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(54) **A HAIR STYLING DEVICE**

(57) A hair styling device, comprising a heater and a heat conduction unit which is thermally coupled with the heater for conducting heat to a treatment surface. The heat conduction unit comprising a first part with a first material and a second part with a second material,

wherein the thermal conductivity of the first material being higher than that of the second material, a temperature sensor being thermally coupled with the first part of the heat conduction unit for sensing the temperature of the first part of the heat conduction unit.

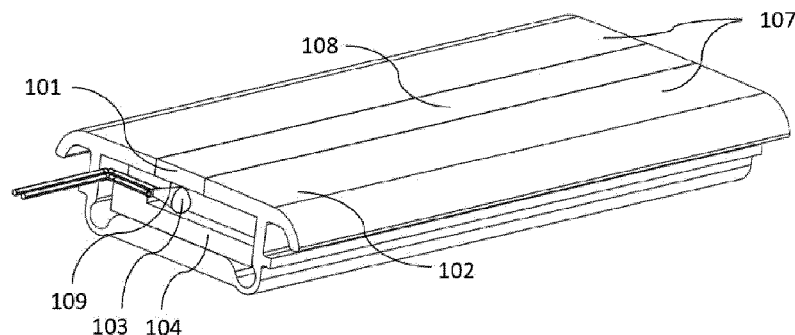


FIG.3

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Description

FIELD OF THE INVENTION

[0001] The invention relates to hair styling devices or appliances.

BACKGROUND OF THE INVENTION

[0002] A typical hair styling device uses temperature sensors to detect a change of a heating plate temperature, and compensate for any heat loss due to heating the hair by increasing the heater's temperature, or when the heating plate temperature is too high, it turns off the power to the heater until the temperature falls within the target range again. A disadvantages of this kind of control is the time delay between when the heating plate temperature changes, and when the sensor starts responding to that change, which makes it impossible for the product to accurately and timely control the temperature of the product on the hair, especially at the high range of the temperature. As a result, the heating plate's temperature will be over the maximum setup so that hair damage occurs.

SUMMARY OF THE INVENTION

[0003] The invention is defined by the claims.

[0004] According to examples in accordance with an aspect of the invention, there is provided a hair styling device, comprising:

- a heater;
- a heat conduction unit thermally coupled with the heater for conducting heat to a treatment surface; the heat conduction unit comprising a first part made from a first material and a second part made from a second material, the thermal conductivity of the first material being higher than that of the second material;
- a temperature sensor thermally coupled with the first part of the heat conduction unit.

[0005] Advantageously, the first material comprises any one of the following: cooper, cooper alloy, brass, silver, and silver alloy.

[0006] Advantageously, the second material comprises any one of the following: aluminum, and aluminum alloy.

[0007] Advantageously, the temperature sensor comprises a negative temperature coefficient thermistor.

[0008] Advantageously, the heater comprises positive temperature coefficient heater.

[0009] Advantageously, the first part of heat conduction unit is thinner than the second part of heat conduction unit.

[0010] Advantageously, a controller adapted to control the heater based on the sensed temperature.

[0011] Advantageously, a first side of the first part and a second side of the second part together forms the treatment surface.

[0012] Advantageously, the treatment surface is formed by a material coated on or covered on a first side of the first part and a second side of the second part.

[0013] Advantageously, the temperature sensor is coupled to a third side of the first part that is opposite to the treatment surface.

[0014] Advantageously, the treatment surface is flat surface, and the hair styling device being a hair straightener.

[0015] Advantageously, the treatment surface is waved surface, and the hair styling device being a hair volumizer.

[0016] Advantageously, the treatment surface is curved surface, and the hair styling device being a hair curler.

[0017] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, in which:

Fig. 1 schematically depicts a heating assembly according to an embodiment of the invention;

Fig. 2 shows the heating assembly of Fig. 1 from bottom view;

Fig. 3 schematically depicts a heating assembly of Fig. 1 from A-A cross section view according to an embodiment of the invention;

Fig. 4 schematically depicts a heating assembly of Fig. 1 from A-A cross section view according to another embodiment of the invention;

Fig. 5 schematically depicts a styling device according to an embodiment of the invention;

Fig. 6 schematically depicts a styling device according to another embodiment of the invention;

Fig. 7 schematically depicts a styling device according to another embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] The invention will be described with reference to the Figs. 1-7.

[0020] It should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the apparatus, systems and methods, are intended for purposes of illustration only and are not intended to limit the scope of the invention. These and other features, aspects, and advantages of the apparatus, systems and methods of the present invention will become better understood from the following description,

appended claims, and accompanying drawings. It is to be understood that the figures are merely schematic and are not drawn to scale. It should also be understood that the same reference numerals are used throughout the figures to indicate the same or similar parts.

[0021] Referring to Figs. 5-7, the invention provides a hair styling device for treating hair. The hair styling device may be for example, a hair straightener 10, or hair volumizer 20, or hair curler 30, etc.

[0022] According to an embodiment of the invention, the hair styling device comprises a heating assembly. The heating assembly includes a heater 104 and a heat conduction unit 105. The heater 104 is thermally coupled with the heat conduction unit 105 for conducting heat to a treatment surface 106 for receiving and treating hair.

[0023] Now referring to Fig. 1 and Fig. 2, a heating assembly including a heater 104 and a heat conduction unit 105 is provided according to an embodiment of the invention. The heat conduction unit 105 comprises a first part 101 and a second part 102. The first part 101 is made of a material that has a higher thermal conductivity than the material of the second part 102. Advantageously, the material of the first part 101 may be copper, copper alloy, brass, silver, and silver alloy. Advantageously, the material of the second part 102 may be normally used heat conduction material, such as: aluminum or aluminum alloy, etc.

[0024] Now referring to Fig. 3, the heating assembly further comprises a temperature sensor 103 which is thermally coupled with the first part 101 of the heat conduction unit 105 for sensing the temperature of the first part 101 of the heat conduction unit 105. As the first part 101 has a higher thermal conductivity than the second part 102, the temperature of the first part 101 changes faster than the second part 102 when the conduction unit 105 absorbs heat from the heater, or when the hair absorb heat from the conduction unit 105 via treatment surface 106. As a result, by coupling the temperature sensor 103 to the first part 101, the hair styling device can sense the temperature change of the heat conduction unit 105 quicker. The first part 101 may be a small strip as long as the temperature sensor 103 can be coupled to it.

[0025] Advantageously, according to another embodiment of the invention, as shown in Fig.4, the first part 101 can be made thinner than the second part 102, and therefore, there is a space/recess to attach the temperature sensor, and the heat conduction speed of the first part 101 may be further increased with a thinner strip, and thus the temperature sensor 103 coupled to it can sense the temperature changing even faster. The thickness of the first part 101 may be selected from 0.3~ 1.9mm.

[0026] The conduction unit 105 in an example of Figs. 1-4 is generally in rectangular shape with a hollow portion. Heater 104 is positioned in the hollow portion of heat conduction unit 105.

[0027] Advantageously, at least a portion of the heater is tightly attached to the heat conduction unit 105 to

enable a good heat conduction, i.e the heater is surrounded by the heat conduction unit 105 and is tightly attached to the heat conduction unit 105 except the portion where the temperature sensor is located.

[0028] Advantageously, a side 108 of the first part of the conduction unit 105 and a side 107 of the second part of the conduction unit 105 together forms the treatment surface 106. Alternatively, the treatment surface 106 may be formed by a material coated on or covered on the side 108 of the first part and the side 107 of the second part. With an additional coating or covering layer, the treatment surface 106 may be smoother and have better integrity.

[0029] Advantageously, the temperature sensor 103 is coupled to a side 109 of the first part that is opposite to the treatment surface 106, i.e the side 109 is opposite to the side 108 of the first part, while the side 108 is part of the treatment surface 106 or is covered by the treatment surface 106.

[0030] When the temperature sensor 103 detects a temperature being lower or higher than a working temperature range, a signal will be provided to a controller (not shown in the figures) of the styling device to turned on the heater 104 to generate heat or to turn off the heater 104 to avoid damaging hair.

[0031] According to an embodiment of the invention, the temperature sensor 103 may be any type of sensor, for example: a negative temperature coefficient (NTC) thermistor.

[0032] According to an embodiment of the invention, the heater 104 may be any type of heater as long as it can generate heat, such as a positive temperature coefficient (PTC) heater.

[0033] The heating assembly shown in Figs. 1-4 may be used in a hair straightener. Fig. 5 shows a hair straightener 10 comprising a heating assembly shown in the Figs. 1-4. In this example, the treatment surface 106 is a flat surface. The hair straightener comprises two plates 110 hinged together and can move relative to each other (i.e. open and close the two plates) for clamping and treating hair. The heating assembly, comprising a heater 104, a heat conduction unit 105 and a temperature sensor 103 according to an example of the invention, is arranged at one of the plates or arranged at both two plates respectively.

[0034] As shown in Fig. 6, the hair styling device may be a hair volumizer 20, the treatment surface 106 is a waved surface. The hair volumizer comprises two plates 210 hinged together and can move relative to each other (i.e. open and close the two plates) for clamping and treating hair. The heating assembly, comprising a heater 104, a heat conduction unit 105 and a temperature sensor 103 according to an example of the invention, is arranged at one of the plates or arranged at both two plates respectively.

[0035] As shown in Fig. 7, the hair styling device may be a hair curler 30, the treatment surface 106 is a curved surface. The hair styling device comprises a heating

barrel 310 around which hair is to be wound for curling. The heating assembly, comprising a heater 104, a heat conduction unit 105 and a temperature sensor 103 according to an example of the invention, is arranged at the heating barrel 310. In this example, the heat conduction unit may be in a hollowed cylinder shape.

[0036] Variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.

[0037] Functions implemented by a processor or controller may be implemented by a single processor or by multiple separate processing units which may together be considered to constitute a "processor". Such processing units may in some cases be remote from each other and communicate with each other in a wired or wireless manner.

[0038] 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.

[0039] If the term "adapted to" is used in the claims or description, it is noted the term "adapted to" is intended to be equivalent to the term "configured to". If the term "arrangement" is used in the claims or description, it is noted the term "arrangement" is intended to be equivalent to the term "system", and vice versa.

[0040] If the term "first", "second", or "third" are used before "part", "element", or "unit", it does not mean a sequential order, it is used only for giving a different name to different element.

[0041] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A hair styling device (10, 20, 30), comprising:

a heater (104);
a heat conduction unit (105) thermally coupled with the heater for conducting heat to a treatment surface (106); the heat conduction unit comprising a first part (101) made from a first material and a second part (102) made from a second material, the thermal conductivity of the first material being higher than that of the second material;
a temperature sensor (103) thermally coupled with the first part (101) of the heat conduction unit.

2. A hair styling device as claimed in claim 1, wherein the first material comprises any one of the following: cooper, cooper alloy, brass, silver, and silver alloy.

3. A hair styling device as claimed in claim 1, wherein the second material comprises any one of the following: aluminum, and aluminum alloy.
4. A hair styling device as claimed in claim 1, wherein the temperature sensor comprises a negative temperature coefficient thermistor sensor.
5. A hair styling device as claimed in claim 1, wherein the heater comprises positive temperature coefficient heater.
6. A hair styling device as claimed in claim 1, wherein the first part is thinner than the second part.
7. A hair styling device as claimed in claim 1, further comprising a controller adapted to control the heater based on the sensed temperature.
8. A hair styling device as claimed in claim 1, wherein a first side (108) of the first part (101) and a second side (107) of the second part (102) together forms the treatment surface (106).
9. A hair styling device as claimed in claim 1, wherein the treatment surface is formed by a material coated on or covered on a first side (108) of the first part (101) and a second side (107) of the second part (102).
10. A hair styling device as claimed in claim 1, wherein the temperature sensor is coupled to a third side (109) of the first part (101) that is opposite to the treatment surface.
11. A hair styling device as claimed in any of claims 1 to 10, wherein the treatment surface is flat surface, and the hair styling device being a hair straightener.
12. A hair styling device as claimed in any of claims 1 to 10, wherein the treatment surface is waved surface, and the hair styling device being a hair volumizer.
13. A hair styling device as claimed in any of claims 1 to 10, wherein the treatment surface is curved surface, and the hair styling device being a hair curler.

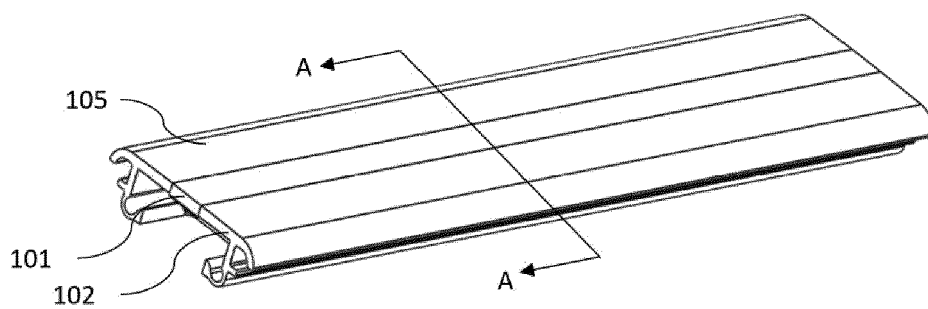


FIG.1

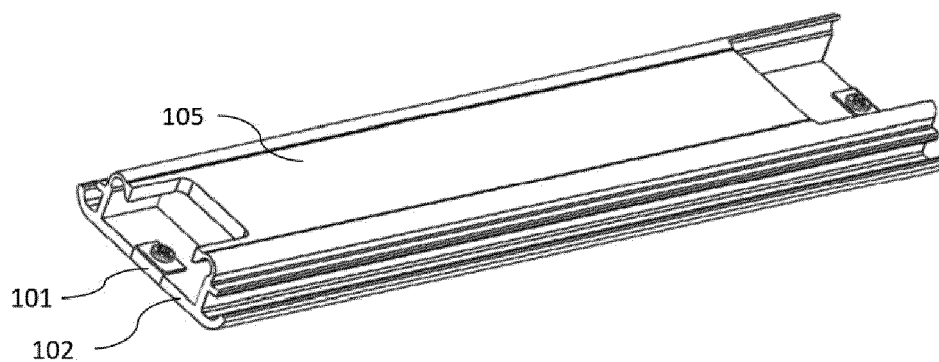


FIG.2

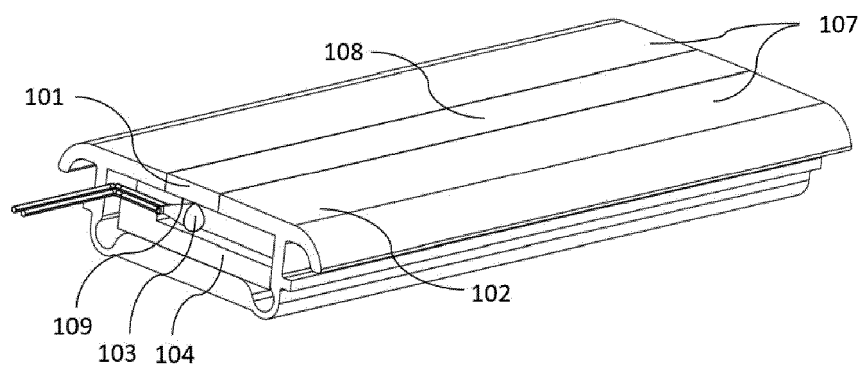


FIG.3

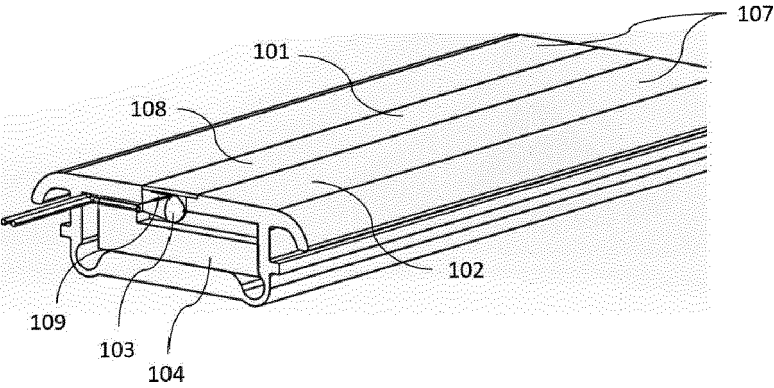


FIG.4

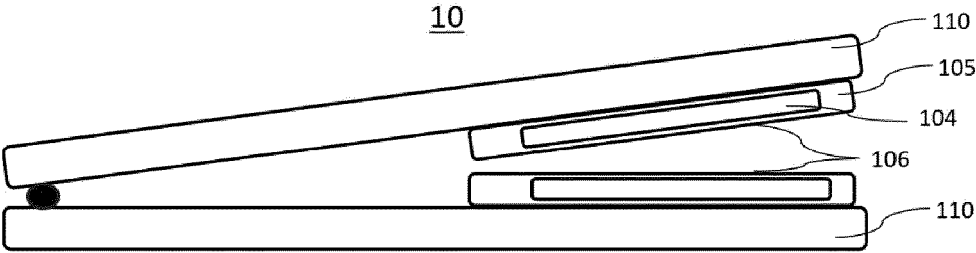


FIG.5

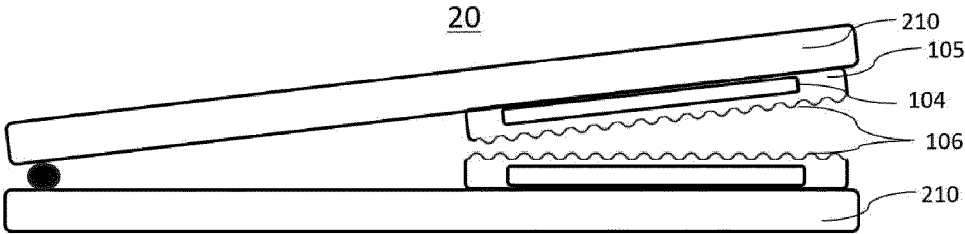


FIG.6

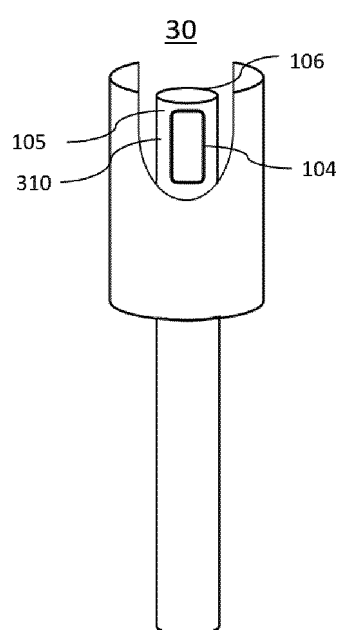


FIG. 7



EUROPEAN SEARCH REPORT

Application Number

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Place of search The Hague		Date of completion of the search 3 October 2024	Examiner van de Beek-Duijker
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