



(51) International Patent Classification:

A24F 47/00 (2020.01) A61M 15/06 (2006.01)

A61M 15/00 (2006.01)

MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(21) International Application Number:

PCT/US2020/020176

(22) International Filing Date:

27 February 2020 (27.02.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/811,581 28 February 2019 (28.02.2019) US

62/941,437 27 November 2019 (27.11.2019) US

(71) Applicant: NANO VAPE CORPORATION [US/US]; 51

Intervale, Roslyn Estates, New York 11576 (US).

Published:

— with international search report (Art. 21(3))

(72) Inventor: EHRLICH, Mel; 51 Intervale, Roslyn Estates,

New York 11576 (US).

(74) Agent: KEEFE, Stephen; 1345 Avenue of the Americas,

15th Floor, New York, New York 10105 (US).

(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,

(54) Title: INHALABLE VAPOR GENERATION METHOD AND SYSTEM

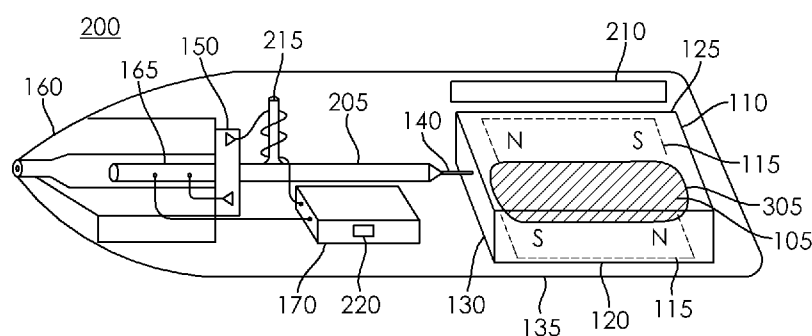


FIG. 2

(57) **Abstract:** Apparatus and associated methods relate to adapting a compressible fluid storage reservoir with magnets configured to compress fluid retained within the reservoir, configuring a transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber. In an illustrative example, the fluid may contain nicotine. In various embodiments, the transducer may be ultrasonic, permitting safe fluid vaporization based on ultrasonic agitation. In some embodiments, the transducer may be powered by a charged capacitor. In some designs, the fluid storage reservoir may be a replaceable pod with a needle-puncturable leak proof seal to permit fluid transfer to the vaporization chamber. Various examples may advantageously reduce user exposure to various hazards.



PATENT COOPERATION TREATY APPLICATION

Inhalable Vapor Generation Method and System

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/941,437, filed on November 27, 2019, and of U.S. Provisional Application No. 62/811,581, filed on February 28, 2019, the entire disclosures of which are herein expressly incorporated by reference.

TECHNICAL FIELD

[0002] Various embodiments relate generally to vapor generation.

BACKGROUND

[0003] An electronic cigarette or e-cigarette is an electronic device that emulates cigarette smoking. All previous electronic cigarettes operate by heating a liquid to generate an aerosol. In an illustrative example, an aerosol may be referred to as a vapor. Use of an e-cigarette to inhale a vapor may be referred to as vaping. In some scenarios, the liquid in the e-cigarette may include propylene glycol, glycerin, nicotine, water, and flavorings.

[0004] Some prior art e-cigarettes generate vapor by Ohmic heating of a wick in fluid. Some prior art e-cigarette designs include an electrical resistive heating element surrounded by the wick in the fluid, potentially exposing a user to bacteria and fungi in the wick material. The power to operate an exemplary prior art e-cigarette electrical resistive heating element may be provided from a rechargeable Lithium Ion battery, exposing the user to the danger of fire or explosion of the Lithium Ion Battery. In such a prior art design, the low resistance heating element may generate a temperature of hundreds of degrees Celsius, creating an aerosol vapor with varying chemical composition. In some scenarios, use of a prior art e-cigarette design may create toxic and carcinogenic chemicals in the high temperature heating process. In an illustrative example, operation of a prior art e-cigarette design may create a variety of dangerous substances due to the high temperature heating, including, for example, formaldehyde, and heavy metals, such as chromium, nickel, and lead.

PATENT COOPERATION TREATY APPLICATION

[0005] E-cigarette health risks are uncertain and their long-term health effects are not known. When used by non-smokers, e-cigarettes may lead to nicotine addiction. The aerosol generated by a prior art e-cigarette may include toxicants and traces of heavy metals, and potentially harmful chemicals not found in tobacco smoke. A prior art e-cigarette design may potentially generate harmful chemicals at concentrations permissible by workplace safety standards, however, the concentrations of harmful chemicals in an aerosol generated by a prior art e-cigarette may exceed stricter public safety limits.

SUMMARY

[0006] Apparatus and associated methods relate to adapting a compressible fluid storage reservoir with magnets configured to compress fluid retained within the reservoir, configuring a transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber. In an illustrative example, the fluid may contain nicotine. In various embodiments, the transducer may be ultrasonic, permitting safe fluid vaporization based on ultrasonic agitation. In some embodiments, the transducer may be powered by a charged capacitor. In some designs, the fluid storage reservoir may be a replaceable pod with a needle-puncturable leak proof seal to permit fluid transfer to the vaporization chamber. Various examples may advantageously reduce user exposure to various hazards.

[0007] Various embodiments may achieve one or more advantages. For example, some embodiments may improve a user's ease of generating an inhalable vapor. This facilitation may be a result of reducing the user's effort charging the energy source powering the user's vapor generating device. In some embodiments, inhalable vapor may be automatically generated for a user on demand, when the user inhales through the vapor generating device's mouthpiece. Such automatic inhalable vapor generation may improve a user's access to inhalable vapor. Some embodiments may reduce a user's exposure to toxic chemicals related to use of inhalable vapor. Such reduced exposure to toxic chemicals may be a result of generating inhalable vapor based on ultrasonic fluid vaporization. In some embodiments, the user's risk of injury or property damage

PATENT COOPERATION TREATY APPLICATION

may be reduced. This facilitation may be a result of inhalable vapor generated with energy supplied by an energy source having reduced risk of fire or explosion.

[0008] The details of various embodiments are set forth in the accompanying drawings and the description below. Other features and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 depicts a perspective view of an exemplary device constructed to generate an inhalable vapor based on compressing fluid retained within a compressible fluid storage reservoir, configuring one or more transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber, in accordance with various embodiments of the disclosure.

[0010] FIG. 2 depicts a cross-sectional side perspective view of an exemplary device constructed to generate an inhalable vapor based on compressing fluid retained within a compressible fluid storage reservoir, configuring one or more transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber, in accordance with various embodiments of the disclosure.

[0011] FIG. 3 depicts a cross-sectional top view of an exemplary vaping fluid container, in accordance with various embodiments of the disclosure.

[0012] Like reference symbols in the drawing indicate like elements.

PATENT COOPERATION TREATY APPLICATION

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0013] FIG. 1 depicts a perspective view of an exemplary device constructed to generate an inhalable vapor based on compressing fluid retained within a compressible fluid storage reservoir, configuring one or more transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber, in accordance with various embodiments of the disclosure. In the embodiment vaping device 100 depicted by FIG. 1, the liquid 105 is in the flexible plastic disposable container (Pod) 110. In some examples, the flexible plastic disposable container (Pod) 110 may be referred to as a cartridge. An exemplary design of an embodiment flexible plastic disposable container (Pod) 110 is also illustrated at least by FIG. 3.

[0014] In the depicted example, the liquid 105 is vaping fluid. In the illustrated embodiment, the flexible plastic disposable container (Pod) 110 includes a compressible fluid storage reservoir. In the illustrated embodiment, the flexible plastic disposable container (Pod) 110 is configured with a fixed bar magnet 115 on each of the opposing surfaces 120, 125 of the flexible plastic disposable container (Pod) 110. In the depicted example, the flexible plastic disposable container (Pod) 110 is configured with two magnets. In some embodiments, the flexible plastic disposable container (Pod) 110 may be configured with one magnet. In the illustrated embodiment, the fixed bar magnets 115 are positioned to attract each other, thereby providing positive pressure on the liquid 105 in the flexible plastic disposable container (Pod) 110. In various embodiment implementations, the vaping fluid in the cartridge may be compressed by other means, such as, for example: a spring; the cartridge comprising a balloon-type self-compressing material; or, the vaping fluid in the cartridge could be without compression, using, for example, osmotic pressure, alone or in combination with other compression means, to apply pressure to the fluid.

[0015] In the depicted embodiment, one end of the flexible plastic disposable container (Pod) 110 is configured with the leak proof seal 130. In the illustrated embodiment, the leak proof seal 130 includes a needle-puncturable elastomeric membrane. In the illustrated embodiment, the

PATENT COOPERATION TREATY APPLICATION

vaping device housing 135 is configured with the fixed syringe-type needle 140. In the depicted embodiment, the fixed syringe-type needle 140 is adapted to puncture the leak proof seal 130 when the flexible plastic disposable container (Pod) 110 is inserted into the vaping device housing 135.

[0016] In the depicted embodiment, the vaping device housing 135 includes a magnetic lock adapted to anchor the flexible plastic disposable container (Pod) 110 to the vaping device housing 135. In an example illustrative of the depicted embodiments' usage in various scenarios, after the flexible plastic disposable container (Pod) 110 is inserted into the vaping device housing 135, the flexible plastic disposable container (Pod) 110 will be anchored by the magnets 115 to the vaping device housing 135. In an illustrative example, the vaping fluid 105 will fill the manifold 145 retaining the piezo transducers 150. In the illustrated embodiment, the manifold 145 is a fluid vaporization chamber configured with the wick 155 in contact with and covering the piezo transducers 150, to distribute the vaping fluid 105 to the piezo transducers 150.

[0017] In an illustrative example, to activate the vaping device 100, the user will suck on the mouthpiece 160. This sucking action will apply a vacuum to decrease the pressure in the vaping device 100, which will activate switch 165 to allow electrical current to flow from the energy storage device 170. In the illustrated example, the switch 165 is a sucking action switch. In the depicted example, the energy storage device 170 is an ultra-capacitor. In an illustrative example, the ultra-capacitor 170 may nominally be ten Farads at Five volts (125 Joules). In some exemplary scenarios, the vaping device 100 may be configured to permit charging the ultra-capacitor 170 through a USB port. In an illustrative example, the ultra-capacitor 170 charging time may be a few minutes with a current limiting resistor. In the depicted example, the electrical current created when the switch 165 is closed will turn on the piezo aerosol transducers 150. In some embodiments, a manual push button switch could be substituted for the sucking action switch 165.

[0018] FIG. 2 depicts a cross-sectional side perspective view of an exemplary device constructed to generate an inhalable vapor based on compressing fluid retained within a compressible fluid storage reservoir, configuring one or more transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir, and automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid

PATENT COOPERATION TREATY APPLICATION

vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber, in accordance with various embodiments of the disclosure. The embodiment vaping device 200 depicted by FIG. 2 includes the disposable container 110. An exemplary design of an embodiment disposable container 110 is also illustrated at least by FIG. 3. The embodiment vaping device 200 and the embodiment disposable container 110 are described with reference to FIGs. 2 and 3.

[0019] In the depicted examples, the embodiment vaping device 200 is preferably retained within the housing 135. In the illustrated embodiments, the housing 135 includes at least one metal plate 210. In the embodiment depicted by FIG. 2, the vaping liquid 105 is retained within the disposable container 110 by the flexible container 305, depicted in FIG. 3.

[0020] FIG. 3 depicts a cross-sectional top view of an exemplary vaping fluid container, in accordance with various embodiments of the disclosure. Turning now to FIG. 3, the flexible container 305 may be maintained under pressure by pressurizing means, depicted, for example, as two magnets 115. In the depicted example, at least one of the two magnets 115 is moveable on opposing surfaces 120 and 125 of the flexible container 305. The depicted flexible container 305 may be composed of an elastomeric material, although any flexible material may be used, if the flexible material has strength to hold the vaping liquid 105 without leaking, and yet can be punctured by the syringe needle 140.

[0021] In the embodiment illustrated by FIG. 2, the ferrous metal plate 210 is positioned so that one of the magnets 115 is operative to removably secure the disposable container 110 in the housing 135. For example, the ferrous metal plate 210 is positioned so that the disposable container 110 may be inserted into, and remain securely held in, the housing 135 by attraction with at least one magnet 115. In an illustrative example, the ferrous metal plate 210 is positioned so that the disposable container 110 is also easily removeable from the housing 135 when the vaping liquid 105 has been substantially consumed. Other means such as pressure fittings may be used to retain the disposable container 110. In the examples depicted by FIG. 1 and FIG. 2, the flexible container 305, depicted in FIG. 3, is housed within the disposable container 110. In the illustrated embodiment, the disposable container 110 may be inserted into the housing 135 to allow controlled

PATENT COOPERATION TREATY APPLICATION

vaporization upon demand by the user, and the disposable container 110 may be removed from the housing 135 when the vaping liquid 105 has been substantially consumed.

[0022] In the disposable container 110 embodiment depicted by FIG. 3, one side of the flexible container 305 may be joined by adhesive to the leak proof seal 130 of the disposable container 110. In the depicted example, the end of the disposable container 110 that includes the leak proof seal 130 is the end of the disposable container 110 that will contact the syringe needle 140 upon disposable container 110 insertion into the housing 135. In the illustrated examples, the end of the disposable container 110 that includes the leak proof seal 130 is the end of the disposable container 110 which will move through the leak proof seal 130 into the flexible container 305, thereby allowing the vaping liquid 105 to flow. In the illustrated embodiment, the moveable magnets 115 are positioned so that the magnets 115 attract each other and preferably fit within the channels 310 in the flexible container 305 housing.

[0023] In various examples, the flexible container housing 305 may be made from plastic, aluminum, or other suitable material. In an illustrative example, the magnets 115 provide positive pressure on vaping liquid 105 retained by the flexible container 305. In the depicted embodiment, one end of the flexible container 305 housing is configured with the leak proof seal 130. In the illustrated embodiment, the vaping device 200 housing 135 is configured with the fixed syringe needle 140. In the depicted embodiment, the fixed syringe needle 140 will puncture the leak proof seal 130 and the flexible plastic container 305 when the flexible container 305 is inserted into the vaping device 200 housing 135.

[0024] In the illustrated embodiment, a non-piercing end of the syringe needle 140 is connected to a first end of tubing 205. In the depicted embodiments, the tubing 205 second end is connected to at least one piezo transducer 150. In some embodiments, additional tubing may connect the other side of the transducer 150 to the mouthpiece 160, allowing vapor generated by the transducer 150 to flow through to the user when the mouthpiece 160 is sucked. In the illustrated example, the valve 215 includes a solenoid operative to position the valve 215 in a normally closed configuration. In the depicted embodiment, the valve 215 keeps the vaping fluid 105 in the tubing 205 connected to the fixed syringe needle 140 from flowing until vaping fluid 105 flow is activated

PATENT COOPERATION TREATY APPLICATION

when the valve 215 opens. In the illustrated embodiment, the tubing 205 is positioned so that when the valve 215 is activated by the solenoid, vaping fluid 105 is brought into contact with the piezo transducer 150. In the depicted embodiment, the piezo transducer 150 includes an oscillating driving crystal. To activate the vaping device 200, the user may suck on the mouthpiece 160. In an illustrative example, this sucking action will decrease the pressure in the vaping device 200, and activate the switch 165 to allow electrical current to flow from the energy storage device 170. In various embodiments, the mouthpiece 160 may have any of several shapes, including rectilinear or tapered.

[0025] In the illustrated embodiment, the switch 165 is a pressure switch. In the depicted example, the energy storage device 170 is an ultra-capacitor. In the illustrated embodiment, the ultra-capacitor 170, or other energy storage means, may be charged through the charge port 220. In various examples, the charge port 220 may preferably be a USB port. The electrical current created when the switch 165 is closed will simultaneously open the solenoid valve 215 and turn on the piezo transducer 150. When the user stops sucking on the vaping device 200, the pressure switch 165 will open, thus allowing the solenoid valve 215 to return to a closed position, blocking vaping fluid 105 flow to the transducer 150 which is simultaneously turned off, and deactivating the vaping process.

[0026] Although various embodiments have been described with reference to the Drawing, other embodiments are possible. For example, various embodiment implementations may use ultra-sonic transducers to generate vapor from an aqueous fluid. In an illustrative example, the aqueous fluid may contain nicotine. Various embodiments in accordance with the present disclosure may provide a device to generate vapor, including nicotine laden vapor, by a user utilizing an ultra-sonic transducer to generate the vapor that may be inhaled from an aqueous fluid containing nicotine. In some embodiment examples, the vapor generated using the ultra-sonic transducers may be inhaled by a user. Various embodiments in accordance with the present disclosure may create aerosol vapor using ultra-sonic transducers powered by energy storage means. In an illustrative example, one preferable energy storage means is an ultra-Capacitor, charged through a USB port.

PATENT COOPERATION TREATY APPLICATION

[0027] In the Summary above and in this Detailed Description, and the Claims below, and in the accompanying drawings, reference is made to particular features of various embodiments of the invention. It is to be understood that the disclosure of embodiments of the invention in this specification is to be interpreted as including all possible combinations of such particular features. For example, where a particular feature is disclosed in the context of a particular aspect or embodiment of the invention, or a particular claim, that feature can also be used—to the extent possible—in combination with and/or in the context of other particular aspects and embodiments of the invention, and in the invention generally.

[0028] While multiple embodiments are disclosed, still other embodiments of the present invention will become apparent to those skilled in the art from this detailed description. The invention is capable of myriad modifications in various obvious aspects, all without departing from the spirit and scope of the present invention. Accordingly, the drawings and descriptions are to be regarded as illustrative in nature and not restrictive.

[0029] It should be noted that the features illustrated in the drawings are not necessarily drawn to scale, and features of one embodiment may be employed with other embodiments as the skilled artisan would recognize, even if not explicitly stated herein. Descriptions of well-known components and processing techniques may be omitted so as to not unnecessarily obscure the embodiments.

[0030] In the present disclosure, various features may be described as being optional, for example, through the use of the verb “may;”, or, through the use of any of the phrases: “in some embodiments,” “in some implementations,” “in some designs,” “in various embodiments,” “in various implementations,” “in various designs,” “in an illustrative example,” or “for example;” or, through the use of parentheses. In the present disclosure, expressions in parentheses may be understood as being optional. As used in the present disclosure, quotation marks may emphasize that the expression in quotation marks may also be understood in a figurative sense. As used in the present disclosure, quotation marks may identify a particular expression under discussion.

[0031] For the sake of brevity and legibility, the present disclosure does not explicitly recite each and every permutation that may be obtained by choosing from the set of optional features. However, the present disclosure is to be interpreted as explicitly disclosing all such permutations. For example, a system described as having three optional features may be embodied in seven

PATENT COOPERATION TREATY APPLICATION

different ways, namely with just one of the three possible features, with any two of the three possible features or with all three of the three possible features.

[0032] In various embodiments, elements described herein as coupled or connected may have an effectual relationship realizable by a direct connection or indirectly with one or more other intervening elements.

[0033] In the present disclosure, the term "any" may be understood as designating any number of the respective elements, i.e. as designating one, at least one, at least two, each, or all of the respective elements. Similarly, the term "any" may be understood as designating any collection(s) of the respective elements, i.e. as designating one or more collections of the respective elements, a collection comprising one, at least one, at least two, each, or all of the respective elements. The respective collections need not comprise the same number of elements.

[0034] While various embodiments of the present invention have been disclosed and described in detail herein, it will be apparent to those skilled in the art that various changes may be made to the configuration, operation and form of the invention without departing from the spirit and scope thereof. In particular, it is noted that the respective features of embodiments of the invention, even those disclosed solely in combination with other features of embodiments of the invention, may be combined in any configuration excepting those readily apparent to the person skilled in the art as nonsensical. Likewise, use of the singular and plural is solely for the sake of illustration and is not to be interpreted as limiting.

[0035] In the present disclosure, all embodiments where "comprising" is used may have as alternatives "consisting essentially of," or "consisting of." In the present disclosure, any method or apparatus embodiment may be devoid of one or more process steps or components. In the present disclosure, embodiments employing negative limitations are expressly disclosed and considered a part of this disclosure.

[0036] Certain terminology and derivations thereof may be used in the present disclosure for convenience in reference only and will not be limiting. For example, words such as "upward," "downward," "left," and "right" would refer to directions in the drawings to which reference is made unless otherwise stated. Similarly, words such as "inward" and "outward" would refer to directions toward and away from, respectively, the geometric center of a device or area and

PATENT COOPERATION TREATY APPLICATION

designated parts thereof. References in the singular tense include the plural, and vice versa, unless otherwise noted.

[0037] The term “comprises” and grammatical equivalents thereof are used herein to mean that other components, ingredients, steps, among others, are optionally present. For example, an embodiment “comprising” (or “which comprises”) components A, B and C can consist of (i.e., contain only) components A, B and C, or can contain not only components A, B, and C but also contain one or more other components.

[0038] Where reference is made herein to a method comprising two or more defined steps, the defined steps can be carried out in any order or simultaneously (except where the context excludes that possibility), and the method can include one or more other steps which are carried out before any of the defined steps, between two of the defined steps, or after all the defined steps (except where the context excludes that possibility).

[0039] The term “at least” followed by a number is used herein to denote the start of a range beginning with that number (which may be a range having an upper limit or no upper limit, depending on the variable being defined). For example, “at least 1” means 1 or more than 1. The term “at most” followed by a number (which may be a range having 1 or 0 as its lower limit, or a range having no lower limit, depending upon the variable being defined). For example, “at most 4” means 4 or less than 4, and “at most 40%” means 40% or less than 40%. When, in this specification, a range is given as “(a first number) to (a second number)” or “(a first number) – (a second number),” this means a range whose limit is the second number. For example, 25 to 100 mm means a range whose lower limit is 25 mm and upper limit is 100 mm.

[0040] Many suitable methods and corresponding materials to make each of the individual parts of embodiment apparatus are known in the art. According to an embodiment of the present invention, one or more of the parts may be formed by machining, 3D printing (also known as “additive” manufacturing), CNC machined parts (also known as “subtractive” manufacturing), and injection molding, as will be apparent to a person of ordinary skill in the art. Metals, wood, thermoplastic and thermosetting polymers, resins and elastomers as may be described herein-above may be used. Many suitable materials are known and available and can be selected and mixed depending on desired strength and flexibility, preferred manufacturing method and particular use, as will be apparent to a person of ordinary skill in the art.

PATENT COOPERATION TREATY APPLICATION

[0041] Any element in a claim herein that does not explicitly state “means for” performing a specified function, or “step for” performing a specific function, is not to be interpreted as a “means” or “step” clause as specified in 35 U.S.C. § 112 (f). Specifically, any use of “step of” in the claims herein is not intended to invoke the provisions of 35 U.S.C. § 112 (f). Elements recited in means-plus-function format are intended to be construed in accordance with 35 U.S.C. § 112 (f).

[0042] Recitation in a claim of the term "first" with respect to a feature or element does not necessarily imply the existence of a second or additional such feature or element.

[0043] The phrases "connected to," "coupled to" and "in communication with" refer to any form of interaction between two or more entities, including, for example, mechanical, electrical, magnetic, electromagnetic, fluid, or thermal interaction. Two components may be functionally coupled to each other even though they are not in direct contact with each other. The term "abutting" refers to items that are in direct physical contact with each other, although the items may not necessarily be attached together.

[0044] The word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments. While the various aspects of the embodiments are presented in drawings, the drawings are not necessarily drawn to scale unless specifically indicated.

[0045] Reference throughout this specification to "an embodiment," "the depicted embodiment," "the illustrated embodiment," or "the embodiment" means that a particular feature, structure or characteristic described in connection with that embodiment is included in at least one embodiment. Thus, the quoted phrases, or variations thereof, as recited throughout this specification are not necessarily all referring to the same embodiment.

[0046] Similarly, it should be appreciated that in the above description of embodiments, various features are sometimes grouped together in a single embodiment, Figure, or description thereof for the purpose of streamlining the disclosure. This method of disclosure, however, is not to be interpreted as reflecting an intention that any claim in this or any application claiming priority to this application require more features than those expressly recited in that claim. Rather, as the following claims reflect, an inventive aspect may lie in a combination of fewer than all features of

PATENT COOPERATION TREATY APPLICATION

any single foregoing disclosed embodiment. Thus, the claims following this Detailed Description are hereby expressly incorporated into this Detailed Description, with each claim standing on its own as a separate embodiment. This disclosure includes all permutations of the independent claims with their dependent claims.

[0047] While the foregoing drawings and description may set forth functional aspects of the disclosed systems, no particular arrangement of elements implementing these functional aspects should be inferred from these descriptions unless explicitly stated or otherwise clear from the context.

[0048] Each step in a process may include a step, or group of steps, of a method. Further, each step may contain one or more sub-steps. For the purpose of description, these steps (as well as any and all other steps identified and described above) may be presented in order. It will be understood that an embodiment can contain an alternate order of the steps adapted to a particular application of a technique disclosed herein. All such variations and modifications are intended to fall within the scope of this disclosure. The depiction and description of steps in any particular order is not intended to exclude embodiments having the steps in a different order, unless required by a particular application, explicitly stated, or otherwise clear from the context.

[0049] The embodiments disclosed hereinabove may be summarized as follows.

[0050] Embodiment 1

A Vaping Device, comprising:

a mouthpiece having a first end and a second end, wherein the mouthpiece is operable to being drawn upon by a user, and wherein the mouthpiece first end is connected by a hole with the mouthpiece second end;

a switch, fluidly coupled with the mouthpiece, wherein the switch is open when the mouthpiece is not being drawn upon by the user, wherein the switch closes when the user draws upon the mouthpiece, and wherein the switch re-opens when the drawing ceases;

PATENT COOPERATION TREATY APPLICATION

a piezo transducer having an oscillating driving crystal attached to the mouthpiece second end so that vapor can be drawn through the hole in the mouthpiece to the user when the mouthpiece is being drawn upon by the user;

a vaping fluid reservoir operative to contain vaping fluid;

tubing connecting said piezo transducer having an oscillating driving crystal with the vaping fluid reservoir; and,

a power source operative to power said transducer when the switch is closed.

[0051] Embodiment 2

The Vaping Device of Embodiment 1, wherein the Vaping Device further comprises a valve operative to allow vaping fluid to flow from the vaping fluid reservoir when the mouthpiece is being drawn upon by the user.

[0052] Embodiment 3

The Vaping Device of Embodiment 2, wherein the valve is also powered by the power source when the switch is closed.

[0053] Embodiment 4

The Vaping Device of Embodiment 3, wherein the valve further comprises a solenoid, wherein the valve is normally closed, and wherein when the valve is closed, the closed valve prevents the vaping fluid from flowing to the transducer when the switch is open.

[0054] Embodiment 5

The Vaping Device of Embodiment 1, wherein the Vaping Device further comprises pressuring means operative to apply pressure to the fluid reservoir.

[0055] Embodiment 6

PATENT COOPERATION TREATY APPLICATION

The Vaping Device of Embodiment 1, wherein the vaping fluid is an aqueous solution containing at least one of the following: medicine; CBD; THC; cannabis components; water soluble material; colloidal suspended material; asthma medication; respiratory medication; a flavored substance; or, nicotine.

[0056] Embodiment 7

The Vaping Device of Embodiment 1, wherein the vaping fluid reservoir further comprises an elastomeric material.

[0057] Embodiment 8

A Vaping Device, comprising:

a mouthpiece having a first end and a second end, wherein the mouthpiece is operable to being drawn upon by a user, wherein the mouthpiece first end is fluidly connected by a hole with the mouthpiece second end;

a switch, wherein the switch is open when the mouthpiece is not being drawn upon by the user, wherein the switch closes when the user draws upon the mouthpiece, and wherein the switch re-opens when the drawing ceases;

a piezo transducer having an oscillating driving crystal attached to the mouthpiece second end so that vapor can be drawn through the hole in the mouthpiece to the user when the mouthpiece is being drawn upon by the user;

a disposable container comprising:

a rigid housing retaining a flexible vaping fluid reservoir operative to contain vaping fluid; and,

pressuring means operative to apply pressure to the flexible vaping fluid reservoir;

PATENT COOPERATION TREATY APPLICATION

tubing fluidly connecting the piezo transducer with the vaping fluid reservoir;

a power source operative to power the transducer when the switch is closed; and,

a valve powered by the power source when the switch is closed, wherein the valve is operative to cease the flow of fluid when the mouthpiece is not drawn, and wherein the valve is opened to allow vaping fluid to flow to the transducer when the switch is closed.

[0058] Embodiment 9

The Vaping Device of Embodiment 8, wherein the disposable container further comprises a leak proof seal, and wherein the tubing is connected or formed as a syringe needle to the end of the tubing, wherein the syringe needle is operative to puncture the leak proof seal of the disposable container when pressure is applied by the user to cause the vapor fluid reservoir to be punctured by the syringe allowing the vaping fluid to flow when the vaping device is drawn upon by the user.

[0059] Embodiment 10

The Vaping Device of Embodiment 9, wherein the pressuring means further comprises two moveable magnets disposed on opposing surfaces of the flexible vaping fluid reservoir, wherein the magnets are positioned so that the magnets attract each other, and wherein the magnets are operative to apply pressure upon the flexible vaping fluid reservoir.

[0060] Embodiment 11

The Vaping device of Embodiment 8, wherein the valve further comprises a solenoid operably coupled with the valve and the switch to open and close the valve when the solenoid is operated by the switch, wherein the valve is in a normally closed position when the mouthpiece is not being drawn upon by the user, and wherein the valve when closed is operative to keep the vaping fluid in the tubing connected to the fixed Syringe needle from flowing until the valve is opened by the closing of the switch operating the solenoid.

[0061] Embodiment 12

PATENT COOPERATION TREATY APPLICATION

The Vaping Device of Embodiment 8, wherein the vaping fluid is an aqueous solution containing at least one of: medicines or other water soluble or colloidal suspended materials such as cannabis components such as CBD or THC, asthma or other respiratory medications, flavored substances, or nicotine.

[0062] Embodiment 13

The Vaping Device of Embodiment 8, where the flexible vaping fluid reservoir further comprises an elastomeric material.

[0063] Embodiment 14

A Vaping Device, comprising:

- a housing operative to rigidly hold all component parts of the vaping device;

- a mouthpiece having a first end operable to being drawn upon by a user and connected by a hole with the second end;

- a switch, open when the mouthpiece is not being drawn upon by the user, wherein the switch closes when a user draws upon the mouthpiece, and wherein the switch re-opens when the drawing ceases;

- a piezo transducer having an oscillating driving crystal attached to the second end of the mouthpiece, wherein vapor can be drawn through the hole in the mouthpiece to the user when the mouthpiece is being drawn upon by the user;

- a disposable container, comprising:

- a rigid housing containing a flexible vaping fluid reservoir operative to contain vaping fluid; and,

- pressuring means operative to apply pressure to the flexible vaping fluid reservoir;

PATENT COOPERATION TREATY APPLICATION

tubing fluidly connecting the piezo transducer with the vaping fluid reservoir;

a power source operative to power the transducer when the switch is closed, wherein the power source is a capacitor capable of being charged through a USB port, and wherein the USB port is accessible to the user through the Vaping Device Housing; and,

a valve operated by the power source when the switch is closed, wherein the valve operates to cease the flow of fluid when the mouthpiece is not being drawn upon.

[0064] Embodiment 15

The Vaping Device of Embodiment **14**, wherein the flexible vaping fluid reservoir composition includes an elastomeric material.

[0065] Embodiment 16

The Vaping Device of Embodiment **14**, wherein the portion of the tubing that contacts the disposable container is formed as or attached to a needle syringe capable of piercing the disposable container and the flexible vaping fluid reservoir.

[0066] Embodiment 17

The Vaping device of Embodiment **14**, wherein the pressuring means is two magnets, wherein at least one of the two magnets is movable, wherein the two magnets are located on opposing surfaces of the flexible container, wherein the two magnets are positioned so that the two magnets attract each other, and wherein the two magnets are operative to apply pressure upon the flexible container.

[0067] Embodiment 18

The Vaping Device of Embodiment **17**, wherein a ferromagnetic strip is attached to the housing so that one of said magnets is attracted to the ferromagnetic strip, wherein the ferromagnetic strip is operative to hold the disposable container in place when the disposable container has been inserted into the housing, and wherein the flexible container is pierced by the syringe needle at the end of the tubing when the disposable container is inserted into the housing.

PATENT COOPERATION TREATY APPLICATION

[0068] Embodiment 19

The Vaping Device of Embodiment **14**, wherein the housing further comprises metal.

[0069] Embodiment 20

The Vaping device of Embodiment **14**, wherein the housing further comprises plastic.

[0070] Embodiment 21

The Vaping Device of Embodiment **14**, wherein the vaping fluid is an aqueous solution containing at least one of the following: medicines or other water soluble or colloidal suspended material including cannabis components such as CBD or THC, asthma or other respiratory medications, flavored substances, and/or nicotine.

[0071] Embodiment 22

The Vaping Device of Embodiment **14**, wherein the valve is located between the transducer and the disposable container operating to control the flow of the vaping fluid through the tubing.

[0072] Embodiment 23

The Vaping Device of Embodiment **14**, wherein the capacitor is an ultra-capacitor.

[0073] Embodiment 24

A process to generate an inhalable vapor, the process comprising:

adapting a compressible fluid storage reservoir to compress fluid retained within the reservoir;

configuring a transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir; and,

PATENT COOPERATION TREATY APPLICATION

automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber.

[0074] Embodiment 25

The process of Embodiment **24**, wherein the transducer is an ultrasonic transducer.

[0075] Embodiment 26

The process of Embodiment **24**, wherein adapting the compressible fluid storage reservoir further comprises adapting the compressible fluid storage reservoir with at least one movable magnet configured to pressurize the fluid with a compressing action applied to the reservoir.

[0076] Embodiment 27

The process of Embodiment **24**, wherein adapting the compressible fluid storage reservoir further comprises adapting the compressible fluid storage reservoir with two magnets configured to attract each other, thereby to pressurize the fluid with a compressing action applied to the reservoir by the magnets.

[0077] Embodiment 28

The process of Embodiment **24**, wherein configuring the transducer further comprises configuring the transducer to be powered by an energy storage device.

[0078] Embodiment 29

The process of Embodiment **28**, wherein the energy storage device is a capacitor.

[0079] Embodiment 30

The process of Embodiment **24**, wherein automatically generating the vapor further comprises configuring a switch to power the transducer when the vacuum applied to the mouthpiece acts on the switch.

PATENT COOPERATION TREATY APPLICATION

[0080] Embodiment 31

The process of Embodiment **24**, wherein automatically generating the vapor further comprises configuring a valve to govern the fluid transfer controlled as a function of the vacuum applied to the mouthpiece.

[0081] Embodiment 32

An apparatus to generate an inhalable vapor, the apparatus comprising:

- a compressible fluid storage reservoir;
- a fluid vaporization chamber fluidly coupled with the fluid storage reservoir;
- a transducer configured to vaporize fluid in the fluid vaporization chamber; and,
- a mouthpiece fluidly coupled with the fluid vaporization chamber.

[0082] Embodiment 33

The apparatus of Embodiment **32**, wherein the transducer is an ultrasonic transducer.

[0083] Embodiment 34

The apparatus of Embodiment **32**, wherein the apparatus is configured to automatically generate a vapor by powering the transducer and discharging fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to the mouthpiece.

[0084] Embodiment 35

The apparatus of Embodiment **32**, wherein the apparatus further comprises a capacitor configured to power the transducer.

[0085] Embodiment 36

PATENT COOPERATION TREATY APPLICATION

The apparatus of Embodiment **32**, wherein the apparatus further comprises the compressible fluid storage reservoir adapted with a plurality of magnets configured to compress fluid retained within the reservoir.

[0086] Embodiment **37**

The apparatus of Embodiment **32**, wherein the apparatus further comprises a switch configured to power the transducer when a vacuum applied to the mouthpiece acts on the switch.

[0087] Embodiment **38**

The apparatus of Embodiment **32**, wherein the apparatus further comprises a valve configured to govern fluid transfer from the fluid storage reservoir to the fluid vaporization chamber, wherein the valve is controlled as a function of a vacuum applied to the mouthpiece.

[0088] Embodiment **39**

An apparatus to generate an inhalable vapor, the apparatus comprising:

a compressible fluid storage reservoir;

a fluid vaporization chamber fluidly coupled with the fluid storage reservoir;

an ultrasonic transducer configured to vaporize fluid in the fluid vaporization chamber;

an energy storage device, operably coupled with the ultrasonic transducer;

a mouthpiece fluidly coupled with the fluid vaporization chamber;

a switch, fluidly coupled with the mouthpiece, wherein the switch is configured to power the ultrasonic transducer from the energy storage device when a vacuum applied to the mouthpiece acts on the switch; and,

a valve, fluidly coupled with the fluid storage reservoir and the fluid vaporization chamber, wherein the switch is operably coupled with the valve to govern fluid transfer

PATENT COOPERATION TREATY APPLICATION

from the fluid storage reservoir to the fluid vaporization chamber, and wherein the fluid transfer is controlled as a function of the vacuum applied to the mouthpiece.

[0089] Embodiment 40

The apparatus of Embodiment **39**, wherein the compressible fluid storage reservoir further comprises a needle-puncturable membrane.

[0090] Embodiment 41

The apparatus of Embodiment **39**, wherein the apparatus further comprises a needle configured to puncture the compressible fluid storage reservoir.

[0091] Embodiment 42

The apparatus of Embodiment **39**, wherein the compressible fluid storage reservoir is removable.

[0092] Embodiment 43

The apparatus of Embodiment **39**, wherein the apparatus further comprises the compressible fluid storage reservoir removably secured in the apparatus by a magnetic lock.

[0093] A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, advantageous results may be achieved if the steps of the disclosed techniques were performed in a different sequence, or if components of the disclosed systems were combined in a different manner, or if the components were supplemented with other components. Accordingly, other implementations are contemplated within the scope of the following claims.

PATENT COOPERATION TREATY APPLICATION

CLAIMS

What is claimed is:

1. A process to generate an inhalable vapor, the process comprising:
 - adapting a compressible fluid storage reservoir to compress fluid retained within the reservoir;
 - configuring a transducer to vaporize fluid in a fluid vaporization chamber fluidly coupled with the fluid storage reservoir; and,
 - automatically generating a vapor by powering the transducer and transferring fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to a mouthpiece fluidly coupled with the fluid vaporization chamber.
2. The process of claim 1, wherein the transducer is an ultrasonic transducer.
3. The process of claim 1, wherein adapting the compressible fluid storage reservoir further comprises adapting the compressible fluid storage reservoir with at least one movable magnet configured to pressurize the fluid with a compressing action applied to the reservoir.
4. The process of claim 1, wherein adapting the compressible fluid storage reservoir further comprises adapting the compressible fluid storage reservoir with two magnets configured to attract each other, thereby to pressurize the fluid with a compressing action applied to the reservoir by the magnets.
5. The process of claim 1, wherein configuring the transducer further comprises configuring the transducer to be powered by an energy storage device.
6. The process of claim 5, wherein the energy storage device is a capacitor.
7. The process of claim 1, wherein automatically generating the vapor further comprises configuring a switch to power the transducer when the vacuum applied to the mouthpiece acts on the switch.

PATENT COOPERATION TREATY APPLICATION

8. The process of claim 1, wherein automatically generating the vapor further comprises configuring a valve to govern the fluid transfer controlled as a function of the vacuum applied to the mouthpiece.

PATENT COOPERATION TREATY APPLICATION

9. An apparatus to generate an inhalable vapor, the apparatus comprising:
- a compressible fluid storage reservoir;
 - a fluid vaporization chamber fluidly coupled with the fluid storage reservoir;
 - a transducer configured to vaporize fluid in the fluid vaporization chamber; and,
 - a mouthpiece fluidly coupled with the fluid vaporization chamber.
10. The apparatus of claim 9, wherein the transducer is an ultrasonic transducer.
11. The apparatus of claim 9, wherein the apparatus is configured to automatically generate a vapor by powering the transducer and discharging fluid from the fluid storage reservoir into the fluid vaporization chamber when a vacuum is applied to the mouthpiece.
12. The apparatus of claim 9, wherein the apparatus further comprises a capacitor configured to power the transducer.
13. The apparatus of claim 9, wherein the apparatus further comprises the compressible fluid storage reservoir adapted with a plurality of magnets configured to compress fluid retained within the reservoir.
14. The apparatus of claim 9, wherein the apparatus further comprises a switch configured to power the transducer when a vacuum applied to the mouthpiece acts on the switch.
15. The apparatus of claim 9, wherein the apparatus further comprises a valve configured to govern fluid transfer from the fluid storage reservoir to the fluid vaporization chamber, wherein the valve is controlled as a function of a vacuum applied to the mouthpiece.

PATENT COOPERATION TREATY APPLICATION

16. An apparatus to generate an inhalable vapor, the apparatus comprising:
- a compressible fluid storage reservoir;
 - a fluid vaporization chamber fluidly coupled with the fluid storage reservoir;
 - an ultrasonic transducer configured to vaporize fluid in the fluid vaporization chamber;
 - an energy storage device, operably coupled with the ultrasonic transducer;
 - a mouthpiece fluidly coupled with the fluid vaporization chamber;
 - a switch, fluidly coupled with the mouthpiece, wherein the switch is configured to power the ultrasonic transducer from the energy storage device when a vacuum applied to the mouthpiece acts on the switch; and,
 - a valve, fluidly coupled with the fluid storage reservoir and the fluid vaporization chamber, wherein the switch is operably coupled with the valve to govern fluid transfer from the fluid storage reservoir to the fluid vaporization chamber, and wherein the fluid transfer is controlled as a function of the vacuum applied to the mouthpiece.
17. The apparatus of claim 16, wherein the compressible fluid storage reservoir further comprises a needle-puncturable membrane.
18. The apparatus of claim 16, wherein the apparatus further comprises a needle configured to puncture the compressible fluid storage reservoir.
19. The apparatus of claim 16, wherein the compressible fluid storage reservoir is removable.
20. The apparatus of claim 16, wherein the apparatus further comprises the compressible fluid storage reservoir removably secured in the apparatus by a magnetic lock.

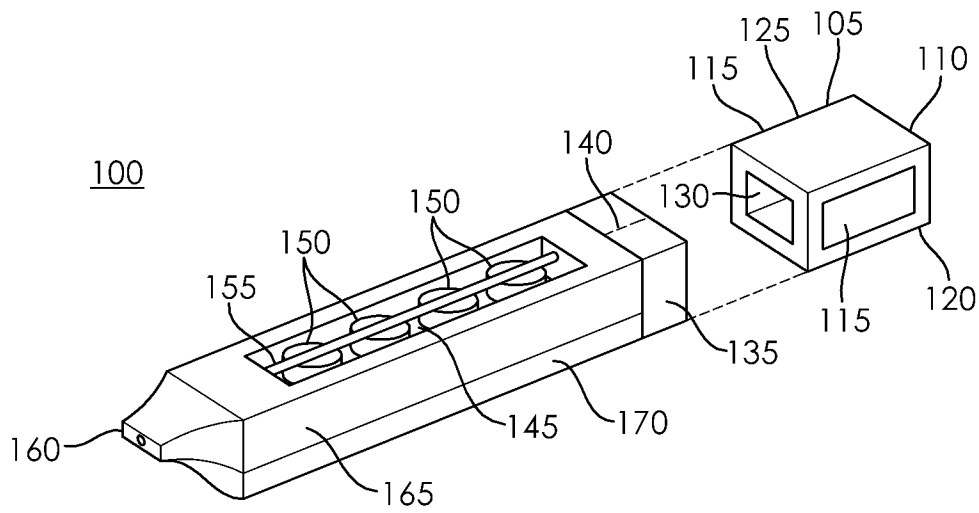


FIG. 1

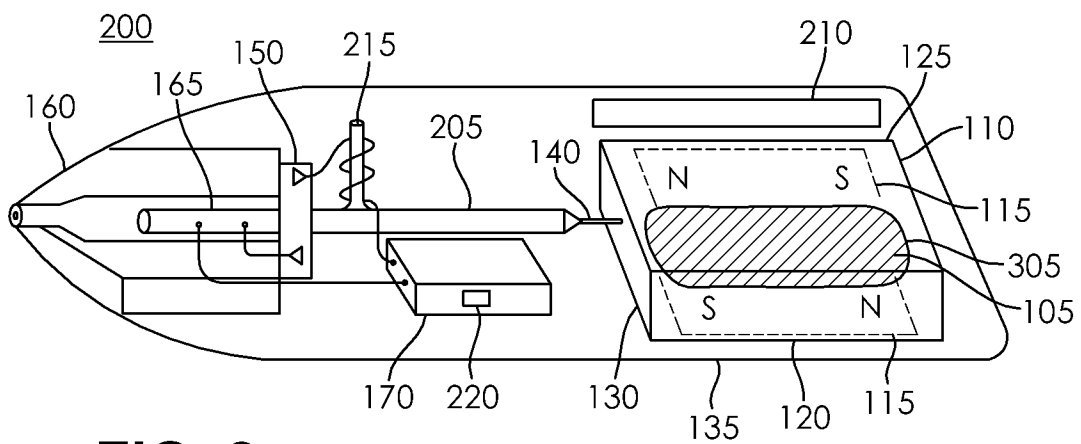


FIG. 2

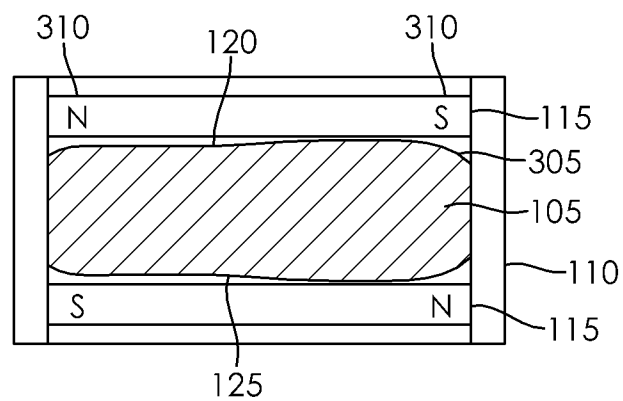


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/20176

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A24F 47/00, A61M 15/00, A61M 15/06 (2020.01)

CPC - A24F 47/00, A24F 47/0002, A24F 47/0004, A24F 47/0008, A61M 11/005, A61M 15/00, A61M 15/0085, A61M 15/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	EP 0569611 A1 (SIEMENS AG) 18 November 1993 (18.11.1993), entire document;	9-10, 12 --- 2, 16-20 --- 3-4, 13
X --- Y --- A	US 2003/0230303 A1 (NICHOLS, ET AL.) 18 December 2003 (18.12.2003), entire document;	1, 5, 7-9, 11, 14-15 --- 2, 6, 16-20 --- 3-4, 13
Y	US 2016/0331034 A1 (LUNATECH, LLC) 17 November 2016 (17.11.2016) entire document;	6
Y	US 2018/0256835 A1 (AVANZATO TECHNOLOGY CORP.) 13 September 2018 (13.09.2018), entire document;	17-18
A	EP 1219314 A1 (INSTRUMENTARIUM CORPORATION) 07 March 2002 (07.03.2002), entire document;	3-4, 13

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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

"D" document cited by the applicant in the international application

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

22 April 2020

Date of mailing of the international search report

26 MAY 2020

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Lee Young

Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/20176

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	'Vapor Without Coils! Zip Kit by Usonicig' (MATT FROM SMM) 08 February 2019 (08.02.2019), [online] < URL: https://www.youtube.com/watch?v=E7eNZZKFwUE > , entire document;	1-20
A	US 2006/0243820 A1 (NG) 02 November 2006 (02.11.2006), entire document;	1-20
A	US 5,950,619 A (VAN DER LINDEN, ET AL.) 14 September 1999 (14.09.1999), entire document;	1-20
A	US 4,294,407 A (REICHL, ET AL.) 13 October 1981 (13.10.1981), entire document;	1-20