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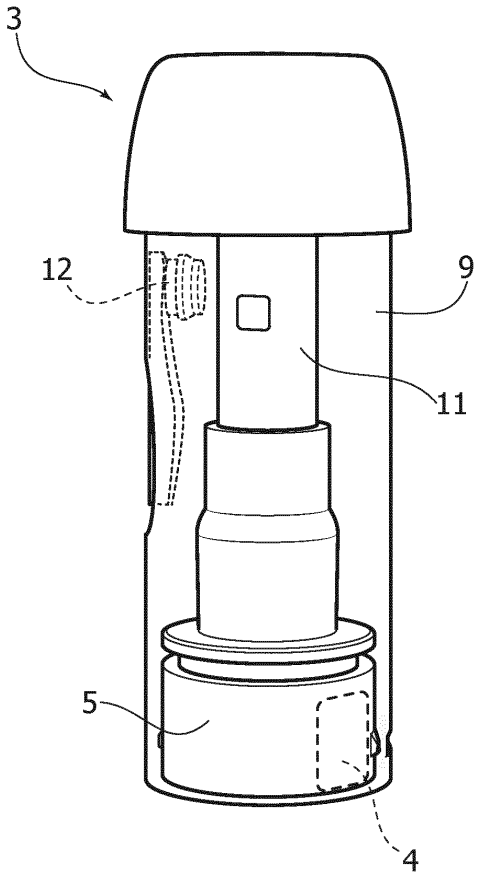
(54) **ELECTRONIC CIGARETTE AND DISPOSABLE CARTRIDGE FOR AN ELECTRONIC CIGARETTE**

(57) Electronic cigarette (1) and cartridge (3) for electronic cigarette provided with an atomiser (5) provided with a chip (4) on which there is stored information that can be modified by means of the control circuit (2) of the electronic cigarette (1).

FIG. 2



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Description

Field of the invention

[0001] The present invention relates to electronic cigarettes and, in particular, it relates to an electronic cigarette and a cartridge for an electronic cigarette provided with an atomiser provided with a memory chip for storing the optimal operating parameters of the resistor of the atomiser.

State of the prior art

[0002] Electronic cigarettes are devices conceived with the intention of replacing conventional cigarettes reducing the harmful effects thereof due to combustion of tobacco.

[0003] An electronic cigarette is substantially an electric device which, through a discharge of electric current, heats resistor elements which bring an "e-liquid" to a vaporisation temperature.

[0004] The e-liquid is a solution comprising propylene glycol, glycerol and one or more flavours; furthermore, a variable amount of nicotine can be added to the e-liquid to make the vapour inhaled by a user even more similar to the smoke produced by a conventional cigarette.

[0005] Currently, various types of electronic cigarettes which consist of an assembly of several parts, sold individually or in special kits which typically comprise a battery, a sealed disposable tank or reusable tank provided with a hole and cap for refilling, and an atomiser, are available on the market. The atomiser includes a porous material, for example cotton, soaked by the liquid contained in the tank, and an electric resistor power-supplied by the battery which, in an operating condition of the electronic cigarette, heats the air inside the porous material so as to vaporise the liquid contained therein. When a user inhales air from the external from an appropriate mouthpiece, normally provided for in the upper end of the cigarette, it enters into the atomiser, it is enriched with vaporised liquid and then it is inhaled.

[0006] Some prior art solutions provide for providing an electronic cigarette with a control circuit, and an atomiser with a chip for storing, in the factory, the optimal operating parameters of the resistor. The electronic circuit is designed to record the parameters stored in the chip and operate the electronic cigarette by supplying the resistor with the appropriate power (Watt).

[0007] The United States Patent application n° US 2019/158938 A1 relates to a vaporiser in which it is possible to modify, for example by means of a mobile phone, the operating data of an e-cigarette stored on a CPU installed on the body of the cigarette.

[0008] The patent application US 2018/020729 A1 and US 2020/315253 A1 relate to methods for controlling the operation of an electronic cigarette by changing some operating parameters thereof.

[0009] Given that the resistor of the atomiser substantially consists of a wire made of metal material, typically an iron-chromium-aluminium alloy, nickel chromium alloy, etc. which heats to vaporise the liquid, a problem common with all electronic cigarettes lies in the wear of the resistor which, upon exceeding a determined period of use, confers a gradually increasingly bitter taste to the vaporised liquid, jeopardising the flavour thereof. Such gradual wear of the resistor wire does not always allow the user to promptly notice the need to replace the atomiser, therefore jeopardising the vaping experience thereof.

[0010] Furthermore, considering that the resistor is normally found in the porous material of the atomiser, it is not accessible to a visual check to verify the actual wear.

Summary of the invention

[0011] The object of the present invention is to overcome the aforementioned drawback, and with the aim of attaining such object, the invention relates to an electronic cigarette of the type defined in claim 1.

[0012] Thanks to this solution idea, when using the electronic cigarette it is possible, whenever there arises the need, to modify the information stored on the memory chip of the atomiser.

[0013] In a preferred embodiment of the invention, upon every use of the electronic cigarette, the control circuit is configured to store the remaining time of use of the atomiser on the memory chip.

[0014] In this manner, if a user for example removes a partially used atomiser from an electronic cigarette and reinserts it into the same cigarette or into another, the control circuit of the electronic cigarette is capable of detecting the remaining time of use of such atomiser.

[0015] In an embodiment of the invention, once the time of use of resistor predetermined and stored on the memory chip has elapsed, the memory chip is suitable to configure the control circuit of the electronic cigarette so as to reduce, for example halve, the power supply of the resistor.

[0016] This allows to "warn" the user of the imminent need to replace the atomiser but without denying the user the possibility to continue vaping.

[0017] In a further embodiment of the invention, once the aforementioned time of use of the resistor has elapsed, the control circuit is configured to modify one of the parameters stored on the memory chip which makes the atomiser no longer usable.

[0018] In this manner, if a user for example removes a finished atomiser and reinserts it into the same cigarette or into another, the control circuit of the electronic cigarette is capable of detecting that such atomiser is finished and that can no longer be used.

[0019] In a further embodiment of the invention, the electronic cigarette comprises a cartridge which includes both the tank of a liquid and the atomiser provided with the memory chip.

[0020] In different embodiments of the invention, the control circuit may be connected with the memory chip electrically or in wireless mode.

[0021] The invention also relates to a cartridge with memory chip for an electronic cigarette provided with a control circuit, wherein the memory chip is configured to store the remaining time of use of the atomiser upon every use of the electronic cigarette.

[0022] In a further embodiment of the cartridge according to the invention, once the predetermined maximum time of use of the atomiser has elapsed, the memory chip is suitable to configure the control circuit of the electronic cigarette so as to reduce, for example halve, the power supply of the resistor.

[0023] In a further embodiment of the cartridge according to the invention, once the predetermined maximum time of use of the atomiser has elapsed, the memory chip can be configured to make the atomiser usable or unusable by means of the control circuit of the electronic cigarette.

[0024] In further embodiments of the cartridge according to the invention, the memory chip is connected electrically or is in wireless connection with the control circuit of the electronic cigarette.

[0025] Furthermore, the invention relates to a method for controlling a cartridge provided with an atomiser for an electronic cigarette, comprising the steps of: providing the electronic cigarette with a control circuit, providing the cartridge with a chip for storing the optimal operating parameters of the atomiser, storing the predetermined maximum time of use of the atomiser on the chip, storing the actual time of use of the atomiser and, when the time of use of the atomiser is equal to the predetermined maximum time of use: storing an information that makes the atomiser unusable on the memory chip, by means of the control circuit.

Brief description of the drawings

[0026] The invention will now be described in detail with reference to the attached drawings, provided purely by way of non-limiting example, wherein:

- figure 1 is a schematic side elevational view of an embodiment of the electronic cigarette according to the invention, and
- figure 2 is a schematic side elevational view of an embodiment of the cartridge according to the invention.

Detailed description of the invention

[0027] Initially with reference to figure 1, an electronic cigarette according to the invention comprising a cylindrical battery 6 and a mouthpiece 8 projecting from an upper portion of the electronic cigarette 1 is indicated in its entirety with 1. In a lower lateral portion of the battery 6 there are provided for three LEDs 7 for respectively indicating the status of the resistor, of the liquid and of the charge of the battery and, in a median portion of the battery 6, there is provided an electronic control circuit 2 to be addressed hereinafter.

[0028] The electronic cigarette 1 is of the generally conventional type and therefore only the essential components and the components expressly referred to in the invention will be described.

[0029] Figure 2 shows a typical cartridge 3 provided with a tank 9 for the liquid, and with an atomiser 5 which includes a heating element comprising a resistor wire (not shown given that it is generally known) arranged at contact with a porous material, for example cotton.

[0030] It should be observed that, in the embodiment of the invention shown in the figures, the electronic cigarette 1 is provided with a cartridge 3 wherein the tank 9 is provided with a hole and a silicone cap 12 for refilling the liquid. Other embodiments falling within the scope of protection of the present invention may comprise different types of cartridges, for example provided with a sealed disposable tank which can be disengaged from a reusable atomiser, or vice versa.

[0031] A vapour outlet duct 11 which connects the atomiser 5 with the mouthpiece 8 extends inside the tank 9. In the lower portion of the cartridge 3 there is installed a chip 4 on which, in the factory, there are stored: the serial number of the cartridge 3, the resistance of the heating element in ohms, the temperature coefficient of resistance (TCR) depending on the material used for the resistor wire, and the maximum number of draws that the respective heating element may carry out expressed in seconds.

[0032] The cartridge 3 is configured to be coupled to the upper end portion of the battery 6 of the electronic cigarette 1 by means of a "childproof" bayonet system not shown given that it is generally known.

[0033] When the cartridge 3 is coupled to the electronic cigarette 1, the control circuit 2 is designed to record the operating parameters stored on the chip 4 so as to carry out the best temperature control (TC) possible. Furthermore, upon every use of the electronic cigarette 1, the control circuit is configured to store the remaining time of use of the atomiser 5 on the chip 4.

[0034] Once the atomiser 5 has carried out the predetermined number of draws, the control circuit 2 indicates - on the corresponding LED 7 - that the resistor needs to be changed and, depending on the predetermined settings, or ceases to power supply the atomiser 5, or it is configured to reduce, for example halve, the power supply of the resistor.

[0035] Furthermore, the control circuit 2 of the electronic cigarette 1 may send a signal to the chip 4 of the respective atomiser 5 changing the parameter thereof which indicates the state of wear of the atomiser 5 making it unusable.

[0036] Obviously, the construction details and the embodiments may widely vary with respect to what has been described and illustrated, without departing from the

scope of protection of the present invention as defined in the claims that follow. Therefore, for example, the general conformation of the cartridge 3 and/or of the battery 6 of the electronic cigarette 1 could be different from the one shown in the drawings.

Claims

1. Electronic cigarette (1) comprising:

- a tank (9) for a liquid,
- an atomiser (5) comprising a resistor for heating the liquid and a chip (4) for storing the optimal operating parameters of said resistor,
- a battery (6) for power-supplying said resistor,
- a control circuit (2) for operating the electronic cigarette (1) consistently with said parameters stored on said chip (4),

wherein
said control circuit (2) is configured to modify at least one of said parameters stored on said memory chip (4) of said atomiser (5), **characterised in that**, once a time of use of said atomiser (5) predetermined and stored on said memory chip (4) has elapsed, said control circuit (2) is configured to change one of the parameters stored on said memory chip (4) which makes the atomiser (5) no longer usable.

2. Electronic cigarette (1) according to claim 1, **characterised in that** upon every use of the electronic cigarette (1), said control circuit (2) is configured to store the remaining time of use of the atomiser (5) on said chip (4).

3. Electronic cigarette (1) according to claim 1 or 2 **characterised in that**, once a time of use of said atomiser (5), predetermined and stored on said memory chip (4) has elapsed, said memory chip (4) is suitable to configure said control circuit (2) so as to reduce, for example halve, the power supply of said resistor.

4. Electronic cigarette (1) according to any one of the preceding claims, **characterised in that** it comprises a cartridge (3) which includes said tank (9) for a liquid and said atomiser (5) provided with said memory chip (4).

5. Electronic cigarette (1) according to any one of the preceding claims, **characterised in that** said control circuit (2) is electrically connected with said memory chip (4).

6. Electronic cigarette (1) according to any one of claims 1-5, **characterized in that** said control circuit (2) is in wireless connection with said memory chip (4).

7. Cartridge (3) for an electronic cigarette (1) provided with a control circuit (2) comprising:

- a tank (9) for a liquid,
- an atomiser (5) including a resistor for heating the liquid, and
- a chip (4) for storing optimal operating parameters of said resistor, wherein

upon every use of the electronic cigarette (1), said memory chip (4) is configured to store both the predetermined maximum time of use of the atomiser and the remaining time of use of the atomiser, **characterised in that** once said predetermined maximum time of use of the atomiser (5) has elapsed, said memory chip (4) can be configured to make said atomiser (5) usable or unusable by means of said control circuit (2) of the electronic cigarette (1).

8. Cartridge (3) according to claim 7, **characterised in that**, once said predetermined maximum time of use of the atomiser (5) has elapsed, said memory chip (4) is suitable to configure said control circuit (2) so as to reduce, for example halve, the power supply of said resistor.

9. Cartridge (3) according to claims 7 and 8, **characterised in that** said memory chip (4) is electrically connected with said control circuit (2) of the electronic cigarette (1).

10. Cartridge (3) according to claim 7 and 8, **characterised in that** said memory chip (4) is in wireless connection with said control circuit (2) of the electronic cigarette (1).

11. Method for controlling a cartridge (3) provided with an atomiser (5) for an electronic cigarette (1), comprising the steps of:

- providing said electronic cigarette (1) with a control circuit (2),
- providing said cartridge (3) with a chip (4) for storing optimal operating parameters of said atomiser (5),
- storing a predetermined maximum time of use of the atomiser (5) on said chip (4),
- storing the actual time of use of the atomiser (5),

when the time of use of the atomiser (5) is equal to the predetermined maximum time of use,
- storing - by means of said control circuit (2) on said chip (4) - an information that makes the atomiser (5) unusable.

FIG. 1

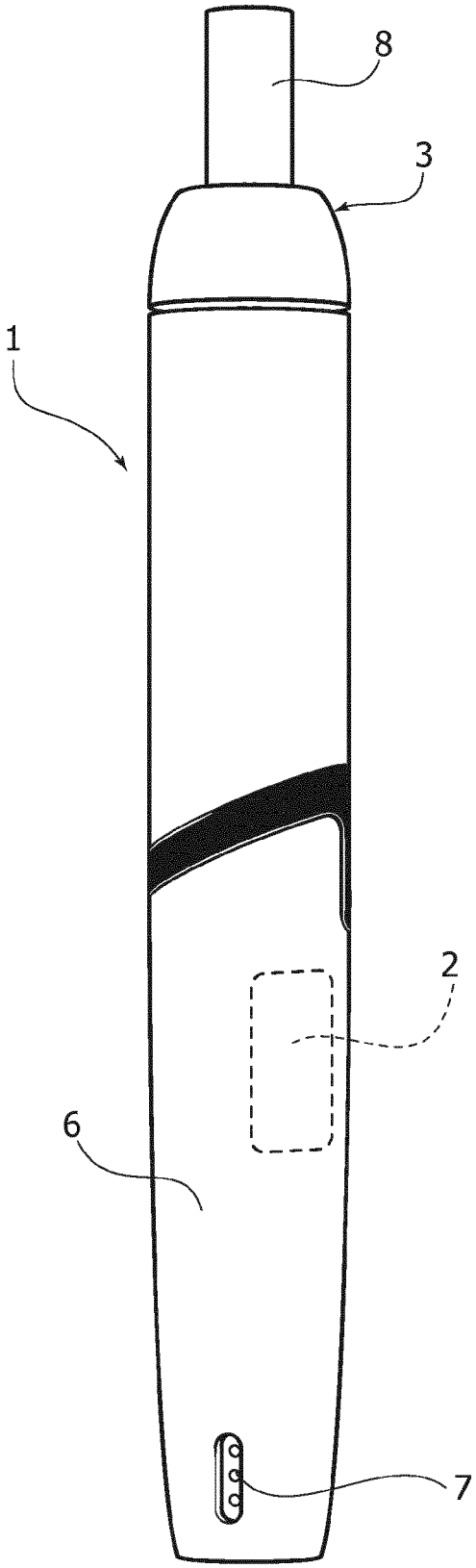
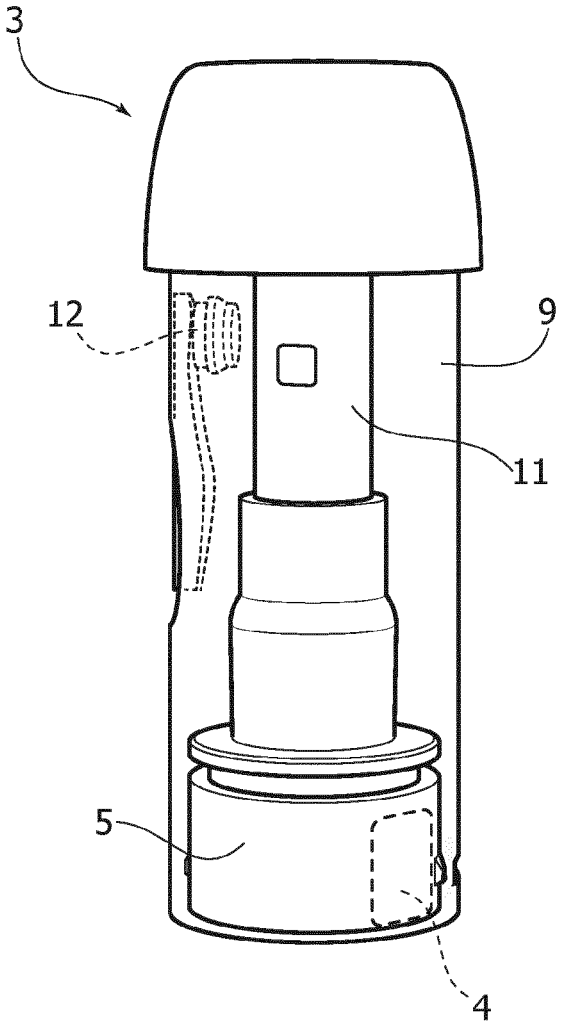


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 3657

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 July 2022	Anticoli, Claud

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
EP 22 16 3657

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 July 2022	Anticoli, Claud

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