizer device of claim 31, wherein the cartridge comprises the vaporizable material, and wherein the vaporizable material comprises a nicotine formulation.

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REMARKS

By this Amendment, the Specification is amended to provide a concise statement of the technical disclosure in the Abstract, Claims 32-43 are amended to enhance their clarity, new Claim 55 is added, and Claims 1-28 are canceled without prejudice or disclaimer. Support for these amendments is present in at least the originally-filed application. Accordingly, no new matter has been added.

Although entry of amendments after a notice of allowance are not granted as a matter of right, Applicant respectfully submits that the amendments address formal matters in the specification and claims. *See* 37 C.F.R. §1.312; M.P.E.P. §714.16. Applicant respectfully submits that the new dependent claim is allowable as it depend from a previously allowable independent claim and requires no substantial amount of additional work on the part of the Office. As such, Applicant respectfully requests that the Examiner enter the amendments.

That any specific rejection, issue, or comment was not particularly addressed, does not signify agreement with that rejection, issue, or comment. In addition, because the arguments made by the Applicant are not intended to be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper.

The Commissioner is hereby authorized to charge any additional fees which may be required with respect to this communication, or credit any overpayment, to Deposit Account No. 50-0311, under Order No. 52210-515001US/736.200. If there are any questions regarding this Amendment, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

Dated: September 19, 2018

/npm/

Nicholas P. Mouton, Esq.
Registration No.: 75,306
MINTZ LEVIN COHN FERRIS GLOVSKY
AND POPEO, P.C.
3580 Carmel Mountain Road, Suite 300
San Diego, California 92130-6768
(858) 314-1500 || (858) 314-1501 (Fax)
Attorney for Applicant

81108063v.1

NJOY Exhibit 1002.606

ABSTRACT

Vaporizer devices and apparatuses are provided. In some implementations, a vaporizer device body comprises a cartridge receptacle, a pressure sensor, and a gasket around the pressure sensor. The cartridge receptacle is configured to insertably receive a cartridge containing vaporizable material. The pressure sensor is configured to output sensor readings. A first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure. The sealed air flow path comprises a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge. The sealed air flow path passes from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge. The gasket is configured to seal the device air path from the sealed air flow path.

Docket No.: 52210-515001US/736.200
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Nicholas Jay Hatton et al.

Application No.: 15/430,317 | Confirmation No.: 8844

Filed: February 10, 2017 | Art Unit: 2833

For: VAPORIZER DEVICES WITH BLOW DISCRIMINATION | Examiner: Vanessa Mary Girardi

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

FILED VIA EFS

Mail Stop Issue Fee
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir or Madam:

Applicant has received the Examiner's Statement of Reasons for Allowance with the September 19, 2018 Notice of Allowance and Allowability regarding the above-identified application. Entry of the Statement into the record should not be construed as any agreement with or acquiescence in the reasoning stated by the Examiner. Each of the claims stands on its own merits and is patentable because of the combination it recites and not because of the presence or absence of any one particular element.

The Examiner's Statement was not prepared by Applicant and only contains the Examiner's possible positions in one or more reasons for allowability. Thus, any interpretation with respect to the Examiner's Statement of Reasons for Allowance should not be imputed to the Applicant.

Respectfully submitted,

Dated: September 19, 2018

/npm/

Nicholas P. Mouton, Esq.
Registration No.: 75,306
MINTZ LEVIN COHN FERRIS
GLOVSKY AND POPEO, P.C.
3580 Carmel Mountain Road, Suite 300
San Diego, California 92130-6768
(858) 314-1500
(858) 314-1501 (Fax)
Attorney for Applicant

PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22314-1450
or Fax **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note Use Block 1 for any change of address)

Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C.
US

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, EFS-Web transmitted, or facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's Name)
(S-signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
15/430,317	2017-02-10	Nicholas Jay HATTON	52210-515001US/736.2(	8844

TITLE OF INVENTION:

APPLN: TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
UTILITY	SMALL	500	0	0	500	2018-12-19

EXAMINER	ART UNIT	CLASS-SUBCLASS
Vanessa Girardi	2833	-

1. Change of correspondence address or indication of "Fee Address" (37CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered attorney or agent. If no name is listed, no name will be printed

1. Mintz, Levin, Cohn, Ferris,
2. Glovsky and Popeo, P.C.
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

1a. NAME OF ASSIGNEE: JUUL Labs, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): San Francisco, CA

Please check the appropriate assignee categories (will not be printed on the patent): ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fees(s): **(Please first reapply and previously paid fee shown above)**
☐ A check is enclosed
☐ Payment be credit card. Form PTO-2038 is attached
☑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 50-0311 (enclose an extra copy of this form)

5. Change of Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /npm/ Date September 19, 2018

Typed or printed name Nicholas P. Mouton, Esq. Registration No. 75,306

NJOY Exhibit 1002.609

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	15430317
Filing Date:	10-Feb-2017
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Filer:	Nicholas Paul Mouton
Attorney Docket Number:	52210-515001US/736.200

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

NJOY Exhibit 1002.611

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	33773597
Application Number:	15430317
International Application Number:	
Confirmation Number:	8844
Title of Invention:	VAPORIZER DEVICES WITH BLOW DISCRIMINATION
First Named Inventor/Applicant Name:	Nicholas Jay HATTON
Customer Number:	148514
Filer:	Nicholas Paul Mouton
Filer Authorized By:	
Attorney Docket Number:	52210-515001US/736.200
Receipt Date:	19-SEP-2018
Filing Date:	10-FEB-2017
Time Stamp:	23:19:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1000
RAM confirmation Number	092018INTEFSW00006753500311
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

NJOY Exhibit 1002.613

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		52210-515001US-312_Amendment.pdf	186245 acf48ad4ba9e0477d8131d271bd534b23df44ac0	yes	9

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment after Notice of Allowance (Rule 312)	1	1
Specification	2	2
Claims	3	7
Applicant Arguments/Remarks Made in an Amendment	8	8
Abstract	9	9

Warnings:

Information:

2	Post Allowance Communication - Incoming	52210-515001US-Comments.pdf	103014 6b86f211bde880e1fb27ae27d5c189c5b1da2bc4	no	1

Warnings:

Information:

3	Issue Fee Payment (PTO-85B)	52210-515001US_IssueFeeTransmittal.PDF	712254 ffbd38eb6d54514d1b3296e2f472dd89ac09a50a	no	2

Warnings:

Information:

4	Fee Worksheet (SB06)	fee-info.pdf	30289 0b5cf00f89986c2c9f9d19f1ab0861daa08b04ae	no	2

Warnings:

Information:

NJOY Exhibit 1002.614

Total Files Size (in bytes):	1031802

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

148514 7590 10/15/2018

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER	
GIRARDI, VANESSA MARY	

ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
10/15/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketingBOS@mintz.com
IPFileroombos@mintz.com

NJOY Exhibit 1002.616

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

CPC						
Symbol					**Type**	**Version**
A24F		47	/	008	F	2013-01-01
H05B		1	/	0244	I	2013-01-01
G01L		9	/	12	I	2013-01-01
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			/			

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.617

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		A	2	4	F	47 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.618

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	43	17	15	33	35	49								
-	2	44	18	16	34	36	50								
2	3	45	19	17	35	37	51								
3	4	46	20	18	36	38	52								
4	5	47	21	20	37	39	53								
5	6	48	22	21	38	40	54								
6	7	49	23	22	39	32	55								
7	8	50	24	23	40										
8	9	52	25	24	41										
9	10	13	26	25	42										
10	11	51	27	26	43										
11	12	53	28	28	44										
12	13	14	29	29	45										
-	14	19	30	30	46										
41	15	27	31	31	47										
42	16	32	32	34	48										

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833 (Primary Examiner)	Oct 10 '18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 25

NJOY Exhibit 1002.619

Response to Rule 312 Communication	Application No.	Applicant(s)
	15/430,317	HATTON ET AL.
	Examiner	Art Unit
	VANESSA GIRARDI	2833

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

1. ☒ The amendment filed on *19 September 2018* under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☒ entered in part. See explanation below.

Newly added Claim 55 has been entered.

The amended Abstract has not been entered. The original Abstract filed 2/10/2017 clearly and concisely states that which is new in the art without the extensive mechanical and design details of the apparatus contained in the amended Abstract.

/VANESSA GIRARDI/
Primary Examiner, Art Unit 2833

NJOY Exhibit 1002.620

DO NOT ENTER: /VG/ 10/10/2018

Use original Abstract filed 2/10/2017 - VG

ABSTRACT

Vaporizer devices and apparatuses are provided. In some implementations, a vaporizer device body comprises a cartridge receptacle, a pressure sensor, and a gasket around the pressure sensor. The cartridge receptacle is configured to insertably receive a cartridge containing vaporizable material. The pressure sensor is configured to output sensor readings. A first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure. The sealed air flow path comprises a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge. The sealed air flow path passes from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge. The gasket is configured to seal the device air path from the sealed air flow path.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

CPC						
Symbol					**Type**	**Version**
A24F		47	/	008	F	2013-01-01
H05B		1	/	0244	I	2013-01-01
G01L		9	/	12	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.622

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		A	2	4	F	47 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 10 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.623

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	43	17	15	33	35	49								
-	2	44	18	16	34	36	50								
2	3	45	19	17	35	37	51								
3	4	46	20	18	36	38	52								
4	5	47	21	20	37	39	53								
5	6	48	22	21	38	40	54								
6	7	49	23	22	39	32	55								
7	8	50	24	23	40										
8	9	52	25	24	41										
9	10	13	26	25	42										
10	11	51	27	26	43										
11	12	53	28	28	44										
12	13	14	29	29	45										
-	14	19	30	30	46										
41	15	27	31	31	47										
42	16	32	32	34	48										

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833 (Primary Examiner)	Oct 10 '18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 25

NJOY Exhibit 1002.624

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

CPC						
Symbol					**Type**	**Version**
A24F		47	/	008	F	2013-01-01
H05B		1	/	0244	I	2013-01-01
G01L		9	/	12	I	2013-01-01
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Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 24 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.625

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		A	2	4	F	47 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833	Oct 24 '18	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	25

NJOY Exhibit 1002.626

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15430317	HATTON ET AL.
	Examiner	**Art Unit**
	VANESSA GIRARDI	2833

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	43	17	15	33	35	49								
-	2	44	18	16	34	36	50								
2	3	45	19	17	35	37	51								
3	4	46	20	18	36	38	52								
4	5	47	21	20	37	39	53								
5	6	48	22	21	38	40	54								
6	7	49	23	22	39	32	55								
7	8	50	24	23	40										
8	9	52	25	24	41										
9	10	13	26	25	42										
10	11	51	27	26	43										
11	12	53	28	28	44										
12	13	14	29	29	45										
-	14	19	30	30	46										
41	15	27	31	31	47										
42	16	33	32	34	48										

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 53	
/VANESSA GIRARDI/ Primary Examiner.Art Unit 2833 (Primary Examiner)	Oct 24 '18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 25

NJOY Exhibit 1002.627

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United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	11/20/2018	10130123	52210-515001US/736.200	8844

148514 7590 10/31/2018

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Nicholas Jay HATTON, San Francisco, CA;
JUUL LABS, INC., San Francisco, CA;
Steven CHRISTENSEN, San Francisco, CA;

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NJOY Exhibit 1002.628

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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/430,317	02/10/2017	Nicholas Jay HATTON	52210-515001US/736.200	8844

148514 7590 05/15/2019

Mintz/JUUL/PAX
One Financial Center
Boston, MA 02111

EXAMINER
GIRARDI, VANESSA MARY

ART UNIT	PAPER NUMBER
2833	

NOTIFICATION DATE	DELIVERY MODE
05/15/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPDocketingBOS@mintz.com
IPFileroombos@mintz.com

NJOY Exhibit 1002.629

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
15/430,317	02/10/2017	HATTON et al.	52210-515001US/73

	EXAMINER	
Mintz/JUUL/PAX One Financial Center Boston, MA 02111	AMY C JOHNSON	
	ART UNIT	PAPER
	2833	20190513

DATE MAILED: _____

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

It has been brought to the attention of the examiner that the amendment filed September 19, 2018 was not fully considered. It has been fully entered with the Certificate of Correction attached.

/AMY COHEN JOHNSON/
Supervisory Patent Examiner, Art Unit 2833

PTO-90C (Rev.04-03)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.: 10130123

DATED: 05/13/2019

INVENTOR(S): HATTON et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

U.S. Patent No. 10130123 Claims 1-13, 41-53 are canceled per the amendment submitted by applicant on September 19, 2018.
The abstract of September 19, 2018 replaces the original abstract.

NJOY Exhibit 1002.631

OK TO ENTER: /A.C.J/ 05/13/2019

ABSTRACT

Vaporizer devices and apparatuses are provided. In some implementations, a vaporizer device body comprises a cartridge receptacle, a pressure sensor, and a gasket around the pressure sensor. The cartridge receptacle is configured to insertably receive a cartridge containing vaporizable material. The pressure sensor is configured to output sensor readings. A first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure. The sealed air flow path comprises a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge. The sealed air flow path passes from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge. The gasket is configured to seal the device air path from the sealed air flow path.

NJOY Exhibit 1002.632

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,130,123 B2
APPLICATION NO. : 15/430317
DATED : November 20, 2018
INVENTOR(S) : Nicholas Jay Hatton et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

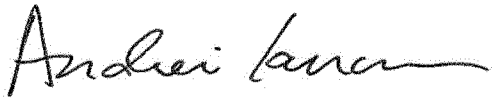
In the Abstract, item (57), "Methods and apparatuses for discriminating between user blowing and drawing (sucking) in an electronic vaporization device. Described herein are electronic aerosol devices and methods of controlling or operating them which can accurately differentiate between blowing and drawing (sucking) through the mouthpiece and adjust the control of the vaporizer accordingly." should be changed to -- Vaporizer devices and apparatuses are provided. In some implementations, a vaporizer device body comprises a cartridge receptacle, a pressure sensor, and a gasket around the pressure sensor. The cartridge receptacle is configured to insertably receive a cartridge containing vaporizable material. The pressure sensor is configured to output sensor readings. A first side of the pressure sensor is exposed to a sealed air flow path and a second side of the pressure sensor is exposed to a device air path open to ambient pressure. The sealed air flow path comprises a channel formed between an interior surface of the cartridge receptacle and an exterior surface of the cartridge. The sealed air flow path passes from an air inlet, through the channel and to a heater and an outlet of a mouthpiece within the cartridge. The gasket is configured to seal the device air path from the sealed air flow path. --.

Under abstract "53 Claims, 19 Drawing Sheets" should read -- 27 Claims, 19 Drawing Sheets --.

In the Claims

At Column 47, Lines 33-65, Claim number 1 should be deleted.
At Column 47, Lines 66-67, Claim number 2 should be deleted.
At Column 48, Lines 1-2, Claim number 3 should be deleted.
At Column 48, Lines 3-4, Claim number 4 should be deleted.
At Column 48, Lines 5-6, Claim number 5 should be deleted.
At Column 48, Lines 7-8, Claim number 6 should be deleted.
At Column 48, Lines 9-10, Claim number 7 should be deleted.
At Column 48, Lines 11-13, Claim number 8 should be deleted.
At Column 48, Lines 14-16, Claim number 9 should be deleted.

Signed and Sealed this
Third Day of September, 2019



Andrei Iancu
Director of the United States Patent and Trademark Office

At Column 48, Lines 17-21, Claim number 10 should be deleted.
At Column 48, Lines 22-27, Claim number 11 should be deleted.
At Column 48, Lines 28-33, Claim number 12 should be deleted.
At Column 48, Lines 34-44, Claim number 13 should be deleted.
At Column 50, Line 61, to Column 51, Line 24, Claim number 41 should be deleted.
At Column 51, Lines 25-26, Claim number 42 should be deleted.
At Column 51, Lines 27-28, Claim number 43 should be deleted.
At Column 51, Lines 29-30, Claim number 44 should be deleted.
At Column 51, Lines 31-32, Claim number 45 should be deleted.
At Column 51, Lines 33-34, Claim number 46 should be deleted.
At Column 51, Lines 35-36, Claim number 47 should be deleted.
At Column 51, Lines 37-38, Claim number 48 should be deleted.
At Column 51, Lines 39-40, Claim number 49 should be deleted.
At Column 52, Lines 1-4, Claim number 50 should be deleted.
At Column 52, Lines 5-15, Claim number 51 should be deleted.
At Column 52, Lines 16-31, Claim number 52 should be deleted.
At Column 52, Lines 32-37, Claim number 53 should be deleted.