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(54) **ELECTRONIC CIGARETTE**

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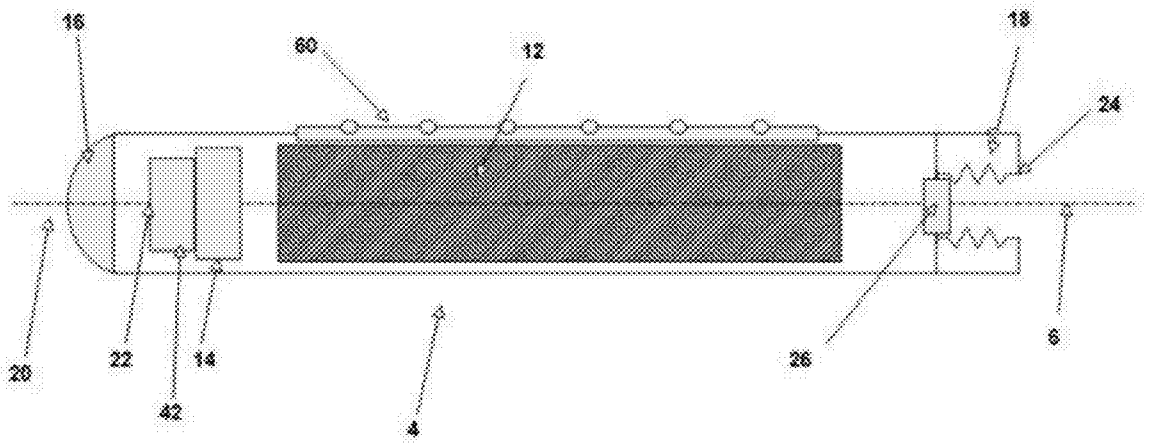
(57) **ABSTRACT**

This invention relates to an electronic cigarette having L.E.D. indicators to indicate the usage of the electronic cigarette as well as memory devices for storing and generating data and charts on the usage of the electronic cigarette. The invention also relates to an improved cartomizer as well as a method of monitoring the inhalation of smoke from an electronic cigarette.



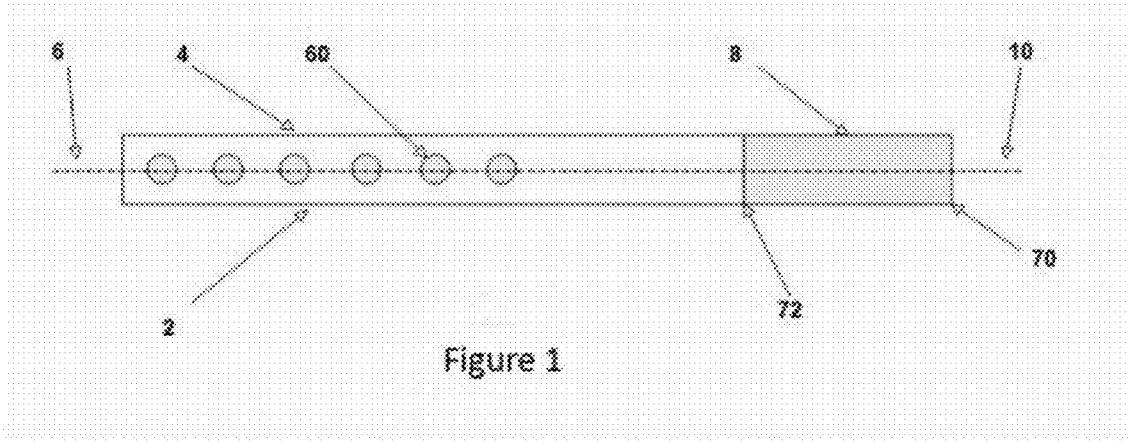


Figure 1

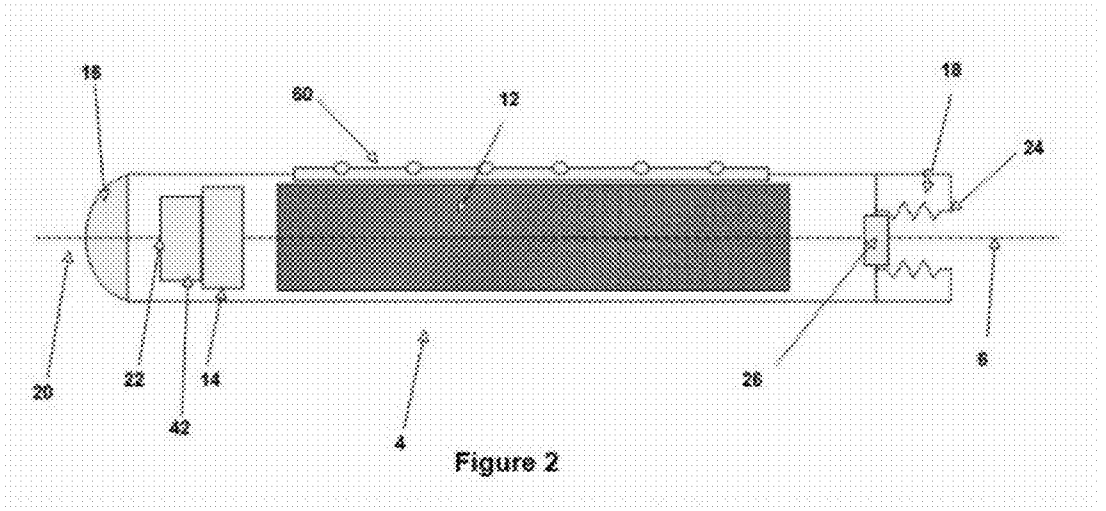


Figure 2

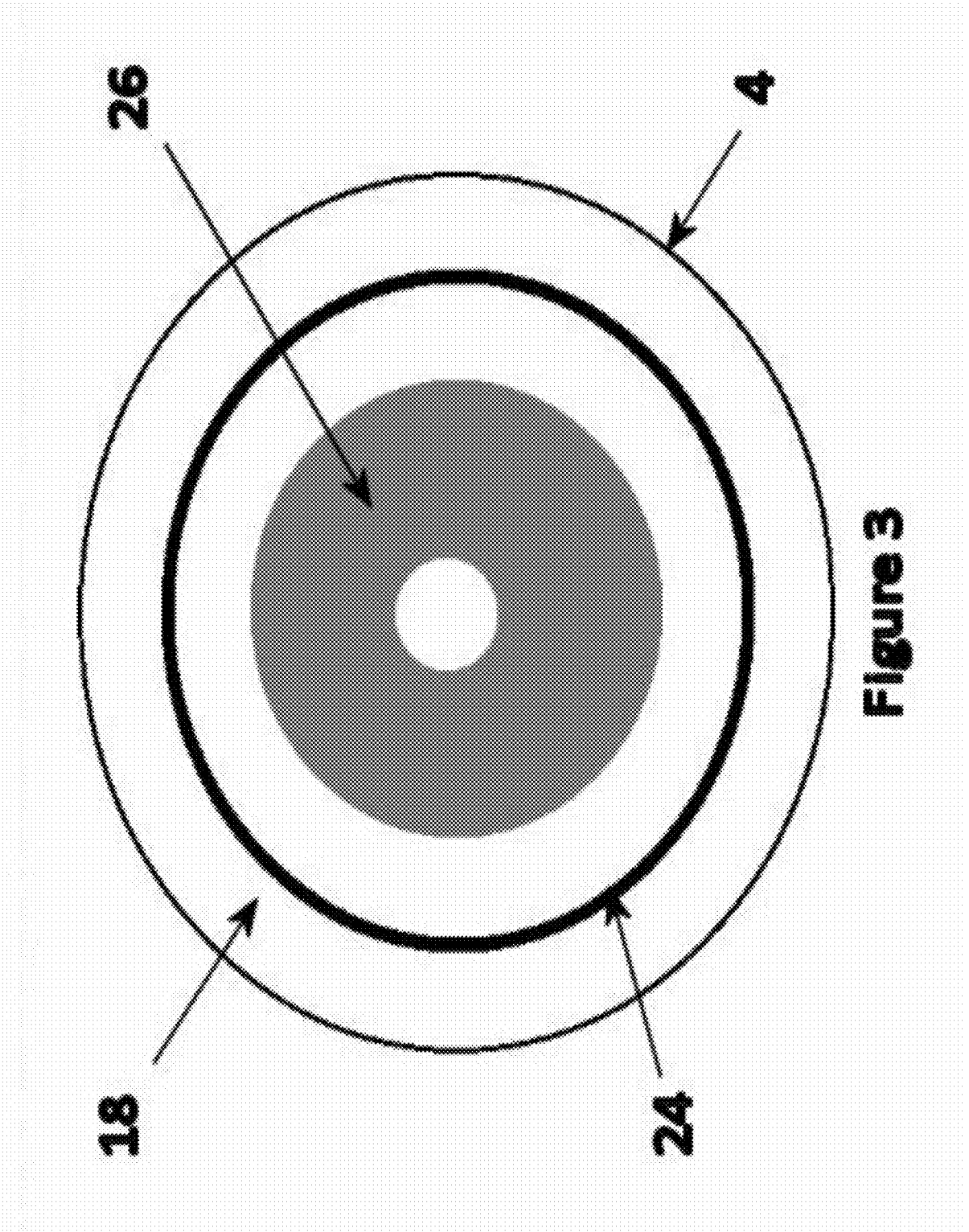


Figure 3

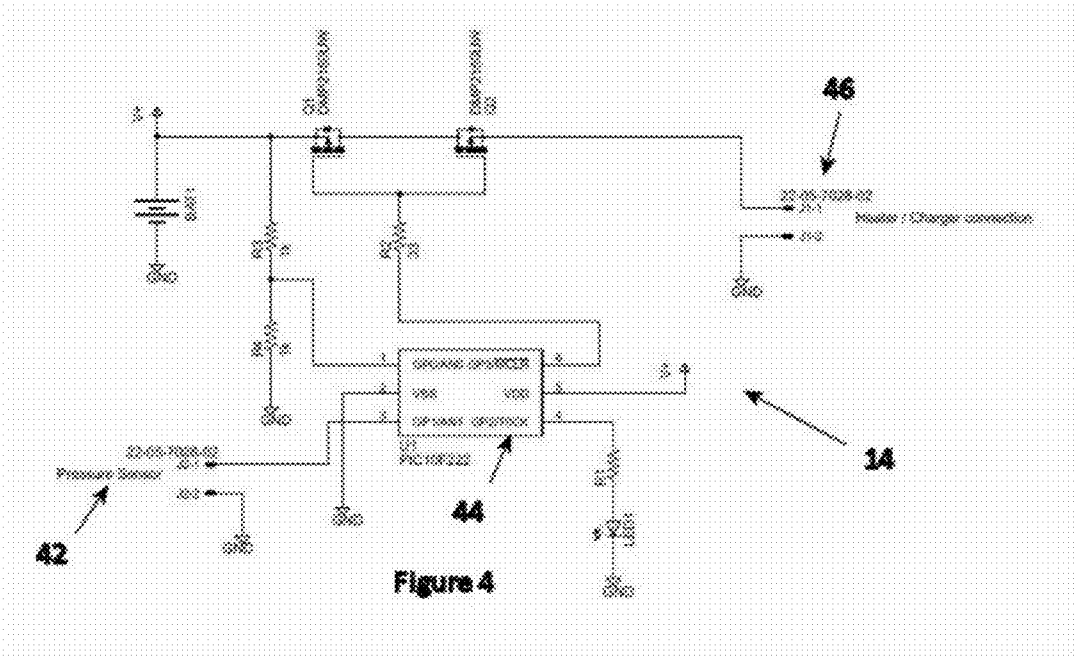


Figure 4

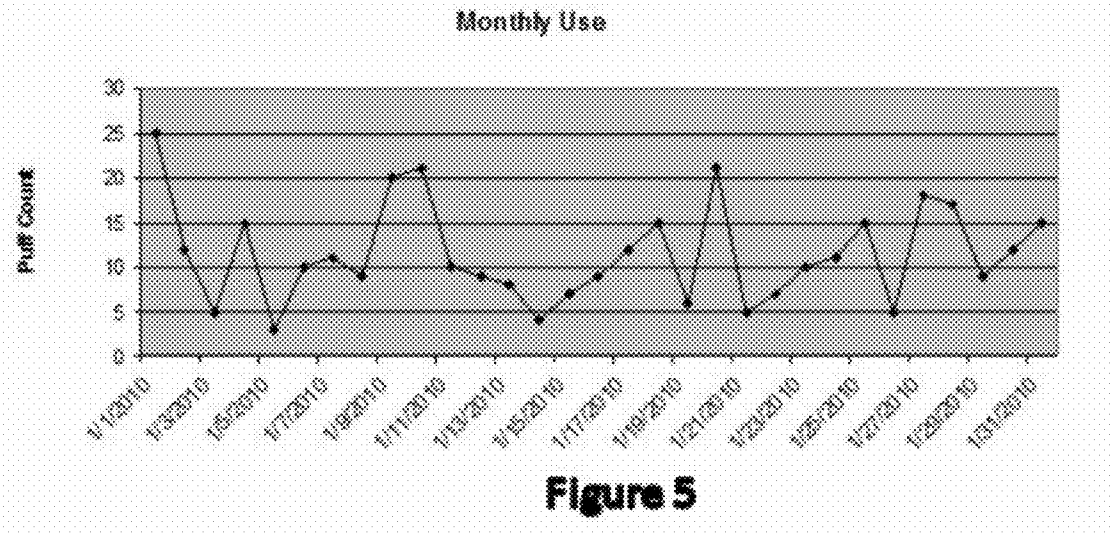


Figure 5

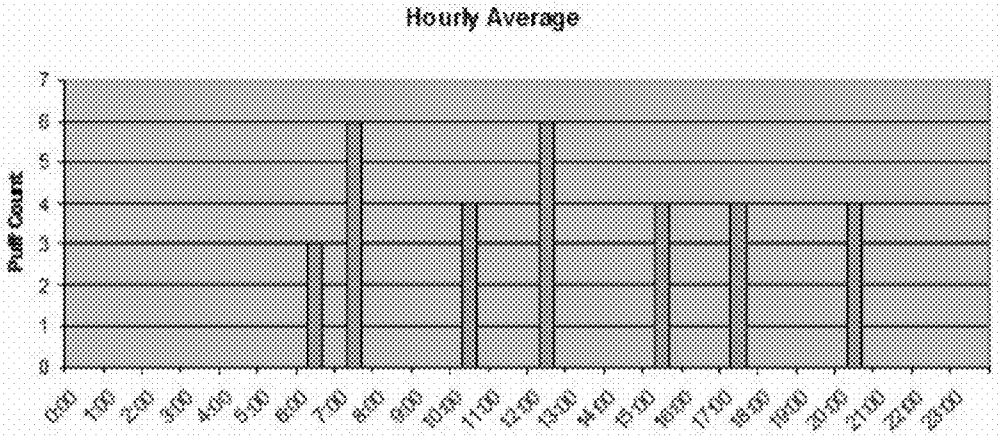


Figure 6

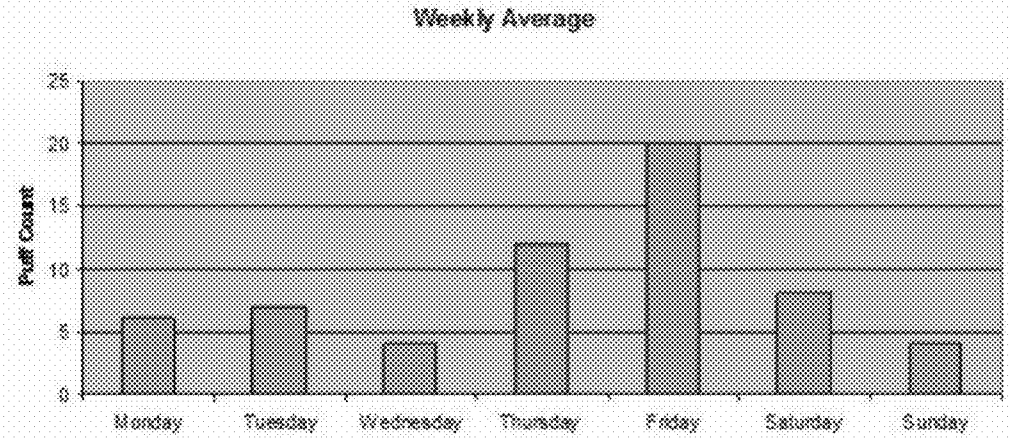


Figure 7

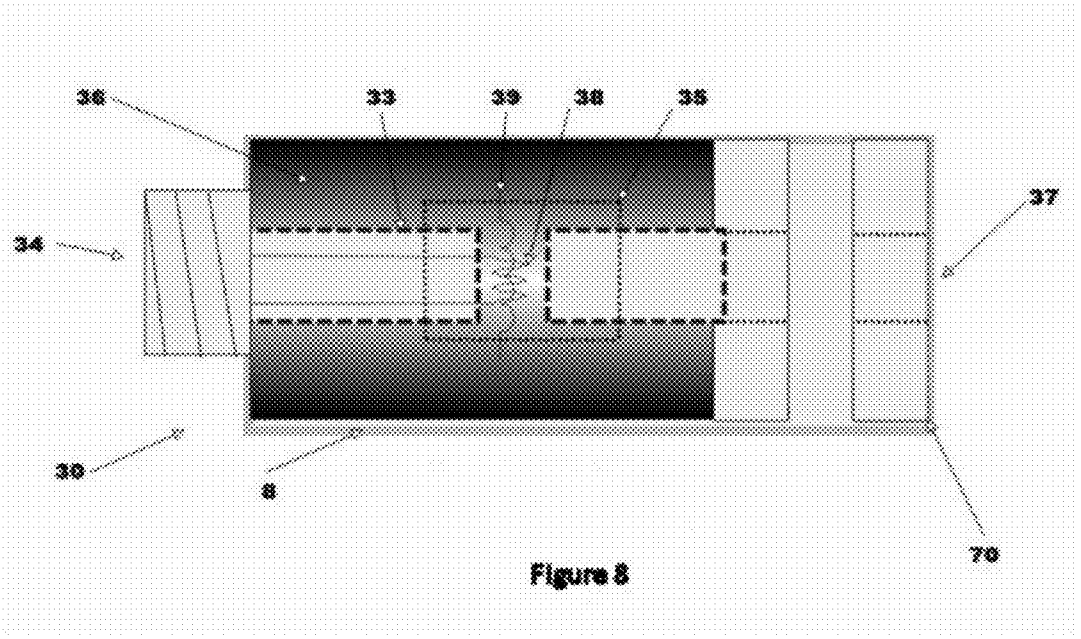


Figure 8

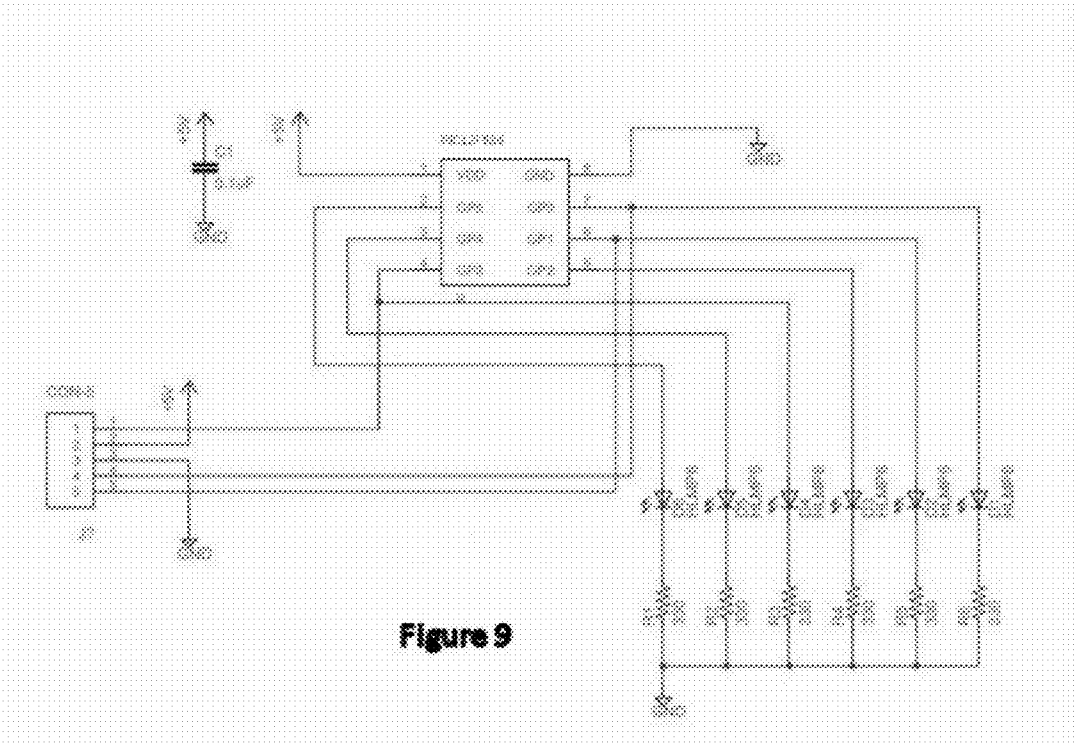


Figure 9

ELECTRONIC CIGARETTE

FIELD OF INVENTION

[0001] This invention relates to an electronic cigarette having L.E.D. indicators to indicate the usage of the electronic cigarette as well as memory devices for storing and generating data and charts on the usage of the electronic cigarette. The invention also relates to an improved cartomizer as well as a method of monitoring the inhalation of vapor from an electronic cigarette.

BACKGROUND TO THE INVENTION

[0002] Electronic cigarettes or e-cigarettes have recently been developed and generally comprise a battery-powered device that provides inhaled doses of nicotine or non-nicotine vapourized solutions. It is an alternative to smoking tobacco products such as cigarettes, cigars or pipes in addition to providing nicotine delivery. The vapour can also provide a flavor or physical sensation to that of inhaled tobacco smoke although no smoke or combustion is actually involved in the operation.

[0003] Generally speaking, when a user inhales an electronic cigarette, air flow is detected by a sensor which activates a heating element which vapourizes a liquid solution stored in the device. A typical e-cigarette will include a L.E.D. light cover, a battery, an atomizer and a cartridge. In some models, the cartridge and atomizer are combined in one as a cartomizer. Various prior art electronic cigarettes have been manufactured and sold.

[0004] For example, U.S. 2009/0283103 discloses a docking station for an electronic vaporizing device where the docking station includes a housing, one or more charging slots in the housing for plurality, and a spare battery for use with the electronic vaporizing device.

[0005] Yet another arrangement is shown in U.S. 2007/0074734 which refers to a smokeless lighter that includes a heater sized to accommodate a smokeable article such as a cigarette, such that a portion of the cigarette protrudes from the lighter. Optionally, a light may be used to indicate when air is drawn through the smokeless lighter.

[0006] Furthermore, U.S. 2010/0200008 shows reveals a smokeless cigarette that provides for the dispensation of vitamins to the user by way of a vitamin-infused cartridge whereby a liquid mixture of vitamins and/or botanicals are injected into a liquid-supplying bottle within the nicotine cartridge for inhalation and absorption by the user.

[0007] Moreover, U.S. Pat. No. 5,269,327 shows features an article where a tobacco flavor medium is electronically heated to evolve inhalable tobacco flavors or other components in vapor or aerosol form. The article has a plurality of charges of the tobacco flavor medium which are heated sequentially to provide individual puffs.

[0008] Yet another arrangement is shown in U.S. 2005/0016550 which illustrates an electronic cigarette having a casing with in an inhalation hole and a substantially cylindrical configuration. Pressure in a cavity filled with a liquid flavored generating medium is changed by driving an actuator to eject the flavor generating medium as droplets from a nozzle in communication with the cavity.

[0009] Another arrangement is shown in U.S. 2006/0196518 which displays a cigarette which includes a smoke mouth integer comprised with a shell, a cell, a high frequency ionizer, nicotine solution storage and its container, control circuit, a display screen, a human contact sensor, a piezoelectric supersound atomizer, a high temperature vaporization nozzle and attachments, an electro-thermal vaporization nozzle installed in the air suction end of the shell goes through an electronic control pump or valve with a measuring chamber and a liquid storage container which contains nicotine solution and is connected to the electric control pump or valve with a one-way flow valve, the control circuit plate having four export ends individually connected to the high-frequency ionizer, electric heater, pump or valve, and a display screen, a human resistance sensor and an airflow sensor are connected to the input end of the control circuit.

[0010] Yet another arrangement is shown in U.S. 2009/0095311 which relates to an aerosol electronic cigarette includes a battery assembly, an atomizer assembly and a cigarette bottle assembly and also includes a shell which is hollow and integrally formed.

[0011] Furthermore, U.S. 2010/0031968 shows an electronic smoking substitute device which includes a tube containing a reservoir containing a liquid. The liquid includes a substance to be inhaled by the user, for example, a nicotine dilution. The device also has a heating element. The heating element is a coil and is in direct contact with the reservoir. A power source is arranged to power the heating element.

[0012] Another arrangement is shown in U.S. 2007/0267031 which relates to an electronic atomizing cigarette that includes a shell and a mouthpiece. The external wall of the shell has an air inlet. An electronic circuit board, a normal pressure cavity, a sensor, a vapor-liquid separator, an atomizer, a liquid-supplying bottle are sequentially provided within the shell, wherein the electronic circuit board comprises an electronic switching circuit and a high frequency generator. A stream passage of the sensor is provided on one side of the sensor, and a negative pressure cavity is provided in the sensor. The atomizer and the liquid-supplying bottle is in contact with each other. An atomization cavity is arranged in the atomizer.

[0013] It is an object of this invention to provide and improve the electronic cigarette and method of monitoring the usage of electronic cigarettes. It is also an object of this invention to provide an improved cartomizer which is easier to construct and more efficient than that of the prior art.

[0014] It is an aspect of this invention to provide an electronic cigarette having: a power means; a heating means; a fluid; an electronic circuitry means for sensing a negative pressure in the electronic cigarette for heating the fluid to produce a vapour when a user puffs on the electronic cigarette; and an indicating means associated with the circuitry means to indicate the usage of the electronic cigarette.

[0015] In one embodiment of the invention, the heating means comprises a cartomizer having: a hollow tube shape with an inlet and outlet; a foam substrate for receiving the fluid; a fiberglass member within the atomizing cavity and in contact with the foam substrate to draw fluid into the atomizing cavity; and a heating element within the atomizing cavity and about the fiberglass member to vaporize the fluid in the atomizing chamber.

[0016] It is another aspect of the invention to provide a method of monitoring the inhalation of vapor from an electronic cigarette comprising: sensing a negative pressure in the electronic cigarette when a user puffs on the electronic cigarette; heating a fluid in the electronic cigarette upon sensing of the negative pressure so as to vaporize a portion of the fluid in the electronic cigarette; storing data regarding the usage of

the electronic cigarette in a memory device; and generating charts from the memory device displaying usage of the electronic cigarette.

[0017] It is yet another aspect of this invention to provide an electronic cigarette comprising: a first hollow cylindrical member having: a battery; electronic circuitry including: a micro-controller and pressure sensor for sensing a pressure drop in the electronic cigarette; and an electronic switch activated by the micro-controller upon sensing of the pressure drop; a second hollow cylindrical member having a second longitudinal axis for coaxial alignment with the first longitudinal axis of the first hollow cylindrical member having: a cartomizer with: a hollow tube shape having an inlet and outlet; foam substrate for receiving the fluid; and a heating element for vaporizing the fluid when the microcontroller senses a pressure drop to activate the switch to heat the heating element upon a user puffing on the electronic cigarette; indicating lights for indicating the usage of the electronic cigarette, a memory device associated with the indicating lights and electronic circuitry for recording the usage of the electronic cigarette.

[0018] These and other objects and features of the invention shall now be described in relation to the following drawings:

DESCRIPTION OF THE DRAWINGS

[0019] FIG. **1** is a side plan view of the electronic cigarette.

[0020] FIG. **2** is a cross-sectional view of the first hollow cylindrical member or hollow tube **4**.

[0021] FIG. **3** is an end view of FIG. **2**.

[0022] FIG. **4** is an electronic schematic view of the electronic circuitry.

[0023] FIG. **5** shows one example of a usage chart.

[0024] FIG. **6** illustrates another example of a usage chart.

[0025] FIG. **7** is another example of a usage chart.

[0026] FIG. **8** is a side elevation view of a cartomizer.

[0027] FIG. **9** is an electronic schematic view of the indicator lights.

DETAILED DESCRIPTION OF THE INVENTION

[0028] Like parts are given like numbers throughout the figures. The drawings are not necessarily to scale but rather illustrate the invention as claimed.

[0029] FIG. **1** generally illustrates the electronic cigarette **2** which has a first hollow cylindrical member **4** disposed along the first longitudinal axis **6** and a second hollow cylindrical member **8** having a second longitudinal axis **10** for co-axial alignment with the first longitudinal axis **6**.

[0030] FIG. **2** illustrates in more detail the first hollow cylindrical member **4** which is a holding tube that houses the battery or power unit **12** and the electronic circuitry means or electronic control board **14** and the end cap **16** and a female screw terminal **18** engageable with the second hollow cylindrical member **8** in the manner to be described more fully herein.

[0031] The first hollow cylindrical member **4** includes a first end **20** which terminates at the end cap **16**. The end cap **16** can contain a LED light **22** which can be activated upon puffing on the electronic cigarette **2** in a manner to be described herein so as to simulate the lit end of a cigarette. The ends **19** and **20** are sealed with the end cap **16** and the screw terminal **18** for connecting the cartomizer **30** to be described herein.

[0032] The battery **12** can be a rechargeable battery or the like and is used to power the electronic circuitry **14** to be described herein. As stated, the battery **12** can be a single use or a rechargeable type. Recharging of the battery **12** can be accomplished through the screw terminal **18** where the threads **24** and terminal **26** provide the positive and negative terminals of the battery **12**.

[0033] FIG. **4** illustrates one embodiment of the electronic circuitry means **14** which includes a small pressure sensor **42** utilized to sense the pressure change applied by the user to the mouthpiece **70**. A microcontroller **44** along with the pressure sensor **42** is used to measure the pressure such as to perform the filtering to ensure proper signal integrity. Once a pressure change is detected the heater means **46** is enabled by way of a solid state switch (MOSFET Q**1** and Q**2** as shown).

[0034] A safety timer is enabled within the microcontroller **44** and is used to turn off the heater **46** if a safety limit of greater than a pre-selected time duration is reached. The timer is reset once the pressure returns to normal. If pressure is removed prior to the pre-selected time duration, the system will turn off the heater means **46** inside the cartomizer **30** generally immediately. As mentioned, the end cap **16** houses a LED light **16** to simulate the look of the cigarette source when activated behind the end cap **16** during the heating operation.

[0035] When a user puffs on the end of the mouthpiece **70** at the second hollow cylindrical member **8**, a pressure drop is created within the electronic cigarette **2** which is sensed by the pressure sensor and microcontroller **44** that activates the heating means **46** as previously described.

[0036] The end cap **16** is a cover that mimics the look of a tobacco cigarette. When the heater means **46** is activated, a light source shines through the end cap **16** to emulate a lit cigarette.

[0037] The screw terminal **18** provides electrical connections to the cartomizer **30** which is located within the second hollow cylindrical member **8**.

[0038] The first hollow cylindrical member **4** also includes indicating means **60** to provide an indication to the user of the approximate usage of the electronic cigarette. Each time a user applies a negative pressure to the electronic cigarette **2** by puffing on the electronic cigarette **2**, the heater means **46** is activated. Whenever the heater power is activated a counter resident in the microcontroller **44** will be activated and displayed on indicating means **60**. When the counter reaches a certain selected count such as for example 6, the next activation will be reset. The indicating means **60** may be displayed on the exterior surface of the first hollow cylindrical member **4** as shown in FIG. **1** or in the circular array of 6 LED located at the end cap **16**.

[0039] In one embodiment, the indicating means **60** is located on the exterior surface of the first hollow cylindrical member **4** and is disposed in a linear fashion. The indicating means **60** can be designed so that the indicator will only stay on when the heater is on or may in another embodiment stay on continuously.

[0040] The data relating to the usage of the electronic cigarette **2** may be stored in the memory of the electronic circuitry means **14** in a non-volatile memory so that it will not be lost once the battery is discharged.

[0041] The circuitry means **14** stores data and can generate usage logs or charts as shown in FIG. **5**. The purpose of the usage log or chart as shown in FIG. **5** is to allow the display of data that is stored in the memory. Each time the user applies

negative pressure and engages the heater means **46**, the count will be logged into the non-volatile memory. A time marker will also be stamped at the same time as the count is recorded. The time stamp will be generated by means of an electronic real time clock. The usage log can be password protected to ensure confidentiality.

[0042] A separate external device can be used to interface with the electronic cigarette **2** by means of a personal computer or the like. The data can be retrievable in one embodiment by means of a link to a personal computer either by using RS323 or USB connection to the screw terminal **18**

[0043] FIG. **5** shows a usage log by month which shows the puff count along the y axis and times of the day along the x axis.

[0044] FIGS. **6** and **7** illustrate other charts that can be generated. The charts can be used by a doctor advising a smoker. For example the charts will be able to graphically illustrate the frequency and time of simulated smoking, for instance that a person smokes more heavily in the morning. Furthermore a doctor will be in a better position to determine if smoking is psychological or addictive in nature and provide treatment regimes or strategies to quit smoking. In another embodiment, the charts can be used to assist in the delivery of medical THC or marijuana.

[0045] FIG. **8** illustrates a cartomizer **30** which is disposed within the second hollow cylindrical member **8**. The cartomizer **30** is generally cylindrical in shape and includes an inlet **34** and an outlet **37**, the cartridge tube **8**, as well as the foam substrate (reservoir which holds liquid) **36**. A non-flammable braided material **33** is used along with a non-flammable wick or fiberglass member **39** which has a nichrome wire **38** wrapped around it.

[0046] More specifically, the electronic cigarette **2** illustrates the cartomizer **30** which comprises a second hollow cylindrical member **8** having an inlet **34** and an outlet **37**. The foam substrate **36** receives and holds the liquid as well as defining an atomizing cavity **35**. The fiberglass member **39** is disposed in the atomizing cavity **35** and is in contact with the foam substrate **36** to draw fluid into the cavity **35**. The heating element **38** is disposed within the atomizing cavity **35** wrapped around the fiberglass member **39** to vaporize the fluid in the atomizing chamber or cavity **35**.

[0047] The fiberglass member **39** acts as a wick to draw fluid into the atomization cavity **35**. In one embodiment the fluid comprises but is not limited to propylene glycol, vegetable glycerin, or other vaporizing liquids.

[0048] FIG. **8** is a cross-sectional view of the cartomizer **30** and illustrates the cartridge tube or second hollow cylindrical member **8** as well as the foam substrate **36**. A non-flammable braided material comprising **33** is used along with a non-flammable wick or fiberglass member **39** with nichrome wire **38** wrapped around it. FIG. **8** also illustrates the foam substrate or reservoir **36** which holds the fluid.

[0049] The second hollow cylindrical member or cartridge tube **8** is used to house the members of the cartomizer **30**. The cartridge tube **8** is shaped to simulate the brown filter end of the tobacco cigarette. On the end **70** of the cartridge tube **8** is an opening **37** to allow the escape of vapour when engaged. End **70** is the mouthpiece. Another end **34** provides the electrical connections to the heater. End **34** provides a mating screw terminal to interface with the screw terminal **18** of the first hollow cylindrical member **4**.

[0050] In one embodiment, the heater means is made from a helical wrap of a heater wire **38** such as nichrome as well as a wick **39** to draw fluid from the reservoir **36**.

[0051] The foam substrate or reservoir **36** holds the fluid to be vaporized. The reservoir **36** is made of a highly porous material that is capable of holding fluids such as propylene glycol, vegetable glycerin, or other vaporizing liquids.

[0052] The foam substrate or reservoir is fire resistant.

[0053] FIG. **9** illustrates an electronic schematic that controls the LED lights associated with the indicating means **60** as previously described.

[0054] Accordingly, the electronic cigarette **2** has a power source **12**, heating means **46**, a fluid, electronic circuitry means **14** for sensing a negative pressure in the electronic cigarette **2** and for heating the fluid to produce a vapour when a user puffs on the electronic cigarette **2**; and indicating means **60** associated with the electronic circuitry means **14** to indicate the usage of the electronic cigarette **2**. There is a memory means associated with the electronic circuitry means **14** for recording the usage of the electronic cigarette **2**. The memory means stores the time and duration of puffs. The memory means can generate charts featuring usage of the electronic cigarette **2**.

[0055] The second hollow cylindrical member **8** houses a cartomizer **30** which comprises:

[0056] (a) A generally cylindrical in shape tube and includes an inlet **34** and an outlet **37**

[0057] (b) a foam substrate **36** for receiving the fluid, the foam substrate **36** defining an atomizing cavity **35**

[0058] (c) a fiberglass member **39** disposed within the atomizing cavity **35** and in contact with the foam substrate **36** to draw fluid into the chamber

[0059] (d) A heating element **38** disposed within the atomizing cavity **35** and wrapped about the fiberglass member **39** to vaporize the fluid in the atomizing chamber.

[0060] The invention described herein also relates to a method of monitoring the inhalation of smoke from an electronic cigarette **2** comprising:

[0061] (a) sensing a negative pressure in the electronic cigarette **2** when a user puffs on a electronic cigarette **2**;

[0062] (b) heating fluid in the electronic cigarette **2** upon sensing a negative pressure so as to vaporize a portion of the fluid in the electronic cigarette **2**

[0063] (c) storing data regarding the usage of the electronic cigarette **2** in a memory device

[0064] (d) Generating data from the memory device and displaying usage of the electronic cigarette **2**.

[0065] The electronic cigarette **2** as described herein illustrates:

[0066] (a) A first hollow cylindrical member **4** disposed along a first longitudinal axis **6** having a rechargeable battery, electronic circuitry which includes a microcontroller **44** along with the pressure sensor **42** for sensing a pressure drop, an electronic switch activated by the microcontroller **44** upon sensing of a pressure drop;

[0067] (b) a second hollow cylindrical member **8** having a longitudinal axis **10** for co-axial alignment with the first longitudinal axis **6** wherein the second hollow cylindrical member **8** has a cartomizer and includes an inlet **34** and an outlet **37**, a foam substrate **36** for receiving the fluid, a heating element **38** for vaporizing the fluid when the microcontroller **44** and pressure sensor **42** senses a

pressure drop to activate the switch to heat the heating element **38** when a user puffs on the electronic cigarette **2**;

[0068] (c) indicating lights **60** for indicating the usage of the electronic cigarette **2**;

[0069] (d) a memory device associated with the micro-controller **44** and associated with the indicating light **60** for recording the usage of the electronic cigarette **2**.

We claim:

1) An electronic cigarette having:

(a) a power means;

(b) heating means;

(c) a fluid;

(d) electronic circuitry means for sensing a negative pressure in the electronic cigarette for heating the fluid to produce a vapour when a user puffs on the electronic cigarette; and

(e) an indicating means associated with the circuitry means to indicate the usage of the electronic cigarette.

2) An electronic cigarette as claimed in claim **1** wherein the indicating means comprises an L.E.D. display.

3) An electronic cigarette as claimed in claim **2** wherein the L.E.D. display comprises a bar indicator disposed along the electronic cigarette.

4) An electronic cigarette as claimed in claim **2** wherein the L.E.D. display comprises a number of L.E.D. lights disposed along the cigarette

5) An electronic cigarette as claimed in claim **4** further including memory means associated with an electronic circuitry means for recording usage of the electronic cigarette.

6) An electronic cigarette as claimed in claim **5** wherein the memory means stores the time and duration of the puffs

7) An electronic cigarette as claimed in claim **6** wherein the memory means generates charts featuring usage of the electronic cigarette

8) An electronic cigarette as claimed in claim **7** wherein the memory means is associated with the indicating means so as to store and display usage of the electronic cigarette.

9) An electronic cigarette as claimed in claim **8** wherein the heating means comprises circuitry and a cartomizer.

10) An electronic cigarette as claimed in claim **9** wherein the cartomizer comprises:

(a) a tube shape having an inlet and outlet;

(b) a foam substrate for receiving the fluid, the foam substrate defining an atomizing cavity;

(c) a fiberglass member disposed within the atomizing cavity and in contact with the foam substrate to draw fluid into the cavity;

(d) a heating element disposed within the atomizing cavity and about the fiberglass member to vapourize the fluid in the atomizing chamber.

11) An electronic cigarette as claimed in claim **10** wherein the fiberglass member acts as a wick to draw the fluid into the atomization cavity.

12) An electronic cigarette as claimed in claim **11** wherein the fluid comprises propylene glycol, vegetable glycerin, or other vaporizing liquids.

13) An electronic cigarette as claimed in claim **12** wherein the electronic circuitry means comprises a microcontroller along with a pressure sensor.

14) An electronic cigarette has claimed in claim **13** wherein the pressure sensor comprises a micro-controller.

15) An electronic cigarette as claimed in claim **14** wherein the heating element is enabled by a MOSFET once a drop in pressure is detected in the chamber.

16) A method of monitoring the inhalation of smoke from an electronic cigarette comprising in:

a) sensing a negative pressure in the electronic cigarette when a user puffs on the electronic cigarette;

b) heating a fluid in the electronic cigarette upon sensing of the negative pressure so as to vapourize a portion of the fluid in the electronic cigarette;

c) storing data regarding the usage of the electronic cigarette in a memory device; and

d) generating charts from the memory device featuring usage of the electronic cigarette.

17) A method as claimed in claim **16** further providing indicating means on the electronic cigarette associated with the memory device to provide a visual indication of the usage of the electronic cigarette.

18) A method as claimed in claim **17** wherein the indicating means comprises a L.E.D. display for recording the number of puffs of a cigarette.

19) An electronic cigarette comprising:

(a) a first hollow cylindrical member disposed along a first longitudinal axis having:

(i) a battery;

(ii) electronic circuitry including:

1. a micro-controller and pressure sensor for sensing a pressure drop in the electronic cigarette; and
2. electronic switch activated by the micro-controller upon sensing of the pressure drop;

(b) a second hollow cylindrical member having a second longitudinal axis for coaxial alignment with the first longitudinal axis of the first hollow cylindrical member having:

(i) a cartomizer with:

1. a tube shape having an inlet and outlet;
2. a foam substrate for receiving the fluid; and
3. a heating element for vapourizing the fluid when the microcontroller senses a pressure drop to activate the switch to heat the heating element upon a user puffing on the electronic cigarette;

(c) indicating lights for indicating the usage of the electronic cigarette;

(d) a memory device associated with the indicating lights and electronic circuitry for recording the usage of the electronic cigarette

20) An electronic cigarette as claimed in claim **19** wherein the memory device generates a selected report on the usage of electronic cigarette.

* * * * *