

Portable Electronic Vapor-Producing Device and Method

Field of the Invention:

[0001]The invention pertains generally to the field of vaporizers, and specifically to portable electronic vapor producing devices.

Background of the Invention:

[0002]Chemical substances containing therapeutic or medicinal ingredients are traditionally delivered in solid or liquid form, either orally, intravenously, or by absorption through the skin. Chemical substances in liquid form may also be converted, through a combustion or vaporizing process, into a gaseous form that can be delivered orally through inhalation.

[0003]The inhalation of substances in gaseous form may cause a therapeutic, desirable sensation, and may even be psychologically addictive. This is particularly the case when the substance being inhaled contains a physically addictive chemical or drug, such as nicotine or cannabis.

[0004]The process of converting substances into gaseous form through combustion is known to eliminate or diminish the potency of some active ingredients, which may decrease the effectiveness of using the process. The combustion process may also result in by-products, such as carbon monoxide, tar, and other known or suspected carcinogens, which may expose both the user and others in the vicinity to health risks.

[0005]Due to both the known and suspected health risks associated with inhaling substances that have been converted into gaseous form through the combustion process, users are often socially ostracized and have increasingly become the target of aggressive legislation intended to control or entirely ban the activity.

[0006]Alternative methods to combustion include vaporizing or heating the substance. A number of devices are available for users who wish to inhale substances that have been converted into gaseous form through such methods. However, many of these

devices, often called vaporizers, are not designed to be mobile or to be used with the same transient frequency and simplicity as rolled tobacco or marijuana cigarettes.

[0007] Examples of typical prior art vaporizers include US Patent Number 7,445,007 to Balch et al. for a Thermal Vaporization Method and Apparatus, and US Patent Number 6,761,164 to Amirpour for a Herbal Vaporizer. Balch and Amirpour disclose devices powered by connection to a static AC outlet and contain a mouth piece for the user to draw on in order to inhale the vapor that is produced.

[0008] More recently, portable vaporizing devices have been used for application with liquid concentrates that contain nicotine as an active ingredient. The purpose of these devices is to mimic a cigarette containing rolled tobacco and to deliver nicotine to the user without the health risks associated with the combustion process. These devices do not generally contemplate use as a delivery method for substances other than nicotine.

[0009] These devices incorporate technologies that can be simply described as a battery powering an internal coil or wire which heats moisture in the air that is drawn into the device by the user's inhalation action. This inhalation draws the resulting steam, or vapor, through a mouth piece, which contains a mesh cartridge soaked with the liquid concentrate, and into the user's mouth and lungs.

[00010] If the mesh soaked with liquid is proximate to the heater, some incidental vaporization of the liquid may occur. Generally, however, the steam produced by these devices does not contain any active ingredients from the liquid, and the user inhales steam along with small particles of the unvapourized liquid. Another flaw with this design is that the mesh cartridge it is exposed to open airflow which results in incidental evaporation.

[00011] The mesh cartridge allows users to manually refill the liquid substance. However, this may be hazardous because:

[00012] - liquid may be spilled during the refilling process, potentially contaminating skin and nearby surfaces with active ingredient(s), causing a health hazard both the user and to others in the environment;

[00013] - mesh cartridges that are overfilled may cause the user to experience backwash of the liquid when inhaling through the device, which may result in the user consuming an over dose of the active ingredient(s); and

[00014] - overfilling the mesh cartridges also may result in the liquid seeping through the mesh to contaminate and damage the device's internal electronics.

[00015] These devices lack a means for controlling the form (liquid or gaseous), quantity and quality of the active ingredient(s) being delivered to and inhaled by the user; and a means for inserting the active ingredient(s) into the device that does not pose a health risk for the user or risk potential damage to the device itself.

[00016] These devices also lack a method for controlling or monitoring the intake of the active ingredient(s) even though the device is often intended to be used as a tool for gradually decreasing or eliminating consumption of such active ingredient(s).

[00017] Additionally, the design of these devices may include the following flaws:

[00018] - they lack a mechanism to prevent accidental use by children;

[00019] - the open airflow approach enables dust particles and moisture to come into contact with internal electrical components and contaminate the liquid concentrate;

[00020] - their activation system, which relies on an airflow sensor to trigger the heater when a user draws air into the device, constantly draws power from the battery when the device is not in use, resulting in decreased battery life and life-span of the device; and

[00021] - their internal components are susceptible to overheating and burning, which may result in combustion, presenting the same health hazards the use of these devices is intended to prevent;

[00022] A portable electronic vapor-producing device that avoids the aforementioned limitations would allow users to inhale the gaseous form of chemical substances for therapeutic or medicinal purposes without being exposed to the health

and safety issues associated with existing devices. Such a device would also have the benefit of being a more reliable consumer product as it would be less susceptible to damage through normal use.

[00023] US Patent Application Pub. No. 2012/0090630 to Lik, entitled Flameless Electronic Atomizing Cigarette and US Patent No. 7,832,410 to Lik, disclose portable vaporizing devices that rely on airflow or touch sensors. US Patent No. 8,156,944 to Han discloses a similar portable vaporizing device that incorporates an airflow sensor and an atomizer. Similarly, PCT Application No. PCT/US2008/059299 to Paterno et al. discloses a portable vaporizing device that relies on producing vapor when air is passed over a coil which has been heated by a rechargeable battery. A mechanism for monitoring usage of the device and battery life is also disclosed.

[00024] In each of these portable vaporizing devices, it is disclosed that the vapor is produced when air is drawn into a chamber containing a microprocessor that is configured to react to the airflow by triggering the activation of the battery which in turn supplies power to a heating element. The vapor is then drawn further into the chamber and through a reusable cartridge containing a nicotine-based liquid, which is inhaled by the user.

Summary of the Invention:

[00025] The present invention generally pertains to a portable electronic vapor-producing device which converts chemical substances in liquid form to a gaseous form so that active ingredient(s) may be inhaled by the user for therapeutic or medicinal purposes.

[00026] An embodiment of the invention includes: a power module; a primary module; and an auxiliary module that may be enclosed separately in exterior hollow casings and fitted together, or enclosed together in one single exterior hollow casing.

[00027] The exterior casing, which may be cylindrical or tubular in shape, includes a distal end-cap fitted into the power module end, and a proximal end-cap fitted into the auxiliary module end.

[00028] The power module contains a disposable or rechargeable battery which is insertable or removable through the distal end-cap.

[00029] The primary module includes: an anode assembly; a cask assembly; and a heater assembly.

[00030] The anode assembly includes:

[00031] 1) an anode barrel, which is hollow, fixed in place and is in electrical contact with the battery;

[00032] 2) a cathode mount, which is fixed in place and is in electrical contact with the heater assembly; and

[00033] 3) an anode mount, which is moveable between the anode barrel and cathode mount.

[00034] The anode barrel and anode mount both have attracting magnets (of opposite polarity) so that, when the device is not active, the anode mount is pulled within the anode barrel, away from the cathode, and does not contact the cathode mount to close the circuit.

[00035] The cask assembly includes a mesh plug that can be filled with a liquid concentrate through a one-way valve, which is accessible by a cut-out in the exterior casing.

[00036] The heater assembly includes a metal coil which is heated when the device is activated.

[00037] The auxiliary module includes a mouth piece and a monitoring assembly which may optionally include: a printed circuit board; a battery, a LED display; a USB port; a moisture sensor; and thumb print reader.

[00038] To activate the device, a user inhales through the mouth piece in the auxiliary module, which draws air into the device through cut-outs in the exterior

casing above and below the anode barrel. The pressure of the air flow pulls the anode mount forward so that it comes in contact with the cathode mount to close the circuit and activate the device.

[00039] As the air flow continues to be drawn through the device, it is pulled through the cask assembly's mesh plug where the air is moistened with the liquid concentrate, then through the heater assembly where it is heated to produce a steam-like vapor, and finally the air passes through the auxiliary module's mouth piece where it may be inhaled by the user.

[00040] The components of the auxiliary module's monitoring assembly function together to perform such actions as calculating, storing and displaying data relative to the number of times the device has been activated, the quality and quantity of steam-like vapor produced, and the remaining moisture level of the mesh plug.

[00041] A portable vapor-producing device that converts liquid into gaseous form for inhalation by a user is provided, including: a battery; an anode assembly having a first anode member electrically connected to the battery; a cathode at a distance from the first anode member; and a movable anode member moveable from a first position not in contact with the cathode to a second position in contact with the cathode, the moveable anode member magnetically attracted to the first anode member; a cask for storage of a liquid substance; a heating element; and a casing for containing the battery, the anode assembly, the cask and the heating element, the casing having an air inlet and a mouthpiece, the casing defining an airflow passage through the cask assembly wherein air traveling through the airflow passage is moistened by the liquid substance, and the airflow then passes by the heating element, the heating element heating the liquid substance to produce vapor; and then the airflow passing through the mouthpiece; wherein when air enters the inlet because of a vacuum within the casing, the moveable anode member moves from the first position to the second position.

[00042] The cask may include a refillable liquid storage container having a storage cavity, a protruding needle, a one-way valve, and mesh plug suitable for absorbing liquid. The casing may be configured to prevent the liquid substance in the storage

cavity from coming into contact with a user in a liquid form. The liquid storage cavity may be separated from the mouthpiece by the heating element.

[00043] The vapor-producing device may include an air intake control switch to regulate the amount of air drawn into the device. The liquid may be stored in a container that is not replaceable or removable. The power to operate the device may be activated when air is drawn into the anode assembly.

[00044] A portable, battery-operated, electronic vapor-producing device that converts a liquid into gaseous form for inhalation by a user is provided, including: a battery, a cask assembly for holding the liquid, a heating assembly having a heating element for heating the liquid to a gaseous form; and a switch to activate said heating element.

[00045] The liquid may contain an active ingredient convertible into a gaseous form for inhalation by a user for therapeutic or medicinal purposes. The device may include a first and second part casing chamber for containing a power supply, such as a battery, cask assembly, heating assembly and switch, wherein the first and second parts are snap-fitable together to form a singular primary casing chamber enclosed by first and second end caps.

[00046] The power supply may be a disposable or rechargeable battery that is insertable and removable by removal of an end cap. The switch may include an anode in electrical contact with the battery, a cathode and a moveable connecting member in contact with the anode, the connecting member moveable from a first position wherein there is distance between the connecting member and the cathode, and a second position wherein the moveable member is connected to the cathode, thereby completing a circuit. The moveable member may be magnetically attracted to the anode, and configured to move to the second position when air flows through the device.

[00047] The device may include a second switch, actuable by the user, the second switch, when actuated, placing a barrier to prevent actuation of the heating element.

The second switch may place a barrier between the moveable member and the cathode to prevent actuation of the heating element

[00048] The cask assembly may include a primary cavity containing a needle to prick a liquid-filled capsule placed in the cavity; and a one-way valve through which the liquid in the capsule flows into a secondary cavity containing a cotton mesh plug to absorb and hold the liquid.

[00049] The heating element assembly may be a metal coil surrounded by a mesh and enclosed on exterior cylindrical sides by a ceramic insulation, and through which air may be drawn containing liquid particles to be heated and converted into gaseous form for inhalation. The vapor producing device may include a mouth piece having an aperture running the length of the mouth piece through which the user can, with a sucking action, draw air into the casing chamber, by the liquid contained in the cask assembly, and then through the heating assembly where the liquid is converted into a gaseous form that the user is able to inhale.

[00050] The vapor producing device may include a second nonrechargeable battery; a printed circuit board; a microprocessor; a moisture sensor with probe; an LED light; an LED display panel; a button; an airflow sensor; an audio signal; a USB port, and a thumb print reader.

[00051] The switch may include an anode in electrical contact with the battery, a cathode and a ball bearing, the ball bearing moveable from a first position wherein it is not in contact with the anode and the cathode, and a second position wherein the ball bearing is in contact with the anode and the cathode, the ball bearing magnetically biased to said first position. When air is drawn into a casing thereby activating the switch, and the air is then drawn through said cask assembly to pick up liquid droplets, and is then draw through the heating assembly wherein the moisturized air is heated to produce a vapour, and then the air exits the device through a mouthpiece.

[00052] The vapor producing device may include a mouthpiece, the battery, switch, cask assembly, and heating assembly may be aligned in a casing. The device

may include a second heating assembly, the cask assembly positioned between the first and second heating assemblies.

Brief Description of the Drawings:

[00053] To assist in the understanding of the invention, drawings depicting embodiments of the invention are appended. The drawings are exemplary only, should not be construed as to limit the invention to any single embodiment, and are not necessarily shown to scale. In the drawings, which form part of this specification:

[00054] Fig. 1 is a front perspective view of a vapor producing device according to the invention;

[00055] Fig. 2 is a disassembled front perspective view thereof;

[00056] Fig. 3 is a back perspective view thereof;

[00057] Fig. 4 is a partially disassembled back view thereof;

[00058] Fig. 5 is a front top perspective exploded view thereof;

[00059] Fig. 6 is a back top perspective exploded view thereof;

[00060] Fig. 7 is a front perspective disassembled view of the primary module;

[00061] Fig. 8 is a front perspective exploded view thereof;

[00062] Fig. 9 is a back perspective disassembled view thereof;

[00063] Fig. 10 is a back perspective exploded view thereof; and

[00064] Fig. 11 is a front disassembled view of an alternate embodiment of the invention..

Detailed Description of the Invention:

[00065] The device according to the invention, generally, is a portable vapor-producing device which converts liquid substances into gaseous form so that active ingredient(s) contained in the liquid substance can be delivered to and inhaled by the user for therapeutic or medicinal purposes.

[00066] The device may be embodied in many different forms and should not be construed as limited to the embodiments described herein, which are exemplary only to disclose the invention in accordance with applicable legal requirements.

[00067] The device incorporates a purpose or intention for its use. The intended purpose may vary, but will generally be to convert a liquid substance into a gaseous form that visually appears as a fine mist and that can be inhaled by the user for therapeutic and/or medicinal benefit. Use of the device incorporates a user's physical action of inhaling, sucking, or drawing air through the mouth and into the lungs.

[00068] The device includes the use of liquid substances that can be converted into gaseous form through a heating process. The type of liquid substance can vary. The liquid substance may not contain any active ingredients, or may contain ingredients without any therapeutic or medicinal value. The liquid substance may contain one type of active ingredient, or a combination or blend of active ingredients. The liquid substance may contain additives for flavor or taste, or may not.

[00069] The embodiments of the invention described herein reference the appended drawings. Throughout the drawings, like numbers refer to like elements. Unless the context clearly dictates otherwise, the singular forms "a", "an" and "the" should be construed to include the plural meaning.

[00070] The embodiments of the invention are now described with reference to the appended drawings Figs. 1 – 11.

[00071] Referring to Figs. 1 and 2, a representative embodiment of the invention is shown, which is a device having a generally cylindrical or tubular shape similar to that of a tobacco cigarette, and including:

- a distal end-cap (2);
- a power module (M1), with an exterior casing (1);
- a primary module (M2), with an exterior casing (6);
- an auxiliary module (M3), with an exterior casing (38); and
- a proximal end-cap (39).

[00072] Although the shape and dimensions of the device can vary, a representative embodiment is generally tubular in shape, similar to that of a cigarette or cigar, with a length of about 12 cm and a diameter of about 1.5 cm.

[00073] The exterior casings (1), (6), (38) of power module (M1), primary module (M2) and auxiliary module (M3), may be individual parts fitted together by friction fit or threaded screw mechanism (not shown) or may be combined into a single casing, and can be made of any heat-resistant non-alloy or alloy material (e.g.: polycarbonate, aluminum or stainless steel), and can be covered in an aesthetically pleasing surface (not shown) or a heat resistant material, such as Teflon. Casing (1), (6), (38) need not be made of metal, and is not required to perform any part of the electrical or electronic functionality of the device.

[00074] The distal end-cap (2) and proximal mouthpiece end-cap (39) may be maintained in place by friction fit, a snap fit, or by threaded screw mechanism (not shown). The distal end-cap may contain a LED light (not shown) to indicate when the device is active.

[00075] As shown in Fig. 5, in an embodiment of the invention, the power module (M1) contains a battery assembly (A1) which includes: a battery mount (3) to hold the battery; a battery flex circuit (4); and a battery (5). The battery (5) may be disposable or rechargeable and may be inserted or removed from the battery assembly (A1) by removing the distal end-cap (2) from the exterior casing (1) as shown in Fig. 2 or alternatively, through an opening in casing (1).

[00076] As shown in Fig. 5, the primary module (M2) includes: an anode assembly (A2) whereby power is transmitted to the heater element (37) from battery (5); a cask assembly (A3) wherein liquid is stored; and a heater assembly (A4) wherein the liquid substance is heated to produce vapor for inhalation.

[00077] The anode assembly (A2) includes anode barrel (13), which is hollow, fixed in place, and is in wired contact with battery (5), cathode mount (22), and anode pin mount (16) which moves to contact cathode mount (22). Anode barrel (13) and anode pin mount (16) both contain magnets of opposite polarity so then when a vacuum is not present they are attracted to each other.

[00078] Switch (20), extending exterior to casing (6) may be present, positionable between cathode mount (22) and anode pin mount (16), so that when actuated by the user by pivoting switch (20), switch (20) blocks cathode mount (22) and anode pin mount (16) from contact and thereby prevents the device from being accidentally activated and draining battery power.

[00079] When air is drawn into the device through air intake holes (10b), (10c), a vacuum is created, moving the anode pin mount (16), which remains in contact with anode barrel (13), to contact the cathode mount (22) thereby completing the circuit and powering the heater assembly (A4) from the battery (5).

[00080] In the embodiment of the invention shown in Fig. 5, the cask assembly (A3) is located between the anode assembly (A2) and heater assembly (A4). In an alternative embodiment of the invention, the heater assembly (A4) may be located between the anode assembly (A2) and cask assembly (A3). In another embodiment of the invention, more than one heater assembly (A4) may be present.

[00081] As shown in Figs. 5 and 6, the auxiliary module (M3) includes a mouth piece mount (42), a mouth piece airflow tube (43) and a mouth piece and monitoring assembly (A5) which includes: a circuit board (44); a battery flex circuit (45); a battery (46); a LED display (47); and a USB port (48). Auxiliary module (M3) casing (38) has

an LED display cutout and a USB port cutout. Monitor LED display cover (40) and a Monitor USB Port cover (not shown) may also be present.

[00082] Mouth piece mount (42) may include a top portion, bottom portion and mouth piece moisture probe aperture. Mouth piece and monitoring assembly (A5) includes mouth piece airflow tube (43) capped with a plastic or rubber gasket through which vapor can be drawn by a user inhaling or sucking. The end of mouth piece airflow tube (43) is positioned at a distance from heating assembly (A4) for safety and to prevent unvaporized liquid from entering a user's mouth.

[00083] Heater assembly (A4) includes vaporizer mount (32) and vaporizer anode lead (34). As shown in Figs. 6 and 8, vaporizer cathode (33), vaporizer heater element (37), first vaporizer mount airflow magnet (35), and second vaporizer mount airflow magnet (36) are also included. Vaporizer heater element (37) may be a metal coil, covered by a fine wire mesh, and encased entirely in a ceramic insulator, except for: (i) its endpoint, into which cold air containing a liquid substance, such as an active ingredient, droplets are drawn; and (ii) the opposite end of element (37) from which vapor is drawn by the user. Magnets (35), (36) have an opposite polarity and provide a seal when the device is not in operation, thereby preventing air (with dust, etc.) being blown back into the cask assembly accidentally. Air pressure causes the magnets (35), (36) to separate and thereby allow the air flow to enter cask chamber (30). Magnets (35), (36) also provide another layer of safety against incidental liquid seepage if the device is not in use for a long period of time. In alternative embodiments of the invention, a rubber dam or filter could be substituted, or for magnets (35), (36). In yet another embodiment, cask chamber 30 can be mechanically moved into an open position from a closed position when the device is actuated, for example by a manual switch (not shown) or by completion of the circuit by the anode assembly (A2).

[00084] Cask assembly (A3) includes cask mount (29), cask chamber (30) and one way cask valve (31). The cask assembly (A3) also includes a needle (not shown). The user can place a small plastic capsule containing the liquid substance, which may include an active ingredient, into cask chamber (30). The needle will make a small hole

in the capsule and allow the liquid substance to drain through one way valve (31) and be absorbed into the cotton mesh plug), or other moisture retaining plug.

[00085] In yet another alternative embodiment an overflow limit plug (not shown) may be part of cask assembly (A3). Applying air pressure from the airflow causes the plug to open and allows liquid to exit. After the pressure is normalized, the plug returns to block liquid from exiting cask assembly (A3).

[00086] The anode assembly (A2) includes cathode mount (22) partially covered by cathode mount airflow cover (25) to control the airflow and cathode (23) at the opposite end thereto. Also present are cathode mount airflow magnet (26), a first cathode mount airflow cover guide rod (27) and a second cathode mount airflow cover guide rod (28) for positioning cover (25).

[00087] Anode switch (20), including anode switch guide rod (21), is positioned between cathode mount (22) and the anode barrel (13). Adjacent to anode switch (20) are first anode airflow tube (14) and second anode airflow tube (15) through which the air flows, anode pin mount (16), first anode pin mount magnet (17) and second anode pin mount magnet (18), and anode pin (19). Anode pin (19) is sized to be received by anode barrel (13), and so that when a vacuum is present, anode pin (19) is still partially within anode barrel (13) and thus in contact with anode barrel (13) and thereby completes the circuit with cathode mount (22). In an alternative embodiment, anode barrel (13) may be shaped in a ring through which anode pin (19) can move. .

[00088] First anode air intake control switch (8) and second anode air intake control switch (9) are positioned on opposite sides of anode barrel mount (10). First anode barrel mount magnet (11) and second anode barrel mount magnet (12) are at an end of anode barrel (13). Anode barrel mount magnets (11), (12) and anode pin mount magnets (17), (18) are of opposite polarity so they are configured to attract each other, thus in the absence of an opposing force caused by a vacuum, anode pin (19) is drawn to and rests within anode barrel (13) and is out of contact with cathode mount (22).

[00089] Referring to Figs. 7 through 10, primary module (M2) is shown in more detail. Anode barrel mount (10) includes top (10a) and bottom (10b). First air intake hole (10c) and second air intake hole (10d) are aligned with first air intake control and second air intake control switch (9), respectively. Anode barrel mount (10) also includes first airflow aperture (10d) and second airflow aperture (10e).

[00090] Anode pin mount (16) includes first anode pin airflow aperture (16a) and second anode pin airflow aperture (16b) to allow air flow.

[00091] Cathode mount (22) includes cathode top portion (22a) and cathode bottom portion (22b). Cathode mount (22) has a number of apertures, including guide rod aperture (22c), lead aperture (22f), and first cathode airflow hole (22d) and second cathode airflow hole (22e) to allow air flow through cathode mount (22).

[00092] Cathode mount airflow cover (25) also has apertures, namely first cover guide rod hole (25a) and second cover guide rod hole (25b) to receive guide rods (27), (28).

[00093] Cask mount (29) of cask assembly (A3) includes top portion (29a), bottom portion (29b), cask mount moisture probe aperture (29c) for positioning a moisture probe (not shown); and cask mount anode lead aperture (29d) for positioning wires from cathode (23). Cask chamber (30) has a corresponding cask chamber moisture probe aperture (30a) for further positioning the moisture probe. The moisture probe can measure the amount of moisture remaining in the capsule within cask chamber (30).

[00094] Vaporizer mount (32) in vaporizer assembly (A4) includes top portion (32a), bottom portion (32b), vaporizer moisture probe aperture (32c) for positioning the moisture probe, first vaporizer anode lead aperture (32d) and second vaporizer anode lead aperture (32e) for positioning wires from cathode (23), and main airflow aperture, first auxiliary airflow aperture and second auxiliary airflow aperture for controlling air flow though the vaporizer assembly. When the airflow approaches vaporizer assembly, magnets (35), (36) are pushed back and the airflow enters the vaporizer mount and passes through the airflow apertures.

[00095] Mouthpiece and monitoring assembly (A5) has a number of components for effective use of the device. As described previously, mouthpiece and monitor assembly (A5) may include a battery (46) (which may be non-rechargeable), a printed circuit board with a microprocessor (44), an airflow sensor (not shown), an LED light (not shown), LED display (47), a button protruding from the casing of the device (not shown), the moisture probe, and a USB port (48).

[00096] Battery (46) supplies power to the other components of mouthpiece and monitor assembly (A5). The moisture probe is placed in the mesh plug and is used by the circuit board (44) to determine when to activate the LED light if the mesh plug is dry.

[00097] The airflow sensor may be configured to trigger an audible signal when the user actuates the device by drawing air. This could be used to serve as an alarm should someone be using the device without permission, thereby functioning as a child safety mechanism.

[00098] The microprocessor and circuit board (44) use the LED display (47) to display information to the user such as the battery life remaining, number of inhalations counted, current moisture level, and time device has been in use.

[00099] If a nonrechargeable battery (46) is used, it should last for approximately the useable life span of the cotton mesh plug, so that when the battery dies, the device should be replaced, and a notice to the user to that effect can be provided.

[000100] The protruding button can be used by the user to change the LED display, reset the inhalation counter, or turn on and off the audible signal.

[000101] The USB port (48) is used to connect the device to a computer with the appropriate software which can communicate with the microprocessor and report usage information to the user. The software should be configured to display to the user appropriate graphs and graphical displays indicating such information.

[000102] Fig. 11 displays an alternative embodiment of the invention, which includes pre-heating chamber (37a). Pre-heating chamber (37a) receives the airflow prior to the air entering cask assembly (A3) and vaporizer mount (32). The air is thus pre-heated, and is able to retain more liquid droplets from the cotton mesh plug.

[000103] Pre-heating chamber (37a) may also serve as an extra chamber near cask chamber (30) to receive any liquid seepage from cask chamber (30) and help prevent the liquid substance from flowing through the device.

[000104] In operation, a user draws air through mouth piece airflow tube (43). The amount of air drawn in is adjustable by setting first and second air intake control switches (8, 9). The airflow generates a vacuum, drawing anode pin mount (16) towards cathode mount (22).

[000105] Anode pin mount (16) contacts cathode mount (23) completing the circuit and activating the device. When the vacuum has ended, first and second anode barrel mount magnets (11, 12) cause anode pin mount (16) to return to a rest position, and break the circuit. The circuit activates vaporizer heating element (37), to vaporize the air containing liquid substance droplets from the cotton mesh.

[000106] In the embodiment of the invention shown in Fig. 11, once the circuit is actuated as described above, pre-heating chamber (37a) is activated by the completed circuit and begins to heat the air. The hot air then contacts fibers soaked in the liquid substance from capsule. The air, now containing suspended droplets of the active ingredient, then enters the vaporizer mount (32). In the vaporizer mount (32) warm moist air is produced and then delivered through the mouthpiece to the user, appearing as a mist and containing the active ingredient of the liquid substance.

[000107] In an alternative embodiment of the invention (not shown), the capsule may contain a fiber glass rope connecting pre-heating chamber (37a) and vaporizer mount (32).

[000108] In an embodiment of the invention, the capsule may be sold with vaporizer assembly (A4) and/or pre-heating chamber (37a) as an insertable unit.

[000109] Of note is the controlled airflow through the device. The air enters at one location through air intake holes (10b), (10c) and is directed through the device to pick up liquid droplets contained in the mesh which is then vaporized by heating element (37) before exiting the device through the mouthpiece. In the alternative embodiment shown in Fig. 11, the airflow is directed through pre-heating chamber (37a) before absorbing moisture from the mesh.

[000110] In an alternative embodiment of the invention, instead of air intake control switches (8), (9), threaded screws could be used to adjust the airflow manually. The screws could be used to close the air intake holes (10b), (10c), and thus prevent use of the device until opened, which may prevent a child from using the device. Adjustable intakes also allow users to replicate the holes present on cigarette filters, to adjust the resistance when inhaling, and replicate the smoking experience.

[000111] Other alternative embodiments of the invention may use springs and/or memory foam instead of, or in addition to, magnets (11), (12), (17), (18). For example springs could be used to draw anode pin mount (16) to anode barrel (13). A sponge or memory foam could also be used to for such a purpose.

[000112] Other embodiments of the invention may have alternatives to anode assembly (A2). For example a ball bearing, magnetically attracted to a conical storage unit, may be drawn by air pressure to connect an anode and cathode to complete the circuit. In another alternative embodiment, a moveable mechanical switch operable from outside the casing of the device could be used to actuate the circuit. Other alternatives include circuits actuable by voice, kinetic action, or even by detection of heat and moisture at the mouthpiece.

[000113] In another alternative embodiment of the invention, the device may be operable only by a user with the appropriate thumb print or voice command. A thumb print reader (not shown) could be placed on the casing of the device, or a microphone included within the electronics.

[000114] The above-described embodiments have been provided as examples, for clarity in understanding the invention. A person with skill in the art will recognize that alterations, modifications and variations may be effected to the embodiments described above while remaining within the scope of the invention as defined by claims appended hereto.

Claims:

1. A portable vapor-producing device that converts liquid into gaseous form for inhalation by a user, comprising:

- a. a battery;
- b. an anode assembly having:
 - i. a first anode member electrically connected to said battery;
 - ii. a cathode at a distance from said first anode member;
 - iii. a movable anode member moveable from a first position not in contact with said cathode to a second position in contact with said cathode, said moveable anode member magnetically attracted to said first anode member;
- c. a cask for storage of a liquid substance;
- d. a heating element;
- e. a casing for containing said battery, said anode assembly, said cask and said heating element, said casing having an air inlet and a mouthpiece, said casing defining an airflow passage through said cask assembly wherein the air traveling through said airflow passage is moistened by said liquid substance, and said airflow then passes by said heating element, said heating element heating said liquid substance to produce vapor; and then said airflow passing through said mouthpiece;

wherein when a user's action of sucking through the said mouthpiece causes air to be drawn into said inlet, and the pressure of the air pulls said movable anode member from said first position to said second position to close the circuit and activate the heating element, the air is drawn through said cask where it is moistened by the liquid substance, and then through said heating

element where it is heated to produce a vapour that travels through said mouthpiece and is inhaled by the user.

2. The vapor-producing device of claim 1 wherein said cask comprises a refillable liquid storage container having a storage cavity, a protruding needle, a one-way valve, and mesh plug suitable for absorbing liquid.
3. The vapor-producing device of claim 2 wherein said casing is configured to prevent said liquid substance in said storage cavity from coming into contact with a user in a liquid form.
4. The vapor-producing device of claim 1 wherein the liquid storage cavity is separated from said mouthpiece by said heating element.
5. The vapor-producing device of claim 1 wherein the liquid substance is drawn to the heating element by airflow pressure.
6. The vapor-producing device of claim 5 wherein the direction of the airflow is the same as the direction of the liquid being drawn to the heating element.
7. The vapor-producing device of claim 1 further comprising an air intake control switch to regulate the amount of air drawn into the device.
8. The vapor-producing device of claim 1 wherein the liquid is stored in a container that is replaceable or removable.
9. The vapor-producing device of claim 1 wherein the power to operate the device is activated when air is drawn into the anode assembly.
10. A portable, battery-operated, electronic vapor-producing device that converts a liquid into gaseous form for inhalation by a user, wherein the device comprises:
 - a. a battery,
 - b. a cask assembly for holding the liquid,

- c. a heating assembly having a heating element for heating the liquid to a gaseous form; and
 - d. a switch to activate said heating element..
11. The device of claim 10 wherein the liquid contains an active ingredient heatable into a gaseous form for inhalation by a user for therapeutic or medicinal purposes.
12. The vapor-producing device of claim 10 further comprising a first and second part casing chamber for containing said battery, cask assembly, heating assembly and switch, wherein said first and second parts are snap-fittable together to form a singular primary casing chamber enclosed by first and second end caps.
13. The vapor producing device of claim 10 wherein the battery is a rechargeable battery that is insertable and removable by removal of an end cap.
14. The vapor producing device of claim 10 wherein said switch comprises an anode in electrical contact with said battery, a cathode and a moveable connecting member in contact with said anode, said connecting member moveable from a first position wherein there is distance between connecting member and said cathode, and a second position wherein said moveable member is connected to said cathode, thereby completing a circuit.
15. The vapour producing device of claim 14 wherein said moveable member is magnetically attracted to said anode, and is configured to move to said second position when air flows through said device.
16. The vapor producing device of claim 10 further comprising a second switch, actuatable by a user, said second switch, when actuated, placing a barrier to prevent actuation of said heating element.
17. The vapor producing device of claim 15 further comprising a second switch, actuatable by a user, said second switch, when actuated, placing a barrier between

said moveable member and said cathode to prevent actuation of said heating element

18. The vapor producing device of claim 10 wherein the cask assembly comprises a primary cavity containing a needle to prick a liquid-filled capsule placed in said cavity; and a one-way valve through which the liquid in the capsule flows into a secondary cavity containing a mesh plug to absorb the liquid.
19. The vapor producing device of claim 10 wherein the heating element assembly is a metal coil surrounded by a fine mesh and enclosed on exterior cylindrical sides by a ceramic insulation, and through which air is drawn containing liquid particles to be heated and converted into gaseous form for inhalation.
20. The vapour producing device of claim 19 wherein the heating element assembly is encased in a polycarbonate cavity that is coated with a heat-absorbing substance to insulate the outer casing.
21. The vapor producing device of claim 12 further comprising an aperture running a length of a mouth piece through which the user can, with a sucking action, draw air into the casing chamber, by the liquid contained in the cask assembly, and then through the heating assembly where the liquid is converted into a gaseous form that the user is able to inhale.
22. The vapor producing device of claim 10 further comprising:
 - a. a second nonrechargeable battery;
 - b. a printed circuit board;
 - c. a microprocessor;
 - d. a moisture sensor with probe;
 - e. an LED light;
 - f. an LED display panel;

- g. a button;
- h. an airflow sensor
- i. an audio signal; and
- j. a USB port.

23. The vapor producing device of claim 10 wherein said switch comprises an anode in electrical contact with said battery, a cathode and a ball bearing, said ball bearing moveable from a first position wherein it is not in contact with said anode and said cathode, and a second position wherein said ball bearing is in contact with said anode and said cathode, said ball bearing magnetically biased to said first position.
24. The vapor producing device of claim 10 wherein said air is drawn into a casing thereby activating a switch, and said air is then drawn through said cask assembly to pick up liquid droplets, and is then drawn through said heating assembly wherein said liquid droplets are turned to vapour, and then said air exits said device through a mouthpiece.
25. The vapor producing device of claim 10 further comprising a mouthpiece, and wherein said battery, switch, cask assembly, and heating assembly are aligned in a casing.
26. The vapour producing device of claim 24 further comprising a second heating assembly, said cask assembly positioned between said first and second heating assemblies.