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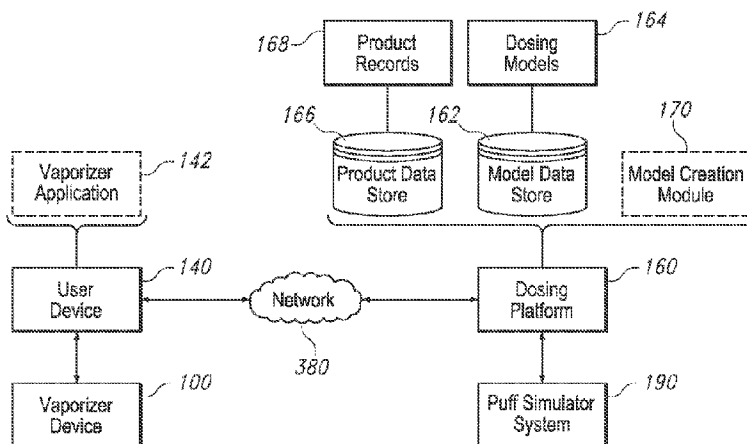


FIG. 1

(57) **Abrégé/Abstract:**

The present disclosure includes a method for vaporizing a product of a plurality of different products including receiving, by a processor of a vaporizing device, a desired dosage amount that is indicative of an amount of a compound to release during one or more inhalation events. The method includes determining, by the processor, an occurrence of a current inhalation event and during the current inhalation event determining, by the processor, an inhalation pressure being applied to a container that contains the product; determining, by the processor, a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the inhalation pressure; and selectively adjusting, by the processor, a vaporizing temperature being applied to the product by the vaporizer based on the desired dosage and the predicted dosage.

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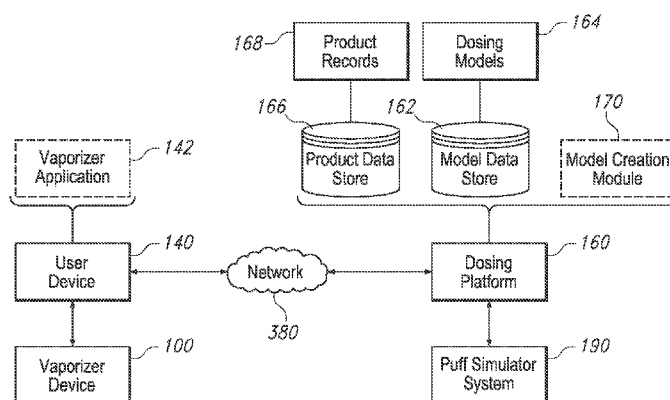


FIG. 1

(57) **Abstract:** The present disclosure includes a method for vaporizing a product of a plurality of different products including receiving, by a processor of a vaporizing device, a desired dosage amount that is indicative of an amount of a compound to release during one or more inhalation events. The method includes determining, by the processor, an occurrence of a current inhalation event and during the current inhalation event determining, by the processor, an inhalation pressure being applied to a container that contains the product; determining, by the processor, a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the inhalation pressure; and selectively adjusting, by the processor, a vaporizing temperature being applied to the product by the vaporizer based on the desired dosage and the predicted dosage.

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VAPOR DOSING PLATFORM FOR VAPORIZATION CARTRIDGES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. provisional application number 62/719,017, filed on August 16, 2018, and entitled Vapor Dosing Platform for Standard Vaporization Cartridges, which is hereby incorporated by reference as if fully set forth herein in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to the field of electronic vaporizer devices and in particular to systems and methods of dosing vapor from vaporization cartridges, and remotely controlling and tracking such uses.

BACKGROUND

[0003] Systems and methods for controlling the dose of vaporized material inhaled from electronic vaporizers, such as battery-powered vape pens, containing vaporizable material, such as liquids or botanicals, are known. Systems that merely pre-determine a set dosage delivered to users are unsatisfactory. Being able to controllably and accurately dose and know the amount of vapor inhaled is desirable because many users want and/or need to control and know their volume of intake of such material whether for health or recreational reasons. Specific reasons include keeping to and tracking dosages prescribed by healthcare professionals, concerns for long-term health, controlling short-term effects, preventing waste, etc.

[0004] Various solutions to the dosing problem have been proposed with varying degrees of success. For example, Pax Labs, Inc. is the assignee of a patent application for a dose vaporization device/system with a removable proprietary pod and claims to offer calibrated dose control. This system covers both the proprietary pod and power source housing/electronics that only function when used together and are not compatible with any other products on the personal vaporization market. Patent application publication no. US 2016/0157524A1 titled “Calibrated Dose Control” (the “Pax disclosure”) describes a number of features, including heated reservoir walls in the pod, a puff sensor (described as an on-off switch), and a “dose predictor unit” that estimates the amount of vapor inhaled and shuts off functions of the vaporizer based on its calculations. The main variables listed in the description of the “memory unit” are “measurements of temperature, temperature profile, the power delivered, or a combination thereof”, which is the essential data used to calculate the measurements of vapor delivered to the user. Unfortunately, the system disclosed herein is imprecise for use with a standard cartridge. Pax Labs’ system only considers three (3) variables in its “vaporized mass

prediction formula” and ignores what the inventors have discovered are important measurements (i.e., inputs) required for truly accurate dosing for a wide variety of consumers and products.

[0005] Application publication no. US2017/0156399A1 titled “Inhalation Device with Metering” offers another potential solution. This disclosure deals with a single-body (or “disposable”) vaporizer that uses sensors (broadly defined) and a metering system that controls and informs on the amount of vaporized material administered to the user. This application discloses a “session” functionality, which is described as “a time in which a user can consume a particular amount”. If the user inhales $\frac{1}{4}$ of the session amount and stops, the device shuts off and will continue the remaining $\frac{3}{4}$ of the session amount at a later time of use. Unfortunately, the application is vague with respect to what exactly a time “session” is and how it operates. It is unclear whether this refers to a time in the day during which the substance amount can be consumed, or whether the time of vaporization correlates with the amount consumed.

[0006] Moreover, this application makes no mention of user feedback (such as wireless communication) and no mention of whether the reservoir is refillable or not. Therefore, there is no disclosure of communicating with an application and collecting/storing data from sensors externally for robust feedback to the user. All of the data collected “from the timer” on this device appears to be stored locally and doesn’t take into account a range of input variables needed to accurately quantify the amount of vaporized material consumed. While the application does vaguely mention that this indicator “is a transmitter that sends a signal to an external device,” it makes no mention of what that signal is, if it transmits actual data, or what the external device is. The disclosed device would also have to be disposed of after the vaporizable material is emptied from the reservoir, which is a waste of plastic and precious metals used in PCB manufacturing. The application also makes no mention of charging capabilities.

[0007] US Patent application publication no. 2018/0093054 titled “Control Of An Electronic Vaporizer,” assigned to JUUL Labs, Inc., (the “JUUL disclosure”) discloses a proprietary cartridge that can be identified through the use of an external device and can write/store data locally. Overall, it is a vaporizer, which is a body “comprising a power source, a controller, and a pair of vaporizer body contacts in communication with the processor” and a “cartridge comprising a cartridge memory, a heater, a source of vaporizable material, and a pair of cartridge contacts configured to engage the pair of vaporizer body contacts on the vaporizer body when the cartridge is coupled to the vaporizer”. The two are exclusive and work together as a complete product. This application mentions active measurement of the resistance of the coil as it is heated and adjusts the voltage accordingly. It does not, however, use data about the specific cartridge being used, including the metal type of the coil found within the cartridge from cartridge identification to most accurately set the voltage.

[0008] Moreover, the JUUL disclosure mentions the use of a pressure sensor, or “puff sensor” to determine when the coil should be heated (*i.e.*, when the device should be activated), only acting as an on/off switch. However, it neither measures the fluctuations of pressure during an inhale to use that data to control the dose, nor does it actively alter the applied voltage from the power source to the female electrical contact, while also taking into account that cartridge’s coil metal type and its characteristics.

[0009] Again, this patent application is for a proprietary pod-based system, designed with unique cartridges and vaporizer bodies. It does not work on other vaporizer bodies or with 510-threaded vaporizable material cartridges and other standard adapter types. It also goes into detail on the communication and experience between the vaporizer, a smartphone, and a remote server. On the smartphone side, the application described shows the account creation process, naming of vaporizer, walkthrough, a dashboard, maps, cartridge info, scroll-wheel heat control, vaporizer settings, cartridge scan, account info, and store locator. The dashboard displays the user’s consumption stats per day in a bar-graph system, as well as showing locations where vaporizable material was consumed, marked as circles on a map. The larger the circle, the more usage that occurred at that location.

[0010] This patent application also describes the ability of the vaporizer to be used for dosing, which includes “dose monitoring, dose setting, dose limiting, user tracking, etc.” It also mentions that the operation of the vaporizer can be “modified, controlled, etc. based on one or more parameters that are received from the cartridge” [application, ¶0046]. However, it does not disclose the ability to schedule dosing for those with specific ailments. And, it does not provide any detail on the input variables that go into measuring and controlling the dose of vaporizable material.

[0011] Various solutions to the 510-threaded connection problems have been proposed with varying degrees of success. For example, CCell™ has designed an alternative battery configuration for connecting 510 cartridges with its Palm™ device (and other similar models) that converts the 510-screw connection to a magnetic connection. It accomplishes this by supplying with the device a metal, ring-shaped adapter tube with ferromagnetic characteristics that are not inherent to the metal of the male 510 thread. The user must thread this ring onto the male 510 thread of the cartridge, which becomes a threadless extension of the cartridge ground. The ring and cartridge assembly are then slid or dropped into a female, tubular terminal featuring a pogo-pin center contact on the device side.

[0012] Unfortunately, this is a less than ideal solution. For one, an additional, easily misplaced, small adapter ring that screws onto the cartridge must be used in order to make electrical connection. Moreover, when the cartridge is empty and ready to be replaced (in the case of

disposable cartridges), the adaptor must be unscrewed from the previous cartridge and screwed onto the replacement cartridge. It is common for users to accidentally dispose of these adapters and require purchasing replacements. These extra steps are both inconvenient (screwing pieces on and off cartridges) and wasteful, and make the battery useless without an adaptor.

[0013] Accordingly, what is needed is a user controllable dosing platform and system that is able to dose with great accuracy based on multiple important input parameters, that is easy to use and control, and that can be used with standard cartridges on the market, such as 510 thread cartridges.

SUMMARY

[0014] The present disclosure meets these needs by disclosing a novel dosing platform, system and device for inhalable vaporized material that solves the aforementioned problems and more. The platform includes a battery-powered, vaporization device that measures and controls vaporized material output with great accuracy, preferably down to the milligram. In one embodiment, the system of the present disclosure also offers great utility and flexibility in that the device does not require the use of a proprietary pod or cartridge system as is the case with numerous prior art devices, but instead can work with existing, standard cartridges already designed, built, and distributed worldwide, such as the ubiquitous “510 thread cartridges.” The device may be controlled by either or both internal and external software.

[0015] The present disclosure also discloses precision dosing heretofore not seen by measuring and using multiple input variables the inventors discovered are relevant to achieving precision dosing. In particular, by measuring in real time the pressure on a cartridge from user inhaling (or, “user drag”) over time, in conjunction with one or more other input variables, such as cartridge coil resistance, greater dosing precision can be achieved. For example, instead of employing the three (or just the three) variables used in the Pax prior art system comprising, in Pax’s words “vaporized mass prediction formula”, it is understood that measuring and adjusting for user drag is critical to achieving optimal dosing control. In one embodiment, the inventors determined three (3) inputs that are believed to have a high degree of influence on the accuracy of the dosing of vaporized material from any given cartridge, namely: (1) pressure from inhalation - user drag, (2) electrical resistance measured on the cartridge coil, and (3) the controlled variable voltage output from the power source to the cartridge based on the coil metal type, its resistance and user preferences. Each additional input variable that is measurable adds various percentages of the accuracy of dosing, and also serves to better understand the vaporizable material and its effects on a wide variety of consumers. Moreover, since the device of the present disclosure is designed to operate with many different vape cartridges found on the market, it is capable of identifying unique properties of those cartridges and their contents and make dosing adjustments accordingly.

For example, for a given cartridge, the device may actively alter the applied voltage from its power source to the cartridge's female electrical contact, while taking into account that cartridge's coil metal type, its vaporizable contents (*e.g.*, the oil viscosity) and other characteristics.

[0016] The platform of the present disclosure further discloses the use of a "library" of stored characteristics of commercial vape cartridges that can be mated with the device. These characteristics are relevant to dosing accuracy and can be used as input variables by the inventive device when mated with such cartridges to improve dosing accuracy.

[0017] The present disclosure also discusses a novel companion application, in any number of forms, including a mobile application or downloadable application on a computer, in communication with the vaporization device that includes a graphical user interface (GUI) that offers a user a great deal of functionality. In embodiments, an application is provided for (a) displaying substantial information relevant to a user's use of the vaporization device, (b) setting up a custom dosing plan; (c) interacting with said information, (d) inputting and exploring products and services related to the material being consumed, (e) providing direct feedback to a user relating to his/her dose plan and/or specific cartridge purchased, (f) displaying detailed scientific data related to the material being consumed, and (g) setting up schedules for vapor intake in accordance with a user's schedule, lifestyle, ailment or the like.

[0018] For example, in one embodiment, the dosing platform includes a companion application that pairs with the dosing device using standard Bluetooth technology to measure, control and track consumption of vaporizable material and relays collected information to the user. The application enables users to set up schedules for the consumption of specified quantities of vaporizable material, say, two milligrams every four hours, much like taking the medication in pill form for various afflictions. In embodiments, this may be referred to as the "Dose Plan" and may be personalized to each consumer.

[0019] In embodiments, the present inventive device works re-usably with standard 510 thread cartridges, the lifespan of the device could be relatively long – such as 2 or 3 years of regular use - instead of the time it takes to consume ½ or 1 gram of vaporizable material. Thus, the device is preferably fully rechargeable. Moreover, the device of the present disclosure may employ a native display to inform the user of the amount they are consuming, dose plan details, cartridge details, product details, vaporizable material details, and inhalation/exhalation details, that provide much more useful feedback than a mere "indicator", which is variably described in the prior art as potentially being an: audio signal, visual signal, visual display, or vibration.

[0020] The present disclosure includes a method for vaporizing a product of a plurality of different products including receiving, by a processor of a vaporizing device, a desired dosage amount that is indicative of an amount of a compound to release during one or more inhalation

events. The compound is released from the product into vapor when the product is vaporized. The method includes determining, by the processor, an occurrence of a current inhalation event. During the current inhalation event, the method further includes determining, by the processor, an inhalation pressure being applied to a container that contains the product; determining, by the processor, a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the inhalation pressure; and selectively adjusting, by the processor, a vaporizing temperature being applied to the product by the vaporizer based on the desired dosage and the predicted dosage.

[0021] In embodiments, the method further includes receiving a dosage model corresponding to the product. The dosage model receives respective sets of inhalation pressure values and, for each input set of inhalation pressure values, outputs predicted dosages of the compound based on the respective set of inhalation pressure values. In embodiments, determining the predicted dosage is further based on the dosage model corresponding to the product. In embodiments, the dosage model further receives sets of vaporization parameters as input and outputs, for each input set of vaporization parameters a respective predicted dosage of the compound in the vapor during a respective inhalation event based on the input set of vaporization parameters. In embodiments, the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of product remaining in the cartridge. In embodiments, the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device.

[0022] In embodiments, the dosage model is provided by an application via a user device that is in communication with the vaporizer device. In embodiments, the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.

[0023] In embodiments, selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container. In embodiments, heating the container

includes heating a wick of the container. In embodiments, selectively adjusting the vaporizing temperature includes stopping a vaporizing voltage from being applied to a coil of the container in response to determining that the predicted dosage is greater than or equal to the desired dosage. In embodiments, selectively adjusting the vaporizing temperature includes increasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is unlikely to be reached during the current inhalation event given the predicted dosage. In embodiments, selectively adjusting the vaporizing temperature includes decreasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is likely to be reached before the current inhalation event is complete given the predicted dosage.

[0024] In embodiments, the inhalation pressure includes a series of inhalation pressure values measured during the current inhalation event. In embodiments, the product is an eliquid and the container is a removable pod that contains the eliquid.

[0025] In embodiments, the product is an eliquid and the container is a removable 510 thread cartridge that contains the eliquid. In embodiments, the product is a dried plant material and the container is a receptacle that contains the dried plant material.

[0026] In embodiments, a vaporizer device includes a communication unit that effectuates communication with a user device via a network; one or more sensor devices, wherein each respective sensor device monitors a condition relating to the vaporizer device and/or an environment thereof; a battery; and a voltage controller that applies a variable voltage to a heating element of a container that contains a product to be vaporized. The vaporizer device also includes a microprocessor that executes processor-executable instructions that cause the microprocessor to: receive a target dosage that is indicative of an amount of a compound to release during an inhalation event. The compound is released from the product into vapor when the product is vaporized. The microprocessor further executes processor-executable instructions that cause the microprocessor to receive a dosage model corresponding to the product. The dosage model receives sets of vaporization parameters as input that include respective predicted dosages of the compound in the vapor during a respective inhalation event based on the input set of vaporization parameters. The microprocessor detects commencement of a current inhalation event. During the current inhalation event, the microprocessor of the vaporizer device determines one or more vaporization parameters based on sensor data received from the one or more sensors. Each vaporization parameter defines a condition relating to the current inhalation event. During the current inhalation event, the microprocessor of the vaporizer device determines a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the vaporization

parameters and the dosing model. During the current inhalation event, the microprocessor of the vaporizer device selectively adjusts a vaporizing temperature being applied to the product by the vaporizer based on the target dosage and the predicted dosage.

[0027] In embodiments, the vaporization parameters include an inhalation pressure that is applied by the user during the current inhalation event. In embodiments, the inhalation pressure includes a series of inhalation pressure values measured during the current inhalation event

[0028] In embodiments, the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of product remaining in the cartridge. In embodiments, the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device. In embodiments, the dosage model is provided by an application via the user device that is in communication with the vaporizer device. In embodiments, the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.

[0029] In embodiments, selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container. In embodiments, the heating the container includes heating a wick of the container. In embodiments, selectively adjusting the vaporizing temperature includes stopping a vaporizing voltage from being applied to a coil of the container in response to determining that the predicted dosage is greater than or equal to the desired dosage. In embodiments, selectively adjusting the vaporizing temperature includes increasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is unlikely to be reached during the current inhalation event given the predicted dosage.

[0030] In embodiments, selectively adjusting the vaporizing temperature includes decreasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is likely to be reached before the current inhalation event is complete given the predicted dosage. In embodiments, the inhalation pressure includes a series of inhalation

pressure values measured during the current inhalation event. In embodiments, the product is an eliquid and the container is a removable pod that contains the eliquid. In embodiments, the product is an eliquid and the container is a removable 510 thread cartridge that contains the eliquid. In embodiments, the product is a dried plant material and the container is a receptacle that contains the dried plant material. In embodiments, the network is a personal area network. In embodiments, the network is a Bluetooth low energy network.

[0031] In embodiments, a method for generating a dosing model corresponding to a respective product using a puff simulation system that performs simulated inhalation event on a vaporizer device that vaporizes one or more instances of the respective product includes for each instance of the product, obtaining one or more inhalation profiles. Each inhalation profile defines inhalation pressures over a duration of a respective simulated event. For each instance of the product, also performing a plurality of simulated inhalation events on the instance of the product using one or more inhalation profiles. For each simulated inhalation event, recording an inhalation profile of the one or more inhalation profiles used to perform the simulated inhalation event; determining a set of one or more vaporization parameters relating to the simulated inhalation event; determining an amount of an active compound in vapor resulting from the simulated inhalation event; and training the dosing model based on the inhalation profile, the set of one or more vaporization parameters, and the amount of active compound in the vapor; and storing the dosing model in a dosing model data store that stores a plurality of different dosing models. Each dosing model of the plurality of dosing model corresponds to a respective product of a plurality of different products.

[0032] In embodiments, the vaporization parameters include a coil resistance of a coil that heats the container during the respective simulated inhalation event. In embodiments, the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective simulated inhalation event. In embodiments, the vaporization parameters include a voltage being applied to a heating element of the container during the respective simulated inhalation event. In embodiments, the vaporization parameters include an amount of product remaining in the cartridge. In embodiments, the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device. In embodiments, the vaporization parameters include an inhalation pressure measured by the vaporizer device during the simulated inhalation event.

[0033] In embodiments, the one or more inhalation profiles are determined by: for each of a plurality of test subjects, measuring an inhalation pressure exerted by the test subject on a mouthpiece of a respective test vaporizer devices during one or more test inhalation events. For each test inhalation event, generating a test inhalation pressure curve corresponding to the test

inhalation event; and determining the one or more inhalation profiles based on the test inhalation pressure curves.

[0034] In embodiments, the one or more inhalation profiles are determined by: for each of a plurality of vaporizer devices, receiving a measured inhalation pressure exerted by a user of the vaporizer device to a mouthpiece of the vaporizer device during a historical inhalation event. For each test inhalation event, generating an inhalation pressure curve corresponding to the historical inhalation event; and determining the one or more inhalation profiles based on the inhalation pressure curves.

[0035] In embodiments, the method includes generating a product record corresponding to the product;

[0036] relating the dosing model to the product record; and storing the product record in a product database that stores a plurality of product records. Each product record corresponds to a different product.

[0037] In embodiments, the method includes receiving a request from a companion application that is associated with a remote vaporizer device, the request indicating a product identifier of a product to be vaporized. The method includes retrieving the product record of the product to be vaporized from the product database based on the product identifier; identifying a requested dosing model based on the product record; retrieving the requested dosing model from the dosing model data store; and providing the requested dosing model to the companion application, wherein the companion application provides the dosing application to the remote vaporizer device. In embodiments, each dosing model is configured to receive a set of vaporization parameters corresponding to a current inhalation event and to output a predicted dosage based on the vaporization parameters corresponding to the current inhalation event.

[0038] In embodiments, a method for accurately dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges interchangeably attachable to a controllable power source, each of the plurality of cartridges containing a heating coil having a coil resistance. The method includes identifying the coil resistance of the selected cartridge; sensing the user's inhaling pressure on the cartridge, when the selected cartridge is attached to the power source; and adjusting, in real time, the dosing voltage output supplied by the source to the cartridge based (at least) on the sensed inhaling pressure and the coil resistance.

[0039] In embodiments, the resistance is identified based on user identification of the cartridge model attached to the power source. In embodiments, the method further includes stopping the voltage output supplied by the power source when a preset dose of vapor has been delivered to the user. In embodiments, a platform for dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges each containing product and interchangeably attachable to

a controllable power source includes storing a library of cartridge characteristic for each of the plurality of vapor cartridges. The cartridge characteristics comprise cartridge identification and associated lab-tested values. The method includes using one or more characteristics of the selected cartridge as one or more input variables to a real-time dosing formula to control the dose supplied to the user of the cartridge when attached to the controllable power source.

[0040] In embodiments, the dosing formula is provided by an application via a user device that is in communication with a vaporizer device connected to the cartridge. In embodiments, the dosing formula is selected from a plurality of dosage formulae. Each of the plurality of dosage formulas corresponds to a respective product of a plurality of products. In embodiments, each dosage formula of the plurality of dosing formulae is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.

[0041] In embodiments, each dosing formula of the plurality of dosage formulae is configured by the backend system based on one or more product properties of the respective product.

[0042] In embodiments, a vaporizer device includes a communication unit that effectuates communication with a user device via a network; one or more sensor devices, wherein each respective sensor device monitors a condition relating to the vaporizer device and/or an environment thereof; a battery; and a voltage controller that applies a variable voltage to a heating element of a container that contains a product to be vaporized. The vaporizer device also includes a microprocessor that executes processor-executable instructions that cause the microprocessor to: receive a dosage model corresponding to the product. The dosage model receives sets of vaporization parameters as input that include respective predicted dosages of the compound in the vapor during a respective inhalation event based on the input set of vaporization parameters. The microprocessor further receives a product profile corresponding to the product, the product profile indicating one or more properties of a container that contains the product, the product, and/or the user. The microprocessor detects commencement of a current inhalation event. During the current inhalation event, the microprocessor of the vaporizer device determines one or more vaporization parameters based on sensor data received from the one or more sensors. Each vaporization parameter defines a condition relating to the current inhalation event. During the current inhalation event, the microprocessor of the vaporizer device determines a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the vaporization parameters and the dosing model. During the current inhalation event, the microprocessor of the vaporizer device selectively adjusts one or more vaporizer settings based on the predicted dosage and the product profile.

[0043] In some embodiments, the microprocessor performs a feedback loop when selectively adjusting the dosage delivered based on the predicted dosage and the product profile. In embodiments, selectively adjusting the one or more vaporizer settings includes adjusting an amount of power being delivered to the heating element to affect a viscosity of the product. In some of these embodiments, the product profile defines viscosity data relating to the product.

[0044] In embodiments, the instructions further cause the microprocessor to receive a dosing plan that indicates a total dosage amount over a period of time. In some of these embodiments, selectively adjusting the one or more vaporizer settings is further based on the dosing plan. In some of these embodiments, the dosing plan is a nicotine cessation plan. In some embodiments, the product profile indicates an amount of nicotine in the product. In some of these embodiments, the dosing plan is a cessation of vaporizable components plan. By way of this example, vaporizable components can be cannabis, nicotine, other opioid compounds, alcohol compounds, and the like. In some embodiments, the product profile indicates an amount of vaporizable components in the product.

[0045] In embodiments, the vaporization parameters include an inhalation pressure that is applied by the user during the current inhalation event. In embodiments, the inhalation pressure includes a series of inhalation pressure values measured during the current inhalation event

[0046] In embodiments, the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event. In embodiments, the vaporization parameters include an amount of product remaining in the cartridge. In embodiments, the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device. In embodiments, the dosage model is provided by an application via the user device that is in communication with the vaporizer device. In embodiments, the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model. In embodiments, each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.

[0047] In embodiments, selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container. In embodiments, the vaporization

parameters include a series of sensor values measured during the current inhalation event. In embodiments, the product is an eliquid and the container is a removable pod that contains the eliquid. In embodiments, the product is an eliquid and the container is a removable 510 thread cartridge that contains the eliquid. In embodiments, the product is a dried plant material and the container is a receptacle that contains the dried plant material. In embodiments, the network is a personal area network. In embodiments, the network is a Bluetooth low energy network.

[0048] A platform for dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges having product and interchangeably attachable to a controllable power source. The platform includes storing a library of cartridge characteristic for each of the plurality of vapor cartridges. The cartridge characteristics comprise cartridge identification and associated lab-tested values. The platform includes using one or more electrical, mechanical or thermodynamic characteristics of the selected cartridge as one or more input variables to a dosing formula to control the dose supplied to the user of the cartridge when attached to the controllable power source. In embodiments, the dosing formula is provided by an application via a user device that is in communication with a vaporizer device connected to the cartridge. In embodiments, the dosing formula is selected from a plurality of dosage formulae, wherein each of the plurality of dosage formulas corresponds to a respective product of a plurality of products.

[0049] In embodiments, each dosage formula of the plurality of dosing formulae is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.

[0050] In embodiments, each dosing formula of the plurality of dosage formulae is configured by the backend system based on one or more product properties of the respective product.

[0051] In embodiments, the method for accurately dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges interchangeably attachable to a controllable power source, each of the plurality of cartridges containing a heating coil having a coil resistance. The method includes identifying the coil resistance of the selected cartridge; identifying the value of an additional variable of the selected cartridge selected from any one or more of electrical, mechanical, and thermodynamic characteristics; sensing the user's inhaling pressure on the cartridge, when the selected cartridge is attached to the power source; and adjusting, in real time, the dosing voltage output supplied by the source to the cartridge based at least in part on the sensed inhaling pressure, the coil resistance and the value of the additional one or more variables of the selected cartridge selected from any one or more of the electrical, mechanical, and thermodynamic characteristics.

[0052] It is to be understood that the inventions are not limited in its application to the details of construction and the arrangement of components described hereinafter and illustrated in the

drawings and photographs. Those skilled in the art will recognize that various modifications can be made without departing from the scope of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053] Further advantages of the various embodiments of the present invention may become apparent to those skilled in the art with the benefit of the following detailed description of the various embodiments and upon reference to the accompanying drawings in which:

[0054] FIG. 1 is a diagrammatic view of a vaporizer device and dosing platform in accordance with the present disclosure;

[0055] FIGS. 2, 3 and 4 are views of a vaporizer device in accordance with the present disclosure;

[0056] FIG. 5 is a diagrammatic view depicting a partial cutaway perspective view of a vaporizer device showing a vape cartridge adapted to be coupled with the device in accordance with the present disclosure;

[0057] FIG. 6 is a block flow diagram showing exemplary steps processed by the platform in accordance with embodiments of the present disclosure;

[0058] FIG. 7 is a block flow diagram showing examples of a dosing protocol in accordance with the present disclosure;

[0059] FIG. 8A shows an exemplary graph of a user inhalation pressure profile in accordance with the present disclosure;

[0060] FIG. 8B shows the graph of FIG. 8A with value and variable adjustments to the pressure made by the voltage controller of the device of the present invention using the user profile and cartridge in accordance with the present disclosure;

[0061] FIG. 8C shows the graph of FIG. 8B showing the total dose of vaporized material delivered to the user having the user inhalation pressure profile shown in FIG. 8A in accordance with the present disclosure;

[0062] FIG. 9 shows an exemplary dose absorption profile and inhale/hold/exhale process of the user referencing the user profile shown in FIGS. 8A, 8B, and 8C in accordance with the present disclosure;

[0063] FIGS. 10A, 10B, and 10C are diagrammatic views that depict screenshots provided by an app used in conjunction with the device of the present disclosure for user onboarding, cartridge identification, cartridge information display, dose plan setup and product education/discovery modes in accordance with the present disclosure;

[0064] FIG. 11 is a diagrammatic view depicting an exemplary system architecture showing how the device may be in wireless communication with a smartphone and the cloud in accordance with the present disclosure;

[0065] FIG. 12 is a diagrammatic view that depicts a vaporizer device showing internal components in accordance with the present disclosure;

[0066] FIGS. 13A and 13B are top and bottom perspective views that depict an exterior of a vaporizer device in accordance with the present disclosure;

[0067] FIGS. 14A and 14B are exploded assembly views that depict a vaporizer device in accordance with the present disclosure;

[0068] FIG. 15 is a diagrammatic view that depicts a methodology for a puff simulator in accordance with the present disclosure;

[0069] FIG. 16 is a graph that depicts a puff simulator calibration information in accordance with the present disclosure;

[0070] FIG. 17 is a diagrammatic view that depicts exemplary structures of a puff simulator in accordance with the present disclosure;

[0071] FIGS. 18A, 18B, 19A, 19B, 19C, 20A, and 20B are graphical depictions of embodiments of puff simulation information in accordance with the present disclosure;

[0072] FIG. 21 is a perspective view of embodiments of a connector in accordance with the present disclosure;

[0073] FIG. 22A is a perspective view of a housing of the connector shown in FIG. 21;

[0074] FIG. 22B is another perspective view of the housing shown in FIG. 22A;

[0075] FIG. 22C is a plan top view of the housing shown FIG. 22A;

[0076] FIG. 23 is an exploded perspective view of the housing shown in FIG. 22A;

[0077] FIG. 24 is a second exploded perspective view of the housing shown in FIG. 22A together with a portion of an exemplary 510 cartridge in position to be push-connected onto the inventive device in accordance with embodiments of the present disclosure;

[0078] FIG. 25A is an exploded perspective view of another embodiment of the present invention showing a housing-in-boot implementation with a 510-cartridge ready to be inserted into the system in accordance with embodiments of the present disclosure;

[0079] FIG. 25B is an assembled perspective view of the system shown in FIG. 25A with a cartridge push-connected therein.;

[0080] FIG. 26 is a perspective, see-through view of the connector shown in FIGS. 25A and 25B, as assembled to a PCB board of a power-supplying device;

[0081] FIG. 27 is a perspective view of a fully-assembled power-supplying device designed with the inventive connector of FIGS 25A and 25B, with a protective cover removed, showing the inventive connector and a cartridge inserted therein; and

[0082] FIG. 28 shows a method of assembling the connector of the present disclosure.

DETAILED DESCRIPTION

[0083] Referring now to the drawings, like reference numerals designate identical or corresponding features throughout the several views.

[0084] FIGS. 1 illustrates an example vaporizer system 10, according to some embodiments of the present disclosure. In embodiments, a vaporizer system 10 includes a vaporizer device 100, a companion application 150 that is hosted or accessed by a user device 140, and a dosing platform 160. A vaporizer device 100 is a battery-operated device that vaporizes a product in a container. Vaporizing may refer to the process of heating a material at a temperature that causes the material to fully or partially vaporize without burning the material.

[0085] In embodiments, a container may be a permanent or removable cartridge 134 (e.g., a 510 thread cartridge as shown in FIG. 6, a disposable pod, a refillable pod, a refillable tank, and the like), whereby the cartridge contains an “eliquid” (also referred to as a “concentrate” or “oil” or “juice”). Examples of eliquids that may be vaporized include, but are not limited to, nicotine juices, cannabis oils, CBD oils, herbal oils, and the like. The cartridges may be prefilled at the time of purchase or may be filled by a user. In other embodiments, the container may be a fixedly coupled or removably coupled receptacle, whereby a user may insert a solid product into the receptacle for vaporizing. Examples of solid products that may be vaporized include, but are not limited to, tobacco, cannabis, THC extracts (e.g., waxes, honey oils, etc.), CBD extracts, herbal mixtures, and the like. For purposes of explanation, the term container may refer to either “cartridges” and “receptacles”. As discussed, a container may be removable or may be fixed to the vaporizer device 100. In some of the embodiments where the container is removable, the containers may be manufactured and/or sold by third parties, and only need to conform to the coupling elements of the vaporizer device (e.g., 510 threading, sufficiently sized and configured, etc.) so that the container may connect both mechanically and electrically to the vaporizer device 100. It is noted that when reference is made to cartridges (e.g., “heating a cartridge” or “loading a cartridge”), the description may also apply to receptacles or other types of suitable containers.

[0086] In operation, the vaporizer device 100 applies a voltage to a coil or other suitable heating element, which heats the product to a temperature that is sufficient to vaporize the product and release an active compound from the product into the vapor. In some embodiments, the vaporizer device 100 may adjust the temperature of the coil by adjusting the voltage that is applied to the coil (or the current that passes through the coil) to either increase or decrease the amount of the active compound in the vapor during an inhalation event. In some of these embodiments, the vaporizer device 100 may be configured to adjust the temperature so as to deliver a desired amount of a compound (also referred to as a “desired dose”) during an inhalation event (e.g., during one “puff” or a series of two or more quick puffs). In embodiments, an inhalation event

may refer to a number of draws (e.g., up to one, two, or three draws) that occur over a defined period of time (e.g., 2.5 seconds) and/or during a behavior pattern (e.g., any number of draws until the vaporizer is not in use for more than 1.5 seconds or only during one uninterrupted draw). As will be discussed, the vaporizer device 100 may monitor one or more parameters during or before an inhalation event and may adjust the temperature to deliver to the desired amount of the compound during the inhalation event based on the one or more parameters and a dosing model 164. A dosing model 164 may refer to a model that determines a predicted dose given one or more input parameters. A dosing model 164 may be implemented as a neural network, a regression-based model, a linear model, a decision tree, or the like. In embodiments, the vaporizer device 100 loads a dosing model 164 that is specific to the product being vaporized into its memory, whereby the predicted dosages determined by the dosing model 164 are based on the input parameters and the features of the product and/or the container that contains the product. The input parameters may include environmental parameters, user parameters cartridge parameters, and/or device parameters. Specific examples of input parameters may include an inhalation pressure that indicates a pressure created by a user's inhalation during an inhalation event, a voltage being applied to the coil, a container temperature indicating a temperature being used to vaporize the product, a resistance of the coil, an ambient temperature of the surrounding environment, an orientation of the device during the inhalation event, an amount of product remaining in the container, an amount of time between the current inhalation event and a previous inhalation event, and/or any other suitable parameters. Additional parameters are discussed throughout the disclosure.

[0087] In embodiments, the vaporizer device 100 may communicate with a user device 150 via a wired (e.g., USB, micro USB, lightning cable, or the like) or wireless communication link (e.g., Bluetooth Low Energy, Bluetooth, RFID, and the like.). In some embodiments, the user device 150 may host or access the companion application 150 (or "application" 150) that is used in conjunction with the vaporizer device 100. The application 150 presents a graphical user interface that allows the user to control one or more aspects of the vaporizer device 100 and/or to provide information relating to a product being used in the vaporizer device 100. In some embodiments, the graphical user interface of the application 150 receives input from a user indicating a desired dose. In some embodiments, the desired dose may be provided in an amount of an active compound (e.g., milligrams of nicotine, milligrams of THC, milligrams of CBD, or the like). In embodiments, the desired dose is an amount per inhalation event (e.g., an amount per puff). In other embodiments, the desired dose is an amount per session (e.g., an amount per N inhalation events). The application GUI may allow the user to provide additional or alternative information as well. In embodiments, the application GUI may allow a user to view or select a

dosing plan, view usage analytics, view a status of the cartridge (e.g., the number of doses remaining in a container or a percentage of vaporizable material remaining in the container), a status of the device (e.g., the battery status). In embodiments, the application GUI may allow the user to create dosing plans, including setting a dose amount, a maximum number of doses per day, a schedule of dosing sessions, limitations of how many hours a day the vaporizer device 100 may be used (or times of the day when the device can or cannot be used), limitations on days of the week when the device can be used, and/or alarms to remind the user to use the vaporizer device 100. In embodiments, the application 150 may determine analytics relating to the usage of the device and/or of a product and may present the analytics via the application GUI. For example, the user may be presented a breakdown of consumption by the hour, day, week, month, and/or year. In another example, the user may be presented with information relating to a current product, such as the dates the product was used. In embodiments, the GUI may allow a user to provide ratings of products and/or feedback. Examples of feedback may include a rating of the experience with a product, a reason that the product was used, a rating of the taste and/or harshness, a timestamp of usage, a dosage amount, a mood at a time of a session, an environment of the user, an effect/experience/duration of the effect, side effects attributed to the cool down period, whether the product was too strong or not strong enough, and the like. In embodiments, the application GUI may present product profiles, such as product name, product images, product stats (e.g., compound ratios, concentrations, classifications, flavor, strain, and the like), effects of the product (e.g., enhances appetite, helps with nausea, etc.), recommended dosages, user review, user ratings, brand information, where the products are available, and the like. In some embodiments, the user may provide user experience settings, such as how thick of vapor the user wants, how much flavor the user wants in the vapor, and the like. In some embodiments, the user can manually control the vaporizer device 100 via the application 150 GUI. For example, the user can increase or decrease the vaporizing temperature using the application and/or can turn the vaporizer device on or off. Examples GUIs that may be presented by the companion application are provided in FIG. 11.

[0088] In embodiments, the application 150 may access a dosing platform 180 to obtain one or more dosing models 164. In some embodiments, each dosing model 164 may be tied to a respective product or set of products (e.g., products sold under the same brand). In some of these embodiments, the application 150 may receive a product name (or other identifiers of a product) that is to be vaporized by the vaporizer device 100 from a user via the graphical user interface of the application 150. For example, the user may select a product (e.g., “mango flavored nicotine cartridge by Company X) from a drop-down menu, a multi-level menu, or using a search function of the application 150. In response, the application 150 may provide the dosing model

164 corresponding to the product to the vaporizer device 100. In some embodiments, the application 150 may request the dosing model 164 corresponding to the selected product from the dosing platform 180. In response, the dosing platform 180 retrieves the dosing model 164 from the dosing model data store 162 and provides the dosing model 164 to the application 150 (e.g., the user device 140 hosting the application 150). The application 150 may store the dosing model 164 in the storage of the user device 140 and/or may transmit the dosing model 164 to the vaporizer device 100 via the communication link between the user device 140 and the vaporizer device 100.

[0089] In embodiments, the dosing platform 160 supports the vaporizer device 100 and/or the application 150. As discussed, in some embodiments, the dosing platform 160 provides dosing models 164 to respective instances of a vaporizer application 150. In some of these embodiments, the dosing platform 160 may include a dosing model data store 162. The dosing model data store 162 stores dosing models 164. In some embodiments, the dosing model data store 162 may further store, for each dosing model 164, any data relating to the generation and/or updating of the dosing model 164, including data obtained from the puff simulation system 190, feedback relating to the model 164, and/or data provided by the producer of a product to which the model 164 corresponds. In embodiments, the dosing models 164 are generated by the model creation system 170, which is discussed in further detail below.

[0090] In embodiments, the dosing platform 160 includes a product data store 166. In some of these embodiments, the product data store 166 stores product records 168. A product record 168 may correspond to a commercially available product, such as a nicotine cartridge, a nicotine juice refill for refillable tanks, a THC oil cartridge, a CBD oil cartridge, THC or CBD refill oils for refillable cartridges, dried tobacco, dried cannabis, cannabis extract (e.g., “wax”), or the like. Each product record 168 may include a product identifier that identifies the product, a name of the product, and one or more features of the product. The features of a product may be different depending on the type of product. For example, for nicotine cartridges the product features may include a maker of the cartridge, a size of the cartridge (e.g., .7 grams of nicotine juice, 1 gram of nicotine juice, or the like), a concentration of the product (e.g., 3% nicotine, 5% nicotine, 6% nicotine, or the like), a flavor of the product (e.g., “tobacco”, “mint”, “mango”, “strawberry”, or the like), a viscosity of the product, a resistance of the cartridge, and/or any other suitable product features. In another example, the product features of a THC oil cartridge may include a maker of the cartridge (e.g., the producer of the oil), a size of the cartridge (e.g., .5 grams of oil, 1 gram of oil, or the like), a concentration of the product (e.g., 80% THC/5% CBD, 90% THC/1% CBD, 95% THC, or the like), a strain used to make the product (e.g., “sour diesel”, “OG”, “girl scout cookies”, “blue dream” or the like), a classification of the strain used to make the product (e.g.,

indica, sativa, or hybrid), a viscosity of the product, a resistance of the cartridge, and/or any other suitable product features. In another example, for dried cannabis the product features may include a producer of the product, a potency of the product (e.g., 29% THC/1% CBD, 31% THC, or the like), a strain of the product, a classification of the product, and/or any other suitable product features. The product features may be obtained from any number of sources. The product features may be crawled from a data source (e.g., crawling publicly available websites), may be provided by a data source, or may be entered by an employee of the dosing platform provider. In embodiments, the product maker (e.g., the cartridge seller, the product cultivator, the product extractor, or the like) may provide one or more of the product features. For example, a product maker may provide one or more of a product name, a flavor of the product, a strain and/or strain classification of the product, a concentration of the product, one or more sizes that the product comes in, a resistance of the cartridge, and the like. Additionally or alternatively, a testing facility may provide one or more features. For example, a testing facility may provide a concentration of the product, a viscosity of the product, a vaporizing temperature of the product, or the like. Additionally or alternatively, the dosing platform provider may obtain the features and/or test and analyze products to determine one or more features. For example, employees (or contractors) of the dosing platform may manually enter information such as the product name, provider may test the concentration of the resistance of the containers, a flavor of the product, a strain and/or strain classification of the product, a concentration of the product, one or more sizes that the product comes in, and the like. The dosing platform provider and/or a third party may also test the products the verify or determine the concentrations, the resistances of the cartridges, and the like. The product features may be obtained in other suitable manners without departing from the scope of the disclosure. Each time a new product is supported by the dosing platform 160, the dosing platform 160 may create a new product record 168 corresponding to the new product. Furthermore, in embodiments, a product record 168 may be updated if the properties change (e.g., a new design in containers may result in different resistances and/or new sizes).

[0091] In some embodiments, a product record 168 may include a reference to a dosage model 164. In these embodiments, a referenced dosing model 164 may be used by a vaporizing device 100 that is vaporizing the product indicated by the referencing product record 168. In this way, each product (or set of products) has a dosing model 164 that is configured to guide the accurate vaporization of the product.

[0092] In embodiments, the dosing platform 160 includes a model creation system 170. A model creation system 170 may be implemented as a set of executable instructions that are executed by one or more processors. In embodiments, the model creation system 170 generates dosing models 164, which may be stored in the dosing model data store 162. It is noted that the model

creation system 170 may generate general dosing models 164 that are used to predict doses for all products of the same type (e.g., all nicotine cartridges or all THC cartridges), product specific dosing models (e.g., each product may have its own corresponding dosing model 164), user specific dosing models (e.g., dosing models that are generated based on a learned draw profile of a user), or the like. While many of the examples provided herein focus on the creation of product-specific models, the techniques described throughout the disclosure may be used to generate general dosing models and/or user-specific dosing models.

[0093] In embodiments, the model creation system 170 may include a computing device that creates the dosing models 164. In some of these embodiments, the computing device may receive input from one or more sensors that monitor conditions of a vaporizer device 100, the product, the container, and/or an environment of the vaporizer device 100. Many factors may be taken into consideration when determining the predicted dose using a model. Thus, when creating dosing models 164, the model creation system 170 may monitor and/or take into consideration one or more of these factors during model creation. In some cases, these factors are implicit and do not need to be measured. In embodiments, relevant factors taken into account by the model creation system 170 may include a container temperature (or coil temperature), a container cooldown rate or heating rate, the environmental temperature (or “ambient temperature”), the inhalation pressure, an ambient pressure, an amount of time between inhalation events, the dosage amount during the previous inhalation event, the type of container (e.g., the type of cartridge or receptacle), the cartridge volume, an airflow temperature, airflow curves, an amount of product in the container, vapor density, particle size in the vapor, a viscosity of the product (if a liquid), an opacity of the product (if a liquid), the density of the product (if a solid), and/or any other suitable factors.

[0094] In embodiments, the temperature related features may be measured by temperature sensors (e.g., thermistors) integrated into the vaporizer device 100, which may be communicated to the model creation system 170 via a wired or wireless communication link. The container temperature is correlated to the dosage. In some scenarios, the container may be bought separately from the vaporizer device 100 (e.g., the cartridge 134 may be preloaded with product and purchased from a store or website), and thus, may not be designed by the maker, supplier, provider and the like of the vaporizer device 100. As such, the vaporizer device 100 may include a temperature sensor that is placed in proximity to the container, such that the container (or coil) temperature can be approximated from the temperature reading output by the temperature sensor. In some embodiments, the container cool-down or heating may be determined by measuring the container temperature at multiple instances and determining a rate of cooling or heating based on the container temperature measurements. The temperature of a container can

affect the viscosity of liquid products, which in turn may affect the refill rate of the coil chamber of the container. The environmental temperature is the ambient temperature of the environment of the vaporizer device 100. The environmental temperature may affect the temperature of the coil and the eliquid, as well as the viscosity of the eliquid. In embodiments, the airflow temperature may be measured (e.g., entering and/or leaving the heating chamber of the container). The airflow temperature(s) affect the temperature of the coil and the temperature of the product in the container, which may affect the dosage during an inhalation event.

[0095] In embodiments, the pressure related measurements may be measured by pressure sensors of the vaporizer device 100 and may be communicated to the model creation system 170 via a wired or wireless communication link. In embodiments, a pressure sensor may measure the inhalation pressure that is applied to the vapor chamber by the user during an inhalation event. The pressure correlates to the dosage amount. As different users will generate different pressure profiles, accounting for different draw profiles may provide with better dose predictions. For example, direct inhalation and mouth inhalation result in different dosages, and a dosing model 164 should account for such differences. In some embodiments, ambient pressure may be measured as well, which may indicate a delta between the pressure in the vaping channel (e.g., the mouthpiece or container) and the environment of the vaporizer device 100. In embodiments, airflow curves may be measured. The airflow curves measure the airflow through the cartridge channel. While airflow and pressure are related, these may both have an effect on the dosage amount.

[0096] In embodiments, the model creation system 170 may also determine a product (e.g., concentrate) level in the container. In embodiments, a capacitive sensor with conductive electrodes on either side of the container may be used to determine changes in the level of product in the container at a given time, as changes in the level of product alter the dielectric constant between the electrodes. In some embodiments, an ultrasonic sensor may be used to measure a distance between the sensor and the surface of the concentrate.

[0097] In embodiments, the model creation system 170 may measure characteristics of the vapor. In some embodiments, optical sensors may be used to measure the particle density and particle size of the vapor. In embodiments, the model creation system 170 measures the characteristics of the concentrate. For example, the model creation system 170 may measure the viscosity of the concentrate and/or the opacity of the concentrate.

[0098] In embodiments, the model creation system 170 maintains parameters relating to the previous inhalation event. In embodiments, the time between the current inhalation event and the previous inhalation event affects the dosage corresponding to the current inhalation event, as a concentrate needs to refill the coil chamber before it can be vaporized. Furthermore, the

dosage amount of the previous inhalation event may affect the amount of time required to refill the coil chamber.

[0099] In some embodiments, one or more of these factors may be implicitly accounted for when the puff simulation system 190 is simulating inhalation events on a container and/or when a dosing model 164 is generated (e.g., using a puff simulation system 190). For example, instead of explicitly measuring the cartridge parameters, many parameters will be implicitly characterized using the puff simulation system 190. These parameters may include the type of container, the volume of the container, and/or the shape of the mouthpiece nozzle.

[0100] In some embodiments, the model creation system 170 generates dosing models based on the output of a puff simulation system 190. A puff simulation system 190 is an electromechanical system that simulates inhalation events, captures the vapor created by the simulated inhalation events, and measures the dosages in the resultant vapor. In embodiments, the puff simulation system 190 may vary one or more relevant parameters in a controlled manner and may measure the resultant dosage delivered from a vaporizer device 100 (e.g., using a gold standard measurement). The parameters that may be varied may be user parameters (e.g., the draw profiles that are simulated by the puff simulation system 190), environmental parameters (e.g., the ambient temperature, ambient pressure), device parameters (e.g., the voltage in the battery, the temperature used to vaporize the product), and product parameters (e.g., the temperature of the product before vaporizing, the viscosity of the product, the amount of product remaining in the cartridge, and/or the like). In these embodiments, the characteristics of the product and the container do not need to be explicitly measured or understood (but they may be). In these embodiments, the model creation system 170 may use the output of the puff simulation system 190 to create a dosing model 164.

[0101] In embodiments, the puff simulation system 190 may connect to a vaporizer device 100 and apply simulated inhalation events (or “synthetic puffs”) to the vaporizer device 100. The simulated inhalation events may be performed in accordance with one or more different draw profiles. A draw profile may be a curve of a potential inhalation event, whereby the draw profile plots magnitudes of inhalation pressures over time. For example, some users may draw vapor directly into their lungs, while other users may draw the vapor into their mouth before removing the vaporizer device 100 from their mouth and then inhaling the vapor. In the former example, the inhalation pressure is generated from the lungs and may be a relatively longer draw, while in the latter example, the inhalation pressure is generated from the mouth and may be a relatively shorter draw. Furthermore, some users may take one long draw, while other users may take shorter consecutive draws. Thus, each draw profile may capture the features of an inhalation technique of a subset of users. In embodiments, the draw profiles may be defined and selected

to collectively represent the majority of potential users of a vaporizer device 100 and/or to test the parameters that most affect the dosage amounts.

[0102] In embodiments, the draw profiles may be generated based on in-house testing and/or by collecting data from users of the vaporizer device. In the former scenario, different test subjects can use a vaporizer device 100 and inhalation pressure curve may be generated for each user. The pressure curves may be used to understand the variation of pressure curves across different users (e.g., average pressures at different times during the inhalation event, standard deviations of the inhalation pressures at the various times, the average duration of the inhalation event, etc.). Using this data, pressure curve shape categories that are representative of human pressure curves may be created, such that the shape of each respective pressure curves represents the inhalation pressure over the course of an inhalation event. These curves may be used as draw profiles to simulate inhalation events.

[0103] In embodiments, the draw profiles are generated using real-world data collected from users of the vaporizer device 100. In these embodiments, the vaporizer devices 100 may be configured to capture and report measurements surrounding a user's use of the vaporizer device 100. For example, each time a user uses the vaporizer device 100, the vaporizer device 100 may record the inhalation pressure during each inhalation event, and one or more additional measurements (e.g., the duration of the inhalation event, the orientation of the vaporizer device 100, the environmental temperature at the time of the inhalation event, and the like). The vaporizer devices 100 may report this information to a corresponding instance of the companion application 150, which in turn reports the collected data to the dosing platform 160. This real-world data may be used to understand the true distribution of inhalation event parameters across a large sample size of users. The inhalation pressure curves may then be generated based on the collected real-world data.

[0104] In embodiments, a large sample of possible pressure curves may be generated based on the collected data (in-house and/or real-world). In some embodiments, the model creation system 170 may use principal component analysis (PCA) and clustering to identify the N (e.g., 50) most common pressure curves that cover a significant percentage (e.g., 99%) of all pressure curves when normalized to max inhalation pressure and duration. These pressure curves may then be translated to input values that control the puff simulation system 190.

[0105] In embodiments, the puff simulation system 190 may simulate inhalation events on one or more instances of a product using the different draw profiles. For example, in generating a model for a particular flavor of a particular brand of an eliquid cartridge (e.g., nicotine cartridges or THC cartridges), one or more of the cartridges may be tested by the puff simulation system 190 using the different draw profiles. In this example, the puff simulation system 190 may

simulate inhalation events in accordance with a respective draw profile until a respective cartridge is completed. The puff simulation system 190 may test multiple cartridges using the same draw profile and may perform the foregoing routine for each individual draw profile. At each simulated inhalation event, the puff simulation system 190 may record one or more features of the inhalation event. In some embodiments, the puff simulation system 190 may record one or more of: the draw profile that was used to simulate the inhalation event, the measured dosage resulting from the inhalation event (or multiple measured dosages taken at different times during the inhalation event), the duration of the inhalation event, the inhalation pressure during the inhalation event, the power supplied to the heating element, the vaporizing temperature that was used to vaporize the product, the voltage that was used to generate the current that pass through the coil, the voltage in the battery at the time of the inhalation event, the amount of product remaining in the container during the inhalation event, the ambient temperature during the inhalation event, the container temperature during the inhalation event, and/or any other suitable features. In some embodiments, the features that are collected may be determined by varying the feature over multiple inhalation events, while maintaining every other feature during the multiple inhalation event to determine if the dosage is affected by that particular feature. For example, the orientation of the vaporizer device 100 may be varied (e.g., sideways, tilted, upside down, right side up) and the puff simulation system 190 may determine whether the orientation affects the dosage amounts.

[0106] The puff simulation system 190 may output the results of the simulated inhalation events using the different draw profiles to the model creation system 170. The model creation system 170 may use the results of the simulated inhalation events for all of the different draw profiles to train the dosing model 164 for a corresponding product. The model creation system 170 may define the inputs of the dosing model 164 to include target parameters that are measurable and/or can be determined before an inhalation event and to output a predicted dose. The input target parameters may include the current inhalation pressure, the vaporizing temperature, the vaporizing voltage (the voltage that is applied to the coil), the power supplied to the heating element, the duration of the inhalation event, and/or any other measurable parameters. The model creation system 170 may define the output of the dosing model 164 as a predicted dosage (which may be measured as a function of the amount of product that was vaporized from the vaporizer device 100 during the inhalation event and/or using optical sensors). In embodiments, the dosing models 164 are predictive models, in that the dosing models 164 predict a dosage given the input parameters. The model creation system 170 may then execute a machine-learning algorithm (e.g., neural network, regression-based learning, decision trees, or the like) to determine a transfer function of the dosing model. The transfer function of a dosing model 164

translates the input parameters surrounding an inhalation event to a predicted dosage at a given time during the inhalation event. In this way, the transfer function for a product may be learned across many different draw profiles. As this process is repeated for different products, the transfer functions and dosing models 164 for different products may be learned. In some embodiments, the dosing models may be cross-validated with user data. In these embodiments, the puff simulation system 190 may be fine-tuned to generate results that align with the results that would be generated by humans. Furthermore, in some embodiments, models may be trained, updated, and/or cross-validated using data collected from vaporizer devices 100 of users (e.g., via reporting by the companion applications 150).

[0107] In embodiments, the model creation system 170 generates dosing models 164 based on the properties of the product and/or the container that contains the product. In some of these embodiments, the dosing models 164 are not determined using a puff simulation system 190. In embodiments, each product is characterized by its measurable parameters. If a product is sold in a container (e.g., cartridge) then the measurable parameters include the measurable parameters of the container (e.g., the resistance of the container, the size of the container, the insulative properties of the container, and the like) in addition to the measurable parameters of the product itself (e.g., the concentration of the product, the viscosity of the product, the vaporization point of the product, and the like). The measurable parameters may be obtained from the product record of a product and/or may be determined in a laboratory testing environment. The model creation system 170 may then generate a dosage model 164 based on the measurable parameters of the product. For example, given the concentration of an eliquid, the viscosity of the eliquid, the vaporization point of the eliquid, the resistance of the cartridge when new, and any other measured parameters, the model creation system 170 may create a dosing model 164 that is based on the measured parameters, whereby the dosing model 164 outputs predicted dosages in vapor given a respective vaporizing temperature and a respective inhalation pressure value. The model creation system 170 may generate the models in any suitable manner. For example, the model creation system 170 may utilize a machine learned model to determine the weights to be used in a dosing model given the measurable parameters of the product, the measurable parameters of previously analyzed products, and the dosing models of the previously analyzed products.

[0108] Once a dosing model 164 is generated, the model creation system 170 may store the dosing model 164 in the dosing model data store 162. The model creation system 170 may relate the dosing model 164 to the corresponding product record 168 (or records 168). In this way, when the dosing platform 160 receives requests corresponding to a particular product, the dosing platform 160 may retrieve the product record 168 of the requested product and may identify the

appropriate dosing model 164 based on the reference in the product record 168.

[0109] In some embodiments, the dosing models 164 may be generated for individual users and/or classes of users that have similar draw profiles. In these embodiments, the model creation system 170 may fine tune each dosing model based on data collected from the individual users and/or the classes of users.

[0110] In operation, the vaporizer device 100 receives a target dosage amount and a dosage model corresponding to a product that the user is vaporizing. The vaporizer device 100 may receive the target dosage amount and the dosage model 164 from the companion application 150. The vaporizer device 100 may load the target dosage and the dosage model into the memory of the vaporizer device 100, whereby the vaporizer device 100 may control the voltage being applied to the container based on the dosage model and the target dosage. When the user begins an inhalation event (e.g., begins inhaling and/or presses a button), the vaporizer device produces a current through the coil of the container (or another suitable heating element) that heats the product to a temperature that is sufficient to vaporize the product and release the desired compounds. As the user is using the device, the vaporizer device 100 may monitor one or more vaporization parameters related to an inhalation event and may adjust one or more settings of the vaporizer device 100 based on the vaporization parameters, the target dosage, and the dosage model. The vaporization parameters are parameters relating to the current inhalation event and may include user conditions (e.g., an inhalation pressure, a duration of the inhalation event, etc.), device conditions (e.g., an amount of remaining battery life), container conditions (e.g., a temperature of the container, an amount of product remaining in the container, a resistance of the container), and/or environment conditions (e.g., an ambient temperature). In embodiments, the vaporizer device 100 may include a pressure sensor that measures the inhalation pressure being applied by the user during an inhalation event. In embodiments, the inhalation pressure may be represented as a set of inhalation pressure measurements over a period spanning from the beginning of the inhalation event to the current time, such that the inhalation pressure is a current draw profile. The vaporizer device 100 may include additional sensors to measure other condition and/or may determine other conditions. For example, the vaporizer device 100 may include temperature sensors that measure a container temperature that indicates a temperature of the container and/or an ambient temperature that indicates a temperature of the surrounding environment. In embodiments, the vaporizer device 100 may determine a voltage that is applied to the heating element and/or an amount of power supplied to the heating element. In embodiments, the vaporizer device 100 may estimate the amount of product remaining in the container based on previous use of the vaporizer device with respect to the product currently being vaporized or using sensors (e.g., capacitive sensors and/or optical sensors). The vaporizer

device 100 may input the vaporization parameters into the dosage model, which outputs a predicted dosage based thereon. In some of these embodiments, the vaporizer device 100 may redetermine the predicted dose during the course of the inhalation event, as the user continues to inhale. In this way, the user's draw profile will be accounted for when determining the predicted dose at a given time during the inhalation event.

[0111] In embodiments, the vaporizer device 100 may adjust the settings of the vaporizer device in response to the predicted dosage. For example, if the user is drawing at a relatively low inhalation pressure, the vaporizer device 100 may determine that the draw is unlikely to reach the target dose, and may increase the vaporizing temperature (e.g., by increasing the voltage to the coil) to increase the rate at which the compound is being released. In another example, if a user is drawing at a relatively higher pressure, the vaporizer device 100 may determine that the user is approaching the predicted dosage faster than what the model suggested and may decrease the vaporizing temperature to decrease the rate at which the compound is released. In another example, the vaporizer device 100 may continue to allow the user to inhale until the predicted dosage reaches the target dosage, at which point the vaporizer device 100 may stop heating the container (e.g., stop the current to the coil), such that no more vapor is created.

[0112] In embodiments, the vaporizer device 100 collects the vaporization parameters during inhalation event and determines a predicted dosage during the course of the inhalation event. In these embodiments, the vaporizer device 100 does not necessarily receive a target dosage. In these embodiments, the predicted dosage over the course of the inhalation event and/or the vaporization parameters can be recorded by the vaporizer device 100 and reported to the companion application, which may in turn report the inhalation event and/or the vaporization parameters to the dosing platform 160. In some embodiments, the application 150 may display analytics to the user regarding the usage of the vaporizer device, the product, and/or the device 100 itself. In example embodiments, the application 150 may display to the user an amount of compound (e.g., nicotine, THC, CBD) that the user has consumed over a period of time (a single session, an hour, a day, a week, etc.) and/or an average consumption over the period of time (e.g., milligrams per session, hour, day, or week). In embodiments, the application 150 may determine an amount of product remaining in the container (e.g., an amount of eliquid remaining in a cartridge) based on the predicted dosages and/or the vaporization parameters. The application 150 may display the remaining amount of product to the user via the GUI of the application 150. In embodiments, the application 150 may determine a user's adherence to a dosing plan (e.g., a dosage regiment, nicotine cessation, cessation of vaporizable compounds, or the like).

[0113] In some embodiments, the vaporizer device 100 is configured to control the vaporizer to

affect the viscosity of a liquid product. In these embodiments, the vaporizer device 100 may receive a profile corresponding to the product, where the profile may be generated from a product record 168 corresponding to the product. In these embodiments, vaporizer device 100 may determine a target viscosity to ensure that the product doses the vapor appropriately. In some embodiments, the target viscosity may be a function of a container temperature. For example, when the container is heated to a certain temperature, the viscosity may be in a condition to result in adequate dosing.

[0114] In embodiments, the vaporizer device 100 may maintain the vaporizing temperature between an upper and lower threshold to ensure a sufficient user experience. In embodiments, a sufficient user experience may refer to an acceptable amount of taste in the vapor and/or a sufficient amount of vapor on a typical exhale. The sufficient user experience will vary depending on the device type and the type of product. For example, in some devices (e.g., nicotine vaporizers) thicker clouds of vapor may be preferred, whereas in other devices (e.g., dry cannabis vaporizers) a smooth vapor that still exhibits the flavors of the original product is preferred. While the type of product and/or the properties of the product itself are important contributors to providing a sufficient user experience and the dosage, one or more settings of the vaporizer device 100 can be set to adjust one or more properties of the resultant vapor. For example, the vaporizer device 100 may adjust its vaporizing temperature and/or the speed at which it heats the container to adjust/increase/decrease the taste, harshness, and/or thickness of the vapor. For example, in reference to vaping eliquids, the range for vaporizing certain types of eliquids may be between 212°F - 482°F. In some embodiments, the flavor of the vapor may be optimized by maintaining a temperature that is greater than 300°F, such that the vapor produced at vaporizing temperatures closer to 212°F may be tasteless or may feel weak to the user. For some of these eliquids, being vaporized at a temperature range between 390°F to 430°F may produce optimal vapor for a user, whereby the vapor exhibits a sufficient user experience for that type of eliquid. Furthermore, within this temperature range, products having different properties (e.g., different brands, strains, flavors, flavoring type, extraction types, and the like), may be vaporized at different temperatures and/or speeds to improve the user experience (as well as the number of compounds). For example, a certain brand of an eliquid may be vaporized at 410°F may provide a cool yet satisfying “hit” that has the desired amount of a compound. At this temperature, the vapor consistency may feel thin and refreshing to the user and/or may be smoother on the inhale. Another brand may be vaporized at 395°F to provide a sufficient user experience that has the desired amount of the compound.

[0115] In some embodiments, the user can select or otherwise provide one or more properties the desired user experience (e.g., via the application 150 or via a user interface of the vaporizer

device 100).

[0116] In some embodiments, the vaporizer system 10 may be used for nicotine cessation, cessation of vaporizable compounds, and the like. In these embodiments, the vaporizer system 10 can dynamically monitor and adjust the nicotine (or other vaporizable compounds) intake of a user, so that the user's consumption may be gradually reduced over time. In these embodiments, the dosing platform 160 may adjust a dosing plan for a user based on the cravings of the user, thereby ensuring that the cravings are kept at a level that lessens the chance of a relapse. In these embodiments, the vaporizer system 10 can limit the daily nicotine intake (or intake of other vaporizable components), monitor nicotine intake and the like over time to understand the user's cravings and enforce a custom dosing plan. In these embodiments, vaporizing device 100 can monitor the dosage of nicotine or other vaporizable components consumed by the user over time. The user may purchase cartridges with controlled amounts of nicotine (or other vaporizable components), whereby the concentrations depending on which stage in the program that the use is at. In some of these embodiments, the companion application may allow a user to interact with the dosing plan and the vaporizer device 100. The application 150 may apply behavior change and/or gamification techniques to help the user reduce nicotine consumption or the consumption of other vaporizable components.

[0117] FIGS. 2-6 illustrate an example vaporizer device 100 according to some embodiments of the present disclosure. In the illustrated example, the vaporizer device 100 is a computer-controlled, programmable, rechargeable handheld hardware device that receives and supplies power to standard cartridges, such as 510 thread cartridges, containing vaporizable material, such as oils, pharmaceuticals, or plant-based material. While depicted as receiving a 510 thread cartridge, other embodiments may receive different types of containers (e.g., pods, disposable receptacles, etc.). The device 100 includes a number of components on and off a central PCB board 132. The components may include (but not limited to) a processor 102 (also referred to as a microprocessor), a communication unit 104 (e.g., Bluetooth low-energy antenna), a voltage controller 106, a display 108, a rechargeable power source 110, a pressure sensor 112, a resistance (Ohm) reader circuit 114, a female electrical contact 116 that receives a cartridge of vaporizable material, an accelerometer 118, one or more other sensors 120 (temperature, light, moisture and/or elevation sensors), a female power source charging input 122, a power management integrated circuit 124, a haptic feedback component 126, and a multi-use button 138. It is noted that the foregoing list of components is not mandatory, and a vaporizer device 100 may include additional or alternative components without departing from the scope of the disclosure.

[0118] In embodiments, the pressure sensor 112 is configured to measure the unique range of

inhalation pressures among diverse users and their particular inhales within the pressure chamber 128. In embodiments, the pressure sensor 112 may output a measurement indicating the inhalation pressure to the microprocessor 102. In these embodiments, the microprocessor 102 monitors the inhalation pressure (amongst zero or more other signals) to alter a dosing formula in real-time based on the inhalation pressure and the zero or more other signals to ensure consistent experiences between each dose. In some embodiments, the pressure sensor 112 may activate the microprocessor 102 from a sleep-state in response to sensing an inhalation pressure. In these embodiments, the pressure sensor 112, upon having an inhalation pressure applied thereto (or otherwise detecting an inhalation pressure) may emit a signal that wakes the microprocessor up. In some embodiments, the microprocessor 102 may be activated in other manners, such as the user pushing the multi-use button 138. In embodiments, the multi-use button 138 allows for powering the device on and off, as well as navigation and selection of various information shown on the device display.

[0119] In embodiments, the sensors 120 may include any sensors that output measurements relating to the vaporizer device 100, the product, and/or an environment of the vaporizer device 100. In embodiments, the sensors 120 may include a container temperature sensor that measures a temperature of the container. The container temperature may be indicative of a temperature of the product in the container at a given time, which may affect the viscosity of the product. In embodiments, the sensors 120 may include an ambient temperature that indicates a temperature of the environment of the vaporizer device 100. In embodiments, the sensors 120 include an accelerometer 118. The accelerometer 118 may output an acceleration signal that indicates one or more accelerations in one or more respective directions. In embodiments, the microprocessor 102 receives the accelerometer signal to determine an orientation of the vaporizer device 100 at a given time. In embodiments, the sensors include capacitive sensors that measure an amount of product remaining in the container. The sensors 120 may include additional or alternative environmental sensors 120 without departing from the scope of the disclosure.

[0120] In embodiments, the resistance (Ohm) reader circuit 114 actively measures the resistance of a heating element of a container (e.g., a coil of the vaporizable material cartridge 134) attached to the vaporizer device 100 (e.g., coupled with the 510 female contact 008, as seen in FIG. 6) and outputs the measured resistance to the microprocessor 102. In embodiments, the resistance reader circuit 114 may output an electric signal of fixed voltage and may measure the current flowing through the heating element of the container. Alternatively, the resistance reader circuit 114 may output a fixed current and may measure the voltage required to achieve the fixed current. In either implementation, the resistance reader circuit 114 may determine a resistance of the heating element by dividing the voltage by the measured current. In embodiments, the

resistance reader circuit 114 may output the resistance to the microprocessor 102. Alternatively, the microprocessor 102 may determine the resistance based on a voltage and current, as discussed above. As will be discussed, in embodiments the microprocessor 102 may adjust the device's voltage output using the voltage controller 106 to a range that sufficiently heats the vaporizable product in the container to achieve a target dose. For example, the voltage may be increased to increase the temperature and decreased to reduce the temperature. Thus, considering even just two variables – namely, (a) inhalation pressure over time and (b) a resistance of the heating element (e.g., specific cartridge's coil resistance) – the vaporizer device 100 may output consistent doses during different inhalation events. In some embodiments, when a consumer that inhales (a) on a relatively “low- resistance” cartridge – meaning, one having low-resistance coils that require less power to vaporize material than high resistance coils – and (b) at a relatively low inhale pressure (a lighter drag), will receive a relatively high ratio of vapor to air, thus requiring less power (e.g., less voltage) to heat the particular coil inside the cartridge 134 for a given dose. By contrast, a high inhale pressure may result in more air being drawn into the mixture, which actually cools the heating element, and in turn, may require more power to the vaporizable material cartridge coil in order to balance the vapor-to-air ratio and provide the same dose. To illustrate this vapor production in relation to airflow (pressure) rate, FIGS. 8A, 8B, and 8C illustrate exemplary pressure-versus-time graphical depictions for a given user that mates a particular cartridge having a known coil resistance to the device and who desires to limit his/her vapor intake to 1 mg. FIG. 8A illustrates the user's inhalation profile from time 0 to time n (in milliseconds) at 800. FIG. 8B shows the same graph at 802 but adds the real-time adjustments made to this inhalation profile by the microprocessor 102 of the vaporizer device 100, taking into account both the inhaling pressure over time and the coil resistance of the container. FIG. 8C illustrates these same graphical depictions at 804 with the adjusted dosage output to the user over this time period to match the user's expectation. In this example, as the user set his desired output to be 1 mg, the device is able to track the intake over the full time period and shut off the delivery of vapor as soon as it calculates that 1 mg has been drawn, that is, at time $t = n$. Thus, as seen, for a given cartridge of known coil resistance, the vaporizer device 100 is able to offer substantially the same experience between users, regardless of how hard they inhale on the cartridge. Moreover, for a given user, the desired dosing delivered can be the same product to product, regardless of the container, the coil resistance, the brand and/or variety of product used.

[0121] In embodiments, the microprocessor 102 pairs with the user device 140 via the communication unit 104, thereby enabling communication between the microprocessor and the application 150 that is hosted or otherwise accessed by the user device 140. For example, the microprocessor 102 and the application 150 may communicate using the Bluetooth Low Energy

protocol, whereby the microprocessor 102 and the user device 140 hosting the application connect via a Bluetooth connection. In embodiments, the application 150 may communicate a dosing model 164 and a target dosage to the microprocessor 102. In embodiments, the application 150 may communicate the dosing model 164 to the microprocessor 102 in response to a user selecting a product that is being vaporized from the GUI of the application. It is noted that the dosing model 164 may be obtained in other manners as well. In embodiments, the application 150 may communicate the target dosage to the microprocessor 102 in response to the user entering the target dosage via the GUI of the application 150. Alternatively, the user may enter the target dosage via a user interface of the vaporizer device 100 (e.g., the multi-use button 138).

[0122] The microprocessor 102 may utilize the dosing model 164 to determine predicted dosages at a given time during an inhalation event and may adjust one or more settings of the vaporizer device 100 based on the predicted dosage and the target dosage. Upon receiving the dosing model 164, the microprocessor may load the dosing model 164 into its memory. When the user commences use of the vaporizer (e.g., begins inhaling), the microprocessor 102 commands the voltage controller 106 to output an initial voltage. The initial voltage may be set to a value that is based on an average or default draw profile (e.g., the most common inhalation pressure and the most common duration) to achieve the target dosage. In some embodiments, the microprocessor 102 may determine a resistance of the heating element (e.g., the coil) to determine the appropriate initial voltage. As the user continues to inhale, the microprocessor 102 determines one or more vaporization parameters. For example, in some embodiments, the microprocessor 102 may determine an inhalation pressure, the container temperature, the ambient temperature, the orientation of the device, an amount of product remaining, the power being applied to the heating element, a voltage being applied to the heating element, and/or the like. As discussed above, the inhalation pressure may be represented as a series of inhalation pressure values beginning at the start of the current inhalation event. The microprocessor 102 can feed the vaporization parameters into the dosing model 164, which outputs a predicted dosage. In embodiments, the predicted dosage may indicate an amount of an active compound that was released into the vapor during the current inhalation event. In embodiments, the microprocessor 102 may continue to let the user inhale until the predicted dosage reaches the target dosage. In these embodiments, the microprocessor 102 can compare the predicted dosage to the target dosage. When the predicted dosage equals the target dosage (or is within a “cooling down” margin), the microprocessor 102 may instruct the voltage controller 106 to stop outputting a voltage, thereby stopping any further vaporization during the current inhalation event. In some embodiments, the microprocessor 102 adjusts the temperature of the heating

element by increasing or decreasing the voltage being applied to the heating element based on the predicted dosage relative to the target dosage. In these embodiments, the microprocessor 102 can utilize a current draw profile of the user to determine whether the user is likely to reach or exceed the target dosage given the predicted dosage. In some embodiments, the current draw profile may be the inhalation pressure values of the user observed during the current inhalation event. If the target dosage is unlikely to be reached, the microprocessor 102 may instruct the voltage controller 106 to increase the voltage that is applied to the heating element. If the target dosage is likely to be exceeded given the vaporization parameters and the predicted dosage, the microprocessor 102 may instruct the voltage controller 106 to decrease the voltage. In some embodiments, the microprocessor 102 can control the haptic feedback component 126 based on the predicted dosage. In some of these embodiments, the microprocessor 102 can actuate the haptic feedback component 126 when the predicted dosage is greater than or equal to the target dosage.

[0123] In embodiments, the microprocessor 102 can monitor the user's intake over a period of time to determine whether to remind the user to use the vaporizer device 100 or to prevent the user from further use of the vaporizer device 100 for the duration of the period of time. In these embodiments, the application 150 may provide a dosing plan to the microprocessor, whereby the dosing plan may indicate limitations on a user's dosing and/or a schedule for the user's dosing. For example, the user may select or define a dosing plan that limits the user's dosing over the course of one day to a certain amount of the active compound. In another example, the user may select or define a dosing plan that requires the user to ingest a certain amount of the active compound over the course of a day. In these examples, the microprocessor 102 (or the application 150) may monitor the user's consumption of the active compound in relation to the dosing plan and may notify the user when the user is not meeting the minimum dosage and/or may prohibit the user from using the vaporizer device 100 if the user has exceeded the maximum defined in the dosing plan. In some embodiments, the microprocessor 102 can control the haptic feedback component based on the dosing plan. For example, if the user needs to be reminded to take a dose, the microprocessor 102 can actuate the haptic feedback component 126 to remind the user of an upcoming dose.

[0124] In embodiments, the vaporizer system 10 can also communicate to the user a "dose absorption profile" as seen at 900 in FIG. 9. The vaporizer device 100, having calculated the one milligram of vapor inhaled, also calculates the amount of time the user may hold his/her breath in order to achieve a desired absorption of the inhaled vapor before being exhaled. This "hold breath" time can either be communicated by the device itself, the application, or both.

[0125] In embodiments, the vaporizer device 100 is intuitive to use for permitted ages or

experiences, and may even function, on a basic level without input from the companion application 150. However, in order to maximize dosing precision, all that is required from the user is the creation of a user profile and input the identification of each new vaporizable material cartridge that is inserted into the device. In the specific case of vaporizing concentrated cannabis, consumers often take months or even years of experimentation to find the right brand/strain that suits their needs, and many are deterred from cannabis consumption because of an initial negative experience. In embodiments, the device/platform of the present disclosure ensures that each consumer, whether experienced or not, may receive a consistent and pleasant experience according to their unique desires and needs without the risk of overconsumption.

[0126] FIG. 7 illustrates an example flow of the vaporizer system 10. Upon purchasing the inventive dosing device and downloading the companion application to a mobile device (step 202), the user will open the application and fill out his/her profile (step 204) (“user onboarding” as shown in connection FIGS. 10A and 10D) and set up a “dosing plan” (step 206) (described herein). At this point, initial setup is complete and the device may be switched on (step 208) and paired with the application (step 210).

[0127] Now, when ready to be used, the user may identify on the application the cartridge brand name to be inserted into the device (step 212), and the cartridge (e.g., the brand, product name, volume) is identified either by the user or by computer vision (FIG. 8, box 706). In embodiments, the dosing platform may identify a product record 168 from the product datastore 166 that stores a library of the technical profiles of the many standard products available on the market (step 214). As shown in FIG. 8, box 708, the profile may include numerous “lab-tested associated values,” or characteristics, of both the cartridge itself and the product contained therein to be vaporized that may be relevant to dosing accuracy. The profile may also reference a dosing model 164 corresponding to the product/cartridge, which may be provided to the vaporizer device via the companion application 150. At step 216, the cartridge is coupled with the vaporizer device 100 and the vaporizer device 100 detects that a new vaporizable material cartridge has been connected by either the cartridge insertion switch 136 or through other electrical means, at which point the device is ready and waits for the user to inhale (step 218).

[0128] Turning back to the “dosing plan” entered on the application 150 (e.g., as shown in FIG. 10D), the user may select a plan to fit his/her particular need, including a purpose (e.g., for chronic pain, Parkinson’s, chemotherapy symptoms, etc.), a dose reduction plan, inhale volume per session, a frequency regiment, etc. In embodiments, the application 150 can optionally recommend a dose plan to regulate the milligram amount of vaporized material to consume during each dose and the number of doses per period of time. Users can also set the dose plan to “freestyle” mode and track the consumption during doses of any time/length (FIG. 10A). In

embodiments, the vaporizer device 100 can detect when the cartridge is removed (FIG. 10B) and save that cartridge's data so that consumers can switch between different brands and product names. In embodiments, when a previously inserted vaporizable material cartridge is reintroduced to the vaporizer device 100, its profile will pop up on their mobile phone to be selected, and consumption will pick up from where it left off. For example, in embodiments, a cartridge may have a cartridge identifier that is encoded on a small RFID tag that is communicated to the vaporizer device 100 when it is connected thereto (FIG. 10C). Once the cartridge is fully depleted, its profile will be removed from selection and archived (FIG. 10D).

[0129] Turning back to FIG. 7, when the user inhales, at step 218, the pressure sensor 112 of the vaporizer device 100 is activated (step 220). In turn, the processor 102 is activated (step 222), the environmental variables are measured and/or calculated (step 224), and the pressure sensor 112 measures and outputs the sensed inhalation pressure to the microprocessor (step 226). The microprocessor 102 may feed the inhalation pressure and other measured variables to dosing model 164, which outputs a predicted dosage based on the numerous input variables, including the inhalation pressure, the product (e.g., brand, flavor, cannabis strain, etc.), the cartridge characteristics, a profile, and the environmental variables. At step 230, the algorithm powers the cartridge and outputs at step 232 the dose time for activating the coil to deliver the inhalable material for the required dose time. At step 234, once the calculated amount has been delivered, power is shut off from the cartridge. At step 236, consumption activity may be stored to local memory.

[0130] In some embodiments, at step 238, the vaporizer device 100 connects to the user's mobile phone via Bluetooth, or other known means and, at step 240, sends the activity data to the application. At this time, the device may also receive settings changes from the application.

[0131] In embodiments, the dosing models 164 incorporate a number of variables specific to an inhalation event/user and facilitate power between the internal battery of the vaporizer device 100 and the container for a determined amount of time. For example, if the user wants to consume two milligrams of vaporizable material, the microprocessor 102, using the dosing model 164, determines an amount of time, based on the specific device, product, and/or user variables, for which the cartridge would have to be powered, and the whatever required power level, in order to deliver that two milligrams.

[0132] As shown in FIGS. 8A, 8B, and 8C, a dosing algorithm (e.g., the Realtime Dose Calculation 700) that may be executed by the vaporizer device 100 to output at output 790 variable voltage over time to achieve a target dosing of vapor (in mg). In embodiments, the dosing calculation 700 takes inputs from three general categories of variables: (a) predefined values 710; (b) variable adjustments 730; and (c) real-time user inhalation pressure 750. In embodiments, the

predefined values include User Input Values 702, Dose Plan Setup 704, the Inserted Cartridge Type Identified 706 (brand, product name (strain), volume), and Lab Tested Associated Values 708 of the product. Cartridge Variable Adjustments 730 are those that the vaporizer device 100 picks up in real time and includes factors such as cartridge volume remaining, based on sensed airflow, resistance, coil heat up and coil cool down. As discussed above, in embodiments, the inhalation pressure is measured by the pressure sensor 112 of the vaporizer device 100 based on the user inhalation 750. As shown, output 790 is continually adjusted in a feedback loop as the variable adjustments are made. In embodiments, the calculation 700 accounts for at least the use of the two inputs of user drag and cartridge coil resistance. In embodiments, the formula will take into account any number of the additional inputs disclosed herein.

[0133] FIG. 11 illustrates an example method 1100 for controlling a vaporizer device 100 in accordance with some embodiments of the present disclosure. In embodiments, the method 1100 is executed by a microprocessor of the vaporizer device 100. The method 1100 may be executed by other suitable components without departing from the scope of the disclosure.

[0134] At 1110, the microprocessor 102 receives a dosing model 164 from the companion application 150 via the user device 140. In embodiments, the companion application 150 receives the dosing model 164 from the dosing platform 160 in response to a user selecting a product that is to be vaporized on the companion application 150.

[0135] At 1112, the microprocessor 102 receives a target dose from the companion application 150 via the user device 140. In embodiments, the companion application 150 receives the target dose from the dosing platform 160 in response to a user defining the target dose on the companion application 150. In some embodiments, the companion application 150 and/or the microprocessor 102 may default to a default target dose if the user does not specify a target dose.

[0136] At 1114, the microprocessor 102 detects an inhalation pressure. In embodiments, the pressure sensor 112 can monitor a pressure that is applied to a mouthpiece of the container. When an inhalation pressure is sensed, the pressure sensor 112 outputs a signal to the microprocessor 102 indicating that an inhalation pressure has been detected, and in some embodiments, a value of the inhalation pressure.

[0137] At 1116, the microprocessor 102 vaporizes the product in the container. In embodiments, the microprocessor 102 may instruct the voltage controller 106 to apply an initial voltage to the heating element of the container. In some embodiments, the microprocessor 102 determines a resistance of the heating element prior to setting the initial voltage. The microprocessor may then set the initial voltage based on the resistance. In some embodiments, the microprocessor 102 may select the initial voltage based on the dosing model 164, whereby the initial voltage causes the heating element to heat to a sufficient temperature to reach the target dose.

[0138] At 1118, the microprocessor 102 determines one or more vaporization parameters during the inhalation event. For example, in some embodiments, the microprocessor 102 may determine an inhalation pressure, the container temperature, the ambient temperature, the orientation of the device, an amount of product remaining, the power being applied to the heating element, a voltage being applied to the heating element, a duration of the inhalation event, and/or the like. In embodiments, the pressure sensor 112 continuously outputs an inhalation pressure value that indicates an inhalation pressure at a given time. The pressure sensor 112 can output the inhalation pressure values to the microprocessor 102. As discussed, the inhalation pressure may be represented as a series of inhalation pressure values measured during an inhalation event. In these embodiments, the inhalation pressure may be a curve or set of points representing the inhalation pressure from the beginning of the inhalation event to the current time. In embodiments, the microprocessor 102 can determine an amount of power being delivered to the heating element of the container and/or a voltage being applied to the heating element. In embodiments, the microprocessor 102 can read a container temperature signal from a temperature sensor to determine a container temperature. In embodiments, the microprocessor 102 can read an ambient temperature signal from a temperature sensor to determine a temperature of the surrounding environment. In embodiments, the microprocessor can maintain a time to monitor a duration of the current inhalation event. In embodiments, the microprocessor 102 may read or determine additional or alternative vaporization parameters based on signals received from the one or more sensors 120 of the vaporizer device 100. For example, the microprocessor 102 can determine an amount of product remaining in the container, an orientation of the container during the inhalation event, and/or other suitable vaporization parameters.

[0139] At 1120, the microprocessor 102 determines a predicted dosage based on the vaporization parameters and the dosing model 164. In embodiments, the microprocessor 102 feeds the vaporization parameters (e.g., inhalation pressure, container temperature, ambient temperature, an amount of product remaining, power being supplied, a voltage being applied, a duration of the inhalation event, and/or the like) into the dosing model 164. In response, the dosing module 164 outputs a predicted dose. In embodiments, the predicted dose may be indicative of an amount of compound released into the vapor during the current inhalation event. As the inhalation pressure may be representative of the inhalation pressure values that were measured since the beginning of the inhalation event, the dosing model 164 may be trained to take into account the user's current draw profile during the inhalation event to determine the predicted dose. In these embodiments, the predicted dose indicates an amount of compound that has been released into the vapor since the beginning of the current inhalation event.

[0140] At 1122, the microprocessor selectively adjusts one or more settings of the vaporizer

device 100 based on the predicted dosage and the target dosage. In embodiments, the microprocessor 102 may continue to supply a voltage to the heating element (e.g., coil) until the predicted dosage reaches the target dosage. In these embodiments, the microprocessor 102 can compare the predicted dosage to the target dosage. When the predicted dosage equals the target dosage (or is within a “cooling down” margin), the microprocessor 102 may instruct the voltage controller 106 to stop outputting a voltage to the heating element, thereby stopping any further vaporization during the current inhalation event. In some embodiments, the microprocessor 102 adjusts the temperature of the heating element by increasing or decreasing the voltage being applied to the heating element based on the predicted dosage relative to the target dosage. In these embodiments, the microprocessor 102 can utilize a draw profile of the user to determine whether the user is likely to reach or exceed the target dosage given the predicted dosage. If the target dosage is unlikely to be reached, the microprocessor 102 may instruct the voltage controller 106 to increase the voltage that is applied to the heating element. If the target dosage is likely to be exceeded given the inhalation pressure and the predicted dosage, the microprocessor 102 may instruct the voltage controller 106 to decrease the voltage. In some embodiments, the microprocessor 102 can control the haptic feedback component based on the predicted dosage. In some of these embodiments, the microprocessor 102 can actuate the haptic feedback component 126 when the predicted dosage is greater than or equal to the target dosage.

[0141] The microprocessor 102 can continue to execute steps 1118-1122 until the predicted dose has reached the target dose or the inhalation event ends. The microprocessor 102 can determine that the inhalation event has ended when the inhalation pressure is equal to zero for a period of time (e.g., one second).

[0142] FIGS. 13A, 13B, 14A, and 14B show the vaporizer device in closed and assembled conditions (FIGS. 13A and 13B) and in exploded views (FIGS. 14A, and 14B). It will be appreciated in light of the disclosure that the exteriors of the vaporizer device at 1300 and 1302 contain ornamental features separate and apart from functional aspects of the vaporizer device. The exploded views FIGS. 14A and 14B at 1310 and 1312 depict the various components of the vaporizer device that contain ornamental features separate and apart from functional aspects of the components of the vaporizer device. With reference to FIG. 15, the device 100 can connect to a large scale human puff database at 1502 that can connect to a parameter characterization (e.g., human pressure curves) at 1504. The parameter characterization at 1504 can also receive information from the human dose collection at 1506. The puff simulator (the test rig) at 1510 can receive information from the parameter characterization at 1504 and feeds information to the high-throughput dose collection at 1512. In embodiments, the training dose prediction model at 1520 can receive information from the high-throughput dose collection at 1512 and the human dose

collection at 1506. The training dose prediction model at 1520 can be optimized at high-throughput model optimization at 1522. FIG. 16 depicts accuracy of the predicted doses at 1600 for different version of product listed at 1602 showing correlation with actual dosage.

[0143] FIG. 17 illustrates an example of a puff simulation system 190 according to some embodiments of the present disclosure. In the illustrated example, the puff simulation system 190 includes a vacuum supply chamber 1702, a vacuum pump 1704, a vacuum regulator 1706, a vacuum controller 1708, a filter 1710, a controllable power supply 1712, a balance 1714, and a smart plug 1716. In embodiments, a computer 1718 (e.g., a computing device of the model creation system 170) is in communication with the controllable power supply 1712, such that the computer 1718 controls the power that is delivered to the vacuum controller 1708. In embodiments, the computer 1718 is also in communication with a vaporizer device 100, whereby the vaporizer device 100 vaporizes a test product and outputs one or more parameters that are measured during a simulated inhalation event. For example, the vaporizer device 100 may output the sensed inhalation pressure, the container temperature, ambient temperature, orientation, and/or any other suitable parameters determined during the simulated inhalation event. The vaporizer device 100 is connected to the filter 1710 by a tube, whereby the simulated inhalation pressure is applied to the vaporizer device 100 from the vacuum regulator 1706 via the filter 1710. In embodiments, the computer 1718 controls the amount of inhalation pressure that is applied to the vaporizer device 100 in accordance with a draw profile. As discussed, the computer 1718 can test a product using different draw profiles to measure the amount of an active compound that is released into the vapor when the different draw profiles are applied. FIG. 18A depicts embodiments of the sum of the pressure curve at 1802 with human data at 1804 and simulated data at 1806. FIG. 18B depicts embodiments of the measured dose at 1810 with human data at 1812 and simulated data at 1814. FIG. 19A depicts embodiments of the human pressure curves at 1820. FIG. 19B depicts embodiments of human pressure curve embeddings at 1822. FIG. 19C depicts embodiments of simulated pressure curves at 1824. FIG. 20A depicts embodiments of human pressure curve with six cluster centers at 1830. FIG. 20B depicts embodiments of simulated pressure curves at the six cluster centers at 1832.

[0144] With reference to FIGS. 21, 22A, 22B, 22C, 23, and 24, various embodiments of a push-connector 2100 of the present disclosure are depicted including a housing assembly (or housing) 2110 and a flexible ring 2120 attached to the open end of the housing 2110. The housing 2110 is preferably made of a generally cylindrical, hard, plastic body 2112 that can define at one end an opening 2114 (FIG. 22A) into which the cartridge 134 may be inserted. The flexible ring 2120 has an inner diameter that is smaller than both the inner diameter of the cartridge receiving opening 2114 to which it is attached and the outer diameters of the threaded and unthreaded parts of the

end of any cartridge 134, such as a 510-thread cartridge, which may be inserted into the connector 2100. The flexible ring 2120 may be made from any robust and flexible material capable of withstanding exposure to repeated frictional and scraping forces caused by repeatedly inserting and removing cartridges from the connector, while nevertheless, the flexible ring 2120 can maintain its shape. In embodiments, the flexible ring 2120 can be made from silicone.

[0145] FIGS 22A, 22B, and 22C depict various embodiments of the housing assembly 2110 as assembled and FIGS. 23 and 24 depict exploded views of housing assembly 2110. The housing 2110 comprises two main sets of components: A hard body 2112 and an electrical contact assemblies 2130, 2140 that can be installed into body 2112 during assembly. The contact assembly 2130 can be a positive electrical contact having a first end 2134 and a second end opposite thereto that can terminate in an electrically conductive dome end 2138. In embodiments, the conductive dome end 2138 can define a hole in its middle region (Figure 24). The contact assembly 2140 can serve as the electrical ground having a first end 2144. In embodiments, the ground can split off into two prongs 2145 and 2147, each terminating in grounding pads 2146 and 2148, respectively. As disclosed herein, when finally assembled in a power supplying device, the first ends or prongs 2134 and 2144 of positive and ground electrical contact assemblies 2130 and 2140 respectively, can be physically and electrically connected to the power supply system that can be connected to the battery.

[0146] With reference to FIG. 24, during assembly, the positive contact assembly 2130 can be inserted through the middle of the housing body 2112 and the prongs 2145 and 2147 of the ground assembly 2140 can be inserted into openings of the housing body 2112. Thus, the assembled housing includes grounding pads 2146 and 2148 protruding from the inner walls of the housing body 2112 (FIG. 22C), in a position to contact the threads 2404 of the cartridge 134 to be inserted therein. In these examples, the conductive dome end 2138 of the positive contact assembly 2130 can be in position to contact the positive pin 2402 of the cartridge 134.

[0147] With connector 2001 fully assembled, the user only needs to push the threaded end of the cartridge 134 through the flexible ring 2120 and into the housing 2110 simultaneously making good positive and ground electrical connections, while the flexible ring 2120 firmly holds and seals the neck 2406 of the connection end of the cartridge 134 to the housing 2110. To remove the cartridge 134, the user can simply pull it off the connector of the power-supplying device much the same way a magnetically-connected system can operate. It will be appreciated that this construction can be simpler to use than the conventional 510-thread screw solution. It will be further appreciated in light of the disclosure that the present disclosure can eliminate the need (i) for users to screw the cartridge to the battery, (ii) any additional parts such as adapters, and (iii) for esoteric and costly magnetic solutions.

[0148] It will be appreciated in light of the disclosure that in the various embodiments, the positive contact 30 can be configured using a “spring metal” material such that when assembled through opening 2150 of the housing 2110 (FIGS. 22B and 22C), its conductive domed end 2138 can flex. Thus, when pushing or snapping a 510-thread cartridge in the housing, the 510-threaded cartridge’s middle pin 2402 can readily and always make secure contact with this positive contact. Likewise, when the ground contact 2140 is assembled into the housing body 2112, the grounding pads or nubs 2146 and 2148 in embodiments can be biased slightly inwardly, such that when any cartridge is pushed into the device, the grounding pads or nubs 2146 and 2148 can flex but also can be sure to press firmly against and make good electrical contact with the outer thread 2404 of a 510-threaded cartridge, which can serve as the ground of the 510-threaded cartridge and the cartridge 134. Finally, the opposite end prongs 2134 and 2144 of the positive and ground electrical contacts 2130 and 2140, respectively, can extend out the back end of the housing 2110. These end prongs 2134 and 2144 can be physically electrically connected to the power supply system and ultimately to the battery.

[0149] It will be appreciated in the light of the disclosure that this positive and ground electrical contact design and construction can be shown to solve, or at least substantially reduce, the problem of premature battery failure caused by liquid leakage as described above in connection with prior art designs. With the design and construction of the present disclosure, even if the cartridge leaks some liquid into the battery, this scenario will not present concerns for the electrical connection as ends 2138, 2146 and 2148 are positioned in opening 2150 relatively far from the base of the battery connector and can always be configured to provide sufficient electrical contact with the cartridge regardless of leakage of liquid.

[0150] With reference to FIGS. 25A, 25B, 26 and 27, the connector 2102 can include in various a hard-shell housing similar to the one described above. In lieu of the flexible ring 2120 in one embodiment, a flexible silicone boot 2500 can be used. FIG. 26 depicts embodiments of a partial see-through view of the boot 2500 and its electrical connection as attached to a printed circuit board of a power-supplying device. In these examples, the boot 2500 serves as an electrically isolating protective sleeve to body 2110. The boot 2500 can also be molded with a cartridge-receiving end 2502 that can serve the same function of the flexible ring 2120 in the embodiments shown in FIG. 21. Turning back to FIGS. 25A and 25B, in assembly, the housing body 2112 completely slide into the boot 2500 until prong 2134 and 2144 can slide through the slits 2530 and 2540 can be cut in the boot, respectively. Moreover, in these embodiments, the boot 2500 can include aperture 210 at the end opposite the cartridge-receiving end and end can be in air-fluid contact with a pressure sensor 2600 (FIG. 26). The pressure sensor 2600 can activate the power supply when it senses a user drawing on the cartridge 134 (or other cartridges) that can be push-

connected ultimately to the battery. Accordingly, FIG. 27 depicts embodiments of the connector 2102 installed in a power-supplying device 2700, which is depicted with its cover removed, and the cartridge 134 push-connected thereto. Assembling the housing 2110 into the silicone boot 2500 can require a tool. Thus, FIG. 28 depicts embodiments of the receiving end of the boot 2500 that can be stretched in a uniformly outward direction to accept the end of the cartridge as shown by arrows 2800. Then, the housing 2110 may be inserted in the boot 2500, as shown by arrow 2802.

[0151] Detailed embodiments of the present disclosure are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the disclosure, which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present disclosure in virtually any appropriately detailed structure.

[0152] The terms “a” or “an,” as used herein, are defined as one or more than one. The term “another,” as used herein, is defined as at least a second or more. The terms “including” and/or “having,” as used herein, are defined as comprising (i.e., open transition).

[0153] While only a few embodiments of the present disclosure have been shown and described, it will be obvious to those skilled in the art that many changes and modifications may be made thereunto without departing from the spirit and scope of the present disclosure as described in the following claims. All patent applications and patents, both foreign and domestic, and all other publications referenced herein are incorporated herein in their entireties to the full extent permitted by law.

[0154] The methods and systems described herein may be deployed in part or in whole through a machine that executes computer software, program codes, and/or instructions on a processor. The present disclosure may be implemented as a method on the machine, as a system or apparatus as part of or in relation to the machine, or as a computer program product embodied in a computer readable medium executing on one or more of the machines. In embodiments, the processor may be part of a server, cloud server, client, network infrastructure, mobile computing platform, stationary computing platform, or other computing platforms. A processor may be any kind of computational or processing device capable of executing program instructions, codes, binary instructions and the like. The processor may be or may include a signal processor, digital processor, embedded processor, microprocessor or any variant such as a co-processor (math co-processor, graphic co-processor, communication co-processor and the like) and the like that may directly or indirectly facilitate execution of program code or program instructions stored thereon. In addition, the processor may enable the execution of multiple programs, threads, and codes.

The threads may be executed simultaneously to enhance the performance of the processor and to facilitate simultaneous operations of the application. By way of implementation, methods, program codes, program instructions and the like described herein may be implemented in one or more thread. The thread may spawn other threads that may have assigned priorities associated with them; the processor may execute these threads based on priority or any other order based on instructions provided in the program code. The processor, or any machine utilizing one, may include non-transitory memory that stores methods, codes, instructions and programs as described herein and elsewhere. The processor may access a non-transitory storage medium through an interface that may store methods, codes, and instructions as described herein and elsewhere. The storage medium associated with the processor for storing methods, programs, codes, program instructions or other type of instructions capable of being executed by the computing or processing device may include but may not be limited to one or more of a CD-ROM, DVD, memory, hard disk, flash drive, RAM, ROM, cache and the like.

[0155] A processor may include one or more cores that may enhance speed and performance of a multiprocessor. In embodiments, the process may be a dual core processor, quad core processors, other chip-level multiprocessor and the like that combine two or more independent cores (called a die).

[0156] The methods and systems described herein may be deployed in part or in whole through a machine that executes computer software on a server, client, firewall, gateway, hub, router, or other such computer and/or networking hardware. The software program may be associated with a server that may include a file server, print server, domain server, Internet server, intranet server, cloud server, and other variants such as secondary server, host server, distributed server and the like. The server may include one or more of memories, processors, computer readable media, storage media, ports (physical and virtual), communication devices, and interfaces capable of accessing other servers, clients, machines, and devices through a wired or a wireless medium, and the like. The methods, programs, or codes as described herein and elsewhere may be executed by the server. In addition, other devices required for execution of methods as described in this application may be considered as a part of the infrastructure associated with the server.

[0157] The server may provide an interface to other devices including, without limitation, clients, other servers, printers, database servers, print servers, file servers, communication servers, distributed servers, social networks, and the like. Additionally, this coupling and/or connection may facilitate remote execution of program across the network. The networking of some or all of these devices may facilitate parallel processing of a program or method at one or more location without deviating from the scope of the disclosure. In addition, any of the devices attached to the server through an interface may include at least one storage medium capable of

storing methods, programs, code and/or instructions. A central repository may provide program instructions to be executed on different devices. In this implementation, the remote repository may act as a storage medium for program code, instructions, and programs.

[0158] The software program may be associated with a client that may include a file client, print client, domain client, Internet client, intranet client and other variants such as secondary client, host client, distributed client and the like. The client may include one or more of memories, processors, computer readable media, storage media, ports (physical and virtual), communication devices, and interfaces capable of accessing other clients, servers, machines, and devices through a wired or a wireless medium, and the like. The methods, programs, or codes as described herein and elsewhere may be executed by the client. In addition, other devices required for execution of methods as described in this application may be considered as a part of the infrastructure associated with the client.

[0159] The client may provide an interface to other devices including, without limitation, servers, other clients, printers, database servers, print servers, file servers, communication servers, distributed servers and the like. Additionally, this coupling and/or connection may facilitate remote execution of program across the network. The networking of some or all of these devices may facilitate parallel processing of a program or method at one or more location without deviating from the scope of the disclosure. In addition, any of the devices attached to the client through an interface may include at least one storage medium capable of storing methods, programs, applications, code and/or instructions. A central repository may provide program instructions to be executed on different devices. In this implementation, the remote repository may act as a storage medium for program code, instructions, and programs.

[0160] The methods and systems described herein may be deployed in part or in whole through network infrastructures. The network infrastructure may include elements such as computing devices, servers, routers, hubs, firewalls, clients, personal computers, communication devices, routing devices and other active and passive devices, modules and/or components as known in the art. The computing and/or non-computing device(s) associated with the network infrastructure may include, apart from other components, a storage medium such as flash memory, buffer, stack, RAM, ROM and the like. The processes, methods, program codes, instructions described herein and elsewhere may be executed by one or more of the network infrastructural elements. The methods and systems described herein may be adapted for use with any kind of private, community, or hybrid cloud computing network or cloud computing environment, including those which involve features of software as a service (SaaS), platform as a service (PaaS), and/or infrastructure as a service (IaaS).

[0161] The methods, program codes, and instructions described herein and elsewhere may be

implemented on a cellular network having multiple cells. The cellular network may either be frequency division multiple access (FDMA) network or code division multiple access (CDMA) network. The cellular network may include mobile devices, cell sites, base stations, repeaters, antennas, towers, and the like. The cell network may be a GSM, GPRS, 3G, EVDO, mesh, or other networks types.

[0162] The methods, program codes, and instructions described herein and elsewhere may be implemented on or through mobile devices. The mobile devices may include navigation devices, cell phones, mobile phones, mobile personal digital assistants, laptops, palmtops, netbooks, pagers, electronic books readers, music players and the like. These devices may include, apart from other components, a storage medium such as a flash memory, buffer, RAM, ROM and one or more computing devices. The computing devices associated with mobile devices may be enabled to execute program codes, methods, and instructions stored thereon. Alternatively, the mobile devices may be configured to execute instructions in collaboration with other devices. The mobile devices may communicate with base stations interfaced with servers and configured to execute program codes. The mobile devices may communicate on a peer-to-peer network, mesh network, or other communications network. The program code may be stored on the storage medium associated with the server and executed by a computing device embedded within the server. The base station may include a computing device and a storage medium. The storage device may store program codes and instructions executed by the computing devices associated with the base station.

[0163] The computer software, program codes, and/or instructions may be stored and/or accessed on machine readable media that may include: computer components, devices, and recording media that retain digital data used for computing for some interval of time; semiconductor storage known as random access memory (RAM); mass storage typically for more permanent storage, such as optical discs, forms of magnetic storage like hard disks, tapes, drums, cards and other types; processor registers, cache memory, volatile memory, non-volatile memory; optical storage such as CD, DVD; removable media such as flash memory (e.g., USB sticks or keys), floppy disks, magnetic tape, paper tape, punch cards, standalone RAM disks, Zip drives, removable mass storage, off-line, and the like; other computer memory such as dynamic memory, static memory, read/write storage, mutable storage, read only, random access, sequential access, location addressable, file addressable, content addressable, network attached storage, storage area network, bar codes, magnetic ink, and the like.

[0164] The methods and systems described herein may transform physical and/or intangible items from one state to another. The methods and systems described herein may also transform data representing physical and/or intangible items from one state to another.

[0165] The elements described and depicted herein, including in flowcharts and block diagrams throughout the figures, imply logical boundaries between the elements. However, according to software or hardware engineering practices, the depicted elements and the functions thereof may be implemented on machines through computer executable media having a processor capable of executing program instructions stored thereon as a monolithic software structure, as standalone software modules, or as modules that employ external routines, code, services, and so forth, or any combination of these, and all such implementations may be within the scope of the present disclosure. Examples of such machines may include, but may not be limited to, personal digital assistants, laptops, personal computers, mobile phones, other handheld computing devices, medical equipment, wired or wireless communication devices, transducers, chips, calculators, satellites, tablet PCs, electronic books, gadgets, electronic devices, devices having artificial intelligence, computing devices, networking equipment, servers, routers and the like. Furthermore, the elements depicted in the flowchart and block diagrams or any other logical component may be implemented on a machine capable of executing program instructions. Thus, while the foregoing drawings and descriptions set forth functional aspects of the disclosed systems, no particular arrangement of software for implementing these functional aspects should be inferred from these descriptions unless explicitly stated or otherwise clear from the context. Similarly, it will be appreciated that the various steps identified and described above may be varied and that the order of steps may be adapted to particular applications of the techniques disclosed herein. All such variations and modifications are intended to fall within the scope of this disclosure. As such, the depiction and/or description of an order for various steps should not be understood to require a particular order of execution for those steps, unless required by a particular application, or explicitly stated or otherwise clear from the context.

[0166] The methods and/or processes described above, and steps associated therewith, may be realized in hardware, software or any combination of hardware and software suitable for a particular application. The hardware may include a general-purpose computer and/or dedicated computing device or specific computing device or particular aspect or component of a specific computing device. The processes may be realized in one or more microprocessors, microcontrollers, embedded microcontrollers, programmable digital signal processors or other programmable devices, along with internal and/or external memory. The processes may also, or instead, be embodied in an application specific integrated circuit, a programmable gate array, programmable array logic, or any other device or combination of devices that may be configured to process electronic signals. It will further be appreciated that one or more of the processes may be realized as a computer executable code capable of being executed on a machine-readable medium. The computer executable code may be created using a structured programming

language such as C, an object oriented programming language such as C++, or any other high-level or low-level programming language (including assembly languages, hardware description languages, and database programming languages and technologies) that may be stored, compiled or interpreted to run on one of the above devices, as well as heterogeneous combinations of processors, processor architectures, or combinations of different hardware and software, or any other machine capable of executing program instructions.

[0167] Thus, in one aspect, methods described above and combinations thereof may be embodied in computer executable code that, when executing on one or more computing devices, performs the steps thereof. In another aspect, the methods may be embodied in systems that perform the steps thereof, and may be distributed across devices in a number of ways, or all of the functionality may be integrated into a dedicated, standalone device or other hardware. In another aspect, the means for performing the steps associated with the processes described above may include any of the hardware and/or software described above. All such permutations and combinations are intended to fall within the scope of the present disclosure.

[0168] While the disclosure has been disclosed in connection with the preferred embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. Accordingly, the spirit and scope of the present disclosure is not to be limited by the foregoing examples but is to be understood in the broadest sense allowable by law.

[0169] The use of the terms “a” and “an” and “the” and similar referents in the context of describing the disclosure (especially in the context of the following claims) is to be construed to cover both the singular and the plural unless otherwise indicated herein or clearly contradicted by context. The terms “comprising,” “having,” “including,” and “containing” are to be construed as open-ended terms (i.e., meaning “including, but not limited to,”) unless otherwise noted. Recitations of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein may be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., “such as”) provided herein, is intended merely to better illuminate the disclosure and does not pose a limitation on the scope of the disclosure unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the disclosure.

[0170] While the foregoing written description enables one skilled in the art to make and use what is considered presently to be the best mode thereof, those skilled in the art will understand

and appreciate the existence of variations, combinations, and equivalents of the specific embodiment, method, and examples herein. The disclosure should therefore not be limited by the above-described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the disclosure.

[0171] Any element in a claim that does not explicitly state “means for” performing a specified function, or “step for” performing a specified function, is not to be interpreted as a “means” or “step” clause as specified in 35 U.S.C. § 112(f). In particular, any use of “step of” in the claims is not intended to invoke the provision of 35 U.S.C. § 112(f).

[0172] Persons skilled in the art may appreciate that numerous design configurations may be possible to enjoy the functional benefits of the inventive systems. Thus, given the wide variety of configurations and arrangements of embodiments of the present invention the scope of the invention is reflected by the breadth of the claims below rather than narrowed by the embodiments described above.

What is claimed is:

1. A method for vaporizing a product of a plurality of different products comprising:
 - receiving, by a processor of a vaporizing device, a desired dosage amount that is indicative of an amount of a compound to release during one or more inhalation events, wherein the compound is released from the product into vapor when the product is vaporized;
 - determining, by the processor, an occurrence of a current inhalation event;
 - during the current inhalation event:
 - determining, by the processor, an inhalation pressure being applied to a container that contains the product;
 - determining, by the processor, a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the inhalation pressure; and
 - selectively adjusting, by the processor, a vaporizing temperature being applied to the product by the vaporizer based on the desired dosage and the predicted dosage.
2. The method of claim 1, further comprising: receiving a dosage model corresponding to the product, wherein the dosage model receives respective sets of inhalation pressure values and, for each input set of inhalation pressure values, outputs predicted dosages of the compound based on the respective set of inhalation pressure values.
3. The method of claim 2, wherein determining the predicted dosage is further based on the dosage model corresponding to the product.
4. The method of claim 2, wherein the dosage model further receives sets of vaporization parameters as input and outputs, for each input set of vaporization parameters a respective predicted dosage of the compound in the vapor during a respective inhalation event based on the input set of vaporization parameters.
5. The method of claim 4, wherein the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event.
6. The method of claim 4, wherein the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event.
7. The method of claim 4, wherein the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event.
8. The method of claim 4, wherein the vaporization parameters include an amount of

- product remaining in the cartridge.
9. The method of claim 4, wherein the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device.
 10. The method of claim 2, wherein the dosage model is provided by an application via a user device that is in communication with the vaporizer device.
 11. The method of claim 10, wherein the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products.
 12. The method of claim 11, wherein each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.
 13. The method of claim 11, wherein each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.
 14. The method of claim 1, wherein selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container.
 15. The method of claim 14, wherein heating the container includes heating a wick of the container.
 16. The method of claim 14, wherein selectively adjusting the vaporizing temperature includes stopping a vaporizing voltage from being applied to a coil of the container in response to determining that the predicted dosage is greater than or equal to the desired dosage.
 17. The method of claim 14, wherein selectively adjusting the vaporizing temperature includes increasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is unlikely to be reached during the current inhalation event given the predicted dosage.
 18. The method of claim 14, wherein selectively adjusting the vaporizing temperature includes decreasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is likely to be reached before the current inhalation event is complete given the predicted dosage.
 19. The method of claim 1, wherein the inhalation pressure includes a series of inhalation pressure values measured during the current inhalation event.
 20. The method of claim 1, wherein the product is an eliquid and the container is a removable pod that contains the eliquid.

21. The method of claim 1, wherein the product is an eliquid and the container is a removable 510 thread cartridge that contains the eliquid.
22. The method of claim 1, wherein the product is a dried plant material and the container is a receptacle that contains the dried plant material.
23. A vaporizer device comprising:
 - a communication unit that effectuates communication with a user device via a network;
 - one or more sensor devices, wherein each respective sensor device monitors a condition relating to the vaporizer device and/or an environment thereof;
 - a battery;
 - a voltage controller that applies a variable voltage to a heating element of a container that contains a product to be vaporized;
 - a microprocessor that executes processor-executable instructions that cause the microprocessor to:
 - receive a target dosage that is indicative of an amount of a compound to release during an inhalation event, wherein the compound is released from the product into vapor when the product is vaporized;
 - receive a dosage model corresponding to the product, wherein the dosage model receives sets of vaporization parameters as input that include respective predicted dosages indicating an amount of the compound in the vapor during a respective inhalation event based on the input sets of vaporization parameters;
 - detect commencement of a current inhalation event; and
 - during the current inhalation event:
 - determine one or more vaporization parameters based on sensor data received from the one or more sensors, wherein each vaporization parameter defines a condition relating to the current inhalation event;
 - determine a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the vaporization parameters and the dosing model; and
 - selectively adjust a vaporizing temperature being applied to the product by the vaporizer based on the target dosage and the predicted dosage.
24. The vaporizer device of claim 23, wherein the vaporization parameters include an inhalation pressure that is applied by the user during the current inhalation event.
25. The vaporizer device of claim 24, wherein the inhalation pressure includes a series of

- inhalation pressure values measured during the current inhalation event
26. The vaporizer device of claim 23, wherein the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event.
 27. The vaporizer device of claim 23, wherein the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event.
 28. The vaporizer device of claim 23, wherein the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event.
 29. The vaporizer device of claim 23, wherein the vaporization parameters include an amount of product remaining in the cartridge.
 30. The vaporizer device of claim 23, wherein the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device.
 31. The vaporizer device of claim 23, wherein the dosage model is provided by an application via the user device that is in communication with the vaporizer device.
 32. The vaporizer device of claim 31, wherein the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products.
 33. The vaporizer device of claim 32, wherein each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.
 34. The vaporizer device of claim 32, wherein each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.
 35. The vaporizer device of claim 23, wherein selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container.
 36. The vaporizer device of claim 35, wherein heating the container includes heating a wick of the container.
 37. The vaporizer device of claim 23, wherein selectively adjusting the vaporizing temperature includes stopping a vaporizing voltage from being applied to a coil of the container in response to determining that the predicted dosage is greater than or equal to the desired dosage.
 38. The vaporizer device of claim 23, wherein selectively adjusting the vaporizing temperature includes increasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is unlikely to be reached

- during the current inhalation event given the predicted dosage.
39. The vaporizer device of claim 23, wherein selectively adjusting the vaporizing temperature includes decreasing a vaporizing voltage that is being applied to a coil of the container in response to determining that the desired dosage is likely to be reached before the current inhalation event is complete given the predicted dosage.
 40. The vaporizer device of claim 23, wherein at least one of the vaporization parameters includes a series of sensor values measured during the current inhalation event.
 41. The vaporizer device of claim 23, wherein the product is an eliquid and the container is a removable pod that contains the eliquid.
 42. The vaporizer device of claim 23, wherein the product is an eliquid and the container is a removable 510 thread cartridge that contains the eliquid.
 43. The vaporizer device of claim 23, wherein the product is a dried plant material and the container is a receptacle that contains the dried plant material.
 44. The vaporizer device of claim 23, wherein the network is a personal area network.
 45. The vaporizer device of claim 23, wherein the network is a Bluetooth low energy network.
 46. A method for generating a dosing model corresponding to a respective product using a puff simulation system that performs simulated inhalation event on a vaporizer device that vaporizes one or more instances of the respective product, the method comprising:
 - for each instance of the product:
 - obtaining one or more inhalation profiles, wherein each inhalation profile defines inhalation pressures over a duration of a respective simulated event
 - performing a plurality of simulated inhalation events on the instance of the product using one or more inhalation profiles;
 - for each simulated inhalation event:
 - recording an inhalation profile of the one or more inhalation profiles used to perform the simulated inhalation event;
 - determining a set of one or more vaporization parameters relating to the simulated inhalation event;
 - determining an amount of an active compound in vapor resulting from the simulated inhalation event; and
 - training the dosing model based on the inhalation profile, the set of one or more vaporization parameters, and the amount of active compound in the vapor; and
 - storing the dosing model in a dosing model data store that stores a plurality of

- different dosing models, wherein each dosing model of the plurality of dosing model corresponds to a respective product of a plurality of different products.
47. The method of claim 46, wherein the vaporization parameters include a coil resistance of a coil that heats the container during the respective simulated inhalation event.
 48. The method of claim 46, wherein the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective simulated inhalation event.
 49. The method of claim 46, wherein the vaporization parameters include a voltage being applied to a heating element of the container during the respective simulated inhalation event.
 50. The method of claim 46, wherein the vaporization parameters include an amount of product remaining in the cartridge.
 51. The method of claim 46, wherein the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device.
 52. The method of claim 46, wherein the vaporization parameters include an inhalation pressure measured by the vaporizer device during the simulated inhalation event.
 53. The method of claim 46, wherein the one or more inhalation profiles are determined by:
 - for each of a plurality of test subjects:
 - measuring an inhalation pressure exerted by the test subject on a mouthpiece of a respective test vaporizer devices during one or more test inhalation events;
 - for each test inhalation event, generating a test inhalation pressure curve corresponding to the test inhalation event; and
 - determining the one or more inhalation profiles based on the test inhalation pressure curves.
 54. The method of claim 46, wherein the one or more inhalation profiles are determined by:
 - for each of a plurality of vaporizer devices:
 - receiving a measured inhalation pressure exerted by a user of the vaporizer device to a mouthpiece of the vaporizer device during a historical inhalation event;
 - for each test inhalation event, generating an inhalation pressure curve corresponding to the historical inhalation event; and
 - determining the one or more inhalation profiles based on the inhalation pressure curves.
 55. The method of claim 46 further comprising:

- generating a product record corresponding to the product;
relating the dosing model to the product record;
storing the product record in a product database that stores a plurality of product records, wherein each product record corresponds to a different product.
56. The method of claim 55, further comprising:
- receiving a request from a companion application that is associated with a remote vaporizer device, the request indicating a product identifier of a product to be vaporized;
 - retrieving the product record of the product to be vaporized from the product database based on the product identifier;
 - identifying a requested dosing model based on the product record;
 - retrieving the requested dosing model from the dosing model data store; and
 - providing the requested dosing model to the companion application, wherein the companion application provides the dosing application to the remote vaporizer device.
57. The method of claim 56, wherein each dosing model is configured to receive a set of vaporization parameters corresponding to a current inhalation event and to output a predicted dosage based on the vaporization parameters corresponding to the current inhalation event.
58. A vaporizer device comprising:
- a communication unit that effectuates communication with a user device via a network;
 - one or more sensor devices, wherein each respective sensor device monitors a condition relating to the vaporizer device and/or an environment thereof;
 - a battery;
 - a voltage controller that applies a variable voltage to a heating element of a container that contains a product to be vaporized;
 - a microprocessor that executes processor-executable instructions that cause the microprocessor to:
 - receive a dosage model corresponding to the product, wherein the dosage model receives sets of vaporization parameters as input and outputs, for each input set of vaporization parameters, a respective predicted dosage indicating an amount of the compound in the vapor during a respective inhalation event based on the input set of vaporization parameters;

receive a product profile corresponding to the product, the product profile indicating one or more properties of a container that contains the product, the product, and/or the user;

detect commencement of a current inhalation event; and

during the current inhalation event:

determine one or more vaporization parameters based on sensor data received from the one or more sensors, wherein each vaporization parameter defines a condition relating to the current inhalation event;

determine a predicted dosage that is indicative of a predicted amount of the compound that has been released in the vapor during the current inhalation event based on the vaporization parameters and the dosing model; and

selectively adjust one or more vaporizer settings based on the predicted dosage and the product profile.

59. The vaporizer device of claim 58, wherein the microprocessor performs a feedback loop when selectively adjusting the dosage delivered based on the predicted dosage and the product profile.
60. The vaporizer device of claim 58, wherein selectively adjusting the one or more vaporizer settings includes adjusting an amount of power being delivered to the heating element to affect a viscosity of the product.
61. The vaporizer device of claim 60, wherein the product profile defines viscosity data relating to the product.
62. The vaporizer device of claim 58, wherein the instructions further cause the microprocessor to:
receive a dosing plan that indicates a total dosage amount over a period of time;
wherein the microprocessor selectively adjusts the one or more vaporizer settings further based on the dosing plan.
63. The vaporizer device of claim 62, wherein the dosing plan is a nicotine cessation plan and the product profile indicates an amount of nicotine in the product.
64. The vaporizer device of claim 62, wherein the dosing plan is a cessation of vaporizable compounds plan wherein the product profile indicates an amount of vaporizable compounds in the product.
65. The vaporizer device of claim 58, wherein the vaporization parameters include an inhalation pressure that is applied by the user during the current inhalation event.
66. The vaporizer device of claim 58, wherein the inhalation pressure includes a series of inhalation pressure values measured during the current inhalation event

67. The vaporizer device of claim 58, wherein the vaporization parameters include a coil resistance of a coil that heats the container during the respective inhalation event.
68. The vaporizer device of claim 58, wherein the vaporization parameters include an amount of power being delivered to a heating element of the container during the respective inhalation event.
69. The vaporizer device of claim 58, wherein the vaporization parameters include a voltage being applied to a heating element of the container during the respective inhalation event.
70. The vaporizer device of claim 58, wherein the vaporization parameters include an amount of product remaining in the cartridge.
71. The vaporizer device of claim 58, wherein the vaporization parameters include an amount of remaining charge in a battery of the vaporizer device.
72. The vaporizer device of claim 58, wherein the dosage model is provided by an application via the user device that is in communication with the vaporizer device.
73. The vaporizer device of claim 58, wherein the dosage model is selected from a plurality of dosage models, wherein each of the plurality of dosage models corresponds to a respective product of the plurality of products.
74. The vaporizer device of claim 58, wherein each dosage model of the plurality of dosage models is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.
75. The vaporizer device of claim 58, wherein each dosage model of the plurality of dosage models is configured by a backend system based on one or more product properties of the respective product.
76. The vaporizer device of claim 58, wherein selectively adjusting the vaporizing temperature includes adjusting a voltage being applied to a coil that heats the container.
77. The vaporizer device of claim 58, wherein the network is a Bluetooth low energy network.
78. A method for accurately dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges interchangeably attachable to a controllable power source, each of the plurality of cartridges containing a heating coil having a coil resistance, the method comprising:
 - identifying the coil resistance of the selected cartridge;
 - sensing the user's inhaling pressure on the cartridge, when the selected cartridge is attached to the power source; and

- adjusting, in real time, the dosing voltage output supplied by the source to the cartridge based (at least) on the sensed inhaling pressure and the coil resistance.
79. The method of claim 78, wherein the resistance is identified based on user identification of the cartridge model attached to the power source.
80. The method of claim 78, further comprising:
- stopping the voltage output supplied by the power source when a preset dose of vapor has been delivered to the user.
81. A platform for dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges each containing product and interchangeably attachable to a controllable power source, the platform comprising:
- storing a library of cartridge characteristic for each of the plurality of vapor cartridges; wherein the cartridge characteristics comprise cartridge identification and associated lab-tested values;
- using one or more characteristics of the selected cartridge as one or more input variables to a real-time dosing formula to control the dose supplied to the user of the cartridge when attached to the controllable power source.
82. The platform of claim 81, wherein the dosing formula is provided by an application via a user device that is in communication with a vaporizer device connected to the cartridge.
83. The platform of claim 81, wherein the dosing formula is selected from a plurality of dosage formulae, wherein each of the plurality of dosage formulas corresponds to a respective product of a plurality of products.
84. The platform device of claim 83, wherein each dosage formula of the plurality of dosing formulae is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.
85. The platform of claim 84, wherein each dosing formula of the plurality of dosage formulae is configured by the backend system based on one or more product properties of the respective product.
86. A platform for dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges having product and interchangeably attachable to a controllable power source, comprising:
- storing a library of cartridge characteristic for each of the plurality of vapor cartridges; wherein the cartridge characteristics comprise cartridge identification and

associated lab-tested values; and

using one or more electrical, mechanical or thermodynamic characteristics of the selected cartridge as one or more input variables to a dosing formula to control the dose supplied to the user of the cartridge when attached to the controllable power source.

87. The platform of claim 86, wherein the dosing formula is provided by an application via a user device that is in communication with a vaporizer device connected to the cartridge.
88. The platform of claim 86, wherein the dosing formula is selected from a plurality of dosage formulae, wherein each of the plurality of dosage formulas corresponds to a respective product of a plurality of products.
89. The platform device of claim 88, wherein each dosage formula of the plurality of dosing formulae is configured by a backend system using results from a puff simulator that simulates inhalation events to vaporize samples of the respective product that corresponds to the dosage model.
90. The platform of claim 89, wherein each dosing formula of the plurality of dosage formulae is configured by the backend system based on one or more product properties of the respective product.
91. A method for accurately dosing vapor to a user of a selected one of any of a plurality of electric vapor cartridges interchangeably attachable to a controllable power source, each of the plurality of cartridges containing a heating coil having a coil resistance, the method comprising:
 - identifying the coil resistance of the selected cartridge;
 - identifying the value of an additional variable of the selected cartridge selected from any one or more of electrical, mechanical, and thermodynamic characteristics;
 - sensing the user's inhaling pressure on the cartridge, when the selected cartridge is attached to the power source; and
 - adjusting, in real time, the dosing voltage output supplied by the source to the cartridge based at least in part on the sensed inhaling pressure, the coil resistance and the value of the additional one or more variables of the selected cartridge selected from any one or more of the electrical, mechanical, and thermodynamic characteristics.

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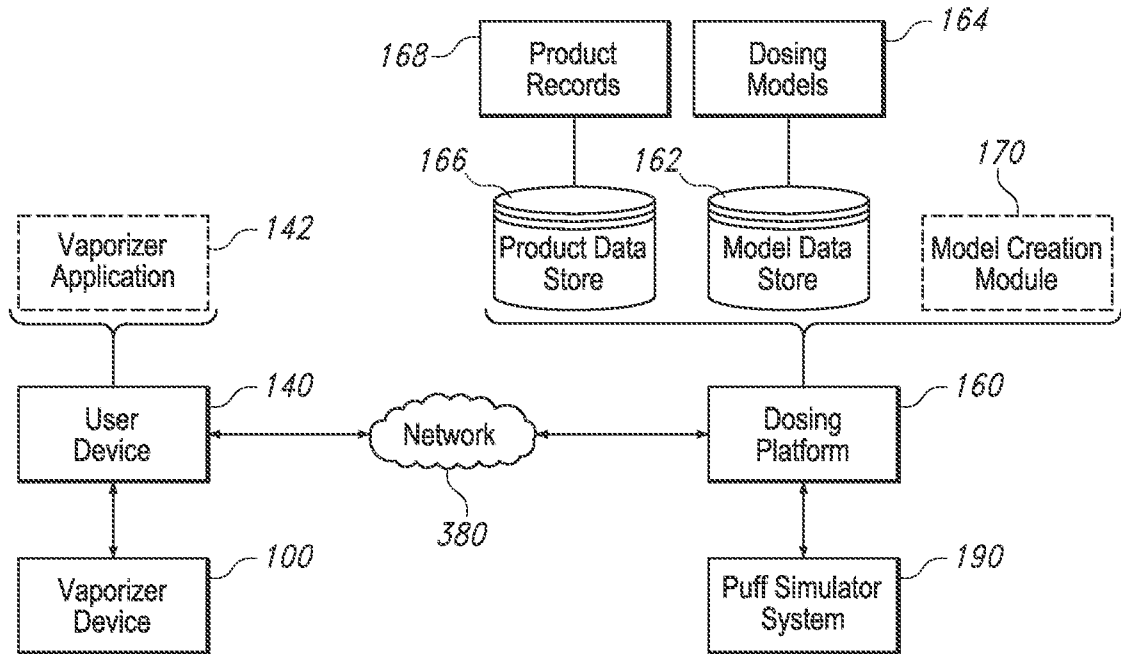


FIG. 1

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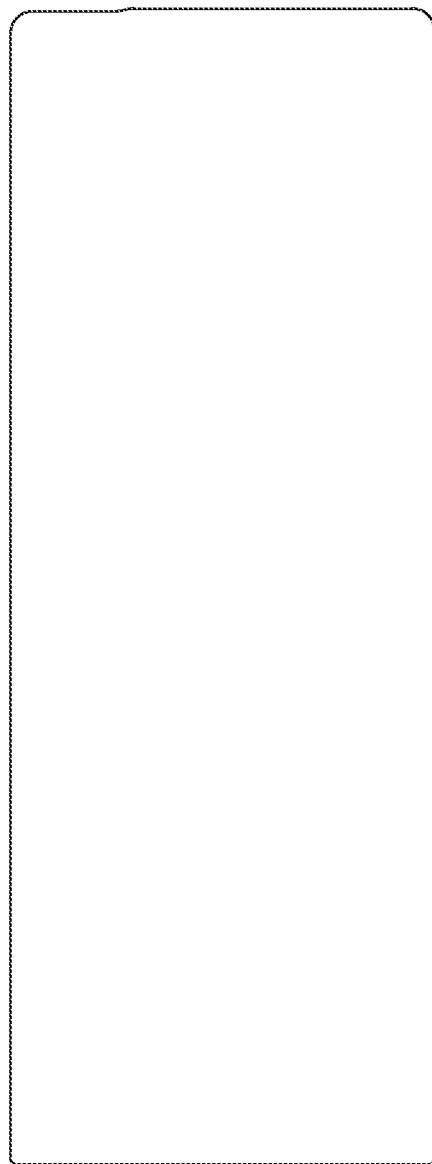


FIG. 2

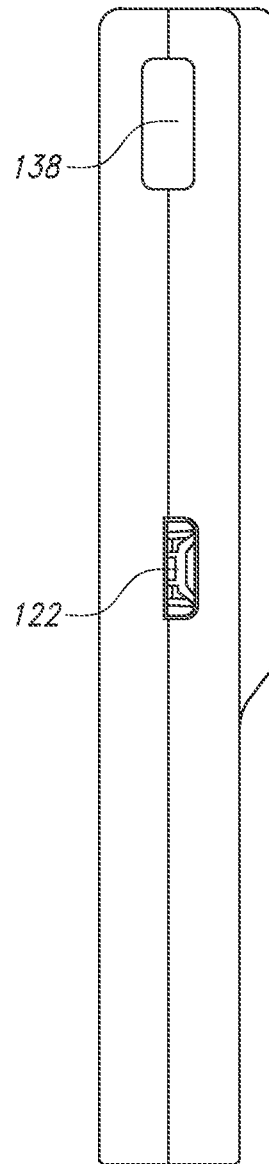


FIG. 3

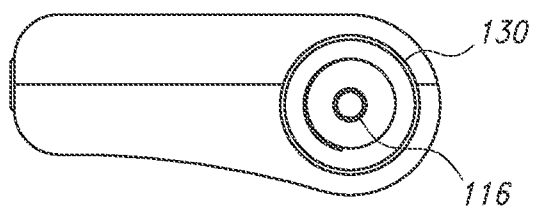


FIG. 4

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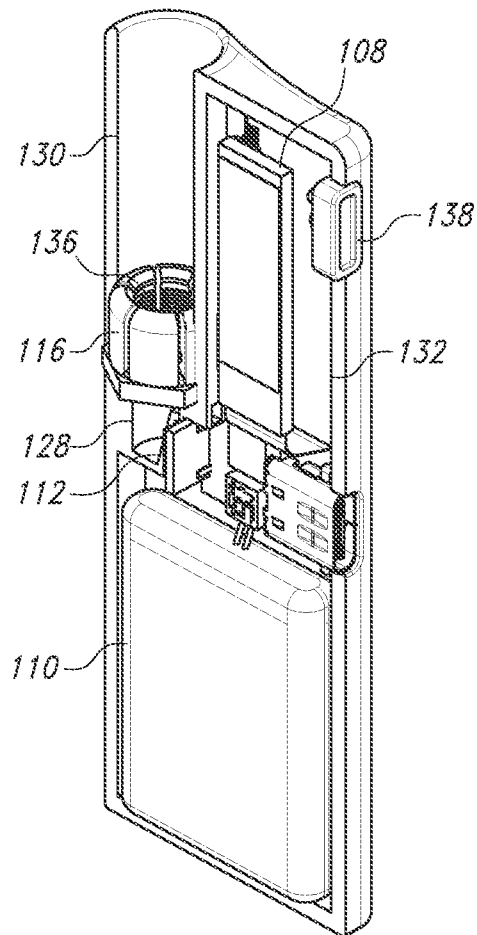
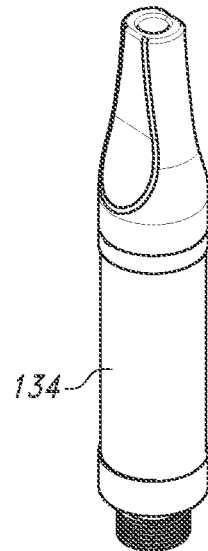


FIG. 5

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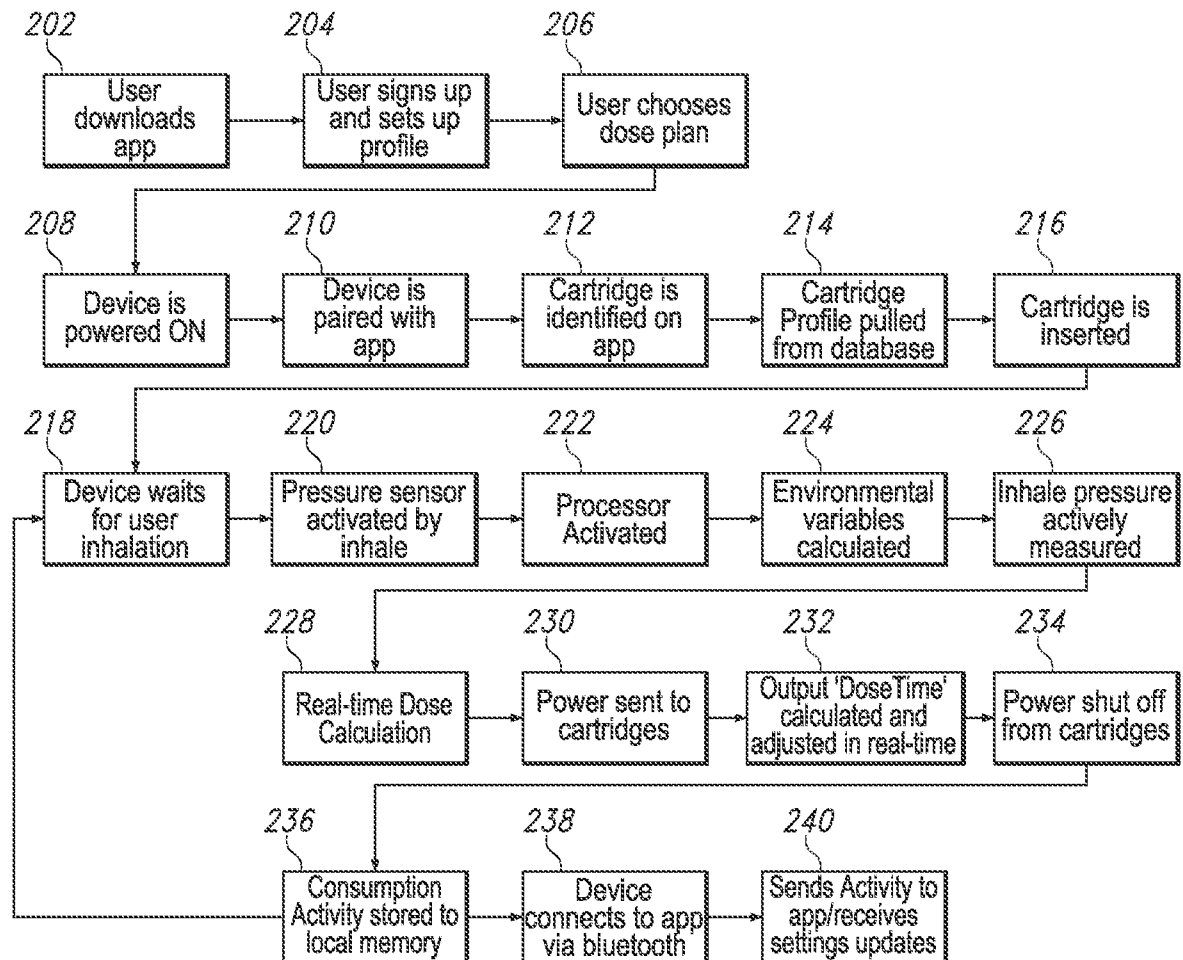


FIG. 6

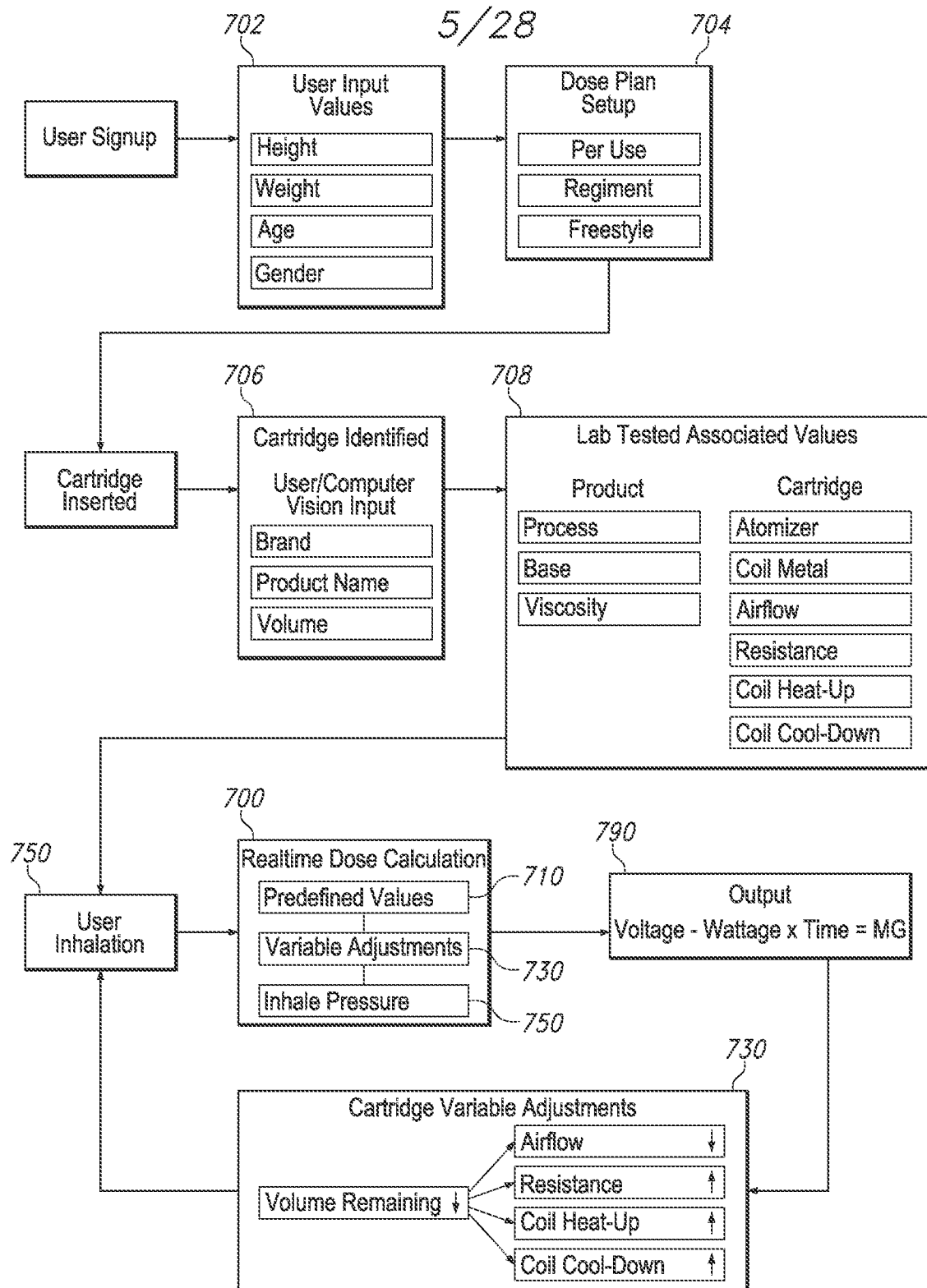


FIG. 7

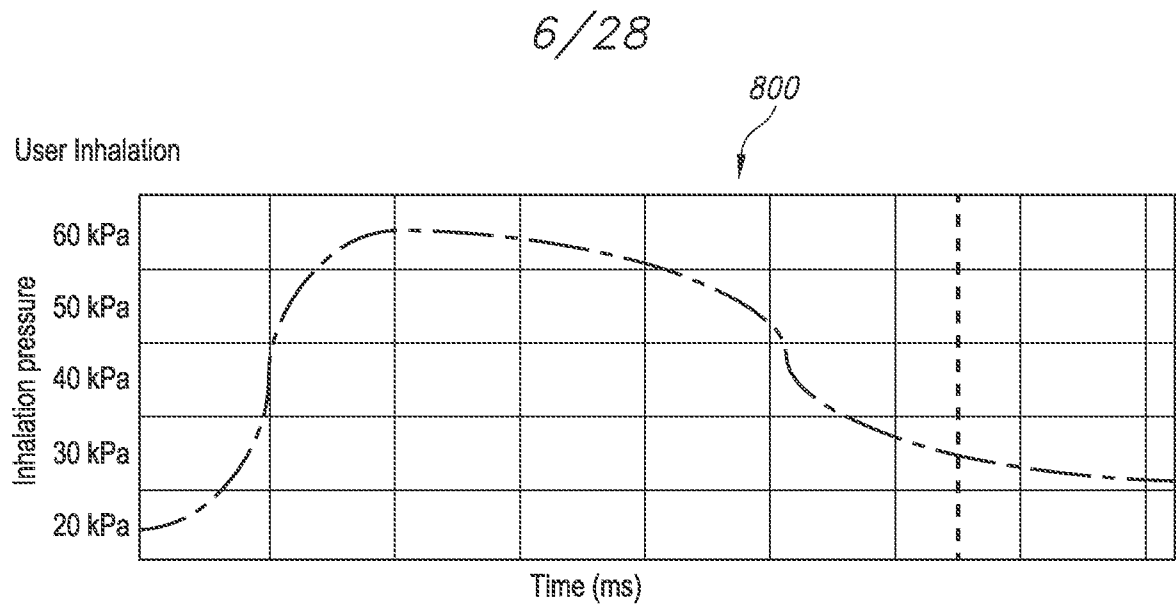


FIG. 8A

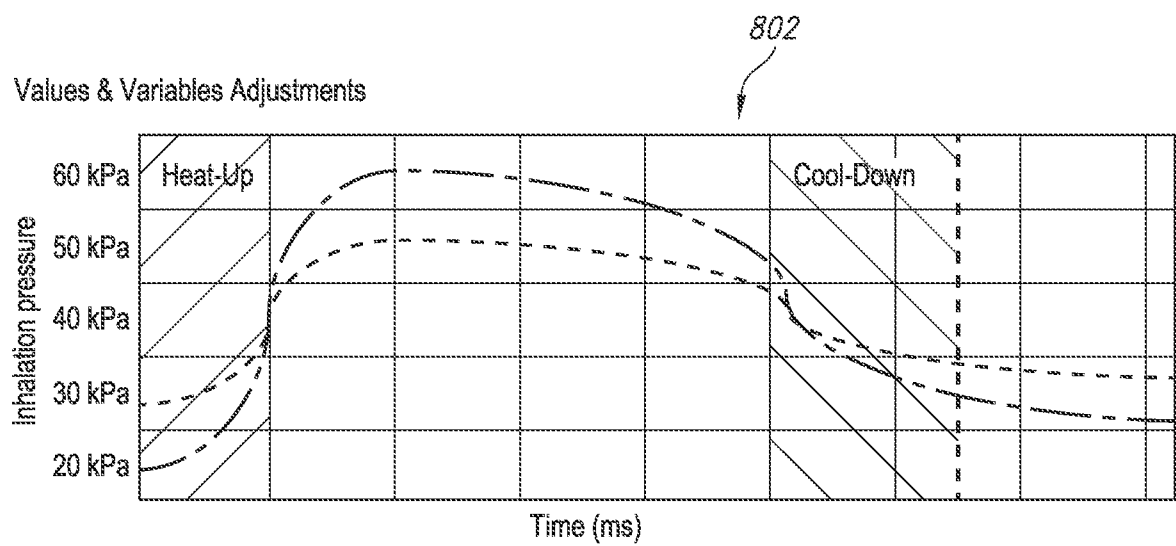


FIG. 8B

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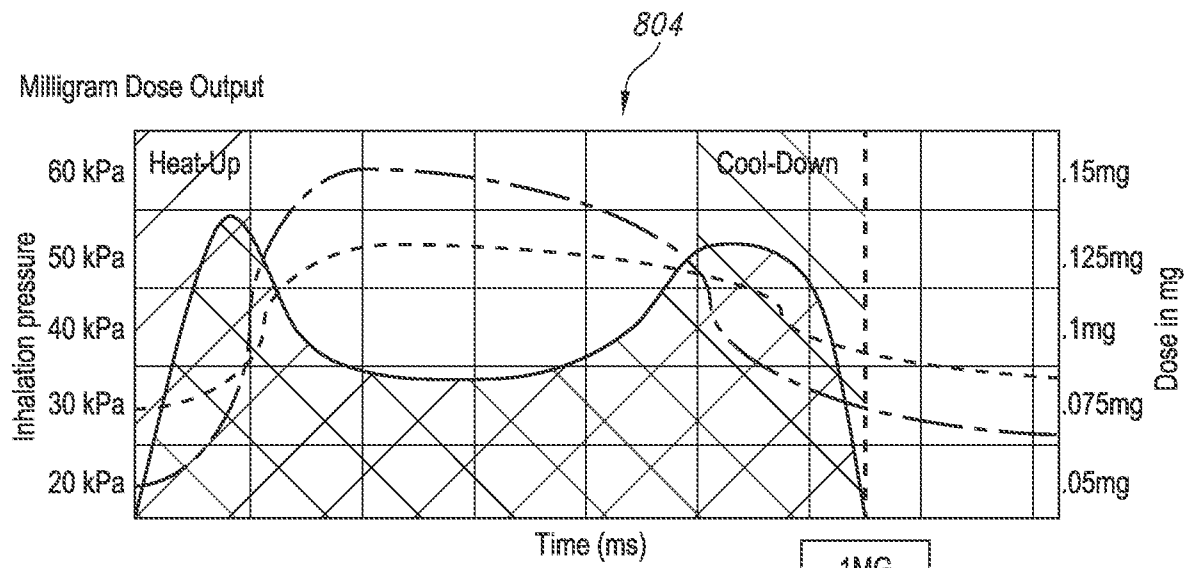


FIG. 8C

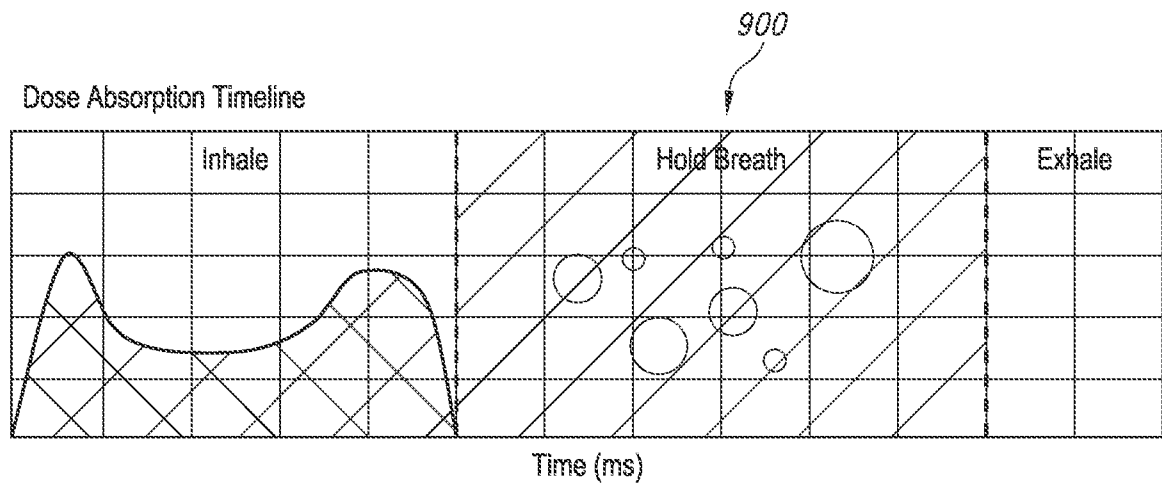


FIG. 9

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User Onboarding

Which Category Describes you best		What Benefits are You looking for		Add Your Stats		How Frequently do you currently consume Cannabis	
				MALE SEX	34 AGE	DAILY	
				6,0 HEIGHT	180 WEIGHT	NIGHTLY	
						WEEKLY	
						OCCASIONALLY	
						NEVER	

FIG. 10A

Cartridge ID, Overview & Dose Plan Setup

Cartridge ID	Overview	Dose Plans	Create Plan
 Looks like You Connected a new Cartridge Type Cartridge Name	Good Evening Today 2/3 Doses 2 MG Select CBD KUSH Sativa Rate Experience 95%	Dose Plans Choose a plan that suits your needs Regimen Per Use Chronic Pain S M T W T F S Parkinsons S M T W T F S Dose Reduction S M T W T F S	Create Plan Dose 1mg 2mg 3mg 4mg 5mg Regimen Per Day Frequency 3X 4H Time Limits Only After And Before 2PM 10PM

FIG. 10B

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Learn & Discover

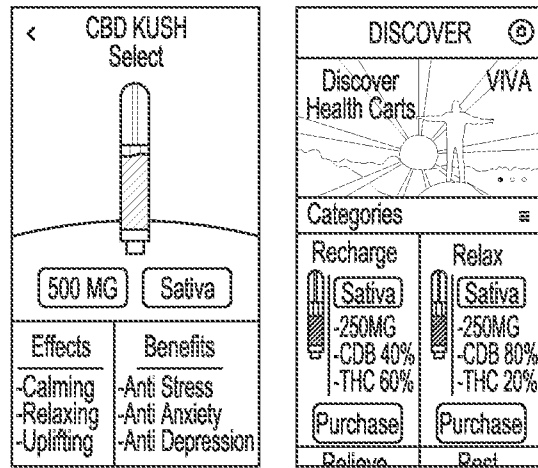


FIG. 10C

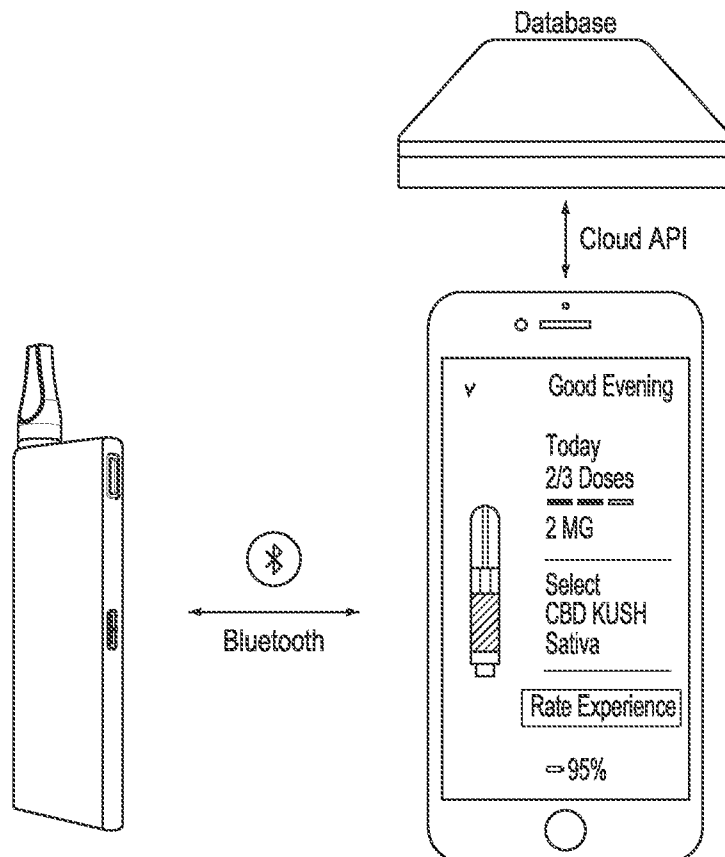


FIG. 10D

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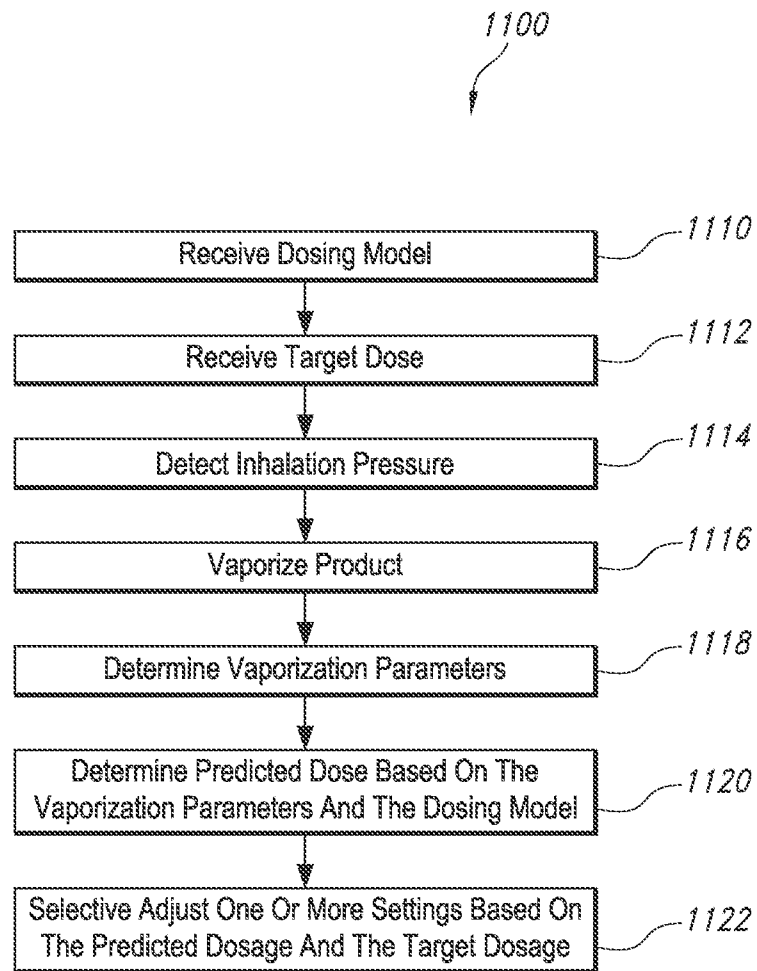


FIG. 11

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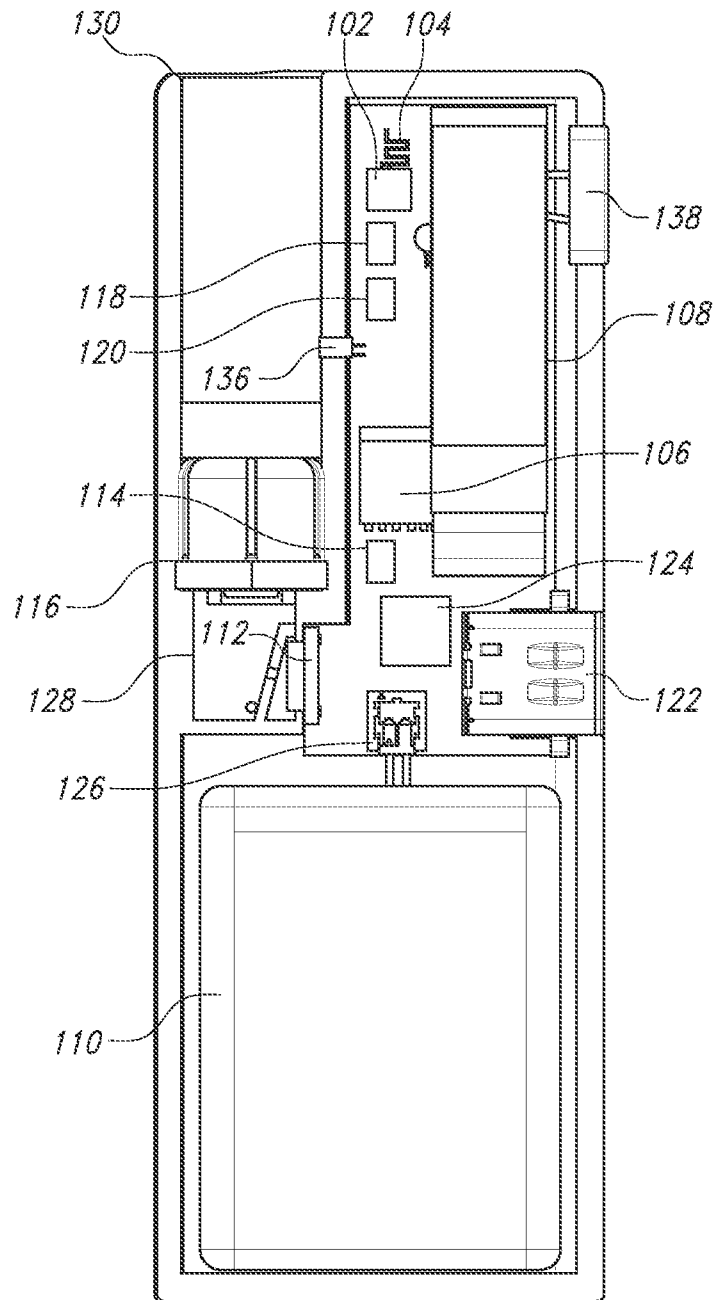


FIG. 12

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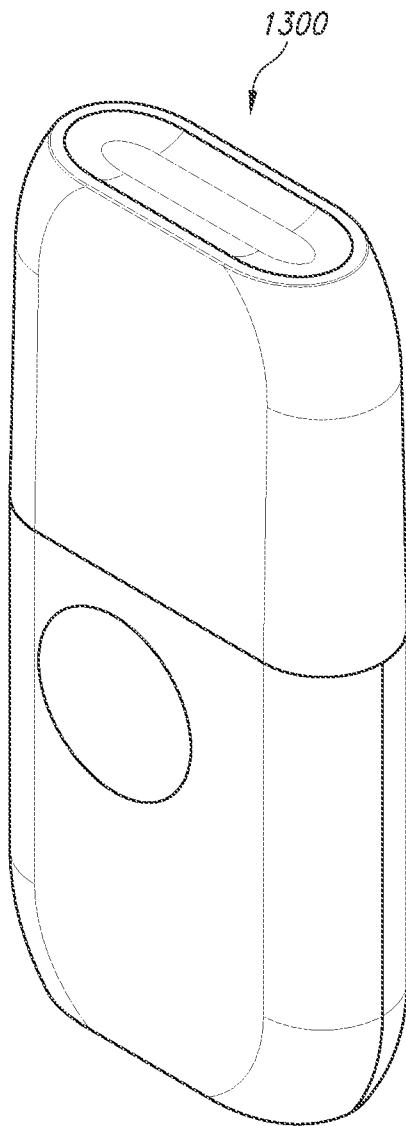


FIG. 13A

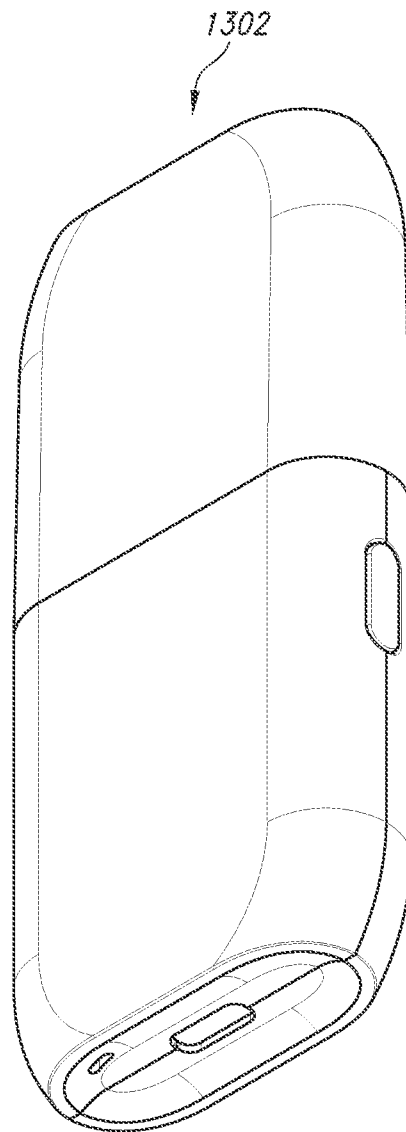
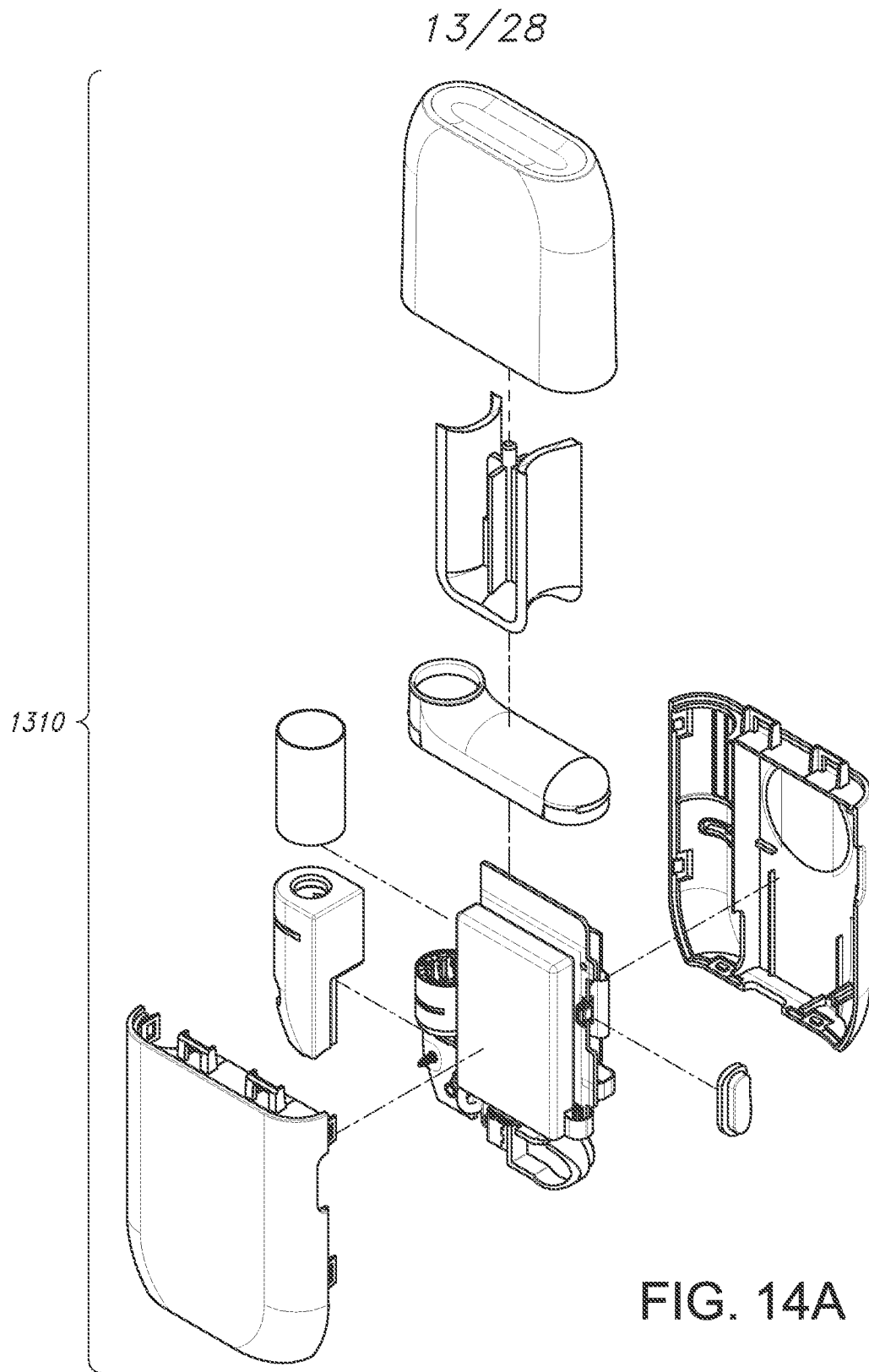
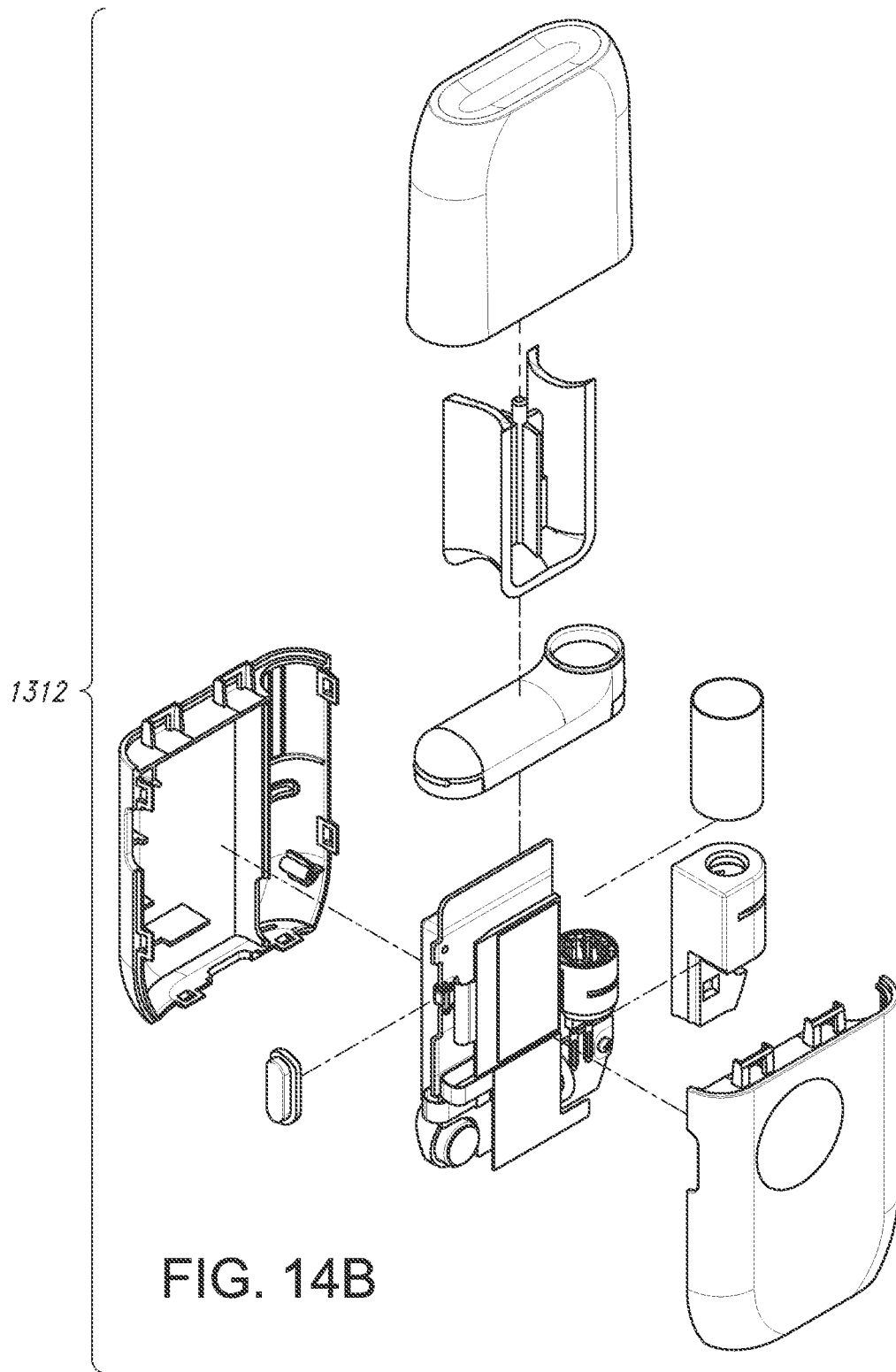


FIG. 13B



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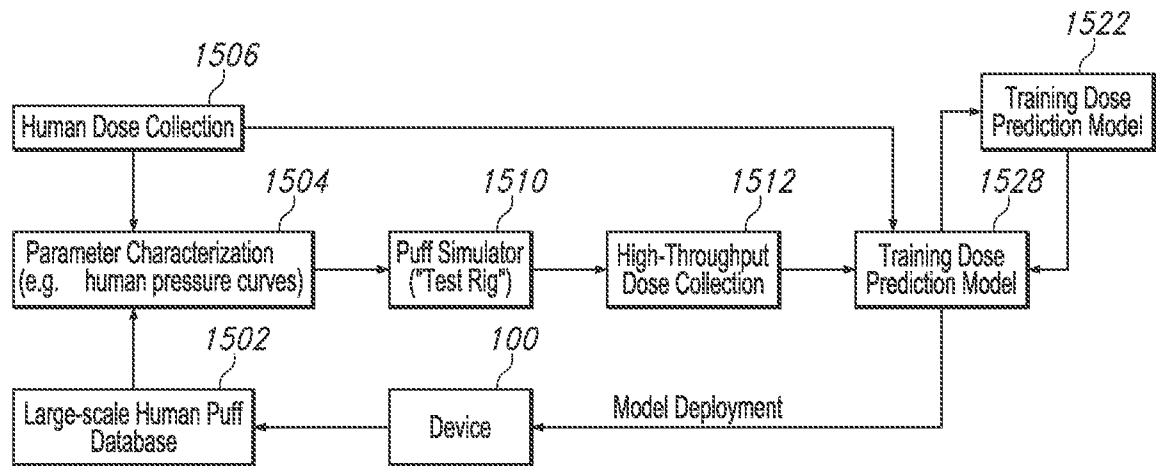


FIG. 15

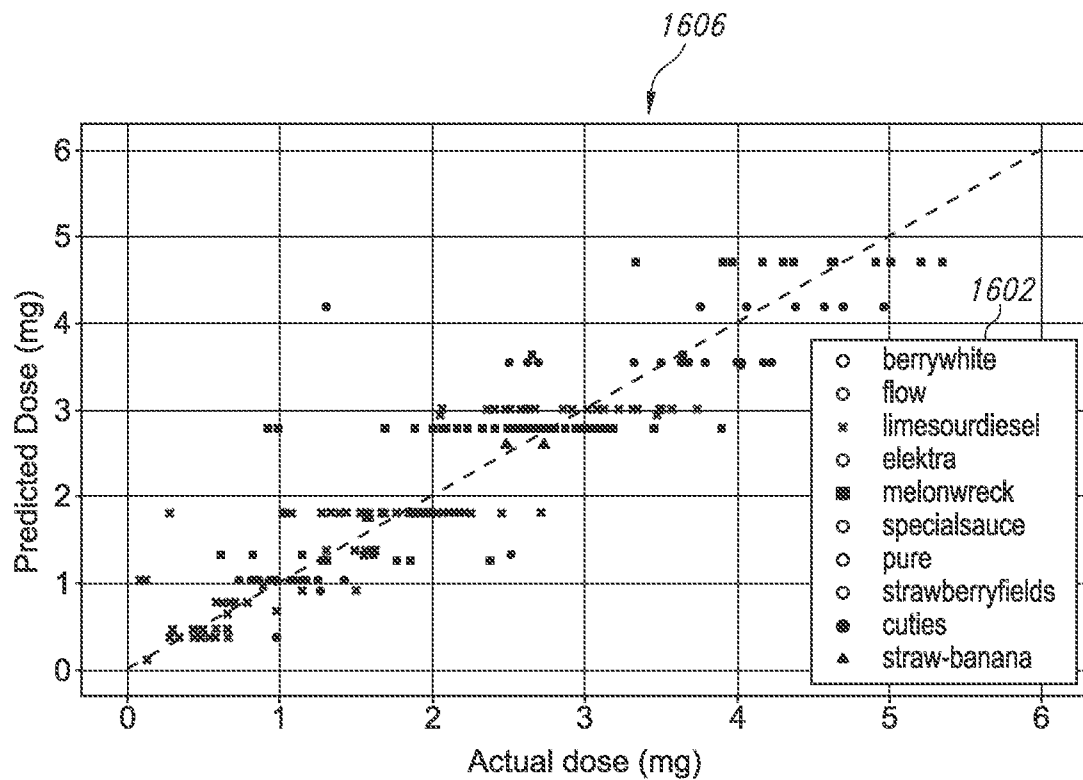


FIG. 16

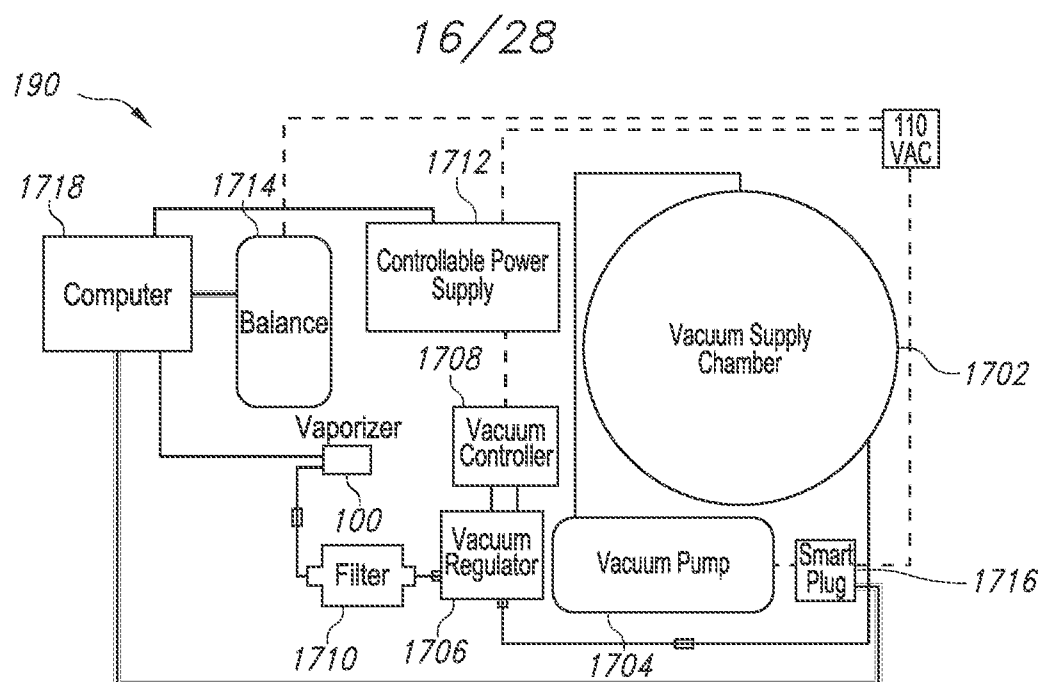


FIG. 17

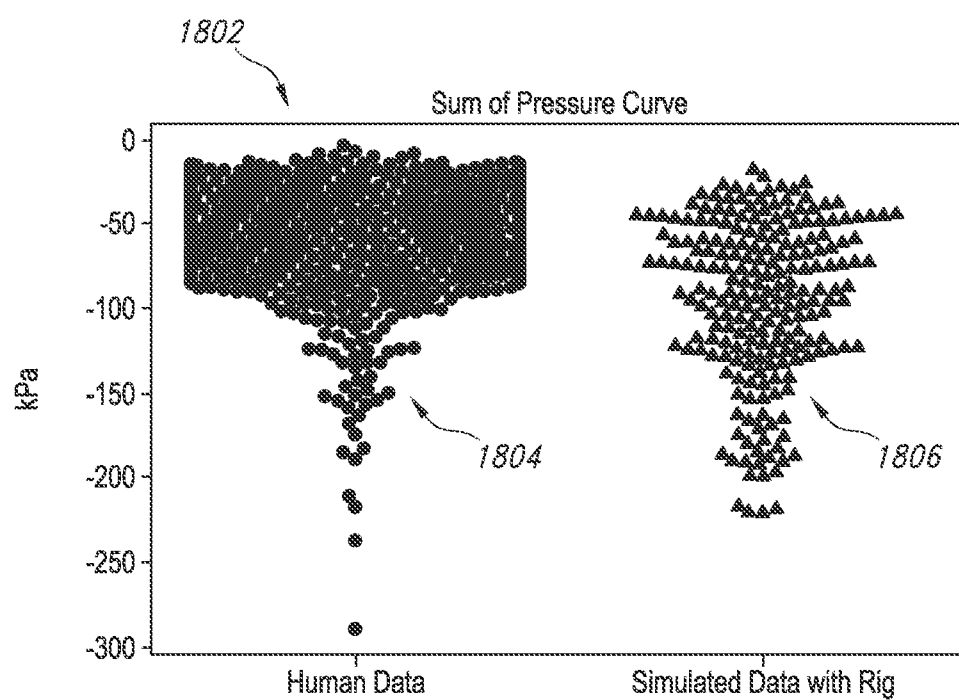


FIG. 18A

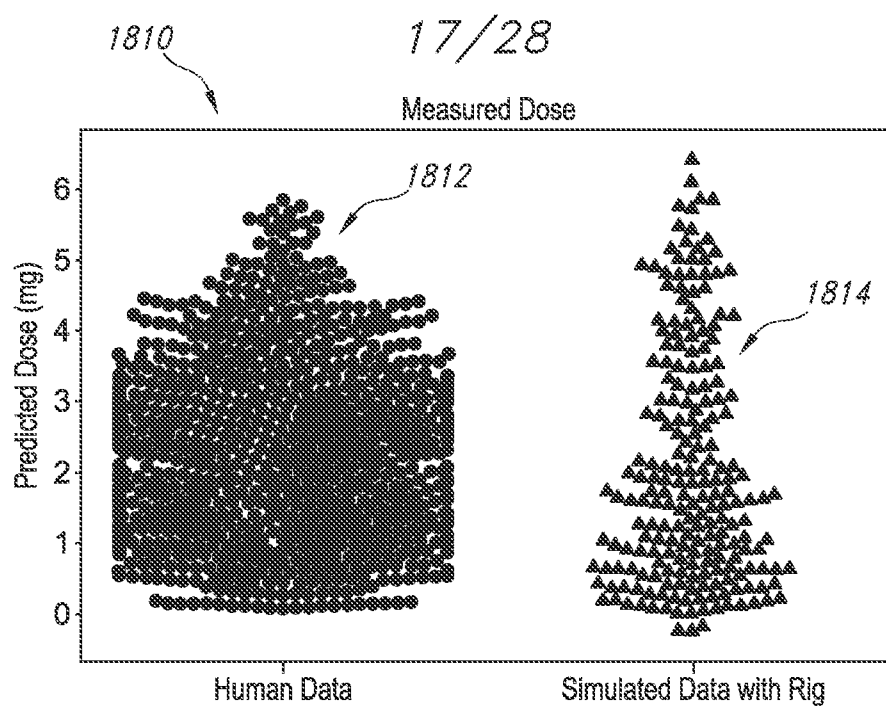


FIG. 18B

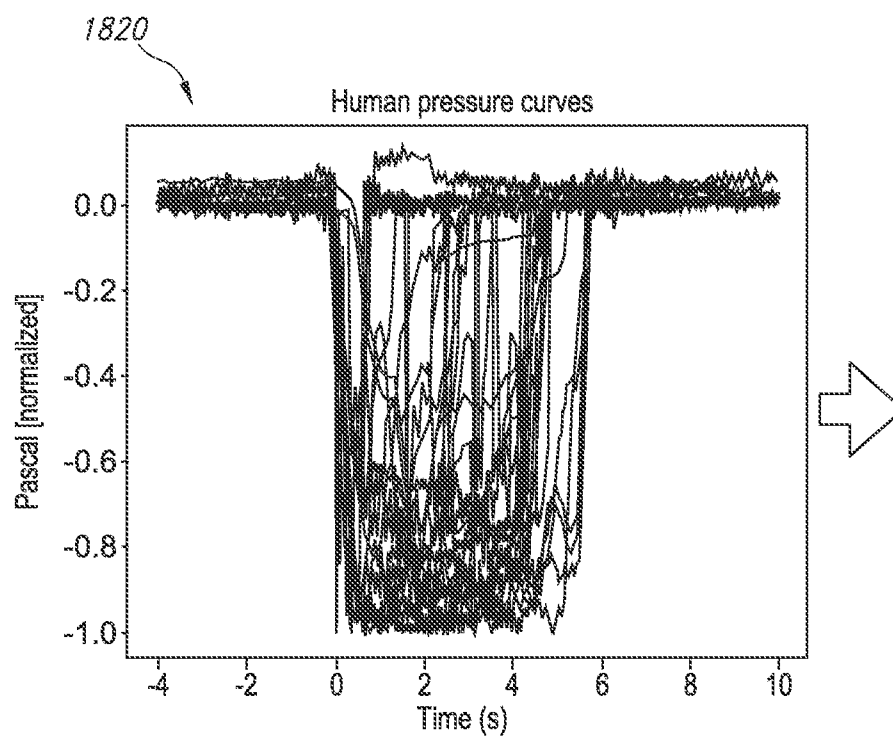


FIG. 19A

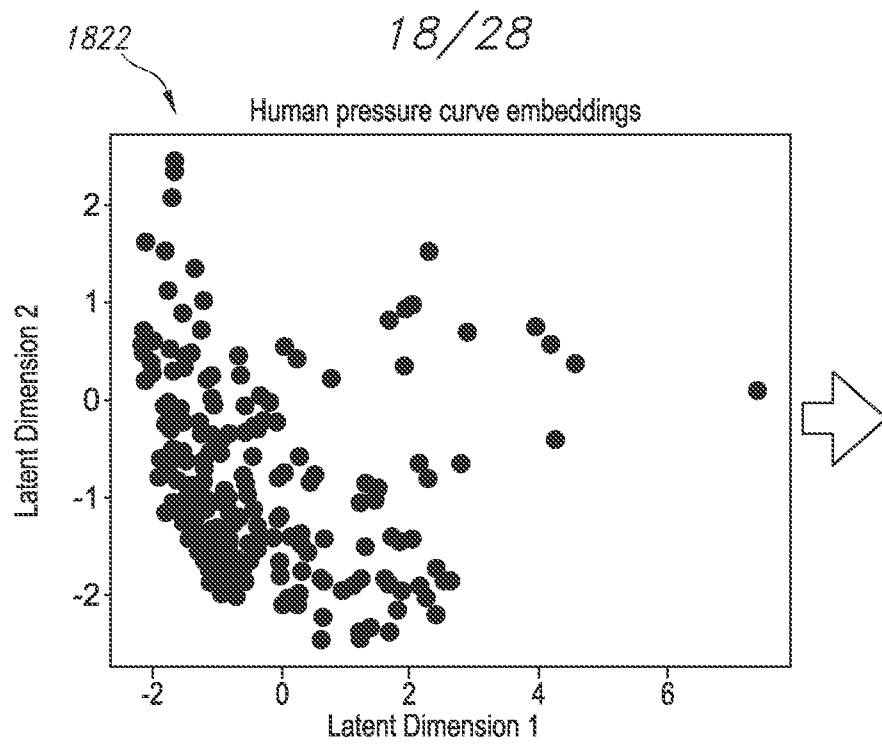


FIG. 19B

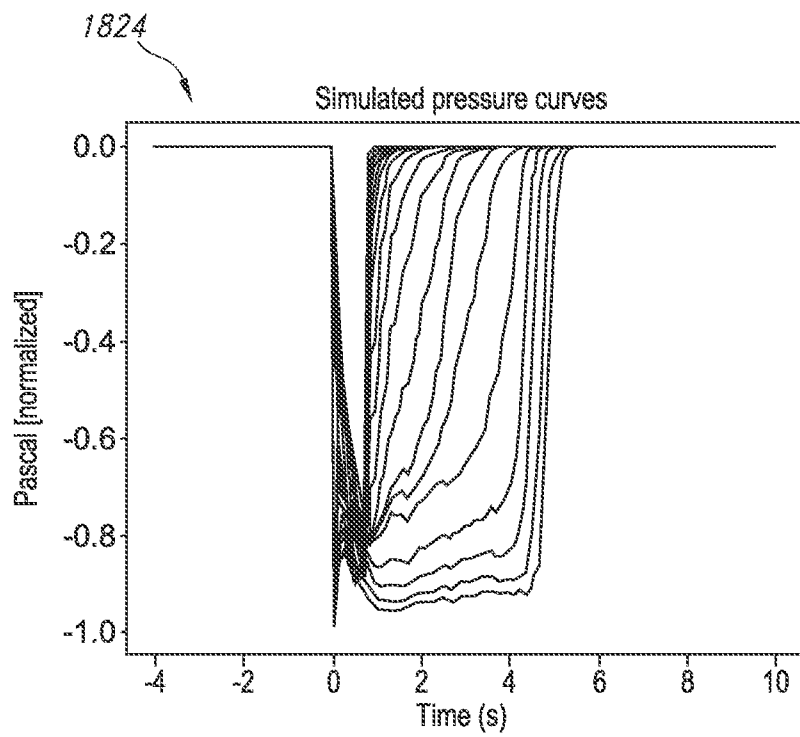


FIG. 19C

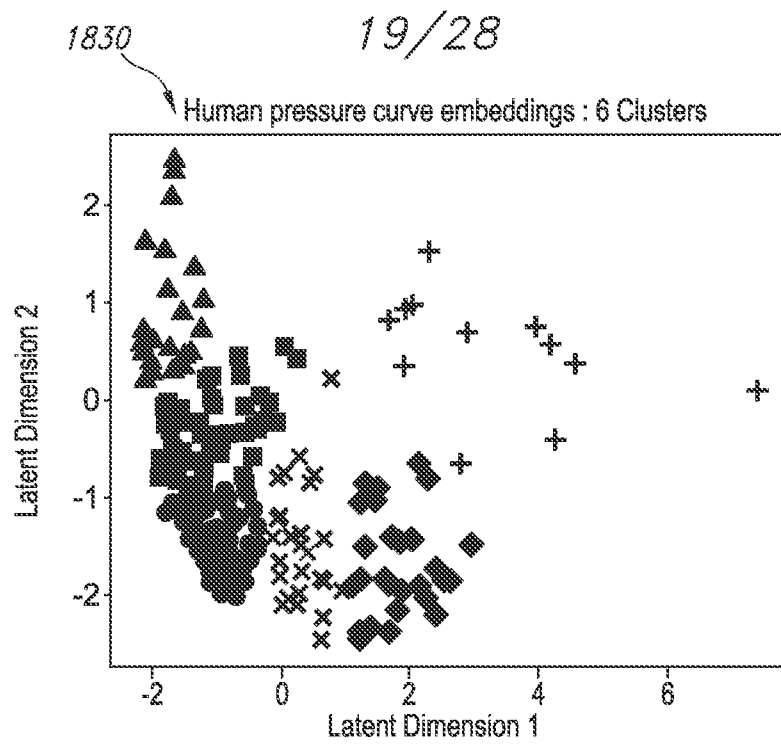


FIG. 20A

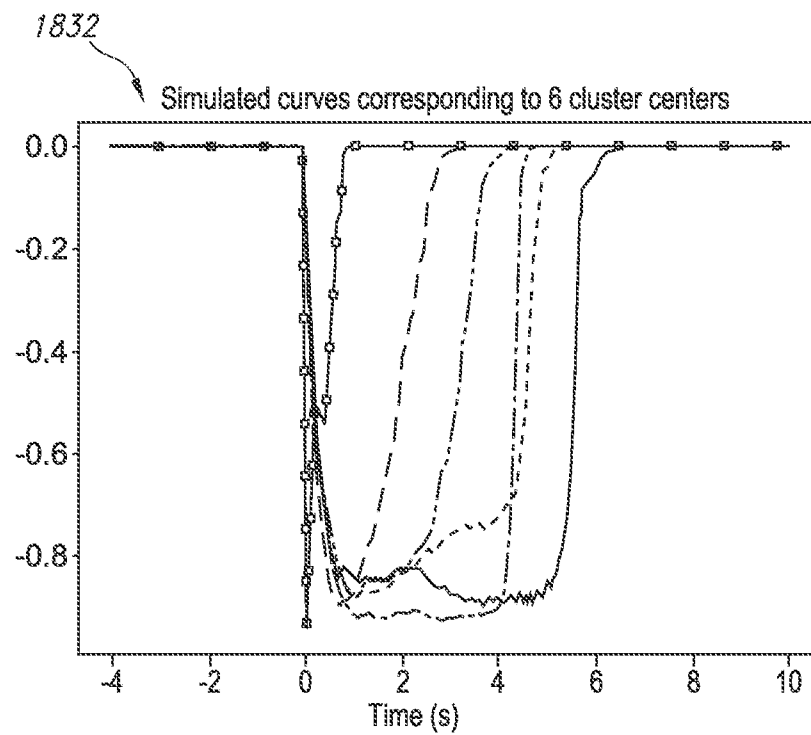


FIG. 20B

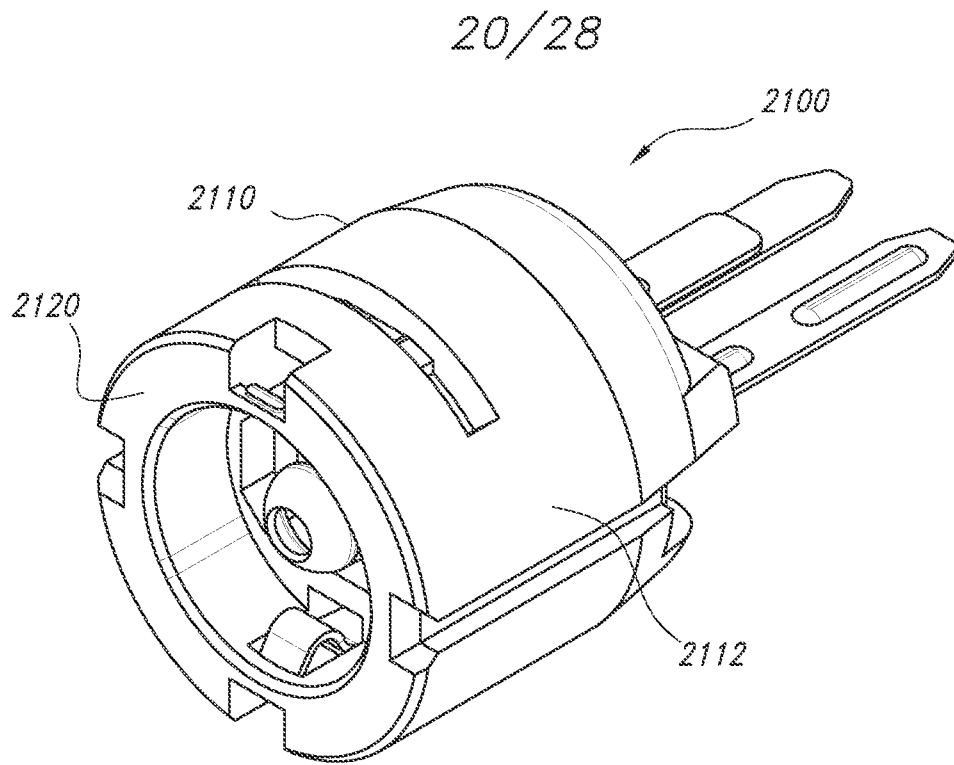


FIG. 21

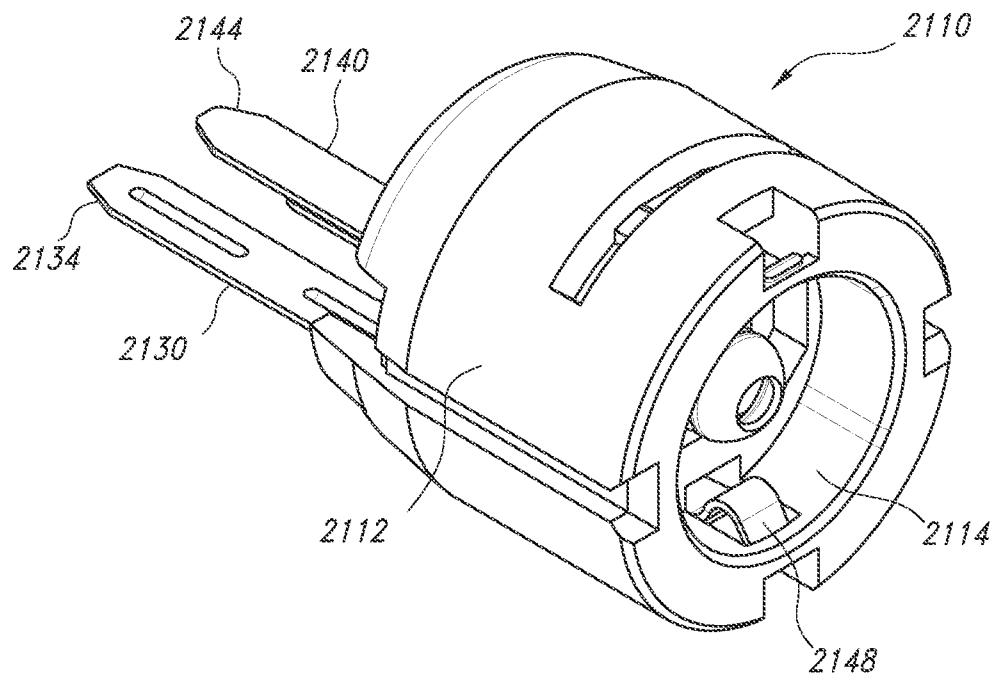


FIG. 22A

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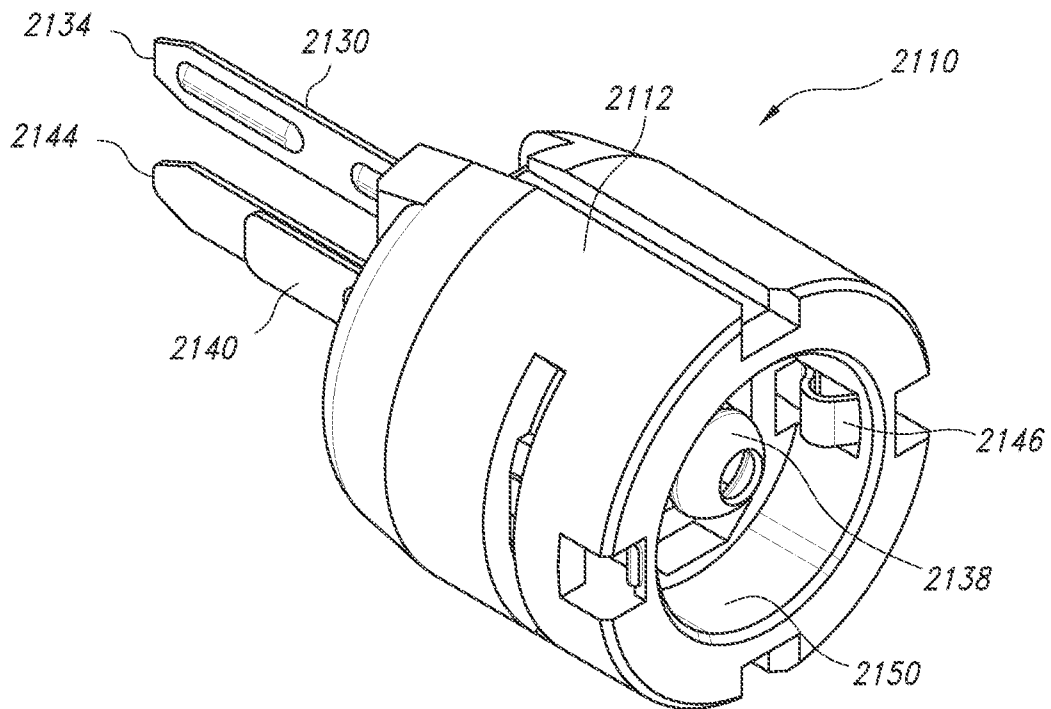


FIG. 22B

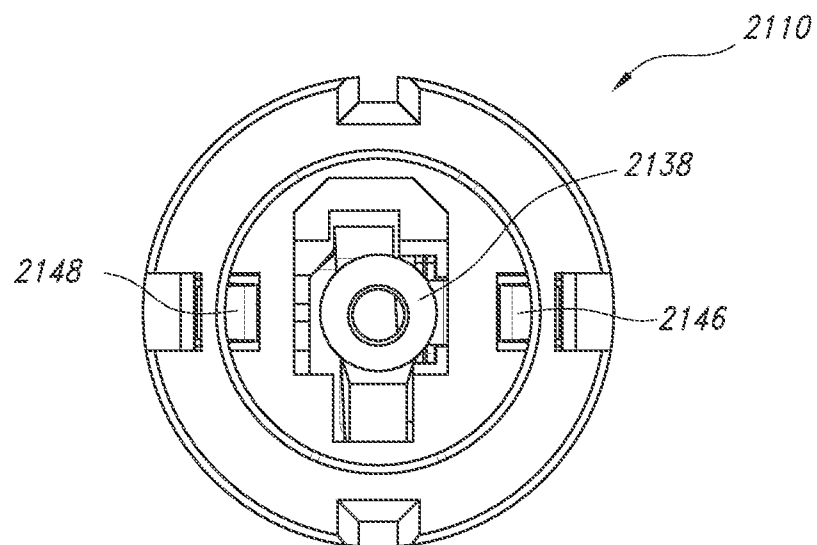


FIG. 22C

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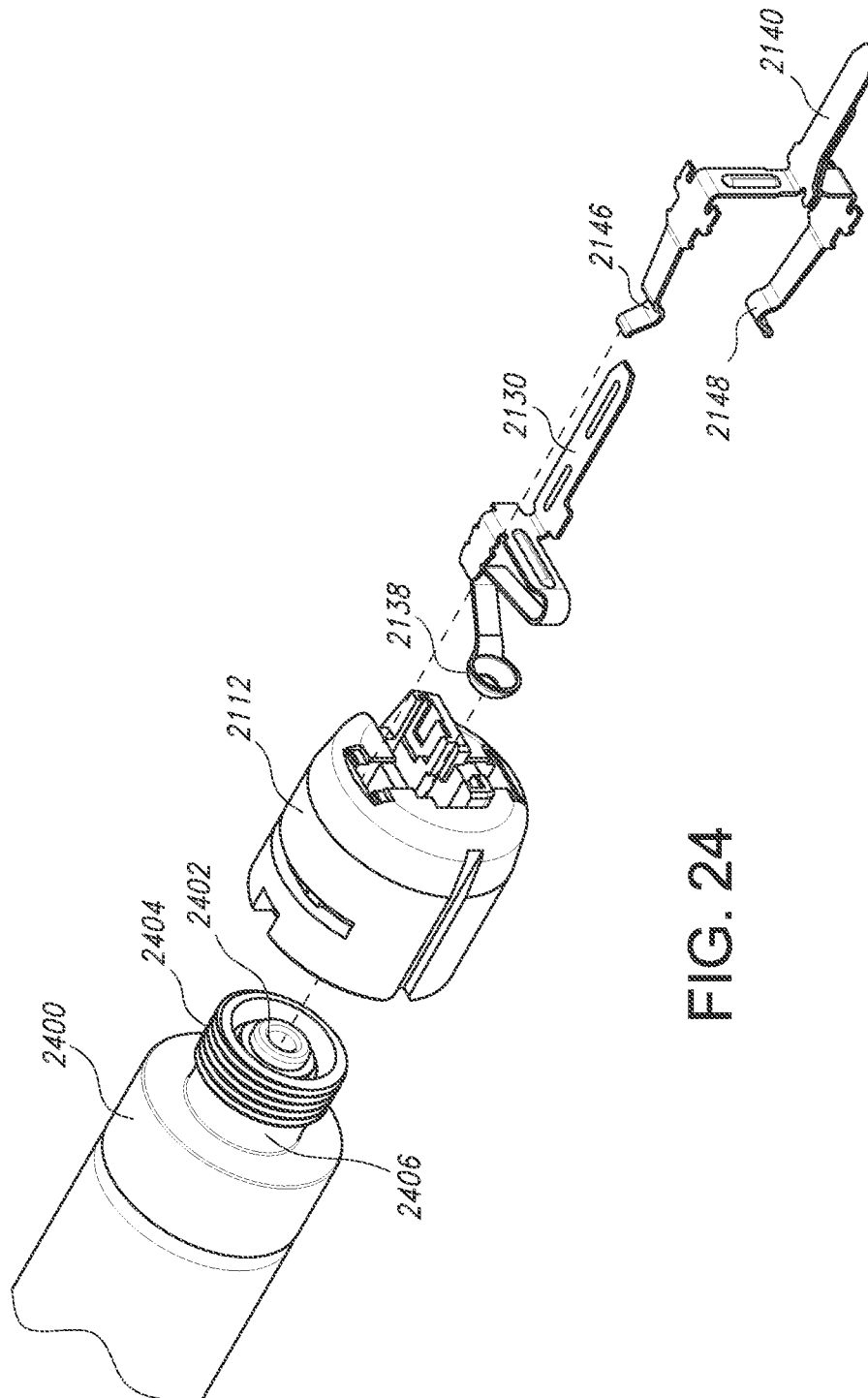
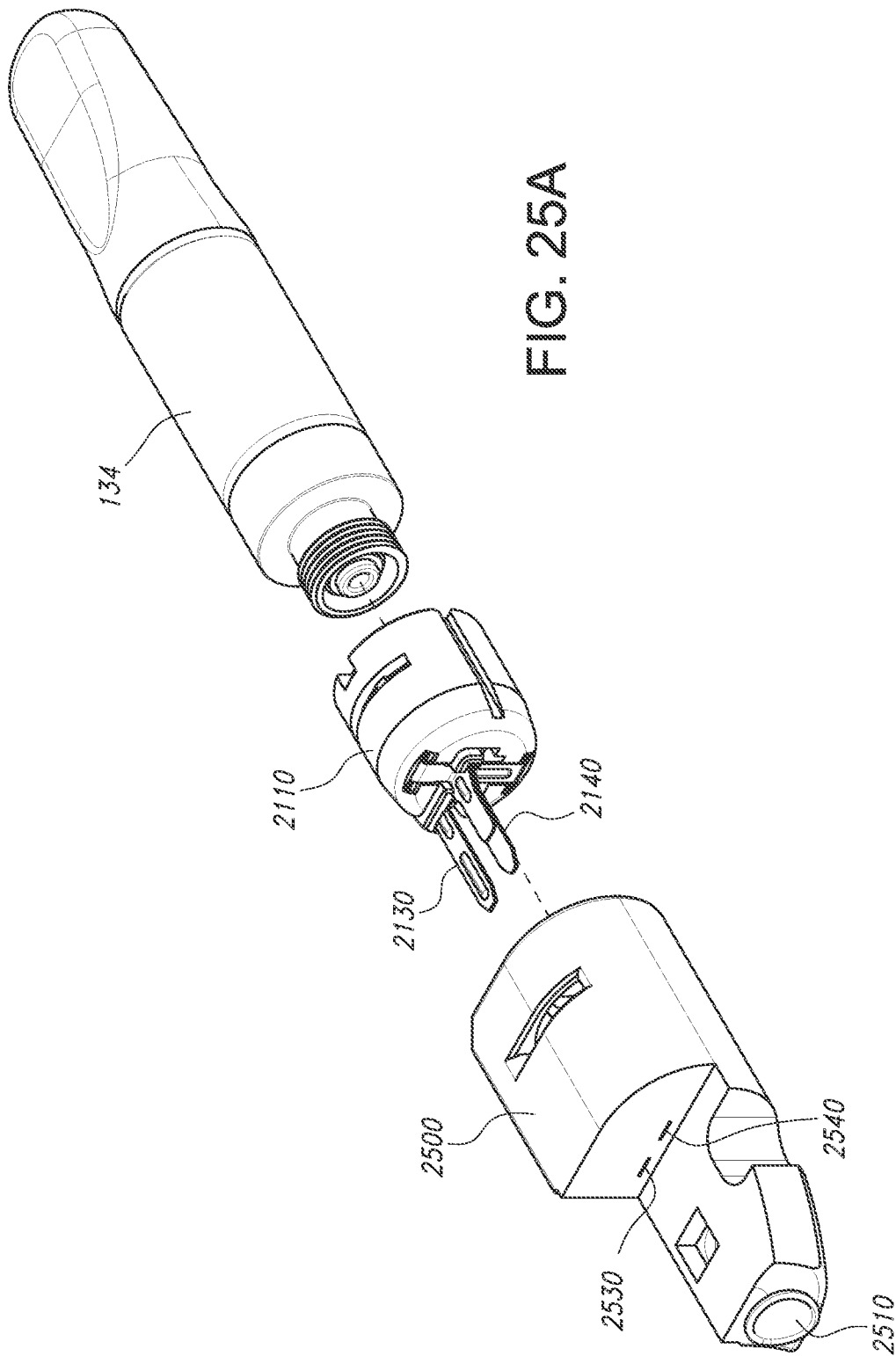


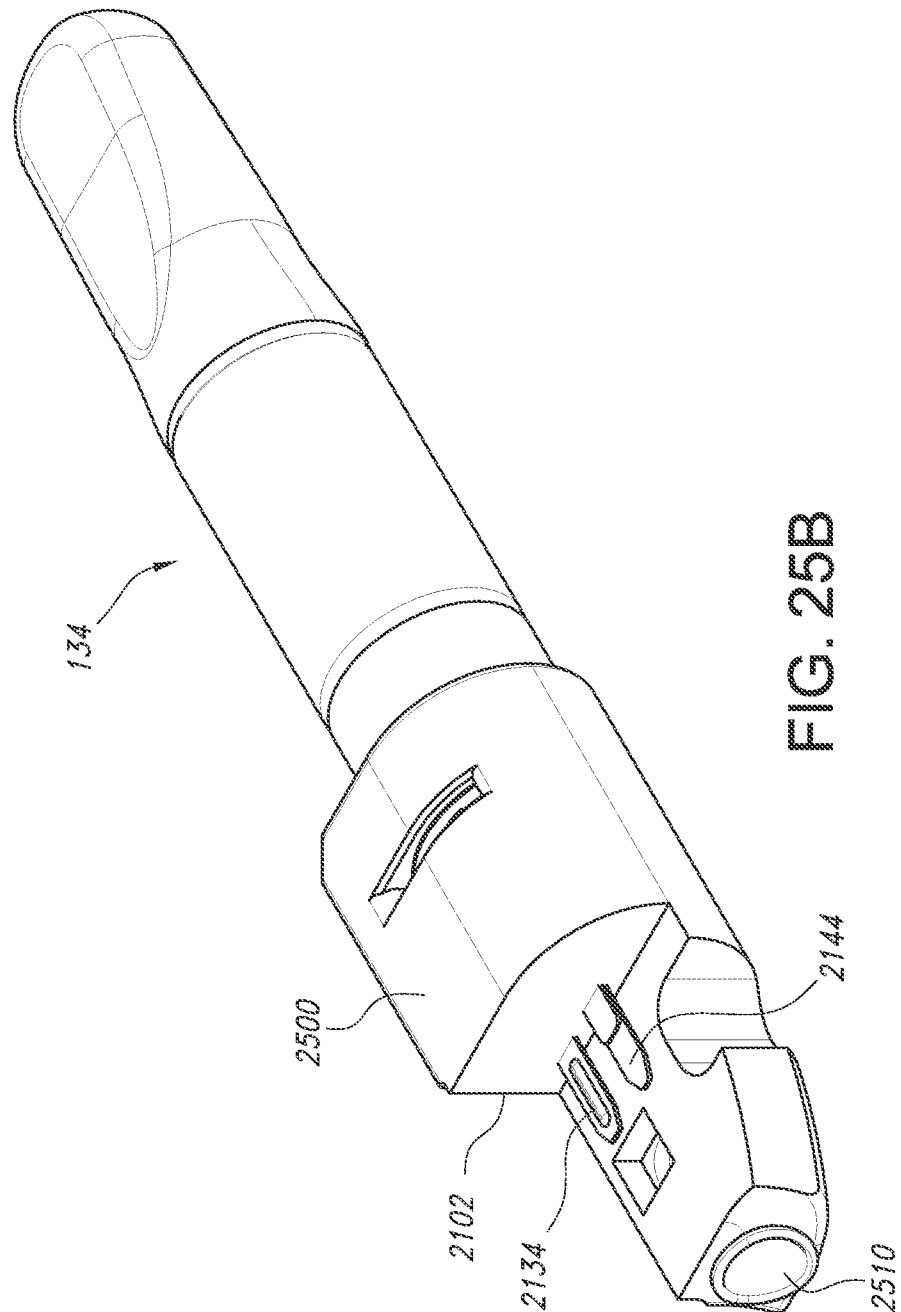
FIG. 24

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FIG. 25A



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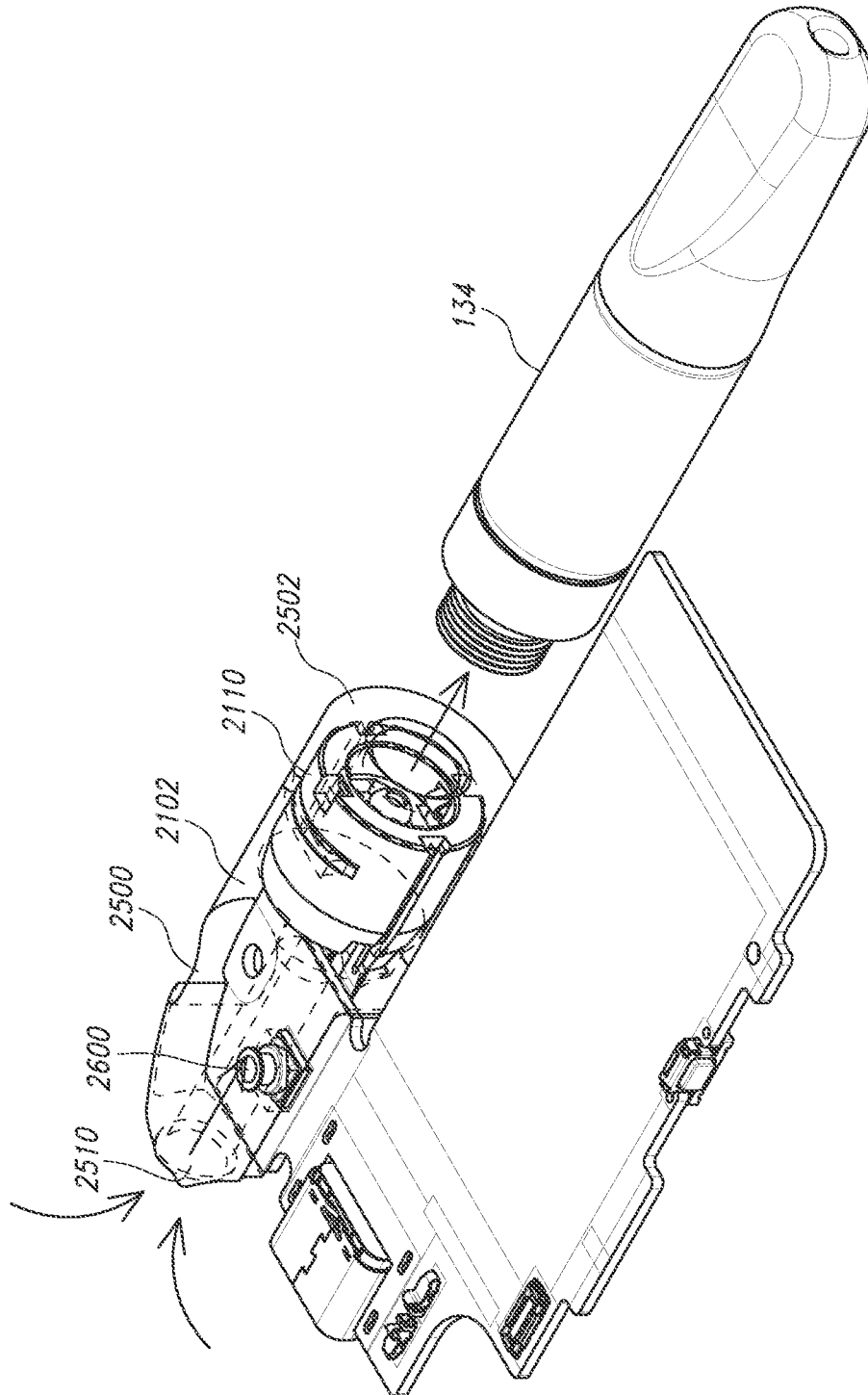


FIG. 26

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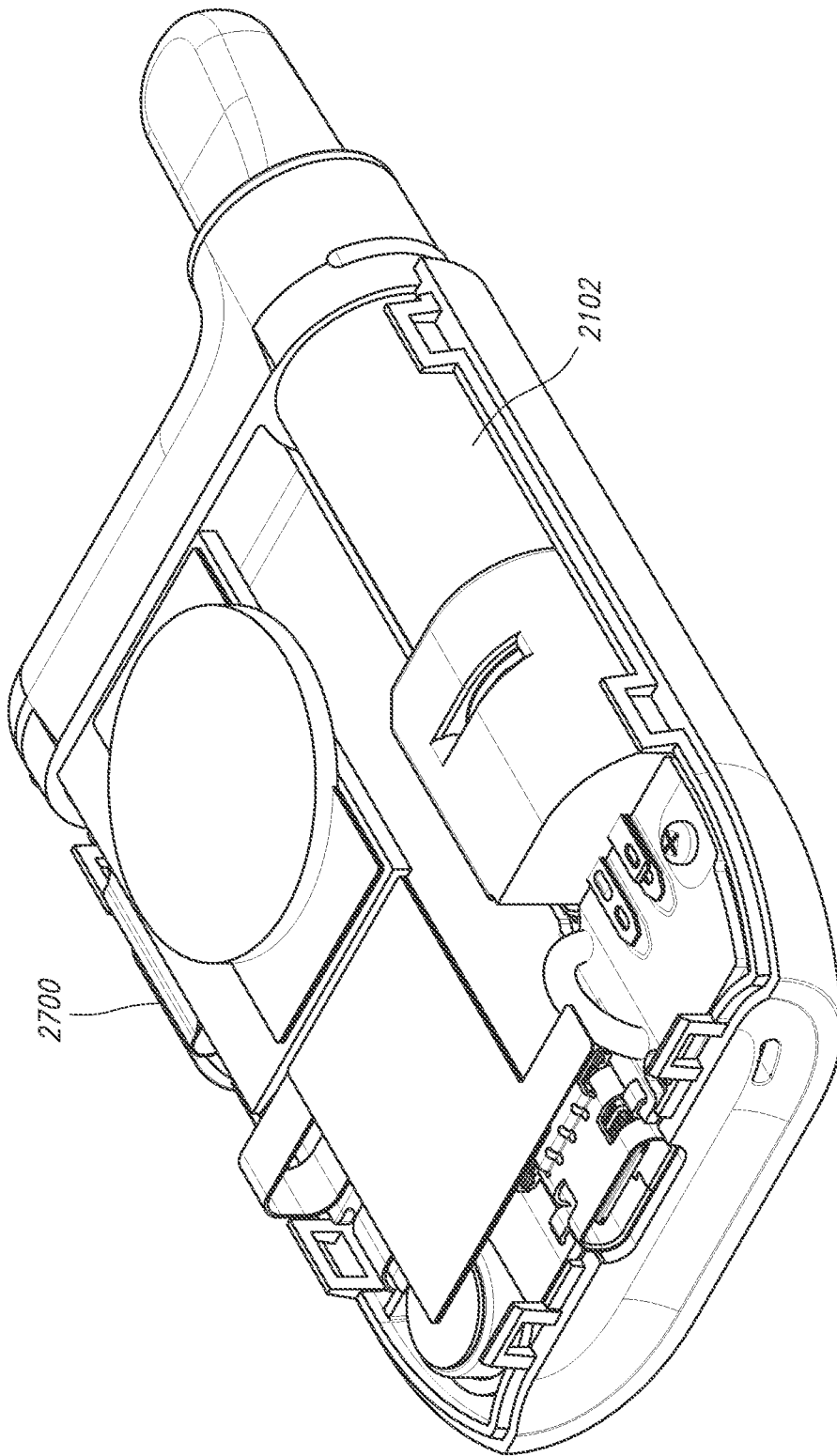


FIG. 27

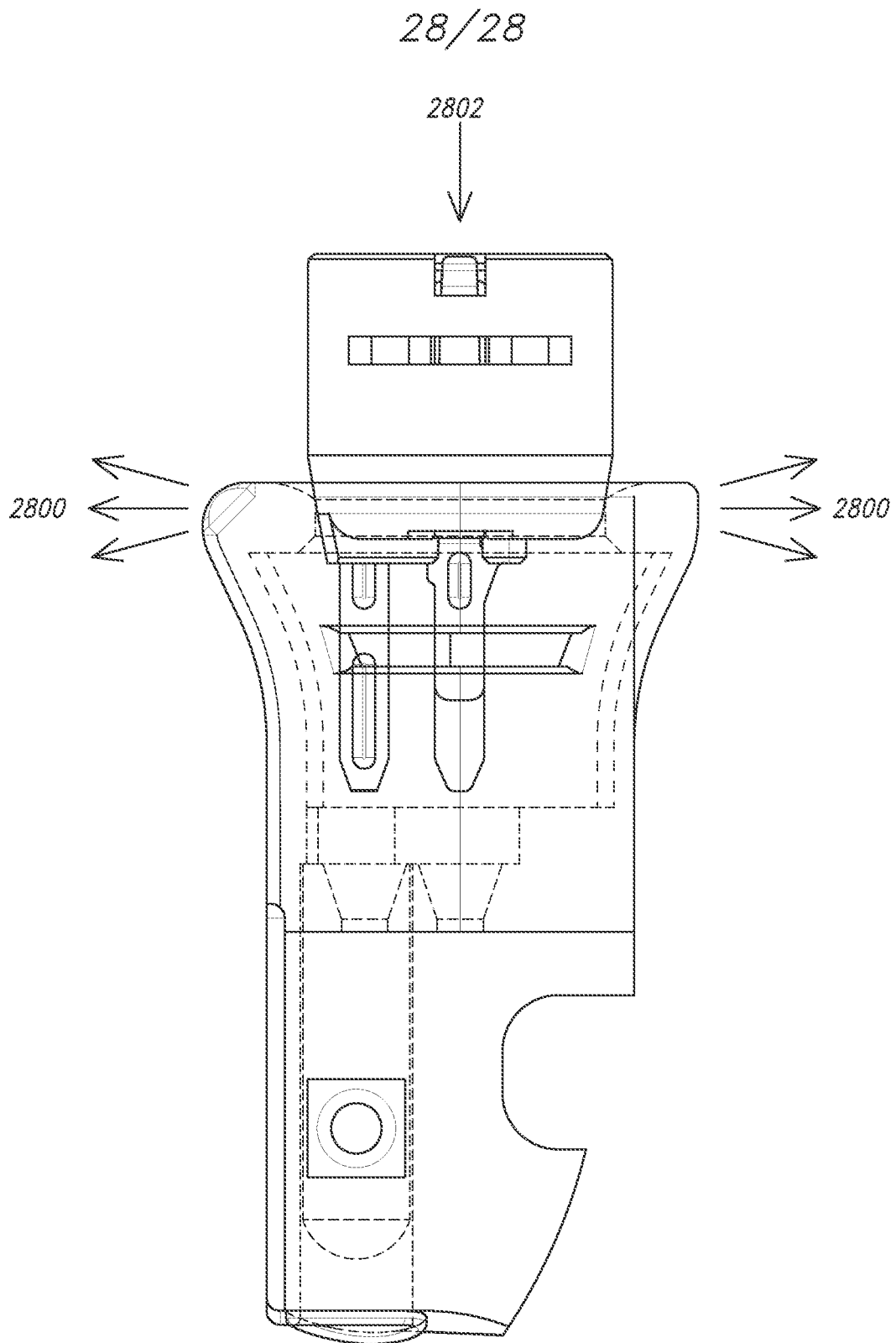


FIG. 28

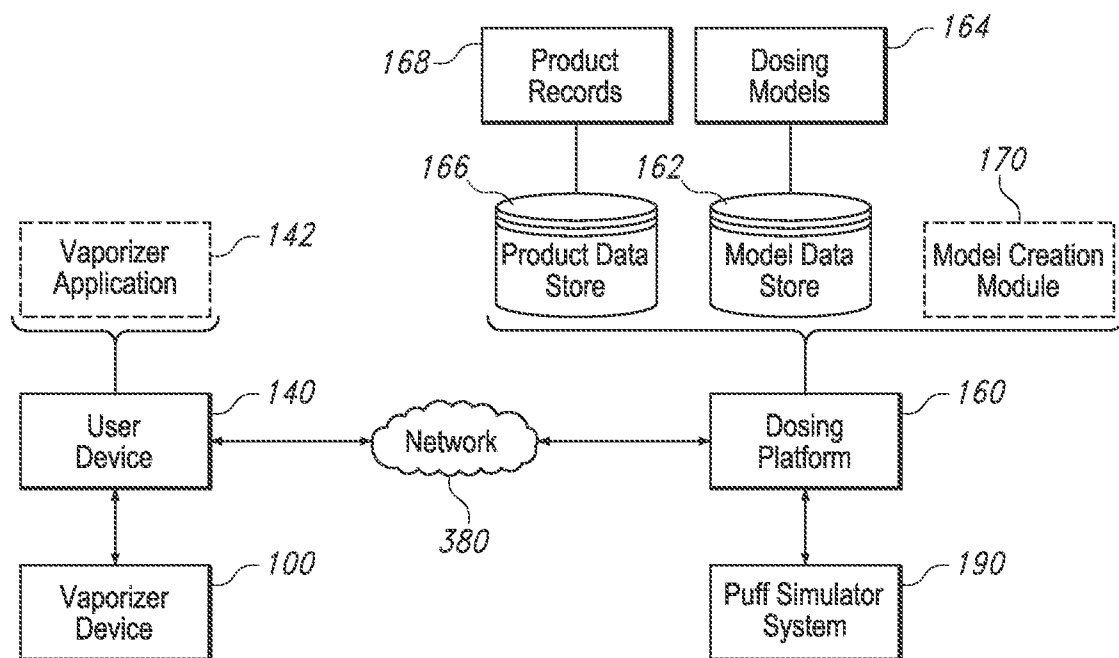


FIG. 1