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(54) **ATOMIZATION CONTROL UNIT AND A PORTABLE ATOMIZING APPARATUS HAVING THE SAME**

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USPC **392/404**

(57) **ABSTRACT**

A portable atomizing apparatus according to the present invention includes a battery case, an atomizing device, a body case, a control unit, and a suction adjustment. The battery case receives a battery, and the atomizing device includes a heating member electrically connected to the battery for generating heat to atomize a source material. The body case is connected between the battery case and the atomizing device. Besides, the control unit is mounted inside the body case, electrically connected to the battery and to the heating member, so that the control unit receives an electrical power from the battery to control the output signal delivered to the heating member. Also, the suction adjustment opens or closes an air inlet of the atomizing apparatus so as to adjust the amount of air entering the atomizing apparatus.

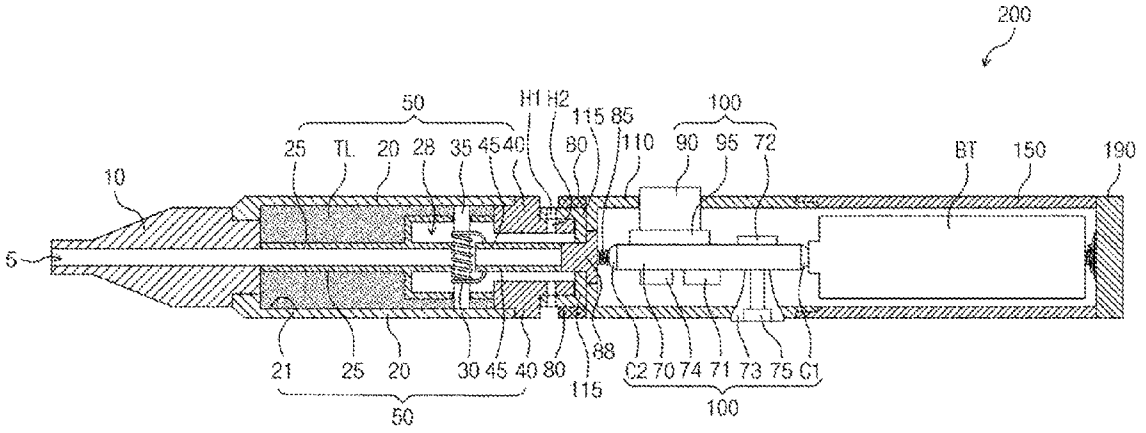


FIG. 1A

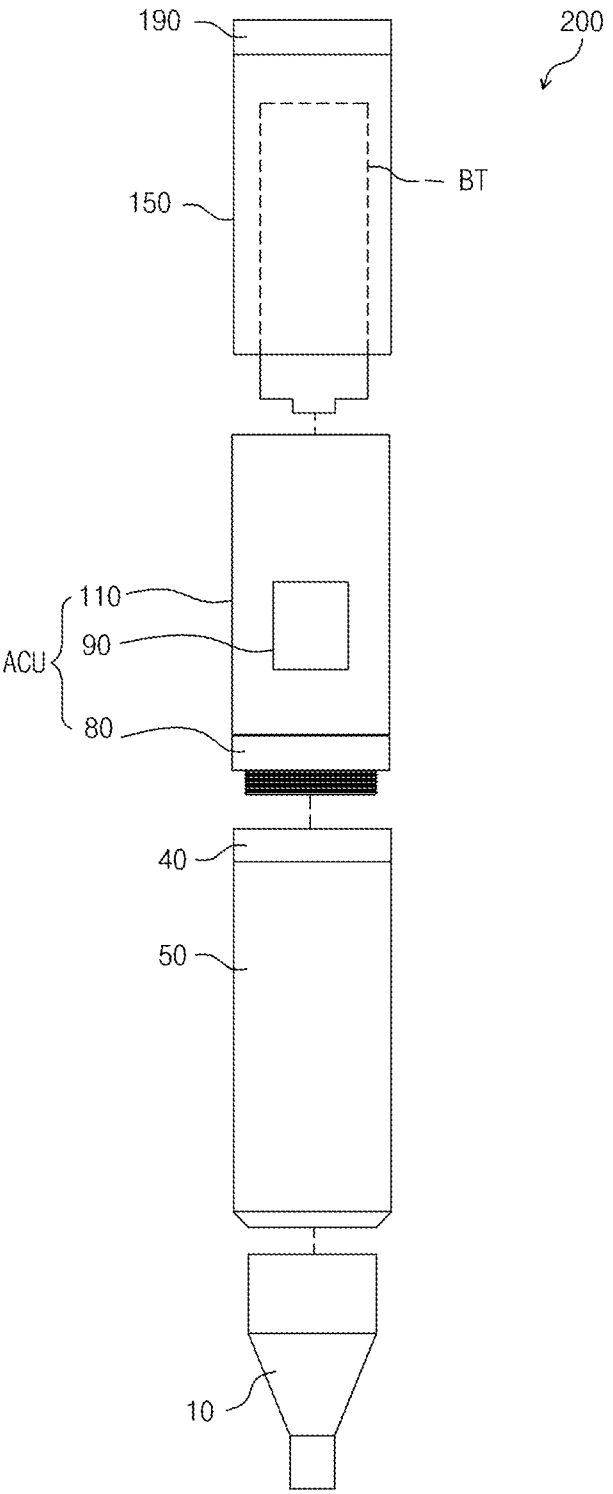


FIG. 1B

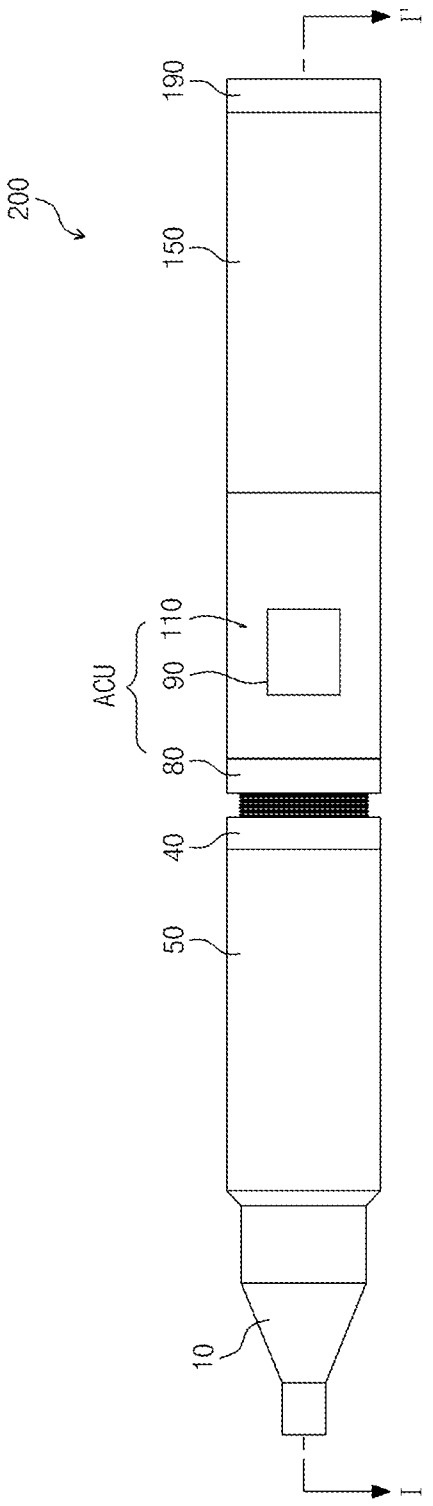


FIG. 2A

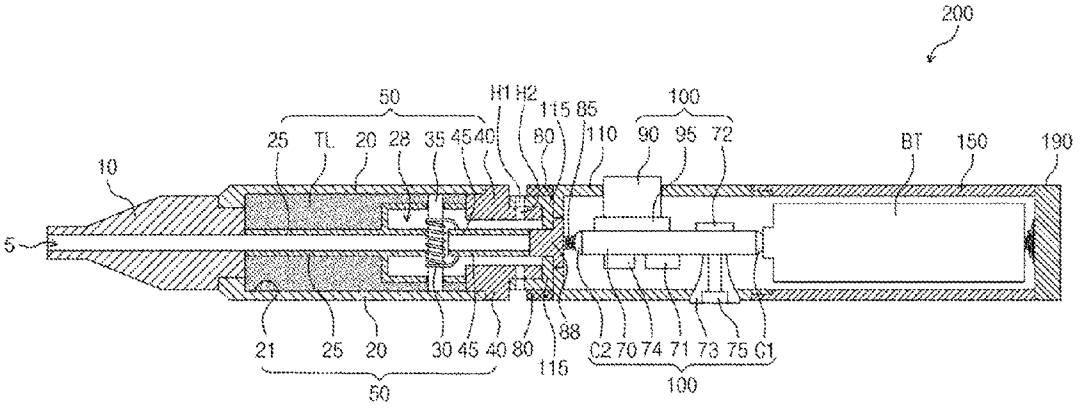

200
50
H1 H2
115 85
100
25 TL 20 28 35 45 40
80
110
90 95 72
BT 150 190
10
5
21 25 20 30 45 40 80
88
115
C2 70 74 71 73 75 C1
50
100

FIG. 2B

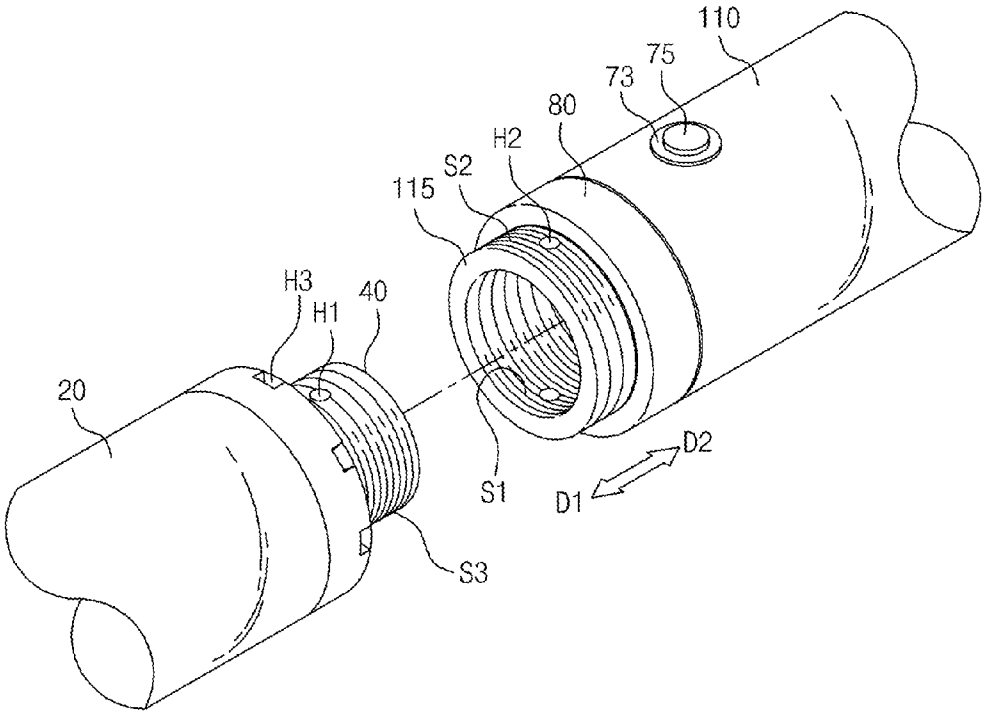

110
75
73
80
H2
S2
115
H3
H1
40
20
S1
D1
D2
S3

FIG. 2C

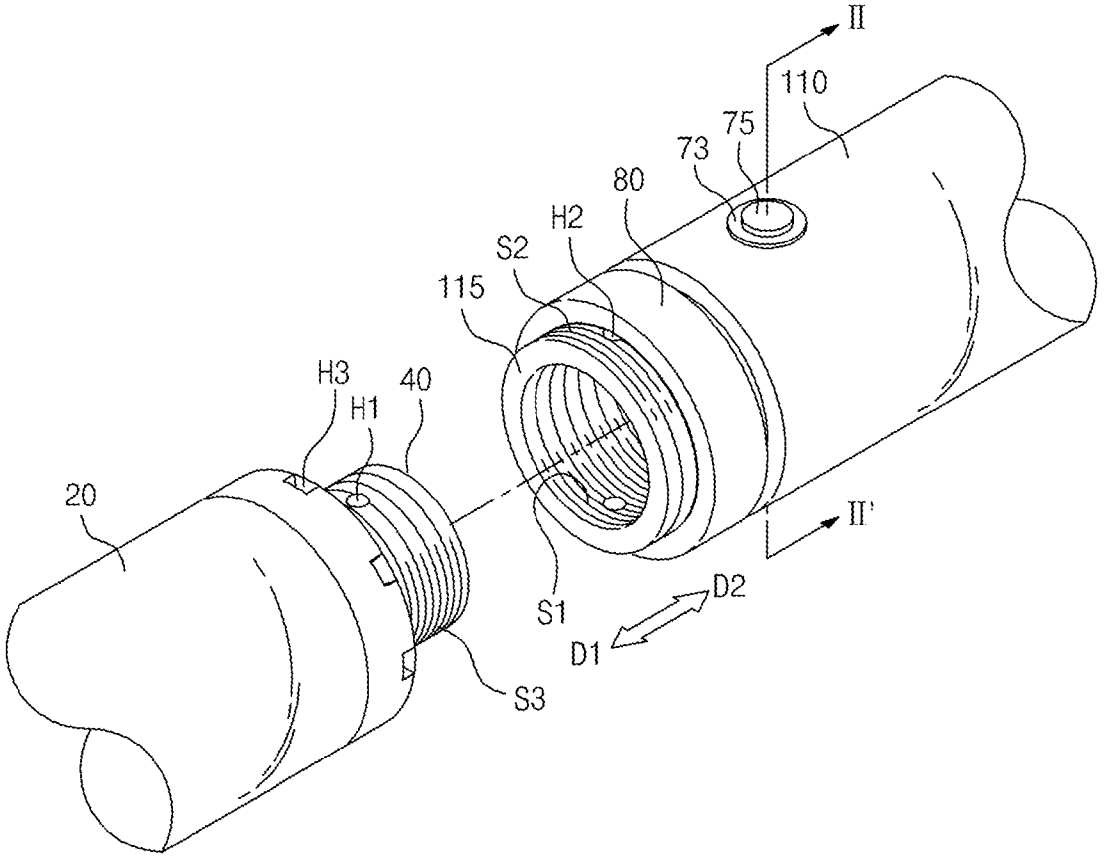

II
110
75
73
80
H2
S2
115
H3
H1
40
20
II'
S1
D2
D1
S3

FIG. 3

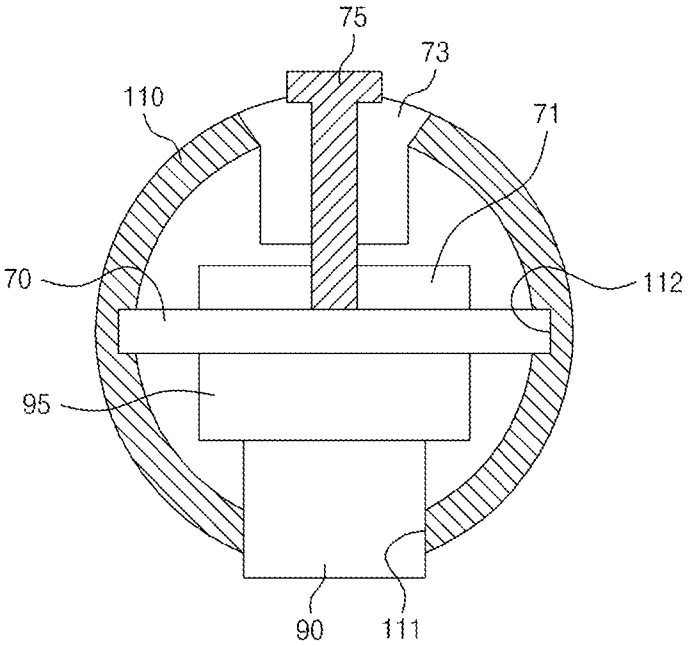

75
73
110
71
70
112
95
90
111

FIG. 4A

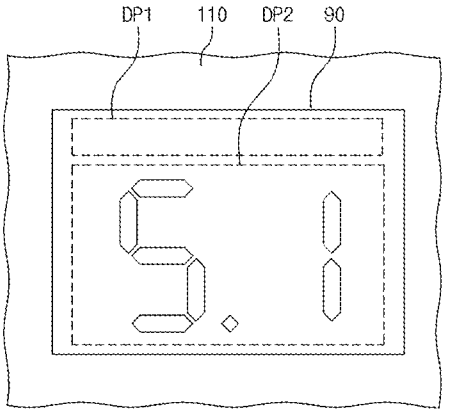


FIG. 4B

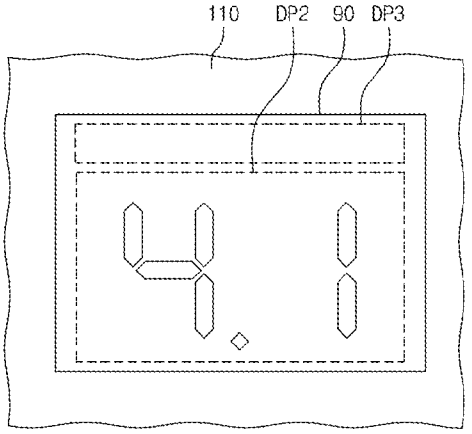


FIG. 5

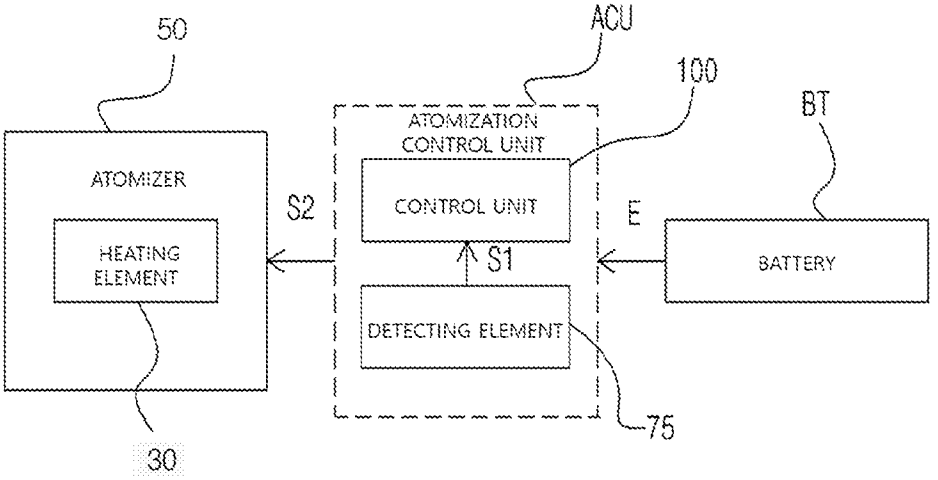


FIG. 6

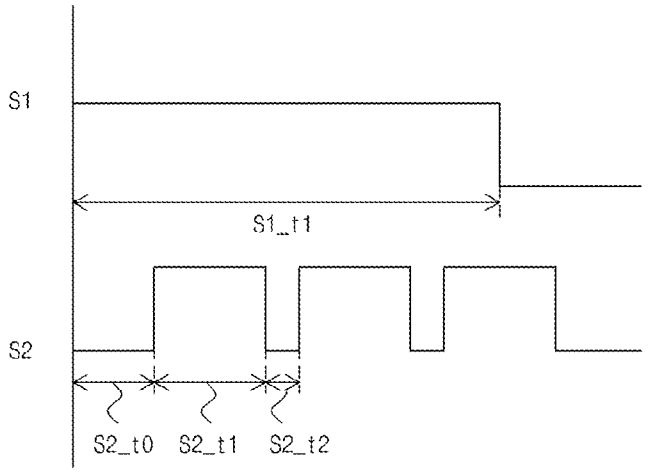


FIG. 7

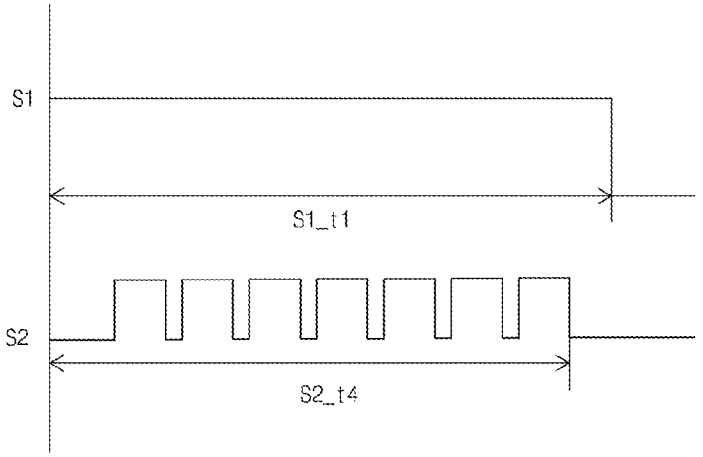
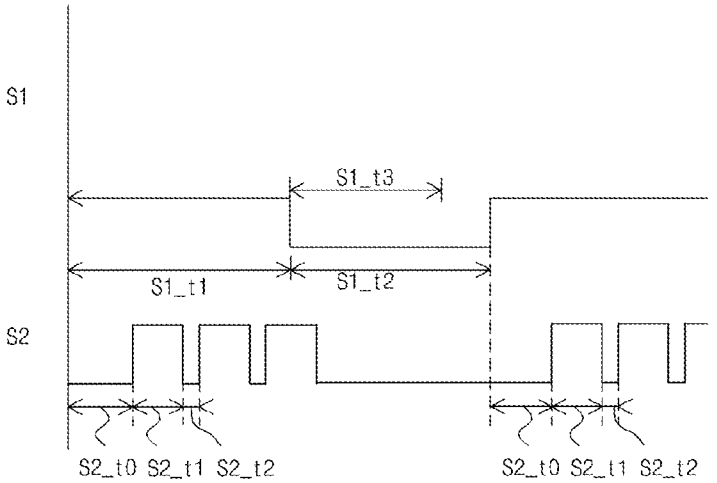


FIG. 8



ATOMIZATION CONTROL UNIT AND A PORTABLE ATOMIZING APPARATUS HAVING THE SAME

TECHNICAL FIELD

[0001] The present invention relates to an atomizing technique, and more particularly, an atomization control unit capable of controlling atomization of a source material and a portable atomizing device having the same.

BACKGROUND ART

[0002] A portable atomizing device is developed to be easily carried by a man to satisfy one's taste by inhaling smoke generated by the portable atomizing device or to fulfill other purposes. An example of portable atomizing devices may be an electronic cigarette, where the electronic cigarette is used as a replacement of cigarette smoking or to aid smoking cessation. Since a method of using the electronic cigarette and an effect of using the same are similar to those of a normal cigarette, a user may receive impression of smoking a normal cigarette by smoking the electronic cigarette.

[0003] In terms of purposes of using the portable atomizing device, factors regarding taste may include not only materials included in source material, but also conditions for the portable atomizing device atomizing the source material. In other words, when a same source material is atomized by the portable atomizing device under different conditions for atomizing the source material, taste, fragrance, and inhaling impression felt by a user while inhaling smoke may be changed. In this case, the user may change expendable parts, such as an atomizer, a cartridge, and a battery, and thus there may be additional costs for a user to use the portable atomizing device.

[0004] Furthermore, times for inhaling smoke from a portable atomizing device once may vary from one user to another. Here, when a user inhales smoke for long period of time, a heating element may be damaged by an overheated the heating element inside an atomizer, or taste or fragrance of smoke may be deteriorated due to excessive combustion of a liquid source material inside the atomizer.

DISCLOSURE OF THE INVENTION

Technical Problem

[0005] The present invention provides an atomization control unit capable of actively controlling atomizing conditions while smoke is being inhaled and capable of controlling atomizing efficiency according to various source ingredients.

[0006] The present invention also provides an atomization control unit capable of preventing a heating element from being overheated and generating fresh smoke without deteriorating taste or fragrance of a liquid source material.

[0007] The present invention also provides a portable atomizing device including the atomization control unit having the advantages as stated above.

Technical Solution

[0008] According to an aspect of the present invention, there is provided an atomization control unit of a portable atomizing device including an atomizer having a heating element for heating a source material and a battery case for accommodating a battery, the atomization control unit including a body case, a control unit, and a suction control unit.

[0009] The body case is combined with the battery case at a first side and is combined with the atomizer at a second side. The control unit is accommodated inside the body case, is electrically connected to the battery and the heating element, receives power voltage from the battery, and controls an output voltage output to the heating element. Furthermore, the suction control unit controls an amount of the air introduced toward the atomizer by opening or closing air inlets connecting the atomizer with the outside.

[0010] According to another aspect of the present invention, there is provided a portable atomizing device including a battery case, a body case, a control unit, and a suction control unit. The battery case accommodates a battery therein, and the atomizer is electrically connected to the battery and includes a heating element for generating heat to atomize a source material. The body case is arranged between the battery case and the atomizer and is combined with the battery case and the atomizer.

[0011] Furthermore, the control unit is accommodated inside the body case, is electrically connected to the battery and the heating element, receives power from the battery, and controls an output signal output to the heating element. Furthermore, the suction control unit controls an amount of the air introduced toward the atomizer by opening or closing air inlets connecting the atomizer with the outside.

[0012] According to another aspect of the present invention, there is provided a portable atomizing device including an atomizer electrically connected to a battery and including a heating element for generating heat to atomize a source material; a detecting element capable of recognizing a continuous touch of a user; and a control unit outputting an output signal having alternately arranged therein a heating time section having a first voltage level and a heating-stopped time section having a second voltage level lower than the first voltage level at least once, to the heating element while a press on the detecting element continues.

[0013] According to embodiments of the present invention, the detecting element may be a button type or a touch type. According to embodiments of the present invention, the control unit may define the first voltage level based on the measured resistance of the heating element. According to embodiments of the present invention, the second voltage level may be 0V. According to embodiments of the present invention, there may be a heating wait time section for not turning the output signal on for a designated period of time from initiation of the continuous touch of the user. According to embodiments of the present invention, the heating wait time section may have a duration from about 0.01 seconds to about 1 seconds. According to embodiments of the present invention, the heating-stopped time section may have a duration from about 0.1 seconds to about 20 seconds, and the heating-stopped time section may have a duration from about 0.05 seconds to about 5 seconds.

[0014] According to embodiments of the present invention, the portable atomizing device further includes a display unit for displaying a user interface for setting one of or both the heating time section and the heating-stopped time section, wherein the control unit may adjust values of the heating time section and the heating-stopped time section based on a press of the user by using the detecting element as a user input interface.

[0015] According to embodiments of the present invention, when a press on the detecting element is stopped for a preset wait time or longer period of time, the control unit may output an output signal due to a later press on the detecting element from the heating wait time section. According to embodiments of the present invention, output of the output signal may be restricted to a preset maximum operation time. According to embodiments of the present invention, the maximum operation time may be from about 0.15 seconds to about 25 seconds.

[0016] According to embodiments of the present invention, the portable atomizing device may further include a battery case for accommodating the battery therein; a body case arranged between the battery case and the atomizer and combined with the battery case and the atomizer; and a suction control unit controlling an amount of the air introduced toward the atomizer by opening or closing air inlets connecting the atomizer with the outside. According to embodiments of the present invention, the portable atomizing device may be one from among a fragrance generator, fragrance therapy device, a sterilizer, a pest exterminator, or a respiratory system treatment device.

Advantageous Effects

[0017] According to embodiments of the present invention, power supplied to a heating element may be maintained constant by adjusting an output signal based on power voltage of a battery or resistance of the heating element. Therefore, problems including short-circuit of a heating element due to excessive power, reduction of an amount of smoke of a portable atomizing device due to insufficient power, and change of fragrance and taste of smoke may be resolved.

[0018] Furthermore, according to embodiments of the present invention, a user may control an output signal according to the user's preference. Therefore, a better smoking condition corresponding to the user's preference may be selected.

[0019] Furthermore, an amount of the outside air to be mixed with an atomized source material may be easily adjusted by using a suction control unit. Therefore, a user may easily adjust atomization amount by using the suction control unit.

[0020] Furthermore, a printed circuit board of a control unit is combined to a combination groove of a body case and may not only support a display unit and a switch mounted thereon, but also directly or indirectly contacts a battery and output terminals for mutual electric connections. Therefore, circuit configuration and mechanical assembly of a portable atomizing device may be easily embodied without a separate connecting member or a combining member.

[0021] Therefore, environment friendliness may be embodied by excluding hazardous materials, such as lead. Furthermore, the overall manufacturing process may be further simplified, thereby reducing manufacturing cost.

[0022] Furthermore, a user may operate a portable atomizing device by using a touch-type switch, such as a detecting element. Therefore, if the portable atomizing device is applied to an electronic cigarette, the portable atomizing device may be operated by simply grabbing the body of the portable atomizing device including a detecting element without keep pressing a button, thereby improving user convenience.

[0023] Furthermore, damages to an atomizer and waste of a source material due to excessive heating of a heating element may be prevented by controlling the heating element by using an output signal having a heating time section of a first voltage level and a heating-stopped time section of a second voltage level that is lower than the first voltage level.

[0024] Furthermore, by allowing a user to adjust durations of a heating time section and a heating-stopped time section based on inhale time or inhale habit of the user, the user may select/adjust smoking conditions in correspondence to the user's preference and may enjoy changed taste, fragrance, and inhaling impression of a source material.

[0025] As described above, by setting a maximum operation time regarding an output signal and a wait time based on interruption of a press on a detecting element, power consumed by a heating element may be reduced, thereby increasing battery time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. **1**A is an exploded view of a portable atomizing device according to an embodiment of the present invention;

[0027] FIG. **1**B is a front view of the portable atomizing device shown in FIG. **1**A;

[0028] FIG. **2**A is a cross-sectional diagram, obtained along a line I-I' of FIG. **1**B;

[0029] FIG. **2**B is a diagram showing a suction control unit of FIG. **1** in closer detail;

[0030] FIG. **2**C is a diagram for describing function of the suction control unit shown in FIG. **2**B;

[0031] FIG. **3** is a cross-sectional diagram, obtained along a line II-II' of FIG. **2**C;

[0032] FIGS. **4**A and **4**B are diagrams showing information displayed at a display unit shown in FIG. **1** in closer details;

[0033] FIG. **5** is a control block diagram of the portable atomizing device shown in FIG. **2**A;

[0034] FIG. **6** is a timing diagram for describing a second output signal of a control unit having a heating time section and a heating-stopped time section;

[0035] FIG. **7** is a timing diagram for describing an output signal according to a maximum operating time setting; and

[0036] FIG. **8** is a timing diagram for describing an output signal according to a standby time setting.

MODE FOR CARRYING OUT THE INVENTION

[0037] A portable atomizing device includes a battery case for accommodating a battery therein, an atomizer that is electrically connected to the battery and includes a heating element for generating heat to atomize a source material, a body case that is arranged between the battery case and the atomizer and is combined with the battery case and the atomizer, a control unit that is accommodated inside the body case, is electrically connected to the battery and the heating element, receives power from the battery, and controls an output signal output to the heating element, and a suction control unit that controls an amount of the air introduced toward the atomizer by opening or closing air inlets connecting the atomizer with the outside.

[0038] Furthermore, a portable atomizing device according to another embodiment of the present invention includes an atomizer including a heating element for generating heat for atomizing a source material, a detecting element capable of recognizing a continuous touch of a user, and a control unit that outputs an output signal, in which a heating time section having a first voltage level and a heating-stopped time section having a second voltage level lower than the first voltage level

are alternately arranged at least once, to the heating element while a press on the detecting element continues.

[0039] The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown.

[0040] The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to one of ordinary skill in the art. Meanwhile, the terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of exemplary embodiments.

[0041] Also, thickness or sizes of layers in the drawings are exaggerated for convenience of explanation and clarity, and the same reference numerals denote the same elements in the drawings. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0042] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of exemplary embodiments. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising" used herein specify the presence of stated features, integers, steps, operations, members, components, and/or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, members, components, and/or groups thereof.

[0043] The present invention will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. In the drawings, for example, sizes and shapes of members may be exaggerated for clarity and convenience of explanation. Accordingly, the shapes may be modified actually. Accordingly, it should not be construed as being limited to specific shapes of regions.

[0044] FIG. **1**A is an exploded view of a portable atomizing device **200** according to an embodiment of the present invention, and FIG. **1**B is a front view of the portable atomizing device **200** shown in FIG. **1**A.

[0045] Referring to FIGS. **1**A and **1**B, the portable atomizing device **200** is used to generate smoke by atomizing a source material, so that a user may fulfill one's taste or a designated purpose, such as a medical treatment, by inhaling the smoke. For example, the portable atomizing device **200** may be used as an electronic cigarette to replace a normal cigarette. In this case, the source material may be a liquid material containing nicotine. However, the portable atomizing device **200** according to the present invention is not limited to embodiments regarding electronic cigarettes. For example, the portable atomizing device **200** may be applied to a device to aid smoking cessation being capable of generating smoke by atomizing a nicotine-free liquid material or may be applied as a healthcare aid device for atomizing a source material containing healthy ingredients, such as an herb extract. Alternatively, the portable atomizing device **200** may be used for a medical treatment by atomizing a source material containing materials (e.g., Ventolin or Pulmican) having pharmacologic activation effects with respect to respiratory diseases, such as bronchitis and pneumonia. However, those are merely examples, and it is clear that purposes of the portable atomizing device **200** may vary according to ingredients of the source material.

[0046] The portable atomizing device **200** includes a battery case **150**, a battery cap **190**, an atomizer **50**, a suction mouthpiece **10**, and an atomization control unit (ACU). The battery case **150** may have a hollow shape, in which a battery BT may be accommodated therein. According to embodiments of the present invention, the battery case **150** may have an internal structure communicating with a battery case **110** of the atomization control unit (ACU), and thus, an electrode of an exposed battery BT, e.g., a positive electrode, may contact an electrode pad arranged at the atomization control unit ACU and electrically connected thereto. In this case, the other electrode of the battery BT, e.g., a negative electrode, may contact the battery case **150** and may be electrically connected to the atomization control unit ACU as the body case **110** of the atomization control unit ACU and the battery case **150** are combined with each other, thereby forming a circuit. However, it is merely an example, and the battery BT may be hidden inside the battery case **150**. According to embodiments of the present invention, an end portion of the battery case **150** may be covered by a battery cap **190**.

[0047] According to embodiments of the present invention, screw threads may be formed at portions of the battery case **150**, the battery cap **190**, and the body case **110** that are to be combined with one another. Therefore, a user may easily detach or combine the battery case **150** or the battery cap **190** from or with the portable atomizing device **200**, and thus the dead battery BT may be easily and periodically replaced.

[0048] Furthermore, a suction mouthpiece **10** is suitable for an electronic cigarette or a respiratory disease treatment device and may be either omitted for an application, such as a fragrance generator, a sterilizer, or a pest exterminator, or replaced with a nozzle for accelerating dispersion of smoke into the air.

[0049] The atomization control unit (ACU) includes the body case **110**, a control unit (**100** of FIG. **2**A) including a display unit **90**, and a suction control unit **80**. The body case **110** has a hollow shape, where the inside thereof communicates with the battery case **150**, and the control unit (**100** of FIG. **2**A) is accommodated therein. FIGS. **1**A and **1**B shows the display unit **90** from among components of the control unit, where the display unit **90** is exposed to outside via an opening formed in a portion of the body case **110**. The display unit **90** may include a self-luminescent display device, such as a liquid crystal display device, an organic light emitting display device, or a vacuum fluorescence display device, or a non-self-luminescent display device.

[0050] The suction control unit **80** is combined with an end portion of the body case **110** and opens or closes an air inlet (H2 of FIG. **2**A) communicating with the outside and the atomizer **50** while the body case **110** is combined with the atomizer **50**. Therefore, according to states that the suction control unit **80** opens or closes the air inlet, amount of smoke that is atomized by the atomizer **50** and discharged to outside via the suction mouthpiece **10** may be changed.

[0051] In the present embodiment, the suction control unit **80** may have a ring-like structure to be combined with an end portion of the body case **110** in which the air inlet is formed. In this case, the suction control unit **80** may move in the lengthwise direction from the end portion of the body case **110** and may open or close the air inlet by moving on the air inlet. The structure and the function of the suction control unit

80 described above will be described below in closer details with reference to FIGS. 2B and 2C.

[0052] The atomizer 50 is combined with the atomization control unit (ACU) to face the battery case 150 across the atomization control unit (ACU). The atomizer 50 is electrically connected to the battery BT via the atomization control unit (ACU) and generates smoke by atomizing a source material. In the present embodiment, the atomizer 50 may be combined with the atomization control unit ACU via a combining portion 40 including a screw thread formed on the inner surface of the combining portion 40, and thus a user may easily detach the atomizer 50 from the portable atomizing device 200 for replacement. Therefore, when performance of the atomizer 50 is deteriorated due to long-term usage, a user may easily replace the atomizer 50.

[0053] The suction mouthpiece 10 is combined with an end portion of the atomizer 50, so that smoke generated by the atomizer 50 may be discharged to outside via the suction mouthpiece 10. In other words, a user may inhale smoke generated by the atomizer 50 via the suction mouthpiece 10. In the present embodiment, the suction mouthpiece 10 may be formed of a material having excellent durability, such as a metal, or a flexible material, such as a silicon polymer, for improved user impression. Hereinafter, the internal structure of the portable atomizing device 200 will be described in closer detail with reference to FIGS. 2A and 2B.

[0054] FIG. 2A is a cross-sectional diagram, obtained along a line I-I' of FIG. 1B, FIG. 2B is a diagram showing the suction control unit 80 of FIG. 1 in closer detail, and FIG. 2C is a diagram for describing function of the suction control unit 80 shown in FIG. 2B. Regarding components denoted by same reference numerals as components shown in previous drawings, descriptions of the components shown in previous drawings may be referred, if not contradictory.

[0055] Referring to FIG. 2A through 2C, the body case 110 of the atomization control unit (ACU) includes an output terminal 88 and a first combining portion 115. The output terminal 88 is arranged at a portion at which the body case 110 is combined with the atomizer 50, so that power is supplied from the control unit 100 to the atomizer 50.

[0056] The first combining portion 115 has a hollow shape, which extends from an end portion of the body case 110 toward the atomizer 50 and has an open top to surround the output terminal 88. The output terminal 88 may be partially exposed by the first combining portion 115. Furthermore, one or a plurality of (at least one or more) air inlets H2 are formed in a sidewall of the first combining portion 115. A first screw thread S1 to be combined with a third screw thread S3 of the second combining portion 40 of the atomizer 50 is formed on the inner surface of the first combining portion 115, and a second screw thread S2 to be combined with the suction control unit 80 is formed on the outer surface of the first combining portion 115. In the structure of the first combining portion 115 as described above, the second combining portion 40 of the atomizer 50 is inserted into and combined with the first combining portion 115, and thus the atomization control unit (ACU) and the atomizer 50 may be combined with each other.

[0057] Furthermore, air holes H1 penetrating through the second combining portion 40 are formed in the second combining portion 40, whereas one or a plurality of air vents H3 may be formed in an end portion of an atomizer case 20. Therefore, the external air may pass through the air vents H3, the air inlets H2, and the air holes H1 in the order stated and be provided into the atomizer 50.

[0058] The atomizer 50 includes the second combining portion 40, the atomizer case 20, a cartridge 21, an electrode tube 45, a wig 35, a heating element 30, and an exhaust tube 25. The second combining portion 40 is arranged at an end portion of the atomizer case 20. The second combining portion 40 has a hollow shape having an open top to surround the electrode tube 45. Therefore, as described above, when the second combining portion 40 is inserted into the first combining portion 115, the electrode tube 45 may contact the output terminal 88 and electrically connected to the output terminal 88.

[0059] The cartridge 21 is arranged inside the atomizer case 20, and a source material TL is accommodated in the cartridge 21. In an embodiment, the source material TL may be a liquid, where ingredients of the source material TL may be determined based on purpose of the portable atomizing device 200. Furthermore, an atomization chamber 28 isolated from the source material TL is arranged inside the cartridge 21, where the wig 35, the heating element 30 wound around the wig 35, and the electrode tube 45 are arranged in the atomization chamber 28. The electrode tube 45 is formed of a conductive material and is electrically connected to the output terminal 88. Meanwhile, a portion of the wig 35 is exposed to the source material TL, so that the source material TL is absorbed by the wig 35 and is provided to the heating element 30.

[0060] The heating element 30 may be a conductive coil, such as a filament, and the heating element 30 receives an output signal, e.g., a controlled voltage signal or a current signal, from the output terminal 88 and generates heat. The output signal may be DC pulses or AC pulses. Preferably, the output signal may be DC pulses for easy power control. In this case, power may be controlled by controlling size or width of pulses. When the output signal is applied to the heating element 30, the heating element 30 is heated, the source material TL absorbed by the wig 35 surrounded by the heating element 30 is atomized, and the atomization chamber 28 is filled with smoke. The output signal will be described below with reference to FIG. 6.

[0061] Furthermore, the exhaust tube 25 is arranged inside the cartridge 21, an end portion of the exhaust tube 25 is connected to a suction tube 5 of the suction mouthpiece 10, and the other end portion of the exhaust tube 25 is connected to the atomization chamber 28. Therefore, when a liquid source material TL is atomized, the atomization chamber 28 is filled with smoke, and a man sucks the suction mouthpiece 10, and the man can inhale the smoke filling the atomization chamber 28 via the exhaust tube 25 and the suction tube 5.

[0062] In another embodiment, the portable atomizing device 200 may include an atomizer, which has a different structure from the heating-type atomizer 50 as above mentioned. For example, the portable atomizing device 200 may include an atomizer which includes an oscillator and generates smoke using an ultrasonic oscillation method.

[0063] The suction control unit 80 has a ring-like shape surrounding the outer surface of the first combining portion 115 and a screw thread (not shown), which is to be combined with the second screw thread S2, is formed on the inner surface of the first combining portion 115, so that the suction control unit 80 is combined with the first combining portion 115. Therefore, if a user is revolved the suction control unit 80, the suction control unit 80 may move in a first direction D1 or a second direction D2 and can completely open, par-

tially open, or close the air inlets H2. For example, FIG. **2**B shows that the suction control unit **80** is moved to the end in the second direction D2. In this case, the suction control unit **80** does not overlap the air inlets H2, and thus the air inlets H2 are completely opened.

[0064] On the other hand, FIG. **2**C shows that the suction control unit **80** revolves along the second screw thread S2 and is moved to the first direction D1. In this case, the suction control unit **80** overlaps approximately a half of the air inlet H2 and closes the air inlet H2 about a half. Therefore, if it is assumed that an amount of air provided from outside toward the atomization chamber **28** via the air inlets H2 when the suction control unit **80** is at the position as shown in FIG. **2**C is a first amount, an amount of air provided from outside toward the atomization chamber **28** via the air inlets H2 when the suction control unit **80** is at the position as shown in FIG. **2**B is a second amount, which is greater than the first amount.

[0065] Therefore, if it is assumed that a user sucks the suction mouthpiece **10** at a same pressure, the user may inhale more smoke when the suction control unit **80** is at the position as shown in FIG. **2**B than when the suction control unit **80** is at the position as shown in FIG. **2**C. In other words, a user may easily control an amount of smoke to inhale by controlling position of the suction control unit **80**.

[0066] In an embodiment, the portable atomizing device **200** may further include an elastic element **85**. The elastic element **85** may be conductive and elastic, such as a metal spring. The elastic element **85** is interposed between the output terminal **88** and a printed circuit board **70**, secures an electric connection between the output terminal **88** and the printed circuit board **70**, and corrects contact between the output terminal **88** and the electrode tube **45**. The output terminal **88** may be connected to the battery BT via the printed circuit board **70**. In detail, the elastic element **85** contacts the output terminal **88** and a second conductive layer C2 of the printed circuit board **70**, a first conductive layer C1 of the printed circuit board **70** contacts a terminal of the battery BT, and power voltage of the battery BT may be output toward the output terminal **88** via the printed circuit board **70**.

[0067] In this regard, conductive layers are formed at the printed circuit board **70** itself and a circuit for supplying power to the atomizer **50** is configured simply as the battery BT contacts the printed circuit board **70** and the printed circuit board **70** contacts the electrode tube **45**, and thus an electric connection may be established by simply combining the atomizer **50**, the atomization control unit (ACU), and the battery case **150** with one another. As a result, according to an embodiment of the present invention, an atomizer, which has a simplified circuit structure and can be easily manufactured and assembled, may be provided without a complex conductive members such as wires.

[0068] Furthermore, since the atomizer **50** is frequently detached from and combined with the portable atomizing device **200** to fill the source material TL to the cartridge **21**, if the elastic element **85** is not provided, a gap may be formed between the output terminal **88** and the second conductive layer C2 as the portable atomizing device **200** is used for longer period of time, and thus an electric connection between the output terminal **88** and the second conductive layer C2 may become unstable. However, according to an embodiment of the present invention, even if a gap is formed between the output terminal **88** and the second conductive layer C2, the elastic element **85** may maintain reliability of an electric connection between the output terminal **88** and the second conductive layer C2.

[0069] FIG. **3** is a cross-sectional diagram, obtained along a line II-II' of FIG. **2**C.

[0070] Referring to FIGS. **2**A and **3**, the control unit **100** is accommodated inside the body case **110**. The control unit **100** is electrically connected to the battery BT and the heating element **30**, receives power from the battery BT, and controls electric output toward the heating element **30**, e.g., output voltage.

[0071] The control unit **100** includes the printed circuit board **70**, a resistance measuring unit **71**, a voltage correcting unit **74**, a micro-computer device **72**, a detecting element **75**, a light source **95**, and the display unit **90**. The resistance measuring unit **71**, the voltage correcting unit **74**, the micro-computer device **72**, the detecting element **75**, and the light source **95** are shown as independent devices. However, it is merely an example, and at least two from among the devices may be combined with each other and may be miniaturized into a one-chip system IC. However, the present invention is not limited thereto. The printed circuit board **70** is inserted into a combination groove **112** formed on the inner surface of the body case **110**, is accommodated inside the body case **110**, and is electrically connected to the battery BT and the heating element **30**. In detail, the first conductive layer C1 is formed on a side portion of the printed circuit board **70** adjacent to the battery case **150**, and the first conductive layer C1 is electrically connected to the battery BT. Furthermore, the second conductive layer C2 is formed on another side portion adjacent to the atomizer **50**, the second conductive layer C2 contacts the output terminal **88** via the conductive elastic element **85**, and may be electrically connected to the heating element **30**. The first and second conductive layers C1 and C2 may be solder layers or printed conductive pads formed at side portions of the printed circuit board **70**.

[0072] In the structure as described above, the printed circuit board **70** may be electrically connected to the battery BT and the heating element **30** via the first and second conductive layers C1 and C2 without a wire or a solder. Furthermore, the printed circuit board **70** not only completes a circuit configuration, but also functions as a mechanical supporting body for the components **71**, **74**, **72**, **75**, **95**, and **90**, thereby simplifying the internal configuration of the body case **110** into a single body. Therefore, environment friendliness may be embodied by excluding hazardous materials, such as lead. Furthermore, the overall manufacturing process may be further simplified, thereby reducing manufacturing cost.

[0073] The resistance measuring unit **71**, the voltage correcting unit **74**, the micro-computer device **72**, the detecting element **75**, the light source **95**, and the display unit **90** are mounted on the printed circuit board **70**. In an embodiment, the resistance measuring unit **71** may include an electric circuit formed on the printed circuit board **70** to detect resistance of the heating element **30**, and the voltage correcting unit **74** may include an electric circuit which corrects of a power voltage of the battery BT and outputs a power signal, such as a constant voltage circuit or a voltage boosting circuit. Furthermore, in another embodiment, the resistance measuring unit **71** and the voltage correcting unit **74** may be integrated in the micro-computer device **72**. The resistance measuring unit **71** may measure resistance of the heating element **30** by applying a measuring current to the heating element **30** and measuring a voltage level applied to the heating element

30 or may measure resistance by applying a measuring voltage to the heating element 30 and measuring an output current flowing in the heating element 30.

[0074] According to the configuration as described above, when resistance of the heating element 30 is smaller than a pre-set value, e.g., a resistance of a power condition applied to an atomizer custom-set by a user, due to specification or product reliability of the atomizer 50, the resistance measuring unit 71 may measure resistance of the heating element 30 and the voltage correcting unit 74 may correct the output voltage to be smaller than the pre-set value based on the detected resistance of the heating element 30. Therefore, regardless resistance of the heating element 30, power having a controlled set value may be constantly supplied toward the heating element 30. For example, as a same power is supplied to an atomizer, an atomizing efficiency and an amount of smoke based on the atomizing efficiency may be maintained constantly. Furthermore, since supplied power may be controlled according to resistance, the heating element 30 may be prevented from being short-circuited due to a high voltage. Detailed descriptions thereof will be given below with reference to FIG. 5.

[0075] The detecting element 75 is supported by a supporting member 73, such as silicon, is mounted on the printed circuit board 70, is exposed to outside via an opening 111 formed in the body case 110, and generates an input signal in correspondence to a touch event. The input signal generated by the detecting element 75 is input to the micro-computer device 72 described below and controls the overall operations of the portable atomizing device 200. In another embodiment, the detecting element 75 may be replaced with other types of touch-type switches, such as an electrostatic switch and a pressure-sensitive switch.

[0076] The micro-computer device 72 is a device using a large-scale integration (LSI) circuit, in which a large number of electric circuits are integrated, and including a central calculation circuit, a memory circuit, and an input/output control circuit for performing simple mathematical calculations and logic calculations. The micro-computer device 72 may receive the input signal and control the overall operations of the portable atomizing device 200. For example, in an embodiment, in response to the input signal, the micro-computer device 72 may turn the portable atomizing device 200 on or off, provide power of a battery to the heating element 30, change operation mode of the portable atomizing device 200, or control the power according to the operation mode. In other embodiments, the control unit 100 may further include a non-volatile memory device, such as an electrically erasable programmable read-only memory (EEPROM), a flash memory, and a phase change memory, where the non-volatile memory devices may be integrated in the micro-computer device 72 or may be separately mounted. User set values or a database unit described below may be stored in the memory device or the non-volatile memory device as described above.

[0077] In detail, when a user touches the detecting element 75 of a plurality of number of times, the micro-computer device 72 may turn the portable atomizing device 200 on. Furthermore, after the portable atomizing device 200 is turned on, while the user is touching the detecting element 75, the micro-computer device 72 may provide the power to the heating element 30, and thus atomization of a source material may be initiated.

[0078] Furthermore, after the portable atomizing device 200 is turned on, a user may touch the detecting element 75 in a pre-set manner, and, in response to the touch, the micro-computer device 72 may set the operation mode of the portable atomizing device 200 to a first operation mode in which power is automatically controlled. In this case, due to functions of the voltage correcting unit 74 and the resistance measuring unit 71 as described above, power applied to the atomizer 50 may be maintained constant or may be changed.

[0079] Furthermore, after the portable atomizing device 200 is turned on, a user may touch the detecting element 75 in another pre-set manner, and, in response to the touch, the micro-computer device 72 may set the operation mode of the portable atomizing device 200 to a second operation mode in which power is controlled by manual operation of the user. For example, in this case, the micro-computer device 72 may manually control the power base on the number of times the user touched the detecting element 75. Therefore, a user may easily increase or decrease the power according to one's preference of inhaling smoke.

[0080] In an embodiment, the micro-computer device 72 may detect power voltage of the battery BT and may control the power voltage to a default value based on the detected power voltage. For example, when it is assumed that the default value of the output voltage is 5.1V and the power voltage of the battery BT is 3.7V, the micro-computer device 72 may detect the power voltage and correct the output voltage by using the voltage correcting unit 74, such that the output voltage becomes identical to the default value.

[0081] The display unit 90 is mounted on the printed circuit board 70, is exposed to outside via the opening 111 formed in the, receives a light from the light source 95, and displays various information regarding operations of the portable atomizing device 200. In an embodiment, the display unit 90 may display various information including the power voltage, the output voltage, resistance of the heating element 30, remaining power of the battery BT, a warning sign based on the remaining power, temperature of the heating element 30, a warning sign based on the temperature, the first operation mode, and the second operation mode.

[0082] As described above, when the resistance measuring unit 71, the voltage correcting unit 74, the micro-computer device 72, the detecting element 75, the light source 95, and the display unit 90 are mounted on the printed circuit board 70 and the printed circuit board 70 is combined with the combination groove 112 formed on the inner surface of the body case 110, a circuit may be easily configured by using the above-stated components mounted on the printed circuit board 70, and the printed circuit board 70 may also mechanically support the detecting element 75 and the display unit 90. Therefore, circuit configuration and mechanical assembly of the portable atomizing device 200 may become easy overall.

[0083] FIGS. 4A and 4B are diagrams showing information displayed at the display unit 90 shown in FIG. 1 in closer details. First, referring to FIG. 4A, various information regarding operations of the portable atomizing device 200 is displayed at the display unit 90. In detail, the display unit 90 includes a first display window DP1 and a second display window DP2, where an image or a text indicating the first operation mode, that is, the automatic mode may be displayed on the first display window DP1.

[0084] Furthermore, the second display window DP2 may display an output voltage provided to the heating element (30 of FIG. 2A) in numbers or an image indicating the output voltage. Therefore, a user may easily recognize that the portable atomizing device 200 is currently operating in the auto-

matic mode and the output voltage is 5.1V based on information displayed in the first display window DP1 and the second display window DP2.

[0085] Referring to FIG. **4**B, the display unit **90** may display information indicating the second operation mode as described above. For example, an image or a text indicating the second operation mode, that is, the manual mode may be displayed at the third display window DP3, and an output voltage provided to the heating element (**30** of FIG. **2**A) may be displayed at the second display window DP2. Therefore, a user may easily recognize that the portable atomizing device **200** is currently operating in the manual mode and the output voltage is 4.1V based on information displayed in the second display window DP2 and the third display window DP3. Furthermore, in the second operation mode, if the user touches the detecting element (**75** of FIG. **3**), the user may confirm that the output voltage increases or decreases from 4.1V via the second display window DP2.

[0086] In another embodiment, the micro-computer device (**72** of FIG. **3**) may be designed, such that a portable atomizing device is turned on or off based on duration of a touch applied to the detecting element (**75** of FIG. **3**). For example, to prevent a portable atomizing device from being turned on based on a touch not intended by a user, e.g., a touch occurs when the user simply grabs the portable atomizing device, the micro-computer device (**72** of FIG. **3**) may be designed to turn the portable atomizing device or a menu mode of the portable atomizing device on or off when the detecting element is successively touched for 3 times or 5 times within 0.5 seconds.

[0087] Furthermore, in another embodiment, the display unit **90** may display various information other than the output voltage, such as remaining power of the battery (BT of FIG. **2**A), the heating element (**30** of FIG. **2**A), temperature of the heating element, or a warning sign related to the temperature. The above-stated information may be simultaneously displayed at the display unit **90** or may be displayed one-by-one in display modes switched based on the number of touching the detecting element. Furthermore, other than the above-mentioned various information displayed at the display unit **90**, other information regarding operation of a portable atomizing device, such as the number of times of inhales, and method of displaying the same may vary according to designs of the micro-computer device and the display unit **90**.

[0088] FIG. **5** is a control block diagram of the portable atomizing device **200** shown in FIG. **2**A, and FIG. **6** is a timing diagram for describing the second output signal S**2** of the control unit **100** having a heating time section and a heating-stopped time section.

[0089] Referring to FIGS. **5** and **6**, while a user keeps pressing the detecting element **75** (referred to hereinafter as a touch on time section; S1_t1), the detecting element **75** generates an input signal S**1** and the control unit **100** outputs an output signal S**2** to a heating element **30** in response to the input signal S**1**. The output signal S**2** has an alternate waveform in which a heating time section S2_t1 having a first voltage level V1 and a heating-stopped time section S2_t2 having a second voltage level V2 smaller than the first voltage level V1, in correspondence to the touch on time section S1_t1 of the input signal S**1**. To this end, the control unit **100** may include a switching device (not shown) that is turned on during the heating time section S2_t1 and is turned off during the heating-stopped time section S2_t2.

[0090] The output signal S**2** may have a rectangular pulse-wave waveform in which time sections having a high level voltage and time sections having a low level voltage are repeated in a cycle. However, it is merely an example, and the output signal S**2** including the heating time section S2_t1 and the heating-stopped time section S2_t2 may have an arbitrary waveform having linear or curved increasing time section and/or decreasing time section, like a chopping wave, a saw-tooth wave, or a semi-circular wave. In this case, voltage level of each time section may be determined as an average value.

[0091] Duration of the heating time section S2_t1 of the output signal S**2** may be longer than that of the heating-stopped time section S2_t2. For example, the heating time section S2_t1 may have a duration from about 0.1 seconds to about 20 seconds and may preferably have a duration from about 0.5 seconds to about 2 seconds in which evaporation or sublimation occurs. On the other hand, the heating-stopped time section S2_t2 may have a duration from about 0.01 seconds to about 5 seconds and may preferably have a duration from about 0.5 seconds to about 0.2 seconds to protect a heating element and prevent combustion of a liquid source material during optimal evaporation or sublimation.

[0092] According to embodiments of the present invention, durations of the heating time section S2_t1 and the heating-stopped time section S2_t2 may be set by a user in advance. For example, if the heating time section S2_t1 is set to be relatively longer and the heating-stopped time section S2_t2 is set to be relatively shorter, a period of time elapsed for heating the source material may increase, and thus amount of smoke may increase. Furthermore, if the time sections described above are adjusted, taste of a liquid source may be changed according to time changes, and thus a user may change taste of the liquid source based on one's preference by adjusting the time sections. To this end, the portable atomizing device **200** may further includes the display unit **90** for displaying a user interface for setting the heating time section S2_t1 and the heating-stopped time section S2_t2, and the control unit **100** may use the detecting element **75** as a user input interface, receive values of the heating time section S2_t1 and the heating-stopped time section S2_t2 based on pressing manipulation of a user, and control the heating time section S2_t1 and the heating-stopped time section S2_t2. According to another embodiment of the present invention, at least one from between the heating time section S2_t1 and the heating-stopped time section S2_t2 (preferably, the heating-stopped time section S2_t2) may be automatically set to prevent thermal damage of the heating element **30** based on resistance of the heating element **30**, or a recommended value thereof may be provided.

[0093] According to embodiments of the present invention, the first voltage level V1 may be a particular voltage level provided by the battery BT, e.g., voltage of the battery BT or a preset voltage. According to another embodiment of the present invention, the first voltage level V1 may vary based on measured resistance of the heating element **30**. As described above, for example, if the measured resistance of the heating element **30** is smaller than resistance of a power condition regarding power to be applied to an atomizer set by a user (referred to hereinafter as reference resistance), the resistance measuring unit **71** detects resistance of the heating element **30** and the voltage correcting unit **74** may correct the first voltage level V1 of the output signal S**2** to be smaller than a preset value based on the measured resistance of the heating element **30**. On the contrary, if the measured resistance of the heating

element **30** is greater than the reference resistance, the first voltage level V1 of the output signal **S2** may be corrected to be greater than a preset value.

[0094] According to embodiments of the present invention, the control unit **100** may refer to a lookup table in which measured resistances and corresponding first voltage levels V1 are defined. The lookup table may be established as a database and may be stored in the storage unit or a memory.

[0095] Table 1 is an example lookup datable in which measured resistances and first voltage levels are defined

[0096] Referring to Table 1, the control unit **100** may measure a resistance, find a first voltage level corresponding to the measured resistance, and output a voltage signal. For example, if the measured resistance is 1Ω, the first voltage level may be defined to 2V. If a measured resistance is not in the lookup table, a mean value may be determined as a first voltage level via linear interpolation or a value in the lookup table may be determined as the first voltage level via approximation.

TABLE 1

Serial Number	Measured Resistance (Ω)	First Voltage Level (V)
1	1	2
2	1.5	2.5
3	2	3
.	.	.
.	.	.
.	.	.

[0097] According to another embodiment of the present invention, the control unit **100** may calculate a first voltage level corresponding to a measured resistance according to Equation 1 or Equation 2 below.

$$V_{out}=R+A \quad \text{[Equation 1]}$$

[0098] Here, Vout denotes a first voltage level, R denotes a measured resistance, and A denotes an arbitrary constant, such as 1.

[0099] In Equation 1, although units for the first voltage level Vout and the measured resistance R are V and Ω, respectively, Equation 1 may be codes that can be actually executed on a computer. In this case, an equation for calculating output of a first voltage level may only be determined algebraically regardless of units.

$$V_{out} = K(R)^{\frac{1}{2}} \quad \text{[Equation 2]}$$

[0100] Here, Vout denotes a first voltage level, R denotes a measured resistance, and K denotes an arbitrary proportional constant. Like Equation 1, Equation 2 may be codes that can be actually executed on a computer. Since power determines Joule heat of a heating element, a first voltage level may be determined by setting the output voltage Vout to be proportional to the square root of the measured resistance.

[0101] The method using a lookup table and the method for algebraic determination are merely examples, and embodiments of the present invention are not limited thereto. For example, another algebraic code for determining a first voltage level based on the measured resistance R may be used.

[0102] According to another embodiment of the present invention, a table or a means of determination regarding power control may be downloaded to the control unit **100** via a wired network or a wireless network. Alternatively, a plurality of tables or means of determinations may be prepared in correspondence to respective liquid sources, such that a first voltage level may be selected by a user based on products, specifications, and types of liquid source materials or automatically selected based on identification information, such as barcodes or data values for identifying products, specifications, and types of liquid source materials and measured resistance based on the identification information. To this end, the portable atomizing device **200** may further include a data scanner, a USB interface, and a wired/wireless communication interface, such as a Bluetooth interface or a Wi-Fi interface.

[0103] To prevent the heating element **30** from being overheated by completely blocking an electric signal E from the battery BT, the second voltage level is 0V. Therefore, when a user continuously pressing a detecting element, power may be intermittently supplied to the heating element **30**. According to embodiments of the present invention, the second voltage level may not be 0V and may be smaller than a first voltage level.

[0104] According to embodiments of the present invention, the output signal **S2** may have a heating standby time section S2_t0 in which the output signal **S2** is not turned on for a designated period of time from a time point at which a user initiates a continuous press. For example, if the heating standby time section S2_t0 is set to 0.5 seconds, if a user contacts a touch button of the detecting element **75** and maintains the contact for a period of time exceeding 0.5 seconds, an output voltage having the first voltage level V1 may be output to an atomizer after 0.5 seconds. The heating standby time section S2_t0 may be from about 0.01 seconds to about 1 second. However, the present invention is not limited thereto. The heating standby time section S2_t0 is set to determine whether a pressing event occurring at a detecting element is for atomization intended by a user and to prevent the output signal **S2** from being transmitted to an atomizer due to an unintended touch based on a careless touch of a user or a contact to a material.

[0105] The control unit **100** may repeatedly perform voltage output cycles while a user is maintaining a press or a touch, where duration of the heating time section S2_t1 may be constant. For example, if the output signal **S2** is located in the heating time section S2_t1 when a user releases a touch and input of the input signal **S1** is stopped, output of the output signal **S2** may be stopped at a time point at which duration of the heating time section S2_t1 ends. In this case, the overall cycle of the output signal **S2** may be longer than the touch on time section S1_t1 of the input signal **S1**. However, if the output signal **S2** is located in the heating standby time section S2_t0 at a time point at which input of the input signal **S1** by a user is stopped, output of the output signal **S2** may be stopped at the same time. According to another embodiment of the present invention, if three or more output cycles are performed, one or two cycles may be added based on a touching habit of a user or a remaining voltage.

[0106] As described above, according to an embodiment of the present invention, damages to the atomizer **50** and waste of a source material due to excessive heating of the heating element **30** may be prevented by controlling the heating element **30** by using the output signal **S2** having the heating time section S2_t1 of a first voltage level and the heating-stopped time section S2_t2 of a second voltage level that is lower than

the first voltage level. Furthermore, by allowing a user to adjust durations of the heating time section S2_t1 and the heating-stopped time section S2_t2 based on inhale time or inhale habit of the user, the user may select/adjust smoking conditions in correspondence to the user's preference and may enjoy changed taste, fragrance, and inhaling impression of a source material.

[0107] FIG. **7** is a timing diagram for describing an output signal according to a maximum operating time setting, and FIG. **8** is a timing diagram for describing an output signal according to a standby time setting. As long as not being contradictory, descriptions of the above-stated components may be referred to with respect to components denoted by the same reference numerals as the above-stated components, and any of descriptions already given above will be omitted.

[0108] Referring to FIG. **7**, to prevent the atomizer **50** from being overheated and excessive smoked, output of the output signal S**2** may be restricted to a preset maximum operation time S2_t4. Even if the touch on time section S1_t1 of the input signal S**1** due to a touch input of a user exceeds the preset maximum operation time S2_t4, application of the output signal S**2** is automatically stopped when the total output time of the output signal S**2** reaches the maximum operation time S2_t4. The maximum operation time S2_t4 may be from about 0.15 seconds to about 22 seconds and may preferably be from about 9 seconds to about 13 seconds, where the preset maximum operation time S2_t4 may be selectively adjusted by a user. For example, if the maximum operation time S2_t4 is set to 11 seconds, even if the touch on time section S1_t1 of the input signal S**1** exceeds 11 seconds after the touch initiation, the output signal S**2** is turned off when the total output time reaches 11 seconds. Therefore, damages to the atomizer **50** and waste of a source material due to excessive heating of the heating element **30** may be prevented, and a time and amount of inhaling tobacco ingredients or atomized pharmacologic activating materials and a user's smoking habit may be controlled regardless of a user input.

[0109] Referring to FIG. **8**, if a press on the detecting element **75** is stopped for a pre-set wait time S1_w or longer period of time, the control unit **100** may output the output signal S**2** due to a later press S1_A on the detecting element **75** from the heating wait time section S2_t0. For example, if a touch off time section S1_t2 of the input signal S**1** exceeds the wait time S1_w and the input signal S**1** is turned on later, the output signal S**2** may have the heating wait time section S2_t0 in which the output signal S**2** is not turned on for a designated period of time after the input signal S**1** is turned on. On the contrary, if the touch off time section S1_t2 of the input signal S**1** is stopped within the wait time S1_w and the input signal S**1** is turned on later, the output signal S**2** may be immediately turned on without the heating wait time section S2_t0 and may be output from the heating time section S2_t1.

[0110] For example, when the heating wait time section S2_t0 is 0.5 seconds and wait time S1_w is set to 3 seconds, if a touch to the detecting element **75** continues and is not recognized for 3 seconds, the output signal S**2** is initialized and the operation mode is switched to wait mode, and, if a touch is recognized later and the operation mode is switched to active mode, the output signal S**2** is turned on 0.5 seconds after the touch and the operation may proceed to a time section in which the heating time section S2_t1 and the heating-stopped time section S2_t2 are alternately arranged.

[0111] As described above, by setting the maximum operation time S2_max regarding an output signal and the wait time S1_w based on interruption of a press on a detecting element, power consumed by the heating element **30** may be reduced, thereby increasing battery time.

[0112] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

1. A portable atomizing device comprising:
- a battery;
- an atomizer electrically connected to the battery and including a heating element for generating heat to atomize a source material;
- a body case combined with the atomizer; and
- a control unit accommodated inside the body case, electrically connected to the battery and the heating element, receiving power from the battery, and controlling an output signal output to the heating element.

2. The portable atomizing device of claim **1**, wherein the control unit detects resistance of the heating element and controls the output signal based on the measured resistance of the heating element.

3. The portable atomizing device of claim **2**, wherein the control unit increases output voltage of the output signal when resistance of the heating element is greater than a preset value, and
- wherein the control unit decreases output voltage of the output signal when resistance of the heating element is smaller than a preset value.

4. The portable atomizing device of claim **1**, wherein the control unit detects power voltage of the battery and controls the output signal based on the measured power voltage.

5. The portable atomizing device of claim **4**, wherein the control unit boosts the power voltage if the power voltage is smaller than the preset value, and
- wherein the control unit drops the power voltage if the power voltage is greater than the preset value.

6. The portable atomizing device of claim **2**, wherein the control unit comprises:
- a printed circuit board accommodated inside the body case and electrically connected to the battery and the heating element;
- a resistance measuring unit mounted on the printed circuit board and measuring resistance of the heating element; and
- a voltage correcting unit mounted on the printed circuit board and correcting the power voltage.

7. The portable atomizing device of claim **6**, wherein the control unit further comprises:
- a switch mounted on the printed circuit board, exposed to outside of the body case, and generating an input signal in correspondence to a touch signal;
- and
- a display unit mounted on the printed circuit board, exposed to outside via an opening formed in the body case, and displaying at least one of the power voltage, voltage of the output signal, resistance of the heating element, charged amount of the battery, a warning sign related to the charged amount of the battery, temperature of the heating element, a warning sign related to the temperature of the heating element, and an operation mode.

8. The portable atomizing device of claim **7**, wherein the control unit further comprises a micro-computer device mounted on the printed circuit board and controlling the output signal in response to the input signal,

wherein the operation mode comprises a first operation mode and a second operation mode based on the input signal,

wherein the output signal is controlled based on the power voltage or resistance of the heating element in the first operation mode, and

wherein the micro-computer device controls the output signal in response to the input signal in the second operation mode.

9. The portable atomizing device of claim **7**, wherein the resistance measuring unit or the voltage correcting unit are integrated in a micro-computer device.

10. The portable atomizing device of claim **6**, wherein the body case comprises an output terminal arranged at a portion of the body case to be combined with the atomizer and transmitting the output signal, and

wherein the printed circuit board comprises:

a first conductive layer formed on a side portion adjacent to the battery case and electrically connected to a terminal of the battery; and

a second conductive layer formed on another side portion adjacent to the atomizer and electrically connected to the output terminal.

11. The portable atomizing device of claim **10**, wherein the first conductive layer directly contacts the terminal of the battery, and

wherein the second conductive layer directly contacts the output terminal.

12. The portable atomizing device of claim **10**, further comprising an elastic element having conductivity and elasticity, interposed between the output terminal and the second conductive layer, and electrically connecting the output terminal to the second conductive layer,

wherein the first conductive layer directly contacts the terminal of the battery, and

wherein the elastic element directly contacts the output terminal and the second conductive layer.

13. The portable atomizing device of claim **1**, wherein the body case comprises a combining unit extending from an end portion, combined with the atomizer, and including the air inlet formed in sidewalls, and

wherein the suction control unit moves in the lengthwise direction of the combining unit and opens or closes the air inlet.

14. The portable atomizing device of claim **1**, wherein the source material is a liquid material for an electronic cigarette.

15-23. (canceled)

24. A portable atomizing device comprising:

an atomizer electrically connected to a battery and including a heating element for generating heat to atomize a source material;

a detecting element capable of recognizing a continuous touch of a user; and

a control unit outputting an output signal having alternately arranged therein a heating time section having a first voltage level and a heating-stopped time section having a second voltage level lower than the first voltage level at least once, to the heating element while a press on the detecting element continues.

25. The portable atomizing device of claim **24**, wherein the detecting element is a button type or a touch type.

26. The portable atomizing device of claim **24**, wherein the control unit defines the first voltage level based on the measured resistance of the heating element.

27. The portable atomizing device of claim **24**, wherein the second voltage level is 0 V.

28. The portable atomizing device of claim **24**, wherein the heating time section is longer than the heating-stopped time section.

29. (canceled)

30. The portable atomizing device of claim **24**, further having a heating wait time section for not turning the output signal on for a designated period of time from initiation of the continuous touch of the user.

31. (canceled)

32. The portable atomizing device of claim **24**, further comprising a display unit for displaying a user interface for setting one of or both the heating time section and the heating-stopped time section,

wherein the control unit adjusts values of the heating time section and the heating-stopped time section based on a press of the user by using the detecting element as a user input interface.

33. The portable atomizing device of claim **24**, wherein output of the output signal is restricted to a preset maximum operation time.

34-37. (canceled)

38. The portable atomizing device of claim **1**, further comprising:

a suction control unit controlling an amount of the air introduced toward the atomizer by opening or closing air inlets connecting the atomizer with the outside.

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