Electronic Atomization Cigarette

Technical Field

The present invention relates to an electronic cigarette, in particular to an electronic atomization cigarette that contains only nicotine without tar.

Background Art

Despite it is commonly known that "smoking is harmful to your health", the number of smokers worldwide is up to 1 billion, and the number is increasing every year. On March 1, 2003, the World Health Organization (WHO) concluded a global Framework Convention on Tobacco Control. According to the statistical data from WHO, about 4.9 million people die of diseases caused by smoking each year. Although smoking may cause serious respiratory diseases and cancer, it remains extremely difficult for smokers to quit smoking completely.

The active ingredient in a cigarette is nicotine. During smoking, nicotine, along with a lot of tar aerosol droplets produced in the cigarette burning, enters smoker's alveolus and is rapidly absorbed. After being absorbed into the blood of a smoker, nicotine then produces its effect on the receptors of the smoker's central nervous system, which makes him/her relax and enjoy an inebriety similar to that produced by an exhilarant.

Nicotine is a kind of alkaloid with low molecular weight, a small dose of nicotine is essentially harmless to human body and its half-life in blood is quite short. Actually the major harmful substance in tobacco is tar, tar in tobacco is composed of thousands of ingredients, tens of which are cancerogenic substances. At present it has been proven that passive smoking can be more harmful on non-smokers.

Some cigarette substitutes that contain only nicotine without tar have been proposed, many of them, such as "nicotine patch", "nicotine mouthwash", "spray agent packaged in high pressure gas tank with propellant", "nicotine chewing gum", "nicotine drink" etc., are made of pure nicotine. Although these cigarette substitutes are free from tar, their major disadvantage is that an effective peak concentration can not be reached in the blood of a smoker due

to slow absorption of nicotine and thus it can not make a smoker get real fun, in addition, these cigarette substitutes can not satisfy habitual smoking actions of a smoker, for example, inhaling action or sucking action, and thus are not likely to be widely accepted as effective substitutes for quitting smoking or cigarette substitutes.

The Summary of the Invention

To overcome the above-mentioned drawbacks, an objective of the present invention is to provide an electronic atomization cigarette that functions as substitutes for quitting smoking and cigarette substitutes.

The objective of the present invention is achieved by the following technical solution.

The present invention includes a shell; a mouthpiece; an air inlet provided in the external wall of the shell; an electronic circuit board, a normal pressure cavity, a sensor, a vapor-liquid separator, an atomizer, a liquid-supplying bottle arranged sequentially within the shell; a stream passage provided on one side of the sensor; a negative pressure cavity provided in the sensor; an atomization cavity arranged in the atomizer; a retaining ring for locking the liquid-supplying bottle provided between one side of the liquid-supplying bottle and the shell; and an aerosol passage provided on the other side of the liquid-supplying bottle, wherein the electronic circuit board comprises an electronic switching circuit and a high frequency generator; the liquid-supplying bottle is in contact with the atomizer; and the air inlet, normal pressure cavity, vapor-liquid separator, atomizer, aerosol passage, gas vent and mouthpiece are sequentially interconnected. A LED and a cell are provided at the front end within the shell, collectively constituting an integrity like a cigarette holder, cigar or a pipe.

Furthermore, a display screen is additionally provided on the inner wall of the shell; a microswitch for manually cleaning is connected to the sensor in parallel connection within the shell; a ripple film is provided between the sensor and the negative pressure cavity inside the sensor; a first magnetic steel, a second magnetic steel and a Reed switch connected between them provided within the sensor, wherein the second magnetic steel is attached to the ripple film; a silicon gel check valve is provided within the sensor, a third magnetic steel is provided the silicon gel check valve, and a Reed switch is provided

outside the valve, on the side close to the magnetic steel; a through hole is arranged on the vapor-liquid separator, a silicon gel check valve covers the through hole on the vapor-liquid separator; a overflow hole is provided on the atomization cavity wall of the atomization cavity, a heating element is provided within the atomization cavity, a long stream ejection hole is provided on one side of the heating element, the porous body is arranged outside around the atomization cavity wall, the first piezoelectric element is provided on one side of the atomizer, and a bulge is provided on the other side; the second piezoelectric element is additionally provided in the atomizer; the porous body in the atomizer can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic; the heating element can be made of platinum wire, nickel chromium alloy or iron chromium aluminum alloy wire with rare earth element, or may be made into a sheet form with conductive ceramics or PTC ceramics; the atomization cavity wall can be made of aluminum oxide or ceramic; the vapor-liquid separator can be made of plastic or silicon rubber; the solution storage porous body is included in the liquid-supplying bottle, and can be filled with polypropylene fiber, terylene fiber or nylon fiber, or be filled with plastics that are shaped by foaming; alternatively, it may be modeled into a column with laminated layers by polyvinyl chloride, polypropylene, polycarbonate; the Reed switch, the first magnetic steel, the second magnetic steel, the ripple film can be replaced by a semiconductor strain gauge with sealed film, which is mounted in the place of the sensor ripple film.

The present invention also discloses an electronic atomization cigarette with another structure, wherein the atomizer is postposed within the shell, the liquid-supplying bottle is arranged between the vapor-liquid separator and the atomizer, and a spring piece for pressing the liquid-supplying bottle on the atomizer is arranged at one end of the liquid-supplying bottle.

The advantages of the present invention include smoking without tar, significantly reducing the cancerogenic risk. Furthermore users still feel as if they are smoking and experiencing the same excitement, and the cigarette is no need to be lit and is no fire risk.

With slight modification of the solution storage container, the device and connecting structures of the present invention can be filled with conventional drug for pulmonary administration apparatus.

Description of the Drawings

Fig. 1 is a schematic diagram of an overall structure according to the present invention;

Fig. 2 is a schematic diagram of another overall structure according to the present invention;

Fig. 3 is a schematic diagram of a overall structure with a display screen according to the present invention;

Fig. 4 is a structural diagram of a sensor according to the present invention;

Fig. 5 is a structural diagram of a sensor with a silicon gel check valve according to the present invention;

Fig. 6 is a structural diagram of an atomizer according to the present invention;

Fig. 7 is a structural diagram of the ceramic member in an atomizer according to the present invention;

Fig. 8 is a structural diagram of another atomizer according to the present invention;

Fig. 9 is a structural diagram of a vapor-liquid separator according to the present invention;

Fig. 10 is a structural diagram of another vapor-liquid separator according to the present invention;

Fig. 11 is a structural diagram of the connection of a liquid-supplying bottle and a mouthpiece according to the present invention;

Fig. 12 is a functional diagram of a circuit according to the present invention.

Detailed Description of the Invention

The present invention is further described below with reference to the accompanying drawings.

Embodiment 1

As shown in Fig. 1, the present invention can form an integrity like a cigarette holder, a cigar or a pipe. An air inlet 4 is provided on the external wall of the shell 14. A LED 1, a cell 2, an electronic circuit board 3, a normal pressure cavity 5, a sensor 6, a vapor-liquid separator 7, an atomizer 9, a

liquid-supplying bottle 11 and a mouthpiece 15 are sequentially provided within the shell 14. The electronic circuit board 3 comprises an electronic switching circuit and a high frequency generator. As shown in Fig. 4, a negative pressure cavity 8 is provided in the sensor 6 and is separated from the sensor 6 by a ripple film 22. A first magnetic steel 20, a second magnetic steel 21and a Reed switch 19 arranged between them is also provided within the sensor 6, and the second magnetic steel 21 is attached to the ripple film 22. The atomizer 9 is in contact with the liquid-supplying bottle 11 via the bulge 36, and the atomization cavity 10 is provided in the atomizer 9. As shown in Fig. 6 and 7, the overflow hole 29 is provided on the atomization cavity wall 25 of the atomization cavity 10. A heating element 26, which can be made of platinum wire, nickel chromium alloy or iron chromium aluminum alloy wire with rare earth element, is provided within the cavity, and can also be made into a sheet form with conductive ceramics or PTC ceramics. An ejection hole is provided on the side opposite to the heating element 26 and the ejection hole can be determined to select either the long stream ejection hole 24 or the short stream ejection hole 30, depending on the material used for the atomization cavity wall 25. The long stream ejection hole 24 can employ slot structure of 0.1 mm-1.3 mm or circular hole structure of Φ0.2 mm-1.3 mm with a single and multiple holes. The short stream ejection hole 30 has the diameter of about 0.3 mm-1.3 mm. The atomization cavity wall 25 is surrounded with the porous body 27, which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic. A first piezoelectric element 23 is also provided on the atomizer 9. The atomization cavity wall 25 can be made of aluminum oxide or ceramic. As shown in Fig. 9, a through hole is provided on the vapor-liquid separator 7, and can be made of plastic or silicon rubber. As shown in Fig. 11, a retaining ring 13 for locking the liquid-supplying bottle 11 is provided between one side of the liquid-supplying bottle 11 and the shell 14, an aerosol passage 12 is provided on the other side of the liquid-supplying bottle. The solution storage porous body 28 is provided in the liquid-supplying bottle, and can be filled with polypropylene fiber, terylene fiber or nylon fiber, or be filled with plastic that are shaped by foaming, such as polyamine resin foam column or polypropylene foam column; alternatively, it may be made of a column formed by molding polyvinyl chloride, polypropylene, polycarbonate into a

stack of laminated layers. The air inlet 4, normal pressure cavity 5, vapor-liquid separator 7, atomizer 9, aerosol passage 12, gas vent 17, mouthpiece 15 are sequentially interconnected.

As shown in the functional diagram of the circuit in Fig. 12, K1 refers to the Reed switch 19, RL refers to the heating element 26, LED1 refers to the Light Emitting Diode 1, U2 refers to the low voltage detecting element used for the over-discharging protection of the lithium cell, M1 refers to the first piezoelectric element 23, and C1, C2, R3, L1, C3, BG, M1 collectively constitute a Colpitts oscillator. The operating principle of the circuit is as follows: when K1 is closed, U1, i.e., the field effect power transistor, is turned on, RL starts, and the Colpitts oscillator starts oscillating, M1 will provide the high frequency mechanical oscillatory wave to the atomizer 9 to achieve the result of atomization.

When a smoker smokes, the mouthpiece 15 is under negative pressure, the air pressure difference or high speed stream between the normal pressure cavity 5 and the negative pressure cavity 8 will cause the sensor 6 to output an actuating signal, the electronic circuit board 3 connected therewith goes into operation. Now the ripple film 22 in the sensor 6 is deformed to take the second magnetic steel 21 away from the Reed switch 19, and the Reed switch 19 is then closed (i.e., K1 is closed) under the effect of the excessive magnetic line of force from the first magnetic steel 20, starting the field effect power transistor electronic switch (i.e., U1 is opened). The high frequency oscillator may uses the Colpitts oscillator with the frequency of 550KHz-8MHz, the automatic fine-adjusting element in the circuit resonates with the first piezoelectric element 23 in the form of a ring to supply power to liquid molecule, and the LED 1 can be lit under the supply of the rechargeable battery 2. The air enters the normal pressure cavity 5 through the air inlet 4, passes through the air passage 18 of the sensor and then the through hole in the vapor-liquid separator 7, and flows into the atomization cavity 10 in the atomizer 9. The high speed stream passing through the ejection hole drives the nicotine solution in the porous body 27 to eject into the atomization cavity 10 in the form of droplet, where the nicotine solution is subjected to the ultrasonic atomization by the first piezoelectric element 23 and is further atomized by the heating element 26. After the atomization, the droplets with large diameter stick to the wall under the action of eddy flow and are

reabsorbed by the porous body 27 via the overflow hole 29, whereas the droplets with small diameter float in stream and forms aerosols, which are sucked out via the aerosol passage 12, gas vent 17 and mouthpiece 15. The solution storage porous body 28 in the liquid-supplying bottle 11 will be in contact with the bulge 36 on the atomizer 9, thereby achieving the capillary infiltration liquid-supplying.

The mouthpiece 15 is threaded. When the nicotine solution in the liquid-supplying bottle 11 is used up, users can screw the mouthpiece 15 out to take the liquid-supplying bottle 11 out, refill the liquid-supplying bottle 11 with the nicotine solution, put the liquid-supplying bottle 11 into the shell 14 again, and then screw the mouthpiece 15.

The Reed switch 19, the first magnetic steel 20, the second magnetic steel 21, the ripple film 22 can be replaced by a semiconductor strain gauge with sealed film, which is mounted in the place of the sensor ripple film.

To simplify the design, the first piezoelectric element 23 on the atomizer 9 can be omitted, and the atomization of the nicotine solution will be made only by the heating element 26. The size of such an atomizer can be made smaller, and the structure of the connection of the whole electronic atomization cigarette is the same as the embodiment 1. In addition, as shown in Fig. 8, the first piezoelectric element 23 and the heating element 26 in the atomizer 9 can be omitted, an additional second piezoelectric element 35 in the form of platen with a single layer or multiple laminated layers can be arranged in the atomization cavity, and the stream passing through the ejection hole vibrates the focus at the center of the second piezoelectric element 35 to achieve the effect of strong ultrasonic atomization.

As shown in Fig. 10, a silicon gel check valve 31 may cover the outside of the through hole on the vapor-liquid separator 7. During smoking, a stream reaches the through hole, as the air pressure in the through hole increases, the silicon gel check valve 31 is opened and the stream passes; otherwise, the silicon gel check valve 31 is closed.

As shown in Fig. 5, the sensor 6 may also be designed into a structure with the silicon gel check valve 31. During smoking, the stream comes into the silicon gel check valve 31, the air pressure increases and the air expands, the third magnetic steel 34 in the valve approaches the Reed switch 19 gradually until the Reed switch is closed and the circuit is turned on, and the

air outlet of the silicon gel check valve 31 is opened with the increment of the air pressure difference. The Reed switch 19 can also be made of Hall device or magneto diode or magneto triode instead.

Embodiment 2

As shown in Fig. 2, to improve the liquid-supplying state, the atomizer 9 is postposed within the shell 14, and the liquid-supplying bottle 11 is arranged between the vapor-liquid separator 7 and the atomizer 9. A spring piece 33 for pressing the liquid-supplying bottle 11 on the atomizer 9 is provided on one end of the liquid-supplying bottle 11. Other components and their functions are the same as those in the embodiment 1.

On the inner wall of the shell 14 of the electronic atomization cigarette described in the embodiment 1 and 2, a digital display screen 32 for showing the smoking times per day and the cell capacity can be also provided. The sensor 6 uses a linear signal output, which is proportional to the suction force (i.e., the stronger one sucks, the longer the time of operation is), the atomizer 9 operates in the linear mode, thereby simulating a humanized cigarette that looks like a normal cigarette.

Within the shell 14, the microswitch 16 is connected to the sensor 6 in parallel and used for manually cleaning. When users do not smoke, they press the microswitch 16 to start the sensor 6 connected therewith in parallel, or clean the residue or other impurity substance within the shell 14.

The nicotine solution for atomization contains 0.4-3.5% nicotine, 0.05-2% cigarette essence, 0.1-3.1% organic acid, 0.1-0.5% anti-oxidation agent, and the rest is 1,2-propylene glycol.

What is claimed is

1. An electronic atomization cigarette, including

a shell; and

a mouthpiece,

characterized by

an air inlet (4) provided on the external wall of the shell (14) ;

a cell (2), an electronic circuit board (3), a normal pressure cavity (5), a sensor (6), an atomizer (9), a liquid-supplying bottle (11) arranged within the shell (14);

a stream passage (18) provided on one side of the sensor (6);

a negative pressure cavity (8) provided in the sensor (6);

an atomization cavity (10) arranged in the atomizer (9); and

an aerosol passage (12) provided on the other side of the liquid-supplying bottle (11),

the liquid-supplying bottle (11) is in contact with the atomizer (9); and

the air inlet (4), normal pressure cavity (5), atomizer (9), aerosol passage (12), gas vent (17) and mouthpiece (15) are sequentially interconnected.

2. The electronic atomization cigarette according to claim 1, wherein the electronic circuit board (3) comprises an electronic switching circuit and a high frequency generator.

3. The electronic atomization cigarette according to claim 1 or 2, said electronic atomization cigarette further comprises a vapor-liquid separator (7).

4. The electronic atomization cigarette according to claim 3 further including

a spring piece (33) for pressing the liquid-supplying bottle (11) on the atomizer (9),

wherein the atomizer (9) is postposed within the shell (14);

the liquid-supplying bottle (11) is arranged between the vapor-liquid separator (7) and the atomizer (9); and

the spring piece (33) is arranged at one end of the liquid-supplying bottle (11).

5. The electronic atomization cigarette according to any one of claims 1-4, further including

a display screen (32) for showing the smoking times per day and the cell capacity arranged on the inner wall of the shell (14).

6. The electronic atomization cigarette according to any one of claims 1-4, further including

a microswitch (16) connected to the sensor (6) in parallel within the shell (14) and used for manually cleaning,

when a user does not smoke, the microswitch (16) is pressed, the sensor (6) connected therewith in parallel is in operation and the residue or other impurity substance within the shell (14) is cleaned.

7. The electronic atomization cigarette according to any one of claims 1-4, further including

a ripple film (22) provided between the sensor (6) and the negative pressure cavity (8) within the sensor (6),

a first magnetic steel (20), a second magnetic steel (21) and a magneto device connected between them provided within the sensor (6),

wherein the second magnetic steel (21) is attached to the ripple film (22).

8. The electronic atomization cigarette according to claim 7, wherein the magneto device is a Reed switch (19).

9. The electronic atomization cigarette according to claim 7, wherein the magneto device is a Hall device.

10. The electronic atomization cigarette according to claim 7, wherein the magneto device is a magneto diode.

11. The electronic atomization cigarette according to claim 7, wherein the magneto device is a magnetic triode.

12. The electronic atomization cigarette according to any one of claims 1-4, further including

a silicon gel check valve (31) provided within the sensor (6);

a third magnetic steel (34) provided in the silicon gel check valve (31); and

a Reed switch (19) provided outside the valve, on the side close to the magnetic steel.

13. The electronic atomization cigarette according to any one of claims 1-4, further including

a through hole arranged on the vapor-liquid separator (7).

14. The electronic atomization cigarette according to claim 9, further including

a silicon gel check valve (31) covering the outside of the through hole on the vapor-liquid separator (7).

15. The electronic atomization cigarette according to any one of claims 1-4, further including

an overflow hole (29) arranged on an atomization cavity wall (25) of the atomization cavity (10).

16. The electronic atomization cigarette according to claim 15, further including

a heating element (26) provided within the atomization cavity (10);

a stream ejection hole (24) provided on one side of the heating element (26); and

a porous body (27) arranged outside around the atomization cavity wall (25).

17. The electronic atomization cigarette according to claim 15 or 16, further including

a first piezoelectric element (23) provided on one side of the atomizer (9) ; and

a bulge (36) provided on the other side of the atomizer (9).

18. The electronic atomization cigarette according to claim 16, wherein the stream ejection hole is a long stream ejection hole with 0.1 mm-1.3 mm of slot structure.

19. The electronic atomization cigarette according to claim 16, wherein the stream ejection hole is a long stream ejection hole with Φ0.2 mm-1.3 mm of circular hole structure having a single and multiple holes.

20. The electronic atomization cigarette according to claim 16, wherein the stream ejection hole is a short stream ejection hole with the diameter of 0.3 mm-1.3 mm.

21. The electronic atomization cigarette according to claim 15, further including

a second piezoelectric element (35) additionally provided in the atomizer (9), wherein the stream passing through the ejection hole is atomized at the central vibration focus of the second piezoelectric element (35) to achieve the effect of strong ultrasonic atomization.

22. The electronic atomization cigarette according to claim 21, wherein the second piezoelectric element (35) is in the form of a platen with a single layer.

23. The electronic atomization cigarette according to claim 21, wherein the second piezoelectric element (35) is in the form of a platen with laminated layers.

24. The electronic atomization cigarette according to any one of the claims 15-23, wherein the atomizer (9) is surrounded by the porous body (27) which can be made of foam nickel, stainless steel fiber felt, high molecule polymer foam and foam ceramic.

25. The electronic atomization cigarette according to claim 16, wherein the heating element (26) is made of platinum wire, nickel chromium alloy or iron chromium aluminum alloy wire with rare earth element.

26. The electronic atomization cigarette according to claim 1614, wherein the heating element is made into a sheet form with conductive ceramics or PTC ceramics.

27. The electronic atomization cigarette according to claim 15, wherein the atomization cavity wall (25) is made of aluminum oxide.

28. The electronic atomization cigarette according to claim 15, wherein the atomization cavity wall (25) is made of ceramics.

29. The electronic atomization cigarette according to claim 13 or 14, wherein the vapor-liquid separator (7) is made of plastics.

30. The electronic atomization cigarette according to claim 13 or 14, wherein the vapor-liquid separator (7) is made of silicon rubber.

31. The electronic atomization cigarette according to any one of claims 1-4, wherein the solution storage porous body (28) is provided in the liquid-supplying bottle (11).

32. The electronic atomization cigarette according to claim 31, wherein the solution storage porous body is filled with polypropylene fiber, terylene fiber or nylon fiber.

33. The electronic atomization cigarette according to claim 31, wherein the solution storage porous body is filled with plastics that are shaped by foaming.

34. The electronic atomization cigarette according to claim 31, wherein the solution storage porous body is molded into a column with laminated layers by polyvinyl chloride, polypropylene, polycarbonate.

35. The electronic atomization cigarette according to any one of claims 1-4, wherein the high frequency oscillator is a Colpitts oscillator with the oscillating frequency of 550KHz-8MHz.

36. The electronic atomization cigarette according to any one of claims 1-4, further including

a semiconductor strain gauge with sealed film arranged between the sensor (6) and the negative pressure cavity (8) inside the sensor (6).

37. The electronic atomization cigarette according to any of the preceding claims, wherein the mouthpiece (15) is threaded,

wherein when the nicotine solution in the liquid-supplying bottle (11) is used up, a user can screw the mouthpiece (15) out to take the liquid-supplying bottle (11) out, refill the liquid-supplying bottle (11) with the nicotine solution, put the liquid-supplying bottle (11) into the shell (14) again, and screw the mouthpiece (15).

38. The electronic atomization cigarette according to any of the preceding claims, further including

a retaining ring (13) for locking the liquid-supplying bottle (11) provided between other side of the liquid-supplying bottle (11) and the shell (14).

39. The electronic atomization cigarette according to any of the preceding claims, further including

a LED (1) at the front end within the shell (14).

40. The electronic atomization cigarette according to any of claims 1-39, wherein the shell is in the shape of a cigarette holder.

41. The electronic atomization cigarette according to any of the claims 1-39, wherein the shell is in the shape of a cigar.

42. The electronic atomization cigarette according to any of the claims 1-39, wherein the shell is in the shape of a pipe.

43. The electronic atomization cigarette according to any of the preceding claims, wherein the electronic atomization cigarette can be filled with conventional drug, functioning as a pulmonary administration apparatus.

44. A nicotine solution used for the electronic atomization cigarette according to any of claims 1-42, wherein the nicotine solution that is injected

into the liquid-supplying bottle (11) and used for the atomization process contains 0.4-3.5% nicotine, 0.05-2% cigarette essence, 0.1-3.1% organic acid, 0.1-0.5% anti-oxidation agent, the rest being 1,2-propylene glycol.