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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
62/184,569	06/25/2015		260	24000-000220-US-PS1		

CONFIRMATION NO. 2624

FILING RECEIPT

127542
Harness, Dickey & Pierce-Altria
11730 Plaza America Drive, Suite 600
Reston, VA 20190



0000000076156181

Date Mailed: 07/09/2015

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. 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)

Geoffrey Brandon JORDAN, Midlothian, VA;
Philip DIANA, Richmond, VA;
Sean SUNDBERG, Richmond, VA;
David BENNETT, Richmond, VA;
Christopher S. TUCKER, Midlothian, VA;
Barry S. SMITH, Richmond, VA;
Edmond J. CADIEUX, Mechanicsville, VA;
Doug A. BURTON, Richmond, VA;
Paul BUTLER, Boston, MA;

Applicant(s)

Geoffrey Brandon JORDAN, Midlothian, VA;
Philip DIANA, Richmond, VA;
Sean SUNDBERG, Richmond, VA;
David BENNETT, Richmond, VA;
Christopher S. TUCKER, Midlothian, VA;
Barry S. SMITH, Richmond, VA;
Edmond J. CADIEUX, Mechanicsville, VA;
Doug A. BURTON, Richmond, VA;
Paul BUTLER, Boston, MA;

Power of Attorney:

Gary Yacura--35416

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 07/08/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/184,569**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No
Title

ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR

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).

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 Assets Control, 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.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2
This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. _____

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Geoffrey Brandon	JORDAN	Midlothian, Virginia
Philip	DIANA	Richmond, Virginia
Sean	SUNDBERG	Richmond, Virginia
David	BENNETT	Richmond, Virginia
Christopher S.	TUCKER	Midlothian, Virginia
Additional inventors are being named on the _____ 1 _____ separately numbered sheets attached hereto.		
TITLE OF THE INVENTION (500 characters max):		
ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		
Direct all correspondence to: CORRESPONDENCE ADDRESS		
☒ The address corresponding to Customer Number: 127542		
OR		
☐ Firm or Individual Name		
Address		
City	State	Zip
Country	Telephone	Email
ENCLOSED APPLICATION PARTS (check all that apply)		
☒ Application Data Sheet. See 37 CFR 1.76.		
☐ CD(s), Number of CDs _____		
☒ Drawing(s) Number of Sheets _____ 10 _____		
☐ Other (specify) _____		
☒ Specification (e.g., description of the invention) Number of Pages _____ 29 _____		
Fees Due: Filing Fee of \$260 (\$130 for small entity) (\$65 for micro entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$400 (\$200 for small entity) (\$100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).		
METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT		
☐ Applicant asserts small entity status. See 37 CFR 1.27.		
☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.		
☐ A check or money order made payable to the <i>Director of the United States Patent and Trademark Office</i> is enclosed to cover the filing fee and application size fee (if applicable).		
☐ Payment by credit card. Form PTO-2038 is attached.		
☒ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit		
Account Number: _____ 08-0750 _____		

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 2 of 2

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.	
☒	No.
☐	Yes, the invention was made by an agency of the U.S. Government. The U.S. Government agency name is: _____
☐	Yes, the invention was made under a contract with an agency of the U.S. Government. The name of the U.S. Government agency and Government contract number are: _____

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.

SIGNATURE _____ /Gary D. Yacura/	DATE _____ June 25, 2015
TYPED OR PRINTED NAME _____ Gary D. Yacura	REGISTRATION NO. _____ 35,416 <i>(if appropriate)</i>
TELEPHONE _____ (703) 668-8000	DOCKET NUMBER _____ 24000-000220-US-PS1

**SUPPLEMENTAL SHEET FOR
PROVISIONAL APPLICATION FOR PATENT COVER SHEET**

Page 1 of 1

First Named Inventor	Geoffrey B. JORDAN	Docket Number 24000-000220-US-PS1
INVENTOR(S)		
Given Name (first and middle (if any))	Family Name or Surname	Residence (City and either State or Foreign Country)
Barry S. Edmond J. Doug A. Paul	SMITH CADIEUX BURTON BUTLER	Richmond, Virginia Mechanicsville, Virginia Richmond, Virginia Boston, Massachusetts

2501981.1

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	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		
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	
	Geoffrey	B.	JORDAN		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Midlothian	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province	VA		
Postal Code	23219	Country i	US		
Inventor 2					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Philip		DIANA		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Richmond	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province	VA		
Postal Code	23219	Country i	US		
Inventor 3					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Sean		SUNDBERG		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

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		24000-000220-US-PS1	
		Application Number			
Title of Invention		ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR			
City	Richmond	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province	VA		
Postal Code	23219	Country i	US		
Inventor 4					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
Mr.	David		BENNETT		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Richmond	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province	VA		
Postal Code	23219	Country i	US		
Inventor 5					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
Mr.	Christopher	S.	TUCKER		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Midlothian	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province	VA		
Postal Code	23219	Country i	US		
Inventor 6					Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Barry	S.	SMITH		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Richmond	State/Province	VA	Country of Residence i	US

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number		24000-000220-US-PS1	
		Application Number			
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR				
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province		VA	
Postal Code		23219	Country i	US	
Inventor 7					Remove
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Edmond	J.		CADIEUX	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Mechanicsville	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province		VA	
Postal Code		23219	Country i	US	
Inventor 8					Remove
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Doug	A.		BURTON	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Richmond	State/Province	VA	Country of Residence i	US
Mailing Address of Inventor:					
Address 1		c/o Altria Client Services Inc.			
Address 2		601 East Jackson Street			
City	Richmond	State/Province		VA	
Postal Code		23219	Country i	US	
Inventor 9					Remove
Legal Name					
Prefix	Given Name	Middle Name		Family Name	Suffix
	Paul			BUTLER	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Boston	State/Province	MA	Country of Residence i	US

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	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		

Mailing Address of Inventor:

Address 1		c/o Altria Client Services Inc.	
Address 2		601 East Jackson Street	
City	Richmond	State/Province	VA
Postal Code	23219	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).	
☐ An Address is being provided for the correspondence information of this application.	
Customer Number	127542
Email Address	Add Email Remove Email

Application Information:

Title of the Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		
Attorney Docket Number	24000-000220-US-PS1	Small Entity Status Claimed	☐
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)		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.

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	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		

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	127542		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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 blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
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(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(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 ^j (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		

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.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices
If 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 World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application. In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application. In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

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.

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	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		

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 i		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.	
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	

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	24000-000220-US-PS1
		Application Number	
Title of Invention	ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		

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				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Gary D. Yacura/			Date (YYYY-MM-DD)	2015-06-25
First Name	Gary	Last Name	Yacura	Registration Number	35416
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ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR

BACKGROUND

Field

[0001] At least some example embodiments relate generally to an electronic vaping (e-vaping) device.

Related Art

[0001] Electronic vaping devices are used to vaporize a pre-vapor formulation into a vapor. These electronic vaping devices may be referred to as e-vaping devices. E-vaping devices include a heater, which vaporizes the pre-vapor formulation to produce the vapor. The e-vaping device may include several e-vaping elements including a power source, a cartridge or e-vaping tank including the heater and a reservoir capable of holding the pre-vapor formulation.

SUMMARY

[0002] At least some example embodiments relate to an e-vaping device.

[0003] At least one example embodiment discloses a section of an electronic-vaping device including a pressure sensor configured to measure a current ambient pressure, the pressure sensor further configured to output the current ambient pressure measurement in accordance with a read request frequency and a controller configured to determine a mode of operation of the electronic-vaping device, control the read request frequency based on the determined mode of operation, and detect a threshold pressure change based on the current ambient pressure and a baseline pressure.

[0004] In an example embodiment, the controller is configured to control the read request frequency such that the read request frequency has a first frequency

in a first mode of operation and a second frequency in a second mode of operation, the first frequency being different than the second frequency and the first and second frequencies being greater than zero.

[0005] In an example embodiment, the first frequency is higher than the second frequency, the first mode of operation is an active mode and the second mode of operation is associated with reduced power consumption relative to the active mode.

[0006] In an example embodiment, the controller is configured to determine the baseline pressure based on previous ambient pressure measurements.

[0007] In an example embodiment, the controller is configured to determine an average of the previous ambient pressure measurements, the average of the previous ambient pressure measurements being the baseline pressure.

[0008] In an example embodiment, the previous ambient pressure measurements are received by the controller within a threshold time period.

[0009] In an example embodiment, the controller is configured to ignore previous ambient pressure measurements received within a threshold time period upon detecting the threshold pressure change.

[0010] In an example embodiment, the controller is configured to control the electronic-vaping device in a reduced power state if the pressure sensor measures a positive pressure as the current ambient pressure.

[0011] In an example embodiment, the pressure sensor is a microelectromechanical system (MEMS) sensor.

[0012] At least one example embodiment discloses an electronic-vaping device including a cartridge including a heating element and a power supply section, the power supply section and the cartridge being configured to connect, the power supply section including a pressure sensor configured to measure a current ambient pressure and further configured to output the current ambient

pressure measurement in accordance with a read request frequency, and a controller configured to determine a mode of operation of the electronic-vaping device, control the read request frequency based on the determined mode of operation, and detect a threshold pressure change based on the current ambient pressure and a baseline pressure.

[0013] In an example embodiment, the controller is configured to control the read request frequency such that the read request frequency has a first frequency in a first mode of operation and a second frequency in a second mode of operation, the first frequency being different than the second frequency and the first and second frequencies being greater than zero.

[0014] In an example embodiment, the first frequency is higher than the second frequency, the first mode of operation is an active mode and the second mode of operation is associated with reduced power consumption relative to the active mode.

[0015] In an example embodiment, the controller is configured to determine the baseline pressure based on previous ambient pressure measurements.

[0016] In an example embodiment, the controller is configured to determine an average of the previous ambient pressure measurements, the average of the previous ambient pressure measurements being the baseline pressure.

[0017] In an example embodiment, the previous ambient pressure measurements are received by the controller within a threshold time period.

[0018] In an example embodiment, the controller is configured to ignore previous ambient pressure measurements received within a threshold time period upon detecting the threshold pressure change.

[0019] In an example embodiment, the controller is configured to control the electronic-vaping device in a reduced power state if the pressure sensor measures a positive pressure as the current ambient pressure.

[0020] In an example embodiment, the pressure sensor is a microelectromechanical system (MEMS) sensor.

[0021] At least one example embodiment discloses a method of detecting a threshold pressure change within an electronic vaping device. The method includes determining a mode of operation of the electronic vaping device, determining a read request frequency based on the mode of operation, receiving a current pressure measurement based on the read request frequency and determining a threshold pressure change of the electronic vaping device based on the current pressure measurement and a baseline pressure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The above and other features and advantages of example embodiments will become more apparent by describing, example embodiments in detail with reference to the attached drawings. The accompanying drawings are intended to depict example embodiments and should not be interpreted to limit the intended scope of the claims. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted.

[0023] FIG. 1 illustrates an electronic vaping device including a reusable section according to an example embodiment;

[0024] FIG. 2 illustrates a semi-transparent view of an example embodiment of the reusable section shown in FIG. 1;

[0025] FIG. 3A illustrates a cross-sectional view of an example embodiment of the reusable section shown in FIG. 1;

[0026] FIG. 3B illustrates a cross-sectional view of an example embodiment of the cartridge section shown in FIG. 1;

[0027] FIG. 3C illustrates a close-up cross-sectional view of an example embodiment of the cartridge section within the dashed lines of FIG. 3B;

[0028] FIG. 3D illustrates a cross sectional view of a connection area between the cartridge section and the reusable section in Fig. 1;

[0029] FIG. 4 illustrates an exploded view of an example embodiment of the reusable section shown in FIG. 1;

[0030] FIG. 5A illustrates an example embodiment of a circuit board of the electronic vaping device shown in FIG. 1;

[0031] FIG. 5B illustrates a more detailed view of a connection between a microprocessor and a MEMS pressure sensor of FIG. 5A; and

[0032] FIG. 6 illustrates a method of detecting a threshold pressure change according to an example embodiment.

DETAILED DESCRIPTION

[0033] Some detailed example embodiments are disclosed herein. However, specific structural and functional details disclosed herein are merely representative for purposes of describing example embodiments. Example embodiments may, however, be embodied in many alternate forms and should not be construed as limited to only the embodiments set forth herein.

[0034] Accordingly, while example embodiments are capable of various modifications and alternative forms, embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit example embodiments to the particular forms disclosed, but to the contrary, example embodiments are to cover all modifications, equivalents, and alternatives falling within the scope of example embodiments. Like numbers refer to like elements throughout the description of the figures.

[0035] It should be understood that when an element or layer is referred to as being "on," "connected to," "coupled to," or "covering" another element or layer, it

may be directly on, connected to, coupled to, or covering the other element or layer or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly connected to," or "directly coupled to" another element or layer, there are no intervening elements or layers present. Like numbers refer to like elements throughout the specification. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0036] It should be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers, and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer, or section from another region, layer, or section. Thus, a first element, component, region, layer, or section discussed below could be termed a second element, component, region, layer, or section without departing from the teachings of example embodiments.

[0037] Spatially relative terms (e.g., "beneath," "below," "lower," "above," "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 should 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 the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the term "below" may encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0038] The terminology used herein is for the purpose of describing various embodiments only and is not intended to be limiting of example embodiments. 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 "includes," "including," "comprises," and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0039] Example embodiments are described herein with reference to cross-sectional illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of example embodiments. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, example embodiments should not be construed as limited to the shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. Thus, the regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of example embodiments.

[0040] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which example embodiments belong. It will be further understood that terms, including those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0041] Referring to FIG. 1, an electronic vaping (e-vaping) device 10 includes a replaceable cartridge (or first section) 50, a reusable section (or second section) 100 and light indicators 105.

[0042] The light indicators 105 may be controlled by a controller and indicate a status of the e-vaping device 10. The light indicators 105 may be three light-emitting diodes (LEDs) that are used in various sequences to illustrate at least the following states of the e-vaping device 10: Cartomizer Detected, Battery Removed From Charger, Puff, Battery Level, Disabled Mode, Enabled Mode, Cartomizer Error and Battery Error.

[0043] The first section 50 and the second section 100 may be coupled together at a connection using a connector. The connector may include a male connecting portion and a female connecting portion. The male connecting portion may be secured to one of the first section 50 and the second section 100. The male connecting portion may include a pair of mating arms extending from a rim of the male connecting portion. The pair of mating arms and the rim may define a pair of angled slots therebetween. A terminus of each of the pair of angled slots includes an enlarged socket end. The female connecting portion is secured to the other of the first section 50 and the second section 100. For example, when the male connecting portion is secured to the first section 50, the female connecting portion is secured to the second section 100 (and vice versa). The female connecting portion may include an inner surface and a pair of lugs on the inner surface. The female connecting portion is configured to longitudinally and rotationally receive the pair of mating arms of the male connecting portion so as to engage each of the pair of lugs of the female connecting portion within the enlarged socket end of each of the pair of angled slots of the male connecting portion to electrically couple the first section 50 and the second section 100.

[0044] The second section 100 may also include a pressure sensor to monitor a pressure within the second section 100, a power supply and a controller configured to control and interpret data from the pressure sensor.

[0045] The first section 50 may include a vaporizer assembly configured to heat a pre-vapor formulation to generate a vapor. A pre-vapor formulation is a material or combination of materials that may be transformed into a vapor. For example, the pre-vapor formulation may be a liquid, solid, and/or gel formulation including, but not limited to, water, beads, solvents, active ingredients, ethanol, plant extracts, natural or artificial flavors, and/or vapor formers such as glycerine and propylene glycol. The battery assembly is configured to power the vaporizer assembly.

[0046] FIG. 2 illustrates a semi-transparent view of the second section 100. As shown in FIG. 2, the second section 100 includes a female connecting portion 106, a housing 108, a power supply 110, a light pipe assembly 112, a printed circuit board (PCB) 116, an end cap 118, a positive contact 120 and a common contact 122. The light pipe assembly 112 includes a light article (e.g., light pipe) 114 which holds the lighting indicators.

[0047] A female connecting portion 106 is disposed at a proximal end of the housing 108, while the end cap 118, the first contact 120 (e.g., positive contact), and the second contact 122 (e.g., common contact) are disposed at an opposing, distal end of the housing 108. The second section 100 has a proximal end (adjacent to the female connecting portion 106) with a cylindrical shape that transitions into a triangular form at the opposing, distal end (adjacent to the second contact 122). For instance, the opposing, distal end may have a cross-sectional shape that resembles a Reuleaux triangle. A Reuleaux triangle is a shape formed from the intersection of three circles, each having its center on the boundary of the other two. The second section 100 may also have a slanted end

face (relative to the longitudinal axis of the second section 100). However, it should be understood that example embodiments may have other configurations and are not limited to the above forms.

[0048] The female connecting portion 106 provides a connection to the first section 50. The female connecting portion 106 is made of a conductive material to provide an electrical connection between the second section 100 and the first section 50. For example, the female connecting portion 106 may have a base made of brass that is plated with nickel and then top plated with silver.

[0049] More specifically, upon completing the connection, the power supply 110 is electrically connected with a heater element of the first section 50 upon sensing negative pressure applied by an adult vaper by a pressure sensor. Air is drawn primarily into the first section 50 through one or more air inlets (see, e.g., FIG. 3B). Example embodiments are not limited to e-vaping devices using a pressure sensor to activate the vaping. Rather, example embodiments are also applicable to e-vaping devices that use another means for activation, such as a push button or a capacitive button.

[0050] The power supply 110 may be operably connected to the heater (as described below) to apply a voltage across the heater. The e-vaping device 10 also includes at least one air inlet operable to deliver air to a central air passage of the first section 50.

[0051] Furthermore, the power supply 110 supplies power to a controller on the PCB 116, as will be described in greater detail below.

[0052] The power supply 110 may be a Lithium-ion battery or one of its variants, for example a Lithium-ion polymer battery. Alternatively, the power supply 110 may be a Nickel-metal hydride battery, a Nickel cadmium battery, a Lithium-manganese battery, a Lithium-cobalt battery or a fuel cell. In that case, the e-vaping device 10 is usable until the energy in the power supply 110 is

depleted or below a set threshold. The power supply 110 may be rechargeable and the PCB 116 includes circuitry allowing the battery to be chargeable by an external charging device.

[0053] FIG. 3A illustrates a cross-sectional view of the second section 100. Referring to FIG. 3A, the second section 100 may increase in size from the proximal end (adjacent to the female connecting portion 106) to the opposing, distal end (adjacent to the second contact 122). The anode portion 102 and a female insulating member 104 may be disposed within the female connecting portion 106. The female insulating member 104 may be an annular structure, with the anode portion 102 extending therethrough. For instance, the anode portion 102 may be arranged concentrically within the female connecting portion 106 while being electrically isolated therefrom via the female insulating member 104.

[0054] As shown in FIG. 3A, the power supply 110 may include a battery arranged in the e-vaping device 10 such that a cathode 110a of the power supply 110 may be downstream of an anode 110b of the power supply 110. The cathode 110a is connected to the PCB 116 by a wire 129a. The PCB 116 is then connected to the cathode portion 106a by a wire 129b. An anode portion 102 of the female connecting portion 106 may be connected to the anode 110b through a wire 128. More specifically, the anode 110b is connected to the circuitry of the PCB 116 by a wire 126. The circuitry on the PCB 116 acts as a switch to connect the anode 110b of the power supply 110 to the anode portion 102 of the female connecting portion 106, and the cathode 110a of the power supply 110 to the cathode portion 106a. When the PCB circuitry enables the switch, current is allowed to flow through this circuitry if the anode portion 102 is connected to an acceptable circuit (e.g., the first section 50).

[0055] It should be understood that the locations of the cathode portion 106a and the anode portion 102 may be switched within the female connecting portion 106.

[0056] FIG. 3B illustrates a cross-sectional view of an example embodiment of the first section 50 shown in FIG. 1. Referring to FIG. 3B, the first section (or cartridge section) 50 includes a housing 202 with a proximal end and an opposing, distal end. The housing 202 may be formed of metal (e.g., stainless steel), although other suitable materials may be used. A mouthpiece 204 and a sealing ring 212 are disposed at the proximal end of the housing 202, while a male connecting portion 206 (e.g., vaporizer connector) is disposed at the opposing, distal end of the housing 202. A male anode 208 (e.g., post) and a male insulating member 210 (e.g., gasket ring) may be disposed within the male connecting portion 206. The male insulating member 210 may be an annular structure, with the male anode 208 extending therethrough. For instance, the male anode 208 may be arranged concentrically within the male connecting portion 206 while being electrically isolated therefrom via the male insulating member 210. The male insulating member 210 and the sealing ring 212 may be formed of silicone. The first section 50 may include one or more air inlets 215 through which air may be drawn and the pressure sensor may measure the air pressure resulting from the air drawn through the one or more air inlets 215.

[0057] The male connecting portion 206 of the first section 50 may, upon attachment of the first section 50 and the second section 100, electrically connect to cathode portion 106a of the second section 100. The first section 50 and the second section 100 may be attached by engaging the female connecting portion 106 of the second section 100 with the male connecting portion 206 of the first section 50. The first section 50 may include a vaporizer 250. The vaporizer 250 may include a heating element (or heater) for vaporizing the pre-vapor formulation.

[0058] From the above description of FIGS. 3A and 3B, it should be understood that the first section 50 and the second section 100 may be coupled together at a connection using a connector. The connector may include the male connecting portion 206 and the female connecting portion 106. According to example embodiments shown in FIGS. 3A and 3B, the male connecting portion 206 may be secured to the first section 50 while the female connecting portion 106 may be secured to the second section 100. The male connecting portion 206 may include a pair of mating arms extending from a rim of the male connecting portion. The pair of mating arms and the rim may define a pair of angled slots therebetween. A terminus of each of the pair of angled slots includes an enlarged socket end. The female connecting portion 106 is secured to the first section 50. For example, when the male connecting portion 206 is secured to the second section 100, the female connecting portion 106 is secured to the first section 50 (and vice versa). The female connecting portion 106 may include an inner surface and a pair of lugs on the inner surface. The female connecting portion 106 is configured to longitudinally and rotationally receive the pair of mating arms of the male connecting portion 206 so as to engage each of the pair of lugs of the female connecting portion 106 within the enlarged socket end of each of the pair of angled slots of the male connecting portion 206 to electrically couple the first section 50 and the second section 100.

[0059] FIG. 3C illustrates a close-up cross-sectional view of an example embodiment of the cartridge section shown in FIG. 3B within the dashed line. As shown in FIG. 3C, a heater 252 of the vaporizer 250 may be electrically connected to a body 220 of the male connecting portion 206 and the male anode 208 at connection points 255 and 260, respectively.

[0060] With reference to FIGS. 3B and 3C, the housing 202 may include a reservoir 290 with porous materials 270 and 280. The reservoir 290 and the

porous materials 270 and 280 may contain the pre-vapor formulation. A density of the porous material 270 may be greater than a density of the porous material 280. The housing 202 may include the vaporizer 250. The vaporizer 250 may include a porous element 251 in fluid communication with the pre-vapor formulation contained within the reservoir 290. The vaporizer 250 may include the heating element (or heater) 252 for vaporizing the pre-vapor formulation contained in the porous element 251. A portion of the heater 252 may be coiled around the porous element 251 while two electrical leads of the heater 252 extend to connection points 255 and 260, respectively. The housing 202 may include an inner tube 265 defining central air channel 275 to allow for air flow between air outlets 295 of the mouth piece 204 and the air inlets 215. The vaporizer 250 may be arranged in the air channel 275 such that vapor generated by the vaporizer may flow toward the mouthpiece 204.

[0061] FIG. 3D illustrates a cross sectional view of a connection area between the first section and the second section in Fig. 1. FIG. 3D shows the electrical connection between the male anode 208 and the anode portion (female anode) 102, and the electrical connection between the male connecting portion 206 and the cathode portion 106a.

[0062] With reference to FIGS. 3A-3D, electrical connection between the anode 110b of the power supply 110 and the heater 252 in the first section 50 may be established through the PCB 116, the anode portion (female anode) 102 in the second section 100, the male anode 208 in the first section 50, and a connection point 260 on the male anode 208 with a first electrical lead of the heater 252. Similarly, electrical connection between the cathode 110a of the power supply 110 and a second electrical lead of the heater 252 may be established through the PCB 116, the cathode portion 106a of the connecting portion 106, the male connecting portion 206, and the connection point 255 of the second electrical lead to the body

220 of the male connecting portion 206. The connection points 255 and 260 may be achieved by, for example, spot welding or soldering the two electrical leads of the heater 252.

[0063] Referring back to FIG. 3A, the housing 108 may be made of a plastic and plated with aluminum and coated with gunmetal pigment. The housing 108 extends in a longitudinal direction and houses the power supply 110, the light pipe assembly 112 and the PCB 116. The female connecting portion 106 and the end cap 118 are provided at opposing ends of the housing 108. The positive contact 120 and common contact 122 are attached to an exposed face of the end cap 118. Both the positive contact 120 and the common contact 122 may be coated with nickel and silver.

[0064] The light article 114 (e.g., light pipe) may be disposed in the distal end of the second section 100. The light article 114 contains light indicators 105a-105c that are configured to emit a light that is visible to an adult vaper based on the state of the e-vapor device. In an example embodiment, the light indicators 105a-105c may emit a light of a first color during vaping, a light of a second color when the power supply 110 is running low, and/or a light of a third color when the power supply 110 is being charged. In lieu of (or in addition to) colored lights, the light indicators 105a-105c may emit a flashing light and/or a pattern of lights as a status indicator.

[0065] For example, the light indicators 105a-105c may be light-emitting diodes (LEDs) that are used in various sequences to illustrate at least the following states: Cartomizer Detected, Battery Removed From Charger, Puff, Battery Level, Disabled Mode, Enabled Mode, Cartomizer Error and Battery Error.

[0066] The positive contact 120 and the common contact 122 may be connected to the PCB 116 by wires. The positive contact 120 and the common contact 122 are connected to the PCB 116 in such a fashion as to permit a charger

to communicate with the controller on the PCB 116 and supply power to the power supply 110. More specifically, when the second section 100 is inserted into a charger, two prongs of the charger, the common contact and the positive contact form a closed circuit.

[0067] FIG. 4 illustrates an exploded view of the second section 100. As shown in FIG. 4, the light pipe 114 may be fitted to be inserted in cylindrical bores 112a, 112b and 112c of the light pipe assembly 112.

[0068] FIG. 5A illustrates a block diagram of components on the PCB 116, according to an example embodiment.

[0069] As shown, the PCB 116 may include a controller 500 and a battery monitoring unit (BMU) 510. In some example embodiments, the PCB 116 includes an external device input/output interface 530. The I/O interface 530 may be a Bluetooth interface, for example.

[0070] The controller 500 includes a microprocessor 502, a computer-readable storage medium 505, a heater control circuit 515, a charge control circuit 520 and a pressure sensor 525.

[0071] The controller 500 performs features of the second section 100, as well as the entire e-vaping device 10, such as controlling the heater, interfacing with an external charger and monitoring the pressure within the e-vaping device 10 to determine whether an adult vaper has applied a negative pressure. Moreover, the controller 500 may determine whether an adult vaper has applied a positive pressure for a threshold time. In such an instance, the controller 500 may place the e-vaping device 10 in a disabled and or hibernation mode (reduced power consumption and/or preventing activation).

[0072] The controller 500 may be hardware, firmware, hardware executing software or any combination thereof. When the controller 500 is hardware, such existing hardware may include one or more Central Processing Units (CPUs), digital

signal processors (DSPs), application-specific-integrated-circuits (ASICs), field programmable gate arrays (FPGAs) computers or the like configured as special purpose machines to perform the functions of the controller 500.

[0073] In the event where the controller 500 is a processor executing software, the controller 500 is configured as a special purpose machine to execute the software, stored in the computer-readable storage medium 505, to perform the functions of the controller 500.

[0074] Furthermore, as shown in the example embodiment shown in FIG. 5, the controller 500 may be a combination of hardware and a processor executing software. As shown, hardware components may include the computer-readable storage medium 505, the heater control circuit 515, the charge control circuit 520 and the pressure sensor 525. As shown, the microprocessor 502 is configured to control the operation of the hardware components described above by executing software stored on the computer-readable storage medium 505.

[0075] As disclosed herein, the term "computer-readable storage medium" or "non-transitory computer-readable storage medium" may represent one or more devices for storing data, including read only memory (ROM), random access memory (RAM), magnetic RAM, core memory, magnetic disk storage mediums, optical storage mediums, flash memory devices and/or other tangible machine readable mediums for storing information. The term "computer-readable storage medium" may include, but is not limited to, portable or fixed storage devices, optical storage devices, and various other mediums capable of storing, containing or carrying instruction(s) and/or data.

[0076] As shown in FIG. 5A, the power supply 110 supplies a voltage V_{BAT} to the heater control circuit 515, the charge control circuit 520 and the light article 114. Based on the voltage V_{BAT} and data from the microprocessor 502 to the light

article 114, the light article 114 produces a light or series of lights indicating a status of the e-vaping device 10.

[0077] The heater control circuit 515 and the charge control circuit 520 are controlled by the microprocessor 502 and transmit/receive data to and from the microprocessor 502.

[0078] More specifically, the heater control circuit 515 is configured to control a voltage supplied to the heater of the first section 50 based on a pulse-width modulation signal and enable signal from the microprocessor 502. For example, when the microprocessor 502 detects that the first section 50 and 100 are connected and an adult vaper has applied a negative pressure, the heater control circuit 515 is configured to supply a voltage to the heater and monitor a voltage of the across the heater and a current across the heater. The heater control circuit 515 is configured to feedback the monitored voltage and current across the heater. The microprocessor 502 is then configured to adjust the pulse-width modulation signal based on the feedback from the heater control circuit 515.

[0079] The charge control circuit 520 acts as an interface between an external charger and the second section 100. More specifically, upon connecting to the charger, the charger sends a series of voltage pulses to the charge control circuit 520. The microprocessor 502 determines whether the series of voltage pulses is a correct series. If the series is determined by the microprocessor 502 to be correct, the microprocessor 502 instructs the charge control circuit 520 to generate a responding series of voltages such that if the charger sees the correct response, the charger begins charging the power supply 110.

[0080] The BMU 510 monitors a voltage V_{BAT} generated by the power supply 110. If the voltage V_{BAT} is within a set range, the BMU 510 supplies the voltage V_{BAT} to the microprocessor 502. If the voltage V_{BAT} is not within the set range, the BMU 510 prevents power being supplied to the microprocessor 502. For example,

the BMU 510 does not allow the battery to be discharged when below 2.5V and cannot be charged above 4.3V.

[0081] The microprocessor 502 includes a voltage regulator to convert the voltage V_{BAT} to another voltage V_{DD} . The microprocessor 502 supplies the voltage V_{DD} to the pressure sensor 525.

[0082] The pressure sensor 525 is a microelectromechanical system (MEMS) sensor that is a true pressure sensor. More specifically, the MEMS pressure sensor 525 does not compare a differential between an ambient and non-ambient pressure. The microprocessor 502 uses the MEMS pressure sensor 525 to determine whether an adult vaper has applied a negative pressure on the e-vaping device 10. When the microprocessor 502 detects an adult vaper applying a negative pressure, the microprocessor 502 controls the heater control circuit 515 to begin a heating process for the heater to create a vapor by vaporizing the pre-vapor formulation.

[0083] Conventionally, e-vaping devices use a differential pressure sensor. Differential pressure sensors measure two air pressures, one ambient and one that changes. The differential pressure sensor is generally set on an end of the device and put into a gasket that seals one side of the sensor from another side of the sensor. When an adult vaper applies a negative pressure, the sealed side of the differential pressure sensor detects a pressure drop (vacuum), while the ambient side detects less of a drop due to the exposure by not being sealed. The differential pressure sensor then provides a differential signal.

[0084] By using a true MEMS pressure sensor 525, the microprocessor 502 determines a negative pressure from an adult vaper faster because the microprocessor 502 does not have to wait for a differential to be detected. Moreover, the MEMS pressure sensor 525 occupies less space than a differential

pressure sensor because the MEMS pressure sensor 525 can be mounted directly on the PCB 116.

[0085] The MEMS pressure sensor 525 may be an MS5637-02BA03 Low Voltage Barometric Pressure Sensor, for example.

[0086] The MEMS pressure sensor 525 and the microprocessor 502 communicate using an Inter-Integrated Circuit (I²C) interface.

[0087] FIG. 5B illustrates a more detailed view of a connection between the microprocessor 502 and the MEMS pressure sensor 525. The MEMS pressure sensor 525 can measure temperature and pressure within the e-vaping device 10. As shown, the MEMS pressure sensor 525 includes an I/O pin 550a for transmitting pressure and temperature data PT_{DATA} and receiving read and write requests (R/W Command) and an input pin 550b for receiving a clock CLK from the microprocessor 502. The microprocessor 502 includes an I/O pin 555a for receiving pressure and temperature data PT_{DATA} and transmitting the read and write requests (R/W Command) to the MEMS pressure sensor 525 and an output pin 555b for transmitting the clock CLK.

[0088] Thus, the pressure and temperature data PT_{DATA} can include at least one of a pressure measurement and a temperature measurement.

[0089] It should be understood that the MEMS pressure sensor 525 and the microprocessor 502 include other pins/ports. Therefore, that the MEMS pressure sensor 525 and the microprocessor 502 are not limited to FIG. 5B.

[0090] The MEMS pressure sensor 525 measures the ambient pressure in accordance with a frequency of the clock CLK. The MEMS pressure sensor 525 sends the measured pressure to the microprocessor 502 in the pressure data PT_{DATA} in accordance with a frequency of read requests (R/W Command).

[0091] The microprocessor 502 controls the frequency of read requests based on a determined operating mode of the e-vaping device 10. Thus, the

microprocessor 502 controls a sampling rate of the pressure from the MEMS pressure sensor 525 by controlling the frequency of read requests.

[0092] More specifically, the e-vaping device 10 may operate in various operating modes to save power. For example, the e-vaping device 10 may operate in an active mode, a middle mode and a hibernation mode.

[0093] The heater control circuit 515 and the microprocessor 502 cooperatively operate to determine whether the second section 100 is connected to the first section 50. When the microprocessor 502 determines that the second section 100 and the first section 50 are not connected or an adult vaper has applied a positive pressure over a disabling threshold difference of the baseline for a threshold time, the microprocessor 502 may operate the second section 100 in the hibernation mode. Therefore, the microprocessor 502 may reduce the frequency of the read requests to a lower frequency, for example, 10 Hz. In an example, the disabling pressure difference may be 225-300 Pa and the threshold time for applying the positive pressure may be three seconds.

[0094] If the microprocessor 502 determines that an adult vaper has applied a negative pressure within a threshold period of time and the second section 100 and the first section 50 are connected, the microprocessor 502 may operate the e-vaping device 10 in the active mode. In the active mode, the microprocessor 502 may control the frequency of the read requests to be a higher frequency, for example, 100 Hz. Other triggers the microprocessor 502 may use for placing the e-vaping device 10 in the active mode include detecting a connection to the cartomizer and removal of the e-vaping device 10 from an external charger.

[0095] If the microprocessor 502 determines that an adult vaper has not applied a negative pressure within a threshold period of time and the second section 100 and the first section 50 are connected, the microprocessor 502 may operate the e-vaping device 10 in the middle mode. In the middle mode, the

microprocessor 502 may control the frequency of the read requests to be between the frequency associated with the active mode and the frequency associated with the hibernation mode, for example, 50 Hz.

[0096] The possible operating modes and associated read request frequencies may be stored as a table in the storage medium 505.

[0097] The microprocessor 502 may determine whether an adult vaper has applied a negative pressure on the e-vaping device 10 by comparing the pressure measured by the MEMS pressure sensor 525 (identified in the pressure and temperature data PT_{DATA}) to a baseline pressure. If the microprocessor 502 determines that the measured pressure differs from the baseline pressure by a initialization threshold difference, the microprocessor 502 determines that an adult vaper has applied a negative pressure and the microprocessor 502 initializes the vaporizing process (i.e., controlling the heater to produce a vapor). In an example embodiment, the initialization threshold difference may be 150 Pa.

[0098] Moreover, after initializing the vaporizing process, the microprocessor 502 continues to monitor the measured pressure from the MEMS pressure sensor 525. If the microprocessor 502 determines that the measured pressure differs from the baseline pressure by an terminating threshold difference, the microprocessor 502 ends the vaporizing process (i.e., reduces the voltage to the heater so as to not produce a vapor such as 0V). In an example embodiment, the terminating threshold difference may be 75 Pa.

[0099] The baseline pressure is a rolling average and may be updated periodically by the microprocessor 502. For example, the microprocessor 502 may calculate the baseline pressure every second based on the samples that occurred after the previous calculation.

[00100] By using a baseline pressure, the microprocessor 502 avoids incorrect determinations. For example, the baseline pressure allows the microprocessor 502

to compensate for changing barometric pressures such as when the weather changes (e.g., a thunderstorm). Thus, the microprocessor 502 does not inadvertently activate the heater when the barometric pressure changes due to the weather and when moving from between indoor spaces having different pressures.

[00101] To avoid the negative pressure applied by the adult vapor affecting the baseline pressure, the microprocessor 502 uses a guard band. For example, the microprocessor 502 may disregard pressure measurements within a threshold time of detecting the negative pressure from the adult vapor.

[00102] Moreover, the microprocessor 502 may use a pre-trigger threshold to prevent the baseline from being updated. More specifically, if the measured pressure from the MEMS pressure sensor 525 is within the pre-trigger threshold difference of the baseline, the microprocessor 502 may updated the baseline pressure. However, the measured pressure from the MEMS pressure sensor 525 is within the pre-trigger threshold difference of the baseline, the microprocessor 502 does not update the baseline pressure. For example, the pre-trigger threshold difference may be 60 Pa.

[00103] In addition to activating the heater when the microprocessor 502 detects a negative pressure from the adult vapor, the microprocessor 502 may limit a maximum puff length and limit a number of puffs within a time limit (e.g., 10 seconds).

[00104] FIG. 6 illustrates a method of detecting a threshold pressure change within an e-vaping device according to an example embodiment. The method of FIG. 6 may be performed by the microprocessor 502.

[00105] At S600, the microprocessor 502 determines a mode of operation. For example, the microprocessor 502 may operate in an active mode, a middle mode and a hibernation mode.

[00106] At S605, the microprocessor 502 determines a read request frequency associated with the operation mode. For example, the microprocessor 502 may access a table to obtain the read request frequency associated with the determined mode of operation.

[00107] At S610, the microprocessor monitors the pressure data, including pressure measurements, from the MEMS pressure sensor 525 and compares the pressure measurements to the baseline pressure. If one of the pressure measurements differs from the baseline pressure by a threshold amount, the microprocessor 502 initiates the vaporizing process.

[00108] Example embodiments having thus been described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the intended spirit and scope of example embodiments, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A section of an electronic-vaping device comprising:
a pressure sensor configured to measure a current ambient pressure, the pressure sensor further configured to output the current ambient pressure measurement in accordance with a read request frequency; and
a controller configured to determine a mode of operation of the electronic-vaping device, control the read request frequency based on the determined mode of operation, and detect a threshold pressure change based on the current ambient pressure and a baseline pressure.
2. The section of claim 1, wherein the controller is configured to control the read request frequency such that read request frequency has a first frequency in a first mode of operation and a second frequency in a second mode of operation, the first frequency being different than the second frequency and the first and second frequencies being greater than zero.
3. The section of claim 2, wherein the first frequency is higher than the second frequency, the first mode of operation is an active mode and the second mode of operation is associated with reduced power consumption relative to the active mode.
4. The section of claim 1, wherein the controller is configured to determine the baseline pressure based on previous ambient pressure measurements.

5. The section of claim 4, wherein the controller is configured to determine an average of the previous ambient pressure measurements, the average of the previous ambient pressure measurements being the baseline pressure.
6. The section of claim 5, wherein the previous ambient pressure measurements are received by the controller within a threshold time period.
7. The section of claim 4, wherein the controller is configured to ignore previous ambient pressure measurements received within a threshold time period upon detecting the threshold pressure change.
8. The section of claim 1, wherein the controller is configured to control the electronic-vaping device in a reduced power state if the pressure sensor measures a positive pressure as the current ambient pressure.
9. The section of claim 1, wherein the pressure sensor is a microelectromechanical system (MEMS) sensor.
10. An electronic-vaping device comprising:
 - a cartridge including a heating element; and
 - a power supply section, the power supply section and the cartridge being configured to connect, the power supply section including,
 - a pressure sensor configured to measure a current ambient pressure, the pressure sensor further configured to output the current ambient pressure measurement in accordance with a read request frequency, and
 - a controller configured to determine a mode of operation of the electronic-vaping device, control the read request frequency based on the

determined mode of operation, and detect a threshold pressure change based on the current ambient pressure and a baseline pressure.

11. The electronic-vaping device of claim 10, wherein the controller is configured to control the read request frequency such that the read request frequency has a first frequency in a first mode of operation and a second frequency in a second mode of operation, the first frequency being different than the second frequency and the first and second frequencies being greater than zero.

12. The electronic-vaping device of claim 11, wherein the first frequency is higher than the second frequency, the first mode of operation is an active mode and the second mode of operation is associated with reduced power consumption relative to the active mode.

13. The electronic-vaping device of claim 10, wherein the controller is configured to determine the baseline pressure based on previous ambient pressure measurements.

14. The electronic-vaping device of claim 13, wherein the controller is configured to determine an average of the previous ambient pressure measurements, the average of the previous ambient pressure measurements being the baseline pressure.

15. The electronic-vaping device of claim 14, wherein the previous ambient pressure measurements are received by the controller within a threshold time period.

16. The electronic-vaping device of claim 13, wherein the controller is configured to ignore previous ambient pressure measurements received within a threshold time period upon detecting the threshold pressure change.

17. The electronic-vaping device of claim 10, wherein the controller is configured to control the electronic-vaping device in a reduced power state if the pressure sensor measures a positive pressure as the current ambient pressure.

18. The electronic-vaping device of claim 10, wherein the pressure sensor is a microelectromechanical system (MEMS) sensor.

19. A method of detecting a threshold pressure change within an electronic vaping device, the method comprising:

determining a mode of operation of the electronic vaping device;

determining a read request frequency based on the mode of operation;

receiving a current pressure measurement based on the read request frequency; and

determining a threshold pressure change of the electronic vaping device based on the current pressure measurement and a baseline pressure.

ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR

ABSTRACT

At least one example embodiment discloses a section of an electronic-vaping device including a pressure sensor configured to measure a current ambient pressure, the pressure sensor further configured to output the current ambient pressure measurement in accordance with a read request frequency, and a controller configured to determine a mode of operation of the electronic-vaping device, control the read request frequency based on the determined mode of operation, and detect a threshold pressure change based on the current ambient pressure and a baseline pressure.

2558980.1

FIG. 1

10

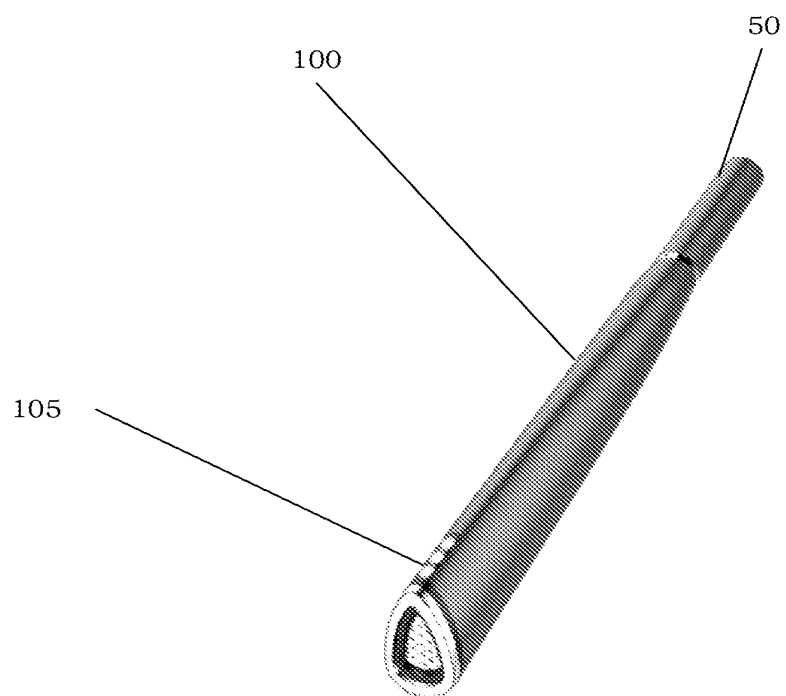


FIG. 2

100

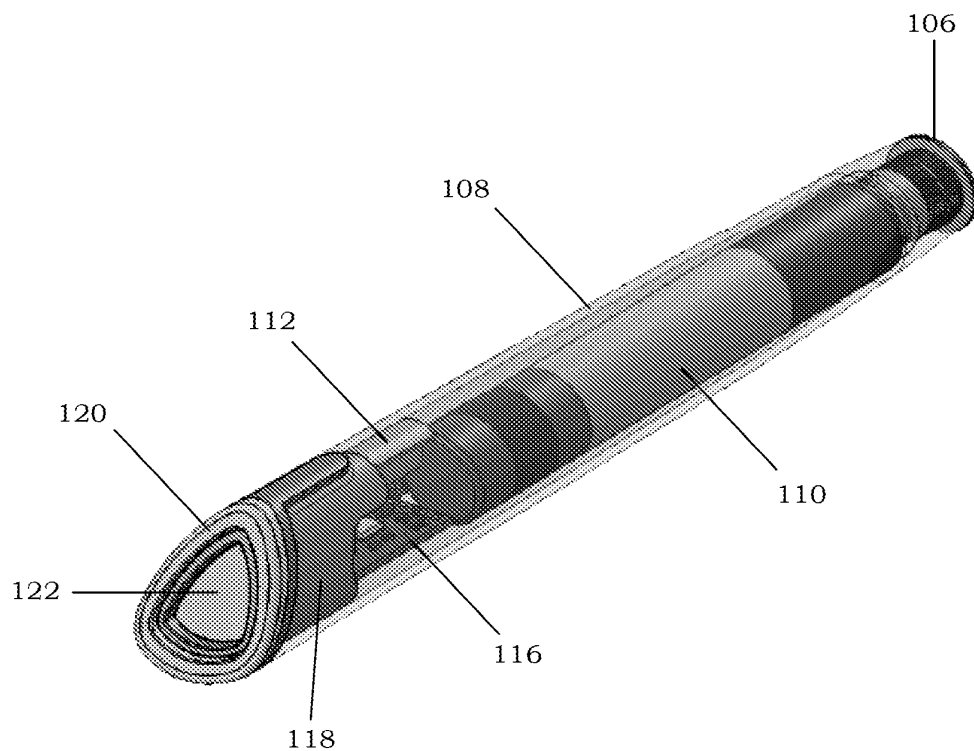


FIG. 3A

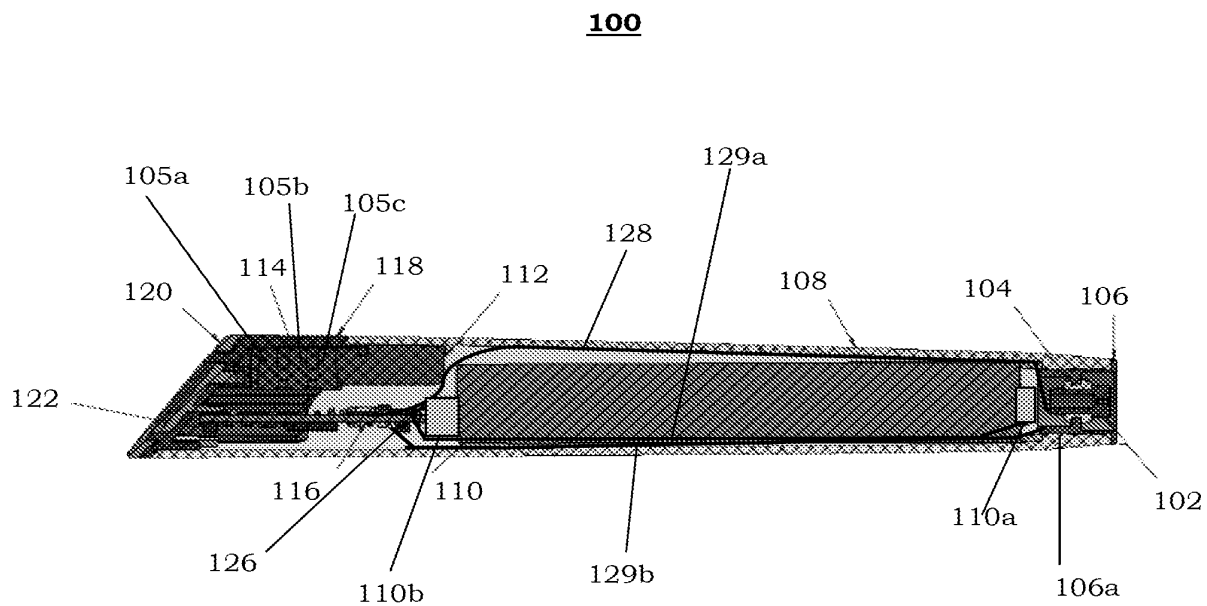


FIG. 3B

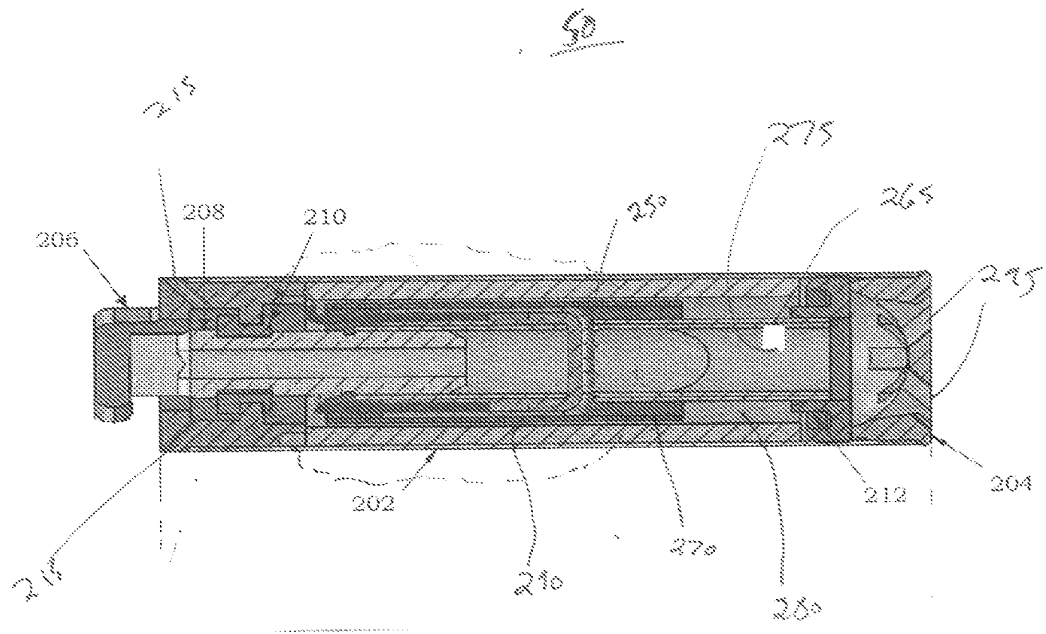


FIG. 3C

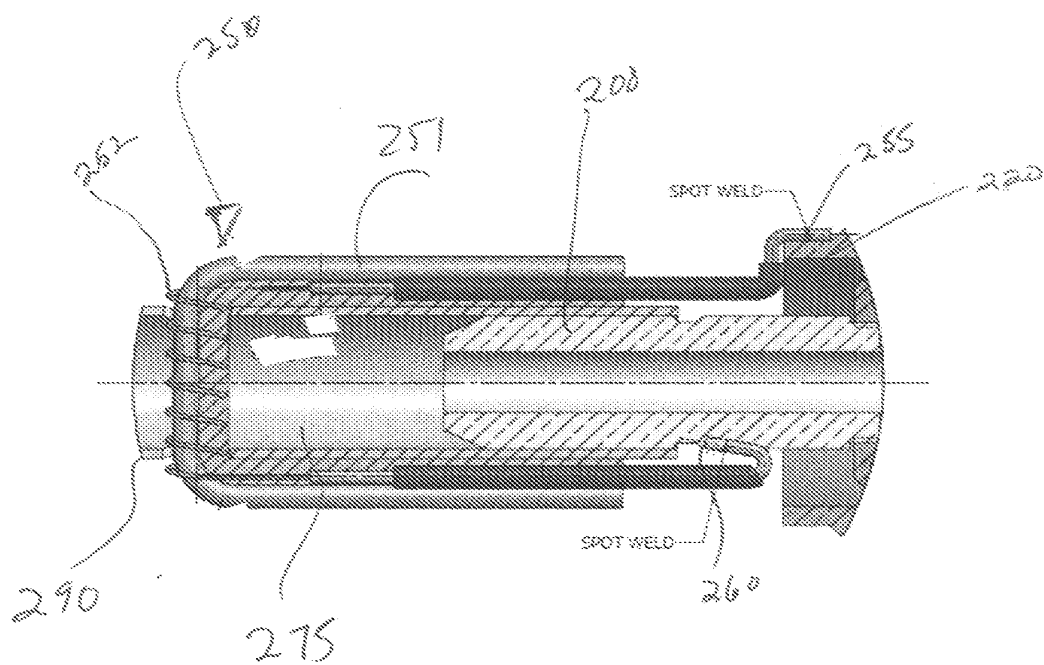


FIG. 3D

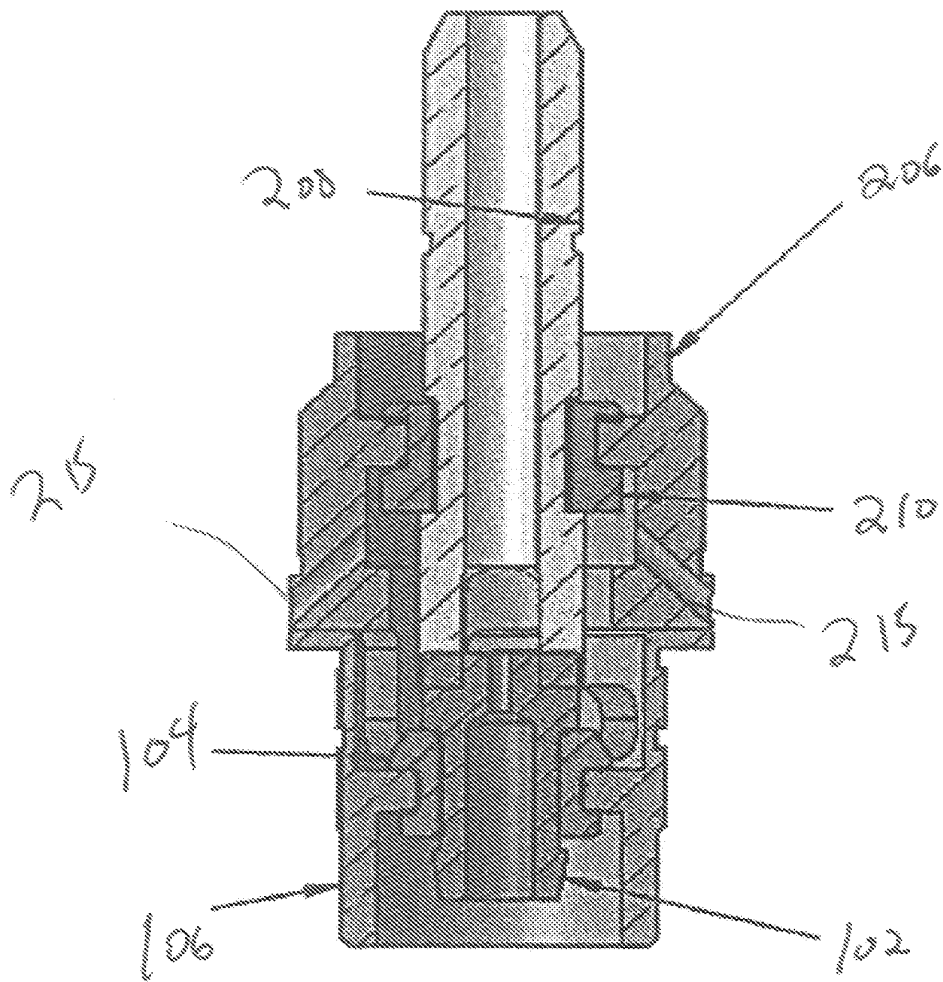


FIG. 4

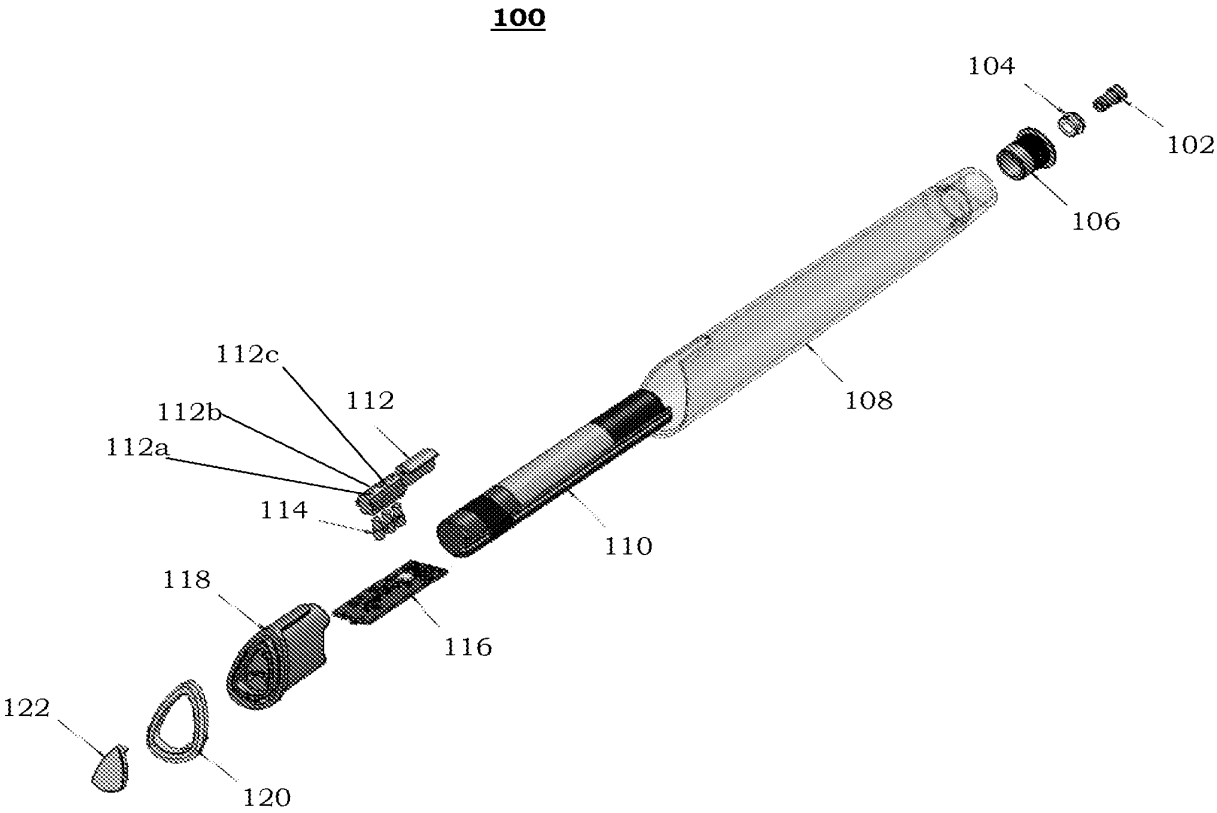


FIG. 5A

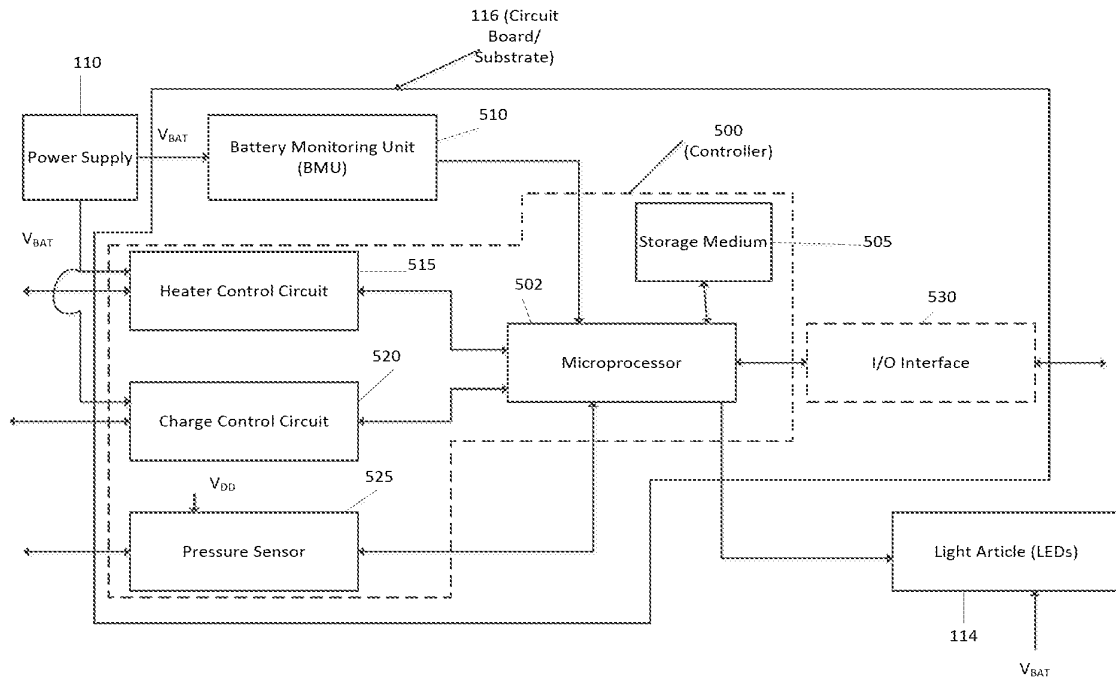


FIG. 5B

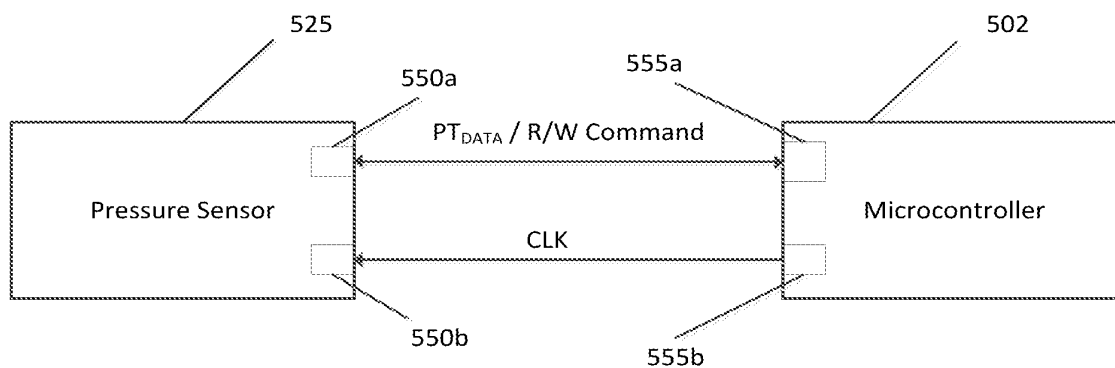
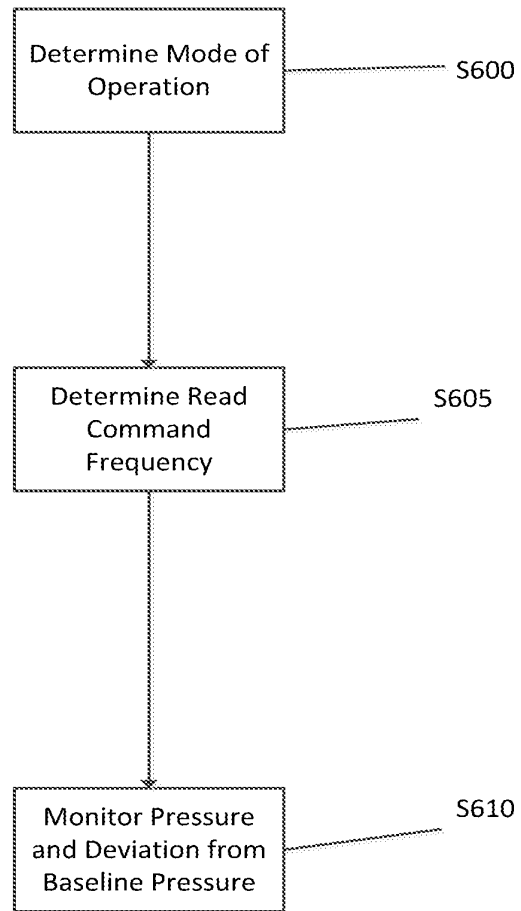


FIG. 6



Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		ELECTRONIC VAPING DEVICE HAVING PRESSURE SENSOR		
First Named Inventor/Applicant Name:		Geoffrey Brandon JORDAN		
Filer:		Blair M. Hoyt/Candice Cosker		
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Provisional Application Filing	1005	1	260	260
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Miscellaneous-Filing:				
Petition:				
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Miscellaneous:				
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Customer Number:	127542
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	20150625coversheetasfiled. PDF	42806 08945fd1e762c3985b23bb1948600cc9d86b6ad2	no	3
Warnings:					
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2	Application Data Sheet	20150625ads.PDF	1894497 eeb9cc4caf3efb6d1234f86af666698bffc4e16	no	9
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3		20150625specasfiled.PDF	175746 1c26567b39497a5d363176ad82b682fe14dbf556	yes	29
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	24	
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4	Drawings-only black and white line drawings	20150625figstofile.PDF	1917318 2b8731b4f767ed88e0a358411fd1b09349bf557e	no	10
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5	Fee Worksheet (SB06)	fee-info.pdf	29838 3d8aca82afc410f2841a18f632fd704dc93708ad	no	2
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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.