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HAIR TREATMENT PROCESS

Abstract

A process for treating a lock of hair, involving moving a device along the lock to perform the following steps when the device is passed over the lock: a heat treatment by gripping between two jaws of the device that are hinged together and passing through an internal heat treatment zone extending between the two jaws, a heat-treatment by passage over an external heat treatment zone extending on the outer surface of one of the two jaws of the device, guiding by passing through a guiding zone extending outside the jaw of the device bearing the external heat treatment zone, the guiding zone having guiding surfaces at the proximal and/or distal part of the jaw, forming laterally to the guiding zone an obstacle to the hair that is sufficient to contain the hair in said guiding zone.

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Background/Summary

[0001] The present invention relates to a hair treatment process, and more particularly, but not exclusively, to processes intended for shaping the hair, in particular for curling and/or straightening the hair.
[0002] The invention relates more particularly to curling processes involving heat treatment of the hair.
PRIOR ART
[0003] Numerous processes of this type have already been proposed. These processes generally involve treating the locks of hair by winding them around a hot convex-shaped surface.
[0004] Patent application EP2319354 describes a process for curling hair by inserting the locks of hair between two plates mounted vertically movably on arms fixed together to hold the lock of hair on the device and winding the lock of hair around the two arms. The heat treatment takes place between the arms by the plates and by the outer surface of the heat-conducting arms. Such a process does not allow thick locks to be treated due to the limited travel of the plates in their housings.
[0005] US 2017/188681 and US 2011/174331 disclose processes for curling and straightening hair, consisting either in thermally treating locks of hair by gripping them between two arms bearing curved plates of complementary shapes, optionally by slightly tilting the device relative to the arms, or in winding a lock of hair around the arm bearing the convex plate and having a hot outer surface, or in winding the hair on the two arms.
[0006] International patent application WO 14/173554 describes processes for treating locks of hair with a device including two heated articulated arms, one of the arms having a rotating jaw bearing teeth on one side thereof. It is described that the hair is gripped between the two jaws and the device is moved along the lock of hair, that the hair is wound on the two closed arms and the device is moved along the lock of hair, or that the hair is slid over one of the arms, with the teeth contacting the scalp.
[0007] There is thus a need to further improve hair treatment processes, notably in order to have an efficient, simple, safe, intuitive treatment process that is easy to perform, even for a person with no particular styling skills.
DISCLOSURE OF THE INVENTION
[0008] The present invention meets all or some of these needs by means, according to one of its aspects, of a process for treating, notably for shaping, in particular for curling, at least one lock of hair, involving the movement of a device along the lock of hair from the root to the tip of the hair in order to perform, during a passage, preferably a single passage, of the device over the lock of hair, the following steps, preferentially performed in this order: [0009] a heat treatment of a portion of the lock of hair by gripping between two jaws of the device that are hinged together and passing through an internal heat treatment zone extending between the two jaws, [0010] a heat treatment of the portion of the lock of hair by passage over an external heat treatment zone extending on the outer surface of one of the two jaws of the device, [0011] guiding the portion of the lock of hair by passing it through a guiding zone extending outside the jaw of the device bearing the external heat treatment zone, the guiding zone having guiding surfaces at the proximal and/or distal part of the jaw, forming laterally to the guiding zone an obstacle to the hair that is sufficient to contain the hair

in said guiding zone.
[0012] The fact of having a heat treatment by gripping the lock of hair between two articulated jaws by passing the lock through an internal heat treatment zone makes it possible to have good holding of the lock of hair. This also allows the heat treatment by the external heat treatment zone to take place on only one of the jaws, which makes it possible to have a well-defined curl, or at least a wave. In addition, as will be detailed later, this internal treatment by gripping makes it possible, by means of holding the lock, to keep the hair taut, which hair is also attached to the scalp.
[0013] The guiding of the portion of the lock of hair allows good holding of the lock of hair on the device during the heat treatment by the external heat treatment zone. The proximal and/or distal guiding surface forms a sufficient obstacle to prevent the lock of hair from leaving the guiding zone during the movement of the device along the lock of hair. Thus, all of the hair to be treated is guided over the external heating surface, making it possible to achieve treatment by uniform contact with the external heating surface. The guiding zone thus makes it possible to keep the hair in the external heat treatment zone, preventing the hair from falling away from or coming out of said zone, as was the case with the prior art appliances. This makes it easier to perform the treatment process, since the user no longer has to worry about keeping the hair on and guiding it properly during the treatment. The user can then in particular treat a greater quantity of hair at once with very great efficiency, thereby saving time for treating all of the hair. This guiding also guarantees the user a successful curling operation, as the risk of the lock falling out of the styling device and thus of having to repeat the process is reduced or eliminated.
[0014] The guiding zone also forms an important visual reference for marking the treatment zone formed by the external plate, thereby making the use of the appliance particularly ergonomic and intuitive for the user.
[0015] Preferably, the device is moved over the lock of hair from the root to the tip after the lock of hair is gripped between the two jaws and has been rotated by at least 180° about one of the two jaws.
[0016] Preferably, the guiding zone has guiding surfaces both proximal and distal to the jaw, the guiding surfaces forming a hair obstacle lateral to the guiding zone that is sufficient to contain the hair in said guiding zone.
[0017] The process may include spreading of the jaws by pivoting the jaws between themselves about a pivot axis arranged at the proximal end of two arms hinged together by a hinge and inserting the portion of the lock of hair between the jaws, followed by closing the jaws on the portion of the lock of hair, notably by manually bringing together two half-handles extending on each arm between the jaw and the hinge.
Internal Heat Treatment
[0018] Preferably, the heat treatment by the internal heat treatment zone is performed by gripping the lock of hair between an internal heating surface and a counter-bearing surface facing the internal heating surface, notably of complementary shape to the internal heating surface, to grip the hair over the entire internal heating surface. The counter-bearing surface may also be an internal heating surface so that the portion of the lock of hair is gripped between two internal heating surfaces.
[0019] The internal heating surface(s) may be made of a material that is a good heat conductor, notably metal, preferably aluminium, notably with hard anodizing. The internal heating surface(s) may have a thermal conductivity of at least 20 W.Math.m.sup.−1.Math.K.sup.−1. Such conductivity allows rapid heating of the or each internal heating surface and efficient heat transfer to the hair extending between the internal heating surface and the counter-bearing surface in the internal heat treatment zone.
[0020] The heat treatment of the portion of the lock of hair in the internal heat treatment zone may take place at a temperature above 50° C., preferentially between 90° C. and 230° C. when in use,

advantageously between 180° C. and 210° C.
[0021] The process may include, simultaneously with the heat treatment in the internal heat treatment zone, an additional treatment by the internal heating surface and/or the counter-bearing surface, notably guiding or combing of the portion of the lock of hair by surface reliefs of the internal heating surface and/or the counter-bearing surface.
[0022] During the heat treatment in the internal heat treatment zone, the internal heating surface and/or the counter-bearing surface may tilt about an axis or a point and/or have a translational movement along an axis perpendicular to a median plane of the device extending between the two jaws when the jaws are in a moved-together configuration, notably as a function of the angle of closure of the jaws and/or as a function of the thickness of the portion of hair to be treated. This notably makes it possible to apply a substantially uniform pressure to the hair from the roots to the ends of the hair, which improves the uniformity of shaping of the hair, notably curling.
[0023] The internal heating surface is preferably a hair contact surface of an internal heat treatment member.
[0024] The process may include passing the portion of the lock of hair, placed under mechanical tension between a lateral edge of the internal heat treatment member and an outer surface of the jaw bearing the internal treatment member adjacent to the lateral edge, against the lateral edge. The portion of the lock of hair under tension may present an angle of less than or equal to 120°, better still less than or equal to 110°, and strictly greater than 90°, better still greater than or equal to 95°, with a median plane of the device, extending between the jaws in the moved-together configuration of the jaws. The lateral edge may have an edge corner configured to come into contact with the portion of the lock of hair placed under tension. The edge corner may protrude, be chamfered or be rounded with a radius of curvature of less than or equal to 3 mm, preferably less than or equal to 2 mm, advantageously equal to 1.5 mm. Such an edge corner makes it easier to curl the hair or make it wavy and makes it possible to achieve good shaping results.
[0025] The expression “under mechanical tension” means that the hair extends along a straight line between the first lateral edge and the adjacent outer surface of the jaw bearing the corresponding internal heat treatment member. In other words, the above angle is thus defined between the median plane defined in the closed position of the jaws and a fictitious plane in contact with the lateral edge, for the one part, and with the adjacent outer surface of the same jaw, for the other part. This placing under mechanical tension is notably achieved by means of the internal heat treatment by gripping and by means of the movement of the device along the lock of hair.
[0026] Such an angle with the outer surface of the jaw makes it possible for a curl to be well formed during the curling of the hair, by the hair bearing on the lateral edge and an adjacent outer surface of the jaw, in particular like the loops created with a blade passed over a gift ribbon. Moreover, with such an angle, the first lateral edge is relatively close to the outer surface of the jaw, without however protruding beyond the latter. This makes it possible, in particular during the straightening of the hair, to bring the first lateral edge close to the scalp, and therefore to increase the portion of hair treated, without, however, touching the scalp. This therefore allows treatment as close as possible to the roots of the hair while maintaining the user's comfort, in spite of the temperature of the inner surface(s).
[0027] The lateral edge of the internal heat treatment member preferably extends from side opposite the guiding zone on the corresponding jaw.
[0028] The internal heat treatment zone may be laterally offset upstream or downstream, preferably downstream, with the portion of the lock of hair being moved during the treatment from upstream to downstream during the heat treatment. Preferably, the internal heat treatment zone is laterally offset to the side opposite the guiding zone.
[0029] The internal treatment member may extend laterally strictly between the two side edges of the external treatment member.
[0030] The internal treatment member may extend laterally strictly between the two side edges of

the outer surface of the jaw on which the internal treatment member extends.

External Heat Treatment

[0031] Preferably, the heat treatment in the external heat treatment zone takes place by contact of the portion of the lock of hair with an external heating surface extending over at least part of the outer surface of one of the jaws.

[0032] The process may include heat treatment by passing through an additional external heat treatment zone extending over the outer surface of the other of the two jaws of the device. The or each external heat treatment zone may include at least one external heating surface extending over one of the jaws.

[0033] The heat treatment by passing through an additional external heat treatment zone may take place after the heat treatment by passing through the external heat treatment zone.

[0034] The heat treatment by passing over an external heat treatment zone may be at a temperature above 50° C., better still between 55° C. and 150° C. when the device is in use, for example in the region of 90° C.

[0035] The external heating surface(s) may be made of a material that is a good heat conductor, notably metal, or ceramic, preferably stainless steel, for example 304 according to the standard JISG4305. The external heating surface(s) may have a thermal conductivity of at least 20 W.Math.m.sup.−1.Math.K.sup.−1. Such a conductivity allows rapid heating of the or each external heating surface and efficient heat transfer to the hair extending over the external heating surface.

[0036] Preferably, the external heating surface(s) are complementary in shape to the outer surface of the jaw bearing it, notably convex in shape.

[0037] The process may include winding the portion of the lock of hair around the two jaws and the heat treatment by passing over an external heat treatment zone may take place by passing the portion of the lock of hair over the external heating surface(s).

[0038] The heat treatment by passing over an external heat treatment zone may be dissociated, notably disjointed, from the heat treatment by the internal heat treatment zone, notably the external heating surface(s) being disjointed from the internal heating surface(s).

[0039] The external heat treatment zone, notably the external heating surface, may extend over only part of the outer surface of the jaw.

[0040] The external heating surface may be arranged on the same jaw as the or one of the internal heating surfaces. In this case, the process may involve heating the internal heating surface and the external heating surface of the same jaw with a single heat source.

[0041] As a variant, the internal heating surface and the external heating surface of the same jaw are heated with separate heat sources.

[0042] The external heat treatment zone may extend over the outer surface of at least one of the jaws opposite the internal heat treatment zone relative to said jaw.

[0043] The external heat treatment zone may be laterally delimited proximally and/or distally by at least one stop surface.

[0044] The or each stop surface may extend around the entire circumference of the jaw, in particular over the entire outer surface of the jaw in section in its plane of extension.

[0045] The external heat treatment zone, in particular the entire external surface of the jaw over which the external heat treatment zone, may be free of projecting combing teeth, in particular free of any projecting relief, preferably smooth, over a length greater than or equal to 50% of its length, better still greater than or equal to 80% of its length, still better still over its entire length.

[0046] The external heat treatment zone may be in one-piece.

[0047] The width of the jaw carrying the external heat treatment zone, at the level of external heat treatment zone, may be smaller than the width of the other jaw at the same level.

[0048] The external heat treatment zone may extend laterally over the entire width of the jaw.

[0049] The side edges of the jaw, on which the external heat treatment zone extends, may extend laterally strictly between the side edges of the other jaw over the entire length of the external heat

treatment zone, in particular the side edges of the other jaw may face each a hollow zone of the jaw on which the external heat treatment zone extends.

[0050] The process may include gripping the device by an outer surface of a distal portion of the jaws that does not have an external heating surface while moving the device along the lock of hair. Preferably, the distal portion of the jaws lacking an external heating surface may have a temperature of less than or equal to 35° C., or at least at a temperature below the user's threshold for burning, pain, or even heat sensation. The process may include the addition of, and preferentially the manipulation of the device by, an insulating end piece on the distal end of at least one of the jaws, preferably on each of the jaws, the insulating end piece(s) having a complementary shape to the distal end of the corresponding jaw. The proximal end of the end piece may at least partially proximally delimit the external heat treatment zone when the insulating end piece is mounted on the corresponding jaw. The gripping of the device by the outer surface of the distal portion of the jaws lacking an external heating surface, notably by the insulating end piece, may include the abutment of the fingers against a stop upstream of the external heat treatment zone, notably a stop at the proximal end of the insulating end piece. The stop may protrude by at least 1.5 mm with respect to an external envelope surface of the corresponding end piece, better still by a height of between 1.5 mm and 4 mm, even better still between 2 mm and 3 mm.

Guiding Zone

[0051] The guiding zone may extend on the jaw along the longitudinal axis of the corresponding jaw between the internal heat treatment zone and the external heat treatment zone extending on said jaw, notably laterally to these two heat treatment zones.

[0052] The guiding zone may extend between the external heat treatment zone and the additional heat treatment zone on the device when in use.

[0053] At least one guiding surface may comprise a flat portion, particularly in a plane transverse to the jaw, particularly flat over a width at least equal to 50% of the width of the jaw, preferably 80% of the width of the jaw, better still 100%, at the level of said stop surface.

[0054] Preferably, the guiding surface(s) form an obstacle to the portion of the lock of hair of at least 2 mm, preferentially at least 3 mm.

[0055] The outer surface of the jaw in the guiding zone may be curved, notably convex, and continuous without a slope discontinuity with the rest of the surface of the jaw.

[0056] The guiding zone may be formed at least partially by a lateral recess in one of the jaws. The guiding surface(s) may be formed at least partially by the side walls of the lateral recess in the jaw.

[0057] The or each guiding zone may be formed at least partially, preferably entirely, by the lateral recess on one side of one of a jaw, the other side of said jaw being deprived of lateral recess.

[0058] The guiding surface(s) may be formed at least partially by a rib extending over the corresponding jaw, notably a rib extending over the side walls of the side recess.

[0059] The or each guiding surface may have a variable height.

[0060] The greatest height of the guiding surface(s) may be between 0.5 mm and 1 cm, better still between 2 mm and 8 mm. Preferentially, the height is at a maximum, for example equal to 5 mm, at the lateral part of the jaw. In other words, the guiding surface(s) form an obstacle at the side of the jaw with a maximum height of 5 mm.

[0061] The or each guiding surface may extend transversely to the outer surface of the jaw, in particular extend in a plane forming a non-zero angle, in particular between 70° and 110°, with the longitudinal axis of the jaw, and in particular extend in a plane substantially orthogonal to the longitudinal axis of the jaw.

[0062] The guiding surface(s) may be formed at least partially by the stop surfaces of the external heat treatment zone.

[0063] Preferably, the guiding zone overlaps at least partially with the external heat treatment zone.

Additional Treatment

[0064] The process may include an additional treatment of the portion of the lock of hair by

passage through an additional treatment zone by the treatment device as it moves over the lock of hair.
[0065] The external heat treatment zone may be deprived of any additional treatment member other than the external treatment member(s) mentioned above.
[0066] Preferably, the additional treatment is upstream of the heat treatments in the internal heat treatment zone, the external heat treatment zone and the additional external heat treatment and hair guiding zone. Preferentially, the additional treatment zone is located in the vicinity of the guiding zone.
[0067] The additional treatment may be performed by an additional treatment member extending from one of the jaws to the other of the jaws during the movement of the device along the lock of hair.
[0068] Preferably, the additional treatment member extends on the opposite jaw to that bearing the guiding zone.
[0069] The additional treatment member may extend at least partially opposite the guiding zone.
[0070] Preferably, the additional treatment on the portion of the lock of hair is temporally disjointed from the heat treatments.
[0071] The additional treatment may include the application of a cosmetic product to the portion of the lock of hair, notably a hair shaping composition. The cosmetic product may be applied by contact of the portion of the lock of hair with a porous member soaked in the cosmetic composition, notably supplied with product by a reservoir in contact with the porous member or by means of a dispensing mechanism which is actuated automatically or manually when the device is used. The cosmetic product applicator member may be a refill mounted removably on the device.
[0072] The cosmetic composition may be a composition for cleaning, dyeing, bleaching, conditioning or shaping the hair. Preferably, the use of the device involves the application of at least one composition for shaping the hair. This composition for shaping the hair may be a composition for curling, setting, relaxing or straightening the hair, preferably for relaxing or straightening the hair.
[0073] The cosmetic composition may contain at least one active agent chosen from reducing agents, in particular thiols, oxidizing agents, in particular hydrogen peroxide or persalts (for example persulfates), colouring agents, in particular pigments, direct dyes or oxidation dyes. The cosmetic composition may also contain at least one active agent chosen from temporary shaping agents, in particular styling polymers that are preferably anionic, amphoteric or nonionic, conditioners, in particular silicones, mineral or plant oils, plant waxes, cationic surfactants and cationic polymers, alkaline agents and acids.
[0074] Preferably, the cosmetic composition contains at least one agent chosen from oxidizing agents, reducing agents or alkaline agents of the hydroxide type.
[0075] Preferably, the additional treatment may include a step of applying steam to the portion of the lock of hair, notably through one or more steam outlets extending from the jaw not bearing the guiding surface to the other jaw. The application of steam may include the containment of steam between the two jaws during the process, notably in a steam containment hollow or groove of at least one of the jaws in which the portion of the lock of hair extends during the treatment, the steam outlet(s) being arranged in a groove or hollow and/or the facing jaw having a groove or hollow extending opposite the steam outlet(s) during the treatment process. Preferentially, the groove or hollow is adjacent to the guiding zone. Such containment allows for even application of steam to the hair and allows for a smaller amount of steam to be used during treatment.
[0076] Preferably, the steam flow rate is less than or equal to 5 g/min, preferentially less than 1 g/min during steam application.
[0077] In addition, the additional treatment may include combing the lock of hair.
[0078] The combing step may be performed with a comb arranged on the jaw opposite to that bearing the guiding zone, the distal end of the comb extending into the guiding zone.

[0079] Preferably, the size of the lock of hair is chosen so that the portion of the lock of hair does not engage the comb as it extends into the guiding zone.
[0080] The comb may be removable and the process may include removing the comb from its housing. It may also be imagined, without departing from the scope of the invention, that the comb may be replaced with a second comb, of different construction and characteristics which would be more suitable for the curling process and/or the characteristics of the hair.
[0081] Preferably, the additional treatment member includes a comb and one or more steam outlets. The additional treatment step may include a hair combing step and a steam application step when the lock of hair is inserted in one direction between the two jaws, the combing step preferably being performed before the steam application step when the device is moved over the lock of hair, and preferentially only one steam application step when the lock of hair is inserted between the jaws in the other direction. This allows, by means of the combing step performed first, the hair to be well disciplined and correctly distributed before being treated with steam and then by heat treatment.

Cover

[0082] The process may include the removal of a protective cover on the or each external heat treatment zone, notably by pivoting the cover about a pivot axis perpendicular to the longitudinal axis of the device and parallel to the median plane of the device extending between the jaws in a moved-together configuration of said jaws. The cover may be removed with the aid of the hand holding the device at the handle of the device.

Sequence of Steps

[0083] Preferably, the heat treatment in the internal heat treatment zone is performed before the heat treatment in the external heat treatment zone on the portion of the lock of hair when the device is moved over the lock of hair. As mentioned, this notably allows the hair to be gripped in order to place it under tension relative to the scalp, and thus facilitates the subsequent process.
[0084] The guiding of the portion of the lock of hair may take place between the heat treatment in the internal heat treatment zone and the heat treatment in the external heat treatment zone on the portion of the lock of hair. In a variant, the guiding of the portion of the lock of hair takes place after both heat treatments by the internal heat treatment zone and the external heat treatment zone. As another variant, the guiding of the portion of the lock of hair takes place between the heat treatments by the external and additional external heat treatment zones. The guiding may also take place several times, i.e. the hair may pass through the guiding zone several times, for example at least twice, if the hair styling appliance is rotated on itself, for example by 360°, along its longitudinal axis, during the curling process.
[0085] The process steps are preferably performed in succession along the lock of hair, notably from the hair roots to the ends, in the following order: [0086] heat treatment in the internal heat treatment zone, optionally steam treatment, hair guiding, and heat treatment in the external heat treatment zone or [0087] optionally combing and/or steaming treatment, heat treatment in the internal heat treatment zone, optionally bearing against the lateral edge of the internal treatment member, optionally guiding by the guiding zone, heat treatment in the external heat treatment zone, guiding by the guiding zone and optionally heat treatment in the additional external heat treatment zone.
[0088] The process is not limited to the steps described previously: additional steps may be present between or after the various steps mentioned above.
[0089] For example, the process may include winding the lock of hair around the two jaws of the device, the process then including a repetition of the following successive steps: heat treatment by the external heat treatment zone, guiding the hair, and heat treatment by the additional external heat treatment zone.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0090] The invention may be understood more clearly on reading the following detailed description of non-limiting exemplary embodiments thereof and on examining the appended drawing, in which:

[0091] FIG. **1** illustrates a perspective view of an example of a device according to the invention,

[0092] FIG. **2** illustrates a perspective view of the distal end of the device in FIG. **1**,

[0093] FIG. **3** illustrates a view in cross section of an example of a device according to the invention,

[0094] FIG. **4** is an enlarged view of FIG. **3** in the region of the treatment member,

[0095] FIG. **5** illustrates a perspective and partial view of the distal end of the device in FIG. **1**,

[0096] FIG. **6** is an enlarged view of FIG. **3**,

[0097] FIG. **7** illustrates an enlarged view of an edge of one of the internal plates of the device in FIG. **3**,

[0098] FIG. **8** illustrates, in isolation, the internal plates and the housings of the device in FIG. **3**,

[0099] FIG. **9** illustrates a perspective view of an example of a thermal protection cover according to the invention,

[0100] FIG. **10** illustrates a perspective view of another example of a thermal protection cover according to the invention,

[0101] FIG. **11** illustrates a perspective view of the distal end of a device having thermal protection covers according to the invention,

[0102] FIG. **12** is a view in longitudinal section of the device in FIG. **11**,

[0103] FIG. **13** illustrates a perspective enlarged view of the device in FIG. **11** in the region of a shoulder,

[0104] FIG. **14** illustrates a perspective enlarged view of the device in FIG. **11** in the region of another shoulder,

[0105] FIG. **15** illustrates a side view of the fitting of a thermal protection cover on a device according to the invention.

[0106] FIG. **16** illustrates a perspective view of the distal end of a device having thermal protection end pieces according to the invention,

[0107] FIG. **17** is a longitudinal section through the distal end of the device in FIG. **16**,

[0108] FIG. **18** illustrates a perspective view, in isolation, of the end pieces in FIG. **16**,

[0109] FIG. **19** illustrates part of an example of a process for treating a lock of hair,

[0110] FIG. **20** illustrates the continuation of the process for treating a lock of hair of FIG. **19**,

[0111] FIG. **21** illustrates the continuation of the process for treating a lock of hair of FIG. **20**,

[0112] FIG. **22** illustrates the continuation of the process for treating a lock of hair of FIG. **21**,

[0113] FIG. **23** illustrates part of a variant of a process for treating a lock of hair, and

[0114] FIG. **24** illustrates the continuation of the process for treating a lock of hair of FIG. **23**.

DETAILED DESCRIPTION

[0115] In the rest of the description, elements that are identical or have identical functions bear the same reference signs. For the sake of conciseness of the present description, they are not described for each of the figures, only the differences between the embodiments being described.

[0116] FIGS. **1** and **2** show an example of a hair treatment device **2** according to the invention.

[0117] This device **2** has two jaws **3** and **4** that are movable with respect to one another between a spaced-apart configuration (not shown) for the introduction of a lock of hair between said jaws, and a moved-together treatment configuration, illustrated in FIG. **1**.

[0118] The jaws **3** and **4** are borne by an upper arm **5** and a lower arm **6**, respectively, which, in the example in question, are connected together at one of their ends by a hinge **8**, the device **2** thus

forming tongs.
[0119] The arms **5** and **6** define, between the hinge **8** and the jaws **3** and **4**, respective half-handles **10** and **11** on which the user can press in order to move the jaws **3** and **4** together and thus grip the hair extending between the two jaws.
[0120] The width of the arms **5** and **6** at the half-handles **10** and **11** is less than that at the jaws **3** and **4**. In a variant, the widths could be substantially identical, or the width of the arms **5** and **6** at the half-handles **10** and **11** could even be greater than that at the jaws **3** and **4**.
[0121] The jaws **3** and **4** each have a convex outer surface and a substantially planar inner surface.
[0122] An elastic return member (not visible) is preferably provided to return the jaws **3** and **4** into the spaced-apart configuration, this elastic return member being for example a spring disposed around a pin of the hinge **8**.
[0123] The invention is not limited to a particular manner of connecting the arms **5** and **6** together and the jaws **3** and **4** may be rendered able to move in some other way without departing from the scope of the present invention. However, the presence of a hinge is largely preferred for the ergonomics that it affords.
[0124] The device **2** extends, for example, along a longitudinal axis X. The device **2** has a line **17** designed to be able to supply the energy necessary for operation of the device. The line **17** may thus be an electric cord designed to connect the device to the electric mains. Without departing from the scope of the invention, the line could also be a fluidic line designed to supply the device with fluid (water for example).
[0125] The device may have a water reservoir for the production of steam.
[0126] A user interface (not shown in the figures) may be present on the device **2** in order to allow the user to control the operation of the device.
Heating Plates
[0127] The device **2** has an inner surface **45** for heating hair to be treated on each of the two jaws **3** and **4** facing the other of the jaws, and facing one another in the moved-together configuration of the jaws **3** and **4** so as to define, between one another, an internal heat treatment zone heated in the moved-together configuration of the two jaws **3** and **4**. The two internal heating surfaces **45** are, for example, configured to grip between one another the hair extending between the two jaws **3** and **4** in the moved-together configuration of the two jaws **3** and **4**.
[0128] The two internal heating surfaces **45** are substantially planar, but do not have to be. They could have complementary wavy shapes or complementary curved shapes for example.
[0129] The internal heating surfaces are, in the example illustrated, formed by the contact surface of internal plates **16** made of a heat conducting material that each extend over one of the jaws. Each internal plate **16** constitutes an internal treatment member of the device.
[0130] In a variant that is not illustrated, only one of the jaws **3** or **4** may bear an internal plate **16** having a heating contact surface facing a counter-bearing surface of the other jaw **3** or **4**. The counter-bearing surface may be formed by the body of the jaw or by an element attached to the jaw.
[0131] In the example illustrated, the internal plates **16** are each mounted in the cavity **30** of a support **9**, which itself is mounted in a housing **38** of the corresponding jaw **3** or **4**. The internal plates **16** are each mounted fixed on the support **9**. At least one of the supports **9** is mounted so as to be movable in its housing, as will be seen below. In a variant that is not illustrated, the internal plates may be mounted directly in the housing and may optionally be movable in the corresponding housing, or the internal plates may be mounted on the support while being movable in the cavity, the support being fixed in the housing.
[0132] At least one of the supports **9** is movable perpendicular to the longitudinal axis of the jaw in its housing **38**, between a high position spaced apart from the bottom of the housing and a low position moved close thereto.
[0133] The travel of the support **9** and the tilting thereof advantageously make it possible to position the internal heating surface **45** in the closed position of the device, such that the hair is

gripped substantially uniformly and effectively during the treatment between the internal heating surfaces, thereby improving the straightening of the hair by the device.

[0134] The support **9** bears against a support means **140** that extends in the housing **38**, allowing the support to carry out a tilting movement and, in the open position of the arms **5** and **6**, keeping the support **9** in the high position.

[0135] The support means **140** may have one or more springs **141**, in particular a spring as illustrated, extending between the bottom of the housing **38** and the support **9**, or a leaf spring fixed in an indentation in the support **9** or in the bottom of the housing **13038**. The support means may, in a variant or additionally, have a protruding relief between the support **9** and the bottom of the housing **38**, allowing the tilting movement and limiting the travel of the support in the housing. For example, in the example illustrated, the support means has a ball joint compressed by a spring, as is described in patent application FR3011449.

[0136] The support **9** that is movable perpendicular to the longitudinal axis may have seals **33** providing sealing between the support **9** and the housing **38** while allowing the support **9** to move in the housing, as was described previously. Such a seal allows in particular the sealing of the housing with respect to the steam output by one or more steam outlets, as will be described below.

[0137] The device **2** also has two outer surfaces, formed by external plates **13**, for heating the hair to be treated, which each extend over one of the two jaws **3** and **4** towards the exterior of the device **2** in the moved-together configuration of the two jaws **3** and **4**, in particular over the convex outer surface of the jaw **3** or **4**, and are on opposite sides to one another on the device **2** in the moved-together configuration of the jaws **3** and **4**. The outer surfaces respectively define external heat treatment zones extending over the outer surface of the respective jaws.

[0138] Each external plate **13** is disposed on a face of the corresponding jaw **3** and **4** that faces away from the face receiving the internal plate **16** borne by the same jaw **3** or **4**.

[0139] In the example illustrated, the external plates **13** are made of stainless steel and the internal plates **16** are made of aluminium. However, other materials that are good heat conductors, in particular other metals, could be used.

[0140] The external plates **13** may be metal sheets that are flexible or preformed so as to have a convex shape complementary to the outer surface of the jaws **3** and **4**.

[0141] The external plates **13** may be in one-piece.

[0142] The external plates **13** may be free of any projecting combing teeth.

[0143] The width of the jaw **3** at the level of external plates **13** may be smaller than the width of the other jaw **4** at the same level.

[0144] The external plates **13** may extend laterally over the entire width of the jaw **3** and **4**.

[0145] The side edges of the jaw **3** may extend laterally strictly between the side edges of the other jaw **4** over the entire length of the external plates **13**, in particular the side edges of the other jaw **4** face a hollow zone of the jaw **3**.

[0146] The external plates **13** are fixed to the jaw **3** or **4** by any suitable means. For example, the external plates **13** have longitudinal edges **90** that are curved inwardly and configured to each be fixed in a corresponding lateral groove or housing **91** of the corresponding jaw **3** or **4**.

[0147] The external plates **13** and the internal plates **16** are preferably elongate along the longitudinal axis Y**1** or Y**2** of each of the jaws **3** and **4**.

[0148] The external plates **13** and the internal plates **16** are at least partially superposed on one another along an axis perpendicular to the longitudinal axis X of the device **2**. The internal plates **16** extend between the two side edges of the external plates **13**.

[0149] The device **2** may, as illustrated, have a distal portion, at the opposite end from the hinge **8**, which does not have a heating plate. This distal part may be domed and be wide enough to be able to be grasped by a hand, in particular while the device **2** is being used.

[0150] The internal plates **16** may be heated to a temperature above 50° C., better still between 90° C. and 230° C.

[0151] The external plates **13** may be heated to a temperature above 50° C., better still between 6° and 100° C.
[0152] In the example illustrated, the internal plate **13** and the external plate **16** borne by the same jaw **3** or **4** are heated by thermal conduction by a single heat source **14** extending in said jaw and visible in FIG. **3**. However, this does not have to be the case, and the device **2** could in particular have several heat sources, respectively for the internal plates and the external plates.
[0153] In the example illustrated in FIG. **3**, each internal plate **16** has a first lateral edge **31** and a second lateral edge **36** opposite the first edge **31**, the edges **31** and **36** extending parallel to the longitudinal axis Y**1** or Y**2** of the corresponding jaw. The internal plates may be off-centre on the corresponding jaw such that the first edge **31** is closer to the adjacent lateral edge **100** of the corresponding jaw than the second edge **36** is to the adjacent lateral edge **101** of the corresponding jaw.
[0154] The internal plates **16** may protrude beyond the housing **30 38** laterally on both sides of the jaw and have a lateral extension defining the first lateral edge **31** that is longer in cross section of the device than the lateral extension defining the second edge **36**.
[0155] As illustrated in FIG. **6** for the jaw **3**, the first edge **31** may be configured such that, when the spring **141** is not compressed, an angle β formed between a median plane Z of the device **2** extending between the jaws **3** and **4** in the moved-together configuration of the jaws **3** and **4** and hair under tension bearing on the first edge **31** of the internal plates **16** and on an adjacent outer surface of the jaw **3** or **4** bearing the internal plate, illustrated by the plane C, is less than or equal to 120° and strictly greater than 90°, better still equal to 105°+5°, better still equal to 105°+3°, notably at rest, for example equal to 105°.
[0156] As visible on FIG. **6**, the device **1** comprises a groove between the first lateral edge **31** of the internal plate **16** and said adjacent outer surface of the jaw **3** or **4** bearing the internal plate **16** and that extends substantially along the longitudinal axis of the corresponding.
[0157] Said adjacent outer surface is offset from the internal plate **16** by a non-zero distance when the device **1** is viewed along its longitudinal axis.
[0158] The first lateral edge **31** extend so that it forms a protruding relief on the jaw **3** or **4**.
[0159] The internal plates **16** may protrude laterally at rest from the housing **38** at the first edge **31** only by a width Ls of 1 mm.
[0160] As illustrated in FIG. **6**, each internal plate **16** may be spaced apart, at rest, from a plane P lying laterally on the adjacent outer surface of the two jaws **3** and **4** by a distance Dp of less than or equal to 6 mm, better still less than or equal to 5.5 mm.
[0161] The first edge **31** of the internal plate **16** of the jaw **3** may have an edge corner **40** configured to come into contact with hair under mechanical tension during the treatment. This hair is depicted by the plane C lying on the first edge **31** of the internal plate **16** and on an adjacent outer surface of the jaw **3**. The edge corner **40** may be rounded with a radius of curvature equal to 1.5 mm.
[0162] The support **9** may protrude, at rest, from the jaw **3** or **4** in the direction of the other jaw **3** or **4** by a height Hl of at least 2 mm, for example 4 mm.
[0163] This distance makes it possible to avoid contact between the surface of the plate protruding beyond the support **9** of the plate and the surface of the jaw bordering the housing **38** facing said surface of the plate during the movement of the support **9** in the housing **38** via the spring **141**.
[0164] As illustrated in the enlarged view in FIG. **7**, the first edge **31** having the edge corner **40** may have a second, planar part **122** that is oriented away from the jaw **4**. This part **122** is parallel to the surface **45** of the internal plate **16**.
[0165] The second part **122** extends, for example, from the edge corner **40** to a rib **125** of the internal plate **16**, this rib **125** engaging in the seal **33** of the support **9** of the jaw **3**.
[0166] Each internal plate **16** has a plurality of these ribs **125**, as illustrated in FIG. **8**. For example, a rib **125** is formed by a curve in the internal plate **16** at its second edge **36**.

[0167] The thickness Eb of the first edge **31** bearing the edge corner **40** is less than the thickness Ep of the internal plate **16**, away from the various ribs **125**.
[0168] As illustrated in FIG. **8**, each internal plate **16** has a cavity **130** configured to receive the heating element **14**. This cavity **130** is formed by two parallel walls **131** extending orthogonally to the surface **45** and a wall **132** connecting the two walls **131**.
[0169] For example, as illustrated in FIG. **8**, each wall **131** has reliefs **135** that help to keep the internal plates **16** on the support **9**.
[0170] As illustrated in FIG. **8**, the first edge **31** of the internal plate **16** of the jaw **4** is not in contact with the support **9**, unlike the second edge **36**.
[0171] The first edges **31** and the second edges **36** are, for example, offset transversely from one another by a non-zero distance Db.
[0172] The first edge **31** of the internal plate **16** of the jaw **4** may be curved without having a protruding edge corner.
[0173] The second edges **36** of the internal plates **16** of the jaws **3** and **4** do not extend laterally with respect to the housings **30** and are curved so as not to have a protruding edge corner.
[0174] The position and the shape of the first edges **31** and in particular of the edge corner **40** allow, during curling, an improvement in the result since it increases the bending angle of the hair and produces, on passing over the edge corner **40**, an effect equivalent to that obtained by a protruding edge corner passing at a particular angle over a gift ribbon.
[0175] The radius of curvature with respect to the longitudinal axis Y**1** of the external plate **13** of the jaw **3** may be smaller than that of the external plate **13** of the jaw **4** with respect to the longitudinal axis Y**2**.

External Guiding Portion

[0176] In the examples illustrated, each jaw **3** and **4** has an external hair guiding portion delimited longitudinally, on each of its two sides, by a stop surface **18** formed by a shoulder. The external hair guiding portion is defined, for example, by the external plates **13**.
[0177] The stop surface **18** may comprise a flat portion, particularly in a plane transverse to the jaw, particularly flat over a width at least equal to 50% of the width of the jaw, preferably 80% of the width of the jaw, better still 100%, at the level of said stop surface **18**.
[0178] The shoulders **18** may have a variable height He, for example varying between 0.5 mm on the outer surface of the jaw extending laterally with respect to the internal plate **16** and 2 mm on the outer surface of jaw opposite the internal plate **16**.
[0179] Each shoulder **18** may be formed by ribs delimiting the external hair guiding portion. The rib is preferably thicker on the opposite side from the internal plates **13** than on the sides of the internal plates **13**.
[0180] Each external guiding portion is set back with respect to the base level of the jaw **3** or **4**, defined as the level of the jaw **3** or **4** away from the shoulders **2018**. Thus, each guiding portion has a visible width l**1** and l**2**, illustrated in FIG. **3**, that is smaller than and set back from the rest of the jaw **3** or **4**.
[0181] The external plates **13** may extend along the entire length of the external guiding portion.
[0182] One of the jaws may have a lateral recess **170** at the corresponding guiding portion forming a hair guiding zone. The recess **170** is delimited laterally by the stop surfaces in the proximal and distal part of the jaw delimiting the guiding portion. These stop surfaces form, at the shoulder, guiding surfaces **20** with a greater height, making it possible to keep the hair in the recess **170**. The recess **170** extends laterally with respect to the jaw and faces a part of the other jaw **3** or **4**. As a result, a part of the outer surface **13** of the other jaw **3** or **4** gives onto the recess **170**, making it possible to have at least a part of an additional treatment member extending from the other jaw into the recess **170**, in particular a comb, as will be shown below, and affords new treatment possibilities. Preferably, the recess **170** has a uniform depth along the longitudinal axis of the device X such that the outer surface of the jaw has a substantially cylindrical shape along the recess

170, meaning that it has an identical cross section along the recess **170**.
[0183] There is no lateral recess on the other side of said jaw.
[0184] On account of the presence of the recess **170**, the width l**1** of the jaw bearing the recess is smaller at said recess **170** than the width l**2** of the other jaw facing said recess **170**. The width l**1** is between 30 mm and 50 mm and is, for example, equal to 38 mm. The width l**2** is between 40 mm and 60 mm and is, for example, equal to 47 mm.
[0185] In a variant that is not illustrated, the hair guiding zone may not be a recess, specifically a zone of the jaw delimited laterally by one or two guiding surfaces in the proximal and/or distal part of the jaw.
Additional Treatment Member
[0186] In the examples illustrated, the device **2** has an additional hair treatment member **12** that extends from the jaw **4** towards the other jaw **3** in the moved-together configuration of the two jaws **3** and **4** and is arranged on said jaw **4** laterally with respect to the internal plate **16**.
[0187] The additional treatment member is only present on the internal part of the jaw **4**. The external parts of the jaws **3** and **4** are deprived of any additional member other than the external plate **13**.
[0188] The member **12** extends longitudinally and parallel to the longitudinal axis Y**2** along the second edge **36**, opposite the first edge **31**, of the internal plate **16** of the jaw **4**, being separated from this internal plate **16**, when the device **2** is viewed along its longitudinal axis X.
[0189] The member **12** may have a steam outlet **21** and a comb **22**, as illustrated in FIG. **3**.
[0190] The comb **22** may be disposed, removably, in a housing such as a longitudinal groove **35**, visible in FIG. **2**. The user can thus change or remove the comb **22** as desired. The groove **35** may have a rectangular cross section and open out at the distal end of the jaw **4**.
[0191] The comb **22** may have, in the distal part of the device **2**, an element **46** that makes it possible to grasp the comb **22** when it is being introduced into the groove **35** or extracted therefrom
[0192] The comb **22** may extend, for example, along the entire length of the guiding portion. In a variant, it could extend over only a part of the guiding portion.
[0193] The steam treatment may be ensured by virtue of a vaporization member formed by an element heating an evaporation chamber **19** supplied with water by a reservoir situated in one arm of the device, or, in a variant, by a remote reservoir. The device may have an electrically driven pump, preferably a peristaltic pump, which draws up the water to be sent to the device **2** from a water reservoir. The pump is for example as disclosed in the publication FR 2 967 018. The evaporation chamber may be produced in accordance with the teaching in patent application EP 2449909A1 or in a different way.
[0194] The evaporation chamber **19** may be disposed on one of the arms, namely the lower arm **6** in the example in question, and the steam outlet **21** is provided on the same arm **6**.
[0195] The steam outlet **21** may be in the form of a strip, with a shape that is elongate in a direction parallel to the longitudinal axis Y**2**.
[0196] The strip may have several orifices for spraying steam, for example between 4 and 10 orifices, preferably 7, which are preferably distributed evenly along the strip and each have an axis oriented substantially perpendicular to the median treatment plane.
[0197] The vaporization member is electrically powered and a temperature sensor is advantageously disposed in the evaporation chamber **19**. The device is designed to keep the temperature of the evaporation chamber at a value of between 110° C. and 130° C.
[0198] The steam produced which exits via the outlets **21** is partially contained between the steam outlet **21**, the internal heating plates **16** and the other jaw **3**, in particular by virtue of the presence of a containment groove **500**, visible in FIG. **3**. This partial containment improves the application of the steam to the hair.
[0199] The comb **22** may be disposed facing the recess **170** of the other arm **5**, illustrated in FIG. **2**, such that the end of its teeth are housed in the recess **170**.

[0200] The comb **22** may be arranged on the jaw **4** such that the distal end **23** of the teeth of the comb is spaced apart by a non-zero distance from hair wound around the two jaws **3** and **4**.
[0201] To this end, the comb **22** is configured such that, for any cross section of the device in the moved-together configuration of the jaws, for example that in FIG. **4**, the tangent T, which may for example fictitiously represent the hair, to the two jaws **3** and **4**, extending on the side of the device bearing the comb **22**, is at a distance from the comb **22**.
[0202] The smallest distance Dd between the distal end **23** of the teeth of the comb **22** and the tangent T may be greater than or equal to 0.5 mm, better still greater than or equal to 1 mm, for example equal to 3 mm.
[0203] When the user winds hair around the jaws **3** and **4**, in particular when curling, the hair under tension follows, between the two jaws **3** and **4**, the tangent T. Thus, the wound hair does not pass through the comb **22**, making the styling operation easier.
[0204] The distal end **23** of the teeth of the comb **22** is, for example, offset laterally, in the moved-together configuration of the jaws **3** and **4**, from the opposite jaw **4**, in this case from the jaw at the recess **170** by a distance Dde greater than or equal to 0.5 mm, preferably greater than 1 mm. This ensures that the teeth of the comb **22** cannot interfere with the jaw **4** at the recess **170**.
[0205] The height Hde of the teeth of the comb **22** may be between 5 mm and 15 mm, preferably between 7 and 10 mm, for example around 8 mm.
[0206] The teeth of the comb **22** may have a rectangular cross section.
[0207] In the example illustrated, the combination of the external guiding portion, of the edge corner **40** and of the heat from the external plates **13** produces high quality curling of the hair.
[0208] In addition, the device **2** may also operate as a straightener, without any loss of straightening quality compared with a conventional device dedicated only to straightening the hair.
Thermal Protection Cover
[0209] As illustrated in FIGS. **3** and **9** to **15**, the device **2** may have a thermal protection cover **70**, for example two, made of polyamide and resistant to a temperature of at least 60° C.
[0210] Each cover **70** is mounted removably by being clip-fastened on one of the jaws **3** and **4** so as to entirely cover the corresponding external plate **13**.
[0211] The cover **70** may be symmetric with respect to a longitudinal median plane.
[0212] Each cover **70** may have a recess **71** configured to form a preferential deformation zone **72** of the cover **70** when it is fitted on the device **2**.
[0213] Each cover **70** may have a curved shape complementary to that of the corresponding external plate **13**.
[0214] Each cover **70** has for example a thickness of about 1 mm at the longitudinal edges and 1.5 mm at the centre.
[0215] Each cover **70** extends along a longitudinal axis W, said recess **71** having an elongate shape transversely to the longitudinal axis of the cover, for example forming a right angle with the longitudinal axis W.
[0216] As illustrated in FIGS. **9** to **11**, the recess **71** is a through-recess and is symmetric with respect to a plane transverse to the longitudinal axis W of the cover **70**. The recess **71** extends over at least 70% of the developed width of the cover **70**.
[0217] For example, as illustrated in FIG. **11**, the recess **71** is straight. In a variant, as illustrated in FIGS. **9** and **10**, the recess **71** has several waves.
[0218] Each recess **71** may extend over the cover **70** at a distance from one of the longitudinal ends of the cover **70**, in particular the distal end **73** of the cover **70**, of less than or equal to 25% of the length Gc of the cover **70**. The length Gc of the cover **70** corresponds to the length of the external treatment **13** of the device and, in this respect, may be between 50 mm and 150 mm, preferably between 80 and 100 mm, advantageously around 88 mm.
[0219] Each cover **70** may have a gripping protrusion **75** extending from the outer surface of the cover **70** at a distance of less than or equal to 25% of the length Gc of the cover **70** from the

longitudinal end **74** opposite the longitudinal end **73**.
[0220] Thus, when the cover **70** is mounted on the jaw **3** or **4**, the protrusion **75** is situated close to the longitudinal end of the cover **70** extending towards the half-handles **10** and **11**. This makes it possible for example to detach the cover **70** with one finger of the hand holding the half-handles **10** and **11** in a single motion, thereby making handling easier.
[0221] As illustrated in FIG. **9**, the protrusion **75** may extend orthogonally to the cover **70** with a constant thickness and a domed outer surface.
[0222] As illustrated in FIG. **10**, the protrusion **75** may have a domed shape along the longitudinal axis W of the cover **70**.
[0223] As illustrated in FIG. **11**, the protrusion **75** may be in the form of a tongue, in particular a wavy tongue, extending from the outer surface of the cover at an angle that is not a right angle.
[0224] Each cover **70** may have first protruding reliefs **77** extending at its two longitudinal ends **73** and **74** and designed to cooperate with second recessed reliefs **80** in the rest of the device **2**, these being particularly illustrated in FIGS. **13** and **14**.
[0225] The first reliefs **77** may extend parallel to, and preferentially along, the longitudinal axis W of the cover **70**.
[0226] Each first relief **77** has a thickness less than the thickness of the longitudinal end **73** or **74** of the cover **70**.
[0227] The second reliefs **80** may be in the shoulders **20 18** opposite the internal plate **13**. Thus, the first reliefs **77** of the cover extend into the shoulders **18**.
[0228] As illustrated in FIG. **15**, the cover **70** is configured to be mounted on the device **2** by the cooperation of the first relief **77** extending at the longitudinal end **73** of the cover **70**, in particular the end opposite the protrusion **75**, with the complementary second relief **80** and by the cover **70** being pivoted, on the rest of the device **2**, about a pivot axis A transverse to the median plane of the cover **70**.
[0229] The pivot axis A may be orthogonal to the longitudinal axis W of the cover **70** and situated at the first relief **77** of the cover **70** at the end **73** towards the recess **71**.
[0230] During this operation of mounting the cover **70**, the zone **72** deforms elastically towards the interior of the cover **70**, allowing a slight displacement of the first relief **77** of the cover **70** towards the protrusion **75** along the longitudinal axis W of the cover **70**. This deformation occurs when the user exerts a longitudinal pressure from the gripping protrusion **75**. By virtue of this movement, the first relief **77** on the gripping protrusion **75** may, during pivoting, not come to rest against the shoulder **18**.
[0231] Once pivoting has been completed, when the cover **70** is contact with the plate **13**, the longitudinal pressure is released, allowing the zone **72** to return to its initial shape by elasticity. The first relief **77** on the side of the gripping protrusion **75** engages, during this releasing, in the second relief **80** of the shoulder **18** which faced it before the pressure was released.
[0232] The first reliefs **77** thus positioned in the second reliefs **80** make it possible to keep the cover **70** on the jaw **3** or **4**.
[0233] To remove the cover **70**, the reverse operation is carried out.
End Piece
[0234] In the example in FIGS. **16** to **18**, the device **2** has two end pieces **50** made of plastic. Each end piece **50** is mounted removably by complementing shapes on a distal end of the corresponding jaw **3** or **4**.
[0235] Each end piece **50** may have an edge **51** adjacent to the external plate **13** along which a stop **52** extends transversely to the longitudinal axis Y**1** or Y**2** of the jaw **3** or **4**. The stop **52** forms a protrusion with a relatively constant height Hs, for example at least 1.5 mm, with respect to an external envelope surface **55** of the end piece **50** situated on the distal side with respect to the stop **51**. The stop **52** extends across the entire width of the end piece **50**.
[0236] For example, the edge **51** extends over the entire distal end **66** of the external plate **13**.

[0237] Apart from this stop, the two stops **50** have for example a smooth outer surface **64** without reliefs.
[0238] Apart from at the stop **52**, each end piece has for example a thickness of between 1 and 2 mm, preferably substantially equal to 1.5 mm.
[0239] Each end piece **50** may have a shell **56** with a shape substantially complementary to that of the jaw **3** or **4** which it covers, for example an ogive shape complementary to the distal end of the jaw **3** or **4**.
[0240] Each external plate **13** may be positioned between the end piece **50** and the proximal end of the jaw **3** or **4**. For example, the end piece **50** covers less than 5% of the external plate **13**, for example covers it by 1 mm.
[0241] Each end piece **50** extends over the rib forming the shoulder **20 18** on the distal side of the external guiding portion.
[0242] Each end piece **50** extends from the distal end of the jaw **3** or **4** to the external guiding portion by covering a distal part of the external guiding portion.
[0243] Each end piece **50** has, on its inner surface, a slot **57** configured to receive the rib forming the shoulder **2018**, in particular by snap-fastening.
[0244] As illustrated in FIG. **18**, the slot **57** may extend under the entire length of the stop **52** and have a variable depth.
[0245] As illustrated in FIG. **16**, each end piece **50** may have a first portion **60** configured to extend facing the other jaw **3** or **4**, a second portion **61** configured to extend outwardly between the distal end of the jaw **3** or **4** and the external plate **13**, and a connecting portion **62** of complementary shape to the distal end of the jaw **3** or **4** and configured to connect the first portion **60** and the second portion **61**.
[0246] This enveloping shape of the end pieces **50** exhibits both flexibility, allowing deformation for fitting the end pieces **50** on the jaws, and sufficient stiffness to ensure a proper hold on the jaws **3** and **4**.
[0247] The inner surface **63** of each end piece **50** may be complementary to the outer surface of the jaw **3** or **4** over which the end piece **50** extends, each end piece **50** being in contact over substantially its entire inner surface **63** with the outer surface of the corresponding jaw **3** or **4**.
[0248] The end piece **50** mounted on the distal end of the jaw **4** bearing the comb **22** has a notch **65** intended to face the groove **35** into which the comb **22** is intended to be inserted. This notch **65** allows the free extraction of the comb **22** through the distal opening of the groove **35** when the end piece **50** is mounted on the jaw **4**.
[0249] Each end piece **50** may be made in one piece from a thermoplastic polymer material that resists a temperature of at least 60° C.
[0250] Each end piece **50** may be configured to be mounted by being moved in translation along the longitudinal axis Y**1** or Y**2** of the jaw **3** or **4**, until the rib of the shoulder **20 18** has been clip-fastened in the slot **57**. In order to remove the end pieces **50**, the user can unclip the end piece **50** by removing the rib of the shoulder **18** from the slot **57** and then translationally moving the end piece **50**.
[0251] The width of the end piece **50** between the distal end of the jaw **3** or **4** and the stop is sufficient to allow it to be grasped by a user's hand during the use of the device. The stop **52** prevents accidental contact of the user's hand on the external heating plate **13**, thus limiting the risk of burns.
Process
[0252] To curl or straighten hair using the device **2**, a lock of hair may be moved on the device **2** between the internal plates **16** in the internal heat treatment zone, passing through the guiding zone and over at least one of the external plates **13** forming the external heat treatment zone, passing or not passing through the treatment member **12**. It may be necessary to remove the cover(s) **70** prior to insertion of the hair into the device.

[0253] The hair treatment process for curling may include gripping a lock of hair between the two jaws and winding it around at least one of the two jaws through at least 180°.
[0254] The hair treatment process for curling, illustrated in FIGS. **19** to **22**, includes moving the device **2** along a lock of hair from the root to the ends thereof to perform the following successive steps on at least part of the lock of hair: [0255] a. Optionally guiding by the guiding zone delimited by the guiding surfaces at the proximal and distal part of the jaw, as seen in FIG. **22** at the hair tip, [0256] b. Optionally a treatment with the member **12**, to comb the hair in the comb **22** and then to apply steam through the outlet **21** onto the hair, as seen in FIG. **19**, [0257] c. A first heat treatment by gripping between the internal plates **16** of the device **2**, as seen in FIG. **19**, [0258] d. Optionally an application against the first lateral edge **31** with the hair tensioned by gripping and/or combing between the internal plates **16** and moving the device over the lock of hair, as seen in FIG. **20**, [0259] e. A second heat treatment by applying to the hair under tension against the external plate **13** the jaw **3**, as seen in FIG. **21**, [0260] f. Guiding through the guiding zone delimited by the guiding surfaces at the proximal and distal part of the jaw, as seen in FIG. **22** at the hair roots, [0261] g. Optionally, notably in the case of locks of hair of great length, a second heat treatment by applying to the hair under tension against the external plate **13** the jaw **4**, as seen in FIG. **22**.
[0262] Preferably, the lock of hair undergoes a change in orientation about the device **2** of at least 180°, preferentially of at least 270°, better still of at least 360°, during the treatment.
[0263] At the end of step c of heat treatment of the hair between the internal plates **16**, the lock of hair undergoes, between the first edge **31** and the adjacent outer surface **32** of the jaw **3** around which the lock of hair is wound, a minimum change of orientation of 100°.
[0264] At the end of step c of heating the hair on the internal plates **16**, the hair is moved over the edge corner **40**, making it possible to produce the abovementioned gift ribbon effect.
[0265] Another application of heat on the external plate **13** of the jaw **4** could also be carried out.
[0266] The lock of hair may also be wound several times around the two jaws, notably by manually winding the lock of hair around the device or by rotating the device on the lock of hair around its longitudinal axis, so that each portion of the lock of hair undergoes a repetition of steps e to g after step d. Thus, the lock of hair may undergo the following successive steps: second heat treatment/guiding by passing through the guiding zone/further application of heat by the plate **13** of the jaw **4**.
[0267] As a variant illustrated in FIGS. **23** and **24**, notably by changing the direction of insertion of the hair into the device, the hair treatment process for curling may include moving the device **2** along a lock of hair from the root to the ends to perform the following steps, preferentially performed in the following order on at least part of the lock of hair: [0268] a. A first heat treatment of the lock of hair by pressing between the internal plates **16** of the device **2**, as seen in FIG. **23**, [0269] b. Optionally treatment of the lock of hair with the member **12**, to apply steam through the outlet **21**, as seen in FIG. **23**, [0270] c. Guiding the lock of hair through the guiding zone delimited by the guiding surfaces at the proximal and distal part of the jaw, the device having been preferentially rotated by 180° about its longitudinal axis, as seen in FIG. **24**, and [0271] d. A second heat treatment of the lock of hair by applying tension against the external plate **13** of the jaw **3**, as seen in FIG. **24**.
[0272] This process is notably more suitable for a lock of hair that is too short to wind around both arms **3** and **4**.
[0273] For these curling processes, it is possible to use the end pieces **50** in order to have better handling of the device **2**, without the risk of burns.
[0274] The invention is not limited to the examples which have just been described.
[0275] The process may include the application of a cosmetic product by an applicator member, notably a porous element configured to come into contact with the hair between the jaws in the moved-together configuration of said jaws.

Claims

1. A process for treating at least one lock of hair, involving the movement of a device along the lock of hair from the root to the tip of the hair in order to perform, during a passage of the device over the lock of hair, the following steps: a heat treatment of a portion of the lock of hair by gripping between two jaws of the device that are hinged together and passing through an internal heat treatment zone extending between the two jaws, a heat treatment of the portion of the lock of hair by passage over an external heat treatment zone extending on the outer surface of one of the two jaws of the device, an additional treatment of the portion of the lock of hair by passage through an additional treatment zone by the treatment device as it moves over the lock of hair, the additional treatment being performed by an additional treatment member extending from one of the jaws to the other of the jaws during the movement of the device along the lock of hair, guiding the portion of the lock of hair by passing it through a guiding zone extending outside the jaw of the device bearing the external heat treatment zone, the guiding zone having guiding surfaces at the proximal and/or distal part of the jaw, forming laterally to the guiding zone an obstacle to the hair that is sufficient to contain the hair in said guiding zone, in which the guiding zone is formed at least partially by a lateral recess of one of the jaws, a part of the additional treatment member extending from the other jaw into the lateral recess.
2. The process according to claim 1, in which the heat treatment by the internal heat treatment zone takes place at a temperature above 50° C.
3. The possess according to claim 1, in which the heat treatment by passing over an external heat treatment zone is at a temperature above 50° C.
4. The process according to claim 1, in which the guiding surface form an obstacle to the portion of the lock of hair of at least 2 mm.
5. The process according to claim 1, in which the or each guiding surface has a variable height.
6. The process according to claim 1, in which the heat treatment in the internal heat treatment zone is performed before the heat treatment in the external heat treatment zone on the portion of the lock of hair when the device is moved over the lock of hair.
7. The process according to claim 1, in which the internal heat treatment surface is a hair contact surface of an internal heat treatment member, the process including passing the portion of the lock of hair, placed under mechanical tension between a lateral edge of the internal treatment member and an outer surface of the jaw bearing the internal treatment member adjacent to the lateral edge against the lateral edge, the portion of the lock of hair under tension presenting an angle of less than or equal to 120°, and strictly greater than 90°, with a median plane Z of the device, extending between the jaws in the moved-together configuration of the jaws.
8. The process according to claim 1, in which the internal heat treatment zone is laterally offset upstream or downstream, the hair being moved from upstream to downstream during the heat treatment.
9. The process according to claim 1, in which the heat treatment by passing over the external heat treatment zone takes place by contact of the portion of the lock of hair with an external heating surface extending over at least part of the outer surface of one of the jaws.
10. The process according to claim 1, including heat treatment by passing through an additional external heat treatment zone extending over the outer surface of the other of the two jaws of the device.
11. The process according to claim 1, including gripping of the device by an outer surface of a distal portion of the jaws not having an external heating surface during the movement of the device along the lock of hair.
12. The process according to claim 1, including an additional treatment of the portion of the lock of hair by passage through an additional treatment zone by the treatment device as it moves over the

lock of hair, the additional treatment notably being upstream of the abovementioned heat treatments and of the guiding of the hair.

13. The process according to claim 12, in which the additional treatment includes the application of steam and/or combing of the portion of the lock of hair.

14. The process according to claim 1 in which the steps of the process are performed in succession along the lock of hair, in the following order: heat treatment in the internal heat treatment zone, hair guiding, and heat treatment in the external heat treatment zone, or heat treatment in the internal heat treatment zone, heat treatment in the external heat treatment zone, guiding by the guiding zone.