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(54) **DEVICE FOR FORMING HAIR**

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(57) **ABSTRACT**

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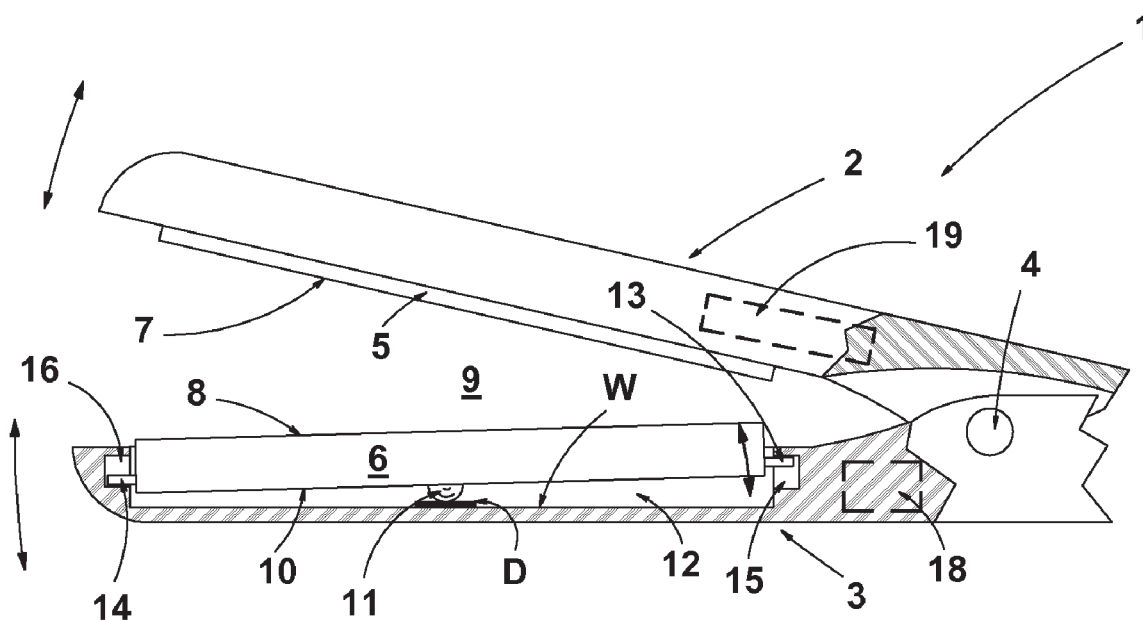
A hair styling device has two arms 2, 3. Each arm 2, 3 has a styling part 5, 6, which cooperates with the styling part 5, 6 on the other arm 2, 3 for the hair styling operation. At least one styling part 5, 6 is designed for heating hair inserted into the hair styling gap 9 located between the styling parts 5, 6. A pressure measuring device D is included in one of the two arms. The pressure measuring device D detects the pressure, or a value representing this pressure, exerted on the hair 17 between the styling parts (5, 6) when the hair styling gap 9 is closed. The hair styling device 1 also has a display device 19 for displaying the pressure or pressure value thus detected.

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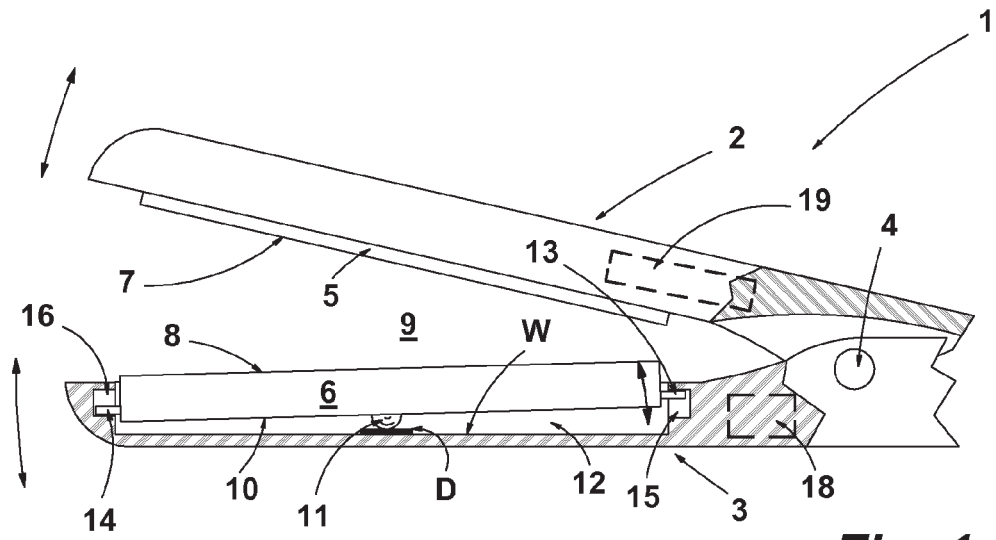


Fig. 1

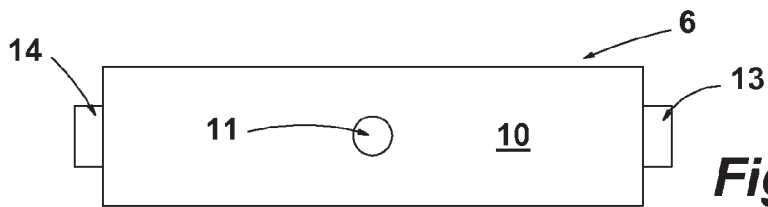


Fig. 2

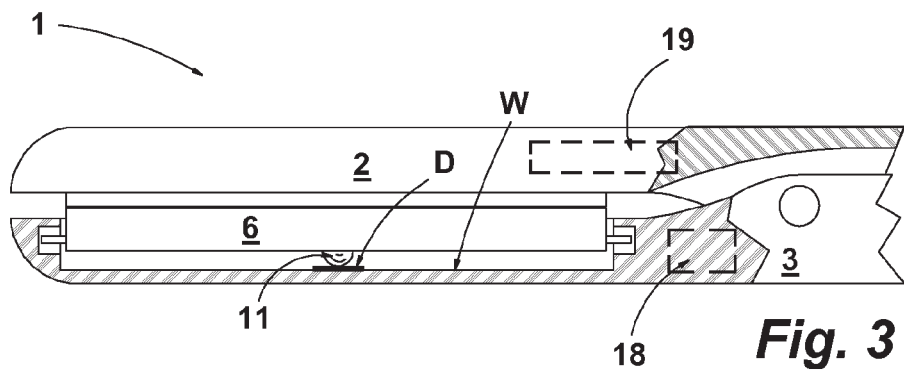


Fig. 3

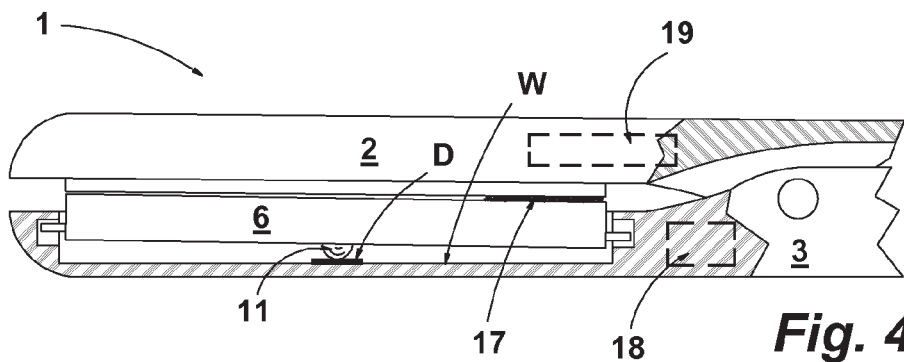


Fig. 4

DEVICE FOR FORMING HAIR

CROSS REFERENCE APPLICATIONS

[0001] This application claims the benefit of German Application No. 20 2008 016 616.0, filed Dec. 17, 2008, which is incorporated herein by reference for all purposes.

BACKGROUND

[0002] The present application relates to a hair styling device having two arms connected by a pivoting joint so they are adjustable relative to one another. Each arm has an adjacent styling part. The styling parts cooperate for the hair styling operation. At least one styling part is designed for heating the hair inserted into the hair styling gap between the styling parts.

[0003] Such hair styling devices often have styling plates as the styling parts and therefore can be used to straighten hair. On such a hair styling device having two arms connected to one another with a pivoting joint, each arm has such a styling part. The styling parts are arranged such that the sides of the styling parts facing one another create a hair styling gap to receive hair. At least one of the two styling plates is heated to support the hair styling operation. Such heating may be accomplished by using an electric resistance heater, which can be integrated into the styling plate. Alternatively, hot air may be used to heat at least one styling part. This is the case with air curlers, for example. The styling part of these hot air, hair styling device have air outlet openings so that the air flowing through the arm of this styling part can be applied directly to the hair.

[0004] Hair styling devices for straightening hair utilize styling plates as styling parts. The top sides of the styling plates face one another and have a smooth design. In order to achieve the desired hair styling result, it is desirable to be able to apply a uniform hair styling pressure to the hair inserted into the hair styling gap. Spring elements have been incorporated to allow movement of one of the styling plates relative to the other. This prevents deformation of one or both arms and/or styling plates as a result of the heating, which could impair the planar and parallel arrangement of the smooth surface of the facing styling plates. The spring element also allows a parallel and/or plane-parallel arrangement of the facing styling part surfaces when the arms are closed even when there has been a change in the geometry of the styling gap due to thermal expansion under some circumstances. Different thicknesses of hair can be successfully inserted into the hair styling gap with hair styling devices where the hair styling part mounted in this way.

[0005] It may be undesirable to apply a high clamping force when using a hair styling device for straightening hair. To perform the straightening operation, the hair styling device is typically pulled outward starting from the scalp with the hair inserted into the hair styling gap and pulling it toward the ends of the hair. Excessive clamping force may pull the hair uncomfortably. On the other hand, a certain amount of pressure must be exerted on the hair to achieve a straightened styling result. This is also true of styling devices for curling hair.

[0006] 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

[0007] 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.

[0008] An aspect of the device of the present application is to provide a hair styling device with improved ability to regulate the pressure exerted on hair during styling and therefore achieve an improved hair styling result.

[0009] The device has a pressure measuring device in one of the two arms. The pressure measuring device detects the pressure exerted, or a value that represents this pressure, on the hair between the styling parts when the hair styling gap is closed. The hair styling device also includes a display unit for displaying the pressure or pressure value.

[0010] This hair styling device has a pressure measuring unit for detecting the pressure exerted on the hair inserted into the hair styling gap by closing the two arms. Furthermore, a display unit is provided for display of the pressure or pressure value thereby detected. Such a pressure measuring unit may be designed to operate mechanically. The same thing applies to the display unit which then generates a tactile signal when a predefined pressure is exceeded. An electronic pressure sensor, e.g., a pressure measurement strip, whose output signal acts upon an analysis unit is can be used as the pressure measuring unit. The analysis unit may in the simplest case be a comparator element for comparing the pressure measurement signal received at the input with a threshold value. The threshold value can adjustable to obtain a higher or lower threshold value as a function of the properties on the hair to be styled and/or the desired hair styling result.

[0011] If the threshold value is exceeded, the display unit is triggered to display the fact that the preset threshold value has been exceeded. Such a display unit could be a visual display, implemented by LEDs, an audio display and/or an actuator that generates tactile signals, e.g., a vibrating unit. When the display unit is triggered, it is possible for it to identify several pressure steps for a person using the hair styling device. For example, by triggering additional LEDs on exceeding additional pressure threshold values. Likewise, a vibrating unit may be triggered on exceeding various pressure threshold values so that it vibrates with a different intensity. Such a display unit is typically provided to notify the user of the fact that a certain pressure threshold value has been reached without the user having to divert his attention away from the hair being styled. Tactile actuators are therefore especially suitable for this purpose.

[0012] In a further embodiment, it is provided that a first signal is delivered via the display unit when a lower pressure threshold value is exceeded and a second signal is delivered when another pressure threshold value is exceeded. In this way a pressure interval with which the hair styling process is to be performed may be defined.

[0013] According to a disclosed embodiment, the pressure measurement device is located in an arm of the hair styling device. A first styling part is attached to the arm by its back side. To accomplish this attachment, the styling part has a supporting body on its back side. The supporting body con-

tacts a pressure measuring unit. In the depicted embodiment, the pressure measuring body comprises a pressure measuring strip beneath the supporting body. The supporting body can be shaped such that it contacts the styling part at a single point, so that when the styling part is mounted on the supporting body, the styling part can move in the manner of a seesaw. This point support provides mobility of the styling part in the manner of a floating support. Point support also ensures pressure detection regardless of where the hair to be styled is situated within the hair styling gap.

[0014] The supporting body is typically situated approximately in the middle of the styling part, in the longitudinal direction of the arm. This styling part is freely movable in the allowed range of movement, which is typically limited by stops, when no contact pressure is applied by the second styling part. When the arms of this hair styling device are closed in order to close the hair styling gap, the two styling part surfaces which border the hair styling gap are in contact with one another as intended because of the seesawing support of the first styling part described above. The arrangement of the styling part and the supporting body allows for application of the desired clamping pressure. The styling surface of the first styling part conforms to the styling surface of the second styling part when the hair styling gap is closed. This conformation occurs because the first styling part is rockable to achieve alignment with the styling surface of the second styling part. Detection of the closing pressure acting on the first hair styling part is also possible at the same time, as described above.

[0015] Depending on the design of the hair styling device it is possible for the first styling part to be freely movable and not held in a starting position by force provided by spring elements. Alternatively, such spring elements may be provided. If no spring elements are provided, only the clamping force exerted by a user to close the arms of the device is exerted on the hair inserted into the hair styling gap of this hair styling device.

[0016] The first styling part is permanently secured to the arm on which it is arranged. To this end, the first styling part may have guide protrusions integrally molded on one or both sides pointing in the direction of seesawing, each engaging in a recess, e.g., a cage provided on the arm side. The length of the recess in the direction of movement of the guide protrusion then defines the seesawing range and also holds the first styling part on the arm permanently.

[0017] If seesawing movement in multiple directions is desired, then a supporting body shaped like a dome is preferred. This dome shape will allow for seesawing motion while still acting on the pressure measuring unit.

[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 partially cut-away schematic side view of the front section of a hair styling device designed for straightening hair and having arms that are open and support styling plates.

[0020] FIG. 2 is plan view of the back side of the styling part of one arm of the hair styling device according to FIG. 1.

[0021] FIG. 3 is schematic view the hair styling device from FIG. 1 with the arms closed.

[0022] FIG. 4 is a schematic with hair inserted into the hair styling gap between the two styling parts.

[0023] 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.

[0024] 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

[0025] Referring first to FIG. 1, a hair styling device 1 has two arms 2, 3 arranged with a pivot relative to one another. The arms 2, 3 are adjustable relative to one another about the axis formed by a pivot pin 4, as indicated by the double arrows at the end of arms 2, 3 in FIG. 1. The hair styling device 1 is designed for straightening hair and has two styling plates 5, 6 as styling parts. The styling plates 5, 6 are heated in a manner not shown in detail here, e.g., by integration of a PTC heating element. Surfaces 7 and/or 8 of the styling plates 5, 6 which face one another are designed to be flat and smooth in the depicted embodiment. The two surfaces 7, 8 encompass a hair styling gap 9 which is open as shown in FIG. 1. This position of the arms 2, 3 relative to one another serves to receive hair that is to be straightened in the hair styling gap 9.

[0026] The first styling plate 5 is rigidly connected to the first arm 2 in the depicted embodiment. In contrast with that, the second styling plate 6 is supported in the manner of a seesaw with respect to the second arm 3. To this end, a dome-shaped supporting body 11 is integrally molded on the back side 10 of the second styling plate 6. The supporting body 11 is supported on the top side of the styling plate holder 12 of the second arm 3 with a pressure sensor D in between. This holder forms abutment W with respect to the second styling plate 6 and/or its supporting body 11. Second styling plate 6 acts in one spot on the pressure sensor D via its supporting body 11 when pressure is exerted on the second styling plate 6 in the direction of the abutment W. The styling plate receptacle 12 likewise serves to limit the displacement movement of the second styling plate 6 in the longitudinal and transverse directions to the second arm 3. A guide protrusion 13, 14 can be integrally molded on each of the side faces of the second styling plate 6. Guide protrusions 13, 14 are located along the longitudinal side of the second arm 3. The guide protrusions 13, 14 each engage in a guide cage 15, 16 to limit the seesawing movement in the longitudinal direction of the second arm 3, as indicated by the double arrow in FIG. 1. At the same time, the second styling plate 6 is permanently held on the second arm 3 by the engagement of the guide protrusions 13, 14 in the guide cages 15 and/or 16.

[0027] The view from above onto the back side 10 of the second styling plate 6 shown in FIG. 2 illustrates the arrangement of the dome-shaped supporting body 11 which is situated at the center of the back side 10 of the second styling plate 6. In the embodiment illustrated in FIG. 1, the second styling plate 6 can be rocked in different directions about the crown of the supporting body 11 because of its dome-shaped curvature. The supporting body 11 moves in a seesaw motion on the pressure sensor D, which is in surface contact with the abutment W.

[0028] FIG. 3 shows the hair styling device 1 with the hair styling gap 9 in a closed position. Surfaces 7, 8 face one another and are in parallel contact with one another. The closed position of FIG. 3 is achieved when the two arms 2, 3 are closed. The end of first styling plate 5 facing pivot pin 4 abuts against the end of the second styling plate 6 facing the pivot pin 4 as arms 2, 3 are closed. This abutment tilts the second styling plate 6 to prevent further closing due to the two surfaces 7, 8 being in parallel contact with one another as shown in FIG. 3. In this way, the device can compensate for any deformation that may occur, for example by heating. The rocking support of the second styling plate 6 shown here and the arrangement of the pressure sensor D make it possible to detect the closing pressure acting on the second styling plate 6 even if any deformation occurs.

[0029] As shown in FIG. 4, even if a strand of hair is arranged unevenly in the hair styling gap 9, the rockable arrangement of the styling plate 6 ensures that a uniform clamping pressure will be exerted onto the hair inserted into the hair styling gap 9. The clamping pressure is attributable only to the closing force acting on the arms 2, 3.

[0030] The pressure sensor D is connected to an evaluation unit 18. The evaluation unit 18 receives the output signals of the pressure sensor D. In the depicted embodiment, the evaluation unit 18 comprises a comparator circuit for comparing the input signal supplied by the pressure measurement strip D with a predefined threshold value. A vibrating unit 19 is connected to the evaluation unit 18 as the display device. The vibrating unit 19 is triggered by the evaluation unit 18 once the pressure threshold is exceeded. This means that a user of the hair styling device 1 receives the signal that a predefined pressure acting on the hair 17 inserted into the hair styling gap 9 has been reached and/or this information is brought to his attention tactilely. In the depicted embodiment, the threshold value is set to indicate to a user the fact that a hair styling pressure required for the desired straightening has been reached. A setting device (not shown) can be provided with the evaluation unit 18 which allows the user to set the pressure threshold. This pressure threshold is set higher or lower because different types of hair require differing amounts of pressure to achieve the desired hair styling result.

[0031] For the sake of simplicity, the electric terminals and the power supply for the pressure sensor D, the evaluation unit 18 and the vibrating unit 19 are not shown. Instead of a comparator circuit, for example, a microcontroller may also be used as the evaluation unit.

[0032] The present device is described as an example on the basis of hair styling devices designed for straightening hair with reference to the figures. The rockable arrangement of the second styling part described here can also be applied to other hair styling devices or may be used for styling parts for creating other hair styles, e.g., curls and waves. Instead of the pressure sensor shown in the description of the figures as the pressure measurement device, the pressure may also be detected by a distance measuring sensor. In such an embodiment, a generator element operates against the force of a restoring spring such that the restoring spring is held between the back side of the styling part and an abutment. The measure by which the spring is moved against its restoring force is a measure of the applied pressure.

[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. Whenever a range is given in the specification, all intermediate ranges and subranges, as well as all individual values included in the ranges given are intended to be included in the disclosure.

[0035] In general the terms and phrases used herein have their art-recognized meaning, which can be found by reference to standard texts, journal references and contexts known to those skilled in the art. The above definitions are provided to clarify their specific use in the context of the invention.

LIST OF REFERENCE NOTATION

[0036]	1 Hair styling device
[0037]	2 First arm
[0038]	3 Second arm
[0039]	4 Pivot pin
[0040]	5 First styling plate
[0041]	6 Second styling plate
[0042]	7 First surface
[0043]	8 Second surface
[0044]	9 Hair styling gap
[0045]	10 Back side
[0046]	11 Supporting body
[0047]	12 Styling plate holder
[0048]	13 First guide protrusion
[0049]	14 Second guide protrusion
[0050]	15 First guide cage
[0051]	16 Second guide cage
[0052]	17 Hair
[0053]	18 Evaluation unit
[0054]	19 Vibrating unit
[0055]	D Pressure sensor
[0056]	W Abutment

I claim:

1. A hair styling device comprising:
 - a first arm;
 - a second arm;
 - the first and second arms connected at a pivot point;
 - the first arm having a first styling part;
 - the second arm having a second styling part;
 - the first and second styling parts cooperating for the hair styling operation;
 - a hair styling gap located between the first and second styling parts;
 - at least one styling part capable of heating hair inserted into the hair styling gap;
 - a pressure measuring device located in either the first or second arm; and

- a display device for displaying the pressure or pressure value detected.
2. The hair styling device according to claim 1, wherein the pressure measuring device is a pressure sensor on which a styling part is supported.
 3. The hair styling device according to one of claim 1 or 2, wherein the output signal of the pressure measuring device is sent to an evaluation unit which triggers the display device.
 4. The hair styling device according to claim 3, wherein the evaluation unit comprises a comparator for comparing the measurement signal of the pressure measurement device with an adjustable threshold value.
 5. The hair styling device according to claim 3, wherein an actuator generating a tactile signal for a person operating the hair styling device is provided as the display device.
 6. The hair styling device according to claim 2 further comprising:
 - a supporting body attached to the back side of the styling part;
 - the supporting body resting on a pressure measurement strip;
 - the pressure measurement strip resting on an abutment; and
 - wherein the styling part is mounted on the supporting body so that the styling part is rockable.
 7. The hair styling device according to claim 6, wherein the supporting body is located approximately the middle of the styling part in the longitudinal direction of the arm.
 8. The hair styling device according to claim 6, wherein the supporting body is dome shaped so that a seesawing action of the styling part in different directions is possible.
 9. The hair styling device according to claim 6, wherein the styling part has guide protrusions integrally molded on the side for limiting the pivoting movements in at least one direction.
 10. The hair styling device according to claims 6, wherein the hair styling parts are styling plates for straightening hair.
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