(19) Europäisches Patentamt
European Patent Office
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(11) **EP 3 721 751 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.10.2020 Bulletin 2020/42

(51) Int Cl.:
A46B 15/00 *(2006.01)* ***A45D 24/10*** *(2006.01)*
A45D 20/48 *(2006.01)*

(21) Application number: **19167741.8**

(22) Date of filing: **08.04.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **HAIR STYLING DEVICE**

(57) A hair styling device (B) comprises a sensor (MP) having an active mode in which the sensor (MP) is arranged for contacting hair, and an inactive mode in which the sensor (MP) is arranged for not contacting the hair. In one embodiment, the sensor (MP) is provided with a cap (C) for covering the sensor in the inactive mode. In another embodiment, the sensor (MP) is movable between a first position in which the sensor (MP) is arranged for contacting hair in the active mode, and a second position in which the sensor (MP) is arranged for not contacting the hair in the inactive mode. Advantageously, the hair styling device (B) further comprises a control unit (CU) for communicating with a user device, separate from the hair styling device, the hair styling device (B) being arranged for switching between the active mode and the inactive mode in response to a control signal received from the user device. The hair styling device may further comprise a removable hair styling unit (HS) that does not include the sensor (MP).

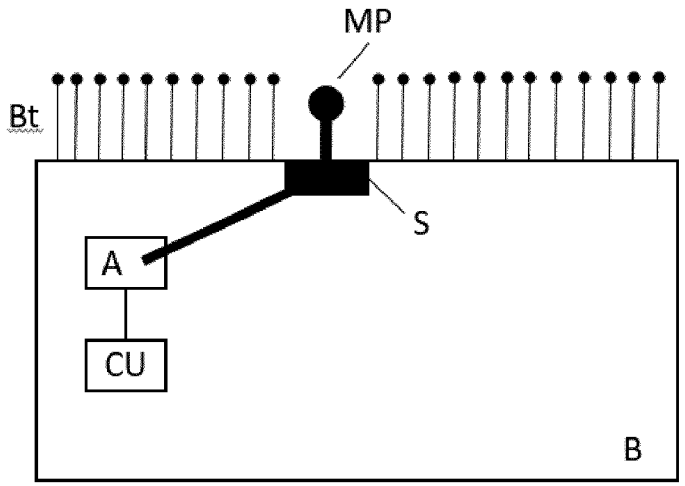

Fig. 2A

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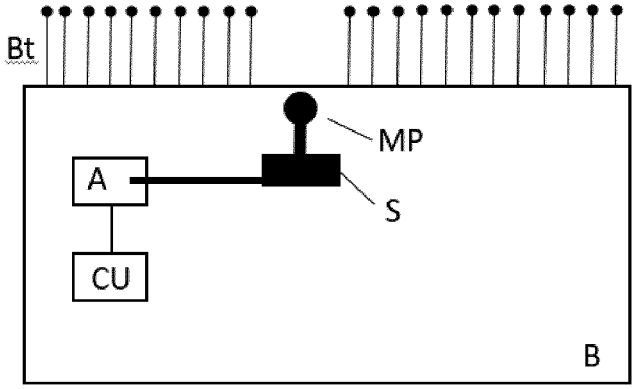

Fig. 2B

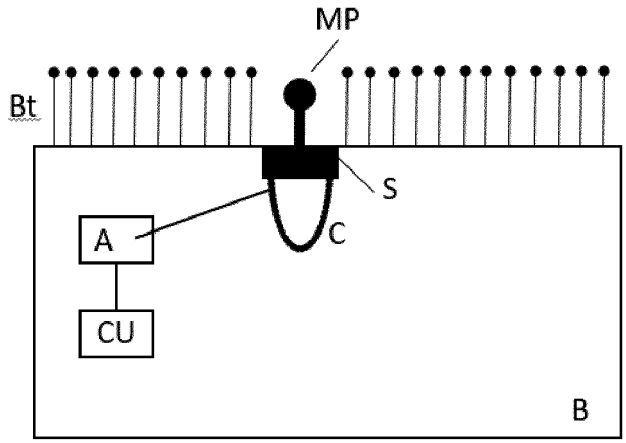

Fig. 3A

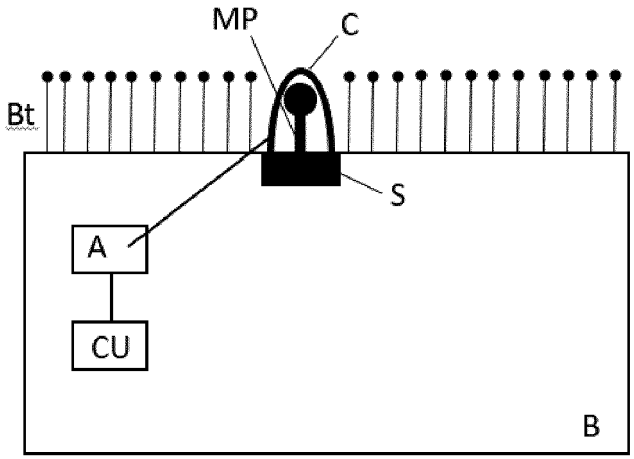

Fig. 3B

Description

FIELD OF THE INVENTION

[0001] The invention relates to a hair styling device.

BACKGROUND OF THE INVENTION

[0002] WO 2019/057575 (attorney's ref. 2017PF02274) discloses a hair styling device having a two-dimensional force sensor.

SUMMARY OF THE INVENTION

[0003] It is, inter alia, an object of the invention to provide an improved hair styling device. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

[0004] One aspect of the invention provides a hair styling device that comprises a sensor having an active mode in which the sensor is arranged for contacting hair, and an inactive mode in which the sensor is arranged for not contacting the hair. In one embodiment, the sensor is provided with a cap for covering the sensor in the inactive mode. In another embodiment, the sensor is movable between a first position in which the sensor is arranged for contacting hair in the active mode, and a second position in which the sensor is arranged for not contacting the hair in the inactive mode. Advantageously, the hair styling device further comprises a control unit for communicating with a user device, separate from the hair styling device, the hair styling device being arranged for switching between the active mode and the inactive mode in response to a control signal received from the user device. The hair styling device may further comprise a removable hair styling unit that does not include the sensor.

[0005] Various embodiments of the invention are based on the following considerations. Hair brushes are getting more innovative. Sensors are added. Hair brushes are vulnerable and can damage easily due to nature of usage and storage. They are under impact of chemical and mechanical stresses during usage. They will easily get dirty and/or subject to wear as a result of hair being moved along the sensor (as hair does not have a smooth surface, moving hair along the sensor will have an abrasive effect). This will also be the case for the sensors in the brushes. Sensors in hair brushes may thus malfunction after usage for a prolonged time.

[0006] One aspect of the invention provides a hair styling device comprising a sensor (e.g. a force sensor as described in WO 2019/057575, or a hair quality sensor) having an active mode in which the sensor is arranged for contacting hair, and an inactive mode in which the sensor is arranged for not contacting the hair. In this way, it is ensured that the sensor only contacts the hair if measurements are needed, which means that the sensor is not exposed to dirt and wear every time that the hair styling device is used for styling.

[0007] In a practical embodiment, the sensor is provided with a cap for covering the sensor in the inactive mode. The cap would form a protection shield of the sensor which is active during brushing and gets de-activated during measurement. The de-activation can be done via various means, such as manual, via a button on the brush (mechanical), via an electronic actuated manner, or via a button on a remote entity (mobile phone) when connected (e.g. via Internet of Things capabilities), or when automatically initiated via internal or remote controller (e.g. time, or due to motion capture).

[0008] In an alternative embodiment, the sensor is movable (e.g. by an actuator or a mechanical lever) between a first position in which the sensor is arranged for contacting hair in the active mode, and a second position in which the sensor is arranged for not contacting the hair in the inactive mode. For example, the second position may be a position in which the sensor is retracted into a brush body.

[0009] Preferably, the hair styling device further comprises a control unit for communicating (e.g. using Bluetooth or WiFi) with a user device (e.g. a smartphone or tablet), separate from the hair styling device, the hair styling device being arranged for switching between the active mode and the inactive mode in response to a control signal received from the user device. If the hair styling device is a connected device that communicates with e.g. a smartphone (and/or thru the smartphone with a remote server) so that the smartphone can be used to display measurement results and/or recommendations for styling and/or hair care based on the measurements by the sensor, then it is very convenient to make the smartphone control when measurements are needed. Alternatively, the hair styling device may have its own control for switching between the active mode and the inactive mode, which may be a straightforward mechanical lever for putting the sensor in the first position or the second position.

[0010] If the hair styling device is provided with a removable hair styling unit that does not include the sensor, then the hair styling unit can be separately cleaned without exposing the vulnerable sensor and sensor electronics to the cleaning action and any cleaning liquids.

[0011] 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

[0012]

Fig. 1 shows a hair styling device largely as shown in WO 2019/057575; and

Figs. 2A-2B, and 3A-3B shows embodiments of a hair styling device in accordance with the present invention.

DESCRIPTION OF EMBODIMENTS

[0013] Fig. 1 shows an embodiment of a brush B having a measuring device at the side where the bristles Bt are located. The measuring device has the same elements as discussed in WO 2019/057575, incorporated herein by reference: sensor with measuring probe MP, alignment elements AE, and guidance elements G. While brushing the hair, the hair H is guided along the alignment elements AE and the measuring probe MP.

[0014] In deviation from WO 2019/057575, the bristles Bt are mounted on removable hair styling units Hs, e.g. foam pads, which can be taken out of a frame of the brush B so that they can be washed without damaging electronics and the sensor with measuring probe MP.

[0015] Figs. 2A and 2B show an embodiment of a hair styling device in accordance with the present invention, in which the sensor S and the measuring probe MP can be moved from a first position shown in Fig. 2A to a second position shown in Fig. 2B by means of an actuator A controlled by a control unit CU. In Fig. 2A, the sensor S is in the active mode and arranged for carrying out measurements, while in Fig. 2B, the sensor S is in the inactive mode and in a safe position in which it can less easily be damaged. The control unit CU may involve a switch on the brush B itself by means of which a user can move the sensor S and measuring probe MP upwards or downwards. Alternatively, the control unit CU may be wirelessly connected (e.g. via WiFi, Bluetooth, NFC, etc.) to a user device (e.g. a smartphone or tablet) by means of which sensor data are analyzed so as to prepare information on the hair to the user, which may include recommendations for hair care. By means of the same wireless connection, the user device can also send a message to the brush B that makes the control unit CU instruct the actuator A to move the sensor S with measuring probe MP upwards into the active mode, or downwards into the inactive mode.

[0016] Figs. 3A and 3B show an embodiment of a hair styling device in accordance with the present invention. In the embodiment of Figs. 3A and 3B, the actuator A makes a cap C move from a first position not covering the measuring probe MP as shown in Fig. 3A, in which the sensor S is in the active mode, to a second position in which the cap C does cover the measuring probe MP as shown in Fig. 3B, in which the sensor is in the inactive mode. Like in Figs. 2A and 2B, also in Figs. 3A and 3B the actuator A is controlled by the control unit CU, which may be wirelessly connected to a user device.

[0017] 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. Measures recited in mutually different dependent claims may advantageously be used in combination.

Claims

1. A hair styling device (B) comprising:
   a sensor (S, MP) having an active mode in which the sensor (MP) is arranged for contacting hair, and an inactive mode in which the sensor (MP) is arranged for not contacting the hair.

2. A hair styling device (B) as claimed in claim 1, wherein the sensor (MP) is provided with a cap (C) for covering the sensor in the inactive mode.

3. A hair styling device (B) as claimed in claim 1, wherein the sensor (MP) is movable between a first position in which the sensor (MP) is arranged for contacting hair in the active mode, and a second position in which the sensor (MP) is arranged for not contacting the hair in the inactive mode.

4. A hair styling device as claimed in any of the preceding claims, wherein the hair styling device (B) further comprises a control unit (CU) for communicating with a user device, separate from the hair styling device, the hair styling device (B) being arranged for switching between the active mode and the inactive mode in response to a control signal received from the user device.

5. A hair styling device as claimed in any of the preceding claims, further comprising a removable hair styling unit (HS) that does not include the sensor (MP).

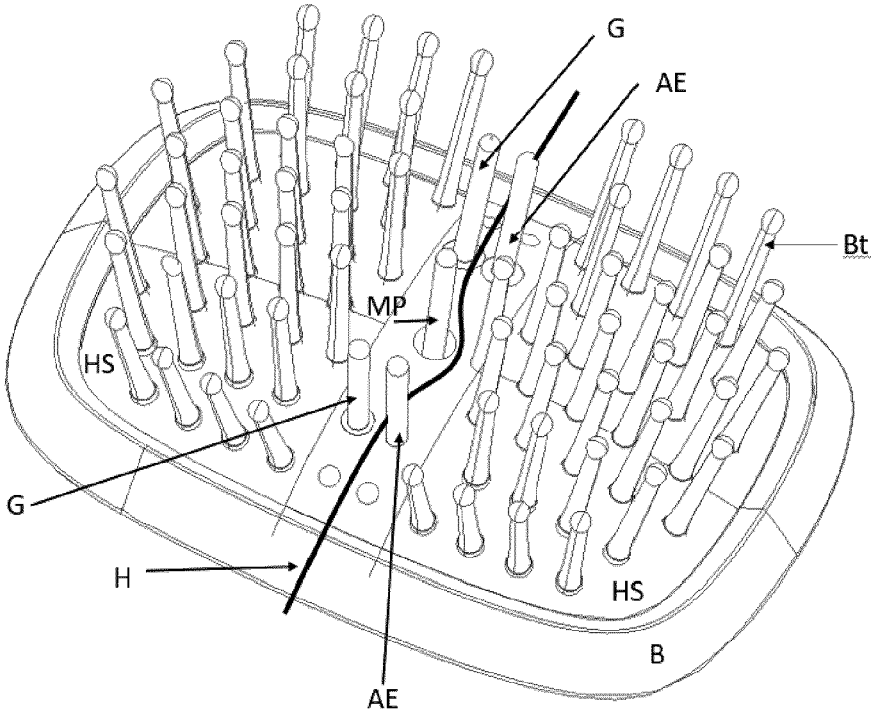

Fig. 1

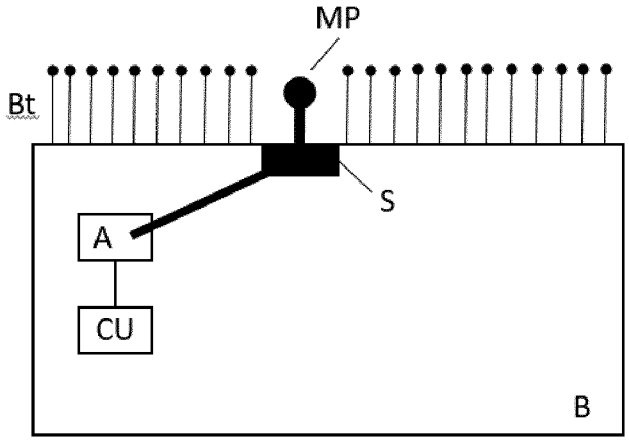

Fig. 2A

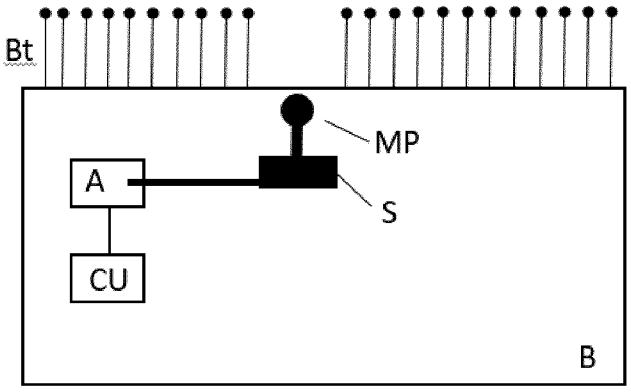

Fig. 2B

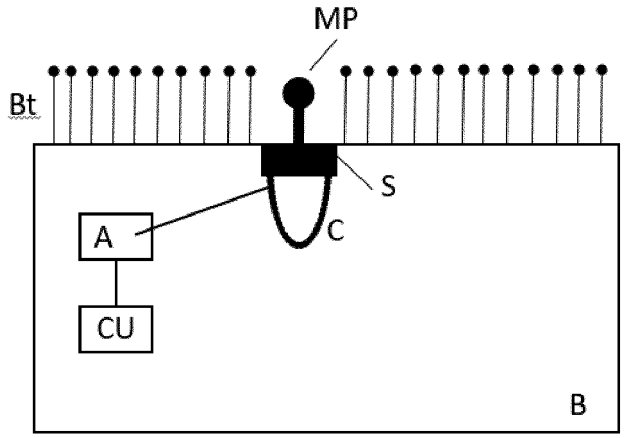

Fig. 3A

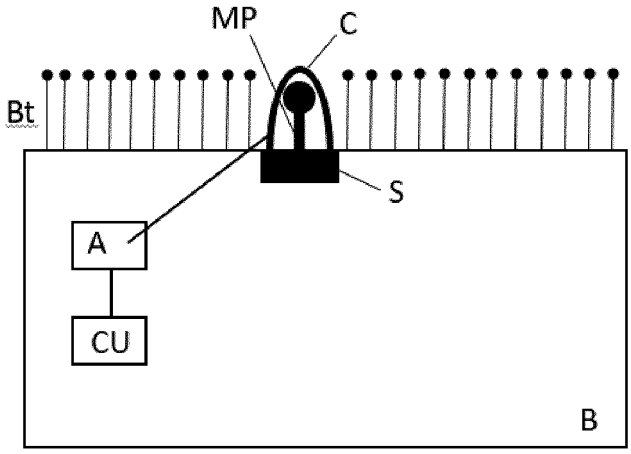

Fig. 3B

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 7741

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 October 2019	Witkowska-Piela, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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