(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 308 337 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
13.04.2011 Bulletin 2011/15

(21) Application number: **09802858.2**

(22) Date of filing: **21.07.2009**

(51) Int Cl.:
A45D 20/12 *(2006.01)*

(86) International application number:
PCT/JP2009/063030

(87) International publication number:
WO 2010/013615 (04.02.2010 Gazette 2010/05)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(30) Priority: **31.07.2008 JP 2008198301**

(71) Applicant: **Panasonic Electric Works Co., Ltd.**
Kadoma-shi, Osaka 571-8686 (JP)

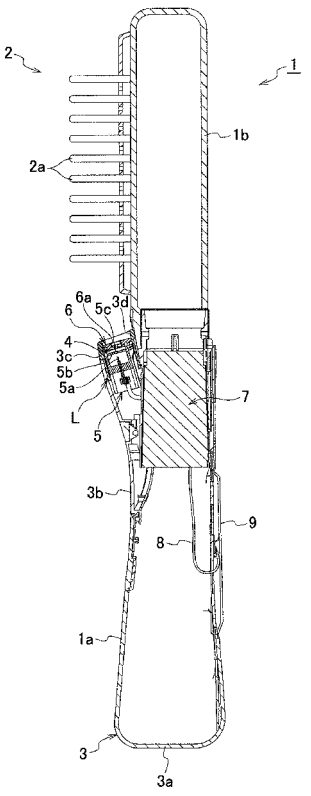
(72) Inventors:
- **MIYATA, Hiromitsu**
  Osaka 571-8686 (JP)
- **SUDA, Hiroshi**
  Osaka 571-8686 (JP)
- **MACHI, Masaharu**
  Osaka 571-8686 (JP)
- **TAKANO, Hiroyuki**
  Osaka 571-8686 (JP)

(74) Representative: **Appelt, Christian W.**
Forrester & Boehmert
Pettenkoferstrasse 20-22
80336 München (DE)

(54) HAIR CARE DEVICE

(57) To obtain a hair care device capable of releasing metallic fine particles with the influence on the discharge characteristic being reduced. A metal member hit by ions to release the metallic fine particles is provided separately from discharge and ground electrodes. The hair care device can therefore release fine metal particles with less influence on the discharge characteristic than that in the case where the fine metal particles are released from only the discharge and ground electrodes.

FIG. 1



EP 2 308 337 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a hair care device.

BACKGROUND ART

[0002] Some of conventionally known hair driers cause a discharge between electrodes containing the transition metal to generate fine particles of transition metal and emit the fine particles toward hair (Patent Literature 1).

[0003] However, in the hair drier disclosed in Patent Literature 1, the electrodes are gradually reduced in size as releasing the fine particles of the transition metal. Accordingly, very long-term use thereof causes a change in the discharge characteristic of the electrodes in some cases.

PRIOR ART LITERATURE

PATENT LITERATURE

[0004]

Patent Literature 1 : Japanese Patent Laid-open Publication No. 2008-23063

SUMMARY OF THE INVENTION

[0005] According to the present invention, in a hair care device which includes an ion generator generating ions by a discharge operation between a discharge electrode and a ground electrode and emits the generated ions, a metal member is provided which is formed separately from the discharge and ground electrodes and is hit by the ions generated by the ion generator to release fine metal particles.

[0006] According to the present invention, the metal member is detachably provided.

[0007] According to the present invention, an ion channel allowing the ions generated by the ion generator to pass therethrough is formed within a case, and the hair care device further includes a blower mechanism producing airflow in the ion channel.

[0008] According to the present invention, an air channel allowing the airflow produced by the blower mechanism to pass therethrough and blow out is formed within the case separately from the ion channel.

[0009] According to the present invention, the air channel is provided with a heating mechanism heating the airflow, and the airflow produced by the blower mechanism is separated on the upstream of the heating mechanism into the ion channel and a portion of the air channel where the heating mechanism is provided.

[0010] According to the present invention, the air channel is provided with a heating mechanism heating the airflow, and the metal member is heated by heat generated by the heating mechanism.

[0011] According to the present invention, the hair care device includes an electrostatic atomizing mechanism which includes the ion generator and a water supplier supplying water to the ion generator, and generates atomized mist, in which the metal member is positioned so as to be hit by the ions generated by the ion generator included in the electrostatic atomizing mechanism.

[0012] According to the present invention, the hair care device further includes an electrostatic atomizing mechanism configured to generate atomized mist, the electrostatic atomizing mechanism including a second ion generator which is separately formed from the ion generator and generates ions by a discharge operation and a water supplier supplying water to the second ion generator.

[0013] According to the present invention, the hair care device further includes a second metal member which is positioned so as to be hit by the ions generated by the second ion generator, the second metal member being configured to be hit by the ions to release fine metal particles.

[0014] According to the present invention, the hair care device further includes a humidifying mechanism configured to humidify the airflow generated by the blower mechanism.

[0015] According to the present invention, the humidifying mechanism includes a cooling unit cooling the metal member and condenses moisture in air on a surface of the metal member cooled by the cooling unit to generate condensation water and supplies the condensation water for humidification.

BRIEF DESCRIPTION OF DRAWINGS

[0016]

FIG. 1 is a cross-sectional view of a hair brush as a hair care device according to a first embodiment of the present invention.

FIG. 2 is a schematic view showing a charged state of a user who is using the hair brush as the hair care device according to the first embodiment of the present invention.

FIG. 3 is a cross-sectional view of a hair brush as a hair care device according to a second embodiment of the present invention.

FIG. 4 is a plan view of a hair drier as a hair care device according to a third embodiment of the present invention.

FIG. 5 is a side view of the hair drier as the hair care device according to the third embodiment of the present invention.

FIG. 6 is a cross-sectional view taken along a line VI-VI of FIG. 4.

FIG. 7 is a cross-sectional view taken along a line VII-VII of FIG. 5.

FIG. 8 is an enlarged view of a part VIII of FIG. 7.

FIG. 9 is a cross-sectional view of a hair drier as a hair care device according to a fourth embodiment of the present invention.

FIG. 10 is a cross-sectional view of a hair drier as a hair care device according to a fifth embodiment of the present invention.

FIG. 11 is a cross-sectional view of a hair drier as a hair care device according to a sixth embodiment of the present invention.

FIG. 12 is a cross-sectional view of a hair drier as a hair care device according to a seventh embodiment of the present invention.

FIG. 13 is an enlarged view of a part of FIG. 12.

FIG. 14 is a side view of a hair iron as a hair care device according to an eighth embodiment of the present invention.

FIG. 15 is a cross sectional view taken along a line XV-XV of FIG. 14.

MODES FOR CARRYING OUT THE INVENTION

[0017] Hereinafter, a description will be given of embodiments of the present invention in detail with reference to the drawings. The plurality of embodiments below include same constitutional components. The same constitutional components are given same reference numerals, and the redundant description thereof is omitted.

[0018] (First Embodiment) FIGS. 1 and 2 show the first embodiment of the present invention. FIG. 1 is a cross sectional view of a hair brush as a hair care device according to the first embodiment, and FIG. 2 is a schematic view showing a charged state of a user who is using the hair brush.

[0019] As shown in FIG. 1, a hair brush 1 as the hair care device has a stick shape and is configured so that a user H (FIG. 2) holds a grip portion 1a and puts a brush section 2 provided for a top portion 1b on hair for styling (bushing). The brush section 2 is provided with a plurality of protruding bristles 2a.

[0020] A casing 3 as a case is composed of a plurality of separate units 3a to 3c joined to each other. The casing 3 includes a cavity inside and accommodates various electric components in the cavity.

[0021] In the separate unit 3c of the casing 3, an aperture 3d and a cavity 4 are formed. The aperture 3d is open toward the bristles 2a of the brush section 2, and the cavity 4 is terminated with the aperture 3d. This cavity 4 accommodates an ion generator 5 and corresponds to an ion channel in this embodiment.

[0022] The ion generator 5 includes a needle-like discharge electrode 5a and a substantially disk-shaped ground electrode 5b placed on the tip side of the discharge electrode 5a. In the ion generator 5, high voltage is applied across the discharge and ground electrodes 5a and 5b to cause a discharge (corona discharge), and the discharge operation produces ions (negative ions in this embodiment such as NO_2^- and NO_3^-, for example) . The ions produced herein are emitted outward through a through-hole 5c, which is formed outside of the tip of the discharge electrode 5a, in the ground electrode 5b. The high voltage circuit and control circuit driving the ion generator 5 are included in a circuit section 7 and, in this embodiment, are accommodated in adjacent to the ion generator 5 between the grip portion 1a and top portion 1b within the casing 3.

[0023] In this embodiment, a metal member 6 is provided facing a portion of the cavity 4 as the ion channel which ions pass through. The metal member 6 is provided at the aperture 3d as a substantially plate or mesh-shaped member having a through-hole 6a. The metal member 6 is fixed to the separate unit 3c substantially cylindrical.

[0024] According to this embodiment, the ions produced at ion generator 5 are emitted to the outside through the through-hole 6a of the metal member 6. Herein, the flow of the ions can be produced without any particular airflow.

[0025] When the ions flowing through the cavity 4 as the ion channel hit the metal member 6, fine metal particles are released from the metal member 6. The metal member 6 can be made of a transition metal (for example, gold, silver, copper, platinum, zinc, titanium, rhodium, palladium, iridium, ruthenium, osmium, or the like) or an alloy containing the same. If the metal member 6 is made of gold, silver, copper, or the like, the fine particles of the metal have an antibacterial effect. If the metal member 6 is made of platinum, zinc, titanium, or the like, the fine particles of the metal have an antioxidant effect. It is known that use of platinum provides an extremely high antioxidant effect. The metal member 6 may be configured so that the aforementioned fine particles are released from at least a portion hit by the ions. For example, the metal member 6 may be subjected to a surface treatment with the metallic material (for example, plating or the like) or may be made of metal tape or foil. Alternatively, the metal member 6 maybe composed of a constituent part such as a screw, a filter, a cooling fin, a spring, or the like. The metal member 6 may take various shapes such as a ring, mesh, and a plate. On the other hand, since the release of the fine particles of metal is mainly handled by the metal member 6, the discharge and ground electrodes 5a and 5b can be made of a metal member not containing any one of the above transition metals (for example, stainless, tungsten, and the like).

[0026] According to the aforementioned configuration, the ions generated by the ion generator 5 hit the metal member 6, and the fine particles of metal contained in the metallic member 6 are then emitted through the aperture 3d, thus acting on a user H's hair and skin. The fine particles of metal provide an antibacterial or antioxidant effect.

[0027] As described above, the hair brush 1 according to the first embodiment emits negative ions and fine particles of metal. As the negative charges accumulate in the user H, the negative ions become less likely to be emitted toward the user H, and then the fine particles of

metal also become less likely to be emitted. Accordingly, the hair brush 1 is provided with a charge function to electrically charge the user H to the opposite polarity to the charges of the ions generated by the ion generator 5 (positive polarity in this embodiment). To be specific, as shown in FIG. 1, the hair brush 1 includes a charge electrode 9 exposed to the outer surface of the grip portion 1a. The charge electrode 9 is set to a high potential, a predetermined voltage higher than the ground level of the ion generator 5. In this embodiment, a voltage source configured to set the charge electrode 9 higher than the ground level (such as a battery or a capacitor, for example) is provided within the circuit section 7, and the positive electrode of the voltage source is connected to the charge electrode 9 through a lead 8. The charge electrode 9 is made of a conductive material (a synthetic resin material containing a conductive filler or the like, for example) and has a predetermined shape. The charge electrode 9 is fixed to the outer surface of the casing 3 in the grip portion 1a. Accordingly, the user H is charged with positive charges from a hand ha to a head he. This can prevent the negative charges to accumulate, and prevent the negative ions becoming less likely to reach the user H.

[0028] In this embodiment, the separate unit 3c, to which the metal member 6 is fixed and which forms the end of the cavity 4, is detachably attached to the separate unit 3b on the grip portion 1a side. To be specific, the inner surface of the cavity 4 of the separate unit 3b is provided with a recess, and the separate unit 3c is provided with a click capable of elastically projecting into and retracting from the aforementioned recess. The recess and click form an engagement portion L. This allows the separate unit 3c to be pulled out from the separate unit 3b with a force being applied by fingers, a tool, or the like and to be pressed and attached to the separate unit 3b. Accordingly, in the case where there is some defect in the metal member 6, for example, in the case where the metal member 6 releases fine particles and is reduced in size due to long-term use, therefore, the metal member 6 can be easily replaced with a new one. In such a case, the metal member 6 may be replaced with a new part including the separate unit 3c. Alternatively, the metal member 6 may be replaced by: detaching the separate unit 3c from the separate unit 3b, replacing the metal member 6 with a new one, and then returning the separate unit 3c with the new metal member 6 to the separate unit 3b.

[0029] As described above, in the first embodiment, the metal member 6 configured to be hit by ions to release fine particles of metal is provided separately from the discharge and ground electrodes 5a and 5b. Compared with the case where the fine particles of metal are released only from the discharge electrode and ground electrodes 5a and 5b, the fine particles of metal can be released with less influence on the discharge characteristic of the electrodes 5a and 5b. Preferably, the metal member 6 is placed in the vicinity of the ion generator 5 within the casing 3 as the case. However, the metal member 6 only needs to be provided facing the portion serving as the route of the ions (the portion which can be hit by the ions) and may be provided for a portion outside of the casing 3 which can be hit by ions.

[0030] Moreover, the hair brush 1 according to the first embodiment is detachably provided with the metal member 6. Accordingly, if there is defect in the metal member 6, such as reduction in size of the metal member 6 due to the release of the fine particles, the metal member 6 can be replaced comparatively easily. Furthermore, the separate unit 3c of the casing 3 to which the metal member 6 is fixed is configured so as to be freely detached from and attached to the different separate unit 3b. Such a configuration of the first embodiment has an advantage that the force for detachment and attachment can be easily controlled using the elasticity of the material of the casing 3 (preferably, a synthetic resin material or the like). The metal member 6 itself may be detachably attached to the casing 3 or the like. Moreover, if the metal member 6 is provided outside of the casing 3, the metal member 6 can be attached or detached more easily.

[0031] Furthermore, in the first embodiment, the charge electrode 9 is provided for the grip portion 1a as a charge mechanism charging the user H with a polarity opposite to the charges of the ions generated at the ion generator 5. This can prevent that the charges of the ions released toward the user H accumulate to inhibit the flow of the ions and make the fine particles less likely to be released.

(Second Embodiment)

[0032] FIG. 3 is a cross-sectional view of a hair brush as a hair care device according to a second embodiment.

[0033] A hair brush 1A as the hair care device according to the second embodiment basically includes the same constituent components as those of the hair brush 1 according to the first embodiment and is configured to cause ions generated at the ion generator 5 to hit the metal member 6 for releasing the fine particles of metal and emit the fine particles of metal through the aperture 3d.

[0034] This embodiment is different from the aforementioned first embodiment in that the hair care device includes a fan 12 producing an airflow in the cavity 4 as the ion channel and a motor 11 driving the fan 12 so that the ions generated at the ion generator 5 can be discharged through the aperture 3d with the airflow.

[0035] In this embodiment, the motor 11 and fan 12 as a blower mechanism are accommodated in a cavity 10 formed by the casing 3. The motor 11 is driven and operated by a driving circuit included in the circuit section 7. At the base end of the casing 3 (at the lower end in FIG. 3), an aperture 10a as an air inlet is formed. The fan 12 rotates to produce an airflow coming from the outside through the aperture 10a into the cavity 10 and passing through the cavity 10 to be discharged through the aperture 3d toward the brush section 2 and also produces

an airflow blown out through the brush section 2. In this embodiment, the electric parts are supplied with power through a power cord 13.

[0036] The aforementioned embodiment can obviously provide the same effects as those of the first embodiment. Moreover, in this embodiment, since the motor 11 and fan 12 as the blower mechanism are provided, producing airflow in the cavity 4 as the ion channel, the produced airflow can accelerate the release of the fine particles of metal from the metal member 6 hit by the ions generated at the ion generator 5 and also accelerate the discharge of the fine particles to the outside through the aperture 3d.

(Third Embodiment)

[0037] FIGS. 4 to 8 show a hair drier as a hair care device according to a third embodiment. FIG. 4 is a plan view of the hair drier; FIG. 5, a side view of the hair drier; FIG. 6, a cross-sectional view taken along a line VI-VI of FIG. 4; FIG. 7, a cross-sectional view taken along a line VII-VII of FIG. 5; and FIG. 8, an enlarged view of a part VIII of FIG. 7.

[0038] A hair drier 1B as the hair care device according to the third embodiment includes a grip portion 1c as a section that the user grips by hand and a body portion 1d joined so as to intersect with the grip portion 1c. The grip portion 1c and body portion 1d are configured to provide a substantially T-shaped or L-shaped appearance (a substantially T-shaped appearance in this embodiment) . The power cord 13 is drawn out from the protruding end of the grip portion 1c. The grip portion 1c may be configured to be foldable.

[0039] A casing 14 as the case is composed of a plurality of separate units joined to each other. As shown in FIG. 6, the casing 14 includes a cavity formed inside and accommodates various types of electric parts in the cavity.

[0040] Within the body portion 1d, a cavity 10 is formed extending from an aperture 10a on an end (the left end) thereof in the longitudinal direction (in the horizontal direction in FIG. 6) to an aperture 10b at the other end (the right end). The fan 12 accommodated within the cavity 10 is rotated to produce an airflow coming from the outside through the aperture 10a into the cavity 10 and passing through the cavity 10 to be discharged through the aperture 3d toward the brush section 2. In this embodiment, the cavity 10 corresponds to an air channel.

[0041] In this embodiment, a substantially cylindrical inner cylinder 15 is provided within the body portion 1d. The air flows within the inner cylinder 15. Within the inner cylinder 15, the fan 12 is located most upstream. The motor 11 driving the fan 12 is located downstream of the fan 12, and a heater 16 as a heating mechanism is located downstream of the motor 11. When the heater 16 is activated, warm air blows out through the aperture 10b as an air outlet. The heater 16 is composed of a belt-shaped or corrugated plate-shaped electric resistor wound along the inner surface of the inner cylinder 15 in this embodiment but is not limited to such a configuration.

[0042] In the body portion 1d, the ion generator 5, the circuit section 7, and an electrostatic atomizing mechanism 17 are arranged in the cavity 4 formed between the casing 14 and inner cylinder 15.

[0043] At the substantially center of the inner cylinder 15 in the longitudinal direction, a communication path 15a is formed, allowing the inside and outside of the inner cylinder 15 to communicate with each other. The communication path 15a is configured to separate a portion of the airflow going through the cavity 10 within the inner cylinder 15 and introduce the same into the cavity 4. The airflow introduced into the cavity 4 is discharged through the aperture 10b and apertures 14a and 14b formed in the casing 14 (see FIG. 7). The ion generator 5 is located within the cavity 4 as described above, and the ions generated at the ion generator 5 are mostly discharged through the aperture 14a located facing the ion generator 5 by the airflow within the cavity 4. Accordingly, the cavity 4 (a portion thereof downstream of the communication path 15a) corresponds to the ion channel also in this embodiment.

[0044] In this embodiment, the communication path 15a is provided downstream of the fan 12 and upstream of the heater 16. Accordingly, the airflow introduced into the cavity 4 through the communication path 15a is not heated by the heater 16 and is comparatively cold.

[0045] As shown in FIGS. 7 and 8, in this embodiment, the ion generator 5 and electrostatic atomizing mechanism 17 are arranged side by side in parallel in a half of the cavity 4 on the aperture 10b side in the longitudinal direction of the body portion 1b (in the right half of FIGS. 7 and 8).

[0046] The electrostatic atomizing mechanism 17 includes a needle-shaped discharge electrode 17a and a substantially ring-shaped ground electrode 17b placed on the tip side of the discharge electrode 17a. In the electrostatic atomizing mechanism 17, high voltage is applied across the discharge electrode 17a and ground electrode 17b to cause a discharge (corona discharge). The electrostatic atomizing mechanism 17 includes a Peltier device 17c as a cooling mechanism and a cold plate 17d composed of a thermally conducting member (for example, a metallic member or the like). The electrostatic atomizing mechanism 17 is configured to condense moisture in the air on the surface of the cold plate 17d cooled by the Peltier device 17c and thus produces condensation water. In such a configuration, the condensation water is atomized by the discharge operation to form very fine nanometer mist (a negatively charged mist containing negative ions) . The mist is emitted to the outside of the casing 14 through the aperture 14b formed outside of the tip of the discharge electrode 17a. The Peltier device 17c and cold plate 17d correspond to a water supplier in this embodiment. The electrostatic atomizing mechanism 17 further includes a second ion generator having the discharge and ground electrodes 17a and

17b.

[0047] The ion generator 5 has the same configuration as that of the ion generator 5 according to the first embodiment. The ions generated at the ion generator 5 (negative ions in this embodiment) are emitted to the outside of the casing 14 through the aperture 14a formed outside of the tip of the discharge electrode 5a.

[0048] As described above, by providing the communication path 15a in the inner cylinder 15, airflow can be produced in the cavity 4. This airflow accelerates discharge of the mist (containing ions) generated at the electrostatic atomizing mechanism 17 through the aperture 14b and the discharge of the ions generated by the ion generator 5 through the aperture 14a.

[0049] As shown in FIG. 8, the metal member 6 is provided facing a portion of the cavity 4 as the ion channel which the ions pass through also in this embodiment. The metal member 6 has a substantially ring shape and is inserted from the inside of the casing 14 to be fixed to the aperture 14a. The ions are therefore emitted to the outside through the through-hole 6a of the metal member 6. At this time, some of the ions hit the metal member 6 to release fine particles of metal from the metal member 6.

[0050] In this embodiment, furthermore, a metal member 6B similar to the aforementioned metal member 6 is positioned so as to be hit by the ion-contained mist generated at the electrostatic atomizing mechanism 17. Similar to the above described metal member 6, the metal member 6B has a substantially ring shape and is inserted from the inside of the casing 14 to the aperture 14b to be fixed thereto. The ion-contained mist is therefore discharged to the outside through the through-hole 6a of the metal member 6B. At this time, some of the ions hit the metal member 6B to also release fine particles of metal from the metal member 6B. The metal member 6B can be made of transition metal, an alloy containing the same, or the like similar to the above described metal member 6. The metal member 6B may be made of a material which is different from the metal member 6 and capable of most efficiently releasing fine particles thereof when being hit by the ion-contained mist. The metal member 6B may be made of a same material and have a same shape as those of the metal member 6. This contributes to reduction in cost.

[0051] The above embodiment can obviously provide the same effects as those of the first and second embodiments. In addition, since the cavity 10 as the air channel is separately formed from the cavity 4 as the ion channel, it is possible to individually adjust the air blow in the air channel and the release of the fine particles of metal from the ion channel.

[0052] In this embodiment, the heater 16 as the heating mechanism which heats the airflow is provided in the cavity 10 as the air channel. The airflow generated on the upstream of the heater 16 by the motor 11 and fan 12 as the blower mechanism is separated into a portion of the cavity 4 serving as the ion channel and a portion of the cavity 10 where the heater 16 is provided. It is therefore possible to prevent the ion generator 5, electrostatic atomizing mechanism 17, metal members 6 and 6B, and the like from being excessively heated by the heat from the heater 16.

[0053] Moreover, this embodiment is provided with the electrostatic atomizing mechanism 17, and the metal member 6B is positioned so as to be hit by the ions generated at the ion generator (a second ion generator) including the discharge and ground electrodes 17a and 17b of the electrostatic atomizing mechanism 17. According to the third embodiment, the fine particles can be released from the metal member 6B together with the mist atomized by the electrostatic anatomizing mechanism 17 using the ions contained in the mist. It is therefore possible to obtain both the moisturizing effect on the user H's hair and skin of the mist and the antibacterial and antioxidant effects of the metallic fine particles.

[0054] In this embodiment, the ion generator 5 is provided separately from the electrostatic atomizing mechanism 17. It is therefore possible to individually adjust the release of mist by the electrostatic atomizing mechanism 17 and release of the fine particles of metal by the ions generated by the ion generator 5. Accordingly, for example, the hair drier 1B may be provided with setting units adjusting the release of mist and the release of fine particles of metal (for example, controls and the like not shown). The user H can therefore control the setting units to increase only the mist, increase only the released fine particles of metal, increase the both, or stop the both in his/her preference.

[0055] In this embodiment, the metal member 6B configured to release the fine particles of metal upon being hit by the ions is positioned so as to be hit by the ions generated at the electrostatic atomizing mechanism 17. The hair drier 1B is provided with the metal member 6B corresponding to the electrostatic atomizing mechanism 17 in addition to the metal member 6 corresponding to the ion generator 5. It is therefore possible to release fine particles of metal also using the mist generated at the electrostatic atomizing mechanism 17, thus increasing the amount of released particles of metal.

(Fourth Embodiment)

[0056] FIG. 9 is a cross-sectional view of a hair drier as the hair care device according to a fourth embodiment.

[0057] A hair drier 1C according to the fourth embodiment basically includes the same constituent components as those of the hair drier 1B according to the third embodiment and is configured so that the ions generated at the ion generator 5 hit a metal member 6C to release fine particles of metal.

[0058] In this embodiment, the fine particles of metal generated at the metal member 6C are emitted through the aperture 10b. The metal member 6C is made of a plate member with a flat surface or a corrugated surface and is located downstream of (on the aperture 10b side

of) the ion generator 5.

[0059] In this embodiment, the metal member 6 is cooled by a Peltier device 18a as a cooling section cooling the metal member 6 so that moisture in air is condensed on the surface of the metal member 6 to produce condensation water. The condensation water is supplied for humidification. In this embodiment, in other words, a humidifying mechanism 18 including the Peltier device 18a and metal member 6C is provided.

[0060] The aforementioned fourth embodiment can obviously provide the same effects as those of the third embodiment. In this embodiment, moreover, the humidifying mechanism 18 additionally provided can moisturize hair and skin. Since the humidifying mechanism 18 is composed of the metal member 6C configured to release fine particles of metal, it is possible to promote use of common parts in the hair drier 1C, thus contributing to reduction in size, weight, and manufacturing cost and the like.

(Fifth Embodiment)

[0061] FIG. 10 is a cross-sectional view of a hair drier as the hair care device according to a fifth embodiment.

[0062] A hair drier 1D according to the fifth embodiment basically includes the same constituent components as those of the hair drier 1B according to the third embodiment. The hair drier 1D is configured so that the ions generated at the ion generator 5 hit a metal member 6D to release fine particles of metal.

[0063] In this embodiment, the metal member 6D is heated using heat from the heater 16 as a mechanism of heating airflow. Specifically, the metal member 6D is embedded in a recess formed in the outer surface of the inner cylinder 15 so as to be located close to the heater 16. At this time, the heated degree of the metal member 6D can be adjusted by controlling the thickness of a portion of the inner cylinder 15 where the metal member 6D is located. Moreover, the metal member 6D may be partially exposed in the inner circumferential surface of the inner cylinder 15. Furthermore, a heat transmission member having thermal conductance may be provided between the metal member 6D and heater 16.

[0064] The aforementioned fifth embodiment can obviously provide the same effects as those of the third embodiment. In this embodiment, moreover, the metal member 6D uses heat from the heater 16 as the heating mechanism to be heated, thus improving the characteristic of releasing fine particles from the metal member 6D.

(Sixth Embodiment)

[0065] FIG. 11 is a cross-sectional view of a hair drier as a hair care device according to a sixth embodiment.

[0066] A hair drier 1E according to the sixth embodiment basically includes the same constituent components as those of the hair drier 1B according to the above-described third embodiment. The hair drier 1E is configured so that the ions generated at the ion generator 5 hit the metal member 6E to release fine particles of metal.

[0067] In this embodiment, the ion generator 5 is provided within the cavity 10 as the air channel, and a metal member 6E is provided as a plate member having mesh shape or including a number of pores.

[0068] As described above, the ion generator 5 and metal member 6E can be provided within the cavity 10 as the air channel. Such a configuration is effective for the case where the ion channel is difficult to form separately because of miniaturization of the hair care device and the like. According to the sixth embodiment, it is obviously possible to obtain the same effects as those of the third embodiment. Moreover, since the metal member 6E is formed as a plate member having a mesh shape or including a number of pores, the metal member 6E has a larger surface area, and the efficiency of releasing the metallic particles is accordingly more likely to increase. Moreover, the metal member 6E can be also used as a filter provided at the outlet of the air channel, thus contributing to the reduction in weight and manufacturing cost compared to the case where the metal member 6E is separately provided.

(Seventh Embodiment)

[0069] FIGS. 12 and 13 show a seventh embodiment of the present invention. FIG. 12 is a cross-sectional view of a hair drier as a hair care device according to the seventh embodiment, and FIG. 13 is an enlarged view of a part of FIG. 12.

[0070] A hair drier IF according to the seventh embodiment basically includes the same constituent components as those of the hair drier 1B according to the above-described third embodiment. The hair drier 1F is configured so that the ions generated at the ion generator 5 hit the metal member 6 to release fine particles of metal.

[0071] In this embodiment, as shown in FIGS. 12 and 13, a detachable cylindrical nozzle 19 forming a part of the casing is attached to the air outlet of the body section 1d, and the ion generator 5 and metal member 6 are provided within the nozzle 19.

[0072] To be specific, a support block 20 is fixed to the inside of the cylinder of the nozzle 19 with a not-shown rib or the like interposed therebetween. The ion generator 5 including the discharge and ground electrodes 5a and 5b is provided for the support block 20, and the ring-shaped metal member 6 is located outside of the tip of the discharge electrode 5.

[0073] In order to supply source power to the ion generator 5, a connector 21 is provided for the support block 20 and body portion 1d (the inner cylinder 15 in this embodiment) . In this embodiment, the connector 21 includes terminals 21b and 21b protruded from a support base 21a fixed to a filter plate 22 and recesses 21c and 21c formed in the support block 20. When the nozzle 19 is attached to the body portion 1d, the terminals 21b and 21b are individually inserted into the respective recesses

21c and 21c to supply source power from the circuit section 7 to the ion generator 5 through the connector 21.

[0074] The aforementioned seventh embodiment can obviously provide the same effects as those of the third embodiment. In this embodiment, moreover, the ion generator 5 and metal member 6 are provided for the nozzle 19 detachably attached to the body portion 1d. Accordingly, the ion generator 5 and metal member 6 can be comparatively easily attached or detached with the attached or detached nozzle 19. The user can easily toggle the states of releasing and not releasing the fine particles of metal by attaching or detaching the nozzle 19. Moreover, since the metal member 6 is provided for the nozzle 19, the maintenance of the metal member 6 can be performed more easily.

(Eighth Embodiment)

[0075] FIGS. 14 and 15 show an eighth embodiment of the present invention. FIG. 14 is a side view of a hair iron as the hair care device according to the eighth embodiment, and FIG. 15 is a cross-sectional view taken along a line XV-XV.

[0076] As shown in FIG. 14, a hair iron 1G as the hair care device according to the eighth embodiment includes two arm units le and lf capable of being unfolded into substantially a V-shape with a rotating joint 23 interposed between the arm units le and 1f. The hair iron 1G sandwiches hair in a sandwiching section 24 at top halves of the arm units 1e and 1f and heats the same by means of a heating section 25.

[0077] As shown in FIG. 15, a casing 26 as the case is composed of a plurality of separate units 26a and 26b joined to each other. The casing 26 includes a cavity formed inside, and the cavity accommodates various types of electric parts.

[0078] The separate units 26b of the casing 26 of the arm unit le are expanded in adjacent to a half of the sandwiching section 24 on the rotating joint 23 side. In these expanded portions, apertures 26c opened toward both sides of the sandwiching section 24 are formed, and cavities 4 terminated with the apertures 26c are formed. Each of the cavities 4 accommodates the ion generator 5 and corresponds to the ion channel in this embodiment. As shown in FIG. 15, the structure including the ion generator 5 and metal member 6 is provided on each side of the heating section 25 in this embodiment.

[0079] The substantially plate-shaped metal member 6 is positioned adjacent to the inside of the aperture 26c so that the metal member 6 can be hit by the ions generated at the ion generator 5. Accordingly, the ions hit the metal member 6 to release the fine particles of metal from the metal member 6.

[0080] According to the aforementioned eighth embodiment, the fine particles of metal contained in the metal member 6 can act on part of the hair sandwiched in the sandwiching section 24 protruding out of the sandwiching section 24 (the right and left sides of FIG. 15), thus providing the antibacterial and antioxidant effects. The eighth embodiment can also provide the same effects as those of each embodiment described above because the metal member 6 is provided separately from the ion generator 5.

[0081] Hereinabove, the preferred embodiments of the present invention are described. However, the present invention is not limited to the above embodiments and can be variously changed. For example, the metal members are not limited by the structure (shape), size, position, and the like disclosed in the above embodiments.

[0082] The structures of the hair care devices can be appropriately changed. The electrostatic atomizing mechanism, blower mechanism, heating mechanism, humidifying mechanism, cooling unit, and the like can be applied to each of the aforementioned hair care devices and can be appropriately combined to be applied thereto. The water supplier supplying water for the electrostatic atomizing mechanism and humidifying mechanism can be composed of a water tank, a tube, a water-contained member, and the like.

[0083] In the example disclosed by the third embodiment, the metal members are provided corresponding to both the electrostatic atomizing mechanism and the ion generator provided separately from the same, and the fine particles of metal are released from the both metal members. However, it is possible to provide the metal member corresponding to only the ion generator provided separately from the electrostatic atomizing mechanism and cause fine particles of metal to be released from only the metal member corresponding to the ion generator.

INDUSTRIAL APPLICABILITY

[0084] The present invention can be used for a hair care device.

Claims

1. A hair care device which includes an ion generator generating ions by a discharge operation between a discharge electrode and a ground electrode and releases the generated ions, the hair care device comprising:

   a metal member which is formed separately from the discharge and ground electrodes and is hit by the ions generated by the ion generator to release fine metal particles.

2. The hair care device according to claim 1, wherein the metal member is detachably provided.

3. The hair care device according to claim 1, wherein

   an ion channel allowing the ions generated by

the ion generator to pass therethrough is formed within a case, the device further comprising:
a blower mechanism configured to produce an airflow in the ion channel.

4. The hair care device according to claim 3, wherein an air channel allowing the airflow produced by the blower mechanism to pass therethrough and blow out is formed within the case separately from the ion channel.

5. The hair care device according to claim 4, wherein the air channel is provided with a heating mechanism heating the airflow, and
the airflow produced by the blower mechanism is separated on the upstream of the heating mechanism into the ion channel and a portion of the air channel where the heating mechanism is provided.

6. The hair care device according to claim 4, wherein the air channel is provided with a heating mechanism heating the airflow, and
the metal member is heated by heat generated by the heating mechanism.

7. The hair care device according to claim 1, further comprising:

an electrostatic atomizing mechanism which includes the ion generator and a water supplier supplying water to the ion generator, and generates atomized mist, wherein
the metal member is positioned so as to be hit by the ions generated by the ion generator included in the electrostatic atomizing mechanism.

8. The hair care device according to claim 1, further comprising an electrostatic atomizing mechanism configured to generate atomized mist, the electrostatic atomizing mechanism including a second ion generator which is separately formed from the ion generator and is configured to generate ions by a discharge operation and a water supplier configured to supply water to the second ion generator.

9. The hair care device according to claim 8, further comprising a second metal member positioned so as to be hit by the ions generated by the second ion generator, the second metal member being hit by the ions to release fine metal particles.

10. The hair care device according to claim 3, further comprising:

a humidifying mechanism configured to humidify the airflow generated by the blower mechanism.

11. The hair care device according to claim 10, wherein the humidifying mechanism includes a cooling unit cooling the metal member and condenses moisture in air on a surface of the metal member cooled by the cooling unit to generate condensation water and supplies the condensation water for humidification.

Amended claims under Art. 19.1 PCT

1. amended) A hair care device which includes an ion generator generating ions by a discharge operation between a discharge electrode and a ground electrode and releases the generated ions, the hair care device comprising:

a metal member which is provided separately from the discharge and ground electrodes and faces a place serving as a flow channel of the ions outside of the ion generator, wherein
the ions generated by the ion generator are hit on the metal member to atomize metal contained in the metal member and release the same.

2. The hair care device according to claim 1, wherein the metal member is detachably provided.

3. The hair care device according to claim 1, wherein

an ion channel allowing the ions generated by the ion generator to pass therethrough is formed within a case, the device further comprising:
a blower mechanism configured to produce an airflow in the ion channel.

4. The hair care device according to claim 3, wherein an air channel allowing the airflow produced by the blower mechanism-to pass therethrough and blow out is formed within the case separately from the ion channel.

5. The hair care device according to claim 4, wherein the air channel is provided with a heating mechanism heating the airflow, and
the airflow produced by the blower mechanism is separated on the upstream of the heating mechanism into the ion channel and a portion of the air channel where the heating mechanism is provided.

6. The hair care device according to claim 4, wherein the air channel is provided with a heating mechanism heating the airflow, and
the metal member is heated by heat generated by the heating mechanism.

7. The hair care device according to claim 1, further comprising:

an electrostatic atomizing mechanism which includes the ion generator and a water supplier supplying water to the ion generator, and generates atomized mist, wherein
the metal member is positioned so as to be hit by the ions generated by the ion generator included in the electrostatic atomizing mechanism.

8. The hair care device according to claim 1, further comprising an electrostatic atomizing mechanism configured to generate atomized mist, the electrostatic atomizing mechanism including a second ion generator which is separately formed from the ion generator and is configured to generate ions by a discharge operation and a water supplier configured to supply water to the second ion generator.

9. The hair care device according to claim 8, further comprising a second metal member positioned so as to be hit by the ions generated by the second ion generator, the second metal member being hit by the ions to release fine metal particles.

10. The hair care device according to claim 3, further comprising:

a humidifying mechanism configured to humidify the airflow generated by the blower mechanism.

11. The hair care device according to claim 10, wherein
the humidifying mechanism includes a cooling unit cooling the metal member and condenses moisture in air on a surface of the metal member cooled by the cooling unit to generate condensation water and supplies the condensation water for humidification.

FIG. 1

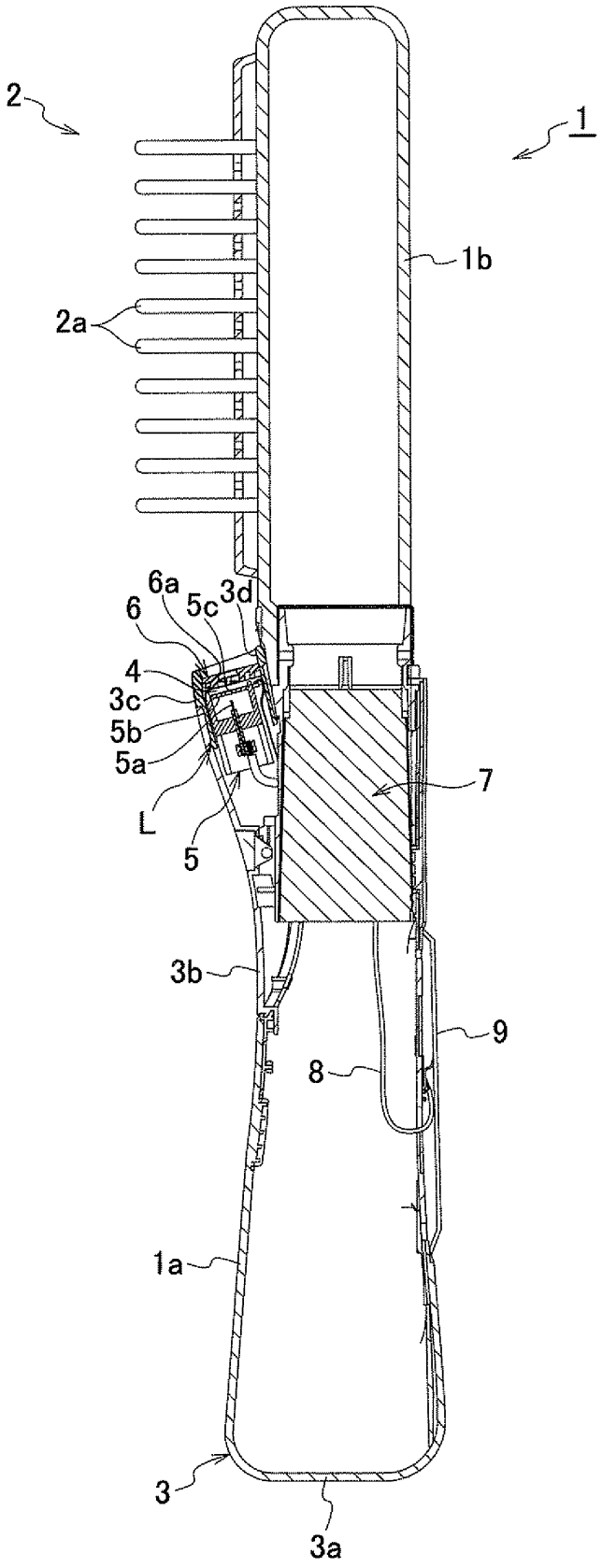


FIG. 2

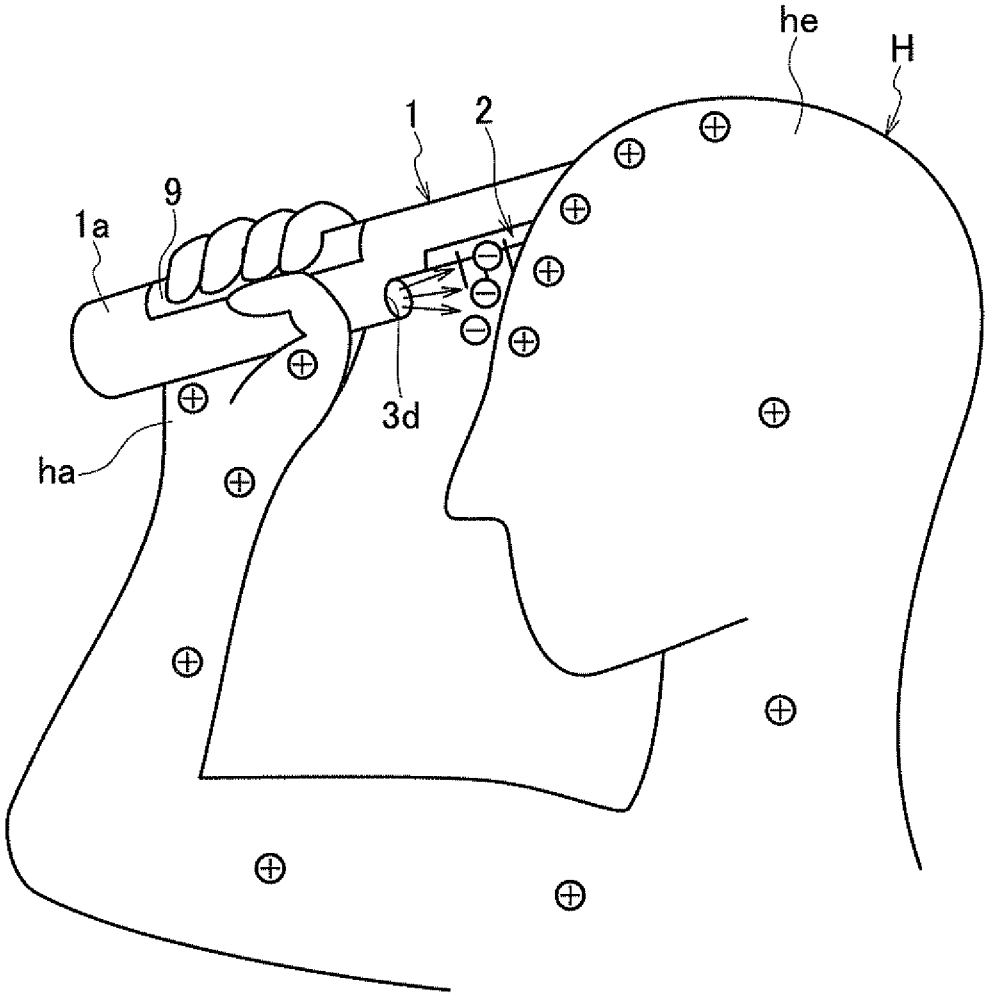


FIG. 3

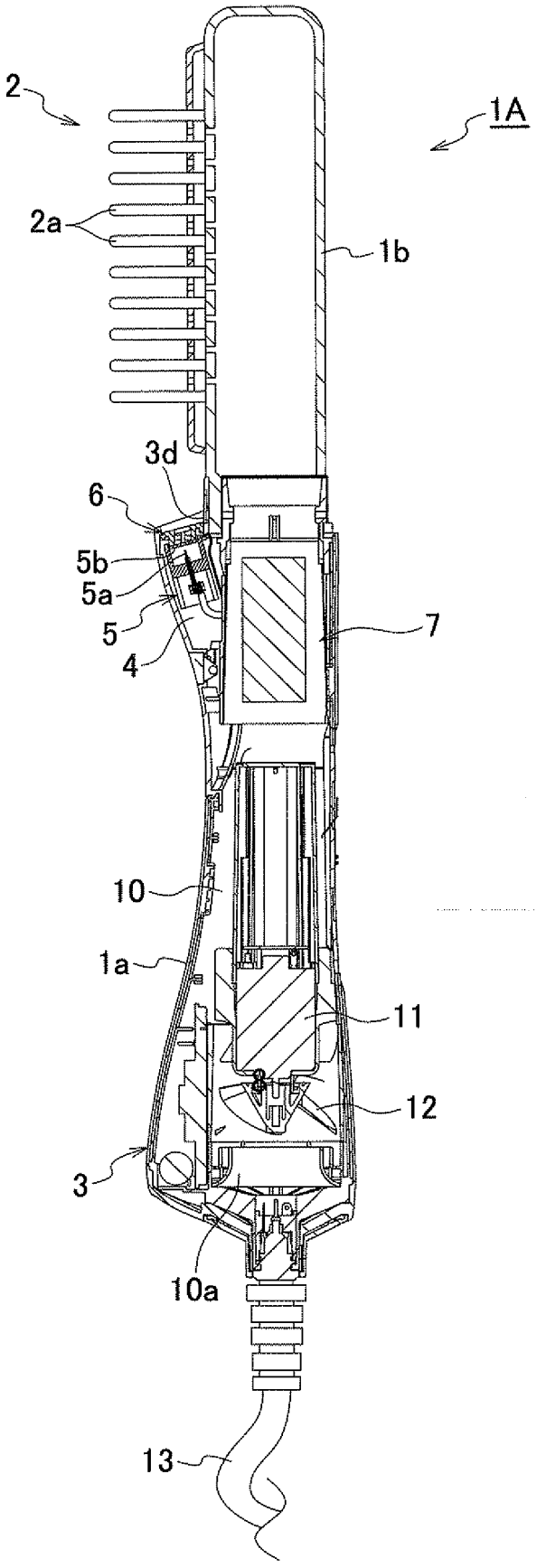


FIG. 4

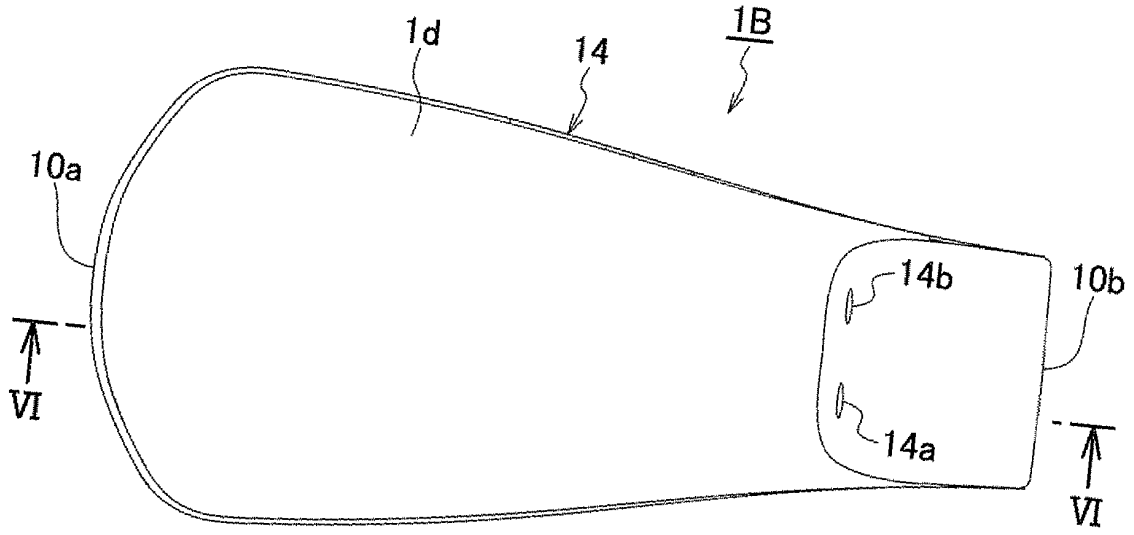


FIG. 5

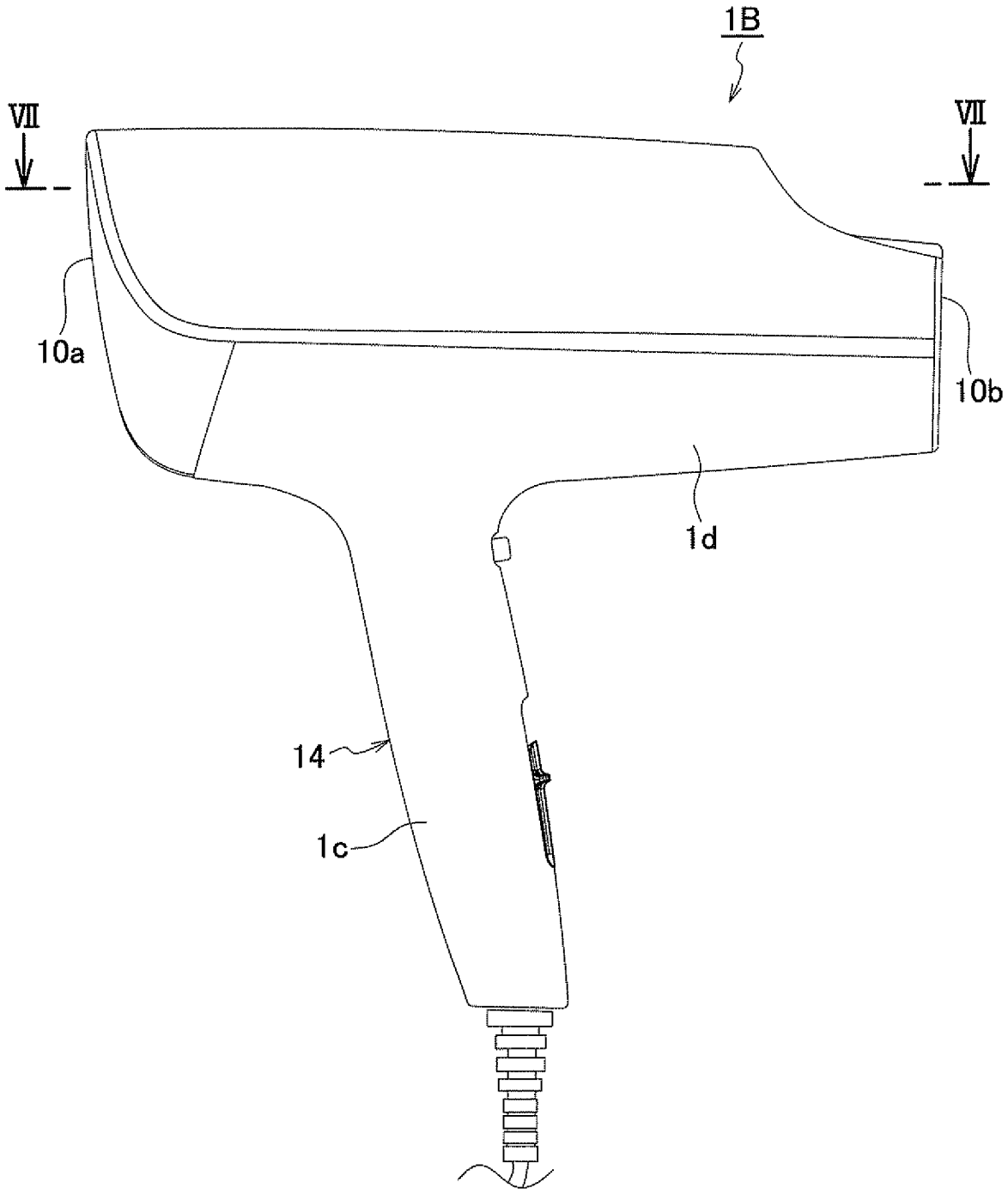


FIG. 6

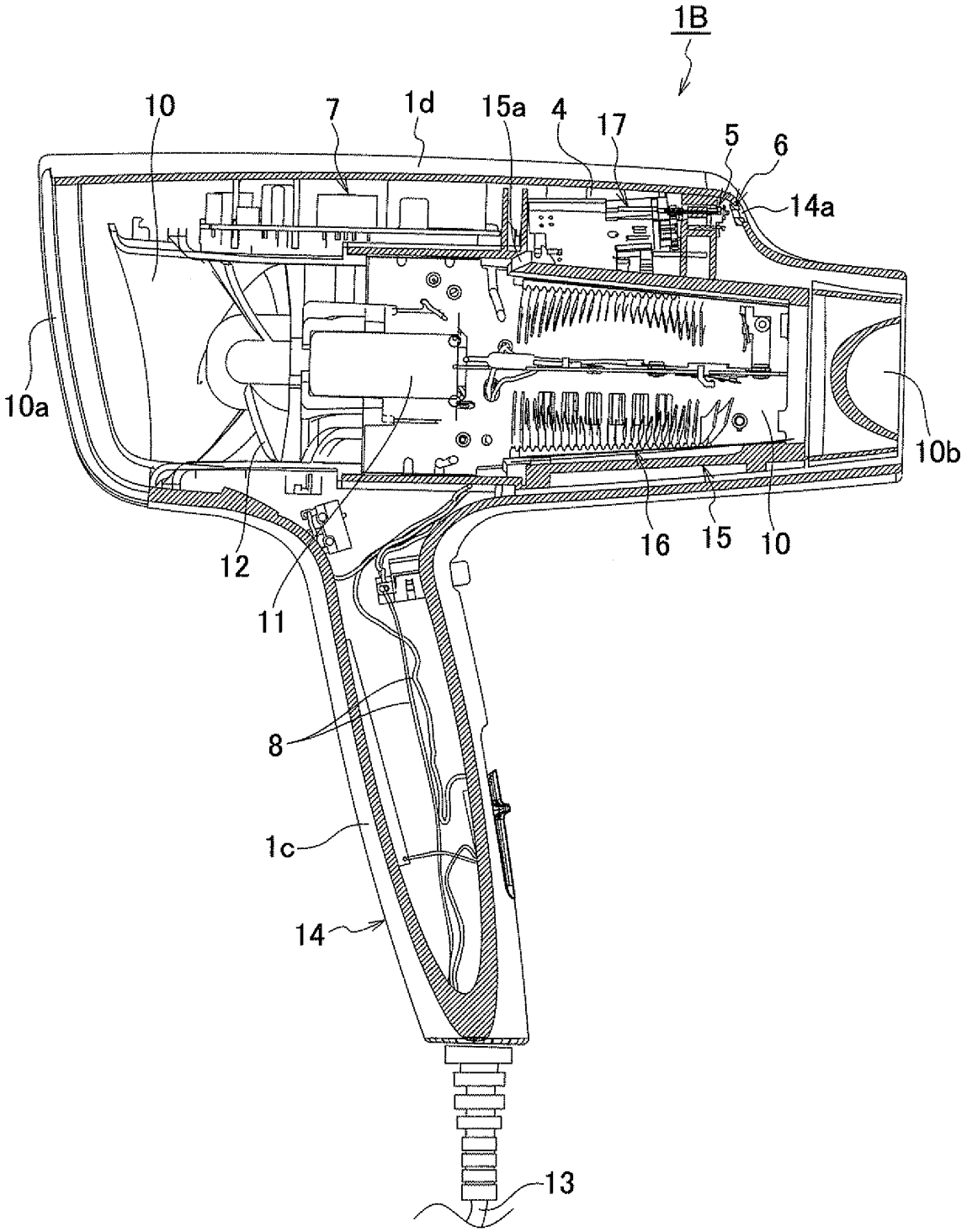


FIG. 7

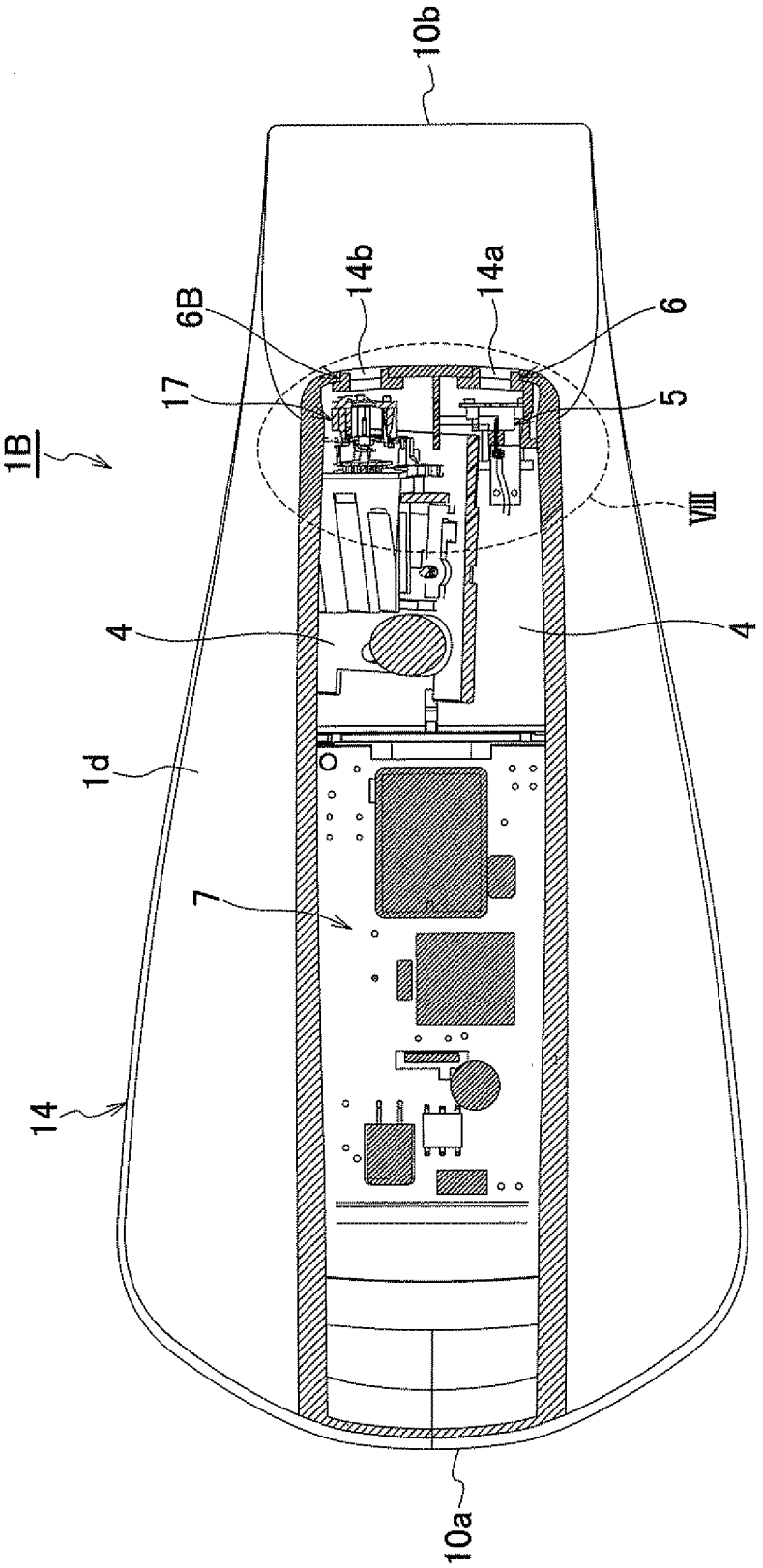


FIG. 8

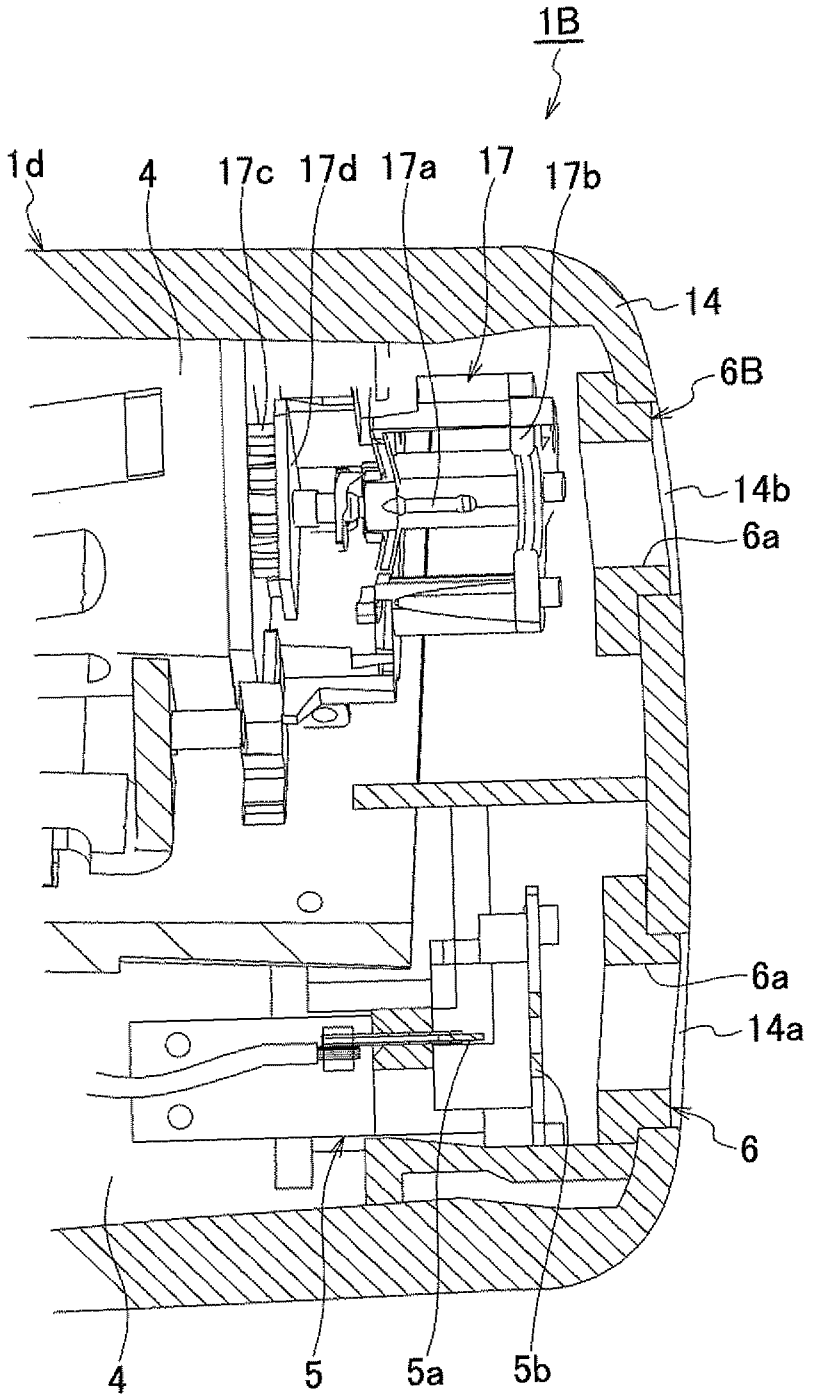


FIG. 9

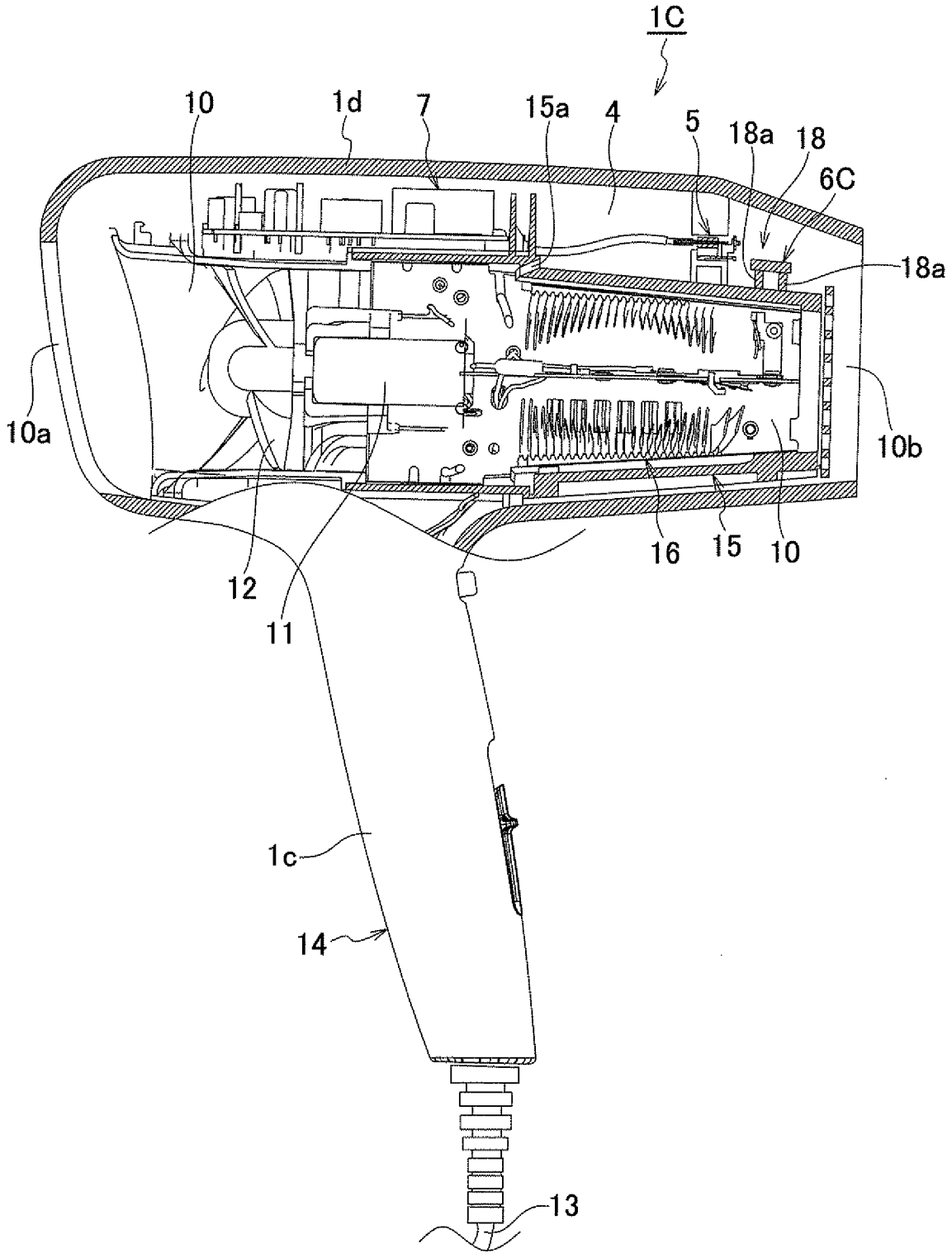


FIG. 10

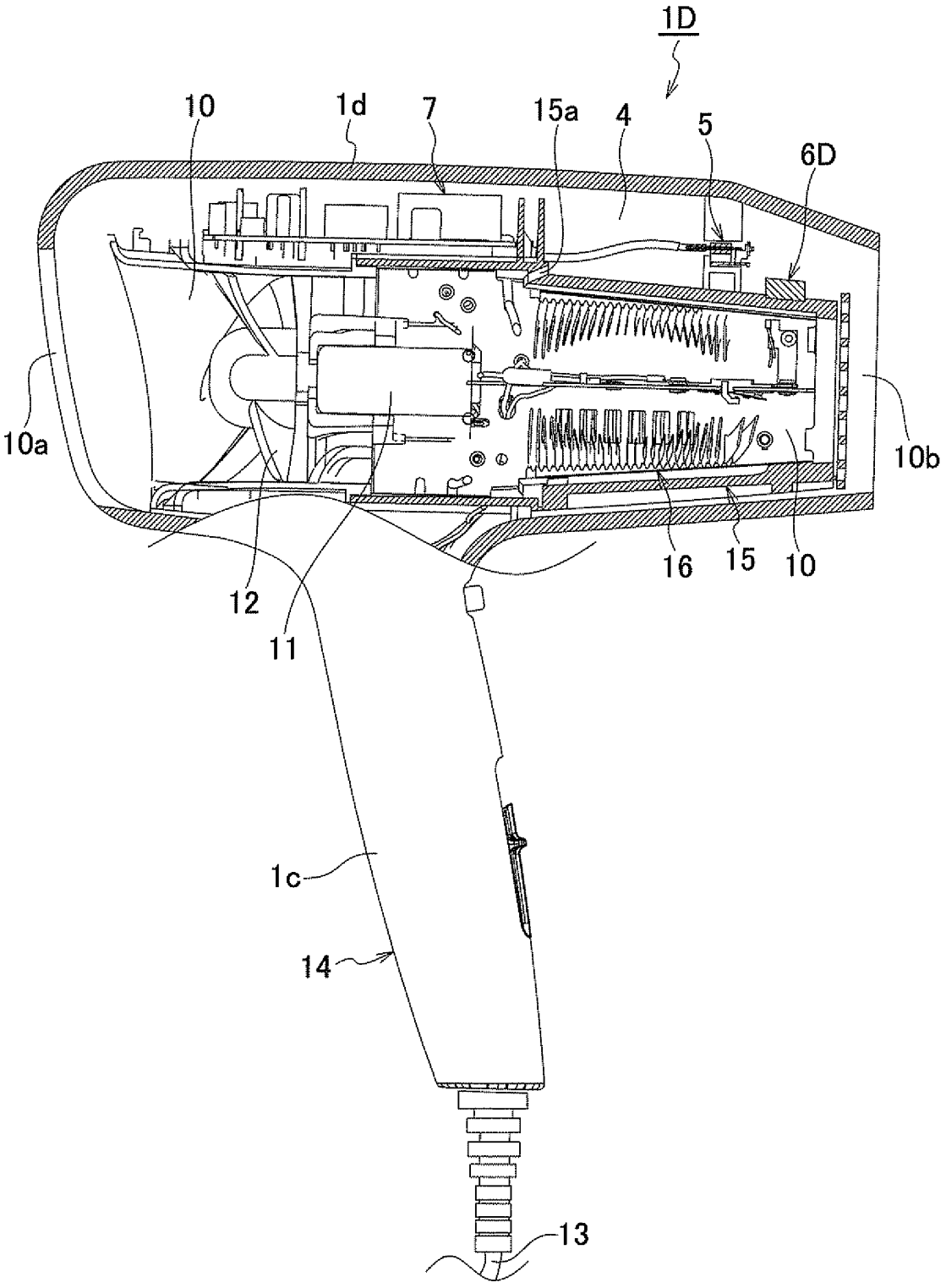


FIG. 11

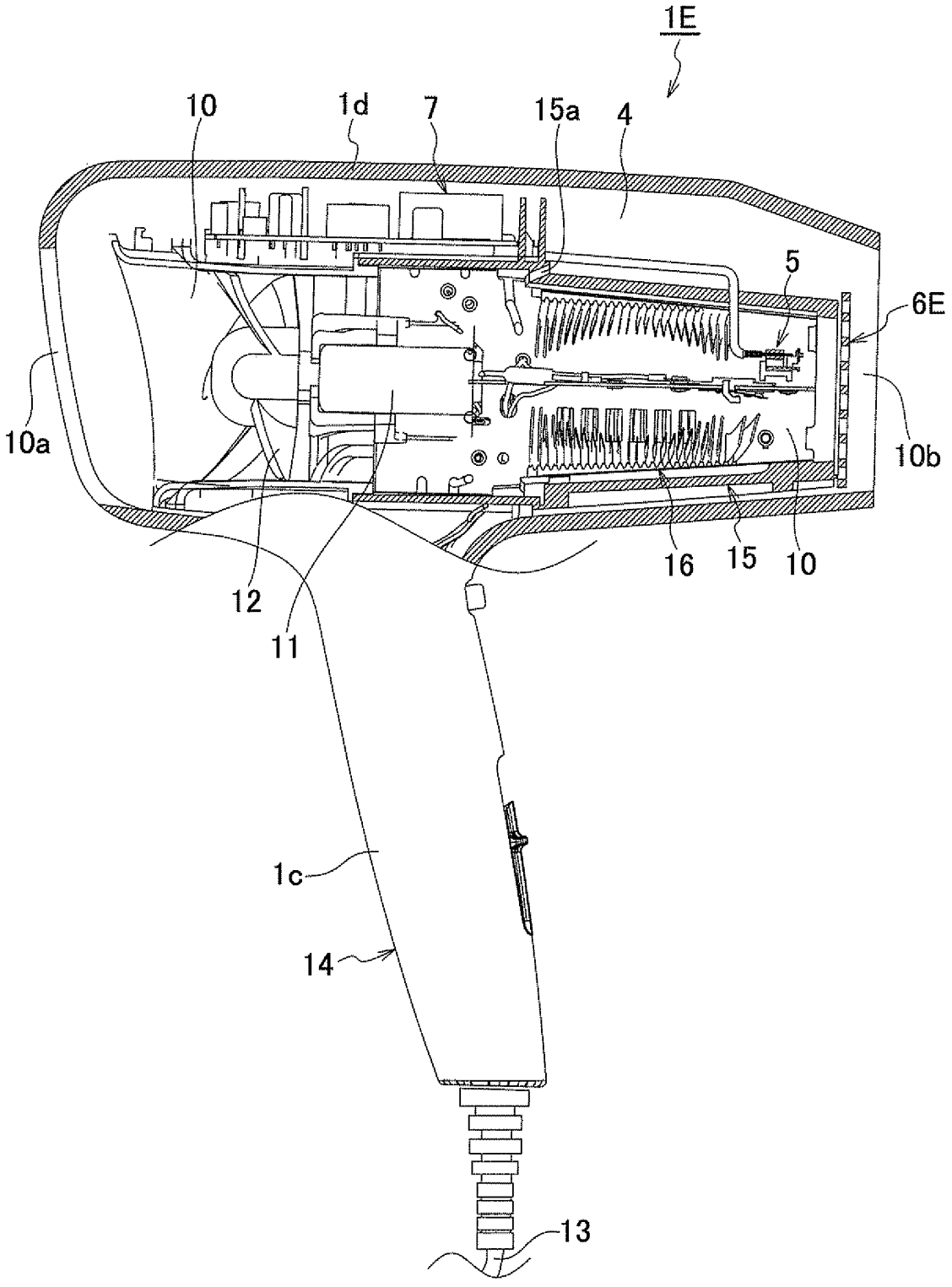


FIG. 12

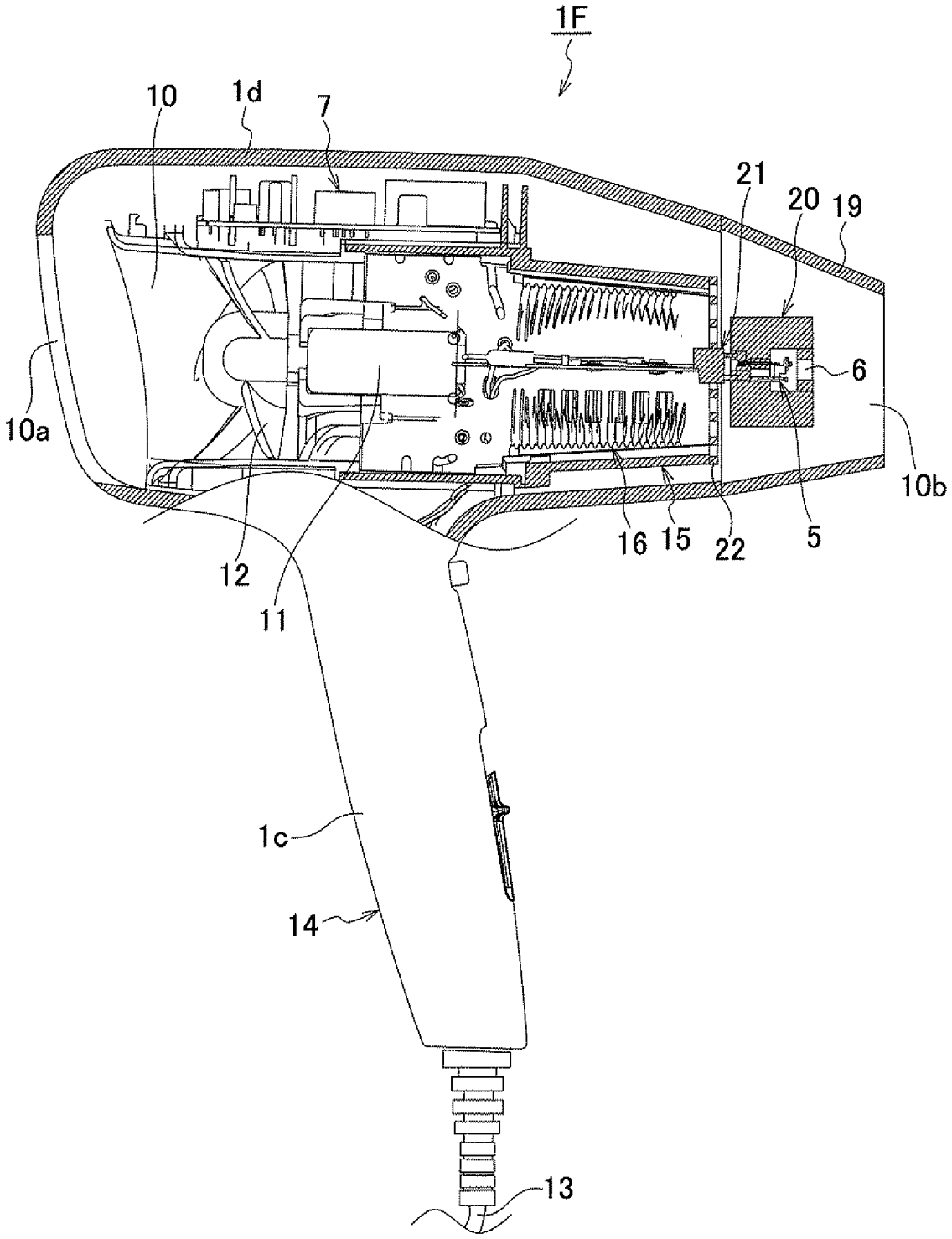


FIG. 13

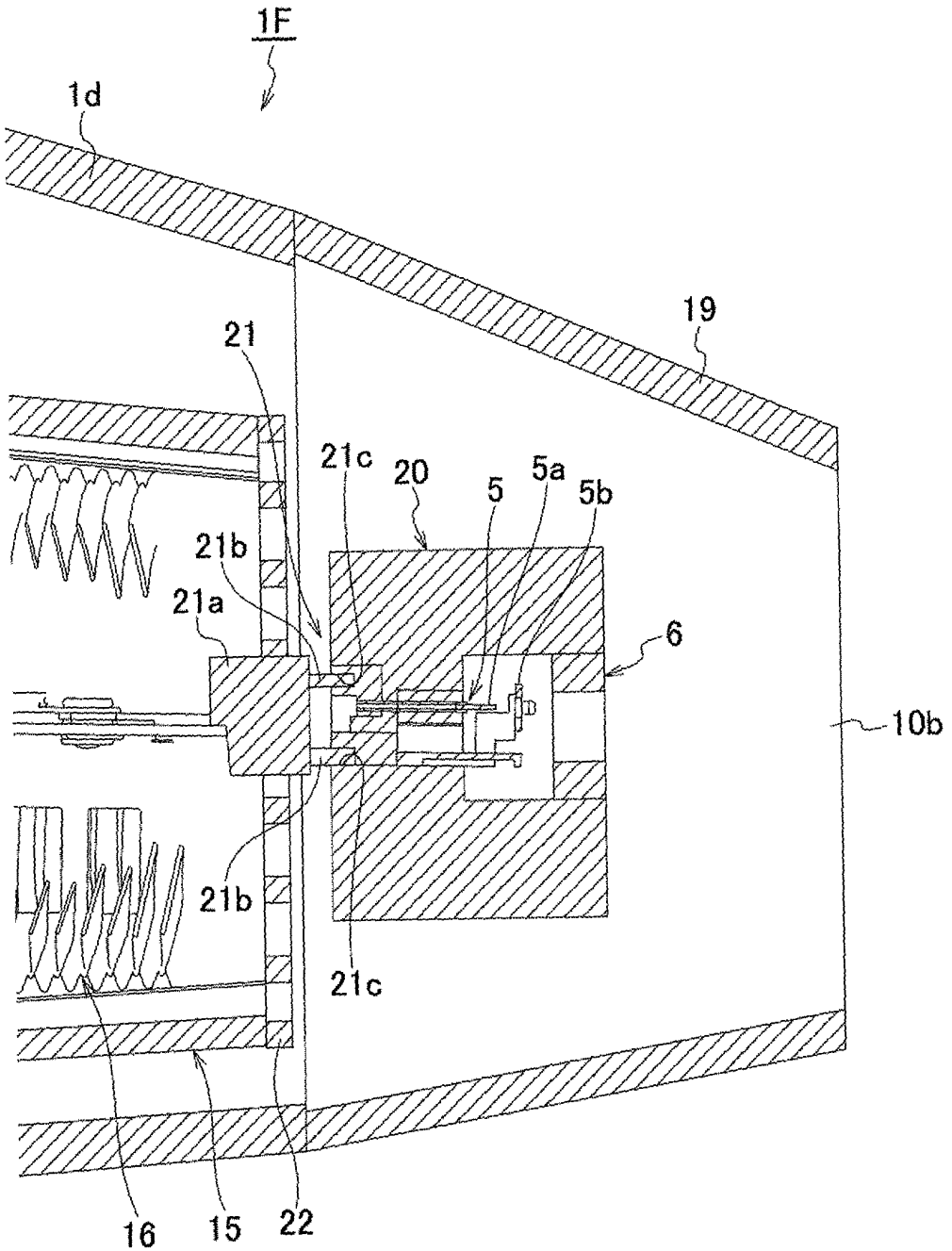


FIG. 14

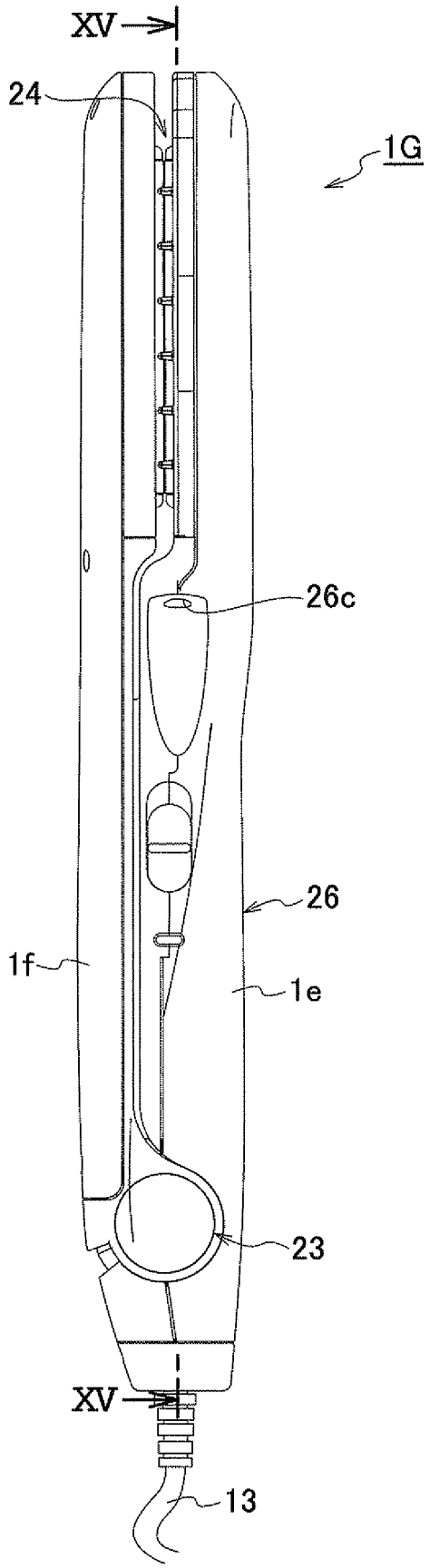
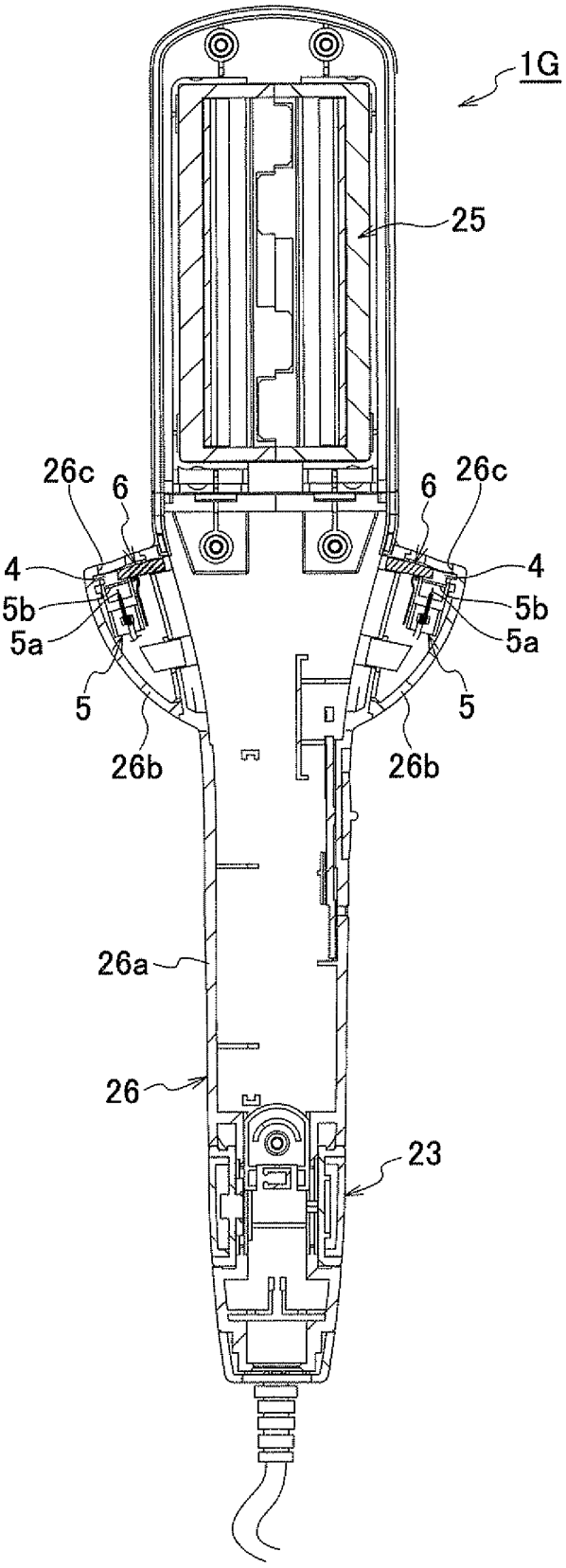


FIG. 15



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/063030

A. CLASSIFICATION OF SUBJECT MATTER
A45D20/12(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A45D20/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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	Relevant to claim No.
X Y A	JP 2008-23063 A (Matsushita Electric Works, Ltd.), 07 February 2008 (07.02.2008), fig. 2, 7 (Family: none)	1-4 5,7-9 6,10,11
Y A	JP 2007-190211 A (Matsushita Electric Works, Ltd.), 02 August 2007 (02.08.2007), paragraphs [0019], [0024]; fig. 3 & US 2007/0166208 A1 & EP 1810592 A1 & DE 602007000353 D & KR 10-2007-0077076 A & CN 101002641 A & CN 201029544 Y & AT 417524 T & RU 2338966 C & ES 2314949 T	5,7-9 6,10,11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 October, 2009 (08.10.09)	20 October, 2009 (20.10.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/063030

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
JP 2008-23063 A (Matsushita Electric Works, Ltd.), 7 February 2008 (07.02.2008), fig, 2 and fig, 7 describes a hair care device that is provided with an ion generation unit for generating ions by a discharge action between a discharge electrode and a ground electrode and emits the generated ions, wherein a metal member that is configured separately from the discharge electrode and the ground electrode and emits metal fine particles by being hit with the ions generated by the ion generation unit is provided. The inventions in claims 1, 2 are not considered to be novel over the invention described in the above document and have no special technical feature. (Continued to the extra sheet)

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

the

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/063030

Continuation of Box No.III of continuation of first sheet(2)

Removably providing the metal member is considered as a workshop modification which a person skilled in the art can make to the device in the above document appropriately when necessary. Thus, as a result of the assessment of special technical features regarding claims dependent on claim 1, four inventions linked by the following respective special technical features are considered to be contained in this international application.
(Invention 1) Claims 1, 2 (Invention 2) Claims 3-6, 10, 11
(Invention 3) claim 7 (Invention 4) Claims 8, 9

Form PCT/ISA/210 (extra sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2008023063 A **[0004]**