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(54) **HAIR CARE OR HAIR STYLING DEVICE**

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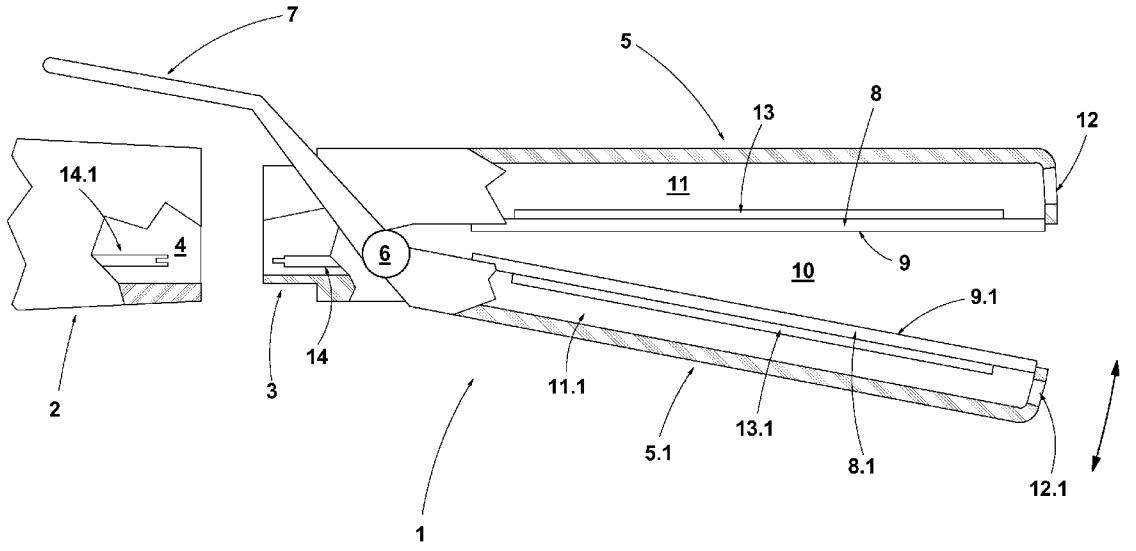
(57) **ABSTRACT**

A hair care or hair styling device **1** comprises two arms **5**, **5.1** arranged articulated to one another and movable relative to one another in the manner of tongs **5**, **5.1**, with the top sides of each of said arms, which face one another, each having a complementary styling surface **9**, **9.1** for forming a hair styling space **10** between the styling surfaces **9**, **9.1**. By virtue of the articulated arrangement of the arms **5**, **5.1** the hair styling space **10** can be opened and closed. Each of the arms **5**, **5.1** is equipped with a flow passage **11**, **11.1** for conducting a flow of hot air, wherein the component **8**, **8.1** that forms the styling surface **9**, **9.1** of each arm **5**, **5.1** is arranged such that a flow of hot air conducted through the flow passage **11**, **11.1** of said arm **5**, **5.1** flows along the back side of the component **8**, **8.1** that forms the styling surface **9**, **9.1** for the purpose of heating said styling surface **9**, **9.1**. In a heat-conducting arrangement, at least one self-regulating heating element having a positive temperature coefficient—a PTC heating element **13**, **13.1**—is connected as an additional heating device to the component **8**, **8.1** that forms the styling surface **9**, **9.1** of at least one arm **5**, **5.1**, for the purpose of supplying heat to the styling surfaces **9**, **9.1**.



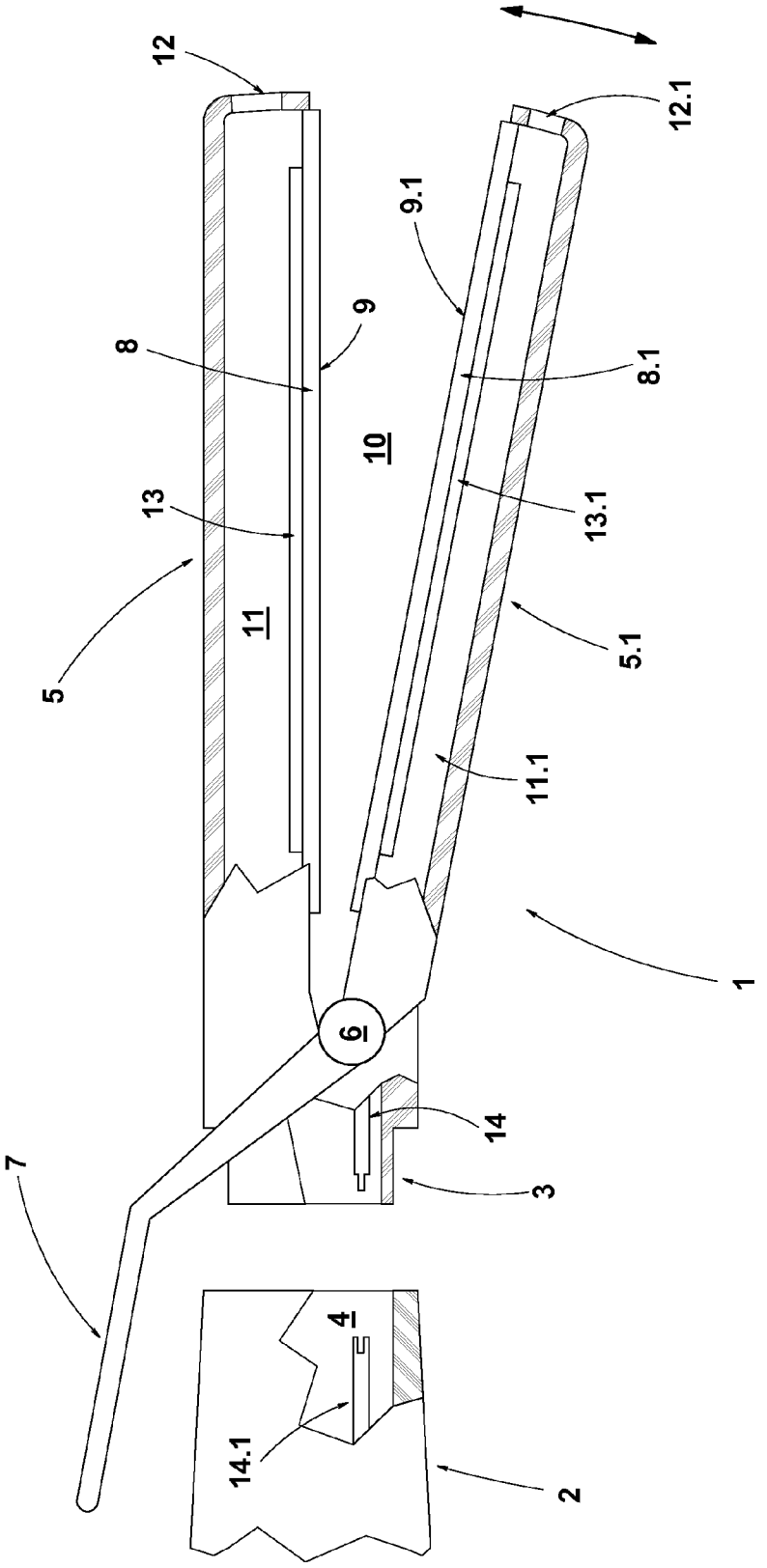


Fig. 1

HAIR CARE OR HAIR STYLING DEVICE

CROSS REFERENCE APPLICATIONS

[0001] This application claims the benefit of German Application No. 20 2011 051 906.6, filed Nov. 9, 2011, which is incorporated herein by reference for all purposes.

BACKGROUND

[0002] Various hair styling devices generate a flow of hot air are used with various hair styling attachments for styling hair. For smoothing or curling hair, hair styling attachments which have two articulated arms that move relative to one another like tongs are also used. A hair styling space is provided for receiving the hair to be styled between the sides of two facing arms. Each of the facing sides of the arms has a styling surface. These surfaces are common on hair straighteners. Also known are hair styling attachments with undulated styling surfaces for producing curls. The styling surfaces of the two arms have complementary shapes.

[0003] Typically, hair styling attachments with two movable arms have an air flow through them. This is the type of device discussed herein. The heat required for hair styling provided by the flow of hot air from an attached hair dryer with at least one of the two arms having a flow passage for transporting the air flow provided by the device. The flow passage opens up into air outlet openings in the styling surface of said arm, supplying air to the styling surface and the hair to be styled. At the same time, the supplied air dries the generally damp hair. In another style, the hot air flows into the flow passage of one of the two arms, and then flows along the back side of the styling surface. The styling surface is typically a metal plate, for example, an aluminum plate. The plate is heated by the hot air flowing along the back side. One or more outlet openings are provided to allow the air flow to exit at a suitable position, such as in the unattached end.

[0004] Sometimes it is necessary for a substantial amount of heat to be applied depending on the design of the styling surfaces. This in turn requires that the hot air blower of the hair dryer be operated at full output. In principle, this is not a problem for the hair dryer, since it is designed for this purpose. However, sometimes the amount of noise produced is considered undesirable.

[0005] In order to style hair a certain amount of heat must be applied to the hair. However, when a straightener is attached to a hair dryer, the two styling surfaces can be heated unevenly due to uneven air flow. As a result, the two styling surfaces can have different temperatures. This is undesirable.

[0006] Straighteners that are heated by an electrical heating element are also known. In those devices the heaters are attached directly to the back side of the component that forms the styling surface. Such a heating of the components that support the styling surfaces prevents different temperatures of the styling surfaces. However, devices of this type cannot be used as an attachment to a hair dryer. Such a hair styling device is known from JP 2004-267787 A.

[0007] The invention further relates to a method for operating hair styling device which has at least one styling element that is placed in contact with a strand of hair to be styled. A flow of hot air is generated to heat the styling element which is conducted along and/or through said styling element to heat said element.

[0008] In light of the discussed prior art, the problem addressed by the invention is therefore that of further developing a hair care or hair styling device and/or a method for operating such a device such that the styling surfaces can be heated evenly, and the noise that is produced by such a device can be decreased without losses in the amount of heat input.

[0009] The foregoing example of the related art and limitations related therewith are intended to be illustrative and not exclusive. Other limitations of the related art will become apparent to those of skill in the art upon a reading of the specification and a study of the drawings.

SUMMARY

[0010] This disclosed device has at least one self-regulating heating element having a positive temperature coefficient, such as a PTC heating element, is connected a heat-conducting arrangement as an additional heating device to the styling surface of at least one arm.

[0011] With this hair styling device, the styling surface or the component that forms and/or supports the styling surface of at least one arm is heated both by a flow of hot air and by a PTC heating element. Therefore, temperature fluctuations in the air flow in the arm and/or fluctuations in the amount of heat introduced are compensated for in a self-regulating manner by the PTC heating element. A hair styling device of this type is typically designed such that the styling surfaces are heated to the intended temperature by the flow of hot air. In such an embodiment, the PTC heating element is preferably designed such that it does not produce any heat when the component connected to the heater is at the intended temperature. If the temperature of the component with the styling surface drops, the needed heat is provided by the PTC heating element as a result of its positive temperature coefficient. In the depicted embodiment, the greater the difference between the target temperature and the actual temperature of the component, the greater the corresponding power input by the PTC heating element, providing more heat. This allows hair styling devices having are articulated arms to have arms with different volumes without having to accept losses in heating performance.

[0012] When starting this type of device, typically both the hot air flow and PTC heating element will be used for heating the components with styling surfaces. This allows the styling surfaces to be heated to operating temperature very quickly. The particular combination of the two heat sources can also be used to heat the styling surfaces with the hot air flow to a first temperature level, typically a temperature level at which a first hair care step can be carried out. If another hair care step is planned at a higher temperature, the additional heating element or heating elements can be used for this purpose. The elements will not be activated when the styling surfaces are to set to be at the first temperature level due to their positive temperature coefficient. These additional electrical heating elements can likewise be used for preheating the styling surfaces, in which case they will remain switched on only for a first heating phase. Also possible is an embodiment with at least two heating elements provided with different, positive temperature coefficients connected to the components having the styling surfaces. This allows one activate one or the other heating element, depending upon the temperature level to which the styling surfaces are to be heated.

[0013] In an embodiment in which both heat sources, hot air flow and electrical heating element(s), are activated during operation of the device, due to the rapid response of such a PTC heating element, the styling surface that is heated by said element will then also be rapidly reheated when a strand of

hair that is at the temperature of the surrounding air has been placed in the hair styling space and has drawn this heat from the styling surface. This substantially improves the flow of heat from a styling surface to the hair to be cared for or styled. In principle, no additional measures are required for controlling a heating element of this type due to the positive temperature coefficient.

[0014] In one embodiment example, the components that form the styling surfaces of the two arms are each equipped with at least one PTC heating element. In this embodiment, mixed heat can be provided from both a hot air flow and heat from the PTC heating element. As a result of the self-regulating properties of these heating elements, the hair styling surfaces have a highly constant, uniform temperature. In addition, the amount of hot air that is conveyed can be decreased in relation to known devices, which helps reduce operating noise.

[0015] A hair care or hair styling device of this type can be an integral component of a device that supplies a flow of hot air. In another embodiment, the hair styling device is an attachment for a hair dryer.

[0016] From the above-described design, it is clear that by skillfully combining different heating mechanisms, a hair styling device has been created which has substantial advantages over known devices. Ultimately, with such a device, not only can the flow of hot air be used to heat a component with styling surfaces, it is also possible to introduce the hot air flow to the hair being styled to dry the hair simultaneously with the styling process. In this type of embodiment, the styling surface typically has openings two allow the flow of hot air through the component to the hair to be styled. The hot air flow can also be used to introduce hot air as a carrier for additional substances that support hair styling or hair care to the hair. These can be scent or hair care products, for example. The flow of air can also be used to transport ions emitted by an ionizing electrode into the hair to be styled, thereby supporting the hair styling process.

[0017] The following embodiments and aspects thereof are described and illustrated in conjunction with systems, tool and methods which are meant to be exemplary and illustrative, not limiting in scope. In various embodiments, one or more of the above described problems have been reduced or eliminated, while other embodiments are directed to other improvements.

[0018] In addition to the exemplary aspects and embodiments described above, further aspects and embodiments will become apparent by reference to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. **1** is a schematic longitudinal view of the hair styling device.

[0020] Before explaining the disclosed embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of the particular arrangement shown, since the invention is capable of other embodiments. Exemplary embodiments are illustrated in referenced FIGURES of the drawings. It is intended that the embodiments and FIGURES disclosed herein are to be considered illustrative rather than limiting. Also, the terminology used herein is for the purpose of description and not of limitation.

DETAILED DESCRIPTION OF THE DRAWINGS

[0021] The straightener **1** of the depicted embodiment is designed as an attachment, allowing it to be attached to a hair dryer **2** which provides a flow of hot air. For this purpose, the straightener **1** has a coupling section **3**, which can be inserted into the anterior opening **4** of the hair dryer and locked in place. Locking can be implemented either in the as a plug-in lock or as a bayonet lock. In FIG. **1**, the straightener **1** is shown spaced from the hair dryer **2**.

[0022] The straightener itself comprises two arms **5**, **5.1**, which are articulated together in the manner of tongs. The axis of rotation of the two arms **5**, **5.1** relative to one another is identified by the reference sign **6**. The two arms **5**, **5.1** have different sizes and therefore different volumes. In the depicted embodiment, the arm **5** has the coupling section **3**, and therefore, the arm **5.1** is ultimately articulated to the arm **5**. Arm **5.1** has an actuating lever **7** which moves arm **5.1** relative to the arm **5** around the axis of rotation **6** in the manner of a scissor. The actuating lever **7** can also be connected to the rotational axis **6** on the rear side of the straightener, which is not visible in FIG. **1**.

[0023] Each of the two arms **5**, **5.1** is has an aluminum plate **8**, **8.1**. The aluminum plates **8**, **8.1** are arranged on the sides of the two arms **5**, **5.1** that face one another. The facing surfaces **9**, **9.1** of the aluminum plates **8**, **8.1** form the styling surfaces of the straightener **1**. Between the styling surfaces **9**, **9.1**, a hair styling space **10** is produced. In this respect, the aluminum plates **8**, **8.1** form the components of the straightener **1** that form and/or support the styling surfaces **9** and **9.1**.

[0024] The arms **5**, **5.1** are hollow have a flow passage **11**, **11.1**. The back side of each of the aluminum plates **8**, **8.1** forms a boundary for the flow passage **11** and **11.1**, respectively. When the hair dryer **2** is operated with the straightener **1** attached the flow of hot air through the flow passage **11** and **11.1** moves along the back side of the aluminum plates **8** and **8.1**, respectively, thereby heating them. The region of the unattached ends of each of the arms **5**, **5.1** has an opening **12**, **12.1** to allow the hot air flow in the respective flow passage **11** or **11.1** to exit. The opening can also comprise individual through openings, typically arranged in the manner of a screen.

[0025] In the depicted embodiment, the back side of each aluminum plate **8**, **8.1** has a PTC heating element **13**, **13.1** attached, typically glued. Heat generated by the respective PTC heating element **13**, **13.1** is therefore introduced to the respective aluminum plate **8** or **8.1**, thereby in turn heating the respective styling surface **9** or **9.1**. The PTC heating elements **13**, **13.1** extend across only a fraction of the surface of the back side of the aluminum plates **8**, **8.1**. Complementary plug-type connector parts **14**, **14.1** are used to connect the PTC heating elements **13**, **13.1** to a source of electricity. These connector parts are placed in engagement with one another when the straightener **1** is attached to the hair dryer **2**. Only one of multiple plug-type connector parts **14**, **14.1** is shown. The electrical connection lines also are not shown in FIG. **1** in the interest of clarity.

[0026] In another embodiment, the back side of each of the aluminum plates **8**, **8.1** is structured as the component that supports the respective styling surface **9** or **9.1**, for example, with ribs formed thereon. This enlarges the surface of the components **8**, **8.1** that receives the heat. PTC heating elements can be arranged in one or more of the channels located between the ribs in such an embodiment.

[0027] In an embodiment example of a straightener attachment not shown in the FIGURE the two arms have a different flow cross-section of their flow passage and a PTC heating element is assigned only to the arm that is smaller with respect to its flow cross-section. In such an embodiment, the stability of the heating system is also improved over known devices.

[0028] During operation of the straightener **1**, a flow of hot air provided by the hair dryer **2** is conducted into the coupling section **3** and from there into the flow passages **11**, **11.1** of the arms **5**, **5.1**. Typically, the flow is conducted through the heating device and the blower of the air dryer **2** at the same time as the flow through the PTC heating elements **13**, **13.1**. Although a flow of hot air immediately flows through the flow passages **11**, **11.1**, it takes a certain amount of time for the aluminum plates **8**, **8.1** to be heated enough that the styling surfaces **9**, **9.1** reach the specific styling temperature if additional measures are not implemented. However, in the depicted embodiment, the PTC heating elements produces a large amount of heat when the straightener **1** is placed in operation due to their positive temperature coefficient, substantially shortening the heating process. Therefore, the styling surfaces **9**, **9.1** are at the operating temperature only a few seconds after the straightener **1** is turned on.

[0029] The straightener **1** of the depicted embodiment is designed such that the aluminum plates **8**, **8.1** or the styling surfaces **9**, **9.1** thereof are heated both by the flow of hot air and by the PTC heating elements **13** or **13.1**. For this reason, the blower of hair dryer **2** can be operated at a relatively low speed, so that the noise generated by the straightener **1** is reduced substantially over known straighteners using a flow of hot air for heating the styling surfaces.

[0030] Therefore, the two heat sources—hot air flow and PTC heating element(s)—complement one another in a special way, particularly in that one of these heat sources, specifically the PTC heating element, is self-regulating.

[0031] It goes without saying that with an embodiment of this type, a potential drop in temperature, as is observed in conventional devices that use a hot air flow as the heat source in the smaller arms, does not occur.

[0032] The invention described above in reference the depicted embodiment can also be implemented likewise in any other air-heated devices or attachments, in which the hot air is used for the purpose of hair care or hair styling, such as with brushes, combs, rotating brushes or curling irons through which air flows. In these applications as well, the same advantages result as are mentioned in reference to the straightener of the described embodiment example.

[0033] While a number of exemplary aspects and embodiments have been discussed above, those of skill in the art will recognize certain modifications, permutations, additions and sub-combinations therefore. It is therefore intended that the following appended claims hereinafter introduced are interpreted to include all such modifications, permutations, additions and sub-combinations are within their true spirit and scope. Each apparatus embodiment described herein has numerous equivalents.

[0034] The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. Thus, it should be understood that although the present invention has been specifically disclosed by preferred embodiments and optional features, modification and variation of the concepts herein disclosed may be resorted to by those skilled in the art, and that such modifications and variations are considered to be within the scope of this invention as defined by the appended claims.

LIST OF REFERENCE SIGNS

[0035] **1** Straightener
[0036] **2** Air styler
[0037] **3** Coupling section
[0038] **4** Opening
[0039] **5**, **5.1** Arm
[0040] **6** Axis of rotation
[0041] **7** Actuating lever
[0042] **8**, **8.1** Aluminum plate
[0043] **9**, **9.1** Styling surface
[0044] **10** Hair styling space
[0045] **11**, **11.1** Flow passage
[0046] **12**, **12.1** Opening
[0047] **13**, **13.1** PTC heating element
[0048] **14**, **14.1** Plug-type connector element

I claim:

1. A hair care or hair styling device comprising:
two arms articulated to one another and movable relative to one another in the manner of tongs;
facing surfaces of said arms each having a component supporting a styling surface, said styling surfaces being complementary, said styling surfaces forming a hair styling space between the styling surfaces;
the articulated arrangement of the arms allowing the hair styling space to be opened and closed;
each of said arms having a flow passage for hot air, wherein each of the components supporting a styling surface is located on the flow passage such that a flow of hot air conducted through the flow passage flows along the back side of the component supporting a styling surface, heating said styling surface; and
at least one self-regulating heating element having a positive temperature coefficient connected in a heat-conducting manner as an additional heating device to the component supporting the styling surface of at least one arm.

2. The hair care or hair styling device of claim **1**, wherein that the heating element is glued to the back side of the component supporting the styling surface.

3. The hair care or hair styling device of claim **1**, wherein the arms have different volumes and the heating element is attached to the component supporting the styling surface of the smaller arm.

4. The hair care or hair styling device of claim **1**, wherein the components supporting the styling surfaces of both arms are each equipped with a PTC heating element.

5. The hair care or hair styling device of claim **1**, wherein the flow passages have an opening in the region of unattached ends of the arms from the hot air flow fully or partially flows when the device is in use.

6. The hair care or hair styling device of claim **1**, wherein the device is part of a device that provides a flow of hot air.

7. The hair care or hair styling device of claim **1**, wherein the device is an attachment for a device that provides a flow of hot air.

8. A method for operating a hair care or hair styling device comprising:

providing at least one one styling element that is placed in contact with a strand of hair to be styled;

heating the styling element with a flow of hot air conducted along and/or through the styling element;

additionally heating the styling element by one or more heating elements, said heating elements self-regulating based upon the operation of the device.

9. The method of claim **8**, wherein both heat sources are used at the same time, wherein the hot air flow is heated to a temperature at which the styling element is heated to a predetermined temperature level, and the fluctuations in the temperature of the styling element are substantially balanced by the at least one additional electrical heating element.

10. The method according to claim **8**, wherein that for the purpose of heating the styling element, both heat sources are used at the same time, wherein the hot air flow is heated to a temperature at which the styling element is heated to a predetermined temperature level, and the at least one additional heating element is activated for the purpose of achieving peak temperatures.

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