

DESCRIPTION

TITLE OF INVENTION

Hair Dryer

5

TECHNICAL FIELD

[0001] The present invention relates to a hair dryer by which hair can be dried and set with hot air blown therefrom and by which hair can be given a treatment with
10 air containing ions blown therefrom.

BACKGROUND ART

[0002] Conventionally, hair dryers have been used by which not only drying, set and the like of hair with hot
15 air blown therefrom but also treatment of hair with air containing ions blown therefrom can be performed.

[0003] In Patent Literature 1, for instance, a hair dryer is disclosed that has a fan for blowing, an ion generator for generating ions, a heater, and the like in a
20 housing. By the hair dryer, hair is dried with air blown from the fan and heated by the heater and with the heated air delivered through an air discharge port of the housing to outside. In this process, the hair may be electrified by brushing or the like. Therefore, the ion generator is
25 placed downstream of the fan, and static electricity

generation is prevented by ionic wind generated thereby and blown against the hair.

CITATION LIST

5 Patent Literature

[0004] PTL1: JP 2002-191426 A

SUMMARY OF INVENTION

Technical Problem

10 [0005] Conventional hair dryers have a problem in that static electricity is generated by rotation of a fan and in that adhesion of dust is caused by resultant electrification. This leads to further problems including fear of fire that may be caused by lumps of the dust having
15 adhered onto the fan, flowing downstream, adhering onto a heater, and discharging electricity, and adhesion of the lumps of the dust onto hair.

[0006] The hair dryers lack such configurations as facilitate replacement, maintenance and the like of an ion
20 generator.

[0007] The invention was made in consideration of above problems, and an object of the invention is to reduce dust that adheres to a fan, with use of ions generated by an ion generator or water molecules bonded to the ions. Another

object of the invention is to facilitate replacement, maintenance, and the like of the ion generator.

Solution to Problem

5 [0008] A hair dryer in accordance with the invention has a housing, a fan placed in the housing, a heater placed in the housing, an ion generator placed upstream of the fan in the housing, and an air intake filter placed upstream of the fan and mounted on the housing.

10 [0009] The ion generator may be placed between the fan and the air intake filter.

 [0010] The housing may have a plurality of air flow paths therein, and the air flow paths may include an air flow path in which the heater is placed and an air flow
15 path in which the heater is not placed.

 [0011] The air flow path in which the heater is not placed and the ion generator may be arranged substantially in parallel to each other, with the fan between the air flow path and the ion generator.

20 [0012] The air intake filter may be detachable from the housing.

 [0013] A back cover may be attached to the housing, and the back cover may be detachable from the housing.

[0014] The ion generator may have an ion generating unit for generating positive ions and an ion generating unit for generating negative ions.

[0015] The ion generator may generate ions bonded to
5 water molecules.

Advantageous Effects of Invention

[0016] The hair dryer in accordance with the invention reduces dust that adheres to the fan, with use of the ions
10 generated by the ion generator or the water molecules bonded to the ions. The hair dryer also facilitates replacement, maintenance, and the like of the ion generator.

15 BRIEF DESCRIPTION OF DRAWINGS

[0017] Fig. 1 is a transparent side view of a hair dryer in accordance with Embodiment 1 of the invention;

Fig. 2 is a transparent rear view of the hair dryer in accordance with Embodiment 1 of the invention;

20 Fig. 3 is a perspective view showing an example of an appearance of an ion generator;

Fig. 4A is a diagram showing an example of a position of the ion generator in accordance with Embodiment 1 of the invention;

Fig. 4B is a diagram showing an example of a position of the ion generator in accordance with Embodiment 1 of the invention;

5 Fig. 4C is a diagram showing an example of a position of the ion generator in accordance with Embodiment 1 of the invention;

Fig. 5 is a front view of a hair dryer in accordance with Embodiment 2 of the invention;

10 Fig. 6 is a transparent side view of a hair dryer in accordance with Embodiment 4 of the invention;

Fig. 7A is a perspective view showing an appearance on blow-off side of an example of a fan;

Fig. 7B is a perspective view showing an appearance on intake side of the example of the fan;

15 Fig. 8 is a transparent side view of a hair dryer in accordance with Embodiment 5 of the invention;

Fig. 9A is a perspective view of a hair dryer in accordance with Embodiment 6 of the invention, the perspective view for illustrating detachment of an air
20 intake filter from a housing;

Fig. 9B is a perspective view of the hair dryer in accordance with Embodiment 6 of the invention, the perspective view for illustrating detachment of the ion generator from the housing; and

Fig. 10 is a transparent side view of a hair dryer in accordance with Embodiment 7 of the invention.

DESCRIPTION OF EMBODIMENTS

5 [0018] Hereinbelow, embodiments of the invention will be described with reference to drawings.

[Embodiment 1]

[0019]

10 (Configuration of Dryer)

Fig. 1 is a transparent side view showing an inner configuration of a hair dryer in accordance with Embodiment 1 of the invention, and Fig. 2 is a transparent rear view thereof.

15 [0020] In the hair dryer 1, exterior is composed of a housing 2, an air intake filter 3 on air-intake side in the housing 2, a handle 4 fixed to the housing 2, and a nozzle 13. The housing 2, the air intake filter 3, the handle 4, and the nozzle 13 may integrally be formed.

20 [0021] Provided inside the housing 2 are an ion generator 5 for generating ions, a fan 6 for blowing air, a motor and interconnections, not shown, for driving the fan 6, a partition plate 10, and a heater 11.

[0022] Herein, a side (right side in Fig. 1) in the
25 housing 2 nearer to the air intake filter 3 than the fan 6

is designated as upstream side, and a side (left side in Fig. 1) in the housing 2 nearer to a discharge port 12 than the fan 6 is designated as downstream side. Being on the upstream side, concerning air flow, of a part as reference is expressed as "being located upstream" or the like. For instance, the fan 6 is located upstream of an air flow path 7.

[0023] The housing 2, which will be described below, is made of plastic and has mica films stuck on inside thereof, so that heat resistance thereof is increased. The inside of the housing 2 is formed of a cavity so as to allow air to flow therethrough. One end of the housing 2 is an inflow port of air on which the air intake filter 3 is mounted, and the other end is the discharge port 12 through which the air is discharged, with the air flow path 7 extending therebetween. In most cases, a filter commonly made of metal is mounted on the discharge port 12.

[0024] The air intake filter 3 is made of metal or plastic, and holes are made thereon so as to form a reticulated or latticed pattern. The air intake filter 3 plays a role of protection so as to prevent entrance of large foreign objects such as dust and so as to prevent accidental contact of a finger or the like with the fan 6 during operations. The air intake filter 3 is attached to the housing 2 so as to be detachable from the housing 2.

[0025] The handle 4 is made of plastic, and a switch 14 is provided thereon. Once the hair dryer 1 is brought into an activated state by an operation of the switch 14 on the handle 4, the ion generator 5, the fan 6, and the heater 11 are activated. By the operation of the switch 14, switching can be carried out among modes corresponding to applications, such as strong and hot airflow mode suitable for drying hair, moderate and hot airflow mode suitable for styling, and blow mode for simply blowing air, for instance. The heater 11 is not activated in the blow mode.

[0026] The ion generator 5 is placed on the upstream side in the housing 2 and, specifically, is placed between the air intake filter 3 and the fan 6. The ion generator 5 is placed above center axis of the fan 6. The ion generator 5 generates ions and may simultaneously generate ions in a state in which the ions are bonded to water molecules. The ions and the water molecules bonded to the ions exercise effects of static elimination, moisturization and the like for the hair.

[0027] The fan 6 takes air into the housing 2 through the air intake filter 3 and discharges the air to outside through the discharge port 12 of the housing 2. The fan 6 is made of polypropylene. The air blown from the fan 6 passes through the air flow path 7. The air flow path 7 is partitioned into an upper air flow path 8 and a lower air

flow path 9 by the partition plate 10 made of mica. The air flowing through the lower air flow path 9 is heated by the heater 11 and the resultant hot air is discharged to the outside. The air flowing through the upper air flow path 8 is discharged without being passed through the heater 11 and being modified. The air having flowed through the upper and lower air flow paths comes out of the discharge port 12 and is discharged to the outside through extremity of the nozzle 13.

[0028] With such blow of mixture of the hot air and the normal air (cool air), unruly hair can be straightened with bonds of hydrogen in the hair cut by heat of the hot air and can be held in such a straightened state because the bonds of the hydrogen in the hair are redeveloped upon application of the cool air immediately after that, so that styling of the hair can be improved.

[0029] The nozzle 13 is made of plastic and has a trapezoidal shape in section with a wide end on a side facing the discharge port and a narrow end on the other side. The nozzle 13 rectifies the air discharged from the discharge port 12 so as to prevent the air from being diffused.

[0030] As in the embodiment, air intake area of the air intake filter 3 is preferably larger than inside dimensions

of the air flow path 7. This makes it possible to blow the air at higher velocity to the outside of the hair dryer 1.

(Ion Generator)

5 Subsequently, the ion generator 5 will be described in detail.

[0031] Fig. 3 is a perspective view of the ion generator 5. The ion generator 5 has two ion generating units formed of a needle electrode 15 and an induction electrode 16. In
10 the ion generating units, the needle electrode 15 is pointed in shape of a needle and the circular induction electrode 16 is placed so as to enclose the needle electrode 15, with distance between both the electrodes being 8 mm.

15 [0032] The ions are generated by application to the needle electrode 15 of a 60Hz alternating current in which a voltage of +2kV or greater in effective voltage and voltage of 0V are alternated and by application to the induction electrode 16 of a direct current with voltage of
20 0V, for instance. When the effective voltage of +2kV or greater is applied to the needle electrode 15, potential difference between the needle electrode 15 and the induction electrode 16 causes corona discharge, which leads to ionization of water molecules in the air in vicinity of
25 extremity of the needle electrode 15, resulting in

production of hydrogen ions (H^+). The hydrogen ions form bonds (clustering) with water molecules in the air, in group state, and positive ions made of $H^+(H_2O)_m$ (m is an arbitrary natural number) are thereby generated.

5 [0033] Negative ions are produced by application to the needle electrode 15 of a 60Hz alternating current in which a voltage of -2kV or lower in effective voltage and voltage of 0V are alternated and by application to the induction electrode 16 of a direct current with voltage of 0V. As
10 the negative ions, oxygen ions O_2^- are produced by ionization of oxygen molecules or water molecules in the air. The oxygen ions form bonds (clustering) with water molecules in the air, and negative ions made of $O_2^-(H_2O)_n$ (n is an arbitrary natural number) are thereby generated. In
15 the invention, the ion generator may generate ions that are not to be bonded to water molecules.

[0034] Herein, the ion generator 5 has the two ion generating units and the ion generating units respectively form a positive ion generating unit and a negative ion
20 generating unit. Thus the positive ions and the negative ions are simultaneously discharged and flow downstream with the air flow produced by the fan 6.

[0035] As shown in Fig. 3, the ion generator 5 is provided so that the ion generating units are arranged side
25 by side. The electrodes 15 and 16 are placed on a side

nearer to the fan 6. Intrinsically, placement in a direction such that the electrodes 15 and 16 are perpendicular to the air flow is preferable. This is because the ion generator has a laterally long ion generating surface having the electrodes thereon and has a great depth in the direction of extension of the needle electrode 15, as shown in Fig. 3, and because such a position as obstructs intake port (air intake filter 3) is undesirable.

[0036] Figs. 4A through 4C are diagrams showing positions of the ion generator 5 that can be assumed in the invention, and quantities of generated ions coming out of the discharge port 12 were measured under conditions of the three positions shown in Figs. 4A through 4C. The quantities of generated ions are shown in Table 1.

[0037] On condition that the electrodes of the ion generator 5 were provided so as to extend in a direction orthogonal to direction, shown by an arrow, of the air flow as shown in Fig. 4A, 950,000 to 1,200,000 ions/cc were discharged as shown in Table 1 and concentration of the ions in the blown air was the greatest. Herein, experiments were carried out under two conditions, i.e., a condition (NORMAL) with normal quantity of air blow and a condition (TURBO) with large quantity of air blow (air blow at high velocity). Though the electrodes are in a downward

position in the drawing, almost the same results are attained in an upward position.

[0038] In Fig. 4B, the electrodes are placed leeward with respect to the direction of the air. Under the
5 condition, 900,000 to 1,100,000 ions/cc, that is, practically nonproblematic quantities of ions, were discharged through the discharge port 12.

[0039] In Fig. 4C, the electrodes are placed windward with respect to the direction of the air. Under the
10 condition, 950,000 to 1,050,000 ions/cc, that is, practically nonproblematic quantities of ions, were discharged through the discharge port 12.

[0040]

[Table 1]

Ion Generator	Quantity of Air Blow	Ion Concentration (Unit: 10,000 ions/cc)	
		Positive Ion	Negative Ion
Fig. 4A	NORMAL	95	110
	TURBO	110	120
Fig. 4B	NORMAL	90	110
	TURBO	100	100
Fig. 4C	NORMAL	95	95
	TURBO	105	100

15 [0041] Thus a sufficient quantity of discharged ions can be obtained from the electrodes in any position, and such positions as in Fig. 4B or 4C are preferably attained so as to prevent decrease in the quantity of air blow that might be caused by the obstruction on the air intake port by the
20 ion generator 5. The position of Fig. 4B that resists

direct adhesion of dust onto the electrodes is particularly preferable.

[0042] It is preferable that number of discharged negative ions should be generally equal to or larger than number of discharged positive ions. Balancing the number of the positive ions with the number of the negative ions increases a probability that OH radicals are generated. On condition that the numbers are imbalanced, it is preferable that the number of the negative ions should be the greater because occurrence of creakiness, damages and the like can be prevented on the hair, which is positively electrified.

[0043] Hair dryers in which conventional ion generators are installed have a defect of insufficient air supply to hair due to low quantity of air blow because the ion generators are provided in dedicated channels which are so thin that the quantity of air blow is confined as disclosed in Patent Literature 1. In such a configuration as disclosed in Patent Literature 1, in which air intrinsic to the dryer is hot and dominant in quantity, users are often unable to be aware whether air that comes out of the channel dedicated to ions and that is inferior in quantity actually reaches their hair and the air often misses reaching the hair, in actual fact. In such a configuration as in the invention, however, in which air common to air for other purposes is used in place of the air dedicated to

ions, users are able to be aware whether the ion wind actually reaches their hair. Therefore, the dryer therewith can be used while accumulated ions are adequately blown against the hair and a scalp, and achievement of the effects of the ions is thereby facilitated.

[0044] Increase in the quantity of air blow makes it possible to effectively discharge the generated ions from the hair dryer to the outside, as apparent from Table 1, and thus more intense effects can be achieved when strong air blow as in hair salons is used to dry hair, so that effects that are similar to those of blow in hair salons, i.e., moisturization, prevention of creakiness and damages, and the like can be obtained in homes.

[0045] The ions blown downstream are passed through the discharge port 12 and the nozzle 13 and are blown against the hair. Hair is prone to be positively electrified by brushing, and thus prevention of static electricity generation and cure for damages to the hair can be attained by the negative ions. On the other hand, prevention of static electricity generation in a brush negatively electrified and cure for damages to the hair can be attained by the positive ions. With the application to the hair of the ions bonded to water molecules, furthermore, moisture can be made to permeate the hair by the small

water molecules of nano-level or micro-level, so that the hair can be made moist.

[0046] With use of the ion generator 5 of the embodiment, the positive ions and the negative ions adhere
5 onto the scalp and both react together to produce OH radicals. The OH radicals oxidize residue of shampoo, rinse and/or the like remaining on the scalp and preventing hair growth and cut double bonds. This helps formation of a scalp optimum for hair growth. OH radicals are so
10 instable that the radicals can exist only for a period on the order of nanoseconds. If OH radicals are produced by the ion generator 5, therefore, the OH radicals disappear before reaching the scalp. The OH radicals, however, can effectively be produced by the production of the positive
15 ions and the negative ions by the ion generator and the reaction between both on the scalp, as in the embodiment. OH radicals also have an effect of disinfection and deodorization.

[0047] In the embodiment, the ions generated by the ion
20 generator 5 are sucked into the fan 6. On the fan 6, rotating at high velocity, static electricity is generated by friction with air and dust is thereby made prone to adhere thereto. In particular, small pieces of dust passing through the air intake filter 3 are easily
25 attracted by the static electricity. With the ion

generator 5 placed on the upstream side that is between the
air intake filter 3 and the fan 6 as in the embodiment,
however, such electrification of the fan 6 is relieved by
the ions generated by the ion generator 5, so that the
5 adhesion of the dust onto the fan 6 can be reduced. Thus
the fan 6 can be kept clean. In addition, problems can be
prevented that include fear of fire which might be caused
by lumps of the dust having adhered onto the fan 6, flowing
downstream, adhering onto the heater, and discharging
10 electricity, and adhesion of the lumps of the dust onto the
hair.

[0048] With use of the fan 6 that is made of
polypropylene or polycarbonate and that is accordingly
prone to be negatively electrified, for instance, the
15 electrification is prevented by air containing the positive
ions, so that the dust adhesion caused by the static
electricity can be reduced. Components that can be
prevented from being electrified in the embodiment are not
limited to the fan 6. The mica films inside the housing 2
20 and a plate onto which the heater is commonly tied are made
of mica and are prone to be positively electrified, whereas
air containing the negative ions prevents the films and the
plate from being electrified and reduces the dust adhesion
caused by the static electricity. With use of the ions
25 bonded to the water molecules as in the embodiment, the

static electricity generation can be suppressed by the water molecules.

[0049] Though use of only negative ions or only positive ions may cause electrification of the filter provided on the discharge port 12 and makes it difficult to discharge the ions, such a phenomenon can be prevented by both the positive ions and the negative ions.

[0050] The ion generator 5 is placed in a position remote from the heater 11 and thus can be prevented from malfunctioning or breaking down because of heat from the heater 11.

[0051] On condition that a propeller fan or the like for blowing swirl air flow is used as the fan 6 and that the ion generator 5 is placed downstream of the fan 6, a problem is caused in that delivery of the swirl air flow immediately after the generation of the ions causes neutralization of the positive ions and the negative ions and thereby reduces the quantity of the ions discharged to the outside of the hair dryer 1. With the placement upstream of the fan 6 as in the embodiment, however, comparatively parallel air flow impinges upon the ion generator 5, so that the neutralization immediately after the generation of the ions is prevented. Once the air is blown in a state in which the positive ions and the negative ions are separated from each other, the separated

state continues and resists the neutralization, even if the air thereafter changes into the swirl air flow, and the quantity of the ions discharged to the outside of the hair dryer 1 is thereby increased.

5 [0052] The ion generating unit for the positive ions and the ion generating unit for the negative ions in the ion generator 5 are preferably placed at a distance on the order of a half of diameter of the fan from each other. It is particularly preferable that the ion generating unit for
10 the positive ions and the ion generating unit for the negative ions in the ion generator should be placed at a distance of about 20 mm or longer from each other in a direction orthogonal to the direction of the air flow. This reduces the neutralization of the positive ions and
15 the negative ions immediately after the generation of the ions.

 [0053] In a configuration in which an ion generator making use of water molecules in air is used as in the embodiment, effective use of the water molecules in the air
20 and generation of a large quantity of ions and a large quantity of ions bonded to the water molecules can be attained by the placement of the ion generator on the air-intake side (upstream side) into which a large quantity of air is taken, rather than such placement in the narrow air
25 flow path as in Patent Literature 1. This increases the

effect of preventing the static electricity generation on the fan 6 and the like and the effect of preventing the static electricity generation on the hair.

[0054] The air flow path 7 partitioned into the upper and lower paths as in the embodiment, which makes it possible to discharge through the discharge port 12 the ions not passing through the heater 11, is effective in that breakage in water molecules by heat can be prevented particularly in use of the ions bonded to the water molecules. In particular, it is effective to place the upper air flow path 8 and the ion generator 5 substantially in parallel to each other as in the embodiment in that more ions can be blown through the upper air flow path 8 to the outside of the hair dryer 1.

[Embodiment 2]

[0055] Fig. 5 is a front view of a hair dryer in accordance with Embodiment 2 of the invention. In Embodiment 2, the air flow path 7 is not only partitioned into the upper air flow path 8 and the lower air flow path 9 by the partition plate 10, but the upper air flow path 8 is separated into an upper left air flow path 8a and an upper right air flow path 8b. Other components thereof are the same as those of Embodiment 1. In such a configuration, only with a change in shape of the partition

plate 10, mixture of the positive ions and the negative ions, generated by the ion generator 5, in the air flow path 7 can be reduced and thus the quantity of the ions discharged to the outside of the hair dryer 1 can be increased. The partition plate 10 may be made of separate members, instead of being integrally formed.

[Embodiment 3]

[0056] In Embodiment 3, the ion generator 5 having only the negative ion generating unit (having no positive ion generating unit) is used in contrast to Embodiments 1 and 2. Used therein is the fan 6 made of polyamide nylon, which is engineering plastic.

[0057] The ion generator 5 with a Peltier element is preferably used therein. The Peltier element, of which a surface on heat absorbing face side undergoes dew condensation because of a difference in temperature from ambience, is capable of attaining effective production of moisture. By provision of a negative potential between facing electrodes with use of the moisture, charged microparticles electrified as negative ions can be produced. Blowing the charged microparticles electrified as the negative ions (negative ions bonded to water molecules) against hair prevents the static electricity generation and provides the hair with a sense of moistness.

[0058] Polyamide nylon is prone to be positively electrified, and thus the negative ions (charged microparticles) generated by the ion generator 5 relieve the electrification of the fan and relieve adhesion of dust onto the fan. With use of the charged microparticles as in the embodiment, the static electricity generation can be suppressed by the moisture.

[Embodiment 4]

[0059] Fig. 6 is a transparent side view showing an inner configuration of a hair dryer in accordance with Embodiment 4 of the invention, and Figs. 7A and 7B are perspective views showing an example of the fan.

[0060] This embodiment is different from Embodiments 1 through 3 in that the air flow path 7 is formed as one air flow path without being partitioned into the upper and lower paths. The heater 11 is provided only in lower part of the air flow path as is the case with above embodiments. As blow-off side thereof is shown in Fig. 7A and as intake side thereof is shown in Fig. 7B, the fan 6 has vanes 6a each provided with a straightening vane on the blow-off side.

[0061] Even in such a configuration, most of the ions generated by the ion generator 5 pass through upper side of the air flow path 7 with parallel air flow, and the air

containing the ions is blown from the discharge port 12 without being heated by the heater 11. Thus the problems caused by heating of the ions and the water molecules bonded to the ions can be relieved. On condition that the
5 positive ions and the negative ions are generated, the neutralization of both can be prevented.

[0062] Combination use of the fan 6 of Embodiment 4 and the partition plate 10 described for Embodiments 1 and 2 is more effective because insulation against heat from the
10 heater 11 in the air flow path 7 and the prevention of the mixture and neutralization of the positive ions and the negative ions in the air flow path 7 can be attained.

[Embodiment 5]

15 [0063] Fig. 8 is a transparent side view showing an inner configuration of a hair dryer in accordance with Embodiment 5 of the invention.

[0064] In this embodiment, in contrast to Embodiment 1 and the like, the heater 11 is provided in the upper air
20 flow path 8, and the lower air flow path 9 lacks the heater 11 and is configured so as to allow air blown from the fan 6 to pass therethrough without being modified. The ion generator 5 is accordingly placed on lower side. Such placement is advantageous in that it is thereby made
25 possible to place electric circuits such as a power supply

circuit for the ion generator 5 in a lump in vicinity of the handle.

[0065] The configuration in which hot air is made to flow through the lower air flow path 9 as in Embodiment 1 may cause the ion wind having passed through the upper air flow path 8 to impinge upon parts other than hair because users are prone to apply the hot air onto the hair. It is preferable that the air flow path through which the hot air flows should be the upper air flow path 8 because the ion wind having passed through the lower air flow path 9 is thereby made to impinge upon the hair for a longer period.

[Embodiment 6]

[0066] Figs. 9A and 9B are perspective views of a hair dryer in accordance with Embodiment 6 of the invention.

[0067] As for Embodiment 6, a specific configuration for detaching the air intake filter 3 from the housing 2 for maintenance of the ion generator 5 is shown.

[0068] As shown in Fig. 9A, initially, the air intake filter 3 is detached from the housing 2. The air intake filter 3 and the housing 2 may be fixed together by claws, with use of magnets, or so as to be detachable by turns, and specific configuration therefor does not particularly matter.

[0069] As shown in Fig. 9B, subsequently, the ion generator 5 is detached from the housing 2. In the embodiment, the ion generator 5 can easily be detached from the housing 2 by being slid. A connector for a power supply for the ion generator 5 is provided on lower part on the electrode side of the ion generator 5 and can be connected to the power supply only by being plugged in. Instead of such a sliding mechanism, various configurations such as screwing and push mechanism using springs can be used.

[0070] The detachment of the air intake filter 3 from the housing 2 facilitates the maintenance, replacement and the like of the ion generator 5. As the generation of the ions is repeated, the needle electrode 15 and the induction electrode 16 in the ion generator 5, in particular, the needle electrode 15 undergoes gradual adhesion of foreign matter on surfaces thereof and deterioration in performance. The inventors et al. verified by experiments that use of hair spray, in particular, causes ingredients thereof to remain in the air, promotes the adhesion of the foreign matter on the surfaces of the electrodes with intake of the air by the fan, and results in the deterioration in the performance in comparatively early stages. Therefore, it is preferable to periodically carry

out maintenance of the electrodes or the replacement of the ion generator 5.

[0071] Thus the placement of the ion generator 5 upstream of the fan 6 facilitates the maintenance of the ion generator 5.

[Embodiment 7]

[0072] Fig. 10 is a transparent side view showing an inner configuration of a hair dryer in accordance with Embodiment 7 of the invention.

[0073] In Embodiment 7, in contrast to the above embodiments, the air intake filter 3 is placed between the ion generator 5 and the fan 6. The ion generator 5 is placed on the upstream side in the housing 2, that is, upstream of the fan 6, like the above embodiments.

[0074] Air is put in from the air intake filter 3, sucked into the fan 6, passed through the fan 6 and the air flow path 7, and blown through the discharge port 12 and the nozzle 13 to the outside of the hair dryer 1. Ions are generated by the ion generator 5 and are thereafter blown downstream with the air flow from the air intake filter 3 to the fan 6. Accordingly, effects can be obtained that are similar to those of the embodiments described above, such as the prevention by the ions of the electrification of the fan 6.

[0075] The embodiment has a structure such that a back cover 17 can be detached for the maintenance of the ion generator 5, in contrast to Embodiment 6 in which the maintenance is carried out with the air intake filter 3 detached. It is preferable to use the same material for the back cover 17 and the housing 2 so that a sense of unity in appearance between the back cover 17 and the housing 2 may not be impaired.

[0076] Though the embodiments of the invention have been described above, various changes other than those in the embodiments may be made. For instance, the ion generator 5 having latticed electrodes may be used and/or a multiblade fan may be used as the fan 6 without limitation to the propeller fan. It goes without saying that a novel hair dryer of the invention can be derived from combination of two or more out of the configurations (matters used to specify the invention) described for the plurality of embodiments described above and a plurality of modifications described above.

INDUSTRIAL APPLICABILITY

[0077] The invention relates to the hair dryers in which the ion generators are installed.

REFERENCE SIGNS LIST

[0078]

- 1 hair dryer
- 2 housing
- 3 air intake filter
- 5 4 handle
- 5 ion generator
- 6 fan
- 7 air flow path
- 8 upper air flow path
- 10 9 lower air flow path
- 10 partition plate
- 11 heater
- 12 discharge port
- 13 nozzle
- 15 14 switch
- 15 needle electrode
- 16 induction electrode
- 17 back cover

CLAIMS

1. A hair dryer comprising:
a housing (2),
a fan (6) placed in the housing (2),
5 a heater (11) placed in the housing (2),
an ion generator (5) placed upstream of the fan
(6) in the housing (2), and
an air intake filter (3) placed upstream of the
fan (6) and mounted on the housing (2).

10 2. The hair dryer as claimed in Claim 1, wherein the
ion generator (5) is placed between the fan (6) and the air
intake filter (3).

3. The hair dryer as claimed in Claim 1 or 2,
wherein the housing (2) comprises a plurality of air flow
15 paths (8, 9) therein, and wherein the air flow paths (8, 9)
comprise the air flow path (9) in which the heater (11) is
placed and the air flow path (8) in which the heater (11)
is not placed.

4. The hair dryer as claimed in Claim 3, wherein the
20 air flow path (8) in which the heater is not placed and the
ion generator (5) are arranged substantially in parallel to
each other, with the fan (6) between the air flow path and
the ion generator.

5. The hair dryer as claimed in any one of Claims 1 through 4, wherein the air intake filter (3) can be detached from the housing (2).

6. The hair dryer as claimed in any one of Claims 1
5 through 5, wherein

 a back cover (17) is attached to the housing (2),
and wherein

 the back cover (17) can be detached from the
housing (2).

10 7. The hair dryer as claimed in any one of Claims 1 through 6, wherein the ion generator comprises an ion generating unit for generating positive ions and an ion generating unit for generating negative ions.

8. The hair dryer as claimed in any one of Claims 1
15 through 7, wherein the ion generator generates ions bonded to water molecules.