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 <i>A45D 2/00</i> (2006.01)</p> | <p>(74) Agent: VAN OUDHEUSDEN-PERSET, Laure E. et al.;
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(54) Title: HAIR CARE DEVICE

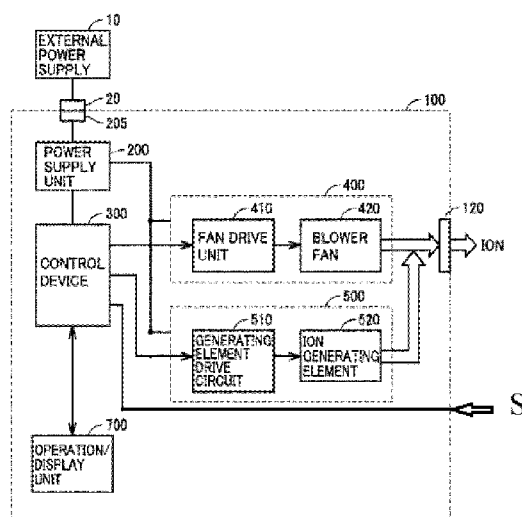


Fig. 1

(57) Abstract: A hair care device (100) capable of drying hair and comprising an ion generator (500) for providing ions to hair, and a switching circuit (300) for switching on the ion generator later than a moment when the hair care device (100) has been switched on, wherein the ion generator (500) is switched on when a moisture level of the hair is deemed to be below a predetermined moisture level, i.e. when the hair has become sufficiently dry to become susceptible of static electricity and frizz related problems. The switching circuit (300) may receive an input from a sensor (S) for measuring a moisture level of the hair, a sensor (S) for measuring a temperature of the hair, and/or a timer for switching on the ion generator (500) after a predetermined period has lapsed.

EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

- *with international search report (Art. 21(3))*

Hair care device

FIELD OF THE INVENTION

The invention relates to a hair care device having an ion generator.

BACKGROUND OF THE INVENTION

WO 2015/196194 discloses a hair styling apparatus having an ion generator adapted to direct a concentration of ions to the length of hair. The ionic discharge will impart a sleeker, smoother texture to the hair and reduces static electricity and frizz. The apparatus may be provided with a control means that allows a user to selectively activate or de-activate the ion generator so that it may or may not be used during operation of the apparatus. Intermittent use is also contemplated. This may be achieved, for example, by an actuator or button and appropriate logic or circuitry.

SUMMARY OF THE INVENTION

It is, inter alia, an object of the invention to provide a more economical hair care device. The invention is defined by the independent claim. Advantageous embodiments are defined in the dependent claims.

Embodiments of the invention provide a hair care device capable of drying hair and comprising an ion generator for providing ions to hair, and a switching circuit for switching on the ion generator later than a moment when the hair care device has been switched on, wherein the ion generator is switched on when a moisture level of the hair is deemed to be below a predetermined moisture level. As a result, it becomes possible to only generate ions once the hair is sufficiently dry to become susceptible of static electricity and frizz related problems. The switching circuit may be coupled to receive an input from a sensor for measuring a moisture level of the hair, a sensor for measuring a temperature of the hair, and/or a timer for switching on the ion generator after a predetermined period has lapsed as examples of ways to determine when a moisture level of the hair is deemed to be below a predetermined moisture level. An advantage of the invention is that if the ion generator is only on when needed, its lifetime is longer. Or with the same lifetime, more economical components can be used.

The hair care device may be a hair dryer, a styling device such as a hot iron, an air styler, or a hot brush. A hair dryer is a device that blows hot air, i.e. it comprises a fan and a heater for heating the air, e.g. by means of applying an electrical current to a heating wire. An air styler is basically a hair dryer with several styling tools. An example of an air styler is the Philips Airstyler HP8656, which has a cool air setting for gentle drying, and a possibility to dry and/or style hair by means of heated air. If an air styler just has a brush, it is called a hot brush. It is known to use a hair iron (i.e. a device having heated plates between which hair is clamped) on wet hair to both style and dry the hair.

The invention is based on the recognition that it is not necessary to provide ions when the hair is still wet, as with wet hair no static electricity and frizz related problems occur anyway. It thus makes sense to only provide ions when the hair is relatively dry, which can be measured by means of a moisture measurement, and/or by a temperature measurement, or without any such measurement by simply only switching on the ion generator after some time has elapsed.

The moisture sensor may use any of the following techniques: resistance, reflection, surface tension, hair weight, friction, raman spectroscopy, back-reflected IR spectrum, and capacitance. WO1999026512 discloses a hair dryer using remote sensing of the moisture content of the hair.

The temperature sensor may be an IR sensor. Infrared thermometers are known, see e.g. https://en.wikipedia.org/wiki/Infrared_thermometer. Hair dryers with a temperature sensor are commercially available, e.g. the Philips hair dryer HP8270, and are also disclosed in e.g. WO1999001726. Using a the temperature sensor to determine dryness of hair is based on the assumption that as soon as hair gets drier and the hair temperature starts to rise but is still below 60 °C, the hair is considered to be too wet to suffer from static electricity and frizz related problems, and that when the hair has exceeded a predetermined minimum temperature, the moisture level of the hair has fallen below a predetermined moisture level so that it makes sense to apply ions to reduce frizz. Alternative temperature sensors may use a thermocouple, a thin film type resistor, or an ultrasonic comb.

Using a timer is based on the realization that after e.g. 200 s of using a hair dryer, the hair has become sufficiently dry to become susceptible of static electricity and frizz related problems.

These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an embodiment of a hair care device in accordance with the present invention; and

Fig. 2 illustrates a drying process of a temperature controlled hair dryer in accordance with an embodiment of the present invention and the moment that ions can be switched on.

DESCRIPTION OF EMBODIMENTS

Fig. 1 shows an embodiment of a hair care device in accordance with the present invention, based on US 2015/0250690 but with the new elements of the present invention. Hair care device 100 includes a power supply unit 200, a control device 300, a blower mechanism 400, ion generating device 500, and an operation/display unit 700.

Power supply unit 200 receives power from an external power supply 10 transmitted from a power connector 20, which is connected to a power receiving unit 205. Power supply unit 200 then distributes the received power, and supplies driving power to control device 300, blower mechanism 400, and ion generating device 500. Note that when hair care device 100 is operated with power from a power storage device (not shown) incorporated therein, power supply unit 200 distributes the power from the power storage device to control device 300, blower mechanism 400, and ion generating device 500.

Blower mechanism 400 includes a fan drive unit 410 and blower fan 420. Fan drive unit 410 is a drive device for driving a fan motor (not shown) contained in blower fan 420. Fan drive unit 410 drives blower fan 420 based on an instruction from control device 300.

Ion generating device 500 includes a generating element drive circuit 510 and ion generating element 520. Generating element drive circuit 510 is a circuit for applying voltage to a high-voltage circuit contained in ion generating element 520, based on an instruction from control device 300. A detailed configuration and a principle of ion generation of ion generating device 500 is described in US 2015/0250690 (incorporated herein by reference) in relation to its FIG. 3. Ion generating element 520 is formed along a path of air flow leading to ion discharge port 120 from blower fan 420. This causes ions generated by ion generating element 520 to be delivered to ion discharge port 120, and the ions are discharged out of hair care device 100 through ion discharge port 120. Alternatively, ion generating device 500 may be configured to be separable from a housing of the hair care device.

Operation/display unit 700 is an interface for receiving an operation signal through the user's operation, and notifying the user of information. Operation/display unit 700

is configured to include, for example, an operation instrument such as a switch and a display instrument such as an LED or a liquid crystal panel. Operation/display unit 700 transmits the received operation signal from the user to control device 300, and displays notification information transmitted from control device 300 to the user.

Control device 300 controls blower mechanism 400, and ion generating device 500, based on the user's setting, operation, and the like.

In accordance with one embodiment of the invention, control device 300 includes a timer (not shown) that ensures that the ion generating device 500 is only switched on after a period sufficiently long for the hair to be sufficiently dry to suffer from static electricity and frizz related problems. Preferably, this period is at least 100 s, and more preferably at least 200 s.

In accordance with other embodiments of the invention, control device 300 has an input to receive information from a sensor S about the moisture level and/or temperature of the hair, so that based on that information, the ion generating device 500 is only switched once the hair has become sufficiently dry to suffer from static electricity and frizz related problems.

Clearly in deviation from US 2015/0250690, a device in accordance with the present invention would not apply ions can during or after spraying of a liquid in the form of mist. A device in accordance with the present invention only applies ions when a moisture level of the hair is below a predetermined moisture level, based on the recognition, which cannot be found in US 2015/0250690, that it only makes sense to apply ions when hair is sufficiently dry to become susceptible of static electricity and frizz related problems, which problems are mitigated by applying ions.

Fig. 2 illustrates a drying process of a temperature controlled hair dryer in accordance with the principles of the present invention, and the moment that ions can be switched on. The left vertical axis shows hair mass M in mg as measured in a test environment, and the right vertical axis shows temperature T in $^{\circ}\text{C}$. The horizontal axis shows time in seconds. With increasing time, hair mass M decreases as water evaporates, while the temperature T of the hair increases. A first horizontal line at hair mass being about 4.2 mg indicates a starting position when hair is wet. A second horizontal line at hair mass being about 2.7 mg indicates a subsequent situation when free water has sufficiently evaporated. When the hair mass crosses that second horizontal line, after an amount of time ΔT has passed, the ion generator can be switched on. In a real-life embodiment, the moisture level of the hair would not be measured by determining its mass; the purpose of Fig. 2 is to visualize the relationship between temperature and moisture content of hair. Fig. 2 illustrates that there are

various ways to determine the moment when the ion generator can be switched on: by just waiting until the amount of time ΔT has passed, by measuring whether the hair temperature has reached a level of about 60 °C e.g. by using a device as disclosed in WO1999001726, and/or by measuring a moisture level as e.g. disclosed in WO1999026512.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements, and/or by means of a suitably programmed processor. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS:

1. A hair care device (100) capable of drying hair and comprising:
an ion generator (500) for providing ions to hair, and
a switching circuit (300) for switching on the ion generator (500) later than a moment when the hair care device (100) has been switched on, characterized in that the ion generator (500) is switched on when a moisture level of the hair is deemed to be below a predetermined moisture level.
2. A hair care device as claimed in claim 1, wherein the switching circuit (300) is coupled to receive an input from a sensor (S) for measuring a moisture level of the hair, the switching circuit (300) being arranged to switch on the ion generator (500) when a moisture level of the hair has fallen below a predetermined moisture level.
3. A hair care device as claimed in claim 1, wherein the switching circuit (300) is coupled to receive an input from a sensor (S) for measuring a temperature of the hair, the switching circuit (300) being arranged to switch on the ion generator (500) when the hair has reached a predetermined minimum temperature.
4. A hair care device as claimed in claim 3, wherein the switching circuit (300) is arranged for switching on the ion generator (500) when the hair has reached a temperature of about 60 °C.
5. A hair care device as claimed in claim 1, 2, 3 or 4, wherein the switching circuit (300) comprises a timer for switching on the ion generator (500) after a predetermined period of time has lapsed.
6. A hair care device as claimed in claim 4, wherein the predetermined period is at least 100 s, and preferably at least 200 s.

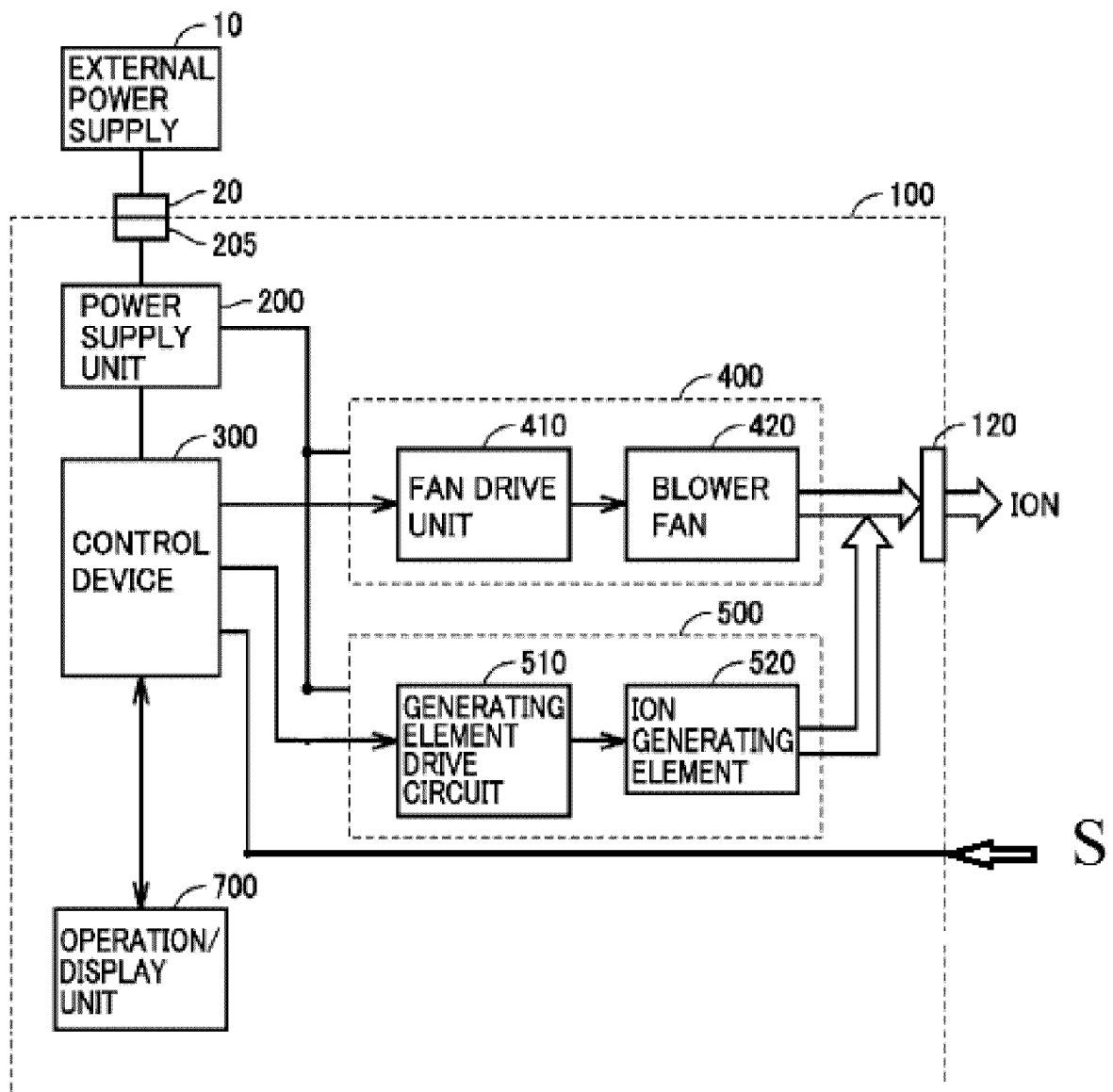


Fig. 1

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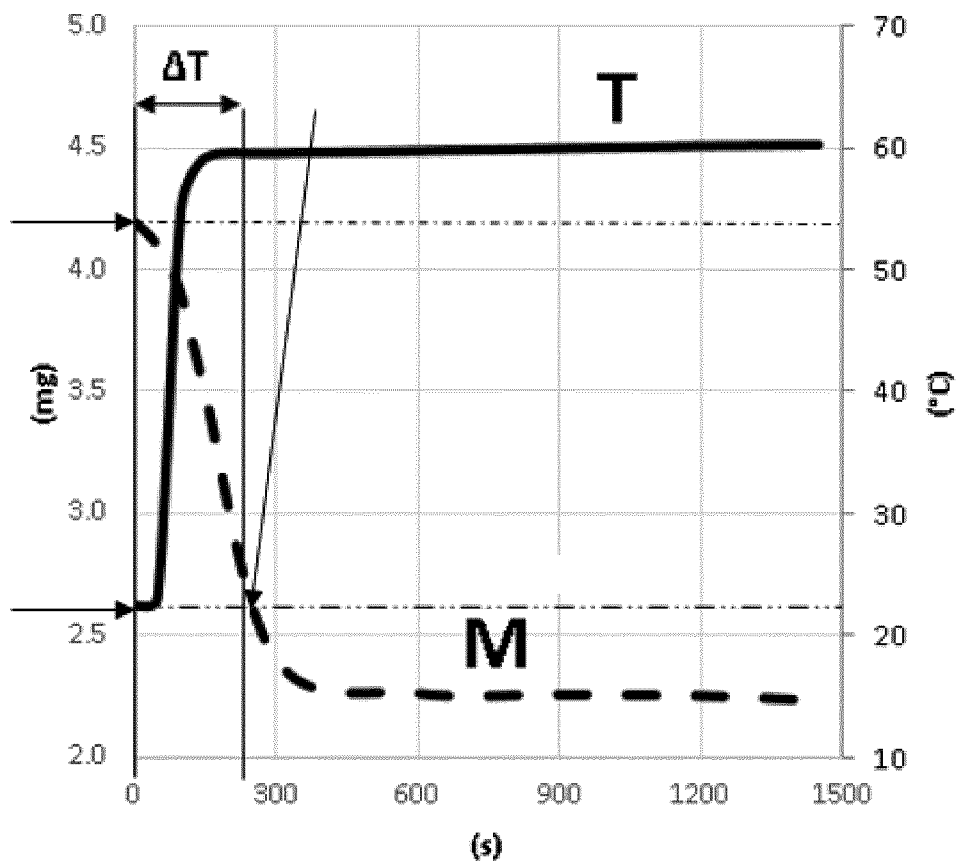


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/076660

A. CLASSIFICATION OF SUBJECT MATTER
INV. A45D1/00 A45D2/00 A45D20/00
ADD.

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)
A45D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 2014/298670 A1 (TAHARA HIROKAZU [JP] ET AL) 9 October 2014 (2014-10-09) paragraph [0011] -----	3
X	US 2003/055469 A1 (OHMURA SHINGO [JP]) 20 March 2003 (2003-03-20) paragraph [0054] -----	1
A	DE 20 2005 001828 U1 (WIK FAR EAST LTD [HK]) 14 June 2006 (2006-06-14) the whole document -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

16 November 2017

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/076660

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