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(72) Inventor: **Zijroecha, Nikolaj**
5656 AE Eindhoven (NL)

(74) Representative: **Steenbeek, Leonardus Johannes et al**
Philips Intellectual Property & Standards
High Tech Campus 5
5656 AE Eindhoven (NL)

(71) Applicant: **Koninklijke Philips N.V.**
5656 AE Eindhoven (NL)

(54) **HAIR CARE DEVICE**

(57) A hair care device (100) 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, e.g. 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.

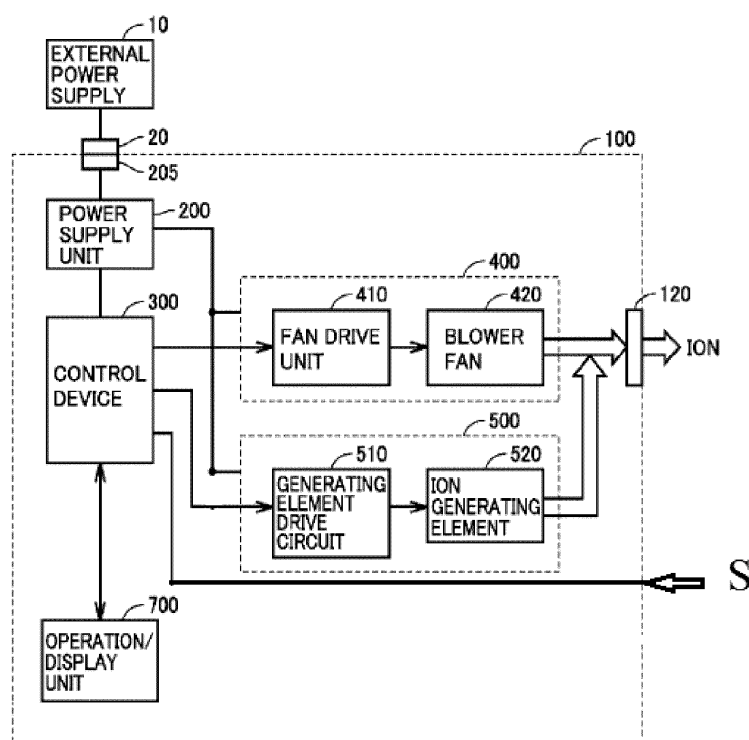


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The invention relates to a hair care device having an ion generator.

BACKGROUND OF THE INVENTION

[0002] 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

[0003] 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.

[0004] Embodiments of the invention provide a hair care device, 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. 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. 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 brush.

[0005] 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.

[0006] 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 con-

tent of the hair.

[0007] 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 could be based on the assumption that hair below 60 °C is too wet to suffer from static electricity and frizz related problems. Alternative temperature sensors may use a thermocouple, a thin film type resistor, or an ultrasonic comb.

[0008] 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.

[0009] 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

[0010]

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

[0011] 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.

[0012] 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.

[0013] 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.

[0014] Ion generating device 500 includes a generat-

ing 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.

[0015] 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.

[0016] Control device 300 controls blower mechanism 400, and ion generating device 500, based on the user's setting, operation, and the like.

[0017] 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.

[0018] 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.

[0019] 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 °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.

[0020] 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), 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.

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.

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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.

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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.

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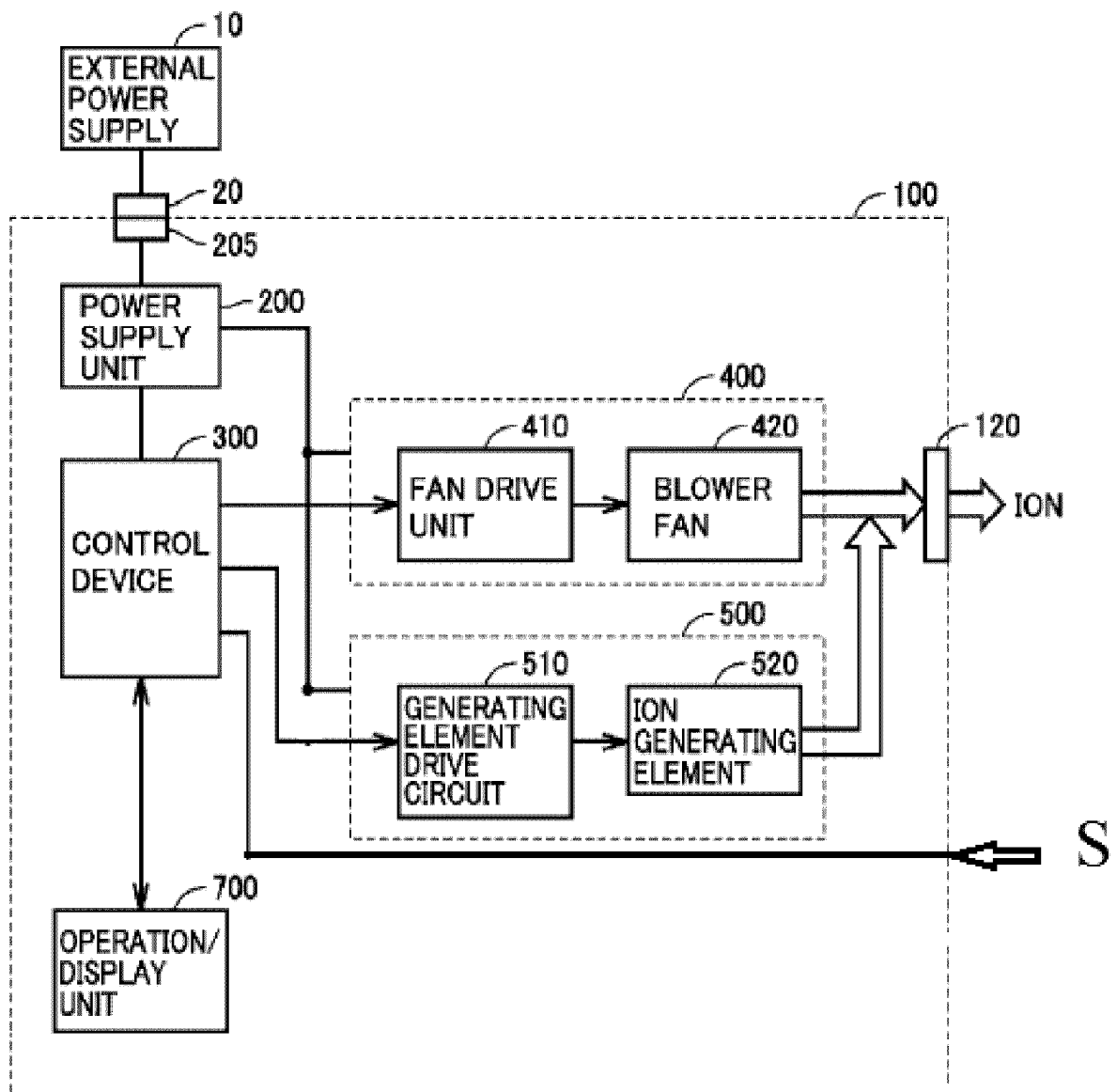


Fig. 1

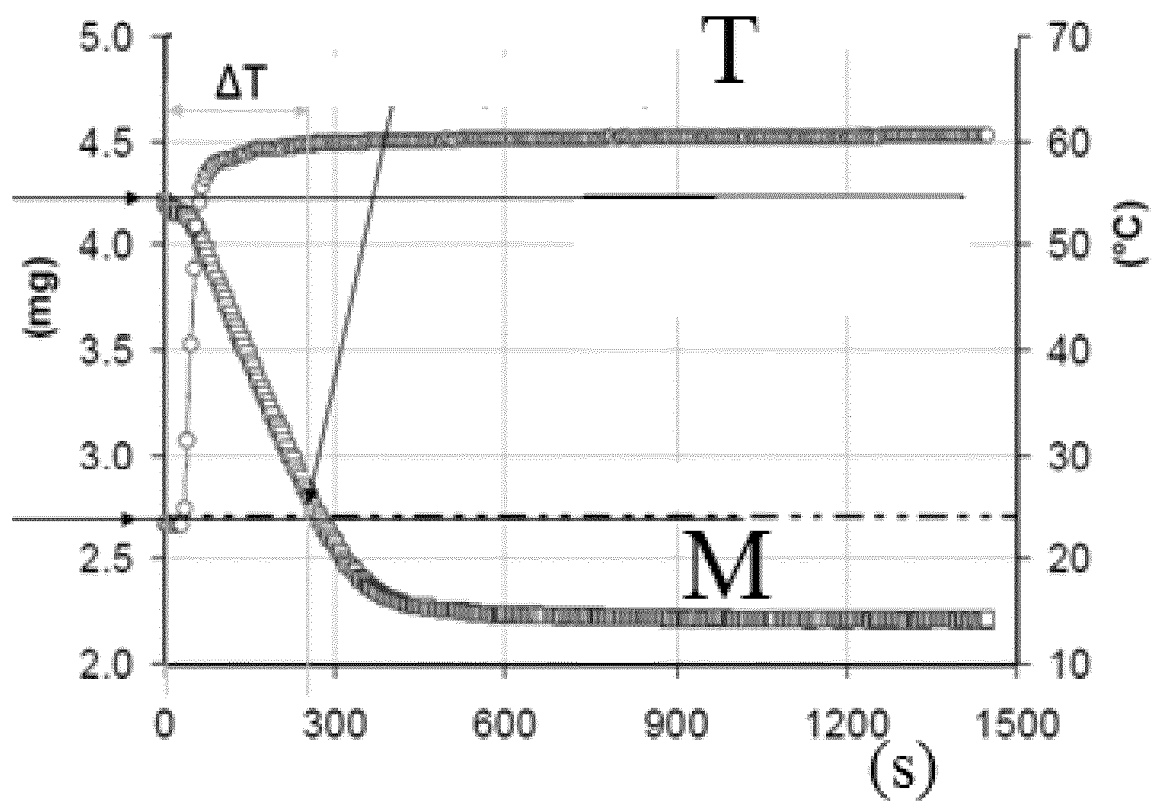


Fig. 2



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 19 6375

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	US 2015/250690 A1 (SAITO EMI [JP]) 10 September 2015 (2015-09-10) * paragraph [0058] * -----	1,4-6	INV. A45D1/00 A45D2/00 A45D20/00
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	
			TECHNICAL FIELDS SEARCHED (IPC)
			A45D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 28 February 2017	Examiner Nicolás, Carlos
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 19 6375

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015250690 A1	10-09-2015	CN 104602663 A	06-05-2015
		JP 2014014644 A	30-01-2014
		US 2015250690 A1	10-09-2015
		WO 2014042173 A1	20-03-2014
US 2014298670 A1	09-10-2014	CN 104023586 A	03-09-2014
		JP 5863404 B2	16-02-2016
		JP 2013102826 A	30-05-2013
		US 2014298670 A1	09-10-2014
		WO 2013069391 A1	16-05-2013
US 2003055469 A1	20-03-2003	AT 282457 T	15-12-2004
		CN 1406644 A	02-04-2003
		CN 101061986 A	31-10-2007
		DE 60201954 D1	23-12-2004
		EP 1295625 A2	26-03-2003
		HK 1109327 A1	10-09-2010
		JP 2003159305 A	03-06-2003
		KR 20030023486 A	19-03-2003
		TW M318419 U	11-09-2007
		US 2003055469 A1	20-03-2003
DE 202005001828 U1	14-06-2006	NONE	

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- WO 2015196194 A [0002]
- WO 1999026512 A [0006] [0019]
- WO 1999001726 A [0007] [0019]
- US 20150250690 A [0011] [0014]