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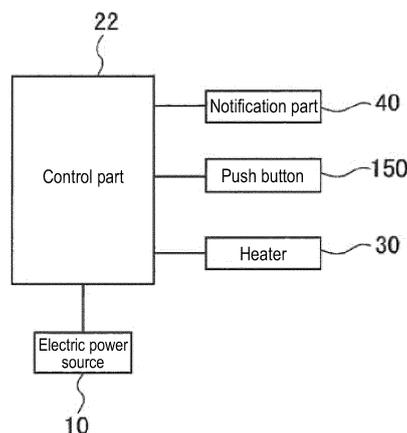
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(54) **CONTROL UNIT, AEROSOL GENERATION DEVICE, AND METHOD AND PROGRAM FOR CONTROLLING HEATER**

(57) This control unit is provided with a controller for controlling a heater that heats an aerosol source. The controller is configured so as to control the temperature of the heater toward a first target temperature during a first period, control the temperature of the heater toward

a second target temperature lower than the first target temperature during a second period after the first period, and control the temperature of the heater toward a third target temperature lower than the second target temperature during a third period after the second period.

Fig. 5



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Description

TECHNICAL FIELD

[0001] The present invention relates to a control unit, an aerosol generation device, and a method and a program for controlling a heater.

BACKGROUND ART

[0002] A non-combustion-type aerosol generation device, which is used in place of a prior-art combustion-type cigarette and delivers, to a user, aerosol generated by atomizing an aerosol source by a heater, has been known (Patent Literature 1 and Patent Literature 2). A non-combustion-type aerosol generation device heats, at high temperature, a smoking article comprising an aerosol source, so that the quantity of consumed electric power may become large. Accordingly, there may be a case that a battery having a large capacity is loaded into a non-combustion-type aerosol generation device, and, in such a case, the size and the weight of the device as a whole may increase.

CITATION LIST

PATENT LITERATURE

[0003]

PTL 1: Japanese Patent Application Public Disclosure No. 2017-113016

PTL 2: PCT international publication No. WO 2018/019786

SUMMARY OF INVENTION

[0004] A first characteristic comprises a control unit, and the gist thereof is that the control unit comprises a control part for controlling a heater which heats an aerosol source, and the control part is constructed to control temperature of the heater to bring the temperature to first target temperature during a first period, control the temperature of the heater to bring the temperature to second target temperature that is lower than the first target temperature during a second period after the first period, and control the temperature of the heater to bring the temperature to third target temperature that is lower than the second target temperature during a third period after the second period.

[0005] A second characteristic comprises the control unit in the first characteristic, and the gist thereof is that a difference between the first target temperature and the second target temperature is larger than a difference between the second target temperature and the third target temperature.

[0006] A third characteristic comprises the control unit in the first characteristic or the second characteristic, and

the gist thereof is that the second period is longer than the first period and the third period.

[0007] A fourth characteristic comprises the control unit in any one of the first characteristic to the third characteristic, and the gist thereof is that the control part is constructed to be able to change the length of the first period based on a speed of rise in temperature of the heater in the first period.

[0008] A fifth characteristic comprises the control unit in the fourth characteristic, and the gist thereof is that the control part is constructed to be able to make the first period become shorter as a period from a start of heating of the heater to a point in time when temperature reaches predetermined temperature becomes shorter.

[0009] A sixth characteristic comprises the control unit in the fourth characteristic or the fifth characteristic, and the gist thereof is that the range that the first period can be varied has a predetermined upper limit value.

[0010] A seventh characteristic comprises the control unit in any one of the first characteristic to the sixth characteristic, and the gist thereof is that the control part has a first off period for stopping supply of electric power to the heater from an end of the first period to an initial period in the second period, and the first off period is set to a time equal to or shorter than 20 seconds.

[0011] An eighth characteristic comprises the control unit in any one of the first characteristic to the seventh characteristic, and the gist thereof is that the control part has a second off period for stopping supply of electric power to the heater from an end of the second period to an initial period in the third period, and the second off period is set to a time equal to or shorter than 20 seconds.

[0012] A ninth characteristic comprises the control unit in any one of the first characteristic to the eighth characteristic, and the gist thereof is that the control part is constructed to report an event that a suction allowable period has started during a period, in the first period, when the temperature of the heater is being maintained at the first target temperature.

[0013] A tenth characteristic comprises the control unit in the ninth characteristic, and the gist thereof is that the control part is constructed to report, in a latter half of the first period, an event that the suction allowable period has started.

[0014] An eleventh characteristic comprises the control unit in any one of the first characteristic to the tenth characteristic, and the gist thereof is that the control part is constructed to stop supply of electric power to the heater after the third period.

[0015] A twelfth characteristic comprises the control unit in any one of the first characteristic to the eleventh characteristic, and the gist thereof is that the control part is constructed to stop supply of electric power to the heater after the third period, and report, after the elapse of a predetermined period since the stop, an event that the suction allowable period has ended.

[0016] A thirteenth characteristic comprises an aerosol generation device, and the gist thereof is that the aerosol

generation device comprises the heater and the control unit in any one of the first characteristic to the twelfth characteristic.

[0017] A fourteenth characteristic comprises the aerosol generation device in the thirteenth characteristic comprises an aerosol generation device, and the gist thereof is that the heater has a cylindrical shape that allows heating of an outer periphery of a smoking article having a column shape.

[0018] A fifteenth characteristic comprises a method for controlling a heater for heating an aerosol source, and the gist thereof is that the method comprises a first step for controlling temperature of the heater to bring the temperature to first target temperature during a first period, a second step for controlling the temperature of the heater to bring the temperature to second target temperature that is lower than the first target temperature during a second period after the first period, and a third step for controlling the temperature of the heater to bring the temperature to third target temperature that is lower than the second target temperature during a third period after the second period.

[0019] A sixteenth characteristic comprises a program, and the gist thereof is that the program makes an aerosol generation device perform the method in the fifteenth characteristic.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

[Fig. 1] Fig. 1 is a figure showing a flavor inhaler according to an embodiment.

[Fig. 2] Fig. 2 is a figure showing the flavor inhaler in which a smoking article is inserted.

[Fig. 3] Fig. 3 is a figure showing an internal construction of the flavor inhaler shown in Fig. 2.

[Fig. 4] Fig. 4 is a figure showing an internal construction of the smoking article shown in Fig. 2.

[Fig. 5] Fig. 5 is a block diagram of the flavor inhaler.

[Fig. 6] Fig. 6 is a schematic enlarged view of the region 5R in Fig. 3.

[Fig. 7] Fig. 7 is a figure schematically showing positional relationship between a base-material part of a smoking article and a heater and an inner-side cylindrical member of an aerosol generation device.

[Fig. 8] Fig. 8 is a figure showing a heating profile of a heater.

[Fig. 9] Fig. 9 is a figure showing a heating profile of a heater and a delivery profile of generated aerosol.

DESCRIPTION OF EMBODIMENTS

[0021] In the following description, embodiments will be explained. In this regard, in the following descriptions of the figures, the same or similar symbols are assigned to the same or similar parts. It should be reminded that the figures are drawn in a schematic manner, so that

ratios between respective sizes and so on may be different from actual ratios and so on.

[0022] Thus, specific sizes and so on should be judged by taking the following description into consideration.

Further, it is a matter of course that, in the figures, relationship and ratios between sizes in one figure may be different from those in other figures.

[Outline of Disclosure]

[0023] A heating profile of a heater for generating aerosol by heating a smoking article is disclosed in each of Patent Literature 1 and Patent Literature 2. Still, there is room for study with respect to a heating profile that brings about suppressing of electric power consumption while bringing about generation of a desired quantity of aerosol.

[0024] According to an embodiment, a control unit comprises a control part for controlling a heater which heats an aerosol source, and the control part is constructed to control temperature of the heater to bring the temperature to first target temperature during a first period, control the temperature of the heater to bring the temperature to second target temperature that is lower than the first target temperature during a second period following the first period, and control the temperature of the heater to bring the temperature to third target temperature that is lower than the second target temperature during a third period following the second period.

[0025] In the present embodiment, the speed of raising of temperature of the heater can be increased by setting the first target temperature, in the first period, to high temperature. By increasing the speed of raising of temperature of the heater, the period from a start of supply of electric power to the heater to the time when suction of aerosol becomes possible can be shortened.

[0026] By lowering the target temperature in the second period and the third period, it becomes possible to reduce electric power consumed in the second period and the third period. As a result, the period when generation of aerosol is possible, that is, the period when suction is allowed, can be extended.

[0027] In view of reduction of electric power consumption explained above, it is preferable to control the heater at the third target temperature without going through the stage of the second target temperature after the first target temperature. However, in the above case, the period required to reach the third target temperature from the first target temperature becomes relatively long. Since the heater is stopped during the period required to reach the third target temperature from the first target temperature, there may be a risk that the temperature of the heater may become that lower than the third target temperature, if a user performs plural times of puff actions during the above period. The inventors relating to the subject application have found that, in the case that the temperature of the heater becomes too low once, aerosol is not generated sufficiently and it may become difficult

to perform re-generation of aerosol.

[0028] By going through the second target temperature, that is set between the first target temperature and the third target temperature, before transitioning from the first target temperature to the third target temperature, the time required for transition from one target temperature to the other target temperature can be shortened. Since the transition period, during that the heater is stopped, is made short, it is possible to prevent excessive lowering of the heater temperature due to execution of plural times of puff actions.

(Flavor Inhaler)

[0029] In the following description, a flavor inhaler according to an embodiment will be explained. Fig. 1 is a figure showing a flavor inhaler according to an embodiment. Fig. 2 is a figure showing the flavor inhaler in which a smoking article is inserted. Fig. 3 is a figure showing an internal construction of the flavor inhaler shown in Fig. 2. Fig. 4 is a figure showing an internal construction of the smoking article shown in Fig. 2. Fig. 5 is a block diagram of the flavor inhaler.

[0030] The flavor inhaler 100 may be a non-combustion-type flavor inhaler for generating, without a combustion process, aerosol from a smoking article. Specifically, the flavor inhaler 100 may be a portable device.

[0031] The flavor inhaler 100 comprises a smoking article 110 including an aerosol source, and an aerosol generation device 120 for generating aerosol from the smoking article 110.

[0032] The smoking article 110 is an exchangeable cartridge which may include an aerosol source and a flavor source, and has a column shape extending in a longitudinal direction. The smoking article 110 may be constructed to generate aerosol and flavor components when it is heated in the state that it is inserted in the aerosol generation device 120.

[0033] In the embodiment shown in Fig. 4, the smoking article 110 comprises a base material part 11A, which comprises a filling article 111 and first rolling paper 112 by which the filling article 111 is wound, and a suction opening part 11B which forms an end part opposite to the base material part 11A. The base material part 11A and the suction opening part 11B are connected by second rolling paper 113 which is different from the first rolling paper 112. In this regard, it is possible to connect the base material part 11A and the suction opening part 11B by using the first rolling paper 112, i.e., by omitting the second rolling paper 113.

[0034] The suction opening part 11B in Fig. 4 comprises a paper tube part 114, a filter part 115, a hollow segment part 116 positioned between the paper tube part 114 and the filter part 115. For example, the hollow segment part 116 comprises a filling layer including one or plural hollow channels, and a plug wrapper for covering the filling layer. Since the density of filled fibers in the filling layer is high, air and aerosol flows through the hol-

low channel only, and almost no air and aerosol flows through the filling layer, when suction action is performed. Regarding the smoking article 110, if it is desired to lower a decrease in the quantity of the aerosol components due to filtering in the filter part 115, it is effective to shorten the length of the filter part 115 and replace that part by the hollow segment part 116, for increasing the quantity of delivery of the aerosol.

[0035] The suction opening part 11B in Fig. 4 is constructed by using three segments; however, in the present embodiment, the suction opening part 11B may be constructed by using one or two segments, or may be constructed by using four or more segments. For example, it is possible to omit the hollow segment part 116, and form the suction opening part 11B by arranging the paper tube part 114 and the filter part 115 adjacent to each other.

[0036] In the embodiment shown in Fig. 4, regarding the length in the longitudinal direction of the smoking article 110, it is preferable to set it to 40-90 mm, more preferable to set it to 50-75 mm, and still more preferably to set it to 50-60 mm. Regarding the circumference of the smoking article 110, it is preferable to set it to 15-25 mm, more preferable to set it to 17-24 mm, and still more preferably to set it to 20-23 mm. Further, in the longitudinal direction of the smoking article 110, the length of the base material part 11A may be 20 mm, the length of the first rolling paper 112 may be 20 mm, the length of the hollow segment part 116 may be 8 mm, and the length of the filter part 115 may be 7 mm; however, the length of each of the above segments may be changed appropriately, according to suitability to manufacture, required quality, and so on.

[0037] In the present embodiment, the filling article 111 in the smoking article 110 may comprise an aerosol source which generates aerosol when heat of predetermined temperature is applied thereto. The kind of the aerosol source is not specifically limited, and extracted material and/or components thereof, that are obtained from various natural products, may be selected as an aerosol source according to a use. Glycerin, propylene glycol, triacetin, 1,3-butanediol, and a mixture thereof, for example, can be listed as aerosol sources. The aerosol source content of the filling article 111 is not specifically limited; and, in view of generation of sufficient quantity of aerosol and satisfactory addition of fragrance inhaling taste, the aerosol source content is usually equal to or greater than 5 weight percent, and, preferably, equal to or greater than 10 weight percent, and is usually equal to or less than 50 weight percent, and, preferably, equal to or less than 20 weight percent.

[0038] The filling article 111 in the smoking article 110 in the present embodiment may comprise shredded tobacco as a flavor source. The material of shredded tobacco is not specifically limited, and publicly known material such as a lamina, a stem, and so on may be used as the material. The range of the content of the filling article 111 in the smoking article 110, in the case that the

circumference is 22 mm and the length is 20 mm, is, for example, 200-400 mg, and, preferably, 250-320 mg. The water content of the filling article 111 is, for example, 8-18 weight percent, and, preferably, 10-16 weight percent. In the case that the water content is that explained above, occurrence of staining at the time of rolling is suppressed, and suitability to rolling at the time of manufacture of the base part 11A is made satisfactory. There is no special limitation with respect to the size, the preparation method, and so on of the shredded tobacco used as the filling article 111. For example, dried tobacco leaves cut into pieces, each having the width of 0.8-1.2 mm, may be used. Alternatively, dried tobacco leaves are crushed and uniformized to become particles, regarding which the average particle size is 20-200 μm , and the particles are processed to become a sheet, and the sheet cut into pieces, each having the width of 0.8-1.2 mm, may be used. Further, the above sheet formed via the sheet process may be processed to gather it, and the gathered sheet may be used as the filling article 111. Further, the filling article 111 may comprise one kind or two or more kinds of flavors. The kinds of flavors are not specifically limited; however, in view of provision of satisfactory smoke flavor, a flavor is menthol, preferably.

[0039] In the present embodiment, each sheet of the first and second rolling paper 112 and 113 may be constructed by use of base paper which has the basis weight of, for example, 20-65 gsm, and, preferably, 25-45 gsm. The thickness of each sheet of the first and second rolling paper 112 and 113 is not specifically limited; however, in view of rigidity, gas permeability, and easiness of adjustment at the time of paper manufacture, the thickness is set to 10-100 μm , and, preferably, set to 20-75 μm , and, more preferably, set to 30-50 μm .

[0040] In the present embodiment, filler may be included in the rolling paper 112 and 113 in the filling article 111. The filler content may be equal to or greater than 10 weight percent and less than 60 weight percent, and, preferably, 15-45 weight percent, with respect to the total weight of the rolling paper 112 and 113. In the present embodiment, it is preferable that the filler be 15-45 weight percent, with respect to a preferable range of basis weight (25-45 gsm). For example, calcium carbonate, titanium dioxide, kaolin, and so on may be used as filler. Paper including filler such as that explained above presents a white color that is preferable in view of appearance of paper used as rolling paper of the smoking article 110, and is able to keep its whiteness permanently. By including a large quantity of filler such as that explained above, the ISO whiteness of rolling paper can be raised to 83 % or more, for example. Further, in view of practicality in terms of use of it as rolling paper in the smoking article 110, it is preferable that the rolling paper 112 and 113 have the tensile strength of 8N/15mm or more. The tensile strength can be increased by reducing the filler content. Specifically, the tensile strength can be increased by reducing the filler content to that less than the upper limit of the filler content that has been shown with respect

to each range of the basis weight illustrated in the above description.

[0041] Here, Fig. 3 is referred to; and the aerosol generation device 120 comprises an insertion hole 130 to which the smoking article 110 can be inserted. That is, the aerosol generation device 120 comprises an inner-side cylindrical member 132 which is a component of the insertion hole 130. The inner-side cylindrical member 132 may be constructed by a thermal conduction component such as aluminum, stainless steel (SUS), or the like, for example.

[0042] Further, the aerosol generation device 120 may comprise a lid part 140 for covering the insertion hole 130. The lid part 140 may be constructed to be able to slide between a state that the insertion hole 130 is closed (refer to Fig. 1) and a state that the insertion hole 130 is exposed (refer to Fig. 2).

[0043] The aerosol generation device 120 may comprise an air flow path 160 which communicates with the insertion hole 130. An end of the air flow path 160 is connected to the insertion hole 130, and the other end of the airflow path 160 communicates with the outside (the air outside) of the aerosol generation device 120 via a part different from the insertion hole 130.

[0044] The aerosol generation device 120 may comprise a lid part 170 for covering an end of the air flow path 160 on a side where the air flow path 160 communicates with the outside air. The lid part 170 may be brought to a state that the end on the outside air communicating side of the air flow path 160 is covered thereby, and a state that the air flow path 160 is exposed.

[0045] The lid part 170 does not block the air flow path 160 airtightly, even in the state that it covers the air flow path 160. That is, it is constructed that, even in the state that the air flow path 160 is being covered by the lid part 170, the outside air is allowed to flow into the air flow path 160 via a part near the lid part 170.

[0046] In the state that the smoking article 110 is being inserted in the flavor inhaler 100, a user holds an end part of the smoking article 110, specifically, the suction opening part 11B in Fig. 4, in the user's mouth and performs a suction action. As a result of the suction action by the user, the outside air flows into the air flow path 160. The air flown into the air flow path 160 is guided to the inside of the mouth of the user via the smoking article 110 in the insertion hole 130.

[0047] In the state that the insertion hole 130 is not covered by the lid part 130 and the smoking article 110 is not inserted therein, i.e., in the state that the inner space of the inner-side cylindrical member 132 and the airflow path 160 are exposed, a user is allowed to clean the inside of the airflow path 160 in the inner-side cylindrical member 132 by using a cleaning device such as a brush. The above cleaning device may be inserted from the side of the top lid part 140 in Fig. 3 to the inside of the air flow path 160, or may be inserted from the side of the bottom lid part 170 to the inside of the air flow path 160.

[0048] The aerosol generation device 120 may be pro-

vided with a temperature sensor in the air flow path 160 or on a wall part which is a component of the air flow path 160. The temperature sensor may be a thermistor, a thermocouple, or the like, for example. When a user has performed a suction action via the suction opening part 11B of the smoking article 110, the temperature of the inside of the air flow path 160 or the temperature of the wall part which is a component of the air flow path 160 decreases, due to effect of air flowing through the air flow path 160 in the direction from the side of the lid part 170 to the side of the heater 30. The temperature sensor can detect a suction action of a user by measuring the decrease in the temperature.

[0049] The aerosol generation device 120 comprises a battery 10, a control unit 20, and a heater 30. The battery stores electric power that is to be used in the aerosol generation device 120. The battery 10 may be a chargeable/dischargeable secondary battery. The battery may be a lithium-ion battery, for example.

[0050] The heater 30 may be installed in a position around the inner-side cylindrical member 132. The space in which the heater 30 is housed and the space in which the battery 10 is housed may be separated by a partition wall 180. In the above case, it is possible to suppress the air heated by the heater from entering the space for housing the battery 10. Thus, increase in temperature of the battery 10 can be suppressed.

[0051] It is preferable that the heater 30 have a cylindrical shape that make it possible to heat the periphery of the column-shape smoking article 110. The heater 30 may be a film heater, for example. The film heater may comprise a pair of film-shape substrates and a resistance heating element positioned between the pair of film-shape substrates. It is preferable that the film-shape substrate be constructed by use of material having excellent heat resistance and electric insulation, and, typically, the film-shape substrate is constructed by using polyimide. It is preferable that the resistance heating element be constructed by use of one or two or more of copper, nickel alloy, chromium alloy, stainless steel, platinum-rhodium, and so on, and the resistance heating element may be formed by using stainless-steel base material, for example. Further, for connection to an electric power source via a flexible printed circuit (FPC), connection parts and lead parts thereof of the resistance heating element may be copper plated.

[0052] Fig. 6 is a schematic enlarged view of the region 5R in Fig. 3, and a cross-section view of the heater 30 and parts around it. In the example shown in Fig. 6, the heater 30 is the above-explained film heater, and is wound around the periphery of the inner-side cylindrical member 132 which can accept the smoking article 110. That is, the heater 30 is wound in such a manner that it forms a cylinder shape surrounding the inner-side cylindrical member 132. As a result, the heater 30 surrounds the outer periphery of the smoking article 110, and can heat the smoking article 110 from the outside thereof.

[0053] Preferably, a heat-shrinkable tube 136 may be

installed on the outer side of the heater 30. In other words, it is preferable that the heater 30 be installed in the heat-shrinkable tube 136. The heat-shrinkable tube 136 is a tube 136 which shrinks in a radius direction when heat is applied, and may be constructed by use of thermoplastic elastomer, for example. As a result of effect of shrinking of the heat-shrinkable tube 136, the heater 30 is pushed to the inner-side cylindrical member 132. As a result, adhesion between the heater 30 and the inner-side cylindrical member 132 is enhanced, so that heat conductivity from the heater 30 to the smoking article 220 via the inner-side cylindrical member 132 is improved.

[0054] The aerosol generation device 120 may comprise a heat insulating material 138 having a cylindrical shape, on the outer side in the radius direction of the heater 30, preferably, on the outer side of the heat-shrinkable tube 136. It is preferable that the heat insulating material 138 be positioned to surround the outer periphery of the heater 30. The heat insulating material 138 may fulfill a role to prevent the temperature of the outer surface of the housing of the aerosol generation device 120 from reaching excessively high temperature, by blocking the heat from the heater 30. The heat insulating material 138 may be constructed by using aerogel, such as silica aerogel, carbon aerogel, alumina aerogel, or the like, for example. For example, the aerogel used as the heat insulating material 138 may be silica aerogel which has a high heat insulation property and can be manufactured by spending a relatively low cost. In this regard, the heat insulating material 138 may be fiber-type heat insulating material such as glass wool, rock wool, or the like, or may be a foam-type heat insulating material such as urethane foam or phenol foam. Alternatively, the heat insulating material 138 may be a vacuum insulating material.

[0055] The insulating material 138 may be installed in a position between the inner-side cylindrical member 132 facing the smoking article 110 and an outer-side cylindrical member 134 on the outer side of the insulating material 138. The outer-side cylindrical member 134 may be constructed by using a heat conducting member which comprises aluminum or stainless steel (SUS), for example. It is preferable that the insulating material 138 be installed in a closed space.

[0056] Fig. 7 is a figure schematically showing positional relationship, in an axis-line direction, between the base part 11A in the smoking article 110 and the heater 30 and the inner-side cylindrical member 132 in the aerosol generation device 120, in the flavor inhaler 100. The axis-line in the present case means the center axis of the insertion hole 130 in the aerosol generation device 120, and, when the smoking article 110 is inserted in the insertion hole 130, the axis-line and the center axis of the smoking article 110 partially overlap with each other (refer to Fig. 3, also).

[0057] The length D0 of the heater 30 in the axis-line direction can be set to that shorter than the length L0 of the base part 11A in the axis-line direction in the smoking

article 110 ($D_0 < L_0$). Further, the ratio of the length D_0 to the length L_0 (D_0/L_0) may be 0.70-0.90, preferably, 0.75-0.85, and, typically, 0.80. Thus, in the case that the length L_0 of the base part 11A is 20 mm, the length D_0 of the heater 30 may be 14-18 mm, preferably, 15-17 mm, and, typically, 16 mm.

[0058] The upstream end of the base member 11A may protrude toward the upstream side above the upstream end of the heater 30 by the length of D_1 . The upstream side and the downstream side in the present case correspond to the upstream side and the downstream side of the flow of air passing through the inside of the air flow path 160 as a result of suction action by a user (refer to Fig. 3, also). The part, which protrudes from the heater 30, of the base part 11A does not have the heater 30 on the outer side in the radius direction of the base part 11A, so that the temperature in the inside thereof may become somewhat lower, compared with the temperature of the other part of the base part 11A. Thus, generation of aerosol in the upstream end and a place near thereof of the base material 11A can be suppressed, so that it is possible to prevent aerosol generated in the above places from being condensed and from flowing backward in the air flow path 160. The aerosol generated in the other part of the base part 11A may be condensed in the upstream end and a place near thereof of the base part 11A.

[0059] The ratio of the protruded length D_1 to the whole length L_0 of the base part 11A (D_1/L_0) may be 0.25-0.40, preferably, 0.30-0.35, and typically, 0.325. Thus, in the case that the whole length L_0 of the base part 11A is 20 mm, the protruded length D_1 may be 5-8 mm, preferably, 6-7 mm, and, typically, 6.5 mm

[0060] The downstream end of the heater 30 may protrude toward the downstream side below the downstream end of the base part 11A by the length of D_2 . Thus, it is possible to sufficiently heat the downstream end and a place near thereof of the base part 11A, so that it is possible to prevent shortage of the quantity of generated aerosol and occurrence of condensation of aerosol in the above places. The ratio of the protruded length D_2 of the heater 30 to the length L_0 of the base part 11A (D_2/L_0) may be 0.075-0.175, preferably, 0.1-0.15, and typically, 0.125. Thus, in the case that the length L_0 of the base part 11A is 20 mm, the protruded length D_2 of the heater 30 may be 1.5-3.5 mm, preferably, 2-3 mm, and, typically, 2.5 mm

[0061] The position of the upstream end of the inner-side cylindrical member 132 and the position of the upstream end of the base part 11A in the axis-line direction may roughly coincide with each other. On the other hand, similar to the case of the downstream end of the heater 30, the downstream end of the inner-side cylindrical member 132 may protrude toward the downstream side below the downstream end of the base part 11A by the length of D_3 . Thus, in addition to the downstream end and a place near thereof of the base part 11A, it is possible to heat the upstream end and a place near thereof of the paper tube part 114, so that it is possible to prevent

aerosol generated from the base part 11A from being excessively cooled and condensed in the upstream end and the place near thereof of the paper tube part 114. The ratio of the protruded length D_3 of the inner-side cylindrical member 132 to the protruded length D_2 of the heater 30 (D_3/D_2) may be 2.6-3.4, preferably, 2.8-3.2, and, more preferably, 3.0. Thus, in the case that the protruded length D_2 of the heater is 2.5 mm, the protruded length D_3 of the inner-side cylindrical member 132 may be 6.5-8.5 mm, preferably, 7.0-8.0 mm, and, typically, 7.5 mm

[0062] When Fig. 5 is referred to, the control unit 20 may comprise a control board, a CPU, a memory, and so on. The CPU and the memory are components for constructing the control part 22 which controls the heater 30 for heating an aerosol source. Further, the control unit 20 has a notification part 40 for reporting a variety of information to a user. For example, the notification part 40 may be a light emitting element such as an LED or a vibrating element, or a combination thereof.

[0063] The control part 22, when it has detected an activation request issued by a user, starts supply of electric power from the battery 10 to the heater 30. The user's activation request is generated, for example, as a result of manipulation of a push button or a slide-type switch by a user, or a suction action by a user. In the present embodiment, the user's activation request is generated as a result of pressing of the push button 150. More specifically, the user's activation request is generated as a result of pressing of the push button 150 during the state that the lid part 140 is being opened. Alternatively, the user's activation request may be generated when a suction action by a user is detected. For example, a suction action by a user may be detected by a temperature sensor such as that explained above.

[0064] Fig. 8 is a figure showing a heating profile of a heater. In the present embodiment, the heating profile is a graph showing time variation of target temperature in controlling of the heater 30. Temperature control of the heater 30 can be realized by using publicly known feedback control, for example. Specifically, the control part 22 can supply electric power from the battery 22 to the heater 30 in the forms of pulses according to pulse width modulation (PWM) or pulse frequency modulation (PFM). In the above case, the control part 22 can perform temperature control of the heater 30 by adjusting the duty ratio of the electric power pulses.

[0065] In the feedback control, the control part 22 may measure or estimate temperature of the heater 30, and, based on a difference between the measured or estimated temperature of the heater 30 and a target temperature, or the like, control the electric power supplied to the heater 30, for example, control the above-explained duty ratio. The feedback control may be PID control, for example. The temperature of the heater can be quantitatively determined, for example, by measuring or estimating an electric resistance value of a heating resistor which is a component of the heater 30. This is because the electric

resistance value of the heating resistor changes in response to temperature. The electric resistance value of the heating resistor can be estimated, for example, by measuring the quantity of voltage drop in the heating resistor. The quantity of voltage drop in the heating resistor can be measured by a voltage sensor which measures a potential difference applied to the heating resistor. In the other example, the temperature of the sensor 30 may be measured by a temperature sensor installed in a position near the heater 30.

[0066] As explained above, in the present embodiment, supply of electric power to the heater 30 may be controlled in such a manner that the actual temperature of the heater 30 approaches a target temperature in the heating profile. In this regard, since there may be a case that the heating profile includes a part whereat the target temperature rapidly changes, there may be a case that, in a part such as the above part, separation between the actual temperature of the heater 30 and the target temperature becomes large temporarily. In the heating profile illustrated in Fig. 9, each of parts, whereat separation between the actual temperature of the heater 30 and the target temperature is large, is shown by using a broken line.

[0067] In the example shown in Fig. 8, when supply of electric power from the battery 10 to the heater 30 is started in response to an activation request issued by a user, the control part 22 first controls the temperature of the heater 30 to bring it to a first target temperature TA1 during a first period P1. That is, the control part 22 heats the heater 30 to raise temperature from initial temperature to the first target temperature TA1. In the first period P1, after the temperature of the heater 30 has reached the first target temperature TA1, the control part 22 performs control to maintain the temperature of the heater 30 at the first target temperature TA1.

[0068] The first target temperature TA1 may be 225-240 degrees Celsius, preferably, and 230 degrees Celsius, typically. The speed of raising of temperature of the heater 30 can be increased by setting the first target temperature TA1 in the first period P1 to relatively high temperature. By increasing the speed of raising of temperature of the heater 30, the period from a start of supply of electric power to the heater 30 to the time when suction of aerosol becomes possible can be shortened.

[0069] The control part 22 may be constructed to report, to a user, a state that a suction allowable period has started, in a period that is in the first period P1 and during that the temperature of the heater 30 is being maintained at the first target temperature TA1. Reporting of the state that the suction allowable period has started may be performed by controlling the notification part 40, and, for example, may be performed by performing a control process to change the color of light emitted from a light emitting element such as an LED or the like, a control process to change a light emitting pattern, or a control process to drive a vibration element, or a control process comprising a combination of the above control processes.

[0070] In the example shown in Fig. 8, reporting of the state that the suction allowable period has started is performed at timing T2. More specifically, reporting of the state that the suction allowable period has started may be performed at either timing T2 when a predetermined period P1b has elapsed since the time when the temperature of the heater 30 has reached the first target temperature, or timing when a predetermined period has elapsed since the time when supply of electric power to the heater 30 has started, that occurs earlier. The predetermined period P1b may be 20-26 seconds, preferably, and 23 seconds, typically. Preferably, the control part 22 may be constructed to report, in the latter half of the first period P1, the state that the suction allowable period has started. The latter half of the first period P1 means a period after the center of the first period P1.

[0071] At timing T3 when predetermined period P1c has elapsed since the timing Ts when a start of the suction allowable period was reported, the control part 22 operates to proceed the period to a second period P2 that will be explained later. The predetermined period P1c may be 5-15 seconds, preferably, and 10 seconds, typically. According to the above construction, the probability of occurrence of an event that a user performs a suction action of the first time during the first period P1 becomes high. In the above case, it is possible to bring a user to perform a suction action of the first time, during a period that the heater temperature is maintained at temperature near the first target temperature TA1 that is the highest temperature in the heating profile.

[0072] The first period P1 changes due to the states of heating, ambient temperature, and so on of the heater 30 and the smoking article 110; however, it may typically be that in the range of 35-55 seconds. In this regard, it is preferable that the control part 22 be constructed to be able to change the length of the first period P1, based on the speed of raising of the temperature of the heater 30 in the first period P1. More specifically, the initial temperature rising period P1a in the first period P1 may be constructed to be changeable, based on the speed of raising of the temperature of the heater 30. Specifically, it is preferable that the control part 22 be constructed to change the length of the first period P1 to become shorter, as the period from a start of heating of the heater 30 to the time when the temperature has reached predetermined temperature becomes shorter.

[0073] In the present embodiment, the first period P1 ends when a predetermined period (P1b+P1c) has elapsed since the time when the temperature of the heater 30 has reached the first target temperature TA1. That is, if the speed of raising of the temperature of the heater 30 is high, the period P1, that is from the time T0 when supply of electric power to the heater 30 is started to the time when the temperature of the heater 30 reaches the first target temperature TA1, becomes short. The predetermined period (P1b+P1c) may be 25-41 seconds, preferably, and 33 seconds, typically.

[0074] As explained above, in the case that the speed

of raising of the temperature of the heater 30 is high, consumption of electric power used during a preheating period can be reduced, by shortening the preheating period.

[0075] It is preferable that the variable range of the first period P1, more specifically, the variable range of the period (P1a+P1b) that ends when a start of the suction allowable period is reported, have a predetermined upper limit value. For example, the upper limit value of the period (P1a+P1b), that is from a start of supply of electric power T0 to the time of reporting of a start of the suction allowable period T2, is 40-60 seconds, preferably, and 50 seconds, typically. According to the above construction, it is possible to prevent the control part 22 continuing preheating without transition to the second period P2, in the case that the temperature of the heater 30 does not reach the first target temperature TA1.

[0076] Next, during the second period P2 following the first period P1, the control part 22 controls the temperature of the heater 30 to change it to a second target temperature TA2 that is lower than the first target temperature TA1. That is, the control part 22 controls the heater 30 to lower the temperature of the heater 30 from the first target temperature TA1, and maintain the temperature at the second target temperature TA2.

[0077] The second target temperature TA2 may be that in the range of 190-210 degrees Celsius, preferably, and 200 degrees Celsius, typically. The second period P2 may be that in the range of 105-160 seconds, preferably, and 130 seconds, typically. It is preferable that the second period P2 be longer than each of the first period P1 and a third period P3 that will be explained later. Since the second period is a period during that temperature higher than that in the third period P3 is maintained, the second period is a period during that the aerosol is stably supplied. Thus, the period, during that the aerosol can be stably supplied, can be made relatively long. By lowering the target temperature in the second period P2, it becomes possible to reduce electric power consumed in the second period P2.

[0078] The control part 22 may have a first off period, that is from the end of the first period P1 to an early period in the second period P2, for stopping supply of electric power to the heater 30. By setting the first off period, lowering of temperature from the first target temperature TA1 to the second target temperature TA2 can be completed in the shortest period of time. The control part 22 can continue measurement of temperature of the heater 30 even in the first off period. In the above case, the control part 22 may be constructed to resume supply of electric power to the heater 30 when the temperature of the heater 30 has decreased and reached temperature near the second target temperature TA2.

[0079] It is preferable that the first off period be a time interval during that a general user cannot perform two or more times of suction actions. If a user performs two or more times of suction actions during the off period, the temperature of the heater 30 may be lowered drastically,

and may become that much lower than the second target temperature TA2. In the above case, there may be a risk that the quantity of aerosol generated from the smoking article 110 is reduced. If it is supposed that a time interval between usual suction actions by a general user is approximately 20 seconds, it is preferable that the first off period be that in the range of 15-20 seconds, for example. The first target temperature TA1 and the second target temperature TA2 may be set in such a manner that lowering of temperature from the first target temperature TA1 to the second target temperature TA2 as a result of natural cooling during the first off period is completed in the above time range. Alternatively, the control part 22 may be constructed to measure elapsed time of the first off period, and, when the first off period has reached a predetermined upper limit value, forcibly resume supply of electric power to the heater 30. It is preferable that the upper limit value of the first off period in the above case be 15-20 seconds.

[0080] Next, during the third period P3 that follows the second period P2, the control part 22 controls the temperature of the heater 30 to change it to a third target temperature TA3 that is lower than the second target temperature TA2. That is, the control part 22 controls the heater 30 to further lower the temperature of the heater 30 from the second target temperature TA2, and maintain the temperature at the third target temperature TA3. The third target temperature TA3 may be that in the range of 175-190 degrees Celsius, preferably, and 185 degrees Celsius, typically. The third period P3 may be that in the range of 30-90 seconds, preferably, and 60 seconds, typically. By further lowering the target temperature in the third period P3, it becomes possible to reduce electric power consumed in the third period P3.

[0081] It is preferable that a temperature difference (ΔT_{12}) between the first target temperature TA1 and the second target temperature TA2 be larger than a temperature difference (ΔT_{23}) between the second target temperature TA2 and the third target temperature TA3. The consumed electric power of the heater 30 in the second period P2 is larger than that in the third period P3, so that electric power consumption through the whole period can be reduced when the temperature difference (ΔT_{12}) at the time of transition from the first period P1 to the second period P2 is set to that larger than the temperature difference (ΔT_{23}) at the time of transition from the second period P2 to the third period P3. Thus, it is preferable that $\Delta T_{12}/\Delta T_{23}$ be larger than 1. On the other hand, in the case that ΔT_{12} is made excessively large compared with ΔT_{23} , the target temperature TA2 in the second period P2, that is set by taking stable supply of aerosol into consideration, becomes relatively low, so that there may be a risk that supply of aerosol in the second period P2 becomes unstable. Thus, it is preferable that $\Delta T_{12}/\Delta T_{23}$ have a predetermined upper limit value. The upper limit value of $\Delta T_{12}/\Delta T_{23}$ may be 2.5, for example. $\Delta T_{12}/\Delta T_{23}$ may be 1.0-2.5, preferably, and 2.0, typically.

[0082] The control part 22 may have a second off pe-

riod, that is from the end of the second period P2 to an early period in the third period P3, for stopping supply of electric power to the heater 30. By setting the second off period, lowering of temperature from the second target temperature TA2 to the third target temperature TA3 can be completed in the shortest period of time. The control part 22 can continue measurement of temperature of the heater 30 even in the second off period. In the above case, the control part 22 may be constructed to resume supply of electric power to the heater 30 when the temperature of the heater 30 has decreased and reached temperature near the third target temperature TA3. Similar to the first off period, it is preferable that the second off period be a time interval during that a general user cannot perform two or more times of suction actions, and that the second off period be that in the range of 15-20 seconds. The second target temperature TA2 and the third target temperature TA3 may be set in such a manner that lowering of temperature from the second target temperature TA2 to the third target temperature TA3 as a result of natural cooling during the second off period is completed in the above time range. Alternatively, the control part 22 may be constructed to measure elapsed time of the second off period, and, when the second off period has reached a predetermined upper limit value, forcibly resume supply of electric power to the heater 30.

[0083] As explained above, it is preferable that the temperature difference (ΔT_{12}) between the first target temperature TA1 and the second target temperature TA2 be larger than the temperature difference (ΔT_{23}) between the second target temperature TA2 and the third target temperature TA3; and the above relationship is preferable in view of setting of the first off period and the second off period to make them have values close to each other. According to the Newton's law of cooling, the speed of lowering of temperature in a high temperature range is faster than that in a low temperature range in the case of natural cooling; thus, for setting the first off period and the second off period as close as possible to each other, it is necessary to set the temperature difference (ΔT_{12}) between the first target temperature TA1 and the second target temperature TA2, that belongs to the high temperature range, to that relatively large. If it is supposed that the temperature difference (ΔT_{12}) between the first target temperature TA1 and the second target temperature TA2 is set to that equal to the temperature difference (ΔT_{23}) between the second target temperature TA2 and the third target temperature TA3, or if it is supposed that the temperature difference (ΔT_{12}) of the former is set to that smaller than the temperature difference (ΔT_{23}) of the latter, the first off period always becomes shorter than the second off period, so that it becomes theoretically impossible to set the two off periods equal to each other.

[0084] Further, it is preferable that the ratio of the difference between the first target temperature TA1 and the second target temperature TA2 to the difference between the second target temperature TA2 and the third target temperature TA3 be less than 2.5. The reason that above

construction is adopted is to allow stable generation of aerosol during a middle stage in the puff allowable period, by preventing the difference between the first target temperature TA1 and the second target temperature TA2 from becoming excessively large.

[0085] It should be reminded that, in view of reduction of electric power consumption, there may be a case that it is preferable to control the heater 30 at the third target temperature TA3 without going through the stage of the second target temperature TA2 after the first target temperature TA1. However, in the above case, the period (the second off period) required to change the temperature from the first target temperature TA1 to the third target temperature TA3 becomes relatively long. Since supply of electric power to the heater 30 is stopped during the period required to reach the third target temperature TA3 from the first target temperature TA1, there may be a risk that the temperature of the heater 30 may become that much lower than the third target temperature, if a user performs plural times of suction actions during the above period. By going through the second target temperature TA2 that is set between the first target temperature TA1 and the third target temperature TA3 before transitioning from the first target temperature TA1 to the third target temperature TA3, the time required for transition from one target temperature to the other target temperature can be shortened. According to the above construction, duration of an off period, during that supply of electric power to the heater 30 is stopped, becomes shorter, so that it becomes possible to prevent excessive lowering of temperature of a smoking article due to plural times of suction actions, and prevent unstable generation of aerosol due thereto.

[0086] The control part 22 stops supply of electric power to the heater 30 at the time when the third period P3 ends. Next, the control part 22 reports an end of the suction allowable period at timing T7 when a predetermined period has elapsed since supply of electric power to the heater 30 is stopped (timing T6). That is, even in the time after supply of electric power to the heater 30 is stopped, a user is prompted to perform an aerosol suction action, until a predetermined period has elapsed, to allow the user to taste the aerosol by using remaining heat of the heater 30 and the smoking article 110. In this regard, reporting of the end of the suction allowable period may be performed by the notification part 40, and, for example, may be performed by performing a control process to change the color of light emitted from a light emitting element such as an LED or the like, a control process to change a light emitting pattern, or a control process to drive a vibration element, or a control process comprising a combination of the above control processes.

[0087] After the heater 30 went through the first period P1, the second period P2, and the third period P3 in the heating profile, heat from the heater 30 has been transferred sufficiently to the inside of the smoking article 110. Thus, in a period from the end of the third period P3 to the end of the suction allowable period, that is, in a fourth

period P4 in Fig. 8, a certain quantity of aerosol can be generated by using remaining heat of the heater 30 and the smoking article 110. In this regard, similar to the cases of the first off period and the second off period, generation of aerosol becomes unstable in the fourth period P4, so that it is preferable that the fourth period P4 be a time interval during that a user does not perform two or more times of suction actions. Thus, the fourth period P4 is preferably 5-15 seconds, and, typically 10 seconds.

[0088] Further, the control part 22 may report a state that the suction allowable period is drawing to an end, at timing T5 that is earlier, by a predetermined period Pe, than timing T7 when the end of the suction allowable period is reported. Reporting such as that explained above may be performed, for example, 20-40 seconds before the end of the suction allowable period. Reporting such as that explained above may be performed by the notification part 40, and, for example, may be performed by performing a control process to change the color of light emitted from a light emitting element such as an LED or the like, a control process to change a light emitting pattern, or a control process to drive a vibration element, or a control process comprising a combination of the above control processes.

[0089] In the above-explained embodiment, the control part 22 stops supply of electric power to the heater 30 at the time of the end of the third period P3. In addition, the control part 22 may stop supply of electric power to the heater 30, even in the second period P2 or the third period P3 in the case that the number of times of suction actions by a user exceeds a predetermined number of times. A puff action by a user may be detected by the above-explained temperature sensor, for example.

[0090] Fig. 9 is a figure showing a heating profile of a heater and a delivery profile of aerosol. The delivery profile of aerosol is a graph representing time variation of main aerosol components delivered to the inside of a mouth of a user, when the user has used the flavor inhaler 100 according to predetermined suction conditions. In this case, the "main aerosol components" are materials from which visible aerosol is generated when they are heated to have temperature equal to or above predetermined temperature, and, specifically, they are aerosol sources included in the filling article 111 in the a smoking article 110.

[0091] The delivery profile of the main aerosol components may be dependent, mainly, on the heating profile of the heater 30. Specifically, the delivery profile of the main aerosol components may basically be a profile corresponding to a temperature profile of the inside of the smoking article 110. The temperature profile of the inside of the smoking article 110 follows the heating profile of the heater 30, so that it generally tends to have a shape that is time-delayed relative to the heating profile.

[0092] Thus, by setting the first target temperature TA1 in the first period P1 to the highest temperature throughout the heating profile, it becomes easier to form an ascending curve having a steep gradient in the initial period

Q1 in the delivery profile of the main aerosol components. Also, by maintaining the temperature of the heater 30 at the second target temperature TA2 during the most part of the second period P2 that follows the first period P1, it becomes easier to form the stable period SP, during that change per suction action is small, in the intermediate period Q2 in the delivery profile of the main aerosol components. Further, by controlling the temperature of the heater 30 to direct it to the third target temperature TA3 that is lower than the second target temperature TA2 during the third period P3 that follows the second period P2, it becomes easier to form a descending curve in the final period Q3 in the delivery profile of the main aerosol components. Especially, by making the temperature difference T23 between the second target temperature TA2 and the third target temperature TA3 small, it becomes easier to form a descending curve having a more gentle gradient in the final period Q3 in the delivery profile of the main aerosol components. As explained above, by performing control of the heater 30 according to the heating profile illustrated in Fig. 8, it becomes easier to form an upwardly convex curve, as a whole, having a maximum point in the intermediate period Q2, it becomes easier to form an ascending curve having a steep gradient in the initial period Q1, and it becomes easier to form a descending curve having a gentle gradient in the final period Q3, in the delivery profile of the main aerosol components.

[0093] As explained above, the delivery profile of the main aerosol components may mainly be dependent on the heating profile of the heater 30. However, the delivery profile of the main aerosol components may change according to factors such as the shape of the heater 30, presence/absence and the shape of the heat insulating material 138, the size of the smoking article 110, the degree of contact between the heater 30 and the smoking article 110, the position of the heating part of the heater 30 relative to the smoking article 110, and so on; so that it should be reminded that the delivery profile in Fig. 9 is that shown as an example.

(Program and Storage Medium)

[0094] A control flow for realizing the heating profile and/or the aerosol profile explained above can be performed by the control part 22. That is, the present invention may include a program for making the flavor inhaler 100 and/or the aerosol generation device 120 perform the above-explained method, and a storage medium in which the program is stored. A storage medium such as that explained above may be a non-transient storage medium.

[Other Embodiments]

[0095] Although the present invention has been explained with reference to the above embodiments, it should be understood that the descriptions and the fig-

ures, which are part of the present disclosure, are not those used for limiting the present invention. Various alternative embodiments, practical examples, and operation techniques will become apparent to a person skilled in the art from the present disclosure.

Claims

1. A control unit comprising a control part for controlling a heater which heats an aerosol source, wherein the control part is constructed to control temperature of the heater to bring the temperature to first target temperature during a first period, control the temperature of the heater to bring the temperature to second target temperature that is lower than the first target temperature during a second period after the first period, and control the temperature of the heater to bring the temperature to third target temperature that is lower than the second target temperature during a third period after the second period.
2. The control unit as recited in Claim 1, wherein a difference between the first target temperature and the second target temperature is larger than a difference between the second target temperature and the third target temperature.
3. The control unit as recited in Claim 1 or 2, wherein the second period is longer than the first period and the third period.
4. The control unit as recited in any one of Claims 1-3, wherein the control part is constructed to be able to change the length of the first period based on a speed of rise in temperature of the heater in the first period.
5. The control unit as recited in Claim 4, wherein the control part is constructed to be able to make the first period become shorter as a period from a start of heating of the heater to a point in time when temperature reaches predetermined temperature becomes shorter.
6. The control unit as recited in Claim 4 or 5, wherein the range that the first period can be varied has a predetermined upper limit value.
7. The control unit as recited in any one of Claims 1-6, wherein the control part has a first off period for stopping supply of electric power to the heater from an end of the first period to an initial period in the second period, and the first off period is set to a time equal to or shorter than 20 seconds.
8. The control unit as recited in any one of Claims 1-7, wherein the control part has a second off period for stopping supply of electric power to the heater from an end of the second period to an initial period in the third period, and the second off period is set to a time equal to or shorter than 20 seconds.
9. The control unit as recited in any one of Claims 1-8, wherein the control part is constructed to report an event that a suction allowable period has started during a period, in the first period, when the temperature of the heater is being maintained at the first target temperature.
10. The control unit as recited in Claim 9, wherein the control part is constructed to report, in a latter half of the first period, an event that the suction allowable period has started.
11. The control unit as recited in any one of Claims 1-10, wherein the control part is constructed to stop supply of electric power to the heater after the third period.
12. The control unit as recited in any one of Claims 1-11, wherein the control part is constructed to stop supply of electric power to the heater after the third period, and report, after the elapse of a predetermined period since the stop, an event that the suction allowable period has ended.
13. An aerosol generation device comprising the control unit recited in any one of Claims 1-12, and the heater.
14. The aerosol generation device as recited in Claim 13, wherein the heater has a cylindrical shape that allows heating of an outer periphery of a smoking article having a column shape.
15. A method for controlling a heater for heating an aerosol source, comprising:
 - a first step for controlling temperature of the heater to bring the temperature to first target temperature during a first period,
 - a second step for controlling the temperature of the heater to bring the temperature to second target temperature that is lower than the first target temperature during a second period after the first period, and
 - a third step for controlling the temperature of the heater to bring the temperature to third target temperature that is lower than the second target temperature during a third period after the second period.

16. A program which makes an aerosol generation device perform the method recited in Claim 15.

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Fig. 1

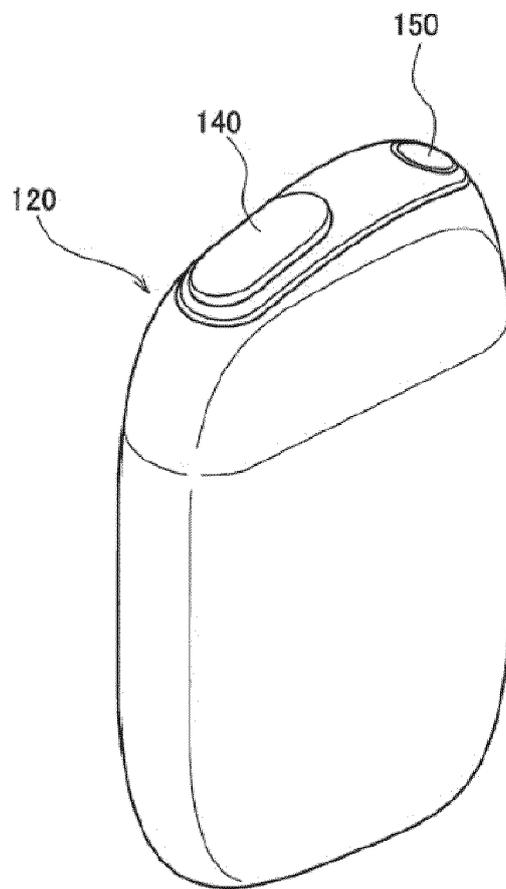


Fig. 2

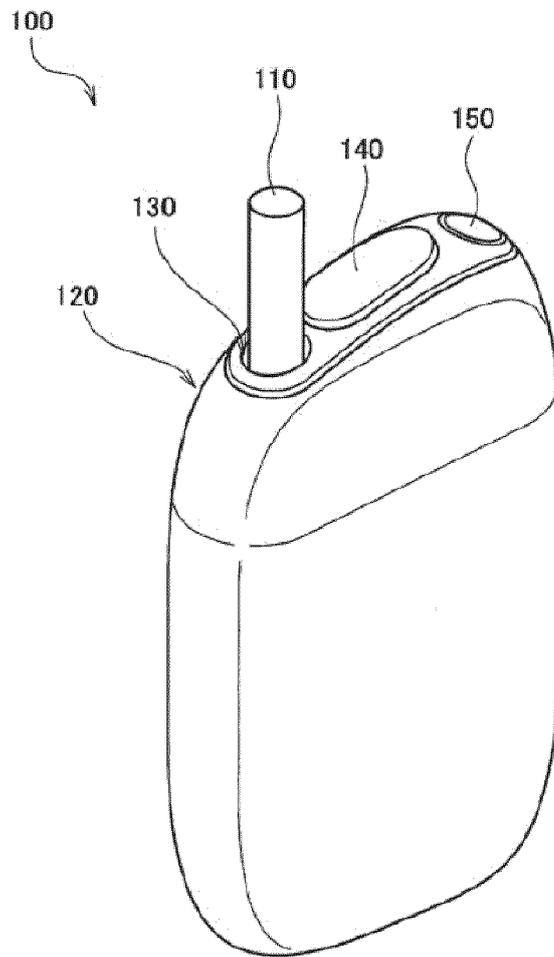


Fig. 3

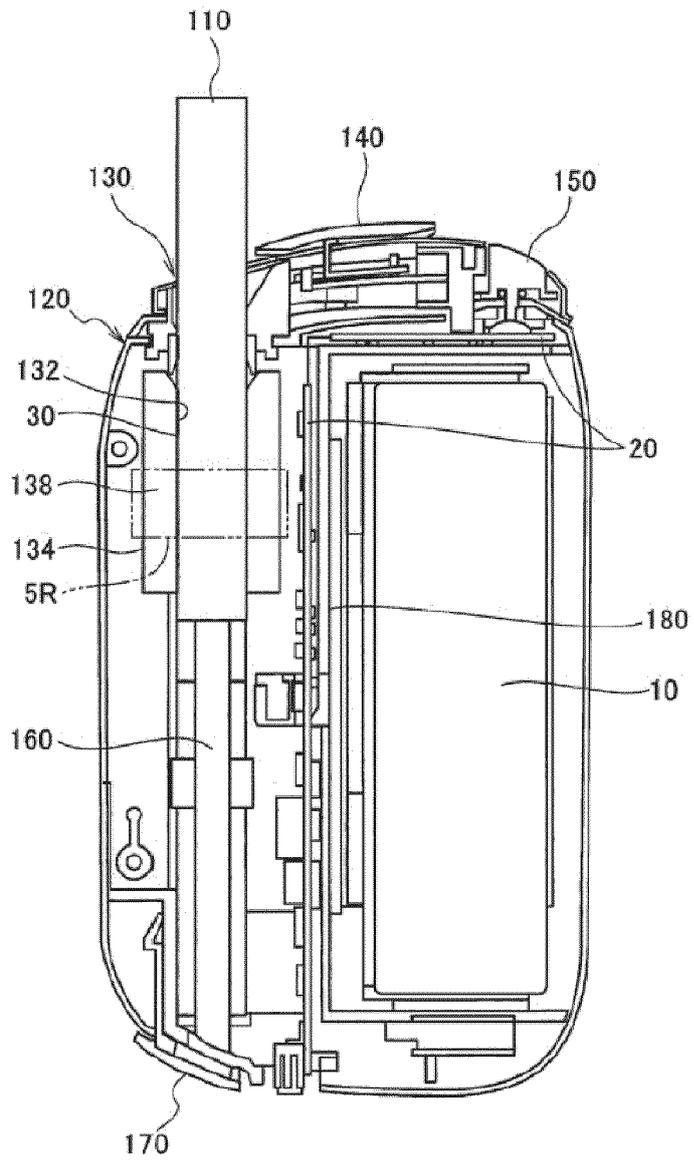


Fig. 4

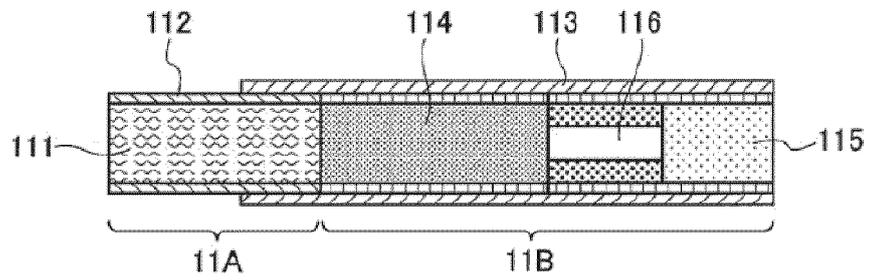


Fig. 5

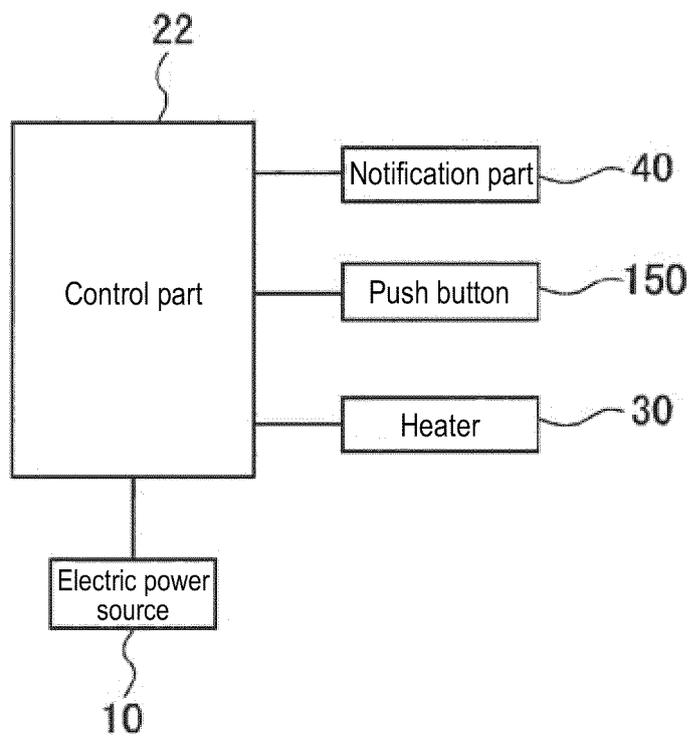


Fig. 6

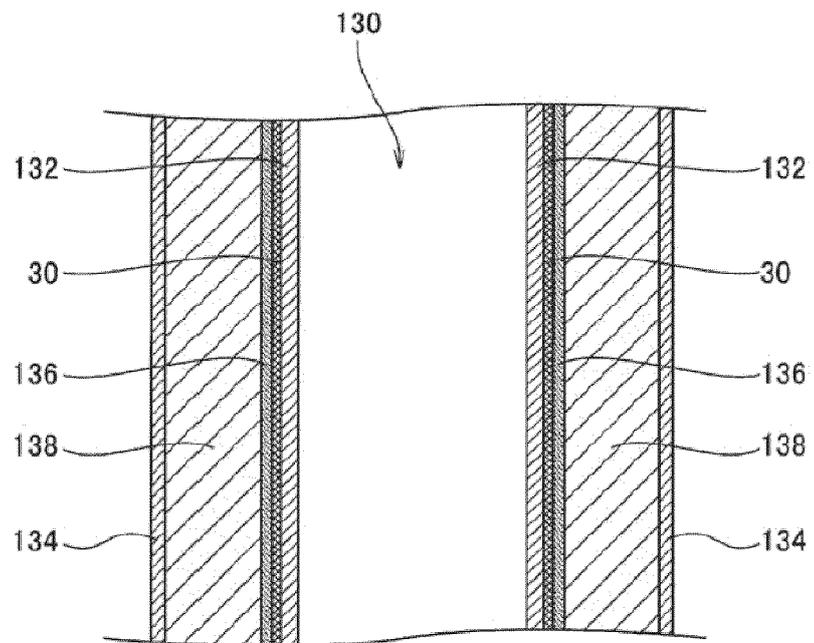


Fig. 7

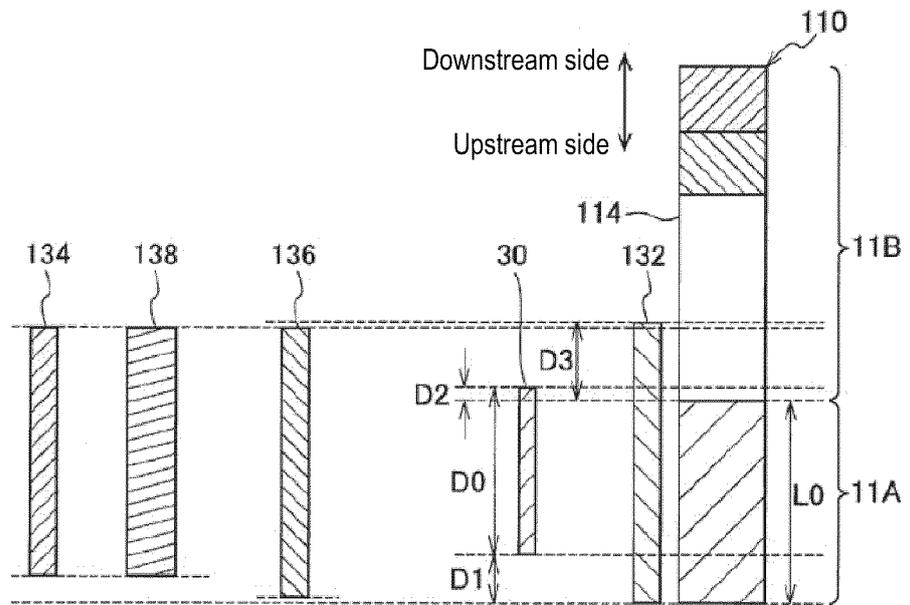


Fig. 8

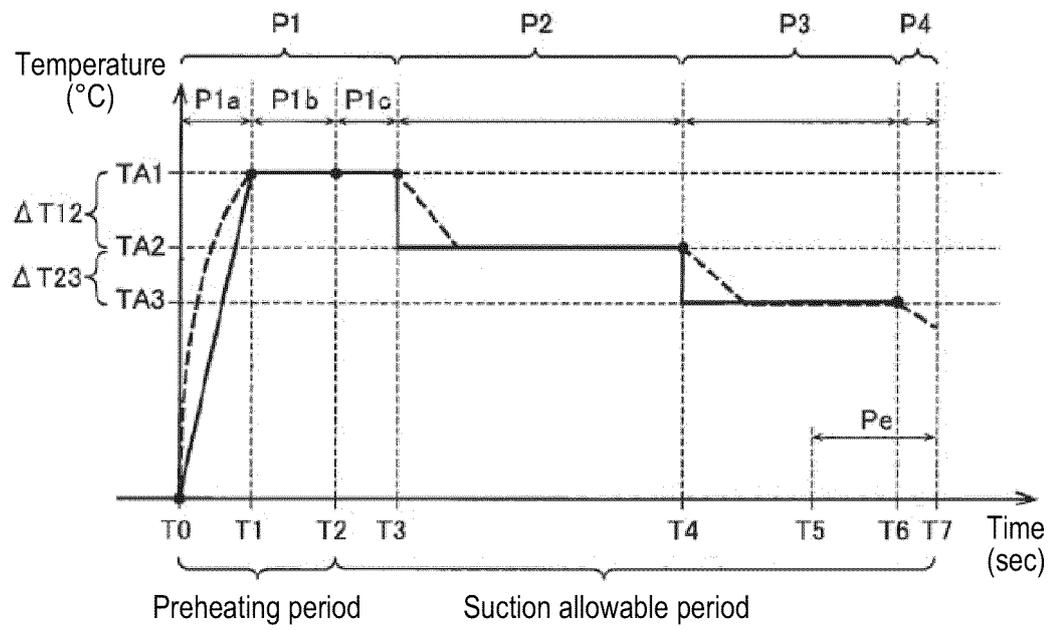
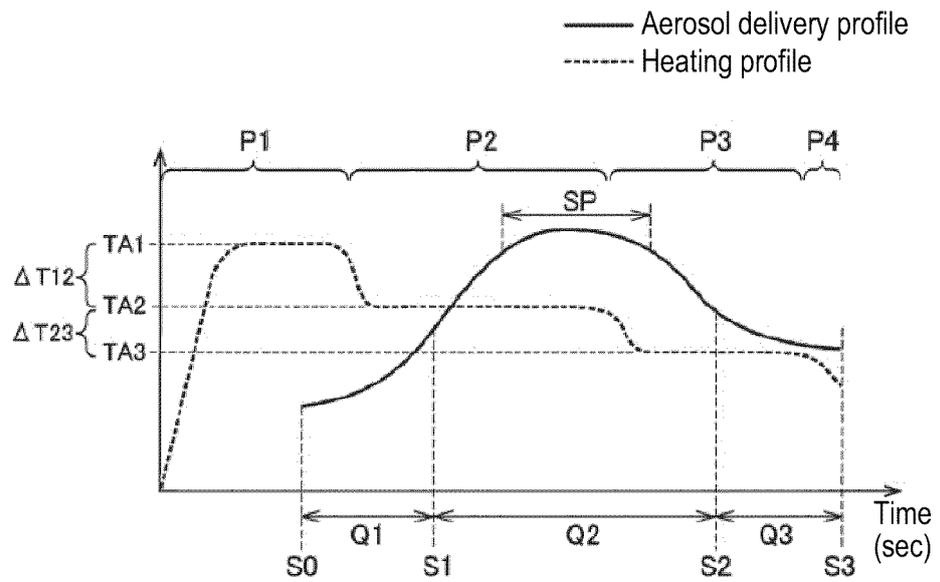


Fig. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/039916

5	A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. A24F47/00 (2006.01) i	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) Int.Cl. A24F47/00, A61M15/06, H05B1/00-3/00, G05D23/00-23/32	
15	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2019 Registered utility model specifications of Japan 1996-2019 Published registered utility model applications of Japan 1994-2019	
20	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages
25	Y	WO 2018/019786 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 01 February 2018, page 4, line 14 to page 20, line 24, fig. 1-3, 12 & TW 201808124 A
30	Y	CN 108618207 A (LYUYAN IND SHENZHEN CO., LTD.) 09 October 2018, paragraphs [0047]-[0078], fig. 1-3 (Family: none)
35		Relevant to claim No.
40	<input checked="" type="checkbox"/>	Further documents are listed in the continuation of Box C.
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50	Date of the actual completion of the international search 11.01.2019	Date of mailing of the international search report 22.01.2019
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-230199 A (KOMATSU LTD.) 24 August 2001, paragraph [0055], fig. 10 (Family: none)	1-16
Y	JP 7-129021 A (RICOH CO., LTD.) 19 May 1995, paragraphs [0021], [0028], fig. 3 (Family: none)	1-16
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- JP 2017113016 A [0003]
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