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(54) HAIR STRAIGHTENER WITH SENSORS

HAARGLATTER MIT SENSOREN

FER A LISSER AVEC CAPTEURS

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(73) Proprietor: **Braun GmbH
61476 Kronberg (DE)**

(72) Inventors:
• **Seng, Juergen
61476 Kronberg (DE)**
• **Soerensen, Olaf
61476 Kronberg (DE)**

- **Schmitz, Christoph
61476 Kronberg (DE)**
- **Pinto, Francis
61476 Kronberg (DE)**
- **Schuessler, Markus
61476 Kronberg (DE)**
- **Beutner, Sven
61476 Kronberg (DE)**

(74) Representative: **Zetterer, Gerd
Braun GmbH
Patentabteilung
Frankfurter Strasse 145
61476 Kronberg (DE)**

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to personal appliances according to the preamble of claim 1 and is concerned with an improved personal appliance comprising a sensor.

BACKGROUND OF THE INVENTION

[0002] In the different fields of personal appliances, efforts are taken to make the appliance efficient and user-friendly. Some appliances comprise sensors.

[0003] Published German patent application DE 31 12 384 A1 (filed by Mühelos-Werk Alfred Müller) discloses a hood dryer. Conventional hood dryers are described as typically allowing for the selection of a heating temperature and a speed of the fan. Both values can often be selected continuously. However, according to this disclosure, it takes a lot of experience, even for a hair dresser, to make the right selections. Therefore, it can happen that the hair is still wet when the hood dryer is switched off according to the selection made when starting the drying process. The disclosed invention attempts to avoid this by providing a wetness sensor. This wetness sensor is supposed to end the process when the hair is sufficiently dry. Air circulating within the hood dryer is guided to the wetness sensor and the sensor is connected to an electrical circuit which can end the drying process by switching off the ventilation fan and the heater.

[0004] A dryer hood is a relatively spacious personal appliance. Hence, it is relatively easy to place one or several sensors in a dryer hood. As a dryer hood is a very specific type of a personal appliance comprising the hood as a closed space, it is relatively easy to find an appropriate place for a sensor and to make representative measurements.

[0005] US patent 4,602,143 (to Clairol Incorporated) discloses an infrared hair styling device. This device is provided in the form of a curling iron with an infrared radiation source. The curling iron comprises a hollow barrel for radiating infrared radiation. The barrel is substantially transparent to radiation. The curling iron is also provided with a circuit for energizing the infrared source in a cyclical manner in order to maintain the temperature of the barrel within a predetermined range. This device also comprises a temperature sensor to sense the temperature of the barrel in order to activate the control unit for maintaining the predetermined temperature range. Hence, within a predetermined temperature range the infrared source will cycle on and off.

[0006] Operating a curler with infrared light requires, inter alia, the use of a transparent barrel for the curler. This is a somewhat costly approach, not necessarily required for all curlers. Curlers with simpler resistive heating, cannot employ the same type of sensor and setup. Further, the circuit allows only to keep one preselected

temperature. Individual user needs and habits are not comprehensively addressed.

[0007] EP 2 524 617 A2 published after the priority date of the current application discloses a hair styling apparatus with a heating device and a hair protection function. It discloses a temperature-sensing unit, a temperature setting by the user and a moisture sensor in order to select suited temperature for the hair treatment. The moisture sensor comprises two electrodes housed in a base. The hair contact portion of the electrodes and the hair contact surface of the base are disposed below the hair heating surface.

[0008] In the US 2001/055501 A1, a hair treatment device, such as a hair straightener, with a temperature control is disclosed. The temperature control has two sensors that are disposed at the outside of the opposing legs of an U-shaped heating surface such, that heating surface and the sensor contact surface of a sensor housing are adjacent to and at level with and/or with step free transition with the heating surface. However, the sensors are provide in a separate sensor housing.

[0009] The US 2007/0119844 A1 discloses a hair styling device with a tubular heating element. Inside the tubular heating element, two sensors are provided integral with the heating unit.

[0010] The present invention attempts to improve these concepts found in the prior art. In particular, the present invention attempts to provide a personal appliance which provides an optimal mode of usage for different users and for different usage situations.

SUMMARY OF THE INVENTION

[0011] The present invention relates to personal appliances according to claim 1 and is concerned with an improved personal appliance comprising a sensor. In particular, the invention concerns a personal appliance for performing a grooming task on a user, the appliance comprising a grooming element, the grooming element comprising a grooming surface and the appliance comprising a sensor and a sensor housing, the sensor housing comprising a sensor contact surface, wherein the sensor contact surface is adjacent to and at level with the grooming surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 shows a hair straightener which is a personal appliance, which implements the present invention.

Fig. 2 shows another schematic representation of another spatial relationship between the above two elements.

Fig. 3 shows yet another spatial relationship between

grooming element and two sensor elements.

Fig. 4 shows a scheme illustrating the cooperation of key components of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0013] A personal appliance can take a variety of forms. The personal appliance can be a grooming appliance, for example a shaver, a trimmer, a beard trimmer, an epilator, or a hair care device, e.g. a curler, a straightener, a brush, a hair dryer, and the like. Depending on the personal appliance the grooming task is different and hence the grooming element and the sensor can be different. Where the personal appliance is a shaver, the grooming element can comprise a hair removing element and can further comprise a heating or cooling element. Such heating or cooling elements can make shaving a more efficient and more pleasant experience. Where the personal appliance is a hair care appliance, the grooming task will typically be the task of drying hair or straightening hair or curling hair. In hair care grooming tasks the temperature at which the task is performed is critical. Therefore, the grooming element will normally be a heating element. In accordance with the present invention the personal appliance is a hair straightener and comprises a grooming element, the grooming element comprising a grooming surface. The grooming surface will be the surface of the grooming element, which is in contact with the skin when the personal appliance is used in the intended manner.

[0014] The personal appliance will further comprise a sensor. The choice of the sensor will also depend on the grooming task. Suitable sensors are temperature sensors or humidity sensors or pressure sensors. A temperature sensor, for example can measure the heat of a skin or hair surface which is treated by the grooming element. A humidity sensor can, for example, measure the humidity of hair to be dried. A pressure sensor can measure, for example, the pressure which is applied to the skin or hair, which is treated and on to which pressure is exerted by the grooming element.

[0015] In accordance with the present invention the sensor is comprised by a housing and the housing comprises a sensor contact surface. The sensor contact surface is adjacent to (that is in close spatial proximity to) and at level with the grooming surface.

[0016] It has been found useful to have sensor contact surface and a grooming surface which are co-planar. Hence, the two surfaces are arranged in one plane.

[0017] According to the present invention, the sensor contact surface and the grooming surface are integral. Hence, both surface can be provided from one piece of material and can form part of one larger surface of that piece of material. It has been found useful to provide a sensor housing which comprises a contact plate. The contact plate comprises a front surface and a rear surface. The front surface of the contact plate provides the

sensor contact surface. In a further aspect, it has been found useful to use a rear surface which comprises a groove. The sensor can then be at least partially comprised by the groove. If the groove is of sufficient depth and size, the sensor can also be fully comprised by the groove. It has been found useful to provide a groove which is V-shaped.

[0018] A groove of declining width, such as and particularly, a V-shaped groove is useful for providing a defined position for sensors and can safely accommodate sensors of different sizes. The sensors are supported by two wall of the groove and hence make contact with two wall of the groove. Thereby, the sensors are in contact with the sensor housing at least at two points. Such contact normally helpful for increasing the reliability of measurements made with the sensor, for example temperature measurements. In a further important aspect, a groove of declining width, such as and particularly, a V-shaped groove will only have minimal negative impact on the mechanical stability of the sensor housing. In a yet further important aspect, a groove of declining width, such as and particularly, a V-shaped groove will make it easy to position the sensor in a pre-defined position within the groove.

[0019] The sensor can be mechanically held down in the groove, for example by a down-holder, for example a spring of the like. Alternatively, but also additionally, the sensor can be held in the groove by an adhesive.

[0020] In one embodiment the appliance can comprise two sensor housings and each sensor housing can comprise a sensor contact surface and the sensor contact surfaces can each be adjacent to and at level with the grooming surface. In another embodiment of the present invention comprising two sensor housings both sensor housings are integral with the grooming surface. In such an embodiment, the sensor housings can further be situated at two opposing sides of the grooming surface.

[0021] According to the present invention the personal appliance can be a hair care appliance. The appliance can in particular be a straightener.

[0022] In some embodiments of the present invention, the data measured by the at least one sensor form a first data set. The first data set comprises a first number of data. In such embodiments a second data set comprising a second number of data can be generated using data from the first data set, the second number being smaller than the first number. In other words, a data set is reduced to a smaller data set. As the smaller data set comprises less data, it in some sense comprises less information. Nevertheless, in relationship to a given question, the data set comprising lesser data can be more meaningful. However, it is critical for providing a meaningful second data set, that the data of the first data set are meaningful. As the data from the first data set come from sensor information, it is important in such situations, that the sensor is arranged to provide reliable data.

[0023] In embodiments of the present invention the personal appliance can comprise at least one sensor

which measured data, the data forming a first data set comprising data representing a first physical property and wherein a second data set, which comprises data representing a second physical property is generated using data from the first data set and wherein the second physical property is different from the first physical property. In this embodiment, data representing a first physical property, for example temperature, are used to create a data set of data representing another physical property. This other physical property can for example be hair humidity. It has been found, that the hair temperature curves measurable by sensors are representative for hair humidity, as hair responds differently to heat exposure depending on its humidity. Of course, the quality of the data and therefore the mechanical arrangement of the sensors yielding the first data is critical to allow an effective transformation of the first data set to a second data set.

[0024] It has been found useful to use two sensors. The two sensors can measure the same property, for example temperature. Two sensors can achieve a more accurate temperature measurement as compared to a single sensor.

[0025] Alternatively or additionally, temperature data received from two sensors can be processed for achieving a different quality of information rather than temperature. For example, the temperature difference between the front end and the rear end of the heating plates of a hair straightener can be representative for the dryness of the hair. If the hair is wet, it will normally absorb more heat from the heated plates of a hair straightener, and hence the temperature drop between the front sensor and the rear sensor (in a given stroke direction) is more pronounced. Therefore, a set of temperature data can be transferred into a set of dryness data. Dryness data are referred to as a data set of a different nature as compared to the temperature data set.

[0026] In the context of the present invention, a personal appliance is considered useful, wherein the data measured by the at least one sensor form a first data set comprising a data representing a first physical property and wherein a second data set comprising a data representing a second physical property is generated using data from the first data set and the second physical property is different from the first physical property. With reference to the example given above, the first set of data can be temperature data and the second set of data can be dryness data.

[0027] In one useful way of practicing the invention, this conversion can be achieved by relying on data stored in the data storage. For example, the data storage may have representative data for temperature drop depending on hair dryness. Hence, by relying on the stored data, it is possible to reliably transform temperature data into dryness data. When the first set of data is created by a single sensor, the quality of the second set of data can be increased by additionally relying on data from the data storage.

[0028] It is also possible that the personal appliance

comprises a third sensor which measures data of a different nature than the first and the second sensor. For example, in case of a hair straightener, the third sensor may measure hair dryness directly. The data of the third sensor can then be compared with the process data of the first two sensors. The comparison can then lead to an estimate about the reliability of the sensors and to an overall more accurate measurement. Generally, in accordance with the present invention, any sensor, including the third sensor, used in a personal appliance comprising a grooming element can be placed in a groove, for example a groove of declining width, such as and particularly, a V-shaped groove.

[0029] Alternatively, the data of the third different sensor can be used to create a data set of yet different quality. For example, when the dryness of the hair is known from data generated by the third sensor, the temperature data generated by the first and second sensor could be used to have an estimate for the speed with which the device is moved through the hair. The third sensor or a fourth sensor could also be a sensor measuring the position of the hair straightener.

[0030] Fig. 1 shows a hair straightener, which embodies the present invention. The hair straightener 200 comprises a gripping unit 210. the gripping unit essentially comprises a first arm 212 and a second arm 214. Both arms are linked at joint 216. A cable 218 is provided at one end of the straightener 200. As an interface the straightener comprises a dial knob 220. Further, the straightener 200 comprises a hair treatment unit 230. This hair treatment unit also comprises a first arm 232 and a second arm 234. At one end of the first arm 232 a gripping unit 236 is provided. Both arms comprise heated surfaces and for the second arm 214 the first heating surface 250 can be clearly seen. Adjacent to the first heating surface 250 an area 240 for the first sensor is provided and an area 242 for the second sensor is provided.

[0031] Fig. 2 schematically shows an arrangement of a grooming element 10 and a sensor housing 20 according to the present invention.

[0032] In this arrangement the sensor housing has a sensor contact surface 22 which is co-planar and even integral with the grooming surface 12. The sensor housing 20 encases the sensor 24. The upper portion of the sensor housing 20 is provided in the form of contact plate 26. Contact plate 26 comprises a front surface, which serves as the sensor contact surface 22 and comprises a rear surface 28.

Fig. 3 represents a useful embodiment of the present invention in a cross-sectional view. The central portion of the combined grooming and sensor housing element is comprised by the grooming element 10. Grooming element 10 comprises the grooming surface 12. Opposite to the grooming surface 12, there is a grooming element rear surface 14. This rear surface 14 can be used to arrange a functional element on it, preferably a heating element 16 as shown. At the right end side of the groom-

ing element 10 a sensor housing 20 is arranged. The sensor housing comprises a sensor contact plate 26 comprising the sensor contact surface 22 and at the opposite side comprises the rear surface 28. The rear surface 28 of the sensor contact plate 26 comprises a groove. This groove is V-shaped, as can be seen on this cross-section. The sensor 24 is arranged in groove 30. Groove 30 is provided deep enough to fully comprise and encase sensor 24. The position of the sensor 24 in groove 30 is secured by hold-down element 32.

[0033] On the left hand side a further sensor housing 20A is provided. It is arranged in mirror symmetry to the right hand side sensor housing 20. It also comprises all the elements comprised by sensor housing 20. The corresponding elements are marked with corresponding reference numbers, to which an "A" has been added.

[0034] The grooming element 10 is formed as a profile, preferably made from a metal strand casting, which is flat at its front surface for straightening hair and which is provided at its rear side with protruding extensions for separating the heating element (16) from the sensors (24). Those extensions limit the heat emission from the heating element to the sensor and increase thus the measuring accuracy of the measured hair temperature. Preferably the rear surface of the combined grooming and sensor housing element is in the shape of three reversed "U's" - see Fig 5.

[0035] Fig. 4 provides a schematic illustration of the functioning of the present invention, without providing actual parts of the invention as embodied in a personal appliance. The personal appliance might generate first sensor data SD1 and second sensor data SD2. Additionally, the user can enter data by a suitable interface, such that further data ED are available. All these data are transmitted to a central processing unit P. This unit will then generate an output signal O, which can be used select a desirable grooming mode.

[0036] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Claims

1. A hair straightener (200) for performing a grooming task on a user, comprising a grooming element (10), which is provided with a grooming surface (12) and a first and a second sensor (24), said first and second sensors (24) are each provided with a sensor housing (20), each of said sensor housings (20) is provided with a sensor contact surface (22), wherein each of said sensor contact surfaces (22) is adjacent to and at level with and/or with step free transition with the grooming surface (12), each of said sensor

housings (20, 20A) being both integral with the grooming surface (12) and situated at two opposing sides of the grooming surface (12), wherein the sensor contact surface (22) and the grooming surface (12) are integral such that both surfaces are provided from one piece of material and form one larger surface of that piece of material and wherein the sensor housing (20) comprises a contact plate (26) and the contact plate (26) comprises a front surface and a rear surface (28) and the front surface provides the sensor contact surface (22).

2. The hair straightener (200) of claim 1, wherein the sensor contact surface (22) and the grooming surface (12) are co-planar.
3. The hair straightener (200) of claim 1 or 2, wherein the grooming element (10) and the sensor housing element are combined and a central portion thereof is provided with the grooming surface (12).
4. The hair straightener (200) of any one of the preceding claims, wherein a rear surface of said central portion of the grooming surface (12) is provided with a functional element, which is preferably a heating element (16).
5. The hair straightener (200) one of the preceding claims, wherein said rear surface (28) comprises a groove (30) and wherein the sensor (24) is at least partially comprised by the groove (30).
6. The hair straightener (200) of claim 5, wherein the groove (30) is V-shaped.
7. The hair straightener (200) of claim 5 or 6, wherein the sensor (24) is mechanically held down in the groove (30).
8. The hair straightener (200) of any of claims 5 to 7, wherein the sensor (24) is held in the groove (30) by an adhesive.
9. The hair straightener (200) of any one of the preceding claims, wherein the grooming element (10) is formed as a profile, preferably made from a metal strand casting, which is flat at its front surface for straightening hair and which is provided at its rear side with protruding extensions for separating the heating element (16) from the sensors (24).
10. The hair straightener (200) of any one of the preceding claims, wherein the data measured by the at least one sensor form a first data set comprising a first number of data and wherein a second data set comprising a second number of data is generated using data from the first data set and the second number is smaller than the first number.

11. The hair straightener (200) of any one of the preceding claims, wherein the data measured by the at least one sensor form a first data set comprising a data representing a first physical property and wherein a second data set comprising a data representing a second physical property is generated using data from the first data set and the second physical property is different from the first physical property.
12. The hair straightener (200) of claim 11, wherein the first physical property is temperature and/or the second physical property is humidity.

Patentansprüche

1. Haarglätter (200) zum Durchführen einer Pflegeaufgabe an einem Benutzer, umfassend ein Pflegeelement (10), das mit einer Pflegeoberfläche (12) und einem ersten und einem zweiten Sensor (24) versehen ist, wobei der erste und der zweite Sensor (24) jeweils mit einem Sensorgehäuse (20) versehen sind, wobei jedes der Sensorgehäuse (20) mit einer Sensorkontaktoberfläche (22) versehen ist, wobei jede der Sensorkontaktoberflächen (22) angrenzend an und in einer Ebene mit und/oder mit stufenfreiem Übergang mit der Pflegeoberfläche (12) angeordnet ist, wobei jedes der Sensorgehäuse (20, 20A) sowohl integral mit der Pflegeoberfläche (12) als auch an zwei gegenüberliegenden Seiten der Pflegeoberfläche (12) angeordnet ist, wobei die Sensorkontaktoberfläche (22) und die Pflegeoberfläche (12) integral sind, so dass beide Oberflächen aus einem Materialstück bereitgestellt sind und eine größere Oberfläche dieses Materialstücks bilden und wobei das Sensorgehäuse (20) eine Kontaktplatte (26) umfasst und die Kontaktplatte (26) eine vordere und eine hintere Oberfläche (28) umfasst und die vordere Oberfläche die Sensorkontaktoberfläche (22) bereitstellt.
2. Haarglätter (200) nach Anspruch 1, wobei die Sensorkontaktoberfläche (22) und die Pflegeoberfläche (12) coplanar sind.
3. Haarglätter (200) nach Anspruch 1 oder 2, wobei das Pflegeelement (10) und das Sensorgehäuseelement kombiniert sind und ein Mittelabschnitt davon mit der Pflegeoberfläche (12) versehen ist.
4. Haarglätter (200) nach einem der vorstehenden Ansprüche, wobei eine hintere Oberfläche des Mittelabschnitts der Pflegeoberfläche (12) mit einem Funktionselement versehen ist, das vorzugsweise ein Heizelement (16) ist.
5. Haarglätter (200) nach einem der vorstehenden An-

sprüche, wobei die hintere Oberfläche (28) eine Rille (30) umfasst und wobei der Sensor (24) mindestens teilweise von der Rille (30) umfasst wird.

6. Haarglätter (200) nach Anspruch 5, wobei die Rille (30) V-förmig ist.
7. Haarglätter (200) nach Anspruch 5 oder 6, wobei der Sensor (24) mechanisch in der Rille (30) festgehalten wird.
8. Haarglätter (200) nach einem der Ansprüche 5 bis 7, wobei der Sensor (24) mittels Klebstoff in der Rille (30) gehalten wird.
9. Haarglätter (200) nach einem der vorstehenden Ansprüche, wobei das Pflegeelement (10) als Profil geformt ist, vorzugsweise von einem Metallstrangguss gebildet ist, der an seiner vorderen Oberfläche zum Glätten von Haar flach ist und der an seiner Rückseite zum Trennen des Heizelements (16) von den Sensoren (24) mit hervorstehenden Erweiterungen versehen ist.
10. Haarglätter (200) nach einem der vorstehenden Ansprüche, wobei die Daten, die von dem mindestens einen Sensor gemessen werden, einen ersten Datensatz bilden, der eine erste Anzahl von Daten umfasst, und wobei ein zweiter Datensatz, der eine zweite Anzahl von Daten umfasst, mithilfe von Daten aus dem ersten Datensatz erzeugt wird und die zweite Anzahl kleiner ist als die erste Anzahl.
11. Haarglätter (200) nach einem der vorstehenden Ansprüche, wobei die Daten, die von dem mindestens einen Sensor gemessen werden, einen ersten Datensatz bilden, der Daten umfasst, die eine erste physikalische Eigenschaft darstellen, und wobei ein zweiter Datensatz, der Daten umfasst, die eine zweite physikalische Eigenschaft darstellen, mithilfe von Daten aus dem ersten Datensatz erzeugt wird und sich die zweite physikalische Eigenschaft von der ersten physikalischen Eigenschaft unterscheidet.
12. Haarglätter (200) nach Anspruch 11, wobei die erste physikalische Eigenschaft Temperatur ist und/oder die zweite physikalische Eigenschaft Feuchtigkeit ist.

Revendications

1. Lisseur capillaire (200) pour l'exécution d'une tâche de coiffage sur un utilisateur, comprenant un élément de coiffage (10), qui est pourvu d'une surface de coiffage (12) et de premier et deuxième capteurs (24), lesdits premier et deuxième capteurs (24) sont chacun pourvus d'un logement de capteur (20), cha-

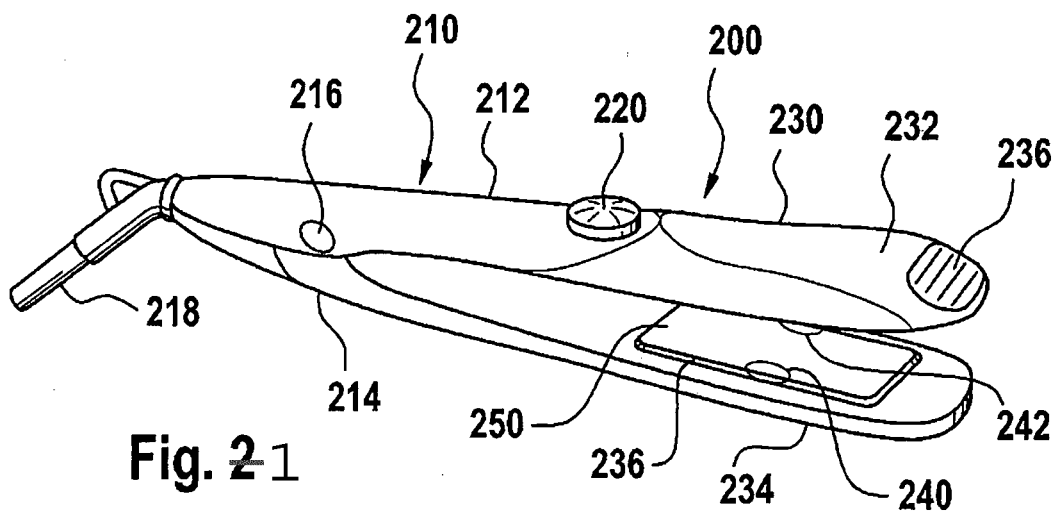
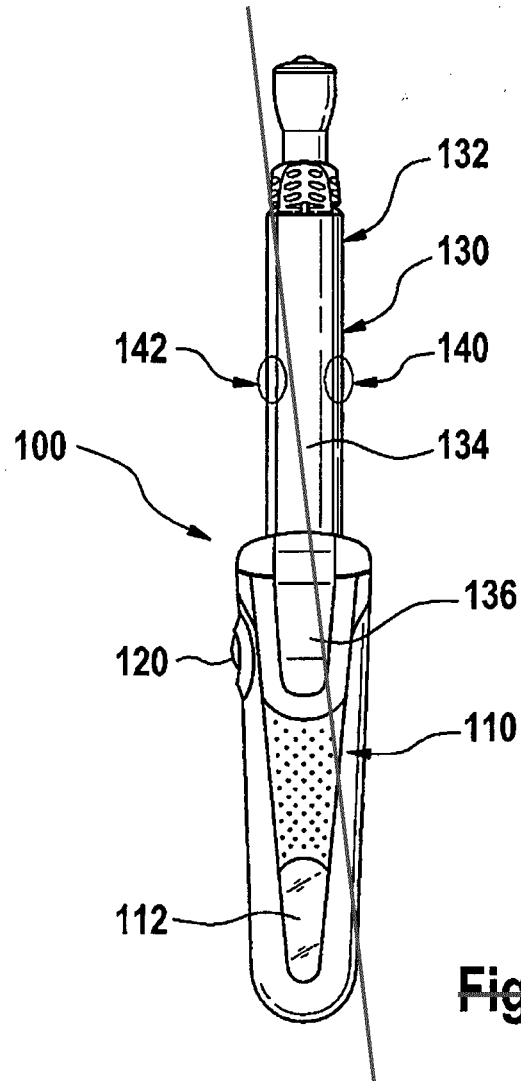
cun desdits logements de capteur (20) est pourvu d'une surface de contact de capteur (22), dans lequel chacune desdites surfaces de contact de capteur (22) est adjacente à, et au niveau de, et/ou dotée d'une transition exempte d'étagement avec, la surface de coiffage (12), chacun desdits logements de capteur (20, 20A) étant

à la fois solidaire de la surface de coiffage (12) et situé au niveau de deux côtés opposés de la surface de coiffage (12), dans lequel la surface de contact de capteur (22) et la surface de coiffage (12) sont solidaires de telle sorte que l'une et l'autre des surfaces sont fournies à partir d'une pièce de matériau et forment une surface plus grande de cette pièce de matériau et dans lequel le logement de capteur (20) comprend une plaque de contact (26) et la plaque de contact (26) comprend une surface avant et une surface arrière (28) et la surface avant fournit la surface de contact de capteur (22).

2. Lisseur capillaire (200) selon la revendication 1, dans lequel la surface de contact de capteur (22) et la surface de coiffage (12) sont coplanaires.
3. Lisseur capillaire (200) selon la revendication 1 ou 2, dans lequel l'élément de coiffage (10) et l'élément de logement de capteur sont combinés et une partie centrale de ceux-ci est pourvue de la surface de coiffage (12).
4. Lisseur capillaire (200) selon l'une quelconque des revendications précédentes, dans lequel une surface arrière de ladite partie centrale de la surface de coiffage (12) est pourvue d'un élément fonctionnel, qui est de préférence un élément chauffant (16).
5. Lisseur capillaire (200) selon l'une des revendications précédentes, dans lequel ladite surface arrière (28) comprend une rainure (30) et dans lequel le capteur (24) est au moins partiellement constitué par la rainure (30).
6. Lisseur capillaire (200) selon la revendication 5, dans lequel la rainure (30) est en forme de V.
7. Lisseur capillaire (200) selon la revendication 5 ou 6, dans lequel le capteur (24) est mécaniquement maintenu en bas dans la rainure (30).
8. Lisseur capillaire (200) selon l'une quelconque des revendications 5 à 7, dans lequel le capteur (24) est maintenu dans la rainure (30) par un adhésif.
9. Lisseur capillaire (200) selon l'une quelconque des revendications précédentes, dans lequel l'élément de coiffage (10) est formé en tant que profil, de préférence fabriqué à partir d'un coulage de toron métallique, qui est plat au niveau de sa surface avant

pour lisser les cheveux et qui est pourvu au niveau de son côté arrière d'extensions faisant saillie pour séparer l'élément chauffant (16) des capteurs (24).

10. Lisseur capillaire (200) selon l'une quelconque des revendications précédentes, dans lequel les données mesurées par ledit au moins un capteur forment un premier ensemble de données comprenant un premier nombre de données et dans lequel un deuxième ensemble de données comprenant un deuxième nombre de données est produit en utilisant les données du premier ensemble de données et le deuxième nombre est plus petit que le premier nombre.
11. Lisseur capillaire (200) selon l'une quelconque des revendications précédentes, dans lequel les données mesurées par ledit au moins un capteur forment un premier ensemble de données comprenant une donnée représentant une première propriété physique et dans lequel un deuxième ensemble de données comprenant une donnée représentant une deuxième propriété physique est produit en utilisant les données du premier ensemble de données et la deuxième propriété physique est différente de la première propriété physique.
12. Lisseur capillaire (200) selon la revendication 11, dans lequel la première propriété physique est la température et/ou la deuxième propriété physique est l'humidité.



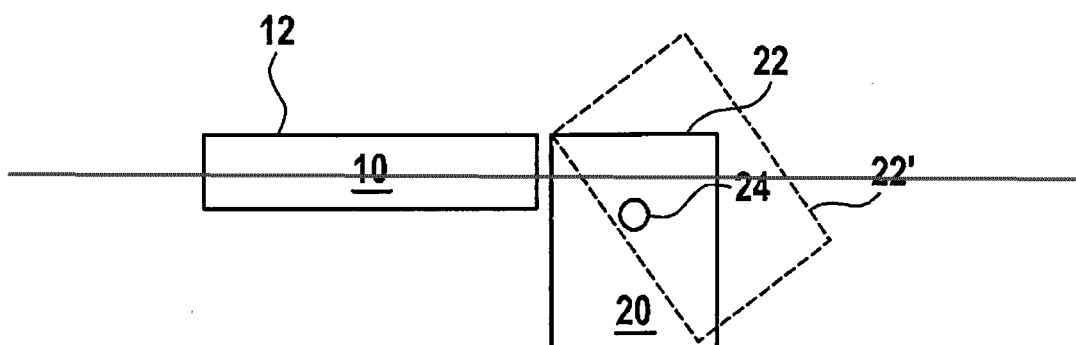


Fig. 3

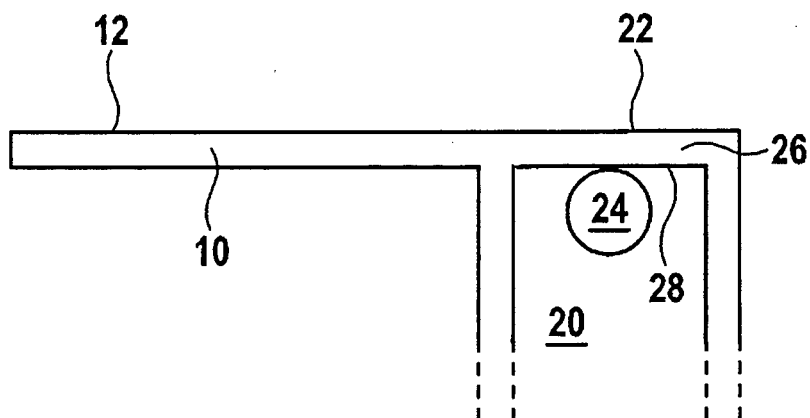


Fig. 4 2

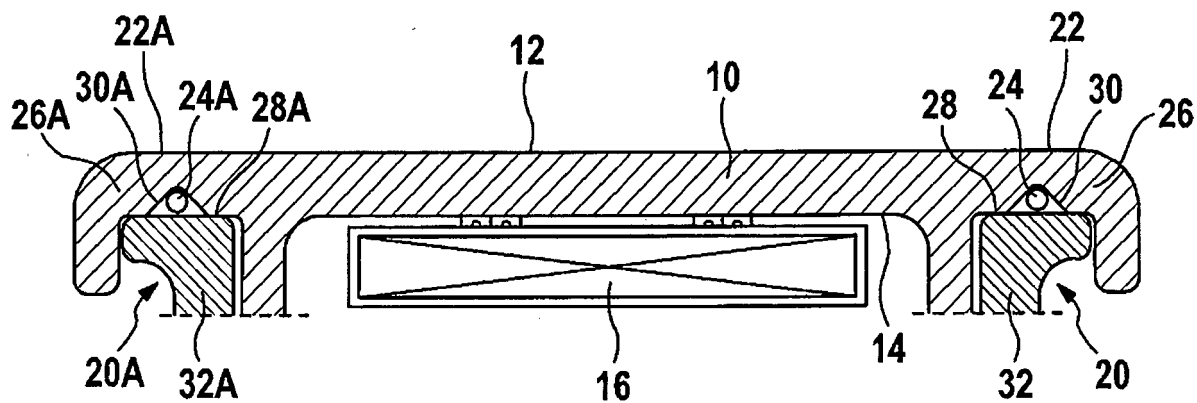


Fig. 5 3

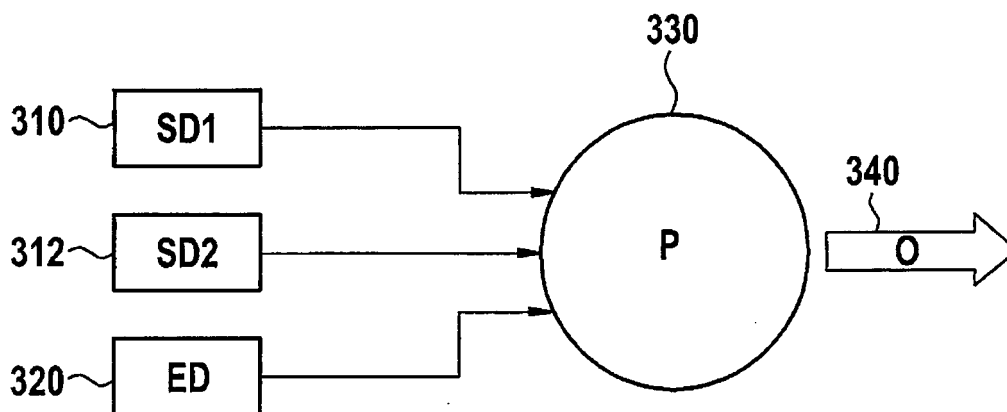


Fig. 6 4

REFERENCES CITED IN THE DESCRIPTION

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