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(54) HAIR CARE APPARATUS

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USPC **34/97**

(57) **ABSTRACT**

A haircare apparatus includes a blower fan (**6**), a heater (**5**), an ion generator (**7**) that is capable of generating positive ions which are $H^+(H_2O)_m$ (m is any natural number) and negative ions which are $O_2^-(H_2O)_n$ (n is any natural number), an actuator (**21**) that is for selecting operation of a penetrating mode that promotes penetration of the positive ions and the negative ions generated by the ion generator (**7**) into hair, and a control unit (**22**) that controls the heater (**5**) such that a temperature of air blown out from an air outlet (**11**) becomes a predetermined promotion temperature at which penetration of moisture accompanying the positive ions and the negative ions generated by the ion generator (**7**) into the hair is promoted while driving the ion generator (**7**) and the blower device (**6**).

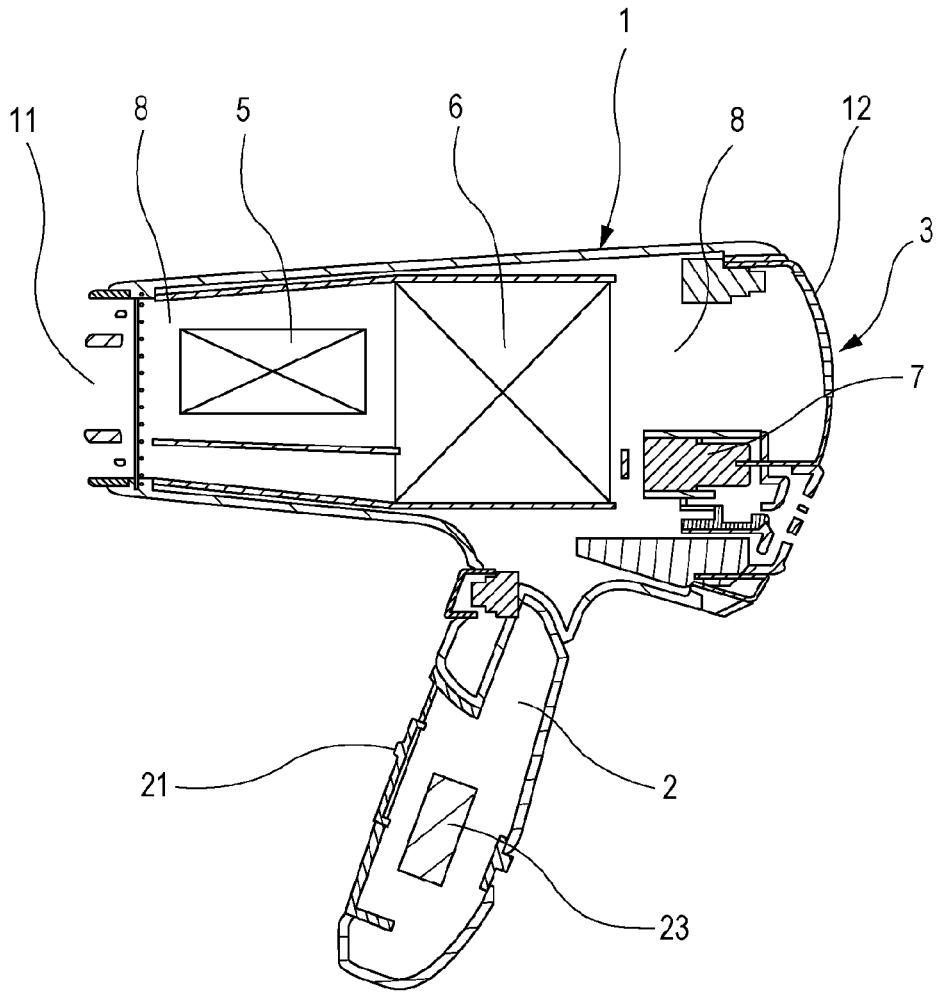


FIG. 1

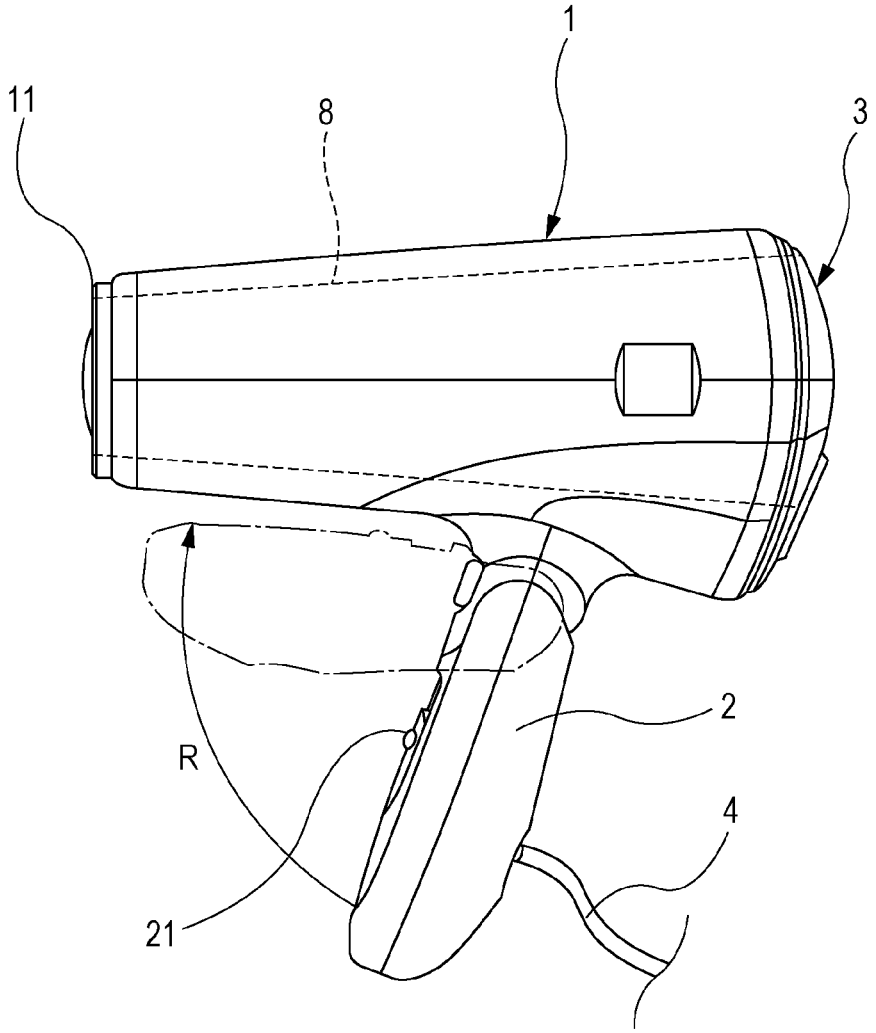


FIG. 2

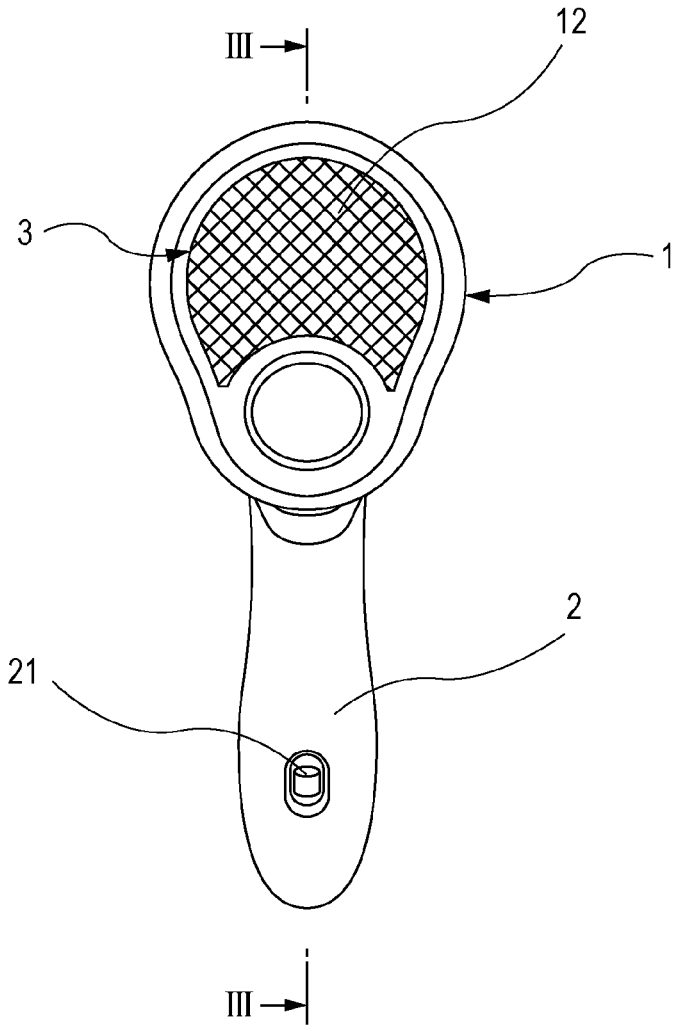


FIG. 3

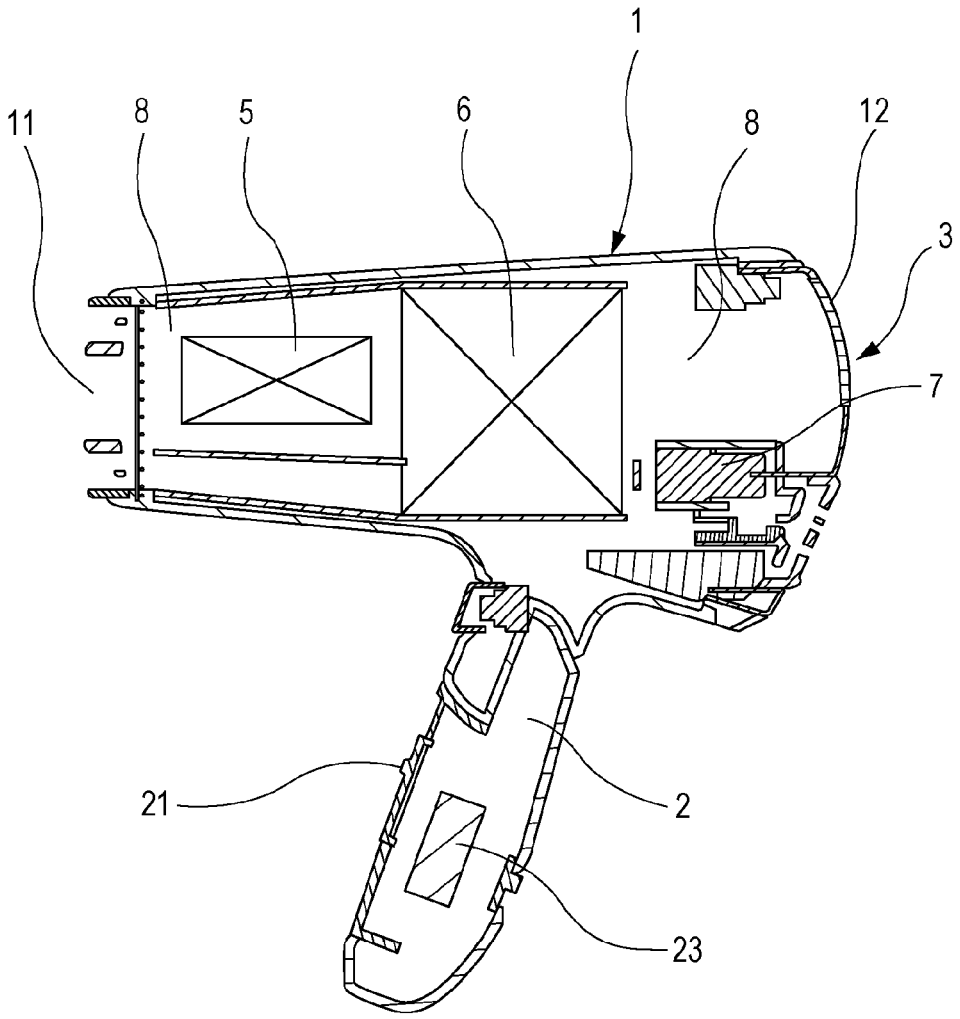


FIG. 4

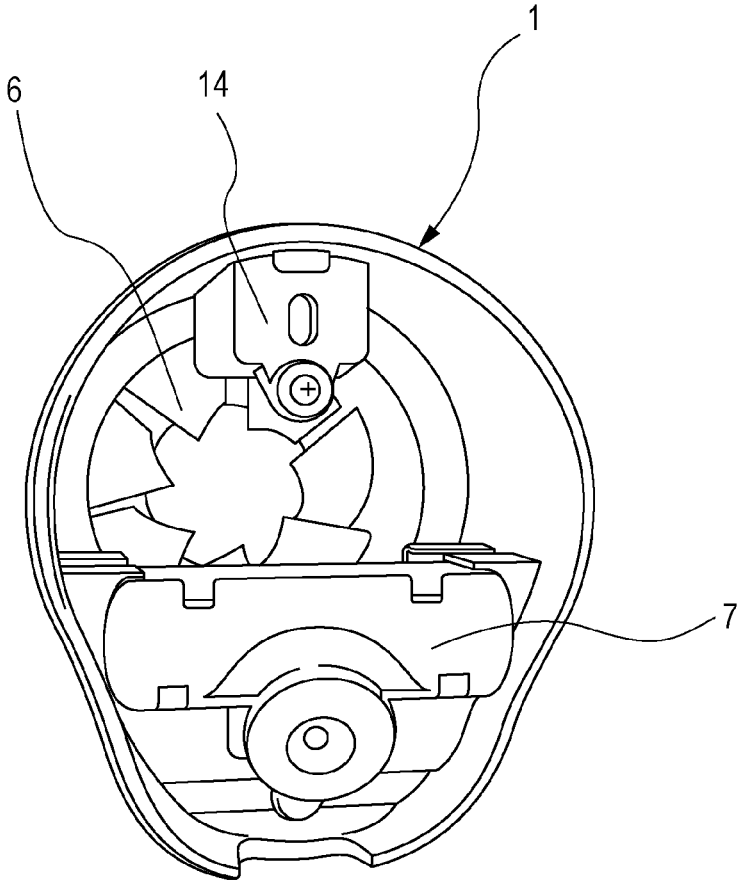


FIG. 5

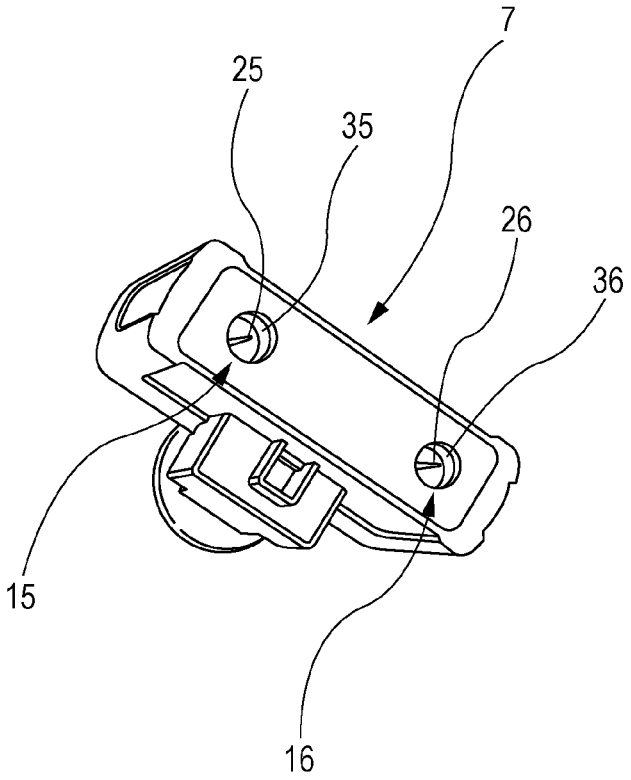


FIG. 6

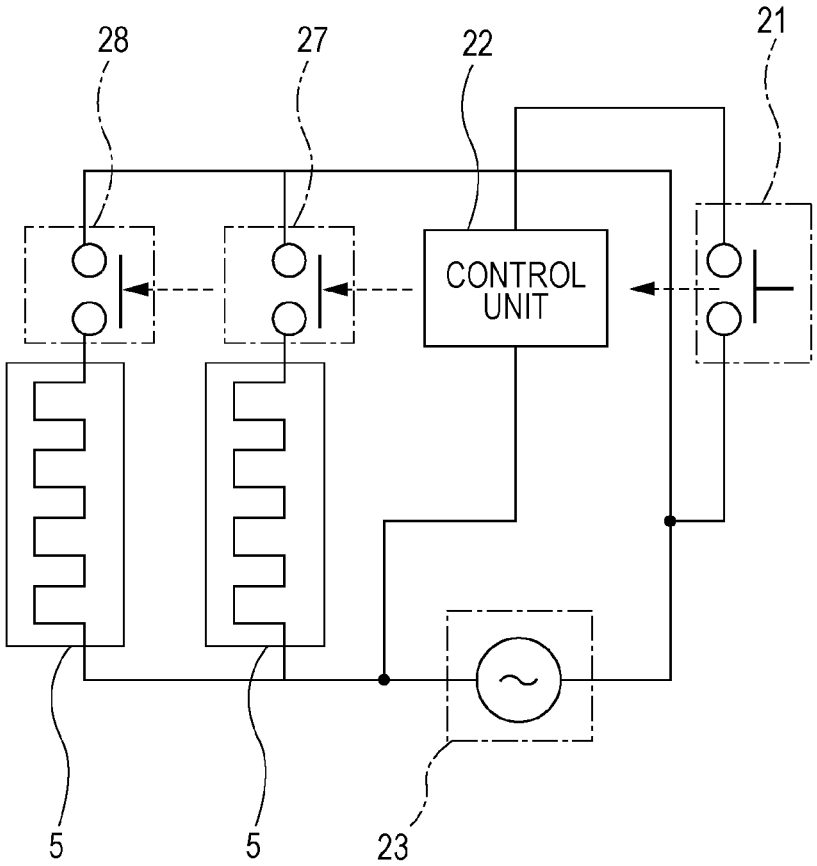


FIG. 7

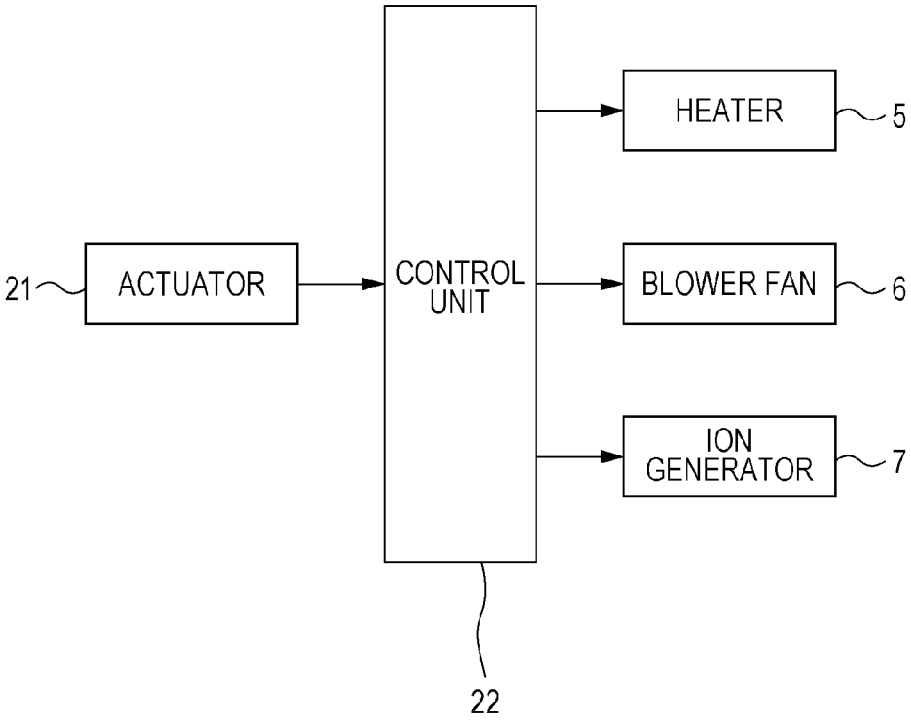

HEATER
5
21
ACTUATOR
CONTROL UNIT
BLOWER FAN
6
ION GENERATOR
7
22

FIG. 8

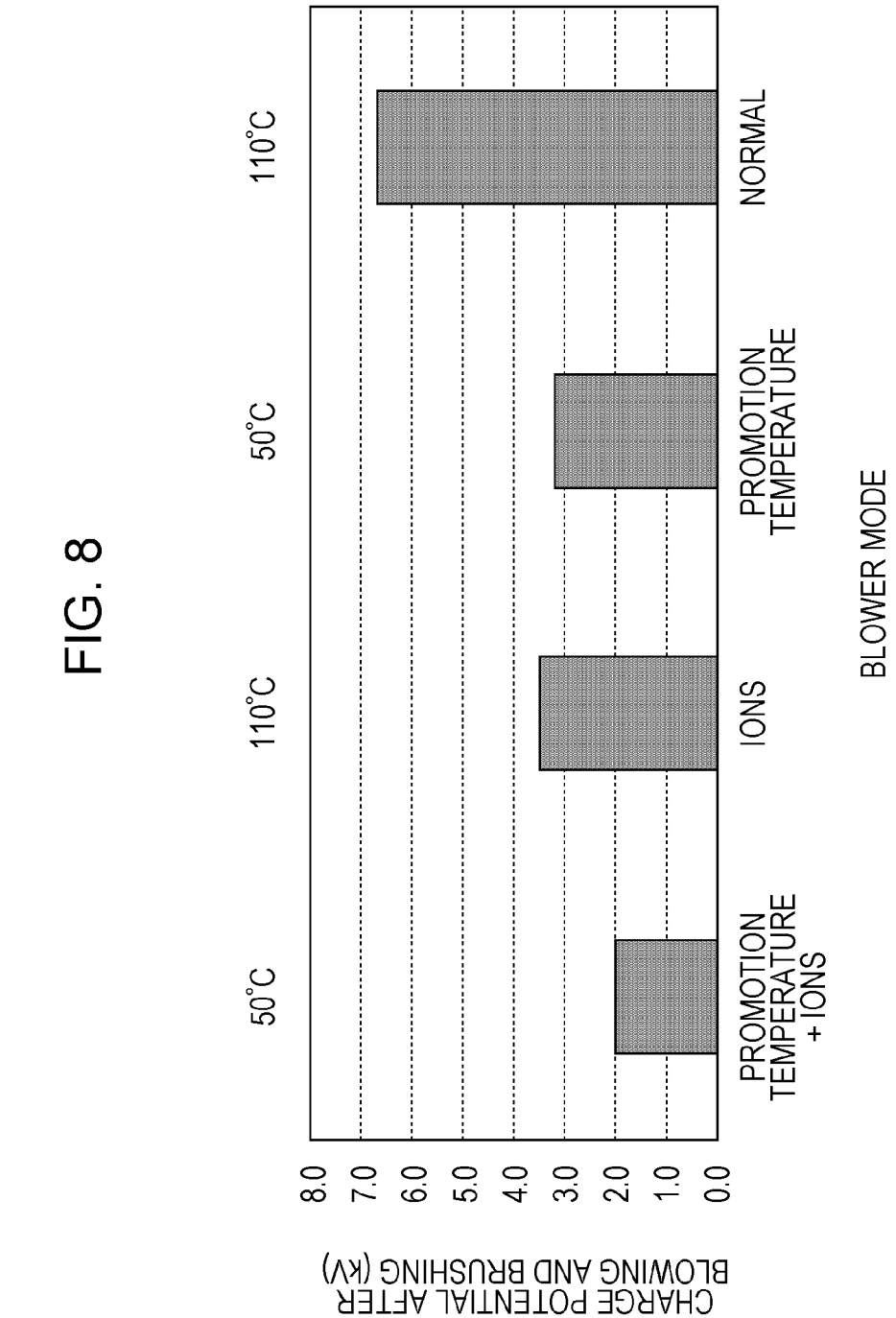

CHARGE POTENTIAL AFTER BLOWING AND BRUSHING (kV)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
50°C
110°C
50°C
110°C
PROMOTION TEMPERATURE + IONS
IONS
PROMOTION TEMPERATURE
NORMAL
BLOWER MODE

FIG. 9

FIRST TEST DEVICE (TURBO OFF)	TEMPERATURE [°C]	FLOW RATE [m^3/min]	POSITIVE ION CONCENTRATION [$10^4/cm^3$]	NEGATIVE ION CONCENTRATION [$10^4/cm^3$]	TOTAL ION CONCENTRATION [$10^4/cm^3$]
COOL MODE	36.3	1.02	125	−136	261
SET MODE	130.2	0.78	129	−126	255
SET HAIR CARE MODE	74.2	0.89	156	−172	328
DRY MODE	146.5	0.98	158	−162	320
DRY HAIR CARE MODE	87.1	1.00	181	−196	377

FIG. 10

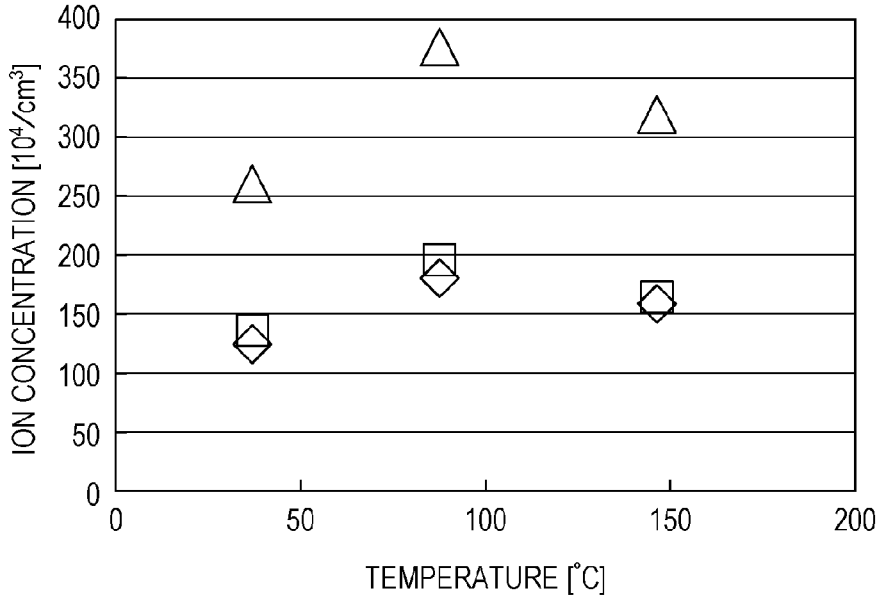


FIG. 11

FIRST TEST DEVICE (TURBO ON)	TEMPERATURE [°C]	FLOW RATE [m^3/min]	POSITIVE ION CONCENTRATION [$10^4/cm^3$]	NEGATIVE ION CONCENTRATION [$10^4/cm^3$]	TOTAL ION CONCENTRATION [$10^4/cm^3$]
COOL MODE	37.1	1.18	156	−179	335
SET MODE	113.9	0.91	133	−155	288
SET HAIR CARE MODE	69.3	1.05	124	−192	316
DRY MODE	130.3	1.15	133	−168	301
DRY HAIR CARE MODE	80.6	1.17	160	−213	373

FIG. 12

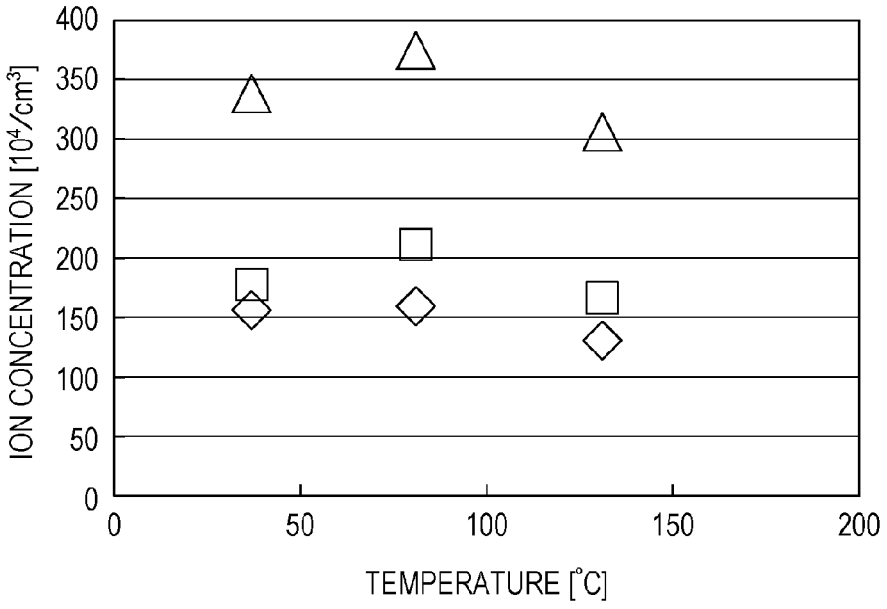


FIG. 13

SECOND TEST DEVICE (TURBO OFF)	TEMPERATURE [°C]	FLOW RATE [m^3/min]	POSITIVE ION CONCENTRATION [$10^4/cm^3$]	NEGATIVE ION CONCENTRATION [$10^4/cm^3$]	TOTAL ION CONCENTRATION [$10^4/cm^3$]
COOL MODE	36.3	1.02	73	−73	146
SET MODE	130.2	0.78	78	−79	157
SET HAIR CARE MODE	74.2	0.89	82	−85	167
DRY MODE	146.5	0.98	85	−84	169
DRY HAIR CARE MODE	87.1	1.00	90	−75	165

FIG. 14

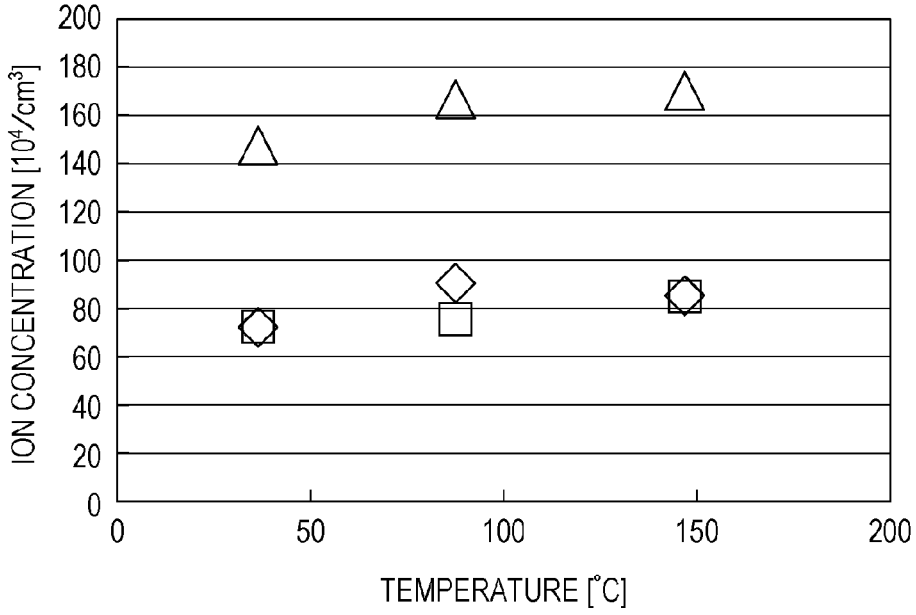
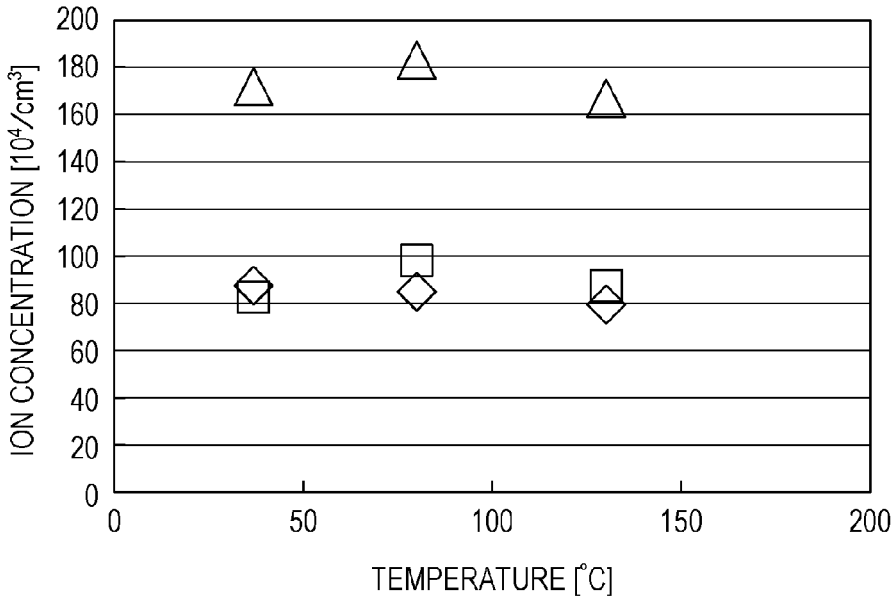


FIG. 15

SECOND TEST DEVICE (TURBO ON)	TEMPERATURE [°C]	FLOW RATE [m^3/min]	POSITIVE ION CONCENTRATION [$10^4/cm^3$]	NEGATIVE ION CONCENTRATION [$10^4/cm^3$]	TOTAL ION CONCENTRATION [$10^4/cm^3$]
COOL MODE	37.1	1.18	87	−83	170
SET MODE	113.9	0.91	76	−88	164
SET HAIR CARE MODE	69.3	1.05	75	−91	166
DRY MODE	130.3	1.15	79	−86	165
DRY HAIR CARE MODE	80.6	1.17	84	−97	181

FIG. 16



HAIR CARE APPARATUS

TECHNICAL FIELD

[0001] The present invention relates to haircare apparatuses such as hairdryers and hair irons.

BACKGROUND ART

[0002] An example of a haircare apparatus of the related art is disclosed in Japanese Unexamined Patent Application Publication No. 2009-254844 (PTL 1). This haircare apparatus includes, inside a casing having an air outlet and an air inlet, a blower device, an ion generator that generates negative ions, a heater, and a Peltier element that cools the air. Electrons are emitted from the ion generator toward the air that has been cooled by the Peltier element and allowed to bond with agglomerated water molecules, and negative ions having a large mass are generated.

CITATION LIST

Patent Literature

[0003] PTL 1: Japanese Unexamined Patent Application Publication No. 2009-254844

SUMMARY OF INVENTION

Technical Problem

[0004] However, in the haircare apparatus of the related art, there has been a problem in that because only negative ions can be generated, the user's hair becomes excessively negatively charged by the negative ions, negative ions that should be supplied to the user's hair receive a repulsive force from the negative charge with which the user's hair has become excessively charged and the negative ions and moisture accompanying the negative ions can no longer be supplied to the user's hair.

[0005] Accordingly, an object of the present invention is to provide a haircare apparatus that prevents hair from becoming excessively charged and can thoroughly supply moisture to the hair.

Solution to Problem

[0006] In order to solve the above-described problem, a haircare apparatus of the present invention is provided with

[0007] a casing having an air outlet and an air inlet,

[0008] a blower device that is provided inside the casing, a heater that is provided inside the casing,

[0009] an ion generator that is provided inside the casing and is capable of generating positive ions and negative ions,

[0010] a penetrating mode selection unit that is for selecting operation of a penetrating mode that promotes penetration of the positive ions and the negative ions generated by the ion generator into hair, and

[0011] a control unit that, when the penetrating mode is selected using the penetrating mode selection unit, controls the heater such that a temperature of air blown out from the air outlet becomes a predetermined promotion temperature at which penetration of the positive ions and the negative ions generated by the ion generator into the hair is promoted while driving the ion generator and the blower device.

[0012] With this configuration, an ion generator that is capable of generating positive ions and negative ions is provided inside the casing and therefore both positive ions and negative ions are supplied to a user's hair, only one of positive charge and negative charge does not excessively accumulate on the user's hair and therefore there is little repulsive force from charged hair and positive and negative ions can be thoroughly supplied to the hair.

[0013] In addition, if operation in the penetrating mode in which penetration of positive ions and negative ions into the hair is promoted is selected by using the penetrating mode selection unit, the control unit controls the heater such that the temperature of hair blown out from the air outlet reaches a promotion temperature at which penetration of positive ions and negative ions into the hair is promoted. Thus, the temperature of air blown out from the air outlet becomes the promotion temperature and penetration of the positive ions and negative ions generated by the ion generator into the user's air is promoted and therefore moisture accompanying these ions is thoroughly supplied to the hair, denaturation of keratin and so forth can be prevented and damage to the hair can be greatly reduced.

[0014] In addition, in an embodiment of the haircare apparatus,

[0015] the positive ions are $H^+(H_2O)_m$ (m being any natural number) and the negative ions are $O_2^-(H_2O)_n$ (n being any natural number).

[0016] According to this embodiment, the ion generator is capable of generating positive ions that are $H^+(H_2O)_m$ (m being any natural number) and negative ions that are $O_2^-(H_2O)_n$ (n being any natural number). These positive ions and negative ions attach to the surfaces of bacteria floating in the air and generate H_2O_2 or .OH (hydroxyl radical), which are active species, through chemical reactions. H_2O_2 or .OH exhibit a very strong activity and therefore are capable of surrounding, inactivating and removing mold and saprophytic bacteria, which are bacteria floating in the air.

[0017] In addition, in an embodiment of the haircare apparatus,

[0018] 55° C. is an upper limit of the promotion temperature.

[0019] According to this embodiment, since the promotion temperature is 55° C. when the penetrating mode is selected, penetration of moisture accompanying positive ions and negative ions into the hair can be promoted with more certainty and denaturation of keratin in the hair can be suppressed.

[0020] In addition, in an embodiment of the haircare apparatus,

[0021] the promotion temperature is from 38° C. to 55° C.

[0022] This embodiment is preferable, since the promotion temperature is from 38° C. to 55° C. when the penetrating mode is selected, and therefore penetration of moisture accompanying positive ions and negative ions into the hair can be promoted with more certainty, and depletion of heat from the body does not occur.

[0023] In addition, in an embodiment of the haircare apparatus, the haircare apparatus is a hairdryer.

[0024] According to this embodiment, a hairdryer can be realized that can prevent hair from becoming charged with just positive charge or negative charge at the time of use, that can promote penetration of moisture accompanying positive and negative ions into the hair, and that can greatly reduce damage to the hair.

Advantageous Effects of Invention

[0025] As has been made clear above, according to a haircare apparatus of the present invention, since positive and negative ions can be generated, the hair can be prevented from becoming excessively charged with just positive charge or negative charge at the time of use, and in addition the temperature of blown out air is controlled to a temperature at which penetration of moisture accompanying positive and negative ions into the hair is promoted and therefore moisture accompanying positive and negative ions is thoroughly supplied to the hair, denaturation of keratin and so forth can be prevented and damage to the hair can be greatly reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0026] FIG. **1** is a perspective view of a hairdryer of an embodiment of a haircare apparatus of the present invention.

[0027] FIG. **2** is a rear view of the hairdryer.

[0028] FIG. **3** is a longitudinal sectional view of the hairdryer taken along line III-III in FIG. **2**.

[0029] FIG. **4** is a perspective view of the hairdryer from an air inlet side with an air filter having been removed.

[0030] FIG. **5** is a perspective view of an ion generator from a surface that faces an air outlet.

[0031] FIG. **6** illustrates an example of the configuration of a heater of the hairdryer.

[0032] FIG. **7** is a block diagram of control of the hairdryer.

[0033] FIG. **8** illustrates a relationship between a blower mode of the hairdryer and a charge potential of hair after blowing and brushing.

[0034] FIG. **9** is a table illustrating the changes in ion concentrations in a cool mode, a set mode, a set haircare mode, a dry mode and a dry haircare mode when turbo is turned off in a first test device.

[0035] FIG. **10** is a graph in which the ion concentrations in the cool mode, the dry mode and the dry haircare mode for around the same flow rate are plotted on the basis of FIG. **9**.

[0036] FIG. **11** is a table illustrating the changes in ion concentrations in the cool mode, the set mode, the set haircare mode, the dry mode and the dry haircare mode when turbo is turned on in the first test device.

[0037] FIG. **12** is a graph in which the ion concentrations in the cool mode, the dry mode and the dry haircare mode for around the same flow rate are plotted on the basis of FIG. **11**.

[0038] FIG. **13** is a table illustrating the changes in ion concentrations in a cool mode, a set mode, a set haircare mode, a dry mode and a dry haircare mode when turbo is turned off in a second test device.

[0039] FIG. **14** is a graph in which the ion concentrations in the cool mode, the dry mode and the dry haircare mode for around the same flow rate are plotted on the basis of FIG. **13**.

[0040] FIG. **15** is a table illustrating the changes in ion concentrations in the cool mode, the set mode, the set haircare mode, the dry mode and the dry haircare mode when turbo is turned on in the second test device.

[0041] FIG. **16** is a graph in which the ion concentrations in the cool mode, the dry mode and the dry haircare mode for around the same flow rate are plotted on the basis of FIG. **15**.

DESCRIPTION OF EMBODIMENTS

[0042] Hereafter, a haircare apparatus of the present invention will be described in detail using an illustrative embodiment.

[0043] A hairdryer of this embodiment, as illustrated in FIG. **1**, includes a casing **1**, a handle **2** and an air filter **3**.

[0044] The casing **1** substantially has the shape of a truncated cone, has an air outlet **11** and an air inlet **12**, and is composed of a plastic that is excellent in terms of heat resistance. The air outlet **11** is provided on a front surface side of the substantially truncated cone shape, the front surface having a small area, and the air inlet **12** is provided on a rear surface side of the substantially truncated cone shape, the rear surface having a large area.

[0045] The handle **2** is attached so as to be freely rotatable toward the bottom and toward the air inlet **12** side of the casing **1** and can be folded away against the casing **1** in the direction of the arrow R. In addition, one end of a power cord **4** is connected to the air inlet **12** side of the handle **2**. In addition, a sliding-type actuator **21**, which is an example of a penetrating mode selection unit, is provided on the air inlet **11** side of the handle **2** in the center in the length direction of the handle **2**.

[0046] The air filter **3** is composed of a metal or plastic and is detachably attached to the air inlet **12** side of the casing **1**. The air filter **3**, as illustrated in FIG. **2**, is provided with a mesh-like plurality of holes and the mesh-like plurality of holes form the air inlet **12**. The air filter **3** ensures that large foreign matter such as dust does not enter the casing **1** and provides protection so that the user's fingers do not come into contact with a blower fan **6** (illustrated in FIG. **3**), which is one example of a blower device, as a result of accidentally entering an air passage **8** during operation.

[0047] FIG. **3** is a longitudinal sectional view of the hairdryer taken along line III-III in FIG. **2**. In FIGS. **2** and **3**, the power cord **4** illustrated in FIG. **1** is omitted.

[0048] As illustrated in FIG. **3**, a heater **5**, the blower fan **6** and an ion generator **7** are provided inside the casing **1**. In addition, although not illustrated, a fan motor that drives the blower fan **6**, wiring, electrical components and so forth are provided inside the casing **1**.

[0049] The heater **5** is arranged between the air outlet **11** and the blower fan **6** inside the air passage **8** and is provided on side walls on the left and right inside the air passage **6**. In FIG. **3**, only one heater **5** is illustrated.

[0050] The blower fan **6** is arranged substantially in the center inside the casing **1** and generates an air flow that flows from the air inlet **12** to the air outlet **11**. Air that has been heated by the heaters **5** is blown out to outside of the casing **1** from the air outlet **11** by the air flow generated by the blower fan **6**.

[0051] The ion generator **7** is provided in a base portion of the casing **1** on the air inlet **12** side and is arranged between the air filter **3** and the blower fan **6**. The ion generator **7** emits positive ions, which are $H^+(H_2O)_m$ (m is any natural number) and negative ions, which are $O_2^-(H_2O)_n$ (n is any natural number). These ions attach to the surfaces of bacteria floating in the air and generate H_2O_2 or .OH (hydroxyl radical), which are active species, through chemical reactions. H_2O_2 or .OH exhibit a very strong activity and therefore are capable of surrounding, inactivating and removing mold and saprophytic bacteria, which are bacteria floating in the air.

[0052] In addition, although not illustrated, a control unit **22**, which controls a power supply unit **23**, the heaters **5**, the blower fan **6** and the ion generator **7**, is provided inside the handle **2**. The power cord **4**, which is illustrated in FIG. **1**, is connected to the power supply unit **23** and power is supplied

to the control unit **22**, the heaters **5**, the blower fan **6** and the ion generator **7** with an on operation of the actuator **21**.

[0053] FIG. **4** is a perspective view of the hairdryer from the air inlet **12** side with the air filter **3** having been removed.

[0054] As illustrated in FIG. **4**, the ion generator **7** is provided on the lower side of the air inlet **12** side the casing **1** and is attached so as to lie in a recess which is not illustrated. The ion generator **7** can be easily removed from the recess and therefore maintenance and so forth can be easily performed on the ion generator **7**.

[0055] In addition, a locking unit **14** is provided on the upper side of the air inlet **12** side of the casing **1**. The air filter **3** is locked in the casing **1** by the locking unit **14**.

[0056] FIG. **5** is a perspective view of the ion generator **7** from a surface that faces the air outlet **11**.

[0057] The ion generator **7**, as illustrated in FIG. **5**, includes a positive ion generating unit **15** that generates positive ions and a negative ion generating unit **16** that generates negative ions. The positive ion generating unit **15** and the negative ion generating unit **16** are provided such that there is a certain space between themselves and a surface facing the air outlet **11** when the ion generator **7** is attached to the casing **1**.

[0058] The positive ion generating unit **15** includes a needle electrode **25**, which has shape of a needle with a sharp tip, and a donut-like disk-shaped induction electrode **35** arranged so as to surround the needle electrode **25**. The needle electrode **25** is arranged substantially in the center of the induction electrode **35** with a gap of 8 mm between the needle electrode **25** and the inner periphery of the induction electrode **35**.

[0059] The negative ion generating unit **16** includes a needle electrode **26**, which has the shape of a needle with a sharp tip, and a donut-like disk-shaped induction electrode **36** arranged so as to surround the needle electrode **26**. The needle electrode **26** is arranged substantially in the center of the induction electrode **36** with a gap of 8 mm between the needle electrode **26** and the inner periphery of the induction electrode **36**.

[0060] Next, operation of the hairdryer will be described. In the thus-structured hairdryer, first, the actuator **21** on the handle **2** is operated. The hairdryer can be switched on and off and switched between a "normal mode" and a "penetrating mode" by operating the actuator **21**. The normal mode is a mode in which the hairdryer is operated such that the temperature of air blown out from the air outlet **11** is around 130° C. and the penetrating mode is a mode in which the hairdryer is operated such that the temperature of air blown out from the air outlet **11** is around 50° C.

[0061] In this specification, the temperature of air blown out from the air outlet **11** is the temperature of blown out air measured using a method stipulated by JISC9613 (7.6.1 normal temperature experiment).

[0062] When the user selects a desired mode by operating the actuator **21**, as illustrated in FIG. **6**, power is supplied to the control unit **22** from the power supply unit **23**, and a signal corresponding to the mode selected with the actuator **21** is sent to the control unit **22** simultaneously with the control unit **22** transitioning to a operating state. The control unit **22** transmits control signals to power control switch units **27** and **28** of the heaters **5** from the control unit **22** on the basis of this signal. Then, power is supplied to the heaters **5** via the power control switch units **27** and **28** and the heaters **5** are made to transition to an operating state.

[0063] The control unit **22** separately controls the heaters **5**. That is, it is possible for just a single heater **5** to be driven and it is possible for both heaters **5** to be simultaneously driven. Consequently, the temperature of air blown out from the air outlet **11** can be freely regulated by changing the number of heaters **5** being driven. The control unit **22** performs control so as to drive both of the two heaters **5** in the normal mode and so as to drive only one of the heaters **5** in the penetrating mode.

[0064] In addition, the control unit **22**, as illustrated in FIG. **7**, also simultaneously transmits control signals to the blower fan **6** and the ion generator **7** to cause them to transition to an operating state. The blower fan **6**, which has been made to transition to an operating state, is controlled so as to blow air at a predetermined flow rate, and forms an airflow that flows from the air inlet **12** to the air outlet **11**.

[0065] Current is supplied to both the positive ion generating unit **15** and the negative ion generating unit **16** of the ion generator **7**, which has been made to transition to an operating state, and the positive ions, which are $H^+(H_2O)_m$ (m is any natural number) and negative ions, which are $O_2^-(H_2O)_n$ (n is any natural number) are caused to be simultaneously generated.

[0066] At this time, in the positive ion generating unit **15** of the ion generator **7**, for example, an alternating current voltage of 60 Hz that switches between an effective voltage of 2 kV or more and 0 V is applied to the needle electrode **25**, and a direct current voltage of 0 V is applied to the induction electrode **26**. When an effective voltage of 2 kV or more is applied to the needle electrode **25**, a corona discharge occurs due to the potential difference between the needle electrode **25** and the induction electrode **26**, water molecules in the air in the vicinity of the tip of the needle electrode **25** are ionized and hydrogen ions (H^+) are generated. The hydrogen ions bond in clusters with water molecules in the air (clustering) and positive ions composed of $H^+(H_2O)_m$ (m is any natural number) are generated.

[0067] On the other hand, in the negative ion generating unit **16** of the ion generator **7**, for example, an alternating current voltage of 60 Hz that switches between an effective voltage of −2 kV or less and 0 V is applied to the needle electrode **35** and a direct current voltage of 0 V is applied to the induction electrode **36**, and as a result negative ions are generated. The negative ions are oxygen ions O_2^- that are formed by ionization of oxygen molecules or water molecules in the air. These oxygen ions bond with water molecules in the air (clustering) and negative ions composed of $O_2^-(H_2O)_n$ (n is any natural number) are generated.

[0068] The positive ions and the negative ions generated by the ion generator **7** are emitted into the inside of the casing **1** from the ion generator **7**, ride along the airflow formed by the blower fan **6**, and are blown out to outside the casing **1** from the air outlet **11** so as to be supplied to the user's hair. Therefore, both positive ions and negative ions are simultaneously supplied to the user's hair and therefore only negative charge or positive charge does not accumulate on the user's hair and therefore there is little repulsive force from charged hair and positive and negative ions can be thoroughly supplied to the hair.

[0069] Regarding the positive and negative ions, the hydrogen ions and oxygen ions are surrounded by a plurality of water molecules. It is thought that if the temperature of the air blown out from the air outlet **11** is too high, the positive ions and the negative ions will be activated and the number of water molecules surrounding the hydrogen ions and the oxygen ions will decrease. Consequently, the positive ions and

the negative ions will be liable to bond with each other and disappear and as a result the amount of ions blown onto the user's hair will decrease.

[0070] This was discovered via the following experiment. In the following experiment, the temperature of the air blown out from the air outlet **11** increases from low to high in the order of a cool mode, a set haircare mode, a dry haircare mode, a set mode and a dry mode. In addition, the flow rate of air that is blown out is made a normal flow rate by turning turbo off and the flow rate of air that is blown out is increased by around 15% over that of the normal flow rate by turning the turbo on.

[0071] The changes in ion concentration in each mode in a first test device in which the turbo is turned off are illustrated in FIG. **9**. A graph is illustrated in FIG. **10** in which the ion concentrations in the cool mode, the dry mode, and dry haircare mode for around the same flow rate are plotted on the basis of FIG. **9**.

[0072] In FIG. **10**, the horizontal axis represents the temperature of the blown out air and the vertical axis represents the ion concentration. In addition, in FIG. **10**, diamonds indicate positive ion concentration, squares indicate negative ion concentration, and triangles indicate the total ion concentration of positive and negative ions. In FIG. **10**, modes in which the flow rates are about the same are compared. This is because the ion concentration increases as the flow rate increases. Since ions are simultaneously neutralized and disappear as they are generated, if they can be extracted before they are neutralized by being blown with a fast flow of air, the amount of ions is increased. From FIG. **10**, it is clear that there are maximum values in the amount of positive and negative ions (ion concentration) with respect to the temperature of the blown out air.

[0073] Similarly, the changes in ion concentration in each mode in the first test device in which the turbo is turned on are illustrated in FIG. **11**. A graph is illustrated in FIG. **12** in which the ion concentrations in the cool mode, the dry mode, and dry haircare mode for around the same flow rate are plotted on the basis of FIG. **11**.

[0074] In FIG. **12**, diamonds indicate positive ion concentration, squares indicate negative ion concentration, and triangles indicate the total ion concentration of positive and negative ions. From FIG. **12**, it is clear that there are maximum values in the amount of positive and negative ions (ion concentration) with respect to the temperature of the blown out air.

[0075] In addition, the changes in ion concentration in each mode in a second test device in which the turbo has been turned off are illustrated in FIG. **13**. A graph is illustrated in FIG. **14** in which the ion concentrations in the cool mode, the dry mode, and dry haircare mode for around the same flow rate are plotted on the basis of FIG. **13**. Different ion generators **7** are used in the first test device and the second test device.

[0076] In FIG. **14**, diamonds indicate positive ion concentration, squares indicate negative ion concentration, and triangles indicate the total ion concentration of positive and negative ions. From FIG. **14**, it is clear that there are maximum values in the amount of positive and negative ions (ion concentration) with respect to the temperature of the blown out air.

[0077] Similarly, the changes in ion concentration in each mode in the second test device in which the turbo is turned on are illustrated in FIG. **15**. A graph is illustrated in FIG. **16** in which the ion concentrations in the cool mode, the dry mode, and dry haircare mode for around the same flow rate are plotted on the basis of FIG. **15**.

[0078] In FIG. **16**, diamonds indicate positive ion concentration, squares indicate negative ion concentration, and triangles indicate the total ion concentration of positive and negative ions. From FIG. **16**, it is clear that there are maximum values in the amount of positive and negative ions (ion concentration) with respect to the temperature of the blown out air.

[0079] From FIG. **10**, FIG. **12**, FIG. **14** and FIG. **16**, it is clear that if a range of temperatures over which the amount of ions is increased in a range of a maximum value or close to a maximum value is taken to be from 50° C. to 100° C. the amount of positive and negative ions can be increased with certainty.

[0080] On the other hand, it is thought that if the temperature of the air that is blown out from the air outlet **11** is decreased, ionization of water molecules by electrical discharge will not proceed and the amount of ions that are blown onto the hair of the user will be decreased as a result.

[0081] In addition, if the temperature exceeds around 55° C. denaturation of keratin in the hair begins to occur. The hair is damaged by the denaturation of the keratin in the hair.

[0082] Consequently, in order to promote penetration of moisture accompanying positive ions and negative ions into the hair, it is preferable that the temperature of air blown out from the air outlet **11** be within a certain temperature range (hereafter, promotion temperature). The promotion temperature is from 38° C. to 55° C. It is preferable that the promotion temperature be 38° C. since this does not remove heat from the body.

[0083] In an experiment, first, a bundle of around 5 g of hair that had been dried by being left in a desiccator containing a desiccant was hung up and subjected to blow drying from 15 cm thereabove. After fifteen minutes, the bundle of hair was brushed ten times with a PP brush and the charge potential of the bundle of hair was measured. The results are illustrated in Table 1 and FIG. **8**.

TABLE 1

Blower Mode	Temperature (° C.)	Charge Potential of Bundle of Hair (kV)
Promotion Temperature + Ions	50	2.0
Ions	110	3.5
Promotion Temperature	50	3.2
Normal	110	6.7

[0084] When the hairdryer is used, if operation in the penetrating mode in which penetration of moisture accompanying positive and negative ions into the hair is promoted is selected by using the actuator **21**, the control unit **22** controls the heaters **5** such that the temperature of hair blown out from the air outlet **11** is at the promotion temperature at which penetration of positive and negative ions into the hair is promoted. Thus, the temperature of air blown out from the air outlet **11** comes to be at the promotion temperature, and penetration of the positive and negative ions generated by the ion generator **7** into the user's hair is promoted and therefore moisture accompanying these ions is thoroughly supplied to the hair, denaturation of keratin and so forth is prevented and damage to the hair can be greatly reduced.

[0085] In this embodiment, the penetrating mode and the normal mode are switched between using the actuator **21**, but a penetrating mode selection button may be separately provided to allow selection of the penetrating mode. In addition, a configuration may be adopted in which the rotational speed of the blower fan **6** can be adjusted to a plurality of levels (for example, two levels of "strong" and "weak") by operating the actuator **21**, whereby the strength of the blown out air can be regulated. In addition, a configuration may be adopted in which whether cold air or warm air is to be blown out can be appropriately selected by turning the heaters **5** on or off.

[0086] In this embodiment, two heaters **5** are provided but not limited to this for example three or more heaters **5** or just a single heater **5** may be provided.

[0087] In this embodiment, the temperature of the air blown out from the air outlet **11** is regulated by regulating the number of heaters **5** that are being driven, but for example a configuration may be adopted in which the temperature of the blown out air is measured by providing a temperature detector in the vicinity of the air outlet **11**. The temperature of air blown out from the air outlet **11** can be freely regulated with more certainty by performing control so as to stop supply of power to the heaters **5** when the temperature of the blown out air detected by the temperature detector reaches a certain value and so as to supply power to the heaters **5** when the temperature of the blown out air drops below a certain value.

[0088] In this embodiment, the ion generator **7** that generates positive ions of $H^+(H_2O)_m$ (m being any natural number) and negative ions of $O_2^-(H_2O)_n$ (n being any natural number) is provided, but not limited to this, an ion generator that generates simple positive and negative ions may be provided.

[0089] In this embodiment, both the positive ion generating unit **15** and the negative ion generating unit **16** of the ion generator **7** are driven at the same time, but not limited to this, a configuration may be adopted in which just the positive ion generating unit **15** or just the negative ion generating unit **16** can be driven. With this configuration, the user can appropriately select whether the ions to be blown out from the air outlet **11** are to be just positive ions, just negative ions or both positive and negative ions by operating the actuator **21**.

[0090] In addition, in this embodiment, the ion generator **7** may be configured such that the amounts of ions generated per unit time by the positive ion generating unit **15** and the negative ion generating unit **16** can be appropriately changed or may be configured such that they cannot be changed.

[0091] In this embodiment, the present invention has been described using a hairdryer as an example, but a haircare apparatus of the present invention is not limited to a hairdryer and for example may be a hair iron or a roll brush, or may be any apparatus that blows out air and can be used in haircare.

REFERENCE SIGNS LIST

[0092] **1** casing
[0093] **2** handle
[0094] **3** air filter
[0095] **4** power cord
[0096] **5** heater
[0097] **6** blower fan
[0098] **7** ion generator
[0099] **8** air passage
[0100] **10** partition
[0101] **11** air outlet
[0102] **12** air inlet
[0103] **14** locking unit
[0104] **15** positive ion generating unit
[0105] **16** negative ion generating unit
[0106] **21** actuator
[0107] **22** control unit
[0108] **23** power supply unit
[0109] **25**, **35** needle electrode
[0110] **26**, **36** induction electrode
[0111] **27**, **28** power control switch units

1. A haircare apparatus comprising a casing (**1**) having an air outlet (**11**) and an air inlet (**12**),

a blower device (**6**) that is provided inside the casing (**1**),

a heater (**5**) that is provided inside the casing (**1**),

an ion generator (**7**) that is provided inside the casing (**1**) and is capable of generating positive ions and negative ions,

a penetrating mode selection unit (**21**) that is for selecting operation of a penetrating mode that promotes penetration of the positive ions and the negative ions generated by the ion generator (**7**) into hair, and

a control unit (**22**) that, when the penetrating mode is selected using the penetrating mode selection unit (**21**), controls the heater (**5**) such that a temperature of air blown out from the air outlet (**11**) becomes a predetermined promotion temperature at which penetration of the positive ions and the negative ions generated by the ion generator (**7**) into the hair is promoted while driving the ion generator (**7**) and the blower device (**6**).

2. The haircare apparatus according to claim **1**, wherein the positive ions are $H^+(H_2O)_m$ (m being any natural number) and the negative ions are $O_2^-(H_2O)_n$ (n being any natural number).

3. The haircare apparatus according to claim **1**, wherein 55° C. is an upper limit of the promotion temperature.

4. The haircare apparatus according to claim **3**, wherein the promotion temperature is from 38° C. to 55° C.

5. The haircare apparatus according to claim **1**, wherein the haircare apparatus is a hairdryer.

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