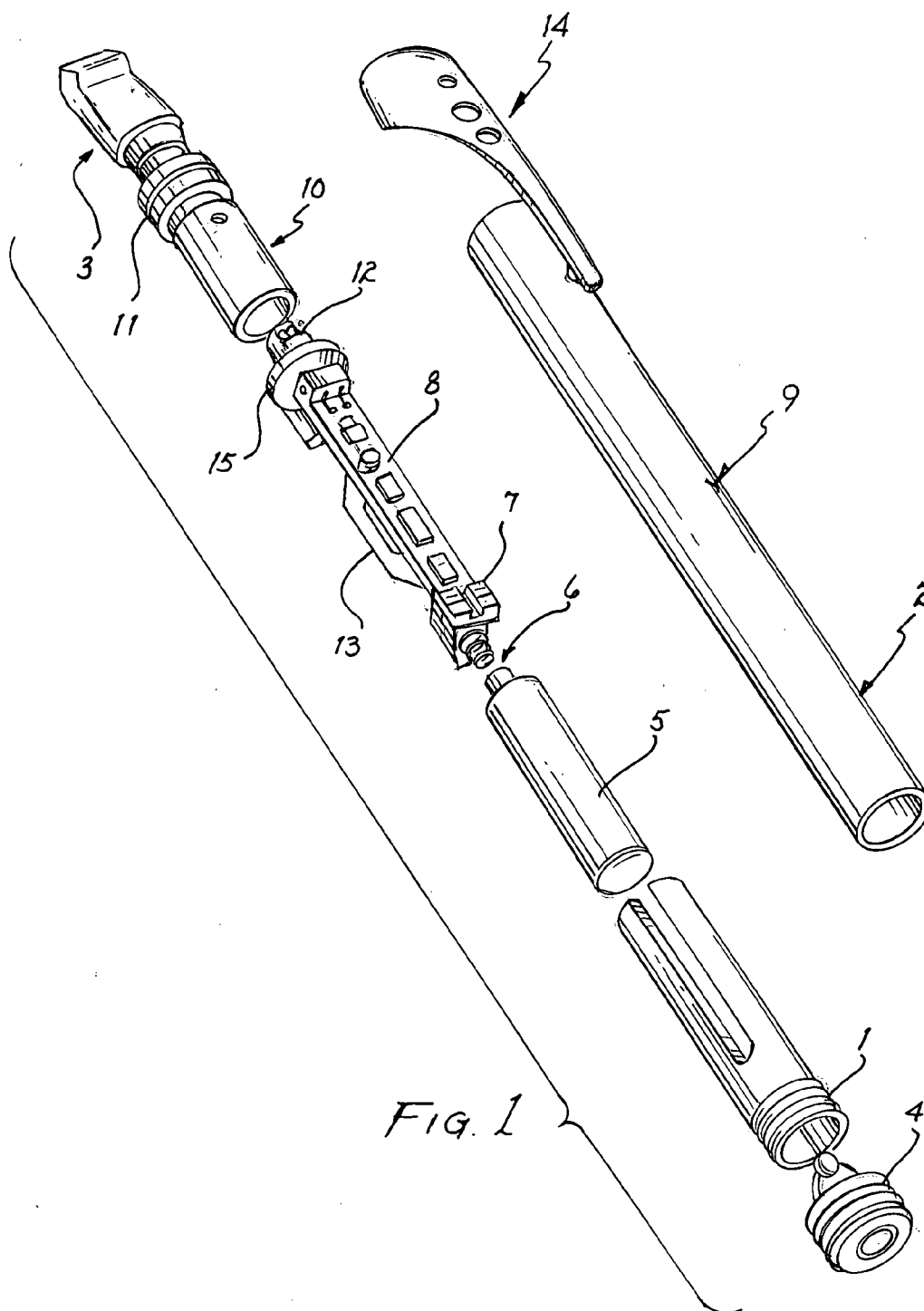


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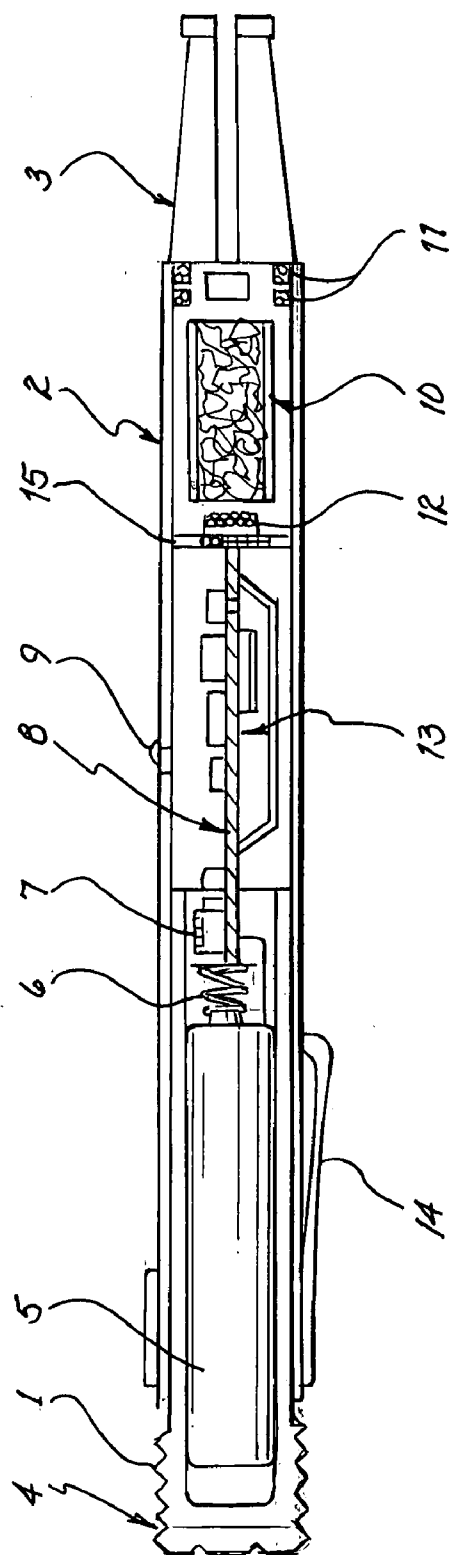


FIG. 2

ELECTRONIC EVAPORABLE SUBSTANCE DELIVERY DEVICE AND METHOD

FIELD OF THE INVENTION

[0001] The present invention relates to electronic substance delivery devices and, more particularly, to an electronic cigarette-like evaporable substance delivery device.

BACKGROUND OF THE INVENTION

[0002] The smoking of cigarettes and, to a lesser extent, cigars and pipes, remains very popular throughout the world. Increasingly, however, there is an awareness of the health-risks associated with tobacco smoke. In the West in particular, there has been in recent years a flurry of legislation aimed at reducing smoking in public places so as to reduce exposure of non-smokers to second-hand smoke. This has made it substantially more difficult for smokers to engage in smoking activity.

[0003] While the health-risks associated with tobacco smoke are well known, recent research points to the many health benefits associated with nicotine itself. Nicotine has been shown to improve attention, memory and overall mood. Most studies nevertheless conclude that the health benefits of nicotine are far outweighed by the carcinogenic effects of tobacco smoke. Nicotine gum and nicotine patches have been developed as non-carcinogenic delivery systems for nicotine. However, while these methods of nicotine intake can be effective in delivering nicotine into the body, studies have shown that many smokers have a psychological addiction to the use of cigarettes themselves. Many smokers have grown accustomed to the oral fixation and manual manipulation that is associated with cigarette smoking. A need therefore exists for a device capable of delivering nicotine while mimicking the smoking experience, but without the carcinogenic effects associated with tobacco smoke.

[0004] Various versions of an electronic cigarette have been disclosed. See PCT applications entitled "A Flameless Electronic Atomizing Cigarette" (WO 2004/095955); "A Flameless Electronic Atomizing Cigarette" (WO/2004/080216); and "An Aerosol Electronic Cigarette" (WO/2005/099494). These devices rely on an atomizer high frequency vibrator and aerosol, respectively, to convert a nicotine solution into gas form for inhalation. These devices do not provide for a means for monitoring the amount and controlling the delivery of nicotine. In addition, these devices do not contemplate the delivery of other therapeutic substances other than nicotine. Finally, these devices do not disclose or suggest alternative mechanisms (besides high frequency vibration and aerosol technology) for the dispersion of nicotine or other therapeutic substances in gas form. Therefore, a need remains for an improved electronic substance delivery device.

SUMMARY OF THE INVENTION

[0005] In accordance with an embodiment of the present invention, an electronic evaporable substance delivery device is provided. The device comprises, in combination: a case; a power source located in an interior of the case; a printed circuit board located in the interior of the case; a microprocessor located on the printed circuit board and in communication with the power source; a heating element in communication with the microprocessor; a cartridge containing an evaporable substance proximate the heating element; an air path opening located in the case; a mouthpiece located at a

first end of the case wherein the mouthpiece has a channel therein and is in communication with the air path opening so that air entering the case through the air path opening may be sucked through the mouthpiece; and a switch configured to activate the microprocessor upon a sucking of air through the interior of the case by a user.

[0006] In accordance with a further embodiment of the present invention, an electronic nicotine delivery device is provided. The device comprises, in combination: a case; a power source located in an interior of the case; a printed circuit board located in the interior of the case; a microprocessor located on the printed circuit board and in communication with the power source; a heating element in communication with the microprocessor; a nicotine-containing cartridge proximate the heating element; an air path opening located in the case; a mouthpiece located at a first end of the case wherein the mouthpiece has a channel therein and is in communication with the air path opening so that air entering the case through the air path opening may be sucked through the mouthpiece; a display device in communication with the microprocessor, the display device configured to display data of at least one of a substance intake and battery power levels; a switch configured to activate the microprocessor upon a sucking of air through the interior of the case by a user; and a light located at a second end of the case, the light configured to indicate at least one of a nicotine intake level and battery power levels.

[0007] In accordance with an additional embodiment of the present invention, a method for delivering an evaporable substance is disclosed. The method comprises: providing an electronic evaporable substance delivery device comprising, in combination: a case; a power source located in an interior of the case; a printed circuit board located in the interior of the case; a microprocessor located on the printed circuit board and in communication with the power source; a heating element in communication with the microprocessor; a cartridge containing an evaporable substance proximate the heating element; an air path opening located in the case; a mouthpiece located at a first end of the case wherein the mouthpiece has a channel therein and is in communication with the air path opening so that air entering the case through the air path opening may be sucked through the mouthpiece; and a switch configured to activate the microprocessor upon a sucking of air through the interior of the case by a user; providing power from the power source to the microprocessor; the microprocessor causing the heating element to heat; air entering the case being heated by the heating element; the heated air coming into proximity with the evaporable substance in the cartridge; at least a portion of the evaporable substance boiling and producing a vapor; and the vapor exiting the case via the mouthpiece.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0008] FIG. 1 is a perspective, exploded view of an electronic evaporable substance delivery device consistent with an embodiment of the present invention.

[0009] FIG. 2 is a side, cross-sectional view of the electronic evaporable substance delivery device of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Referring first to FIG. 1, an electronic evaporable substance delivery device consistent with an embodiment of

the present invention is shown. Initially, it should be noted that the device is adapted to permit a user to inhale a vapor containing preferably nicotine and perhaps other additives, and to exhale that vapor. The device is electronically powered, generally re-useable, does not require "lighting" in the conventional manner that a cigarette is commonly lit, and does not produce second-hand smoke of the type associated with cigarettes. It should be clearly understood that while in the preferred embodiment, the evaporable substance is comprised primarily of nicotine, substantial benefit could be derived from alternative embodiments of the present invention in which other substances having a therapeutic effect (such as medications, herbs, or vitamin compounds) are evaporated for a user to inhale.

[0011] The user may insert the mouthpiece **3** into his or her mouth. The mouthpiece **3** may comprise a hard plastic, rubber, or other desired material. It should be noted that some users enjoy chewing on the end of a cigar or cigarette, and it may be desired to provide a mouthpiece **3** comprising a deformable material, to facilitate such activity.

[0012] As shown in FIG. 2, the mouthpiece **3** contains a channel therethrough which opens into an interior of the device. Air path hole **9** permits the entry of outside air into the device interior. The user may inhale, causing a sucking action that is communicated via that channel and drawing in ambient air via air path hole **9**. That sucking action may cause reed switch **13** to move, sending a signal to a microprocessor located on printed circuit board **8** that "smoking" has been initiated. The microprocessor may then send a signal, activating heating member **12**. The heating member **12** may be a heating coil, light emitting diode, an infra-red device, a laser, vibration chamber, pressure chamber, butane or other flame, or other device capable of bringing nicotine (or another substance) to its boiling point.

[0013] Where the heating member **12** is a heating coil, it is noted that the passage of current therethrough causes warming, at a level dependent upon the amount of current, which can be controlled. Air entering via air path hole **9** passes through the heating coil and is heated, causing hot air to hit the cartridge **10**, boiling and vaporizing its contents.

[0014] Where the heating element **12** is a laser, a beam is focused at a heat collector. Where the heating element **12** is infrared, an infra-red LED heats a heat collector. In both examples, air entering via air path hole **9** passes directly through the heat collector, causing hot air to hit the cartridge **10**, boiling and vaporizing its contents.

[0015] The heating member **12** is located proximate cartridge **10**, which may contain therein nicotine mixed with a low boiling point substance (e.g., propylene glycol) and, optionally, flavors and/or other additives. For example, flavored nicotine, or other flavored evaporable substances could be provided in cartridges **10**, allowing users different the experience of inhaling and tasting different flavors. Activation of the heating member **12** causes the contents of the cartridge **10** to reach their boiling point, producing a vapor. The vapor is inhaled by the user via the channel located in mouthpiece **3**. Cartridge **10** may be replaced when emptied by removal from the device of the mouthpiece **3**. Heat shield **15** may be interposed between the heating member **12** and the printed circuit board **8**, to protect components thereon.

[0016] The microprocessor may maintain the heating member **12** at a constant temperature, where desired, using a smart monitoring circuit located on the printed circuit board **8**, so as to limit power consumption and/or optimize performance.

The microprocessor may utilize an algorithm software program that calculates nicotine consumption by the user and may store the amount of consumption in onboard flash memory integrated into the microprocessor. The printed circuit board **8** may further comprise at least one display device **7**, in communication with the microprocessor, to relay data to the user regarding, for example, nicotine intake and/or battery power levels. The display device **7** may be one or more light emitting diode (in one embodiment, nicotine intake quantity may be communicated by a blinking of the display device, with each blink corresponding to the nicotine associated with a single cigarette), a liquid crystal display, or other display. In one embodiment, the display device **7** may be a radio frequency transmitter, adapted to relay data (including data saved in memory) to the user via a remote radio frequency receiver (not shown). In this manner, a user may monitor and/or track nicotine consumption.

[0017] The device, including the heating member **12** and microprocessor **8**, is powered by power source **5**. Power source **5** may be a replaceable or rechargeable battery, inserted against battery spring **6**. Where rechargeable, the battery may be removed for recharging or, optionally, be recharged while remaining in the device by placement of the device in contact or proximity to a docking device (not shown). The microprocessor can also be used to monitor the battery when charging. The docking station itself may be battery-operated, so that it can recharge the device a number of times when away from an AC outlet. This docking station may be the size of a pack of cigarettes and have a collapsible plug so that it plugs directly into the wall. It may also be provided with a storage compartment, for use in carrying replacement cartridges **10**.

[0018] At least the power source **5**, printed circuit board **8**, heating element **12** and cartridge **10** may be retained within a case **2**. In the preferred embodiment, the case **2** and the mouthpiece **3** together approximate a tobacco cigarette in size and form factor, although it should be clearly understood that substantial benefit could be deprived from an alternative embodiment of the present invention in which the case **2** with or without a mouthpiece **3** together approximate a tobacco cigar in size and form factor.

[0019] In one embodiment, a lighted tip **4** may be provided at an end of the case **2**. The lighted tip **4** may be in contact with the power source **5** and may also be activated by movement of the reed switch **13**, so as to light when "smoking action" is occurring. The lighted tip **4** may simulate the lighting of an end of a cigarette or cigar.

[0020] A pocket clip **14** may be provided on an exterior of the case **2**. The pocket clip **14** facilitates clipping of the case **2** to the interior of a shirt pocket or the like.

[0021] While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

We claim:

1. An electronic evaporable substance delivery device comprising, in combination:

- a case;
- a power source located in an interior of said case;
- a printed circuit board located in said interior of said case;
- a microprocessor located on said printed circuit board and in communication with said power source;

a heating element in communication with said microprocessor;

a cartridge containing an evaporable substance proximate said heating element;

an air path opening located in said case;

a mouthpiece located at a first end of said case wherein said mouthpiece has a channel therein and is in communication with said air path opening so that air entering said case through said air path opening may be sucked through said mouthpiece; and

a switch configured to activate said microprocessor upon a sucking of air through said interior of said case by a user.

2. The device of claim 1 wherein said evaporable substance is nicotine.

3. The device of claim 1 wherein said power source is a replaceable battery.

4. The device of claim 1 wherein said power source is a rechargeable battery.

5. The device of claim 1 further comprising a heat shield interposed between said heating element and said printed circuit board.

6. The device of claim 1 further comprising a display device in communication with said microprocessor, said display device configured to display data of at least one of a substance intake and battery power levels.

7. The device of claim 1 further comprising a light located at a second end of said case, said light configured to indicate at least one of a substance intake level and battery power levels.

8. The device of claim 1 further comprising a pocket clip coupled to an exterior of said case.

9. The device of claim 1 wherein said case and said mouthpiece substantially resemble a tobacco cigarette.

10. An electronic nicotine delivery device comprising, in combination:

- a case;
- a power source located in an interior of said case;
- a printed circuit board located in said interior of said case;
- a microprocessor located on said printed circuit board and in communication with said power source;
- a heating element in communication with said microprocessor;
- a nicotine-containing cartridge proximate said heating element;
- an air path opening located in said case;
- a mouthpiece located at a first end of said case wherein said mouthpiece has a channel therein and is in communication with said air path opening so that air entering said case through said air path opening may be sucked through said mouthpiece;
- a display device in communication with said microprocessor, said display device configured to display data of at least one of a substance intake and battery power levels;
- a switch configured to activate said microprocessor upon a sucking of air through said interior of said case by a user; and
- a light located at a second end of said case, said light configured to indicate at least one of a nicotine intake level and battery power levels.

11. The device of claim 10 wherein said power source is a replaceable battery.

12. The device of claim 10 wherein said power source is a rechargeable battery.

13. The device of claim 10 further comprising a heat shield interposed between said heating element and said printed circuit board.

14. A method for delivering an evaporable substance comprising:

providing an electronic evaporable substance delivery device comprising, in combination:

- a case;
- a power source located in an interior of said case;
- a printed circuit board located in said interior of said case;
- a microprocessor located on said printed circuit board and in communication with said power source;
- a heating element in communication with said microprocessor;
- a cartridge containing an evaporable substance proximate said heating element;
- an air path opening located in said case;
- a mouthpiece located at a first end of said case wherein said mouthpiece has a channel therein and is in communication with said air path opening so that air entering said case through said air path opening may be sucked through said mouthpiece; and
- a switch configured to activate said microprocessor upon a sucking of air through said interior of said case by a user;

providing power from said power source to said microprocessor;

said microprocessor causing said heating element to heat;

air entering said case being heated by said heating element;

said heated air coming into proximity with said evaporable substance in said cartridge;

at least a portion of said evaporable substance boiling and producing a vapor; and

said vapor exiting said case via said mouthpiece.

15. The method of claim 14 wherein said evaporable substance is nicotine.

16. The method of claim 15 further comprising the step of said microprocessor calculating an amount of nicotine exiting said case via said mouthpiece.

17. The method of claim 15 further comprising displaying said amount of nicotine exiting said case via said mouthpiece to a user.

18. The method of claim 15 wherein said step of displaying occurs on a display device located on said case.

19. The method of claim 15 wherein said amount of nicotine exiting said case via said mouthpiece to a user is communicated from said case to another device.

20. The method of claim 14 wherein said heating element comprises at least one of a heating coil, a light emitting diode, an infra-red device, a laser, a vibration chamber, a flame, and a pressure chamber.

* * * * *