

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: LI HAN
APPLICATION No.: 13/079,937
FILED: APRIL 5, 2011
FOR: AEROSOL ELECTRONIC CIGARETTE

EXAMINER: DIONNE WALLS
MAYES
ART UNIT: 1747
CONF. NO: 1784

AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated 07/19/2012, please amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 5 of this paper.

[Continued on Next Page.]

Certificate of Electronic Filing

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being electronically filed with the U.S. Patent and Trademark Office on the date entered below.

August 7, 2012
Date of Electronic Submission

Debbie Gilbert
Signature
Debbie Gilbert
Printed Name

76320-8012 US01/LEGAL24335806.1

Please amend the Specification as follows:

Please replace the Specification as filed with the enclosed substitute specification filed under 37 CFR 1.125. The enclosed substitute specification corrects various grammatical and punctuation errors; divides the text into paragraphs; deletes extraneous and redundant content; and adds paragraph numbers for reference.

The Title of the Application is changed to "Electronic Cigarette" to provide a better idiomatic English description of claimed device.

Also enclosed is a copy of the original specification with handwritten markings showing the changes made in preparing the substitute specification.

Statement Under 37 CFR 1.125

The substitute specification contains no new matter.

Amendment to the Claims:

This listing of the claims will replace all prior versions, and listings, of claims in the application:

1-29. (Canceled)

30. (Currently Amended) An aerosol electronic cigarette, comprising:

a battery assembly, an atomizer assembly and a cigarette bottle assembly, and features a shell that is hollow and integrally formed ~~[[]]~~;

the ~~[[said]]~~ battery assembly electrically connected connects with the ~~[[said]]~~ atomizer assembly, and both are located in the ~~[[said]]~~ shell;

the ~~[[said]]~~ cigarette bottle assembly is detachably located in one end of the shell, and fits with the ~~[[said]]~~ atomizer assembly inside it;

the ~~[[said]]~~ shell has through-air-inlets;

the atomizer assembly is an atomizer, which includes a porous component and a heating body;

the ~~[[said]]~~ heating body is heating wire;

the ~~[[said]]~~ atomizer includes a frame;

the ~~[[said]]~~ porous component is supported by the set-on-the-said frame;

the heating wire is wound on the ~~[[said]]~~ porous component;

the ~~[[said]]~~ frame has a run-through hole ~~[[on it]]~~;

~~the-said-porous-component-is-wound-with a heating wire wound in-the-on the-side-in-the-axial-direction-of on a part of the porous component that is substantially aligned with the run-through hole; and with the porous component also positioned substantially within the one end of the said-porous-component fits-in-with-the-said~~
cigarette bottle assembly.

31. (New) An electronic cigarette, comprising:

- a battery assembly and an atomizer assembly within a housing with the battery assembly electrically connected to the atomizer assembly;
- a liquid storage component in the housing;
- with the housing having one or more through-air-inlets;
- the atomizer assembly including a porous component supported by a frame having a run-through hole;
- a heating wire wound on a part of the porous component in the path of air flowing through the run-through hole; and
- the porous component substantially surrounded by the liquid storage component.

32. (New) An electronic cigarette, comprising:

- a battery assembly and an atomizer assembly within a housing with the battery assembly electrically connected to the atomizer assembly;
- with the housing having one or more through-air-inlets and an outlet;
- the atomizer assembly includes a frame having a run through hole, and a porous component between the frame and the outlet;
- a heating wire wound on a part of the porous component which is substantially aligned with the run-through hole; and
- with the porous component in contact with a liquid supply in the housing.

REMARKS

A substitute specification is filed with this Amendment to correct various errors in the original specification.

Claim 30 has been amended to overcome the section 112 rejection at paragraph 3 of the Office Action. Lines 16-17 of original claim 30 are directed to Fig. 18, as shown below.

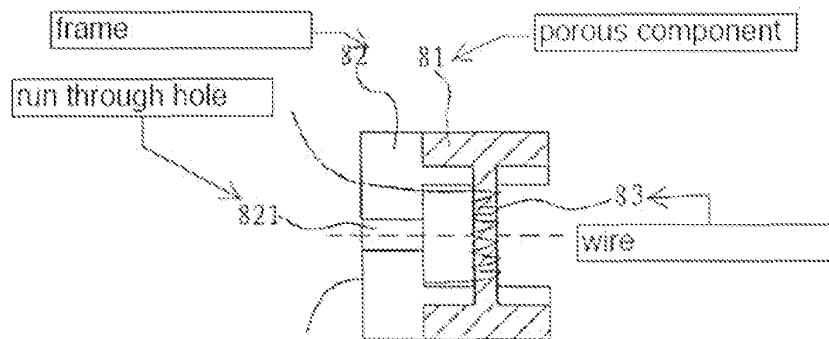


Fig. 18

Claim 30 is accordingly amended to replace "...porous component is wound with heating wire in the on the side in the axial direction of the run-through hole" with "the heating wire is wound on a part of the porous component that is substantially aligned with the run-through hole".

New claim 31 is similar to claim 30 and includes the elements of claim 30, but written with more common English usage. New claim 32 is similar to claims 30 and 31 but describes a heating wire wound on a part of the porous component substantially aligned with the run-through hole, as shown in Fig. 18 above; and with the porous

component in contact with a liquid supply in the housing, rather than the removable bottle assembly of claim 30.

New claims 31 and 32 are believed to be allowable for the same reason that claim 30 is indicated to be allowable at paragraph 4 of the Office Action.

In view of the changes to the claims, the Application is in condition for allowance, and a Notice of Allowance is requested.

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~~APPENDIX~~ ELECTRONIC CIGARETTE

~~TECHNICAL FIELD~~

~~[0001] The present invention relates to an electronic cigarette, in particular, an aerosol electronic cigarette that doesn't contain tar but nicotine.~~

BACKGROUND ART

~~[0002] Today when "smoking is harmful to your health" has become a common sense, there are one billion people smoking cigarettes, and this figure is still rising. On Mar. 1, 2003, the World Health Organization (WHO) issued the first international smoking ban--Framework Convention on Tobacco Control. According to WHO's data, smoking causes 4,900,000 deaths each year. Smoking causes serious respiratory system diseases and cancers, though it is a hard job to persuade the smokers to completely quit smoking.~~

~~[0003] Nicotine is the effective ingredient of cigarette^s ^{in cigarettes} which produces a lot of tar mist as they burn. The tar mist ^{enters} accesses the pulmonary alveolus and is quickly absorbed into the blood. Nicotine thus acts on the receptor of the central nervous system, bringing the euphoria like stimulant drugs to the smokers, who feel light in the head and on wings as well.~~

[0004] Nicotine is a micromolecular alkaloid, which is basically harmless to human bodies ^{at} with a small dosage. Plus, its half life period is extremely short in blood. Tar is the major harmful substance in tobacco. Tobacco tar comprises ~~of~~ several thousands of ingredients, dozens of which are carcinogenic substances. ~~It has now been proved that second hand smoking is even more harmful to those who don't smoke.~~

^{provide} [0005] To seek the cigarette substitutes that ~~don't~~ contain ^{nicotine but not} harmful tar ^{have been used.} but nicotine, many inventors have used the relatively pure nicotine to create such products as "Cigarette Patch", "Nicotine Gargle", "Aerosol Packed in the High Pressure Tank with Propellant", "Nicotine Chewing Gum", and "Nicotine Beverage". These products are not as harmful as tar, but are absorbed very slowly. As a result, ~~its peak concentration can't be effectively established in blood,~~ ⁱⁿ and the smokers can't be satisfied ~~to the full.~~ In addition, the smokers are deprived of the "smoking" habit. ~~Therefore, the substituting products are not real cigarette substitutes or products helping to quit smoking.~~

[0006] The electronic cigarettes currently available on the market may resolve the above-mentioned issue, though they are complicated in structure. ~~Their cigarette bodies can be roughly divided into three sections, which have to be connected through via plugging or thread coupling before use. Also, their batteries have to be changed frequently, making it inconvenient for the users. What's worse, the electronic cigarettes don't provide the ideal aerosol effects, and their atomizing efficiency is not high.~~ ^{they}

Summary

~~CONTENTS OF INVENTION~~

[0007] To overcome the above-mentioned disadvantages, ~~this invention has been designed to~~
provide an aerosol electronic cigarette ~~that substitutes for cigarettes and helps the smokers to quit~~
~~smoking.~~

~~[0008] The purpose of this invention is fulfilled with the following technical solution: 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. The said battery~~
~~assembly connects with the said atomizer assembly and both are located in the said shell. The~~
~~said cigarette bottle assembly is located in one end of the shell, which is detachable. The said~~
~~cigarette bottle assembly fits with the said atomizer assembly. The said shell has through-air~~
~~inlets.~~

[0009] ~~The additional features of this invention are as follows: The said battery assembly includes~~
~~the battery, and the operating indicator, electronic circuit board, and airflow sensor, which are~~
~~connected with the said battery. The signal output of the said airflow sensor is connected with the~~
~~said electronic circuit board.~~

~~[0010] It also includes a check valve. The said battery is a rechargeable battery, which has a~~
~~flexibly connected charging plug. The blades of the said plug come out of the other end of the~~
~~said shell.~~

[0011] Between the said charging plug and rechargeable battery is a spring, which lies against the body of the said rechargeable battery on one end, and its free end ties against the said charging plug.

[0012] The said battery is a rechargeable battery, which has a charging slot on it. The said operating indicator is a LED.

[0013] The said airflow sensor may be alternatively a semiconductor force-sensitive chip, capacitance sensor or an inductance sensor.

[0014] The said electronic circuit board includes an electronic switch circuit.

[0015] The said airflow sensor has a silica gel corrugated membrane, which connects with magnetic steel with a reed relay on one of its ends. Both ends of the said reed relay correspond to the relay electrodes.

[0016] The said airflow sensor has a silica gel corrugated membrane, which connects with magnetic steel with a Hall element or a magneto-diode or a magneto-triode on one of its ends.

[0017] The said atomizer assembly is an atomizer, which includes a porous component and a heating body.

[0018] The said atomizer also includes an electric heating rod. The body of the said porous component has a run-through atomizing chamber. The diameter of the said electric heating rod is less than the diameter of the said atomizing chamber. The said electric heating rod enters into the said atomizing chamber, and there is a clearance between the said electric heating rod and interior wall of the atomizing chamber. The said clearance forms a negative pressure cavity. One end of the said porous component fits with the said cigarette bottle assembly.

[0019] The said electric heating rod includes a cylinder. The said heating body is heating wire, which is wound on the wall of the said cylinder. The said porous component has a protuberance on one end, and the said protuberance fits with the said cigarette bottle assembly. The said protuberance is a half sphere, on the side of which there is a run-through hole connecting to the said atomizing chamber.

[0020] The said electric heating rod includes a cylinder. The said heating body is made of electrically conductive ceramic PTC material. The said heating body is set on the wall of the said cylinder. On the wall of both ends of the said cylinder, there are mandrills respectively. The said porous component has a protuberance on one end, and the said protuberance fits with the said cigarette bottle assembly. The said protuberance is a half sphere, on the side of which there is a run-through hole connecting to the said atomizing chamber.

[0021] The said heating body is heating wire. The said atomizer assembly includes a frame. The said porous component is set on the said frame. The said porous component is wound with heating wire. The said frame has a run-through hole on it. The said porous component is wound

with heating wire in the part that is on the side in the axial direction of the said run-through hole.

One end of the said porous component fits with the said cigarette bottle assembly.

[0022] The said porous component is made of foamed nickel, stainless steel fiber felt, macromolecular polymer foam or foamed ceramics.

[0023] The said heating wire is made of platinum wire, nickel-chromium alloy wire or iron-chromium alloy wire containing rare earth, or is flaked.

[0024] A restriction component, which is detachable, is set on one end of the said porous component. There is a restriction hole on the body of the said restriction component. The said restriction hole corresponds to the said atomizing chamber. The pore diameter of the said restriction hole is less than the inner diameter of the atomizing chamber.

[0025] The said cigarette bottle assembly includes a hollow cigarette holder shell, and a perforated component for liquid storage inside the said cigarette holder shell. One end of the said cigarette holder shell plugs into the said shell, and the outer peripheral surface of the said cigarette holder shell has an inward ventilating groove. On one end surface of the said cigarette holder shell, there is an air channel extending inward.

[0026] The said air channel is located in the center on one end surface of the said cigarette holder shell.

[0027] One end of the said porous component lies against one end surface of the said perforated component for liquid storage, and contacts the said perforated component for liquid storage.

[0028] The said perforated component for liquid storage is made of such materials as PLA fiber, terylene fiber or nylon fiber.

[0029] The said perforated component for liquid storage is plastic foam molding or column of multi-layer plates made through plastic injection with polyvinyl chloride, polypropylene and polycarbonate.

[0030] The said electronic cigarette is held in a charging device.

[0031] The said charging device includes a case, which contains an auxiliary charging storage battery inside it, and holds the electronic cigarette and the charger for the rechargeable battery embedded in the electronic cigarette, as well as the power supply circuit. The power inputs of the said auxiliary charging storage battery and charger are connected with the power supply circuit respectively.

[0032] The said case has a spare liquid supply bottle in it.

[0033] The power output of the said auxiliary charging storage battery is connected with the power input of the said charger.

[0034] The power output of the said charger is a charging slot, which fits with the charging plug of the rechargeable battery inside the said electronic cigarette, or a charging plug, which fits with the charging slot of the rechargeable battery.

[0035] The said charger is a constant voltage & current charger.

[0036] On the body of the said shell, there is a pair of slide ways corresponding to the position of the said electronic cigarette, and on the slide ways, there is a slide cover.

[0037] This invention will bring the following benefits: (1) For this invention, the perforated

A component for liquid storage of the cigarette bottle assembly stores the nicotine liquid only, which doesn't contain cigarette tar, considerably reducing the carcinogenic risks of smoking. At the same time, the smokers can still enjoy the feel and excitement of smoking, and there is no fire hazard since there is no need for igniting. (2) For this invention, the battery assembly and atomizer assembly are directly installed inside the shell, and then connected with the cigarette bottle assembly. That is, there is just one connection between two parts, resulting in a very simple structure. For use or change, you just need to plug the cigarette holder into the shell, providing great convenience. When the nicotine liquid in the cigarette bottle assembly is used up or the cigarette bottle assembly is damaged and needs to be changed, the operation will be extremely easy. (3) For this invention, the rechargeable battery inside the battery assembly has a charging plug, whose blades come out of the shell. When the rechargeable battery inside the electronic cigarette runs out of power, it may be directly plugged into the charger for charging, with no need to remove the rechargeable battery, resulting in very easy use. (4) For this

~~invention, the charging device includes the charger and the auxiliary charging storage battery. The electronic cigarette is put inside the charger when not in use, and then the charging device may be electrified to charge the electronic cigarette and the auxiliary charging storage battery as well. In the event that power supply is not available for the charging device, the auxiliary charging storage battery may be used to charge the electronic cigarette. Therefore, the electronic cigarette can be charged anywhere you go, and it is very suitable for use when you are on a business or tourist trip. Further, the charging device includes a spare liquid supply bottle, which contains nicotine liquid for spare use when you are on a business or tourist trip. (5) For this invention, on one end of the shell of the cigarette bottle assembly, there is an air channel extending inward. The electronic cigarette works to produce mist, which flows to the shell, generating some fine drips; the fine drips are condensed into bigger drips, which fall along the exterior wall of the air channel into the cavity of the shell of the cigarette bottle assembly, so that they are not inhaled by the smoker out of the air channel. (6) In addition, with a little bit modification to the liquid storage, the unit and its connecting structure of this invention may also be loaded with drugs for delivery to the lung.~~

DESCRIPTION OF DRAWINGS

an

[0038] FIG. 1 is the side section view of ~~the electronic cigarette of this invention.~~

housing

[0039] FIG. 2 is the section view of the shell (a) separated from the cigarette bottle assembly ~~of the electronic cigarette of this invention, illustrating the structure of the cigarette bottle assembly that is detachably plug in the shell (a).~~

[0040]FIG. 3 is the diagram of the axial structure of the cigarette bottle assembly ~~of this invention~~, illustrating the ventilating groove on the peripheral surface of the cigarette holder shell.
housing

[0041]FIG. 4 is the side section view of the cigarette bottle assembly ~~of this invention~~, illustrating the structure of the air channel.

9
[0042]FIG. 5 is the side section view of ~~the~~ porous component of the atomizer ~~of this invention~~, illustrating the ~~atomizing chamber, a protruding half sphere structure.~~

an
[0043]FIG. 6 is the diagram of the structure of ~~the~~ electric heating rod of the atomizer ~~of this invention~~.

[0044]FIG. 7 is the side section of the atomizer ~~of this invention~~, illustrating the locations of and connection relation between the electric heating rod and porous component.

[0045]FIG. 8 is the diagram of the ~~cubic structure of the~~ atomizer ~~of this invention~~, illustrating the locations of and connection relation between the electric heating rod and porous component.

a
[0046]FIG. 9 is the section view of ~~the~~ check valve ~~of this invention~~.

[0047]FIG. 10 is the front section view of ^athe restriction component in ^athe second preferred embodiment of ~~this invention~~, illustrating the structure of the restriction component.

[0048]FIG. 11 is ^athe diagram of the axial structure of the cigarette bottle assembly in ^{another}the third preferred embodiment of ~~this invention~~.

[0049]FIG. 12 is ^{a section view taken along line}the A-A section view of FIG. 11.

[0050]FIG. 13 is ^athe diagram of the structure of the electric heating rod of the atomizer in ~~the~~ fourth preferred embodiment of ~~this invention~~.
^{another}

[0051]FIG. 14 is ^athe section view of the porous component of the atomizer in the fourth preferred embodiment of ~~this invention~~.
^{shown in Fig. 13}

[0052]FIG. 15 is ^athe diagram of the axial structure of FIG. 14.

[0053]FIG. 16 is ^athe side section view of the atomizer in the fourth preferred embodiment of ~~this invention~~, illustrating the locations of and connection relation between the electric heating rod and porous component. ^{FIG. 13}

[0054]FIG. 17 is ^athe diagram of the axial structure of the atomizer in ^{another}the fifth preferred embodiment of ~~this invention~~.

[0055]FIG. 18 is the side section view of the atomizer in the fifth preferred embodiment of this invention. [^]
shown in FIG. 17

^{another}
[0056]FIG. 19 is the side section view of the electronic cigarette in the sixth preferred embodiment of this invention, illustrating the diagram of the structure of the airflow sensor adopting Hall element.

^{an}
[0057]FIG. 20 is the electric circuit diagram of the electronic cigarette of this invention, with the airflow sensor adopting a reed relay structure.

^{another} ^{an}
[0058]FIG. 21 is the electric circuit diagram of the electronic cigarette of this invention, with the airflow sensor adopting Hall element.

^c ^{of a}
[0059]FIG. 22 is the diagram of the cubic structure of the charging device of this invention, illustrating the locations of and connection relation of various internal parts.

[0060]FIG. 23 is the side section view of the charging device of this invention, illustrating the structure of slide way and cover.

[0061]FIG. 24 is the diagram of the front structure of the charging device of this invention, illustrating the structure of the sliding cover.

SPECIFIC MODE FOR CARRYING OUT THE INVENTION

[0062] ~~This invention is further described as follows on the basis of the drawings:~~

[0063] As shown in FIG. 1-10, ~~this utility model provides an aerosol electronic cigarette, which~~ includes a battery assembly, an atomizer assembly and a cigarette bottle assembly, and also includes a shell ^{or housing} (a), which is hollow and integrally formed. The battery assembly connects with the atomizer assembly and both are located in the shell. The cigarette bottle assembly is located in one end of the shell, which is detachable. The cigarette bottle assembly fits with the atomizer assembly. The shell has through-air-inlets (a1).

[0064] In this specific embodiment, the battery assembly includes the battery, and the operating indicator (1), electronic circuit board (4), and airflow sensor (5), which are connected with the battery. It also includes a check valve (7). The signal output of the airflow sensor (5) is connected with the said electronic circuit board (4). The battery is a rechargeable battery (3), which may be either a rechargeable polymer lithium ion battery or a rechargeable lithium ion battery. The airflow sensor (5) may be alternatively a semiconductor force-sensitive chip capacitance sensor or an inductance sensor. ⁴ The rechargeable battery (3) has a flexibly connected charging plug (2). The blades (21) of the charging plug (2) come out of the other end of the shell (a). Between the charging plug (2) and rechargeable battery (3) is a spring (6), which lies against the body of the rechargeable battery (3) on one end, while its free end lies against the charging plug (2), forming a flexible structure, which buffers the charging plug (2) when plugged for charging, thus protecting the rechargeable battery against any damage. Of course, the

rechargeable battery (3) in this embodiment has a charging slot on it, which replaces the structure of charging plug (2) to perform the charging function and protect the rechargeable battery (3) against any damage. The operating indicator (1) is a LED. In this embodiment, there are two LEDs. The electronic circuit board (4) includes an electronic switch circuit, which controls the electric circuit according to the input signals, so that the rechargeable battery (3) electrifies the electric heating rod (82) inside the atomizer (8) and the LEDs as well.

[0065]As shown in FIGS. 1 and 2, the airflow sensor (5) has a silica gel corrugated membrane (53), which connects with magnetic steel (54) with a reed relay (52) on one of its ends. Both ends of the said reed relay (52) correspond to the relay electrodes (51) respectively.

[0066]As shown in FIG. 5-8, the atomizer assembly is an atomizer (8), which includes a porous component (81) and a heating rod (82). The body of the porous component (82) has a run-through atomizing chamber (811). The diameter of the electric heating rod (82) is less than the diameter of the atomizing chamber (811). The electric heating rod (82) enters into the atomizing chamber (811), and there is a clearance between the electric heating rod (82) and interior wall of the atomizing chamber (811), which forms a negative pressure cavity (83). One end of the ~~said~~ porous component (81) fits with the ~~said~~ cigarette bottle assembly. As FIGS. 5, 7 and 8 show, the porous component (81) has a protuberance (812) on the other end, and the protuberance (812) fits with the cigarette bottle assembly. The protuberance (812) is a protruding half sphere, on the side of which there is a run-through hole (813) connecting to the atomizing chamber (811). Of course, the protuberance (812) may also be a taper, rectangle or any other shape. The porous component (81) is made of foamed nickel, stainless steel fiber felt, macromolecular polymer

foam or foamed ceramics, providing the remarkable capabilities in liquid absorption and diffusion, and the ability to absorb the liquid stored in the cigarette bottle assembly.

[0067]As shown in FIG. 6, the electric heating rod (82) includes a cylinder (821). The heating wire (822) is wound on the wall of the cylinder (821). On the wall of both ends of the cylinder (821), there are mandrils (823) respectively, which lie against the interior wall of the atomizing chamber (811) of the porous component (81). There is a negative pressure cavity (83) between the electric heating rod and interior wall of the atomizing chamber.

[0068]The heating wire is made of platinum wire, nickel-chromium alloy wire or iron-chromium alloy wire containing rare earth, or is flaked. The electric heating rod (82) may alternatively have on its peripheral wall the heating layer made of electrically conductive ceramic PTC material, to replace the heating wire.

In

[0069]~~Of~~ this embodiment, the battery assembly and atomizer assembly are mutually connected and then installed inside the integrally formed shell (a) to form a one-piece part. The rechargeable battery (3) may be charged without frequent change of battery. The user just needs to plug the cigarette bottle assembly into the open end of the shell (a), for easy use and very easy change.

[0070]As shown in 3 and 4, the cigarette bottle assembly includes a hollow cigarette holder shell (b), and a perforated component for liquid storage (9) inside the shell (b). The perforated component for liquid storage (9) is made of such materials as PLA fiber, terylene fiber or nylon

fiber, which are suitable for liquid storage. Alternatively, it may be plastic foam molding or column of multi-layer plates made through plastic injection with polyvinyl chloride, polypropylene and polycarbonate. One end of the cigarette holder shell (b) plugs into the shell (a), and the outer peripheral surface of the cigarette holder shell (b) has an inward ventilating groove (b2). On one end surface of the cigarette holder shell (b), there is an air channel (b1) extending inward. The air channel (b1) is located in the center on the surface of one end of shell (b).

[0071] As shown in FIG. 1-9, one end of the porous component (81) lies against one end surface of the ~~and~~ perforated component for liquid storage (9), and contacts the perforated component for liquid storage (9). It absorbs the cigarette liquid from the perforated component for liquid storage (9). When the smoker smokes, the cavity of the cigarette holder shell (b) is in the negative pressure state. In the shell (b), one end of the airflow sensor (5) forms a normal pressure cavity, while the other end forms a negative pressure cavity. The air pressure difference between the normal pressure cavity and negative pressure cavity or the high-speed airflow enables the magnetic steel (54) of the airflow sensor (5) to drive the reed relay (52) to contact the relay electrode (51). As shown in FIG. 20, the electric circuit is electrified, and the electronic switch circuit on the electronic circuit board (4) is electrified. Thus, the rechargeable battery (3) starts to electrify the electric heating rod (82) inside the atomizer (8), and at the same time, the LEDs, which are electrified by the rechargeable battery (3), emit light. The air enters the normal pressure cavity through the air inlet (a1), passes the check valve (7) via the airflow passage in the airflow sensor (5), and flows to the negative pressure cavity (83) in the atomizer (8). Since the negative pressure cavity (83) provides the negative pressure compared with the outside, the air

flow sprays into it, bringing the cigarette liquid from the porous component (81) to spray into the negative pressure cavity (83) in the form of fine ~~drips~~ ^{drops}. In the meantime, the electric heating rod (82) is electrified by the rechargeable battery (3) under the control of electronic circuit board (4), to heat the fine drips for atomization. After atomization, the big-diameter fine drips are re-absorbed by the porous component (81) under the action of vortex, while the small-diameter fine drips are suspended in the airflow to form ~~gasoloid~~ ^{aerosol}, which is discharged through the negative pressure cavity (83) and run-through hole (813), flows into the cigarette holder shell (b) of the cigarette bottle assembly, and is absorbed by the air channel (b1). When the ~~gasoloid~~ ^{aerosol} enters the cigarette holder shell (b), multiple small liquid ~~drips~~ ^{drops} are condensed into bigger ones, which fall into the clearance between the cigarette holder shell (b) and air channel (b1) without being absorbed by the air channel (b1). The perforated component for liquid storage (9) of the cigarette bottle assembly and the porous component (81) of the atomizer (8) contact each other to achieve the capillary impregnation for liquid supply.

[0072]The unit and its connecting structure of this invention may also be loaded with drugs for delivery to the lung.

[0073]As shown in FIGS. 22, 23 and 24, the electronic cigarette (5) is held in a charging device. The charging device includes a case (1), which contains an auxiliary charging storage battery (2) inside it, and holds the electronic cigarette (5) and the charger (3) for the rechargeable battery embedded in the electronic cigarette (5), as well as the power supply circuit. The power inputs of the auxiliary charging storage battery (2) and charger (3) are connected with the power supply respectively. The charger (3) in this embodiment is a constant voltage & current charger. It may

be a GY5210 charger, or any other constant voltage & current charger. The case (1) has a spare liquid supply bottle (4) in it. The power output of the auxiliary charging storage battery (2) is connected with the power input of the charger (3). The power output of the charger (3) is a charging slot (31), which fits with the charging plug of the rechargeable battery inside the electronic cigarette, or a charging plug, which fits with the charging slot of the rechargeable battery.

[0074]As shown in FIGS. 23 and 24, on the body of the shell (1), there is a pair of slide ways (12) corresponding to the position of the electronic cigarette, and on the slide ways, there is a slide cover (11).

[0075]In the second preferred embodiment ~~of this utility model~~, a restriction component (10), which is detachable, is set on one end of the ~~said~~ porous component (81). There is a restriction hole (101) on the body of the restriction component (10). The restriction hole (101) corresponds to the atomizing chamber (811). The pore diameter of the restriction hole is less than the inner diameter of the atomizing chamber (811) to the extent that the size of the restriction component (10) installed on the porous component (81) varies, for the purpose of airflow capacity control. On the basis of different applications, the restriction component of different sizes and pore diameters may be used.

[0076]In the third preferred embodiment of this utility model, as shown in 11 and 12, on the outer peripheral wall of the cigarette shell (b), there is a protruding rib (b2) that is evenly partitioned. The perforated component for liquid storage (9) enters the cigarette holder shell (b)

and lies against the protruding rib (b2). Thus, there appears a clearance between the outer peripheral surface of the perforated component for liquid storage (9) and the interior wall of the shell (b). The clearance is for connection the shell (a) and cigarette holder shell (b). When the user smokes, the air channel (b1) absorbs the air to cause airflow inside the shell (a), thus triggering the airflow sensor (5) and eventually starting the electronic cigarette. Also, the atomizer (8) works to atomize the cigarette liquid and produce gas flow, which enters the cigarette holder shell (b).

[0077]In the fourth preferred embodiment of ~~this utility model~~, as shown in FIGS. 13, 14, 15 and 16, on one end of the cylinder (821), there is a fixed plate (84), whose outer peripheral wall has partitioned supports (841). The outer ends of the supports (841) lie against the interior wall of the shell (a), thus suspending the cylinder (821), which is connected with the fixed plate (84), in the cavity of the shell (a). On the surface of the fixed plate (84), there is a mandril (842), whose front end lies against one end of the porous component (81), so that the fixed plate (84) is separated from the atomizing chamber (811) of the porous component (81). As a result, the run-through hole on one end of the atomizing chamber (811) won't be blocked, and the mist generated in the atomizing chamber (811) can be dispersed. One end of the porous component (81) has two protuberances (812) at the outlet of the atomizing chamber (811). Between the two protuberances (812) is a clearance. The two protuberances (812) lie against the perforated component for liquid storage (9).

[0078]In the fifth preferred embodiment of ~~this utility model~~, as shown in FIGS. 17 and 18, the atomizer assembly is an atomizer (8), which includes a frame (82), the porous component (81)

set on the frame (82), and the heating wire (83) wound on the porous component (81). The frame (82) has a run-through hole (821) on it. The porous component (81) is wound with heating wire (83) in the part that is on the side in the axial direction of the run-through hole (821). One end of the porous component (81) fits with the cigarette bottle assembly. The porous component (81) is made of foamed nickel, stainless steel fiber felt, macromolecular polymer foam or foamed ceramics.

[0079]In the sixth preferred embodiment of ~~this utility model~~, as shown in FIG. 19, the airflow sensor (5) has a silica gel corrugated membrane (53), which connects with magnetic steel (54) with a Hall element (52), or a magneto-diode or a magneto-triode on one of its ends. FIG. 21 shows the electric circuit of the electronic cigarette of this solution.

SUBSTITUTE SPECIFICATION

ELECTRONIC CIGARETTE

BACKGROUND ART

5 [0001] Smoking causes serious respiratory system diseases and cancer, though it is hard to persuade the smokers to completely quit smoking.

[0002] Nicotine is the effective ingredient in cigarettes. Nicotine acts on the receptor of the central nervous system.

[0003] Nicotine is a micromolecular alkaloid, which is basically harmless to
10 human bodies at a small dosage. Plus, its half life period is extremely short in blood. Tar is the major harmful substance in tobacco. Tobacco tar comprises several thousands of ingredients, dozens of which are carcinogenic substances.

[0004] To provide cigarette substitutes that contain nicotine but not harmful tar, many products have been used. These products are not as harmful as tar, but are
15 absorbed very slowly. As a result, smokers can't be satisfied in full. In addition, the smokers are deprived of the "smoking" habit.

[0005] The electronic cigarettes currently available on the market may resolve the above-mentioned issue, though they are complicated in structure. They don't provide the ideal aerosol effects, and their atomizing efficiency is not high.

20 SUMMARY OF INVENTION

[0006] To overcome the above-mentioned disadvantages, an aerosol electronic cigarette includes a battery assembly, an atomizer assembly and a bottle assembly.

The battery assembly connects with the atomizer assembly and both are located in a housing. The bottle assembly is located in one end of the housing and fits with the atomizer assembly.

[0007] The battery assembly may include the battery, an operating indicator,
5 electronic circuit board, and airflow sensor, which are connected with the battery, and with the signal output of the airflow sensor connected the electronic circuit board.

[0008] A component for liquid storage of the cigarette bottle assembly stores the nicotine liquid. Smokers can enjoy the feel of smoking, with no fire hazard since there is no need for igniting.

10 DESCRIPTION OF DRAWINGS

[0009] FIG. 1 is the side section view of an electronic cigarette.

[0010] FIG. 2 is the section view of the housing (a) separated from the cigarette bottle assembly.

[0011] FIG. 3 is the diagram of the axial structure of the cigarette bottle
15 assembly, illustrating the ventilating groove on the peripheral surface of the cigarette holder housing.

[0012] FIG. 4 is the side section view of the cigarette bottle assembly, illustrating the structure of the air channel.

[0013] FIG. 5 is the side section view of a porous component of the atomizer.

20 [0014] FIG. 6 is the diagram of the structure of an electric heating rod of the atomizer.

[0015] FIG. 7 is the side section of the atomizer, illustrating the locations of and connection relation between the electric heating rod and porous component.

[0016] FIG. 8 is the diagram of the atomizer, illustrating the locations of and connection relation between the electric heating rod and porous component.

[0017] FIG. 9 is the section view of a check valve.

[0018] FIG. 10 is the front section view of a restriction component in a second
5 embodiment.

[0019] FIG. 11 is a diagram of the axial structure of the cigarette bottle assembly in another embodiment.

[0020] FIG. 12 is a sectional view taken along line A-A of FIG. 11.

[0021] FIG. 13 is a diagram of the structure of the electric heating rod of the
10 atomizer in another embodiment.

[0022] FIG. 14 is a section view of the porous component of the atomizer in the embodiment shown in Fig. 13.

[0023] FIG. 15 is a diagram of the axial structure of FIG. 14.

[0024] FIG. 16 is a side section view of the atomizer in the embodiment of
15 FIG. 13, illustrating the locations of and connection relation between the electric heating rod and porous component.

[0025] FIG. 17 is a diagram of the axial structure of the atomizer in another embodiment.

[0026] FIG. 18 is the side section view of the atomizer shown in FIG. 17.

20 [0027] FIG. 19 is the side section view of another electronic cigarette embodiment.

[0028] FIG. 20 is the electric circuit diagram of an electronic cigarette.

[0029] FIG. 21 is another electric circuit diagram of an electronic cigarette.

[0030] FIG. 22 is a diagram of a charging device, illustrating the locations of and connection relation of various internal parts.

[0031] FIG. 23 is the side section view of the charging device.

[0032] FIG. 24 is the diagram of the front structure of the charging device.

5 SPECIFIC MODE FOR CARRYING OUT THE INVENTION

[0033] As shown in FIGS. 1-10, an aerosol electronic cigarette includes a battery assembly, an atomizer assembly and a cigarette bottle assembly, and also includes a shell or housing (a), which is hollow and integrally formed. The battery assembly connects with the atomizer assembly and both are located in the shell. The cigarette
10 bottle assembly is located in one end of the shell, which is detachable. The cigarette bottle assembly fits with the atomizer assembly. The shell has through-air-inlets (a1).

[0034] In this specific embodiment, the battery assembly includes the battery, and the operating indicator (1), electronic circuit board (4), and airflow sensor (5), which are connected with the battery. It also includes a check valve (7). The signal output of
15 the airflow sensor (5) is connected with the said electronic circuit board (4). The battery is a rechargeable battery (3), which may be either a rechargeable polymer lithium ion battery or a rechargeable lithium ion battery. The airflow sensor (5) may be alternatively a semiconductor force-sensitive chip capacitance sensor or an inductance sensor.

[0035] The rechargeable battery (3) has a flexibly connected charging plug (2).
20 The blades (21) of the charging plug (2) come out of the other end of the shell (a). Between the charging plug (2) and rechargeable battery (3) is a spring (6), which lies against the body of the rechargeable battery (3) on one end, while its free end lies against the charging plug (2), forming a flexible structure, which buffers the charging

plug (2) when plugged for charging, thus protecting the rechargeable battery against any damage. Of course, the rechargeable battery (3) in this embodiment has a charging slot on it, which replaces the structure of charging plug (2) to perform the charging function and protect the rechargeable battery (3) against any damage. The operating indicator (1) is a LED. In this embodiment, there are two LEDs. The electronic circuit board (4) includes an electronic switch circuit, which controls the electric circuit according to the input signals, so that the rechargeable battery (3) electrifies the electric heating rod (82) inside the atomizer (8) and the LEDs as well.

[0036] As shown in FIGS. 1 and 2, the airflow sensor (5) has a silica gel corrugated membrane (53), which connects with magnetic steel (54) with a reed relay (52) on one of its ends. Both ends of the said reed relay (52) correspond to the relay electrodes (51) respectively.

[0037] As shown in FIGS. 5-8, the atomizer assembly is an atomizer (8), which includes a porous component (81) and a heating rod (82). The body of the porous component (82) has a run-through atomizing chamber (811). The diameter of the electric heating rod (82) is less than the diameter of the atomizing chamber (811). The electric heating rod (82) enters into the atomizing chamber (811), and there is a clearance between the electric heating rod (82) and interior wall of the atomizing chamber (811), which forms a negative pressure cavity (83). One end of the porous component (81) fits with the cigarette bottle assembly. As FIGS. 5, 7 and 8 show, the porous component (81) has a protuberance (812) on the other end, and the protuberance (812) fits with the cigarette bottle assembly. The protuberance (812) is a protruding half sphere, on the side of which there is a run-through hole (813) connecting

to the atomizing chamber (811). Of course, the protuberance (812) may also be a taper, rectangle or any other shape. The porous component (81) is made of foamed nickel, stainless steel fiber felt, macromolecular polymer foam or foamed ceramics, providing the remarkable capabilities in liquid absorption and diffusion, and the ability to
5 absorb the liquid stored in the cigarette bottle assembly.

[0038] As shown in FIG. 6, the electric heating rod (82) includes a cylinder (821). The heating wire (822) is wound on the wall of the cylinder (821). On the wall of both ends of the cylinder (821), there are mandrills (823) respectively, which lie against the interior wall of the atomizing chamber (811) of the porous component (81). There is a
10 negative pressure cavity (83) between the electric heating rod and interior wall of the atomizing chamber.

[0039] The heating wire is made of platinum wire, nickel-chromium alloy wire or iron-chromium alloy wire containing rare earth, or is flaked. The electric heating rod (82) may alternatively have on its peripheral wall the heating layer made of electrically
15 conductive ceramic PTC material, to replace the heating wire.

[0040] In this embodiment, the battery assembly and atomizer assembly are mutually connected and then installed inside the integrally formed shell (a) to form a one-piece part. The rechargeable battery (3) may be charged without frequent change of battery. The user just needs to plug the cigarette bottle assembly into the open end
20 of the shell (a), for easy use and very easy change.

[0041] As shown in 3 and 4, the cigarette bottle assembly includes a hollow cigarette holder shell (b), and a perforated component for liquid storage (9) inside the shell (b). The perforated component for liquid storage (9) is made of such materials as

PLA fiber, terylene fiber or nylon fiber, which are suitable for liquid storage. Alternatively, it may be plastic foam molding or column of multi-layer plates made through plastic injection with polyvinyl chloride, polypropylene and polycarbonate. One end of the cigarette holder shell (b) plugs into the shell (a), and the outer peripheral surface of the cigarette holder shell (b) has an inward ventilating groove (b2). On one end surface of the cigarette holder shell (b), there is an air channel (b1) extending inward. The air channel (b1) is located in the center on the surface of one end of shell (b).

[0042] As shown in FIGS. 1-9, one end of the porous component (81) lies against one end surface of the perforated component for liquid storage (9), and contacts the perforated component for liquid storage (9). It absorbs the cigarette liquid from the perforated component for liquid storage (9). When the smoker smokes, the cavity of the cigarette holder shell (b) is in the negative pressure state. In the shell (b), one end of the airflow sensor (5) forms a normal pressure cavity, while the other end forms a negative pressure cavity. The air pressure difference between the normal pressure cavity and negative pressure cavity or the high-speed airflow enables the magnetic steel (54) of the airflow sensor (5) to drive the reed relay (52) to contact the relay electrode (51).

[0043] As shown in FIG. 20, the electric circuit is electrified, and the electronic switch circuit on the electronic circuit board (4) is electrified. Thus, the rechargeable battery (3) starts to electrify the electric heating rod (82) inside the atomizer (8), and at the same time, the LEDs, which are electrified by the rechargeable battery (3), emit light. The air enters the normal pressure cavity through the air inlet (a1), passes the

check valve (7) via the airflow passage in the airflow sensor (5), and flows to the negative pressure cavity (83) in the atomizer (8). Since the negative pressure cavity (83) provides the negative pressure compared with the outside, the air flow sprays into it, bringing the cigarette liquid from the porous component (81) to spray into the negative pressure cavity (83) in the form of fine drops.

[0044] In the meantime, the electric heating rod (82) is electrified by the rechargeable battery (3) under the control of electronic circuit board (4), to heat the fine drips for atomization. After atomization, the big-diameter fine drips are re-absorbed by the porous component (81) under the action of vortex, while the small-diameter fine drips are suspended in the airflow to form aerosol, which is discharged through the negative pressure cavity (83) and run-through hole (813), flows into the cigarette holder shell (b) of the cigarette bottle assembly, and is absorbed by the air channel (b1). When the aerosol enters the cigarette holder shell (b), multiple small liquid drops are condensed into bigger ones, which fall into the clearance between the cigarette holder shell (b) and air channel (b1) without being absorbed by the air channel (b1). The perforated component for liquid storage (9) of the cigarette bottle assembly and the porous component (81) of the atomizer (8) contact each other to achieve the capillary impregnation for liquid supply.

[0045] The unit and its connecting structure of this invention may also be loaded with drugs for delivery to the lung.

[0046] As shown in FIGS. 22, 23 and 24, the electronic cigarette (5) is held in a charging device. The charging device includes a case (1), which contains an auxiliary charging storage battery (2) inside it, and holds the electronic cigarette (5) and the

charger (3) for the rechargeable battery embedded in the electronic cigarette (5), as well as the power supply circuit. The power inputs of the auxiliary charging storage battery (2) and charger (3) are connected with the power supply respectively. The charger (3) in this embodiment is a constant voltage & current charger. It may be a GY5210
5 charger, or any other constant voltage & current charger. The case (1) has a spare liquid supply bottle (4) in it. The power output of the auxiliary charging storage battery (2) is connected with the power input of the charger (3). The power output of the charger (3) is a charging slot (31), which fits with the charging plug of the rechargeable battery inside the electronic cigarette, or a charging plug, which fits with the charging
10 slot of the rechargeable battery.

[0047] As shown in FIGS. 23 and 24, on the body of the shell (1), there is a pair of slide ways (12) corresponding to the position of the electronic cigarette, and on the slide ways, there is a slide cover (11).

[0048] In the second preferred embodiment, a restriction component (10), which
15 is detachable, is set on one end of the porous component (81). There is a restriction hole (101) on the body of the restriction component (10). The restriction hole (101) corresponds to the atomizing chamber (811). The pore diameter of the restriction hole is less than the inner diameter of the atomizing chamber (811) to the extent that the size of the restriction component (10) installed on the porous component (81) varies, for the
20 purpose of airflow capacity control. On the basis of different applications, the restriction component of different sizes and pore diameters may be used.

[0049] In the third preferred embodiment of this utility model, as shown in 11 and 12, on the outer peripheral wall of the cigarette shell (b), there is a protruding rib (b2)

that is evenly partitioned. The perforated component for liquid storage (9) enters the cigarette holder shell (b) and lies against the protruding rib (b2). Thus, there appears a clearance between the outer peripheral surface of the perforated component for liquid storage (9) and the interior wall of the shell (b). The clearance is for connection the shell (a) and cigarette holder shell (b). When the user smokes, the air channel (b1) absorbs the air to cause airflow inside the shell (a), thus triggering the airflow sensor (5) and eventually starting the electronic cigarette. Also, the atomizer (8) works to atomize the cigarette liquid and produce gas flow, which enters the cigarette holder shell (b).

[0050] In the fourth preferred embodiment, as shown in FIGS. 13, 14, 15 and 16, on one end of the cylinder (821), there is a fixed plate (84), whose outer peripheral wall has partitioned supports (841). The outer ends of the supports (841) lie against the interior wall of the shell (a), thus suspending the cylinder (821), which is connected with the fixed plate (84), in the cavity of the shell (a). On the surface of the fixed plate (84), there is a mandril (842), whose front end lies against one end of the porous component (81), so that the fixed plate (84) is separated from the atomizing chamber (811) of the porous component (81). As a result, the run-through hole on one end of the atomizing chamber (811) won't be blocked, and the mist generated in the atomizing chamber (811) can be dispersed. One end of the porous component (81) has two protuberances (812) at the outlet of the atomizing chamber (811). Between the two protuberances (812) is a clearance. The two protuberances (812) lie against the perforated component for liquid storage (9).

[0051] In the fifth preferred embodiment, as shown in FIGS. 17 and 18, the atomizer assembly is an atomizer (8), which includes a frame (82), the porous

component (81) set on the frame (82), and the heating wire (83) wound on the porous component (81). The frame (82) has a run-through hole (821) on it. The porous component (81) is wound with heating wire (83) in the part that is on the side in the axial direction of the run-through hole (821). One end of the porous component (81) fits with
5 the cigarette bottle assembly. The porous component (81) is made of foamed nickel, stainless steel fiber felt, macromolecular polymer foam or foamed ceramics.

[0052] In the sixth preferred embodiment, as shown in FIG. 19, the airflow sensor (5) has a silica gel corrugated membrane (53), which connects with magnetic steel (54) with a Hall element (52), or a magneto-diode or a magneto-triode on one of its ends.

10 FIG. 21 shows the electric circuit of the electronic cigarette of this solution.