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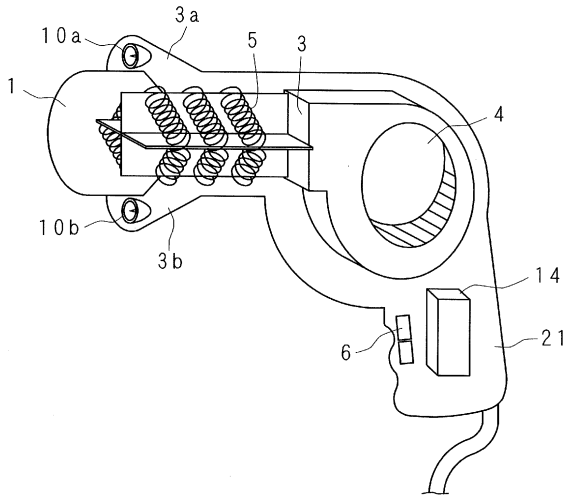
(54) METHOD FOR HUMIDIFYING HAIR AND REDUCING DAMAGE, AND DEVICE FOR HUMIDIFYING HAIR AND REDUCING DAMAGE

(57) There is provided with a method for humidifying hair and reducing hair damage that humidifies hair readily and improves hair damage with the use of both positive ions and negative ions.A positive ion generation means 10b for discharging electricity between electrodes applied by a voltage to generate positive ions combined to water molecules and a negative ion generation means 10a for discharging electricity between electrodes applied by a voltage to generate negative ions combined to water molecules are prepared. Hair is humidified and hair damage is reduced by irradiation of hair with the positive and negative ions generated respectively by the positive ion generation means 10b and the negative ion generation means 10a.

F I G. 2



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Description

[Technical Field]

[0001] The present invention relates to a method and an apparatus for humidifying hair and reducing hair damage for providing moisture to hair with ions and improving hair condition.

[Background Art]

[0002] Many ladies have various worries on the cosmetics. One of typical problems is hair damage, and it is mainly caused by hair drying. The hair drying not only generates dry feeling, but also produces some problems such as easily generating static electricity and losing cohesiveness of the whole hairs as well as mote and dust easily attaching to hair.

[0003] Cosmetics, such as hair conditioner, are sold as hair care use for a long time. The basic mechanism of these cosmetics is for making hair surface smooth. As using the cosmetics, the hair friction is reduced and the hair obtains soft feeling. Additionally, the efficiency of light reflection becomes better and hence the hair obtainsglossiness.

[0004] The hair conditioner is composed mainly of cationic surfactant.The cationic surfactant is easily adhered to the hair carrying a negative charge. For this property, the cationic surfactant covers the hair and then smoothens the surface of hair.

[0005] Unfortunately, the above-mentioned method of using cosmetics has temporary effects such as unable to sustain the effect under drying environment in addition to the troublesome treatment.

[0006] Recently, a cosmetic apparatus capable of hair caring at home has also been commercialized. For example, Patent Documents 1 and 2 disclose and commercialize cosmeticapparatuses such as hair drying and hair ironing for producing ions. These apparatuses improve hair condition with ions carrying negative charges. However, in the event of having wet hair or damaged hair, since the hair is carryinga negative charge, the hair has lower absorption efficiency even if many negative ions are generated.

[0007] On the other hand, in the event of having dry hair, in particular, in the event of brushing and drying, since the hair is carried with a positive charge through friction generated between the hair and the brush, the hair has higher absorption efficiency as many negative ions are generated.

[0008] In addition, Patent Document 3 discloses a hair dryer generating positive ions and negative ions. The invention of it aims to improve hair damage by cancelling a charging phenomenon on hair, similar to the inventions disclosed in Patent Documents 1 and 2.

Patent Document 1: Japanese Patent Application Laid-Open No. 2003-275011.
Patent Document 2: Japanese Patent Application Laid-Open No. 2004-55351.
Patent Document 3: Japanese Patent Application Laid-Open No. 2008-49101.

[Summary of the Invention]

[Problems to be Solved by the Invention]

[0009] As described above, the conventional cosmetic apparatuses performing hair caring with the generation of ions improve hair damage by means of cancelling a charging phenomenon on hair. However, generating positive ions and negative ions, providing moisture to hair with the positive ions and negative ions and then improving hair damage have not been proposed.

[0010] It has been known that more serious hair damage, such as split hair or distrix, is caused at the time of drying and styling washed hair. However, any method for improving these problems other than a method of using a pack of medicine has not been proposed.

[0011] In addition, with regard to the use of a cosmetic apparatus for hair caring, it is desired to vary the amount of generated ions in accordance with events such as generating more negative ions in the case of obtaining relaxation effects.

[0012] In view of such circumstances as described above, the present invention aims to provide a method and an apparatus for humidifying hair and reducing hair damage that humidifies hair at ease and improves hair damage with the use of positive ions and negative ionsand that reduces hair damage such as serious split hair or cracked hair, which easily occurs at the time of drying and stylingwashed hair.

[Means for Solving Problems]

[0013] A method for humidifying hair and reducing hair damage in accordance with the present invention comprises preparing a positive ion generation means for discharging electricity by the application of voltage to generate positive ions combined to water molecules and a negative ion generation means for discharging electricity by the application of voltage to generate negative ions combined to water molecules; and humidifying hair and reducing damage occurring in hair by irradiating the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means to hair.

[0014] The method for humidifying hair and reducing hair damage in accordance with the present invention features that the positive ion is $H^+(H_2O)_m$ (m is anarbitrary natural number), and the negative ion is $O_2(H_2O)_n$ (n is anarbitrary natural number).

[0015] The method for humidifying hair and reducing hair damage in accordance with the present invention further comprises preparing an air blowing mechanism for blowing air including the positive ions and negative

ions generated respectively by the positive ion generation means and the negative ion generation means and blowing air from the air blowing mechanism.

[0016] The apparatus for humidifying hair and reducing hair damage in accordance with the present invention comprises a positive ion generation means for discharging electricity by the application of voltage to generate positive ions combined to water molecules and a negative ion generation means for discharging electricity by the application of voltage to generate negative ions combined to water molecules, and is configured to irradiate the positive ions and negative ions generated respectively by the positive ion generation means; and the negative ion generation means to hair.

[0017] With regard to the method and apparatus for humidifying hair and reducing hair damage in accordance with the present invention, the positive ion generation means discharges electricity by the application of voltageto generate positive ions combined to water molecules, and the negative ion generation means discharges electricity by the application of voltageto generate negative ions combined to water molecules. The positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means are irradiated to hair.

[0018] The apparatus for humidifying hair and reducing hair damage in accordance with the present invention features that the positive ion is $H^+(H_2O)_m$ (m is an arbitrary natural number), and the negative ion is $O_2(H_2O)_n$ (n is an arbitrary natural number).

[0019] The apparatus for humidifying hair and reducing hair damage in accordance with the present invention is configured such that the positive ion generation means and the negative ion generation means are capable of changing the amount of positive ions and negative ions to be generated respectively.

[0020] With regard to this apparatus for humidifying hair and reducing hair damage, the positive ion generation means and the negative ion generation means are capable of changing the amount of positive ions and negative ions to be generated respectively.

[0021] The apparatus for humidifying hair and reducing hair damage in accordance with the present invention further comprises an air blowing mechanism for blowing air including the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means.

[0022] With regard to the method and the apparatus for humidifying hair and reducing hair damage in accordance with the present invention, the air blowing mechanism blows air including the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means.

[0023] The apparatus for humidifying hair and reducing hair damage in accordance with the present invention is configured such that the air blowing mechanism blows air at a wind speed not more than 15 m/s.

[0024] With regard to this apparatus for humidifying hair and reducing hair damage, the air blowing mechanism blows air at a wind speed not more than 15 m/s.

[0025] The apparatus for humidifying hair and reducing hair damage in accordance with the present inventionfurther comprisesa heating means for heating air blown from the air blowing mechanism.

[0026] With regard to this apparatus for humidifying hair and reducing hair damage, the heating means heats air blown from the air blowing mechanism.

[Effects of the Invention]

[0027] With regard to the method for humidifying hair and reducing hair damage in accordance with the present invention, the method provides moisture to hair irradiated with generated positive and negative ions by discharge, and removes static electricityso as to bring the effect of hair beauty, therefore, it is easy to handle without maintenance and cost required for buying medicine. The method for humidifying hair and reducing hair damage that humidifies hair and improves hair damage with the use of positive ions and negative ions can be realized. These positive ions and negative ions are combined to water molecules, and these water molecules adhere to the hair and provide moisture. Since positive ions and negative ions are both generated, the effect of moisture giving can be obtained with sufficient numberof ions even if the hair is carried with either polarity.

[0028] According to the apparatus for humidifying hair and reducing hair damage, the apparatus provides moisture to hair irradiated with generated positive and negative ions by discharge, and removes static electricity so as to bring the effect of hair beauty, therefore, the maintenance and cost required for buying medicine is not necessary. The apparatus for humidifying hair and reducing hair damage that humidifies hair and improves hair damage with the use of positive ions and negative ions can be realized. These positive ions and negative ions are combined to water molecules, and these water molecules adhere to the hair and provide moisture. Since positive ions and negative ions are both generated, the effect of moisture giving can be obtained with sufficient numberof ions even if the hair is carried with either polarity.

[0029] In addition, according to the apparatus for humidifying hair and reducing hair damage, each generation amount of positive ions and negative ions can be freely changed, therefore, the effect of ions matched with peripheral temperature and humidity conditions can be efficiently obtained.

[Brief Description of the Drawings]

[0030]

FIG. 1 is a perspective view showing an appearance of a cosmetic apparatus as an embodiment of a method and an apparatus for humidifying hair and reducing hair damage related to the present inven-

tion.

FIG. 2 is a perspective view showing an internal configuration of the cosmetic apparatus as indicated in FIG. 1.

FIG. 3 is a perspective view showing an example of appearance of an ion generation apparatus.

FIG. 4 is a circuit diagramshowing an example ofconfiguration of the ion generation apparatus.

FIG. 5 is a graph showing a measurement result related to the variation of moisture amount of a hair sample in the case of non-wind.

FIG. 6 is a graph showing a measurement result related to the variation of moisture amount of a hair sample at a wind speed about 3 m/s.

FIG. 7 is a circuit diagram showing an example of configuration of an ion generation apparatus of a cosmetic apparatus related to the present invention.

FIG. 8A is an explanatory diagram showing a diagrammatic configuration of a hair dryer for commercial use as an embodiment of a method and an apparatus for humidifying hair and reducing hair damage related to the present invention.

FIG. 8B is an explanatory diagram showing the hair dryer for commercial use as indicated in FIG. 8A in a state of being used.

FIG. 9 is a perspective view showing an example of appearance of an ion generation apparatus.

FIG. 10 is a graph showing a measurement result of moisture amount of a hair sample at a wind speed about 8 m/s.

FIG. 11 is a graph showing a measurement result of a number of hair damage generation in a hair sample at a wind speed about 15 m/s.

[Description of Reference Numerals]

[0031]

1Discharge Port
2 Suction Port
3 Air Flow Channel
3a, 3bBranch Path
4 Air Blowing Mechanism
6 Operation Switch
10, 10c, 204Ion Generation Apparatus
10a, 10b Ion Generation Part
11a, 11b Discharge Electrode
13High-Voltage Power Supply Part
20Hair Dryer for Commercial Use
21Handle
201Dome-shaped Enclosure
202Blower
207Opening
208Humidification Part
204a Positive Ion Generation Part
204b Negative Ion Generation Part
TRSwitching Element

[Best Mode for Carrying Out the Invention]

[0032] The present invention is described in more detail hereinafter with reference to the drawings showing the embodiments.

(Embodiment 1)

[0033] FIG. 1 is a perspective view showing an appearance of a cosmetic apparatus as an embodiment of a method and an apparatus for humidifying hair and reducing hair damage related to the present invention. FIG. 2 is a perspective view showing an internal configuration of the cosmetic apparatus.

[0034] The cosmetic apparatus has a substantially cylindrical shape with an air flow channel 3 formed therein.A discharge port 1 for discharging air is formed at the downstream side of the air flow channel 3, and a suction port 2 for sucking air is formed at the upstream side thereof.The air flow channel 3 is a flow channel connected from the suction port 2 to the discharge port 1. An air blowing mechanism 4 provided with a sirocco fan and a motor for driving the sirocco fan is arranged inside the air flow channel 3, and an intake port of the siroccofan becomes the suction port 2.

[0035] The air blowing mechanism 4 sucks air through the suction port 2 and introduces the air into the air flow channel 3, and then circulates the air at the downstream side of the air flow channel 3. A heating part 5 for heating the air circulated in the air flow channel 3 is arranged in the part of the downstream side of the air flow channel 3 relative to the air blowing mechanism 4. The heating part 5 is configured with an insulation plate and a heater wire wounded up at the outside of the insulation plate.

In addition, two branch paths 3a, 3b are divided from the part positioning at the downstream side of the air flow channel 3 relative to the air blowing mechanism 4 and at the upstream side of the air flow channel 3 relative to the heating part 5. The branch paths 3a, 3b are formed inside cylindrical protrusive cylinders 7a, 7b jointly connected to outside from a lateral surface of the air flow channel 3, and they communicate with the air flow channel 3 at inlet ports thereof.

[0036] Each of ion generation parts 10a, 10b for generating positive ions and negative ions respectively is arranged inside the two branch paths 3a, 3b, individually. The positive ions and negative ions generated by the ion generation parts 10a, 10b are sent to hair with wind individually.

[0037] At the side of the suction port 2 of the air flow channel 3, a handle 21 is provided at a direction substantially perpendicular to a longitudinal direction of the air flow channel 3. An operation switch 6 is provided at the part of the handle 21 to be grasped by a user. A main body case 14 of an ion generation apparatus including the ion generation parts 10a, 10b is stored inside the handle 21.

[0038] FIG. 3 is a perspective view showing an exam-

ple of configuration of the ion generation apparatus 10.

[0039] The ion generation apparatus 10 is provided with the main body case 14 for storing a circuit part and the ion generation parts 10a, 10b. The ion generation parts 10a, 10b are formed in a substantially hemispherical shape. Ion emission holes 14a, 14b formed in a circular shape with a diameter of, for example, about 8 mm are opened at the plane surface part of the hemisphere, and the top part of the hemisphere is connected to the main body case 14 through a high-voltage wire.

[0040] Discharge electrodes 11a, 11b formed in stylus shape are arranged in a manner of crossing in a direction perpendicular to the emission holes almost at the center inside the emission holes 14a, 14b. In addition, counter electrodes 12a, 12b formed in annular shape are arranged oppositely along the emission holes 14a, 14b at the surrounding of the discharge electrodes 11a, 11b.

[0041] FIG. 4 is a circuit diagram showing an example of configuration of the ion generation apparatus.

[0042] With regard to the ion generation apparatus 10, the counter electrodes 12a, 12b and the discharge electrodes 11a, 11b are connected to a high-voltage power supply part 13 stored inside the main body case 14.

[0043] The high-voltage power supply part 13 is connected to an AC 100V power supply 15 through an outlet, and the anode of a diode D1 is connected to one plug of the outlet. One terminal of a capacitor C1 and the anode of a two-terminal thyristorD2 are connected to the cathode of the diode D1 through a resistor R1. The other terminal of the capacitor C1 is connected to the other plug of the outlet, and the primary coil of a transformer 16 is connected between the cathode of the two-terminal thyristor D2 and the other plug of the outlet.

[0044] One terminal of the secondary coil of the transformer 16 is connected to the cathode of a diode D3 of the ion generation part 10a, and the anode of the diode D3 is connected to the discharge electrode 11a. The one terminal of the secondary coil of the transformer 16 is also connected to the anode of a diode D4 of the ion generation part 10b, and the cathode of the diode D4 is connected to the discharge electrode 11b.

[0045] The other terminal of the secondary coil of the transformer 16 is connected to the counter electrodes 12a, 12b.

[0046] The high-voltage power supply part 13 connected to the discharge electrode 11a at one side generates a negative high-voltage pulse voltage (for example, a frequency of 60Hz, a point voltage about - 2kV). The high-voltage power supply part 13 connected to the discharge electrode 11b at the other side generates a positive high-voltage pulse voltage (for example, a frequency of 60Hz, a point voltage about 2kV). Therefore, the electricity discharge occurs between the tips of the discharge electrodes 11a, 11b and the counter electrodes 12a, 12b, and then plasma is generated. Because of the generated plasma, a molecule such as oxygen (O_2) and water $(H_2O)_m$ in air receives energy.

[0047] When the voltage applied to the discharge electrode is a positive voltage, a water molecule in air is ionized and then a hydrogen ion (H^+) is generated. The hydrogen ion clusters around a water molecule in air, and then a positive ion composed of $H^+(H_2O)_m$ (m is an arbitrary natural number) is mainly generated. Then, the positive ionsare emitted from the emission hole 14b with the discharge electrode 11b.

[0048] When the voltage applied to the discharge electrode is a negative voltage, an oxygen molecule or a water molecule in air is ionized, and then an oxygen ion (O_2^-) is generated. The oxygen ion clusters around a water molecule in air, and then a negative ion composed of $O_2(H_2O)_n$ (n is an arbitrary natural number) is mainly generated. Then, the negative ionsare emitted from the emission hole 14a with the discharge electrode 11a.

[0049] With regard to the Embodiment 1, the positive ion generation part and the negative ion generation part are arranged at the positions mutually opposite to each other relative to the air flow channel 3 and the discharge port 1. Since the ions which are generated by the positive ion generation part and the negative ion generation part respectively and flowed with the air sent from the discharge port 1 can reach the user's hair without being combined and eliminated by the attractive force of ions with reverse polarity, it is possible to arrange both ion generation parts to each other closely.

[0050] Based on the confirmation made by the inventors, if the positive ion generation part and the negative ion generation part are about 20 mm away from the direction which is orthogonal to the delivery direction of air, then the effect of ions can be attained.

[0051] Moreover, though the positive ion generation part and the negative ion generation part are further arranged closely to the extent of making a contact to each other, it is unavoidable that a part of ionsis eliminated by combination, however, the effect is not necessarily lost. It is preferable that the positive ion generation part and the negative ion generation part are arranged such that the positive ions and negative ions are transported by the air sent from the discharge port 1.

[0052] The operation of the cosmetic apparatus having such configuration is described hereinafter.

[0053] With regard to this cosmetic apparatus, when the operation switch 6 is on, the air blowing mechanism 4 and the ion generation apparatus 10 are activated. In this case, the air blowing mechanism 4 blows air below a wind speed of 15 m/s at the position of an object.

[0054] The air blowing mechanism 4 sends the air sucked in through the suction port 2 from the discharge port 1. During the "drying operation" for generating warming air to be used for drying hair, the heating part 5 is in operation.

[0055] The negative ions and positive ions generated by the ion generation parts 10a, 10b respectively are emitted, individually. The generated ions are emitted to the front through air, which flows through the branch paths 3a, 3b, and then the generated ions flowed with the air stream to be sent from the discharge port 1 are

irradiated on the user's hair.

[0056] With regard to the cosmetic apparatus described in Embodiment 1, it is configured such that a moisture retaining operation and a drying operation are selectable. During the moisture retaining operation, the air blowing mechanism 4 and the ion generation apparatus 10 are in operation. In addition, during the drying operation, the air blowing mechanism 4 and the heating part 5 are in operation.

[0057] The moisture generated by the combination of a positive ion $H^+(H_2O)_m$ and a negative ion $O_2(H_2O)_n$ and the moisture clustering around the both ions are different from commonly recognizedwater. Due to the size of molecule level,it is considered that the moisture amountis directly increased with the penetration into the interior regardless of the surface tissue of hair.

[0058] Generally, the ion generation apparatus by discharge can generate various kinds of ions, however,it is preferable to generate less nitrogen oxides in view of the influence on hair.

[0059] With regard to the water sucked into hair generated by the ion reactions or the water sucked into hair clustering around ions, a molecular motion is activated by heating and then a diffusion into air is caused. Therefore, it is preferable not to activate the heating part 5 during the moisture retaining operation.

[0060] On the contrary, during the drying operation, since the both generated ions act as electrical charges, ions with polarity reverse to the electrical charge included in hair are mainly sucked into hair and thenelectric static charges are removed. Generally, ashair is easily carried with a positive charge, the negative ions to be sent are sucked into hair and then the positive ions are repelled.

[0061] As described above, although it is not expected to have the effect of moisture retaining during the drying operation, the effect of charge removing can be attained. Therefore, it is preferable that the ion generation apparatus 10 is capable of maintaining operation.

[0062] Accordingly, the user-friendlinesscan be enhanced by providing a "drying operation" mode to operate the air blowing mechanism 4, the heating part 5 and the ion generation apparatus 10 and a "moisture retaining operation" mode to operate only the air blowing mechanism 4 and the ion generation apparatus 10.

[0063] Instead of an automatic operation, it is possible that all functions can be selected by a user. It is preferable that air quantity of the air blowing mechanism 4 can be selected by "strong", "weak" and "stop", and it is preferable that "operation" / "stop" of the ion generation apparatus 10 and "operation" / "stop" of the heating part 5 are selectable. Generally, configuring the operation switch 6 as a multi-circuit switch or providing switch separately to make on/off on each function means is a well-known matter, therefore, the detailed description is omitted.

(Embodiment 2)

[0064] Since the electrification of hair is changed by seasons and quality of hair, in addition to the Embodiment 1, it is preferable to configure an ion generation apparatus 10 such that the user can change the amount of ion generation.

[0065] Similarly, the user-friendliness can be enhanced by making a configuration capable of changing air blowing quantity from the air blowing mechanism 4. In this case, it is preferable to increase the amount of ion generation made by the ion generation apparatus 10 to maintain the concentration of ions even if the air blowing quantity is large.

[0066] Generally, the amount of ion generation made by the ion generation apparatus 10 is naturally increased with the increasing air flow passing through the ion generation parts 10a, 10b without changing a voltage applied to the discharge electrodes 11a, 11b. However, it is not necessarily to sustain the expected concentration of ions, therefore, it is preferable to make a configuration capable of changing a pulse applied to the discharge electrodes 11a, 11b.

[0067] FIG. 7 is a circuit diagram showing an example of configuration of an iongeneration apparatus of a cosmetic apparatus as the Embodiment 2 related to the present invention.

[0068] This ion generation apparatus 10c is an example of adding a switching element conducted by the computer control at the exterior in the configuration of the ion generation apparatus 10 as shown in FIG. 4.

[0069] This switching element is an NPN transistor TR, the base is connected to the output terminal of a microcomputer through a resistor R3, and the collector is connected to the cathode of a photodiode D5 in a photocoupler 17 through a resistor R2. A resistor R4 is connected between the base and emitter of the transistor TR, and the negative terminal of a 12V battery 19 is connected to the emitter. The positive terminal of the battery 19 is connected to the anode of the photodiode D5.

[0070] The photo-receiving side (output side) of the photocoupler 17 is a bidirectional photodiode T, and the bidirectional photodiode T is connected between the other terminal of an AC 100V power supply and the other terminal of a capacitor C1.

[0071] It is also possible to incorporate the switching element TR into the main body circuit of the ion generation apparatus 10c. The number of pulses applied to the ion generation parts 10a, 10b can be changed by storing the switching element TR in the main body of the ion generation apparatus 10c and then switching power to be supplied to the ion generation apparatus 10c on/off at any arbitrary timing through the microcomputer.

[0072] Generally, the amount of ion generation is increased with the increasing number of pulses, and the amount of ion generation is decreased with the decreasing number of pulses. It is common to provide a means for uniformly designating increasing and decreasing amount of ions in the main body of the cosmetic apparatus, that is, a "increasing amount/decreasing amount" switch, "increasing amount" button and "decreasing

amount" button for enhancing the user-friendliness.

[Embodiment 3]

[0073] FIG. 8 is an explanatory diagram showing a diagrammatic configuration of a hair dryer for commercial use as an Embodiment 3 of a method and an apparatus for humidifying hair and reducing hair damage related to the present invention.

[0074] The hair dryer for commercial useis a large-sized hair dryer machine to be used in hair salon and the like that is worn in a manner of covering the user's head entirely, as shown in FIG. 8B.

[0075] With regard to the hair dryer for commercial use shown in FIG. 8A, a plurality of openings 207 for sucking in air are arranged and formed in circular shape at the top part of a dome-shaped enclosure 201, and a blower 202 and a heating device 203 are provided at the top part inside the dome-shaped enclosure 201. In addition, a hole-opening disc-shaped partition plate 205 for partitioning the space between the blower 202 and the heating device 203 forms a space 206 for accommodating the user's head. A humidification part 208 including a sponge and the like having a water retention function for humidifying air to be sucked in is provided at each opening 207.

[0076] A plurality of ion generation apparatuses 204 are arranged at the bottom surfaces of the partition plates 205. The ion generation apparatus 204 used herein is a unit-type which is embedded with a high-voltage circuit and includes a positive ion generation part and a negative ion generation part.

[0077] FIG. 9 is a perspective view showing an example of appearance of the ion generation apparatus 204.

[0078] The plurality of ion generation apparatuses 204 are arranged in circular shape centered on the opening part at the center of the partition plate 205 (FIG. 8) and supply sufficientamount of ions to the space 206 (FIG. 8).

[0079] This ion generation apparatus 204 includes a positive ion generation part 204a and a negative ion generation part 204b, and an induction electrode 204c formed with a hole-opening metal plate is arranged such that it is opposite to the positive ion generation part 204a and the negative ion generation part 204b respectively. The positive ion generation part 204a and the negative generation part 204b are discharge electrodes formed in stylus shape respectively, and ions are generated by applying a high voltage between the parts 204a, 204b and the induction electrodes 204c.

[0080] With regard to the hair dryer 20 for commercial use, the necessary function, without making particular changes in each case of the Embodiments 1 and 2, includes a "Warm Air Drying Mode" for heating air to dry hair and a "Cool Air Drying Mode" for drying hair without heating air.

[0081] The effect of readily trimming hair by removing the electrification of hair in the "Warm Air Drying Mode" is expected to be similar in each case of the Embodiments 1 and 2.

[0082] Accordingly, the blower 202, the heating device 203 and the ion generation apparatus 204 are operated in the "Warm Air Drying Mode".

[0083] Additionally, with regard to the "Cool Air Drying Mode", the effect of providing moisture to hair and improving the quality of hair is expected, and the blower 202 and the ion generation apparatus 204 are in operation.

[0084] It is preferable to provide an ion quantity adjusting means for changing the amount of ions as similar in each case of the Embodiments 1 and 2 for adjusting drying conditions differed by the seasons and hair quality.

[0085] In the both operation modes, air is sucked into the plurality of openings 207 arranged at the top part of the dome-shaped enclosure 201 and sent to the space 206 from the gap between the partition plate 205 and the inner wall of the dome-shaped enclosure 201. Generally, the hair dryer for commercial use is provided with a timer device (not shown) for controlling a drying time and with a temperature setting device (not shown) for controlling the degree of heating, which is a well-known matter, therefore, the detailed description is omitted.

(Verification 1)

[0086] The experiments about the variation of moisture amountof hair blown by the air containing positive ions and negative ions generated by the ion generation parts 10a, 10b and the air free of ions were conducted, and the results are explained hereinafter.

(Experimental Method)

<Preparation of Damaged Hair (Human Hair) Sample>

[0087] A 15cm, 2g black hair bundle was soaked in a 1% polyoxyethylene (POE) sodium lauryl sulfate aqueous solution at 30 to 35° C for 1 minute.

[0088] After rinsing the sample with flowing water and wiping off moisture with a towel, the sample was dried by a dryer.

[0089] After the hair was soaked in the mixed solution containing 4.5% hydrogen peroxide and 2.5% ammonia in a ratio of 1:1 for 20 minutes, rinsed with flowing water and wiped off moisture with a towel, the hair was dried by a dryer.

<Ion Irradiation>

[0090] Ions with different concentrationwere irradiated to the hair sample in the room at the temperature of 20 ± 2° C and the humidity of 50 ± 5%.

<Measurement of MoistureAmount>

[0091] 2 g of the hair sample after ion irradiation was taken and heated at the temperature of 65° C for 40 minutes. The total weight decreased during this heating proc-

ess was regarded as moisture amount, and the moisture amount decreased herein was regarded as primarytranspiration moisture.

[0092] Moreover, the hair sample was heated at 180° C for 30 minutes and then the weight was measured. The moisture amountdecreased herein was regarded as secondarytranspiration moisture.

[0093] Based on the obtained value, the secondary transpiration moisture amount (secondary transpiration moisture percentage) relative to the drying weight of hair (the weight of hair after being heated at 180 °C for 30 minutes)was evaluated.

(Experiment 1)

[0094] To achieve the concentration of ions to be irradiated to the hair sample at positive and negative 100,000 ions/cm^3, the hair sample forconducting damage processing was arranged at the position 50 cm away from an ion generation apparatus provided with an ion generating element and a fan for diffusing ions and was irradiated for 8 hours. Since the wind speed at the position of the sample was 0.05 m/s, it was contrasted with natural standing because of the similar condition as no-wind.

[0095] Thus, the measurement result of the variation of moisture amountof hair sample is shown in FIG. 5. The graph shown in FIG. 5 illustrates temporal variations in the moisture amountof hair in contact with the air containing positive and negative ions and in the moisture amount of hair in natural standing with the air containing no ions.

[0096] According to this graph, the hair irradiated with positive and negative ions had a moisture amount of 115.1% as compared with the case prior to performing irradiation, however, the hair irradiated with only wind had a moisture amount of 68.2%. With regard to the hair irradiated with ions, the result of increased moistureamountwas obtained as compared with the hair not irradiated with ions.

(Experiment 2)

[0097] To achieve the concentration of ions to be irradiated to the hair sample at positive and negative 3,000,000 ions/cm^3, the hair sample forconducting damage processing was arranged at the position 10 cm away from an ion generation apparatus provided with an ion generating element and a fan for diffusing ions and was irradiated for 8 hours. Since the wind speed at the position of the sample was 2.9 m/s, it was contrasted with conducting only blowing with a use of same fan.

[0098] Thus, the measurement result of the variation of moisture amount of hair sample is shown in FIG. 6. The graph shown in FIG. 6 illustrates temporal variations in the moisture amount of hair in contact with the air containing positive and negative ions and in the moisture amount of hair in contact with the air containing no ions.

[0099] According to this graph, the hair irradiated with positive and negative ions had a moisture amount of about 113.2 % as compared with the case prior to performing irradiation, however, the hair irradiated with only wind had a moisture amount of 88.3 %. With regard to the hair irradiated with ions, the result of increased moistureamountwas obtained as compared with the hair not irradiated with ions.

(Experiment 3)

[0100] To achieve the concentration of ions to be irradiated to the hair sample at positive and negative 2,000,000 ions/cm^3, the hair sample forconducting damage processing was arranged at the position 15 cm away from an ion generation apparatus provided with an ion generating element and a fan for diffusing ions and was irradiated for 20 minutes. Since the wind speed at the position of the sample was8.4 m/s, it was contrasted with conducting only blowing with a use of the same fan.

[0101] Thus, the measurement result of the variation of moisture amount of hair sample is shown in FIG. 10. The graph shown in FIG. 10 illustrates temporal variations in the moisture amount of hair in contact with the air containing positive and negative ions and in the moisture amount of hair in contact with the air containing no ions.

[0102] According to this graph, the hair irradiated with positive and negative ions had a moisture amount of about 110.4 % as compared with the hair only blown by the air containing no ions. With regard to the hair irradiated with ions, the result of increased moisture amountwas obtained as compared with the hair not irradiated with ions.

Therefore, in the case of hair, it was verified that moisture retention can be achievedregardless of wind speed.

(Verification 2)

[0103] The experiments about the amount of hair damage generation with the air containing positive ions and negative ions generated by the ion generation parts 10a, 10b and the air free of ions were conducted, and the results are explained hereinafter.

(Experimental Method)

<Preparation of Damaged Hair (Human Hair) Sample>

[0104] A 60 cm, 5 g black hair bundle was soaked in a 1% polyoxyethylene (POE) sodium lauryl sulfate aqueous solution at 30 to 35 °C for 1 minute.

[0105] After rinsing the sample with flowing water and wiping off moisture with a towel, the sample was dried by a dryer.

[0106] After the hair was soaked in the mixed solution containing 4.5% hydrogen peroxide and 2.5% ammonia in a ratio of 1:1 for 20 minutes, rinsed with flowing water and wiped off moisture with a towel, the hair was dried

by a dryer.

<Ion Irradiation>

[0107] In the room at the temperature of 20 ± 2 °C and the humidity of 50 ± 5%, the hair sample for conducting damage processing was arranged at the position 15 cm away from an ion generation apparatus provided with an ion generating element and a fan for diffusing ions in order to achieve the concentration of ions to be irradiated to the hair sample at positive and negative 3,000,000 ions/cm^3. The hair sample was brushed with the revolution speed of 100 turns per minute and was irradiated with ions through a hot air (about 125 °C) for 15 minutes. Since the wind speed at the position of sample was 14 m/s to 15 m/s, it was contrasted with conducting only blowing with a use of the same fan.

<Evaluation of the Amount of Hair Damage Generation>

[0108] A hair bundle to which treatment was conducted was observed, and number of pieces of generated split hair and cracked hair was counted.

[0109] Thus, the counting result of the damaged hair generated on the hair sample is shown in FIG. 11. The graph shown in FIG. 11 illustrates the number of pieces of split hair and cracked hair generated on the hair in contact with the air containing positive and negative ions as well as the hair in contact with the air containing no ions. According to this graph, the number of pieces of split hair or cracked hair on the hair irradiated with positive and negative ions is halved approximately as compared with the hair in contact with the air containing no ions. The hair irradiated with ions attained the effect of suppressing damage as compared with the hair not irradiated with ions.

[0110] The above-mentioned effectis capable of neutralizing a brush carried with a negative charge and a brush carried with a positive charge to reduce friction during brushing because the method for humidifying hair and reducing hair damagenot only provides moisture to hair and enhances hair strengthbut also generates positive and negative ions.

[0111] The method and the apparatus for humidifying hair and reducing hair damage related to the present invention are capable of conducting water retention to hair safely and easily along with reducing damage during brushing by applying to a hair dryer for commercial use utilized in a hand dryer and a hair dresser salon without using medicine and steam.

[Industrial Applicability]

[0112] The present invention is applicable to the method and the apparatus for humidifying hair and reducing hair damage that are utilized for humidifying hair and reducing hair damage for readily improving humidification of hair and damage of hair using both positive ions and negative ions as well as reducing hair injury such as serious split hair or cracked hair, which easily occurs at the time of drying and stylingwashed hair.

Claims

1. A method for humidifying hair and reducing hair damage, comprising:

   preparing a positive ion generation means for discharging electricity by the application of voltageto generate positive ions combined to water molecules and a negative ion generation means for discharging electricity by the application of voltageto generate negative ions combined to water molecules; and
   humidifying hair and reducing damage occurring in hair by irradiating the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means to hair.

2. The method for humidifying hair and reducing hair damage according to Claim 1,
   whereinthe positive ion is $H^+(H_2O)_m$ (m is an arbitrary natural number), and the negative ion is $O_2^-(H_2O)_n$ (n is an arbitrary natural number).

3. The method for humidifying hair and reducing hair damage according toClaim 1 or 2, further comprising:

   preparing an air blowing mechanism for blowing air including the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means; and
   blowing air from the air blowing mechanism.

4. An apparatus for humidifying hair and reducing hair damage, comprising:

   a positive ion generation means for discharging electricity by the application of voltage to generate positive ions combined to water molecules; and
   a negative ion generation means for discharging electricity by the application of voltage to generate negative ions combined to water molecules,
   wherein hair is irradiated with the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means.

5. The apparatus for humidifying hair and reducing hair damage according to Claim 4,

whereinthe positive ion is $H^+(H_2O)_m$ (m is an arbitrary natural number), and the negative ion is $O_2^-(H_2O)_n$ (n is an arbitrary natural number).

6. The apparatus for humidifying hair and reducing hair damage according to Claim 4 or 5,
whereinthe positive ion generation means and the negative ion generation means are capable of changing the amount of positive ions and negative ions to be generated respectively.

7. The apparatus for humidifying hair and reducing hair damage according to any one of Claims 4 to 6, further comprising:

an air blowing mechanism for blowing air including the positive ions and negative ions generated respectively by the positive ion generation means and the negative ion generation means.

8. The apparatus for humidifying hair and reducing hair damage according to Claim 7,
whereinthe air blowing mechanism blows air at a wind speed not more than 15 m/s to an object to be blown.

9. The apparatus for humidifying hair and reducing hair damage according to Claim 7 or 8, further comprising:

a heating means for heating air blown from the air blowing mechanism.

FIG. 1

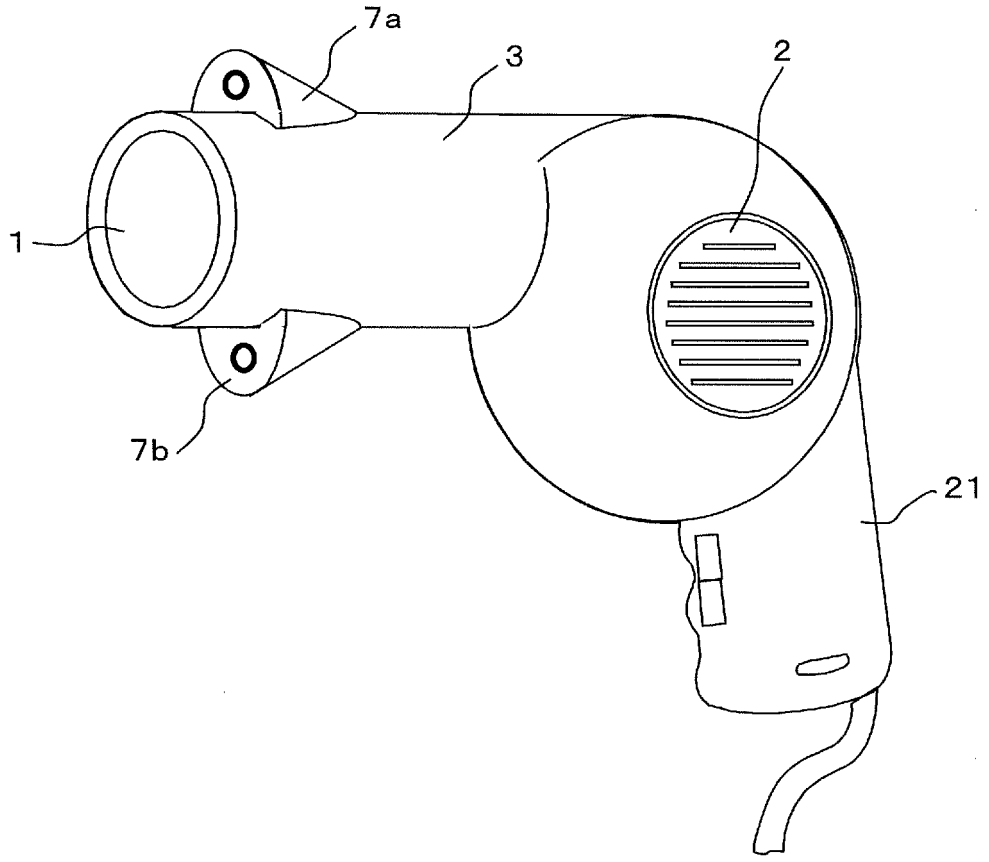


FIG. 2

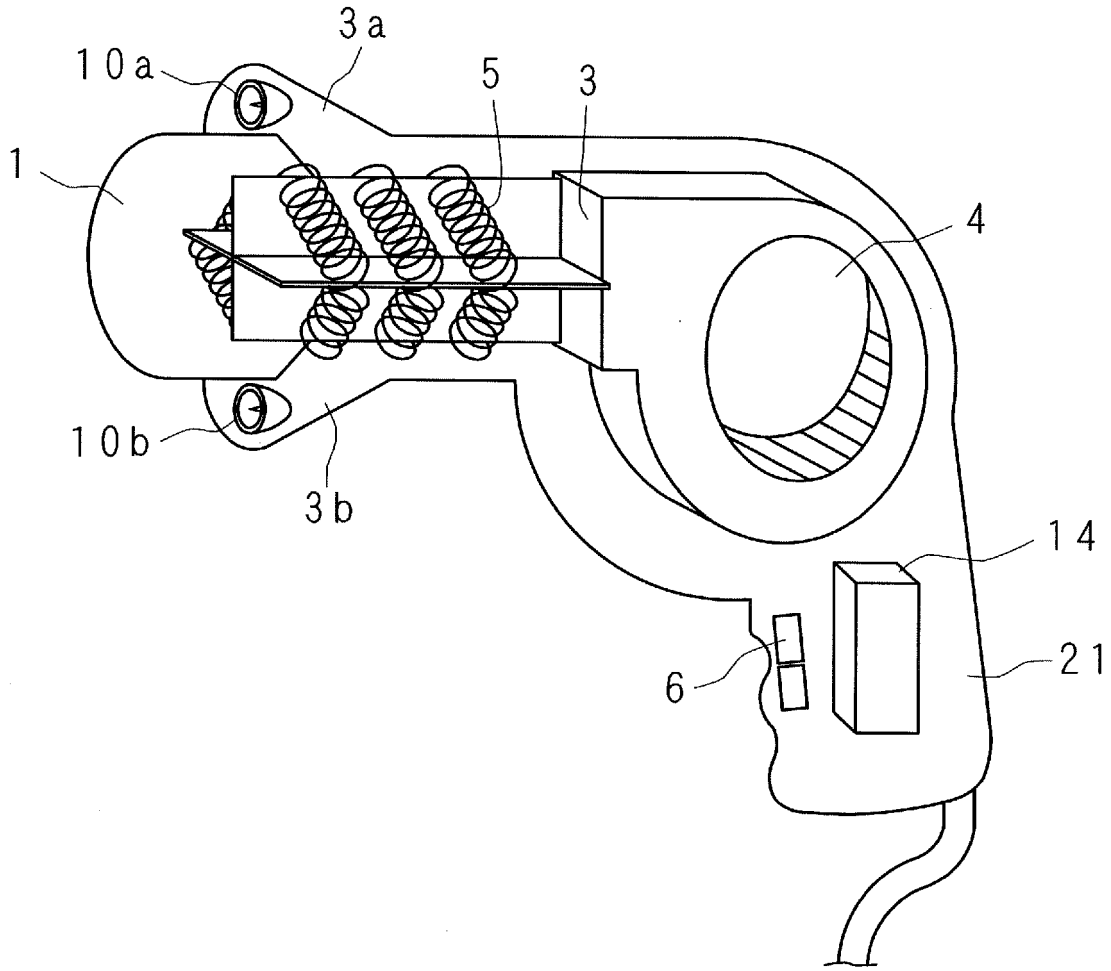


FIG. 3

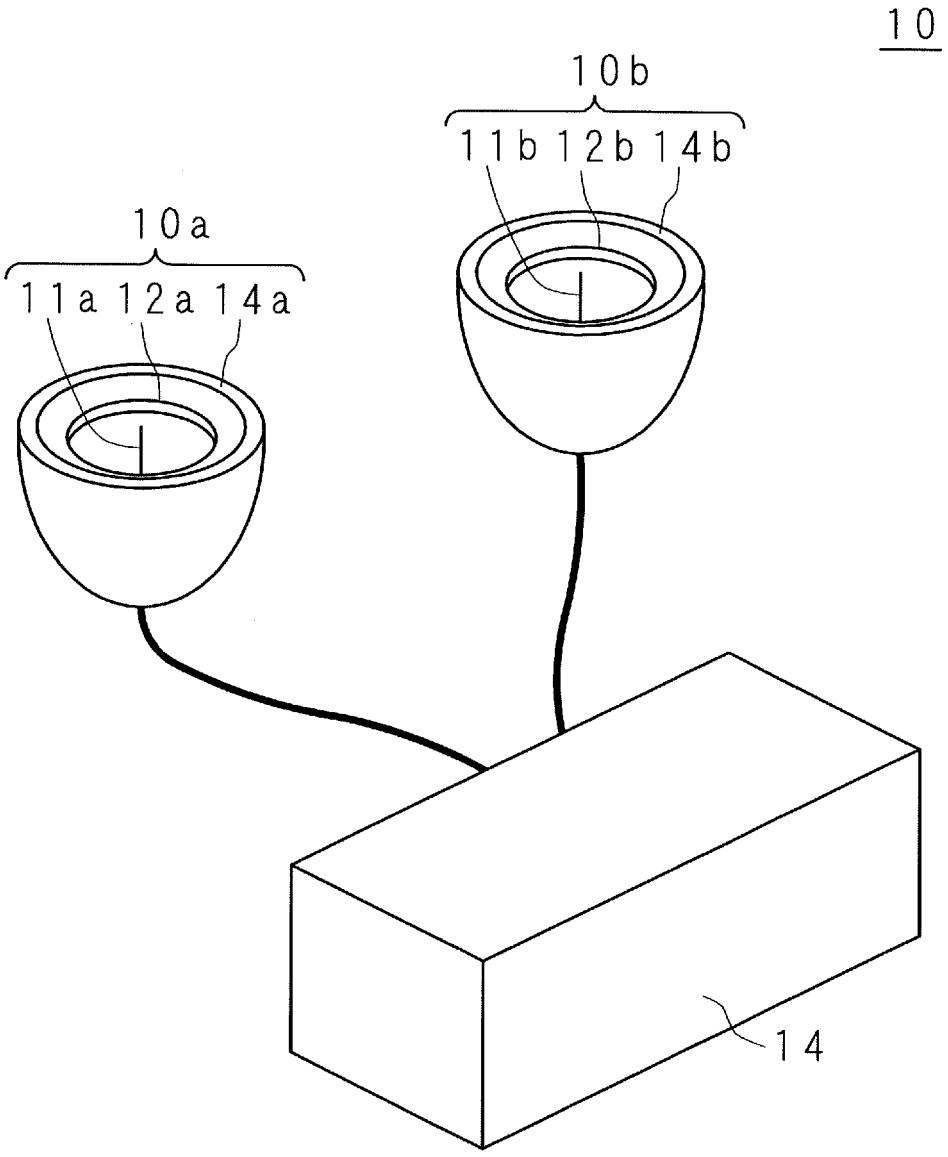


FIG. 4

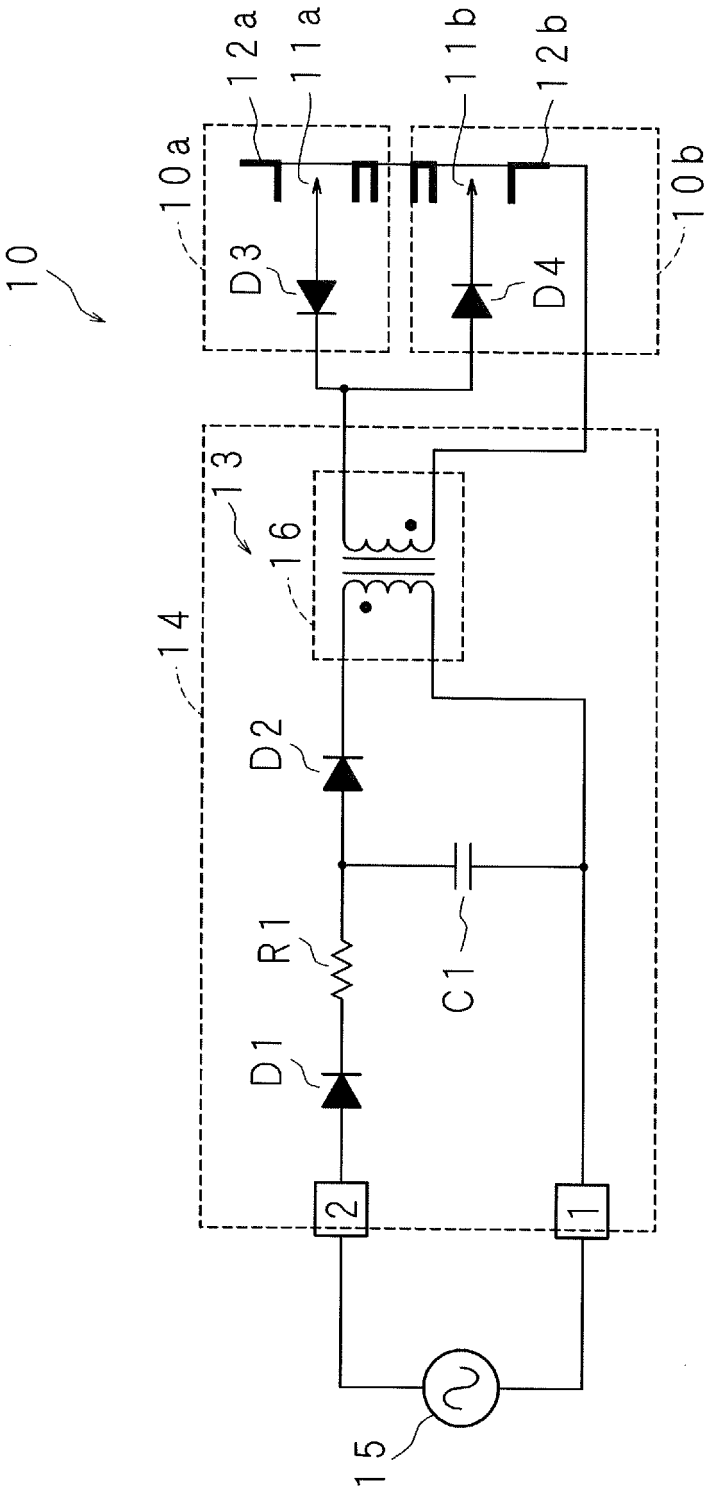


FIG. 5

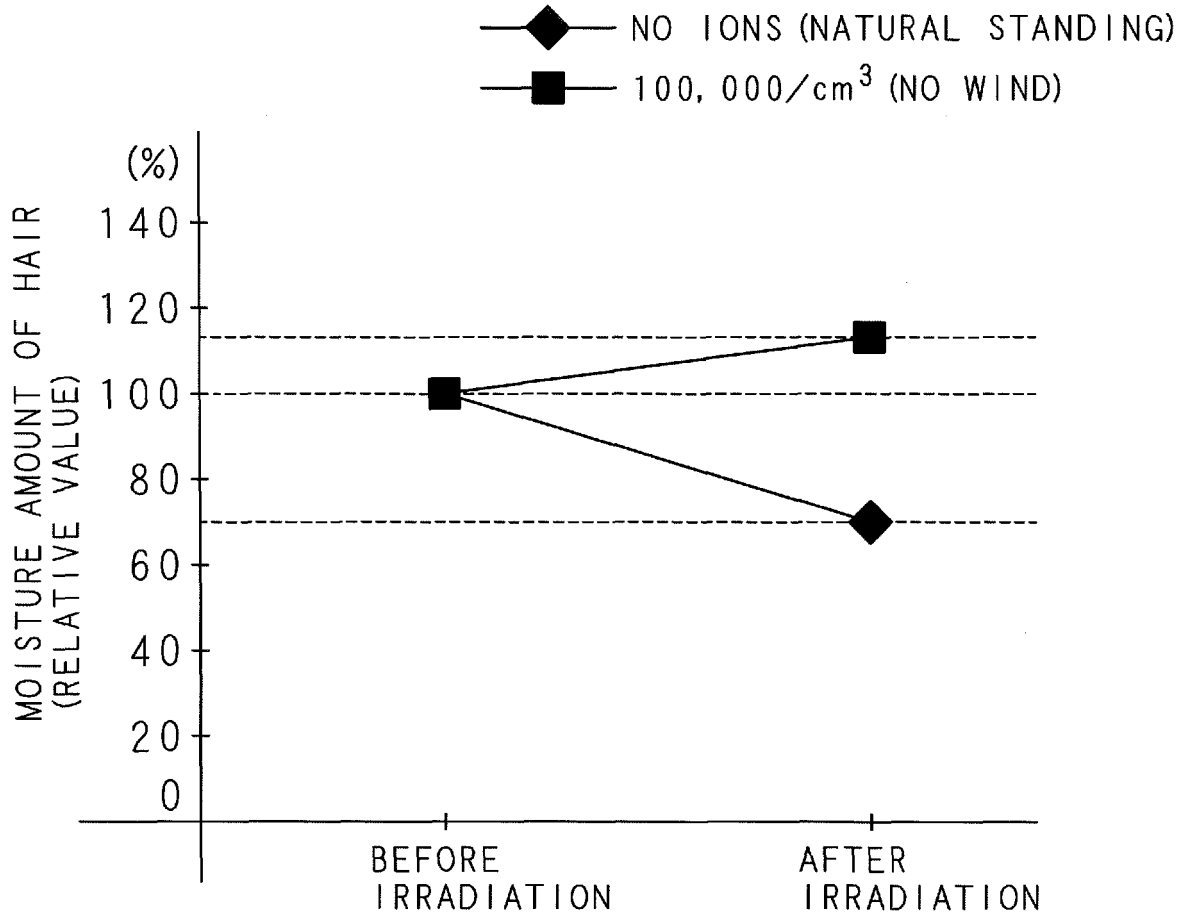

NO IONS (NATURAL STANDING)
100, 000/cm3 (NO WIND)
MOISTURE AMOUNT OF HAIR (RELATIVE VALUE)
(%)
140
120
100
80
60
40
20
0
BEFORE IRRADIATION
AFTER IRRADIATION

FIG. 6

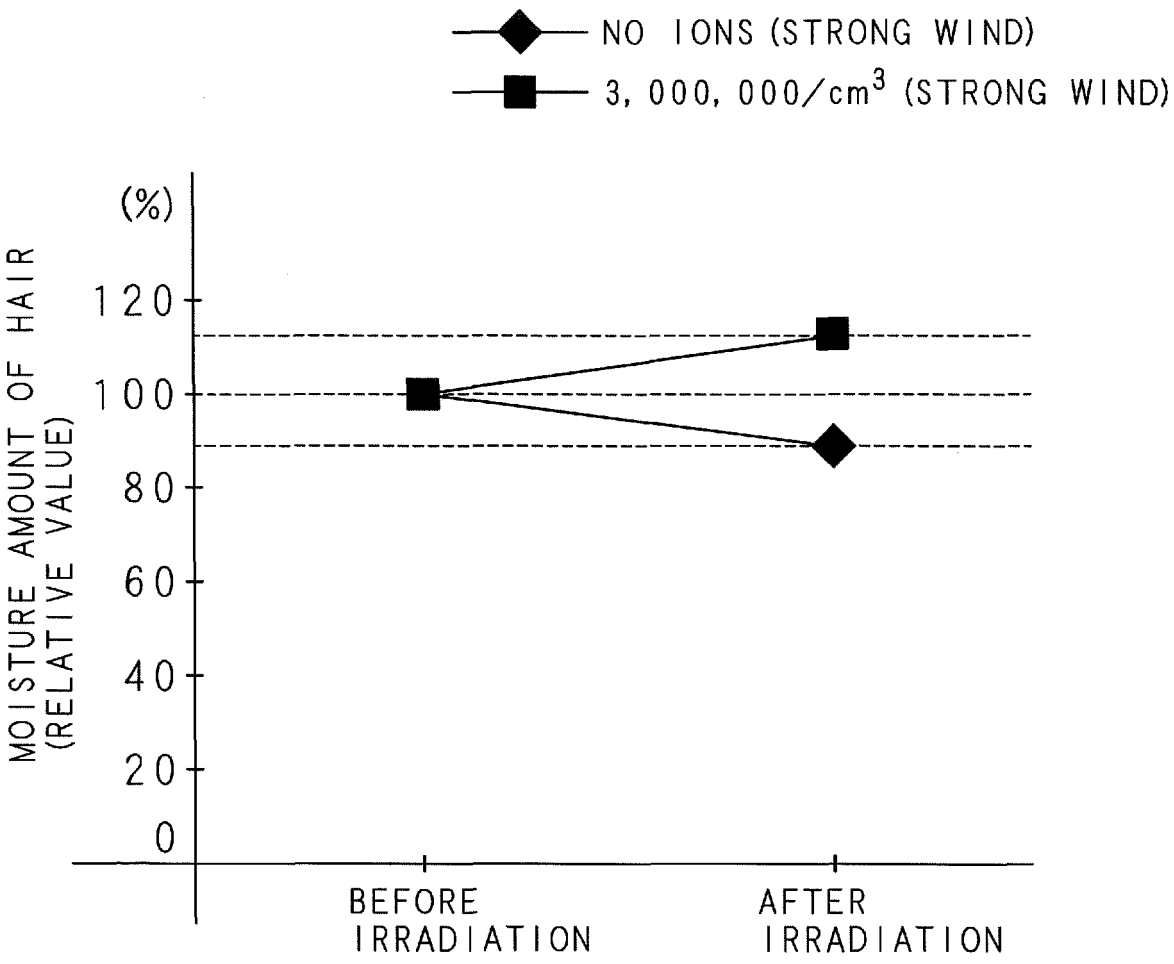

NO IONS (STRONG WIND)
3, 000, 000/cm3 (STRONG WIND)
MOISTURE AMOUNT OF HAIR (RELATIVE VALUE)
(%)
120
100
80
60
40
20
0
BEFORE IRRADIATION
AFTER IRRADIATION

FIG. 7

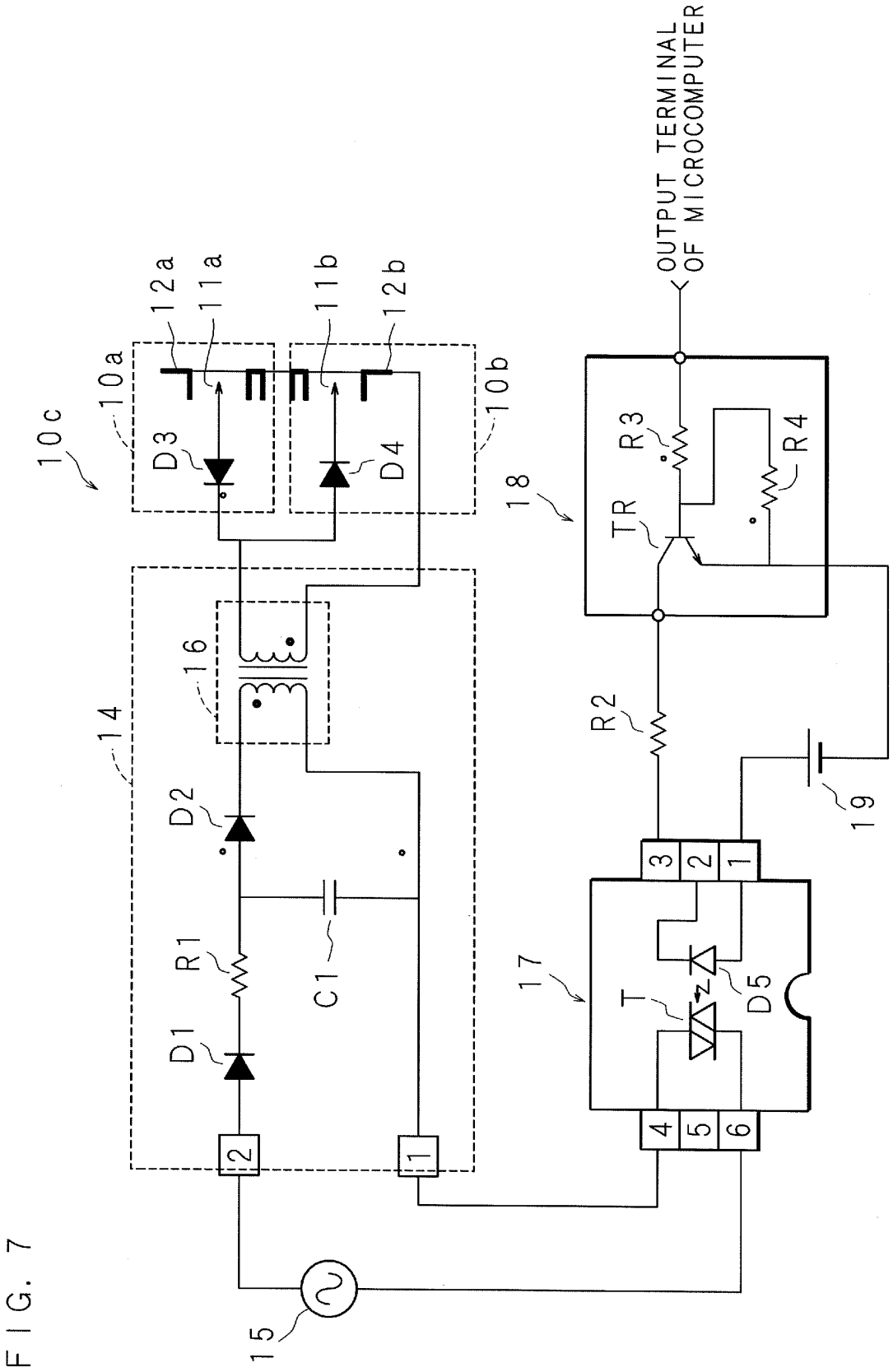

OUTPUT TERMINAL OF MICROCOMPUTER
10c
10a
10b
12a
11a
11b
12b
D3
D4
16
14
D2
R1
C1
D1
18
TR
R3
R4
R2
19
17
T
D5
15
1
2
3
4
5
6

FIG. 8A

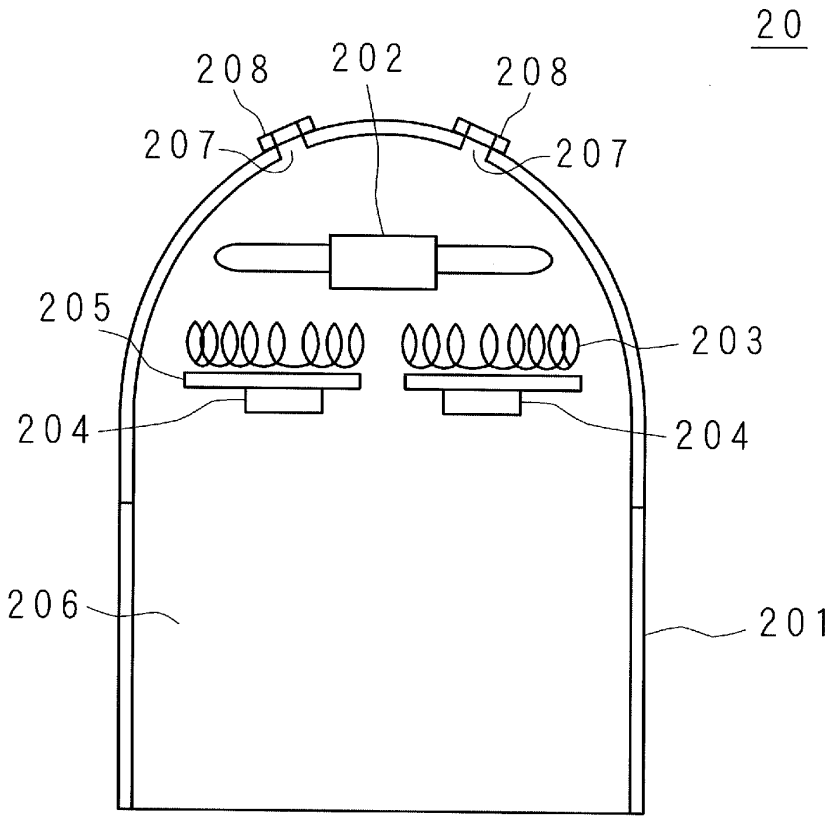


FIG. 8B

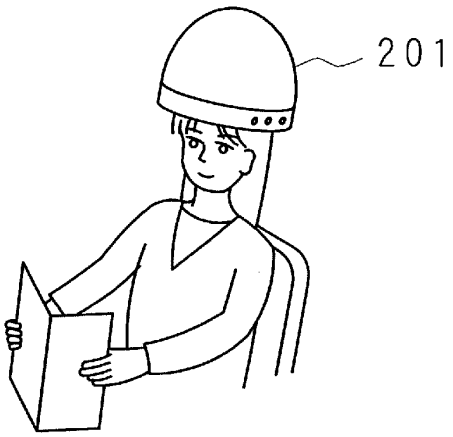


FIG. 9

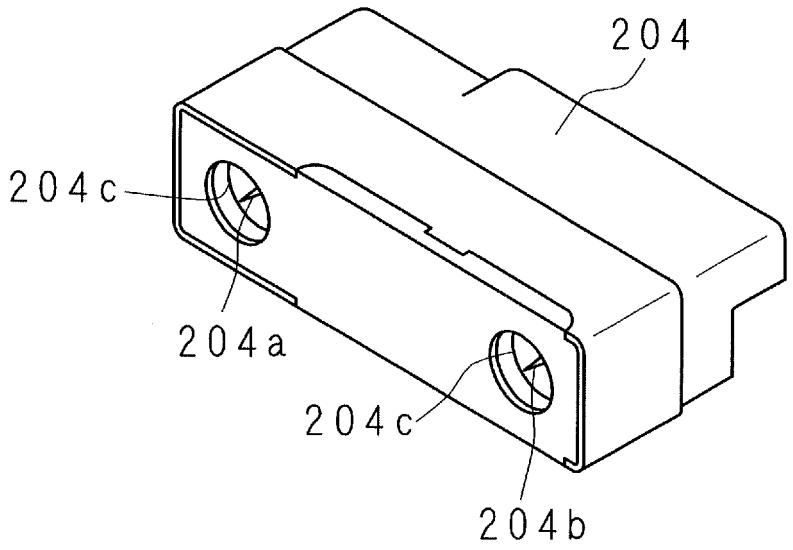


FIG. 10

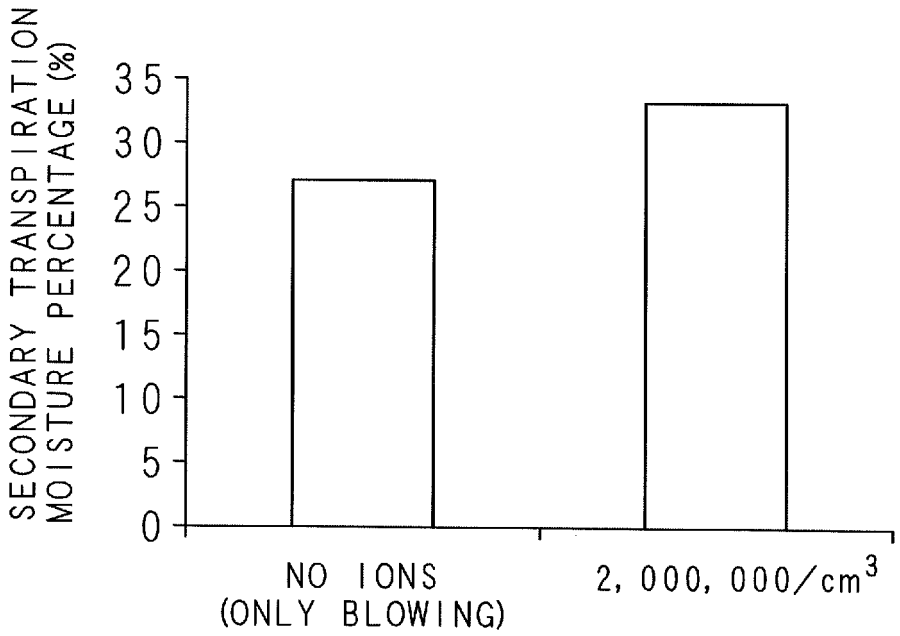
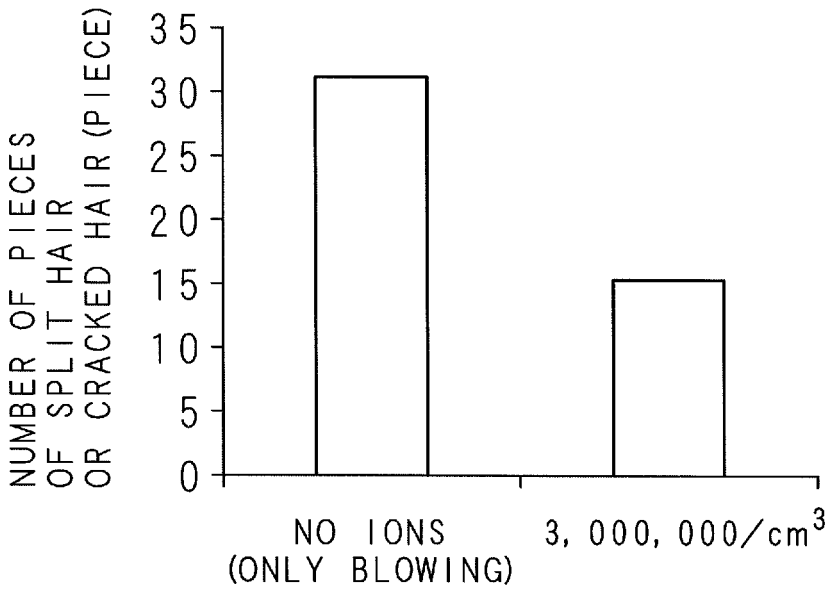

SECONDARY TRANSPIRATION MOISTURE PERCENTAGE (%)
35
30
25
20
15
10
5
0
NO IONS (ONLY BLOWING)
2,000,000/cm3

FIG. 11


NUMBER OF PIECES OF SPLIT HAIR OR CRACKED HAIR (PIECE)
35
30
25
20
15
10
5
0
NO IONS (ONLY BLOWING)
3,000,000/cm3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/060316

A. CLASSIFICATION OF SUBJECT MATTER
A45D20/10(2006.01)i, *A45D1/00*(2006.01)i, *A45D20/12*(2006.01)i, *A45D20/22*(2006.01)i, *A45D20/42*(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)
A45D20/10, A45D1/00, A45D20/12, A45D20/22, A45D20/42

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 1996-2012
Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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.
A	JP 2011-5149 A (Panasonic Electric Works Co., Ltd.), 13 January 2011 (13.01.2011), paragraphs [0056], [0057]; fig. 1 (Family: none)	1-9
A	JP 2008-49101 A (Nihon Seimitsu Co., Ltd.), 06 March 2008 (06.03.2008), paragraphs [0014] to [0017]; fig. 2 (Family: none)	1-9
A	JP 2009-136548 A (Panasonic Electric Works Co., Ltd.), 25 June 2009 (25.06.2009), paragraphs [0032], [0033] (Family: none)	9

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

* Special categories of cited documents:
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"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
13 July, 2012 (13.07.12)	24 July, 2012 (24.07.12)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003275011 A **[0008]**
- JP 2004055351 A **[0008]**
- JP 2008049101 A **[0008]**