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(71) Applicant *(for all designated States except US)*: **L'OREAL** [FR/FR]; 14 rue Royale, F-75008 Paris (FR).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **GUERET, Jean-Louis** [FR/FR]; 27 avenue Raymond Poincaré, F-75016 Paris (FR).

(74) Agent: **TANTY, François**; Nony, 3 rue de Penthièvre, F-75008 Paris (FR).

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(54) Title: APPLICATOR FOR COMBING AND/OR APPLYING A PRODUCT ON EYELASHES AND/OR EYEBROWS

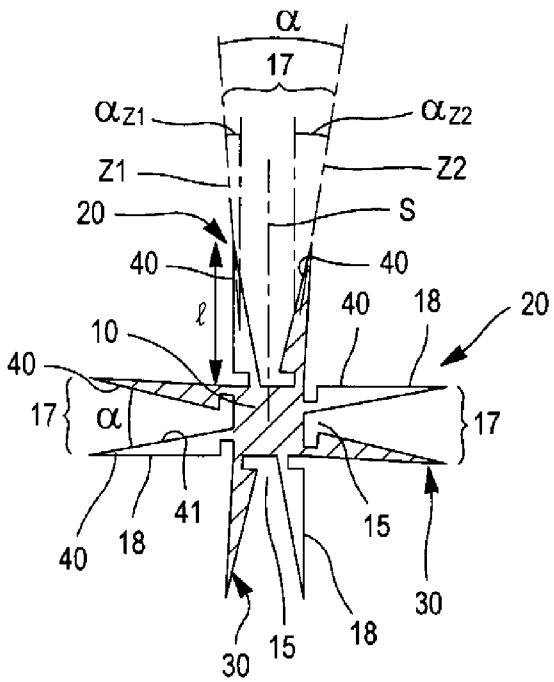

FIG. 3

(57) Abstract: The present invention relates to an applicator for combing and/or applying a product on eyelashes and/or eyebrows, comprising a molded application member, comprising: -a core(10) having a longitudinal axis, -teeth (18) extending from the core outwards towards a free end of the tooth, along an elongation direction of the tooth, at least one tooth (18) comprising a shrinked stem located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimensionless than a larger transverse dimension of the tooth, this larger transverse dimension being further away from the core (10) than said smaller transverse dimension, and the transverse dimension of the teeth not increasing from said larger transverse dimension towards its free end, over at least one quarter of the length (*l*) of the tooth.

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Applicator for combing and/or applying a product on eyelashes and/or eyebrows

The present invention relates to an applicator for combing keratinous fibers, notably eyelashes and/or eyebrows, and/or applying a cosmetic, make-up or care product, for example mascara, on the latter.

The invention also relates to a conditioning and application device including such an applicator.

The invention is further concerned with a cosmetic treatment method.

Applicators for applying mascara on eyelashes are known, which include a molded application member with a core and teeth extending from the core outwards, all around the core.

US 6,866,046 describes a comb for eyelashes, the teeth of which are molded with reliefs.

International application WO 01/05271 describes mascara applicators including teeth having reliefs on their side surface.

Mascara applicators including bristles having multiple branches are further known from patent application FR 2 744 608.

With such mascara applicators the eyelashes or eyebrows may be caught by means of reliefs or branches, which is not inevitably sought or desired by the user.

US 2,806,476 describes a dress comb for hair provided with anchoring reliefs in the hair.

There is a need for benefiting from an applicator allowing novel make-up effects to be achieved on eyelashes or eyebrows, already coated with a product or not, and improvement of the application of the product, the loading of the eyelashes or eyebrows with a product, and lengthening and separation of the latter, if necessary.

There is also a need for benefiting from an applicator which is comfortable when in use.

The object of the present invention according to one of its aspects *inter alia*, is thus an applicator for combing eyelashes and/or eyebrows, and/or applying a product on eyelashes and/or eyebrows, comprisinga molded application member comprising:

- a core having a longitudinal axis,
- teeth extending from the core outwards towards a free end of the tooth, along an elongation direction of the tooth,

at least one tooth, or even two teeth, better three teeth, or even all the teeth, comprising a shrinked stem located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimension less than a larger transverse dimension of the tooth, this larger transverse dimension being further away from the core than said smaller transverse dimension, and

the transverse dimension of the tooth not increasing from said larger transverse dimension towards its free end over at least one quarter of the length of the tooth, or even over a third, better over half of the length of the tooth. By « transverse dimension away from » should be understood the distance from the plane where this transverse dimension is measured, this plane being perpendicular to the elongation axis of the tooth.

The transverse dimension of the tooth may decrease if necessary, substantially continuously towards the free end of the tooth, over at least one quarter of the length of the tooth, or even at least over the half. This continuous reduction of the transverse dimension may proceed from the largest transverse dimension towards the free end of the tooth, or even as far as this free end.

By « longitudinal axis of the core » should be understood the line which joins the centers of gravity of the transverse sections of the core. The longitudinal axis may in certain cases be a central axis, or even an axis of symmetry for the core, notably when the core has a transverse section with the general shape of a regular or circular polygon. The longitudinal axis of the core may be a straight line or a curved line. The longitudinal axis of the core may be contained in a middle plane for the core. By « middle plane » for the core, is meant a plane containing the centers of gravity of the transverse sections of the core and which may be a plane of symmetry for certain or even all the transverse sections of the core.

By « tooth » is designated an individualizable protruding element intended to engage with the eyelashes, this term being a synonym of « bristle » within the scope of the present invention.

By « length of a tooth », is designated the distance measured along the elongation direction of the tooth between the free end of the tooth and its base through which it is connected to the core. The length of a tooth is the apparent length of the tooth as measured from the core of the application member.

By « smaller transverse dimension of the stem of the tooth », is designated the smallest transverse dimension measured perpendicularly to the elongation direction of the tooth, in any orientation with respect to the latter.

Also, by « larger transverse dimension of the tooth » further away from the core than the smallest transverse dimension of the stem of the tooth, is designated the largest transverse dimension measured perpendicularly to the elongation direction of the tooth in any orientation with respect to the latter. The plane of this larger transverse dimension, perpendicular to the elongation direction of the tooth, is located between the smallest transverse dimension of the stem of the tooth and the free end of the tooth. Both of these transverse dimensions are not necessarily measured in a same plane containing the elongation direction of the tooth, but they may also be therein.

Said larger transverse dimension of the tooth is located closer to the free end of the tooth than the smallest transverse dimension of the stem of the tooth.

The shrinked stem of the tooth provides the latter with some flexibility, allowing it to be tilted at least in a given tilt direction, or even in several directions, thus providing flexibility and elasticity to the wiping of the application member and/or to the application of the product. Advantageously and by means of the invention, such flexibility is obtained without having to necessarily use a very flexible material for making the teeth. The material used for making the teeth may thus be relatively rigid.

Further, it is not necessary to make the teeth in an excessively flexible material for compensating stiffness of the core, since flexibility is provided to the teeth by their shrinked stem. The behavior of each tooth may thus be adjusted by acting on its flexibility and its shape, and larger surfaces of teeth may for example be retained in order to deposit more product without the teeth being stiffer than fine teeth. Thus, between two teeth separately selected on the applicator, the length and the shape may either vary or not.

Further, removal of the teeth from the mold may be facilitated if necessary because the latter may be deformed on their stem, which may make their extraction from the mold easier.

With the flexibility of the teeth, it may further be possible to more easily avoid removal of the product from the eyelashes when the latter are combed while preventing sticking or thickening of the latter together, notably in the case when the application member is subject to vibrations, and/or to rotations. With the shrinked stem of the teeth,

storage of the product on the application member may be improved, providing the applicator with more autonomy.

Finally, the flexibility of the teeth provides more gentleness upon application and wiping, allowing, if this is sought, the wiping member to be only slightly deformed.

The transverse dimension of the tooth may not increase towards its free end from said larger transverse dimension. By « not increasing » is meant that it decreases or remains constant over a portion of the length of the tooth, or even over the whole length of the tooth, except for the stem of the tooth.

The smallest transverse dimension of the shrinked stem may be located in the first half of the tooth from the core, or even in the first third, or even in the first quarter of the length of the tooth from the core.

A larger transverse dimension of the stem of the tooth located between the core and the smaller transverse dimension of the stem of the tooth may be less than or equal to said larger transverse dimension of the tooth further away from the core than said smaller transverse dimension.

The largest transverse dimension of the stem may alternatively be larger than the largest transverse dimension of the tooth further away from the core than said smaller transverse dimension.

The stem of at least one tooth may have a non-constant cross-section after 90° rotation around the elongation direction of the tooth. The tooth may thus be configured in order to promote a particular tilt direction of the latter with respect to the longitudinal axis of the core. Thus, the teeth may have a tilt direction which belongs to a plane perpendicular to the longitudinal axis of the core.

Each tooth of the application member may either have or not one or more preferential tilt directions, different from that or those of the other teeth. The preferential tilt direction(s) may notably alternate from one tooth to the other. The stems of two consecutive teeth of a row may either be identical or not. The stem of at least one tooth, or even of a few teeth, or even of all the teeth of the application member, may include at least one cross-section extending along a major axis perpendicular to the longitudinal axis of the core. At least one tooth, or even a few teeth, or even all the teeth of the application member, may thus be configured in order to promote their deformation in a plane containing the longitudinal axis of the core, improving the quality of wiping at the outlet of

a container containing the product. Indeed, the teeth having a shrinked stem according to the invention bend over their stem when the application member crosses the wiping member, thereby contributing to a gentler wipe.

Further, the stem of at least one tooth, or even of a few teeth, or even of all the teeth of the application member, may include at least one cross-section extending along a major axis parallel to the longitudinal axis of the core. At least one tooth, or even several teeth, or even all the teeth of the application member may thus be configured so as to allow them to be deformed in a plane perpendicular to the longitudinal axis of the core, which may promote application of the product on the eyelashes and better brushing of the latter. Indeed, upon applying the application member against the fringe of eyelashes, the teeth having a shrinked stem according to the invention may be bent in order to afford gentleness during the application, better in order to smooth the eyelashes and promote deposit of the product on the latter.

The stem of at least one tooth may include several cross-sections with a small relative dimension alternating with cross-sections of larger relative dimension.

The stem of a tooth may be centered with respect to the cross-section of the largest transverse dimension of the tooth. By « centered stem », is meant that the elongation axis of the tooth, as defined hereafter, does not have any displacement at the connection of the tooth to the remainder of the tooth located above the stem. For example, the elongation axis may be rectilinear or may follow a slightly bent curve.

Alternatively, the stem of the tooth may be excentered relatively to the cross-section of the larger transverse dimension of the tooth. The stem may notably not be connected to the middle of the portion of the tooth located above the stem.

A stem of a tooth may have a cross-section perpendicular to the elongation axis of the tooth, which is of an elongated shape along a major axis which may be rectilinear or even curved, for example undulating.

Further, the stem of tooth may be continuous or broken, with at least one opening, if necessary.

The largest transverse dimension of the tooth may form, when the tooth is tilted relatively to the core by contact with the wiping member or eyelashes, an abutment preventing a stronger tilt of the tooth relatively to the core.

The stem of the tooth may be configured in order to allow tilting of the tooth relatively to its elongation direction by at least 3° or even 5°, better by at least 10°, for example upon crossing the wiping member, and/or upon applying the product. The shrinked stem of the tooth may thereby form a hinge.

The bending of the tooth over its shrinked stem may for example be of at most 45°.

The smallest transverse dimension of the stem of the tooth may be less than 30%, better less than 40% or even less than 50% of said larger transverse dimension of the tooth, or even less than 60% or 70%.

The smallest transverse dimension of the stem of the tooth may be comprised between 0.1 and 5.5 mm, or even between 0.2 and 0.4 mm, for example of the order of 0.35 mm.

The height of the stem of the tooth, measured between the core and the largest transverse dimension located above the smallest transverse dimension of the stem of the tooth, may for example be comprised between 0.05 and 1 mm, or even between 0.1 and 0.8 mm, better between 0.2 and 0.7 mm, for example of the order of 0.5 mm.

The largest transverse dimension of the tooth, located above the smallest transverse dimension of the stem of the tooth, may for example be comprised between 0.3 and 2 mm, or even between 0.5 and 1.5 mm, for example of the order of about 1 mm.

In an alternative embodiment, the smallest transverse dimension may for example be of the order of 0.35 mm and the largest transverse dimension of the order of about 0.55 mm.

The teeth according to the invention may preferentially be positioned in a distal portion of the application member rather than in a proximal portion of the latter, in order to promote combing of small eyelashes and making-up of the corner of the eye.

The teeth may be positioned in a row or in rows, for example extending along the longitudinal axis of the core. By « row » is designated a succession of teeth generally located on a same side of the core and in succession when one proceeds along the core for example from the proximal end of the core to the distal end of the core.

Certain rows may include teeth having a shrinked stem according to the invention, while other rows may be entirely without any teeth having a shrinked stem according to the invention. Rows of teeth having a shrinked stem according to the

invention may notably alternate with other rows without any tooth having a shrinked stem according to the invention.

Still alternatively, all the rows may include at least one tooth, or even several teeth, better all their teeth, having a shrinked stem according to the invention.

The application member may further be without any axis of symmetry.

The object of the invention according to another of its aspects is further an applicator for combing and/or applying a product on eyelashes and/or eyebrows, including a molded application member, including:

- a core having a longitudinal axis,
- teeth extending from the core outwards towards a free end of the tooth, along an elongation direction of the tooth,

at least one tooth, or even two teeth, better three teeth, or even all the teeth, including a shrinked stem located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimension, less than a larger transverse dimension of the tooth further away from the core than said smaller transverse dimension, and

the stem of the tooth being configured so as to allow tilting of the tooth with respect to its elongation direction by at least 3°, or even 5°, better by at least 10°, for example upon crossing the wiping member and/or upon applying the product on the eyelashes.

The object of the invention according to another of its aspects is an applicator for combing and/or applying a product on eyelashes and/or eyebrows, including a molded application member, including:

- a core having a longitudinal axis,
- teeth extending from the core outwards towards a free end of the tooth, along an elongation direction of the tooth,

at least one tooth, or even two teeth, better three teeth, or even all the teeth including a shrinked stem located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimension less than a larger transverse dimension of the tooth further away from the core than said smaller transverse dimension, and

the smallest transverse dimension of the stem of the tooth being less than 30%, better less than 40% or even less than 50% of said larger transverse dimension of the tooth, or even 60% or 70% less.

The object of the invention according to another of its aspects is further an applicator for combing and/or applying a product on eyelashes and/or eyebrows, including a molded application member, including:

- a core having a longitudinal axis,
- teeth extending from the core outwards, towards a free end of the tooth, along an elongation direction of the tooth,

at least one tooth, or even two teeth, better three teeth, or even all the teeth including a shrinked stem located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimension less than a larger transverse dimension of the tooth, further away from the core than said smaller transverse dimension, and the smallest transverse dimension being comprised between 0.1 and 0.5 mm, for example of the order of 0.35 mm.

The core may have a larger transverse dimension, as measured perpendicularly to its longitudinal axis, at least constant over a major portion of its length, or even on two thirds of the latter, three quarters or the whole of its length. The length of the core is measured along its longitudinal axis.

The length of the core may be measured between the bases of the far most respectively the closest, to the distal and proximal ends of the applicator.

A larger transverse dimension of the core may be comprised between 1.5 and 3 mm or between 2 and 3 mm for example.

The core may have a length less than or equal to 25 mm, or even less than or equal to 20 mm.

The core may have a cross-section, taken perpendicularly to its longitudinal axis with constant shape when one moves along the longitudinal axis of the core over for example at least half of its length, or even three quarters or the whole of its length.

The shape of the cross-section of the core may for example be selected from the following list which is non-limiting: circular, oval, elliptic, oblong, triangular, square, rectangular, pentagonal, hexagonal or octagonal shapes.

The cross-section of the core may be solid.

The cross-section may have the shape of a polygon, either regular or not, preferably regular, the sides corresponding to the longitudinal faces of the core which may be straight or slightly concave or convex.

The core may have a non-circular cross-section over the major portion of its length.

The core may have a generally axisymmetrical shape or not. The core may not be spherical. The core may be without reliefs other than the teeth.

The application member may include a molded endpiece as a single piece with the core, intended to be firmly attached, for example via a rod, to a grip member of the applicator. This endpiece is for example intended to be inserted into a mating housing made at the distal end of a rod, connected by its proximal end to the grip member. The endpiece may thereby form an extension of the core without any teeth.

The endpiece may extend over a length, measured parallel to its longitudinal axis, comprised between 5 and 50 mm, or even between 7 and 40 mm. This endpiece may be of a relatively substantial length with respect to known endpieces, with which high flexibility of the applicator according to the invention may be ensured.

A larger transverse dimension of the endpiece may be larger than the largest transverse dimension of the core.

The endpiece may have a cross-section, taken perpendicularly to the longitudinal axis of the core, with a shape selected from the following list, which is not limiting : circular, oval, elliptic, oblong, polygonal, either regular or not, triangular, square, rectangular, pentagonal, hexagonal, octagonal shapes.

The endpiece may include one or more shrinked portions with which the flexibility of the applicator and therefore the suppleness upon application may be improved.

Free ends of the teeth of application member may define an envelope surface of the application member. This envelope surface may have a larger transverse dimension, as measured perpendicularly to the longitudinal axis of the core, smaller than or equal to 11 mm, or even smaller than or equal to 10 mm, better less than or equal to 9 mm, for example of 7 mm $\pm$ 1 mm.

The envelope surface when observed perpendicularly to the longitudinal axis of the core may be of a circular, oval, oblong, ellipsoidal, or polygonal, either regular or not, shape.

The shape of the envelope surface may mainly be due to the positioning of the teeth relatively to the core, some of the latter for example being increasingly tilted with

respect to the longitudinal axis of the core upon moving towards the distal end of the core and others upon moving towards the proximal end of the core. The shape of the envelope surface may notably not be exclusively due to the fact that the length of the teeth varies.

The teeth may each extend along an elongation direction perpendicular to the surface of the core to which they are connected, or alternatively not perpendicular, forming a non-zero angle with the normal to the core at the base of the tooth.

Alternatively, the shape of the envelope surface may be due to the fact that the length of the teeth varies.

The envelope surface may extend along a longitudinal axis forming a non-zero angle with the longitudinal axis of the core.

The envelope surface may be of a larger transverse dimension, for example with a substantially constant diameter over at least one portion of the length of the application member.

The teeth of the application member may include a larger tooth with a length measured along its elongation direction from the core, comprised between 1.7 and 4.5 mm, better between 1.7 and 3.5 mm, or even between 2 and 3.5 mm. This length of the teeth may notably be larger than a larger transverse dimension of the teeth, measured perpendicularly to the elongation direction of the latter. More than half of the teeth may have a length as defined above, better at least 60%, or even 70%, still better 80% of the teeth, or even all the teeth.

The applicator may be made in such a way that the teeth having a length as defined above are distributed all around the core over at least one portion of the length of the latter, thereby defining a combing surface having substantially uniform properties all around the core, for at least one portion of the length of the application member.

The teeth having a length as defined above may for example be located at least in the middle portion of the core, notably between the first quarter and the last quarter of the apparent length of the core.

The teeth of the application member may all have the same length, except possibly those located in the vicinity of each of both axial ends of the core.

The application may thus notably include at the ends of the core, teeth having a length comprised between 0.5 and 1.8 mm.

Teeth, or even all the teeth, may have a cross-section of a shape selected in the following list which is not limiting: circular, semi-circular, semi-elliptical shapes, for example with the general shape of a D. Such a shape may facilitate removal of the application member from the mold. Removal from the mold may notably be facilitated when the teeth include at least one rectilinear edge cross-sectionally.

At least one tooth may have a circular or non-circular, polygonal, either regular or not, notably square, rectangular, octagonal cross-section, as a parallelogram, rhombus or oval. At least one tooth may have at least one relief, for improving adherence of the product on the tooth. The transverse section of the tooth may decrease in homothetic progression upon moving away from the core, over for example more than half of the length of the tooth for example.

At least one tooth, or even all the teeth, may be above their shrinked stem with a pyramidal, conical, semi-pyramidal or further semi-conical shape. By semi-pyramidal or semi-conical, it is understood that the shape of the tooth corresponds to a pyramid or a cone cut in the direction of its length, for example cut in half.

At least one tooth or even all the teeth may notably be without branches, or even without multiple branches.

Teeth of the applicator other than the teeth including a shrinked stem according to the invention, may have a thickness, as measured at their base, i.e. at the connection point of the teeth to the core, comprised between 0.3 and 0.6 mm, or even between 0.3 and 0.5 mm. By « thickness of the tooth » is designated the largest transverse dimension of the tooth, in a cut perpendicularly to its elongation direction. The applicator may include teeth having a thickness comprised between 0.2 and 0,5 mm and/or other teeth having a thickness comprised between 0.5 mm and 0.65 mm or even strictly larger than 0.5 mm.

At least one tooth may have a frusto-conical or pyramidal profile, for example terminated with a rounded free end, so that the cross-section of the tooth decreases from its base towards its free end.

The applicator may include a large number of teeth, the teeth not being very apart, so as to avoid an excessive load of product among them which will be due to too large separation. The applicator may include between 75 and 500 teeth, for example.

The applicator may include a single row of teeth, or further two rows, or even at least three rows of teeth, extending along the longitudinal axis, for example between 1 and

20 rows of teeth, better between 1 and 8 rows, still better between 1 and 10 rows, for example 6 rows. Within a row of teeth, the number of teeth may be comprised between 6 and 60, notably between 10 and 50. At least one row, and preferably each row, may include one or more teeth including a shrinked stem, for example a majority or a totality of the teeth including a shrinked stem.

At least one row of teeth may extend along a rectilinear axis, which may either be parallel or not to the longitudinal axis of the core.

At least two teeth of at least one row may have different or identical lengths. A row of teeth extending along the longitudinal axis may have at least three teeth of same length.

At least two teeth of at least one row may have different or identical shapes. At least one tooth of at least one row may have a general tapered shape towards its free end. At least one tooth may be a frusto-conical or pyramidal tapered shape.

When the applicator includes several rows of teeth, at least one tooth of one of the rows may have a shape different from a tooth of another row. At least one tooth of a row may for example have a length different from that of another tooth of this row, notably that of a consecutive tooth within the row.

When the core is observed along its longitudinal axis, two teeth of a row may extend at their base in respective directions which form an angle between them and two teeth of another row may extend at their base in directions which form a second angle between them, the first and second angles may be equal or different.

Within each row, the teeth may be regularly spaced along the longitudinal axis of the row or grouped together in groups of two teeth or more, the spacing between the teeth of a group along the longitudinal axis of the row being for example less than the spacing between two groups of adjacent teeth to this row.

By acting on the geometry of the teeth and on their spacing, it is possible to form more or less substantial cavities between the teeth, such cavities may be loaded with product.

Two rows of teeth may be made in different respective materials.

The teeth of a row of teeth may be made in different materials for example with different hardnesses or colors.

A first row of teeth may include teeth having, for example for a given abscissa along the core, a first length, a second row of teeth including teeth having, for example for this same abscissa, a second length, different from the first.

The application member may include an inner core elongated along a longitudinal axis, including first and second opposite regions each extending along the longitudinal axis, and a plurality of rows of teeth, including first rows and second rows of teeth extending from the first and second regions of the core respectively, the teeth of the first rows differing from the teeth of the second rows by at least one property selected from their shape, length, thickness, material, hardness, spacing in the row, and/or orientation in the row, and teeth extending for each of the regions outwards in at least three different directions. All or part of these teeth may include a shrinked stem according to the invention.

By « region of the core », is understood a longitudinal portion of the core extending angularly continuously around the longitudinal axis, for example over about 180°, or over another angular sector, for example comprised between 150° and 210°. The regions of the core may either be symmetrical relatively to each other or not, with an axial symmetry or relatively to a plane. The regions of the core may be delimited by a plane including the longitudinal axis of the core, for example a middle plane for the core.

At least two successive teeth of a row may be contiguous or non-contiguous to their base, all the teeth of the rows being for example non-contiguous or contiguous to their base, respectively. The spacing between the teeth, measured at the base of the teeth may be comprised between 0 and 1.2 mm within a row, for example between 0.01 and 1 mm. When the teeth are contiguous at their base, the spacing between the teeth measured at the base of the teeth is zero.

At least two teeth may define, when the applicator is observed from the side perpendicularly to its longitudinal axis, a V-shaped groove.

The teeth may have variable orientations measured with respect to the longitudinal axis of the core. When the applicator is observed perpendicularly to the longitudinal axis of the core, a few teeth, or even all the teeth, may be positioned as a half fan, or further as a fan.

By « teeth positioned as a half fan » are designated teeth for which the acute angle formed between the elongation directions of the teeth and the longitudinal axis of the

core only increases or only decreases, upon moving along this longitudinal axis towards one of its ends. The teeth may thus be gradually set upright relatively to the longitudinal axis of the core while remaining oriented towards an end of the core until they are perpendicular to the longitudinal axis, upon moving along the latter towards the opposite end. The teeth may further be perpendicular to the longitudinal axis of the core and gradually bend down relatively to the latter while remaining oriented towards an end of the core, upon moving along the longitudinal axis of the core towards said end. One or more teeth may be perpendicular to the longitudinal axis along a first portion of the core adjacent to a second portion of the core bearing forward-bending teeth or backward-bending teeth.

By « teeth positioned as a fan » are designated teeth for which the acute angle formed between the elongation directions of the teeth and the longitudinal axis of the core increases and then decreases upon moving along this longitudinal axis. The teeth may thus be gradually set upright relatively to the longitudinal axis while remaining oriented towards an end of the core, and then gradually bent while remaining oriented towards the opposite end. One or more teeth may be perpendicular to the longitudinal axis along a transition portion between the portions of the core bearing forward-bending teeth and backward-bending teeth, respectively.

One stem, or even a few stems, or even all the stems of the teeth positioned as a half fan, or as a fan, may either be connected or not to the middle of the portion of the tooth located above the stem. They may notably be connected to said portion, in an excentered way on the side towards which the tooth is tilted or on the opposite side, in order to either facilitate or not deformation of the tooth tending to further bend it down or to set it upright.

A single row, several rows, or even all the rows of teeth may be positioned as a half fan, or as a fan.

Teeth of one row and teeth of another row may extend in different directions.

The teeth of a row may have substantially aligned bases, i.e. the centers of the bases of three consecutive teeth are substantially located on a same straight line.

The teeth of at least one row may be connected to a corresponding longitudinal face of the core on a same side of a middle longitudinal line of this longitudinal face.

The teeth may have bases which are not centered on the longitudinal face of the core to which they are connected.

The bases of the teeth of a row may be aligned or positioned in a staggered pattern. In the case of staggered positioning, a plurality of consecutive teeth of the row may be shifted at least partly, alternately on either side of a geometrical separation surface. The consecutive teeth may be entirely shifted, alternately on either side of the geometrical separation surface. By « entirely shifted », it should be understood that the geometrical separation surface does not cross the teeth, being at most tangent to the latter.

All the teeth of each row may be alternately shifted on either side of a geometrical separation surface associated with the row. Alternatively, the teeth may be shifted on either side of the geometrical separation surface, not alternately, but by groups of teeth, for example of groups of two or three teeth.

Two consecutive teeth of a row may not be the image of each other one by simple translation, notably when the teeth have a non-circular shape cross-sectionally.

At least two consecutive teeth of a row of teeth, may have first faces having a same first shape, for example a planar shape, notably at least at a lower portion of the tooth, and second faces having a same second shape, for example a non-planar, notably rounded shape. The first faces may be oriented in the same rotary direction around the core, i.e. be all oriented in the same clockwise or anti-clockwise direction, when the core is observed along its longitudinal axis.

The first faces of the teeth, notably when they are planar, may substantially be connected perpendicularly to the corresponding face of the core, at least for certain teeth of the row. At least one tooth, or even each tooth, may have a planar face parallel to its elongation direction.

The teeth may either be rectilinear or not, each extending for example along an elongation axis for the tooth which is rectilinear, or further curved, for example undulating.

By « elongation axis of the tooth » is understood the axis which passes through the axis which passes through the centers of gravity of the cross-sections of the tooth. The elongation axis may be an axis of symmetry of the tooth, if necessary.

The rows of teeth may extend over the core each along a longitudinal axis of the row. The longitudinal axis of a row is an axis for the bases of the teeth of the row, being the straight line passing through the centers of the bases of the teeth in the case of strictly aligned teeth or the axis passing through the geometrical separation surface in the case of staggered teeth.

The major axes of the stems of the teeth of one row may all be oriented in the same way with respect to the longitudinal axis of a row, being for example parallel, oblique or perpendicular to the latter, or further at least one tooth may have the major axis of its stem oriented differently from the others, or further all the teeth may have the major axis of their stem oriented differently from that of all the other teeth.

As the longitudinal axis of a row is considered to be at the surface of the core, two longitudinal axes of two successive rows, upon moving around the longitudinal axis of the core, may be angularly separated by an angle of less than 80°, for example of the order of 60°, or even less than 50°, for example of the order of 45° or less. The distribution of the longitudinal axes of the rows at the surface of the core may be substantially regular, with a substantially constant spacing between them, equal to a predefined value to within ± 20 %, better 10 %, still better 5 %.

The implantation and the distribution of the teeth on the core may be relatively regular.

Upon moving around the longitudinal axis of the core, for example one tooth may be encountered for about every 360°/n, with n comprised between 2 and 20, better 4 and 16, still better 6 and 10.

A relatively regular arrangement of the teeth around the longitudinal axis of the core may facilitate less than totally accurate use of the applicator.

The application member may not include any portion extending angularly over more than one eighth of a turn without any tooth, which facilitates use considering that the user does not have to orient the applicator too accurately with respect to the eye.

The teeth may for example extend in at least six different directions around the longitudinal axis of the core.

In the exemplary embodiments of the invention, the teeth are made by molding (including overmolding) with the core.

Alternatively, the core may include a sleeve bearing the teeth which is freely mounted at least partly in rotation around a central portion of the core, this central portion being intended to be mounted on the rod, as described in application EP 1 935 279, the content of which is incorporated by reference. The teeth are molded with the sleeve.

In an exemplary embodiment of the invention, the eyelashes may be loaded with product upon contacting the core. The latter may thus be actively involved in applying

the product on the eyelashes, which provides more freedom in selecting and laying out the teeth.

At least one tooth of a row may extend, at least at the portion connected to the core, or even over the whole of its length, along a first direction Z_1, perpendicular to the longitudinal face of the core to which the tooth is connected or forming a small angle with the normal to said surface of the core, for example of less than 10°, better 5°. A consecutive tooth of the row may extend, from the same face of the core, along a second direction Z_2, at least at the portion connected to the core, or even over its whole length, forming an angle α with the first direction, when the core is observed along its longitudinal axis.

The teeth may be considered as belonging to a same row insofar that they are positioned, optionally on either side of a middle line, along a longitudinal axis of the row which is either parallel to the longitudinal axis of the core which bears this row, or parallel to the longitudinal face of the core from which the teeth are erected, when this face may be defined relatively to the remainder of the core, for example bordered by the longitudinal edges of the core.

Substantially half of the teeth of a row may extend parallel to the first direction Z_1. The angle α between directions Z_1 and Z_2 may be comprised between 5 and 80°.

The application member may be without any obliquely oriented teeth in opposite rotary directions. For example, when the core is observed from its distal end, all the teeth extending obliquely may be oriented anti-clockwise.

The core may include at least one planar longitudinal face. Alternatively, the core may include at least one non-planar longitudinal face, being for example at least partly concave or convex.

The core may have a variable profile, when observed perpendicularly to its longitudinal axis. The core may notably have a transverse dimension attaining a minimum in a central portion of the core, along its longitudinal axis.

The core may have a concave or convex longitudinal face cross-sectionally, the concavity or convexity of which may vary upon moving along the longitudinal axis of the core.

The core may have at least one face from which teeth extend, which has a variable width upon moving along the longitudinal axis of the core.

The core may have a substantially constant cross-section at least over a portion of its length. The core may further have a variable cross-section. The cross-section of the core may pass through an extremum, for example substantially at half-length of the core, this extremum being for example a minimum. This may impart increased flexibility to the core and allow definition of an envelope surface with a variable section along the application member, notably when the length of the teeth is constant in a row, at least over a portion of the application member.

The envelope surface of the application member may in a first location on the longitudinal axis of the application member, have a first substantially polygonal cross-section and in a second location on the longitudinal axis, a second substantially polygonal cross-section, at least one first apex of the first cross-section being connected to at least one second apex and to a third apex of the second cross-section through respective edges, the first and second apices being angularly shifted around the longitudinal axis of the application member, at least one of the first and second cross-sections being centered on the longitudinal axis of the core.

The core may have a twisted longitudinal face. The application member may have a helical distribution of the teeth on the core, oriented to the right or to the left upon proceeding towards the distal end of the application member.

The applicator may include a single row of teeth per longitudinal face of the core.

The length of a row may be comprised between about 10 and 45 mm, notably between 15 and 35 mm, or even between 20 and 30 mm, being about 25 mm for example.

When the core is observed along its longitudinal axis, passing from one row to the others may be carried out by rotation by an integer sub-multiple of 360° around the longitudinal axis of the core, for example a rotation by 360°/n, where n is an integer comprised between 3 and 20 for example.

The core may, in a cross-sectional plane, have axial symmetry, notably around its longitudinal axis.

The core may extend along a longitudinal axis forming in at least one point of its length, an angle with the longitudinal axis of the rod to which the core is attached. The application member may be bent at its connection to the rod.

The core may include a recess in which is engaged a supporting portion, for example in metal or in plastic. The core may be configured in order to be attached to this support or be freely in rotation and translation relatively to this support.

Alternatively, the portion of the core which supports the teeth may be solid. The core may only include one housing at one of its ends in order to allow its attachment to a rod connected to a gripping member.

The core and the teeth may be molded in a same material, or alternatively may be made in at least two different materials. One portion of the core and teeth may for example be made in a first material and another portion of the core and teeth may be made in a second material.

The teeth may be made in a single piece with the core, for example by molding, notably by injection. The teeth may be formed by mono-injection of material or over-injection, preferably in a thermoplastic material, which may be elastomeric. The injection may take place through the core if necessary.

The application member may be made by simultaneous bi-injection of both materials in a same mold.

The teeth may be made in a more or less stiff material than a material used for making the rod of the applicator to which the core is connected.

At least one of the core or tooth may have magnetic properties. The latter may be due to a load of magnetic particles, for example ferrites, dispersed in the plastic material of the core and/or of the tooth.

At least one of the core and tooth may include at least one biocidal agent, selected for example from certain metals, for example silver, copper or preservatives, for example parabens or other preservatives.

At least one of the core and tooth may be flocked and/or include a filler, intended for improving sliding for example.

At least one of the core and tooth may have been subject to antibacterial or antistatic treatments.

The applicator may include a rod at a first end of which is attached the application member. The core may be formed by a part added onto the rod of the applicator. The core may be attached to the rod of the applicator by inserting an endpiece extending the apparent portion of the core in a housing made at the end of the rod.

Alternatively, the core may include a housing extending longitudinally, in which the rod is inserted. Still alternatively, the core may be made by molding a plastic material in a single piece with the rod of the applicator.

The core may be formed in a more or less flexible plastic material than the one used for making the rod of the applicator.

The diameter of the rod may for example be comprised between 1.5 and 3.5 mm.

The rod may be connected at a second end, opposite to the first, to a gripping member which may be configured in order to seal a container containing the product to be applied. This container may include a wiping member, which may be adapted in order to wipe the rod and the application member.

The applicator may be without any metal, so that it may be put in a micro-wave oven.

If necessary, the core may be inwardly recessed, and include for example at least one channel for feeding the product through the application member.

The object of the invention is further a device for conditioning and applying a product on keratinous fibers, notably eyelashes or eyebrows, including an applicator as defined above, and a container containing the product. The gripping member of the applicator may form a cap for closing the container. The closure cap may allow sealed closure of the container, the device including a seal lip for example. The container may include a wiping member. The product may be mascara, for example a mascara resistant to water, of a black or other color.

The object of the invention is further a method for making up eyelashes or eyebrows by means of an applicator as defined above.

The invention will be better understood upon reading the detailed description which follows, of non-limiting exemplary embodiments of the latter, and upon examining the appended drawing, wherein:

- Fig. 1 is a schematic elevational view with a partial longitudinal sectional view of an exemplary device made according to the invention,
- Fig. 2 separately illustrates from the side, the application member of Fig. 1,
- Fig. 3 is a schematic and partial transverse sectional view along III-III, of the application member of Figs. 1 and 2,

- Fig. 4 is a schematic and partial longitudinal sectional view of the application member of Figs. 1 to 3,
- Figs. 4A-4C illustrate a few tooth configuration possibilities relatively to the core,
- Fig. 5 illustrates the use of the member of the applicator of Figs. 1 and 4,
- Figs. 6-8 and 12-21, illustrate alternative teeth according to the invention,
- Figs. 9-11 are schematic and partial transverse sectional views of alternative teeth according to the invention.
- Figs. 22 and 23 are views similar to Figs. 2 and 3 of an alternative embodiment,
- Figs. 24-28 are schematic and partial sectional views of alternative embodiments,
- Figs. 29, 31, 33, 35-37 schematically and partially illustrate arrangement of teeth,
- Figs. 30, 32, 34 are perspective partial views of alternative embodiments,
- Figs. 38-48 are transverse sectional views of teeth,
- Fig. 49 is a perspective view of an exemplary embodiment,
- Fig. 50 is a view similar to Fig. 2 of another alternative,
- Figs. 51-55 schematically illustrate envelope surfaces of other alternative embodiments,
- Figs. 56 and 57 are partial longitudinal sectional views of alternative embodiments,
- Figs. 58-60 illustrate alternative embodiments of the teeth,
- Fig. 61 is a schematic and partial transverse sectional view of an alternative embodiment of the wiping member, and
- Figs. 62 and 63 represent details of alternative embodiments of the rod.
- Figs. 64-66 are schematic and partial transverse sectional views of alternative teeth according to the invention,
- Fig. 67 schematically and partly illustrates an arrangement of teeth in a transverse sectional view, and
- Figs. 68 and 69 are partial longitudinal views of alternative embodiments.

A conditioning and application device 1 made according to the invention, including an applicator 2 and an associated container 3 containing a product P to be applied on the eyelashes and/or eyebrows, for example mascara or a care product, is illustrated in Fig. 1.

The container 3 may include as in the illustrated embodiment, a threaded neck 4 and the applicator 2 includes a closure cap 5 laid out to as to be attached onto the neck 4 in order to sealably close the container 3 in the absence of use, the closure cap 5 also forming a gripping element for the applicator 2.

The applicator 2 includes a rod 7 with a longitudinal axis Y, which is connected to the closure cap 5 at its upper end and to an application member 8 at its lower end. The latter includes a core 10 bearing teeth 18.

The container 3 also includes a wiping member 6, for example inserted into the neck 4.

This wiping member 6 which may be any wiping member, in the illustrated embodiment includes a lip 9 laid out for wiping the rod 7 and the application member 8 when the applicator 2 is removed from the container 3. The lip 9 defines a wiping orifice with a diameter adapted to that of the rod.

In the illustrated example, the rod 7 has a circular cross-section but there is no departure from the scope of the present invention when the rod 7 has another section, the attachment of the cap 5 on the container 3 may then be achieved in a way other than by screwing if necessary. The wiping member 6 may be adapted to the shape of the rod 7 and to that of the application member 8, if necessary.

In the example shown, the longitudinal axis Y of the rod 7 is rectilinear and coincides with the longitudinal axis of the container 3 when the applicator 2 is in place on the latter, but there is no departure from the scope of the present invention when the rod 7 is not rectilinear, for example forming a bend.

The rod 7 may include if necessary a ring-shaped shrinkage on its portion which will be positioned facing the lip 9 of the wiping member 6, so as not to mechanically stress the latter excessively during storage.

The application member 8 includes an endpiece 14 allowing it to be attached in the rod 7. In the exemplary embodiment illustrated in Fig. 1, this end-piece 14 is axisymmetrical, with a circular cross-section.

There is no departure from the scope of the present invention if this endpiece includes shrinkages with which flexibility of the applicator and suppleness upon application may be improved.

The attachment of the application member 8 may notably be achieved by force-fitting, by snap-on engagement, adhesive bonding, welding or crimping, in a corresponding housing, provided at the end of the rod 7. Alternatively, the rod may be inserted in a housing provided in the core.

The core 10 may further be made in a single piece by material molding with the rod 7.

Referring to Fig. 2, it is seen that the core may be of an elongated shape extending along a longitudinal axis X, of larger transverse dimension, measured perpendicularly to its longitudinal axis, comprised between 1.5 and 3.5 mm for example.

In the example shown, the core 10 has over the majority of its length, a polygonal cross-section, the sides of which define substantially planar longitudinal faces 15. The longitudinal axis X is for example central, as illustrated.

In the example shown, a single row 17 of teeth 18 is connected on each of the longitudinal faces 15.

In the example shown, the teeth 18 are made in a single piece by thermoplastic material molding with the core 10.

For molding the application member 8, a thermoplastic material either relatively rigid or not, for example SEBS, silicone, latex, butyl, EPDM, nitrile, thermoplastic elastomer, polyester, polyamide, polyethylene or vinyl elastomer, polyolefin such as PE or PP, PVC, EVA, PS, PET, POM, PA or PMMA, or further PU, or SIS may be used. Materials known under the brands of Hytrel®, Cariflex®, Alixine®, Santoprène®, Pebax® may notably be used, this list not being a limitation.

The teeth and the core may be made in different materials.

At least one tooth 18, cf. the illustration of the whole of the teeth 18, includes a shrinked stem 18a, as more specifically illustrated in Fig. 4. The stem defines a smallest transverse dimension d_0. In the described embodiment, the smallest transverse dimension d_0 of the stem 18 remains constant over a height p of the stem. The stem is joined to the cross-section of the tooth which defines a larger transverse dimension d_1

above the stem 18a of the tooth. Further, the transverse dimension d of the tooth decreases upon moving towards its free end from d_1.

The stem 18a of the tooth 18 forms a hinge allowing flexure of the latter, for example upon applying the product on an eyelash C, as illustrated in Fig. 5, and/or upon passing over the wiping member 6 when removing the applicator 2 from the container 3, possibly depending on the orientation of the stem relatively to the longitudinal axis of the core.

Generally, as illustrated in Figs. 4A-4C, independently of how the teeth 18 are made, and also independently of the shape of the core 10, and of how the teeth 18 are positioned on the core 10, it is possible to have a shrinked stem 18a positioned transversely to the longitudinal axis X of the core, as illustrated in Fig. 4A, so as to allow flexure of the tooth 18 towards the proximal or distal ends of the core.

In the example of Fig. 4A, the possibility of having the shrinked stem 18a centered relatively to the portion of the tooth located above the shrinked stem is illustrated.

The thickness d_0 of the shrinked stem for example has the value of 0.2 mm and the length l_0 above the shrinked stem as measured parallel with the X axis for example has the value of 0.45 mm.

In Fig. 4B, the possibility of having the tooth 18 bend around a flexural axis which is parallel to the longitudinal axis X of the core, is illustrated, the shrinked stem 18a for example having an elongated cross-section parallel to the axis X. For example d_0 has the value 0.2 mm and the length l_0 of the shrinked stem as measured along the X axis for example has the value 0.6 mm.

In Fig. 4C, one also has a shrinked stem with an elongated cross-section parallel to the axis X, with for example a shrinked stem thickness d_0 of 0.2 mm and a length l_0 of the shrinked stem along the axis X of 0.55 mm.

In the configurations of Figs. 4B and 4C, the shrinked stem 18a on one side of the tooth, an outer face of the shrinked stem 18a are located in the continuity of the face of the portion of the tooth which extends above the shrinked stem towards its free end.

The application member 8 may at its distal end 12 include a head which is tapered forwards in order to facilitate entry of the applicator 2 into the container 3. The height of the teeth 18 may decrease upon approaching the head 12, along a distal transition portion 13a as illustrated in Fig. 2.

The height of the teeth 18 may also decrease along a proximal transition portion 13b towards the rod 7, so as to facilitate crossing of the wiping member 6 by the application member 8 upon removal of the applicator 2.

The head 12 may be axisymmetrical or include radial fins, as illustrated in Fig. 2.

In the embodiment shown, the core 10 is extended from its proximal side, with a cylindrical endpiece 14 which allows it to be attached onto the rod 7. The attachment may notably be achieved by force fitting, by snap-on engagement, sticking, welding or crimping, in a housing provided at the end of the rod. Alternatively, the rod may be inserted in a housing provided in the core.

The core 10 may further be made in a single piece by material molding with the rod 7.

The longitudinal faces 15 in the described embodiment are four in number, as this may be seen in Fig. 3, the cross-section of the core being substantially square. These faces 15 are planar in the illustrated example.

Each row 17 of teeth 18 includes a first set 20 of first teeth being connected while forming an angle α_{Z1} with the normal to the corresponding face 15 of the core 10 and a second set 30 of teeth being obliquely connected to this face 15 while forming an angle α_{Z2} with this normal.

The teeth 18 of the first set of teeth 20 are straight, extending along a direction Z_1 substantially perpendicular to the face 15, the angle α_{Z1} being relatively small, for example less than 10°, or even less than 5°.

In the example shown, the teeth 18 of the second set of teeth 30 are also straight, extending along a direction Z_2 forming an angle α with the direction Z_1. The angle α is for example comprised between 20 and 80°.

In Fig. 3 it may be seen that each row includes teeth having a face which connects perpendicularly to the corresponding longitudinal face 15.

In the described embodiment, the teeth 18 of each row 17 are positioned in a staggered pattern. Two consecutive teeth 18 of each row 17 are alternately shifted on either side of a geometrical separation surface S, this surface S being for example a bisecting plane of the angle α.

The teeth of the first set 20 are positioned on one side of this geometrical separation surface S while those of the second set 30 are positioned on the other side of the latter, when the core 10 is observed along its longitudinal axis.

Within each row 17, the bases of the teeth of the first set 20 and those of the second set 30 are not aligned, since they are entirely located on either side of the geometrical separation surface respectively.

The teeth of the first set 20 and of the second set 30 do not overlap, in the illustrated example, when the application member is observed from the side, in a direction perpendicular to the X axis, as illustrated in Fig. 3.

Moreover, the directions Z_1 and Z_2 of the teeth 18 of the first 20 and second 30 sets of teeth do not cut the longitudinal axis X of the core, the teeth being slightly excentered relatively to this axis.

It may be seen in Fig. 3 that in the illustrated embodiment, with each tooth 18 of the first set 20 of a row 17, may be associated a respective tooth of the first set 20 of another row 17, substantially occupying the same axial position along the axis X of the core, passing from one tooth to the other is performed by rotation around the axis X by a sub-multiple of 360°, in this case 90°. The same applies for each tooth 18 of the second set 30.

The oblique teeth 18 of the different rows are oriented in the same direction of rotation around the core, i.e. clockwise in Fig. 3.

The teeth for example have a length larger than 1.7 mm, at least for more than half of them. For example, they have a larger thickness comprised between 0.2 and 0.65 mm, which corresponds to the largest transverse dimension located above the smallest transverse dimension of the stem.

In the illustrated embodiment in Figs. 1-5, the tooth 18 and its stem 18a make with the core a recess which in the described example is non-central relatively to an elongation axis Z1, Z2 of the tooth. This thus promotes tilting of the tooth in a direction perpendicular to the longitudinal axis X of the core, as illustrated in Fig. 4 in dotted lines.

The tooth may tilt as far as an abutment position in which the largest dimension of the largest cross-section of the tooth abuts on the core. Such tilting of the teeth may promote combing of the eyelashes as illustrated in Fig. 5.

In an alternative embodiment, the stem may be central, as illustrated in Fig. 6 or even slightly excentered as illustrated in Fig. 7, or further completely shifted relatively to the remainder of the tooth, as illustrated in Fig. 8;

Depending on the positioning of the stem relatively to the remainder of the tooth, the tooth has the possibility of tilting in one or more directions, relatively to the longitudinal axis X of the core, thereby promoting combing of the eyelashes for example, as illustrated in Fig. 5, or further promoting deformation of the teeth during wiping, the teeth bending over the core upon passing of the wiping lip 9.

As an illustration, a stem centered relatively to the remainder of the tooth is illustrated in a transverse sectional view at the stem of the tooth, allowing deformation of the latter in all the directions, in Fig. 9. In the exemplary embodiment illustrated in Fig. 10, the stem is centered and only allows deformation of the tooth in directions parallel to the longitudinal axis X of the core on both sides, while in the exemplary embodiment illustrated in Fig. 11, the stem is excentered and only allows deformation of the tooth in a direction perpendicular to the longitudinal axis X of the core and on only one side. Further, in these figures, the axis X may be oriented otherwise, and the deformation may occur perpendicularly and parallel to this axis X, respectively.

The tooth and its stem may further assume various shapes as illustrated in Figs. 12-21.

In the embodiment illustrated in Fig. 12, the tooth is with constant cross-section over a large portion of its length.

In the exemplary embodiment illustrated in Fig. 13, the tooth has the shape of an artillery shell.

In the embodiment illustrated in Fig. 14, the stem of the tooth has several shrinkages in succession, between which the tooth includes larger portions.

In the embodiment illustrated in Figs. 15 and 16, the tooth has the shape of a fir tree with a trunk or without a trunk.

In the embodiment illustrated in Fig. 17, this fir tree shape also includes a succession of shrinked and widened portions.

Finally, the stem of the tooth may be connected to the core through a base having a cross-section of large dimension, as illustrated in Fig. 18-21. One of these

cross-sections may have a larger dimension greater than the largest dimension of the tooth located above the smallest transverse dimension of the stem.

In the examplary embodiment of Fig. 18, the stem assumes the shape of a diabolo positioned vertically.

In the exemplary embodiment of Fig. 19, the stem includes a parallelepipedal base with a horizontal top.

In the embodiment illustrated in Fig. 20, the top of the base is tilted and in the embodiment illustrated in Fig. 21 the base has a hemi-spherical shape.

Each of the longitudinal faces 15 of the core 10 may include a row of teeth 17 as described earlier, but there is no departure from the scope of the present invention if at least one face 15 is without any row of teeth 17, or even is entirely without any teeth 18.

The rows 17 may include different numbers of teeth, one of the rows for example being shorter than another row.

In the embodiment of Figs. 22 and 23, the core has a hexagonal cross-section and includes six rows of teeth extending from the six faces 15 of the core 10.

The core may include any number of longitudinal faces, all the characteristics described above being valid independently of the number of longitudinal faces.

Still alternatively, the core 10 may have a circular cross-section, as illustrated in Fig. 24, or oval cross-section as illustrated in Fig. 25, or further triangular, orthogonal or pentagonal cross-sections as illustrated in Figs. 26, 27 and 28, respectively.

An application member 8 according to the invention may include more than two apparent teeth per longitudinal face when the core is observed along its longitudinal axis and may include, in addition to the first and second teeth 18 of the sets 20 and 30, one or more additional teeth 18 forming for example an angle larger than α with the direction Z_1, or further extending perpendicularly to the face of the corresponding core.

There is no departure from the scope of the present invention if the teeth of the second set 30 of teeth are not tilted relatively to longitudinal face 15 of the core to which they are connected and the directions Z_1 and Z_2 are parallel for each row 17.

In the examples which have just been described, the teeth of the first 20 and second 30 sets of teeth 18 are positioned in a staggered pattern, their bases not being aligned.

They may be otherwise and the bases of the teeth 18 may be aligned, as illustrated in Fig. 29, with a same line parallel to the longitudinal axis X of the core 10 intersecting all the bases of the aligned teeth of the row, this line forming the longitudinal axis of the row.

Two consecutive teeth of a row may define, when the applicator is observed perpendicularly to its longitudinal axis, a V-shaped groove, as illustrated in perspective in Fig. 30.

Two consecutive teeth of a row may further form a V when the application member is observed along its longitudinal axis, as illustrated in Fig. 31;

It is seen in Figs. 32 and 33 that the applicator may within a row include patterns of four teeth, two of the middle forming a V. The four teeth are in succession upon moving along the longitudinal axis of the row.

In the embodiment illustrated in Figs. 34 and 35, the row 17 includes patterns of three consecutive teeth including two teeth forming a V with one tooth between them. These teeth however form a single row, because they follow each other upon moving along the longitudinal axis of the core.

On the other hand, two rows 17 of teeth of an application member 8 according to the invention may include teeth which are spaced apart with a same spacing, as illustrated in Fig. 36, or on the contrary, with variable spacing, as illustrated in Fig. 37.

Within each row, the teeth may be gathered together in groups of teeth, for example in pairs. Of course, the teeth may be grouped other than in pairs, the spacing between the groups of teeth within a same row being either regular or not, and notably larger than the average spacing between the teeth within a group.

Moreover, in the example of Fig. 1, each tooth 18 includes a first longitudinal face 40 with a planar shape and a second longitudinal face 41 with a rounded notably convex shape.

Alternatively, and regardless of the implantation of the teeth, at least one tooth may have a circular cross-section as illustrated in Fig. 38, or oval cross-section as illustrated in Fig. 39, or semi-circular cross-section as illustrated in Fig. 40, or further triangular cross-section as illustrated in Fig. 41, or hexagonal cross-section as illustrated in Fig. 42 or a cross-section as a rhombus as illustrated in Fig. 43, as a trapezium as illustrated in Fig. 44, formed with two triangles side-by-side of different dimensions, as

illustrated in Fig. 45, in the shape of a diabolo, as illustrated in Fig. 46 or of a half-diabolo, as illustrated in Fig. 47, or triangular with a groove, as illustrated in Fig. 48. The teeth are preferably of a cross-section other than a circular cross-section. The non-circular shape of the cross-section of the teeth may promote retention of product on the teeth.

The longitudinal faces 15 of the core 10 may be non-planar, being for example concave or convex over at least one portion of their length. The core 10 may include at least partly concave longitudinal faces 15, the concavity being for example centered on a middle plane of the core 10 cutting the latter substantially at half of its length.

The concavity of the longitudinal faces 15 may be formed by shrinkage of the cross-section of the core 10, as illustrated in Fig. 22.

In an alternative embodiment, the longitudinal faces 15 of the core 10 are twisted as illustrated in Fig. 49, i.e. the corresponding side performs at least one rotation in the direction of the distal end of the core.

In order to produce such a shape, the core 10 may be deformed at the moment of its removal from the mold by rotation of the endpiece 14 or alternatively be deformed in the mold.

The longitudinal axis X of the core 10 may coincide with the longitudinal axis Y of the rod 7, but there is no departure from the scope of the present invention if this is otherwise, and as an example, an alternative embodiment is illustrated in Fig. 50 wherein the longitudinal axis X of the core 10 forms an angle γ_1 with the longitudinal axis Y of the rod. Such a configuration may for example improve the application by facilitating handling of the applicator.

The core may extend along a non-rectilinear longitudinal axis X. In Fig. 52, an alternative embodiment is illustrated in which the core extends along a curved longitudinal axis X. When observed as a longitudinal sectional view, as in Fig. 51, the envelope surface E may have on one side of the axis X, a first convex contour 54 substantially in the same direction as the X axis, but on the opposite side of the X axis, a second contour 55 may have a concave curvature in the same direction as the X axis.

In another alternative, illustrated in Fig. 52, the envelope surface E has a cross-section which passes through a minimum. The axis X coincides with the axis Y.

In the alternative illustrated in Fig. 53, the longitudinal axis X of the core 10 is rectilinear and the envelope surface E has an ovoid shape.

In another embodiment, illustrated in Fig. 54, the free end of the teeth 18 defines an envelope surface E which generally extends along a longitudinal axis W forming an γ_2 with the longitudinal axis X of the core 10, the application member being described as excentered.

The alternative of Fig. 55 differs from that of Fig. 54 by the shape of the envelope surface E, which has a cross-section which passes through a minimum.

In the alternative embodiment illustrated in Fig. 56, the application member includes teeth having a shrinked stem according to the invention at a distal end of the core, the other teeth being without any shrinked stems according to the invention. Such an applicator may notably be particularly indicated for applying product in the corner of the eyes and on small eyelashes.

In the alternative embodiment illustrated in Fig. 57, the core includes a recess into which is engaged a supporting portion 60, for example in metal or in plastic. The core may be configured so as to be attached to the support 60 or be rotationally or translationally free relatively to this support 60. The core may further for example be overmolded on the support 60.

The teeth of at least one of the rows may have different heights, passing for example through an extremum between the furthest teeth of the row.

At least one of the teeth 18 of the rows 17 may have a non-smooth surface condition, for example striations from molding or bumps, for example related to the presence of a filler in the plastic material.

The application member may be made with a plastic material including magnetic particles. The magnetic field generated by such particles which may be magnetizable and/or magnetized, may for example exert an effect on the eyelashes and/or interact with the magnetic fibers or pigments which would be present in the product.

The application member may be made with flocking, the latter extending for example only over the teeth or only over the core.

The teeth may have at their free end, a relief or a particular shape, for example a fork, a ball or a hook, as illustrated in Figs. 58-60. The hook may for example extend transversely, in parallel or obliquely, relatively to the longitudinal axis X of the core. In order to obtain balls, it is for example possible to heat the application member so as to melt

the end of the teeth. In order to obtain forks or hooks, it is possible to grind the application member for example.

The wiping member may be produced otherwise, for example it may include a block of foam, which may be slit. For example, the wiping member may further be such as described in patent applications US 2005/0028834, US 6,328,495, US 6,375,374, US 2004/0258453 and US 2005/0175394, the contents of which is incorporated by reference.

The wiping lip 9 may advantageously be undulating, with a radially inner free edge defining a passage orifice 122 for the application member, as illustrated in Fig. 61. The wiping lip 9 may include undulations 120 extending around the orifice 122. The wiping member 9 may include a certain number of undulations 120 comprised between 3 and 12, for example.

The wiping lip 9 may generally extend along a converging cone towards the bottom of the container, with a generatrix G forming an angle i with the axis K of the container. Alternatively, the wiping lip 9 may generally extend along a middle plane perpendicular to the axis K or further generally along a converging cone towards the outlet of the container.

The wiping member may further be adjustable, if necessary.

The rod 7 to which is attached the core may be at least partly, notably entirely, flexible, notably in proximity to the application member. The rod may for example include at least one flexible element 80, as illustrated in Fig. 62, for example in elastomer and/or with a shape imparting flexibility, for example at least one notch 81 as illustrated in Fig. 63. The flexible element may for example be flocked and also used for applying the product.

In order to use the device 1, the user may unscrew the closure cap 5 and extract the application member 8 from the container 3.

After the wiping member 6 is crossed by the application member 8, a certain amount of product remains between the rows 17 and between the teeth 18 of these rows, for example on the stems 18a of the teeth 18, and may be applied on the eyelashes or eyebrows by the user.

With the relatively large number of teeth as well as their positioning in the application member, it is possible to be overly careful with make-up.

A rotation of the application member around the axis X may optionally accompany the gesture for making-up eyelashes or eyebrows. In the presence of teeth obliquely oriented on the application member, the latter may be oriented towards the eyelashes upon making up.

Still alternatively, vibrations may be applied to the application member during the application, the combing or the picking-up of the product, for example as described in the application WO 2006/090343.

The shape of the teeth may have an influence on the transmission of the oscillations.

In alternative embodiments, the major axis D of the stem may be rectilinear, as illustrated in Fig. 64, or further curved as illustrated in Fig. 65. The stem may be continuous, as illustrated in Fig. 64, or even be broken as illustrated in Fig. 66. The axis X may further be oriented in another way.

The major axis D of the stem of the teeth of a row may not be parallel with the longitudinal axis R of said row, as illustrated in Fig. 67. The major axis R of the stem of the teeth may further be oriented in another way.

In exemplary embodiments, all the teeth may be positioned as a fan, as illustrated in Fig. 68, or further the teeth of each row may be positioned as a half-fan, as illustrated in Fig. 69. The teeth positioned as a half-fan may all be bent in the same direction, towards the distal end or alternatively the proximal end of the core. Further, all the rows may not be positioned as a fan, as a half-fan, respectively. For example, only one, two, three or four rows may be positioned as a fan or as a half-fan.

Of course, the invention is not limited to the exemplary embodiments which have just been described, the characteristics of which may be combined within alternatives not shown.

The teeth may all be connected to the core along a direction contained in a plane perpendicular to the X axis. They may be otherwise and some teeth may be tilted in the direction of the distal or proximal end.

In the invention, the envelope surface has a variable cross-section and passes through at least a maximum. This maximum cross-section of the envelope surface of the application member may, in a particular embodiment of the invention, occupy at least 70% of an inner section of the container, at least along a portion of the path covered by the

application member upon its extraction from the container, the height of this portion being at least twice the length of the application member, for example ranging between 2 and 10 times the length of the application member.

The maximum cross-section of the envelope surface of the application member may occupy between 70% and 120% of the inner section of the container over this height, in order to generate a piston effect.

In this case, the container may define an inner space containing the product, the height of which may be at least twice the length of the application element.

The device may include at least two containers containing either identical or different products, each comprising a removal closure cap and an application member. Both application members may be different from each other, one for example may include a brush with a twisted core. Both containers may be joined via a coupling member, for example in the extension of each other, and which may be elastically deformable.

The expression « including one or comprising one», should be understood as being a synonym of the expression « including at least one or comprising at least one », unless the opposite is specified and « comprised between » is understood including limits, except if the opposite is specified.

CLAIMS

1. An applicator (2) for combing and/or applying a product on eyelashes and/or eyebrows, comprising a molded application member comprising:

- a core (10) having a longitudinal axis (X),
- teeth (18) extending from the core outwards towards a free end of the tooth, along an elongation direction of the tooth,

at least one tooth (18) comprising a shrinked stem (18a) located in the first half of the length of the tooth from the core, the stem having a smaller transverse dimension (d_0) less than a larger transverse dimension (d_1) of the tooth, this larger transverse dimension (d_1) being further away from the core (10) than said smaller transverse dimension, and

the transverse dimension (d) of the tooth not increasing from said larger transverse dimension (d_1) towards its free end, over at least one quarter (l) of the tooth.

2. The applicator according to the preceding claim, wherein the transverse dimension (d) of the tooth does not increase towards its free end from the larger transverse dimension (d_1).

3. The applicator according to any of the two preceding claims, wherein a larger transverse dimension of the stem of the tooth located between the core and the smallest transverse dimension (d_0) of the stem of the tooth is less than or equal to said larger transverse dimension (d_1) of the tooth further away from the core than said smallest transverse dimension (d_0).

4. The applicator according to any of the preceding claims, wherein the stem of at least one tooth has a non-constant cross-section after rotation by 90° around the elongation direction of the tooth.

5. The applicator according to any of the preceding claims, wherein the stem (18a) of at least one tooth has at least a cross-section extending along a major axis (K) perpendicular to the longitudinal axis (X) of the core.

6. The applicator according to any of the preceding claims, wherein the stem (18a) of at least one tooth has at least one cross-section extending along a major axis parallel to the longitudinal axis of the core.

7. The applicator according to any of the preceding claims, wherein the stem (18a) of at least one tooth comprises several cross-sections of relative small dimension alternating with cross-sections of large relative dimension.

8. The applicator according to any of the preceding claims, wherein the stem (18a) of a tooth is centered relatively to the cross-section of the largest transverse dimension of the tooth.

9. The applicator according to any of claims 1 to 7, wherein the stem (18a) of a tooth is excentered relatively to the cross-section of the largest transverse dimension of the tooth.

10. The applicator according to any of the preceding claims, wherein the largest transverse dimension (d_1) of the tooth forms, when the tooth is tilted relatively to the core, an abutment preventing a stronger tilt of the tooth relatively to the core.

11. The applicator according to any of the preceding claims, wherein the stem (18a) of the tooth is configured in order to allow tilting of the tooth relatively to its elongation direction by at least 3°, or even 5°, better by at least 10°.

12. The applicator according to any of the preceding claims, wherein the smallest transverse dimension (d_0) of the stem (18a) of the tooth is less than 50% of said larger transverse dimension (d_1) of the tooth.

13. The applicator according to any of the preceding claims, wherein the smallest transverse dimension of the stem of the tooth is comprised between 0.1 and 0.5 mm, or even between 0.2 and 0.4 mm.

14. The applicator according to any of the preceding claims, wherein the largest transverse dimension of the tooth, located above the smallest transverse dimension of the stem of the tooth, is comprised between 0.3 and 2 mm, or even between 0.5 and 1.5 mm.

15. The applicator according to any of the preceding claims, wherein the height of the stem of the tooth, measured between the core and the largest transverse dimension located above the smallest transverse dimension of the stem of the tooth, is comprised between 0.05 and 1 mm, or even between 0.1 and 0.8 mm.

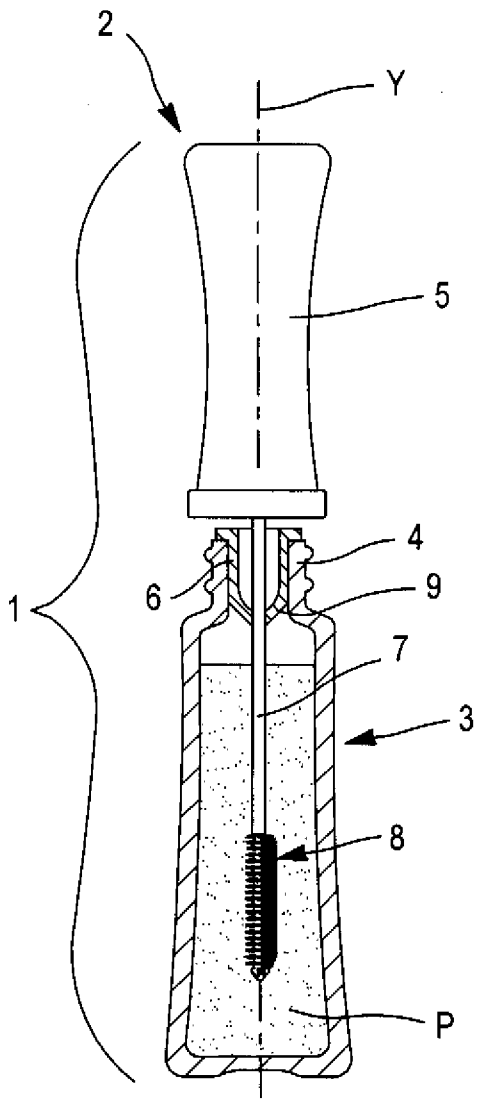

FIG. 1

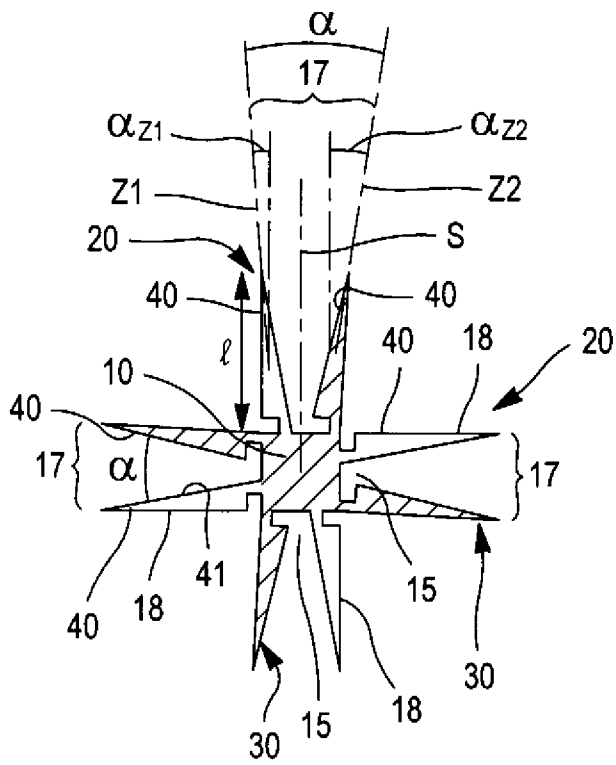

FIG. 3

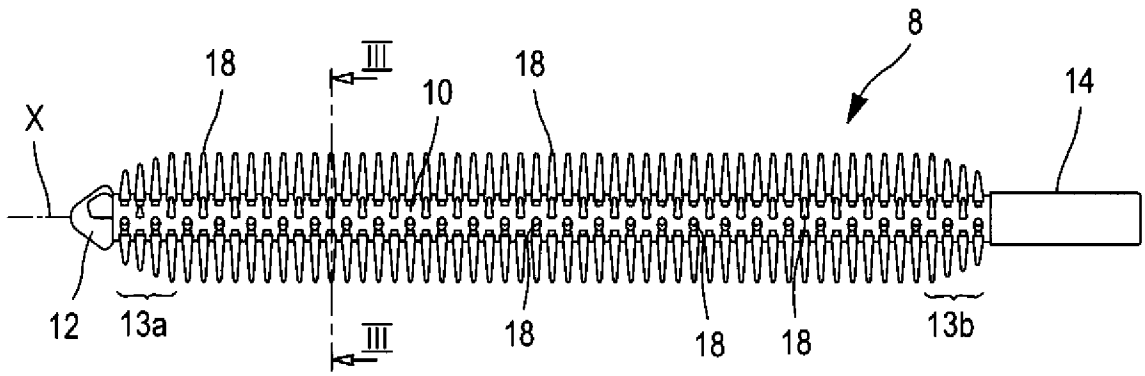

FIG. 2

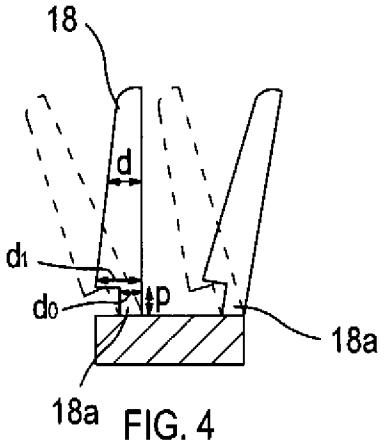

FIG. 4

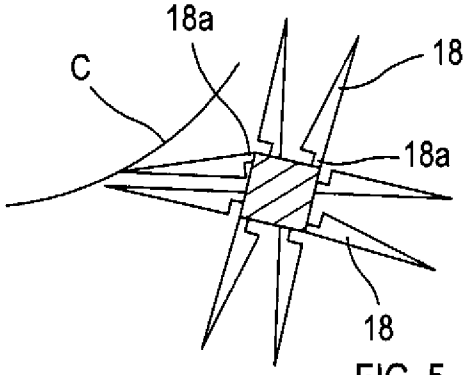

FIG. 5

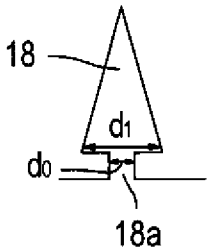

FIG. 6

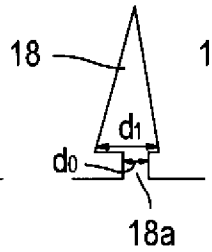

FIG. 7

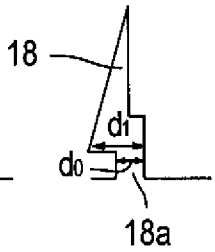

FIG. 8

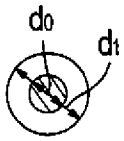

FIG. 9

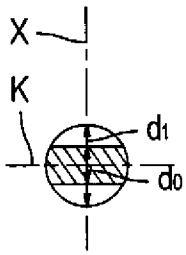

FIG. 10

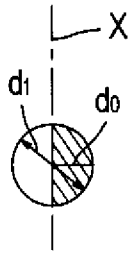

FIG. 11

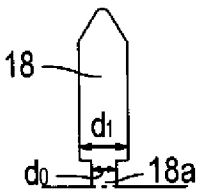

FIG. 12

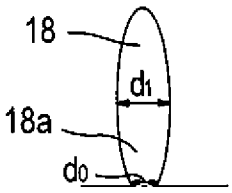

FIG. 13

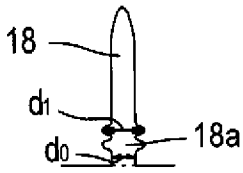

FIG. 14

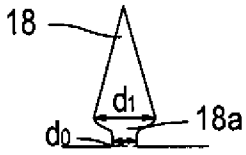

FIG. 15

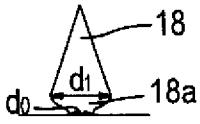

FIG. 16

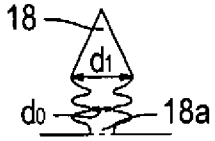

FIG. 17

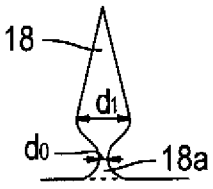

FIG. 18

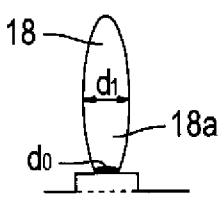

FIG. 19

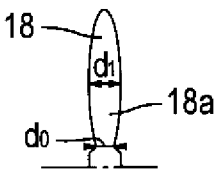

FIG. 20

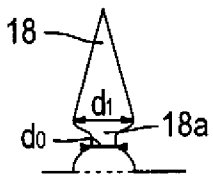

FIG. 21

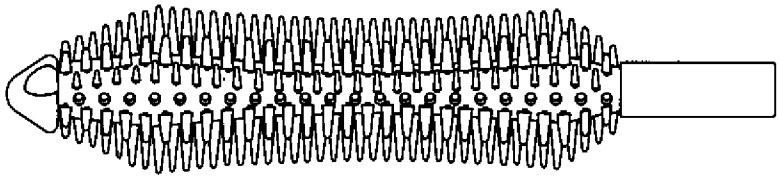

FIG. 22

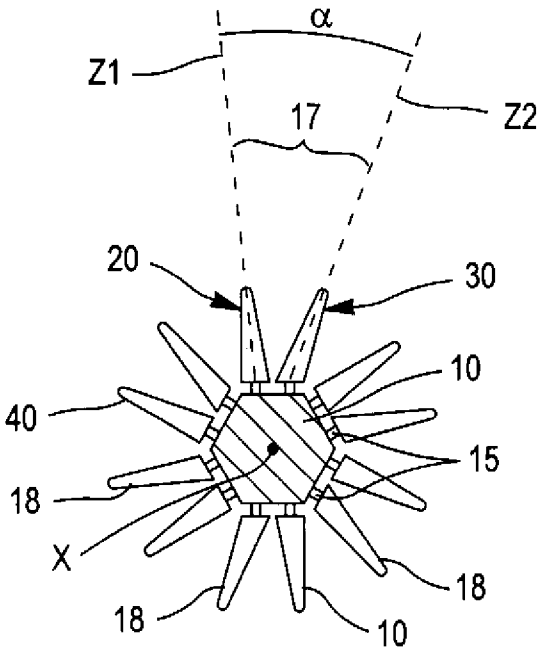

FIG. 23

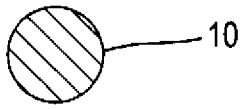

FIG. 24

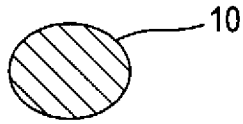

FIG. 25

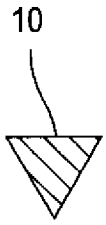

FIG. 26

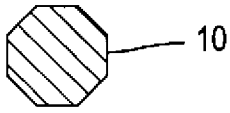

FIG. 27

FIG. 28

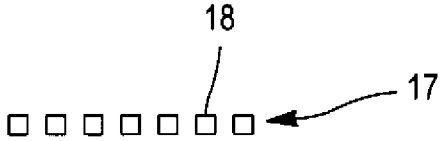

FIG. 29

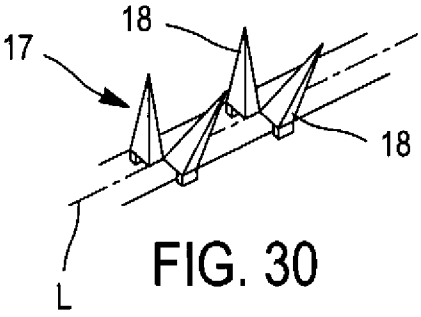

FIG. 30

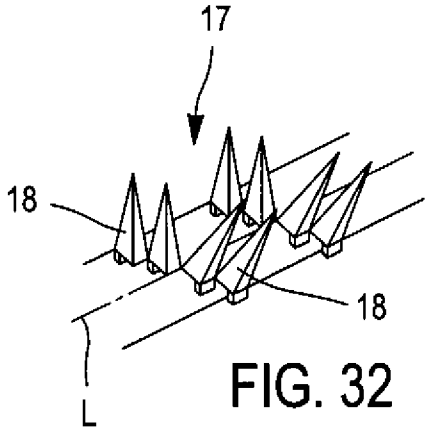

FIG. 32

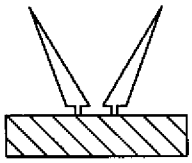

FIG. 31

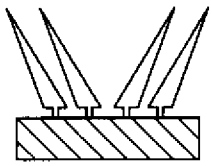

FIG. 33

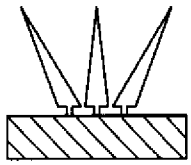

FIG. 35

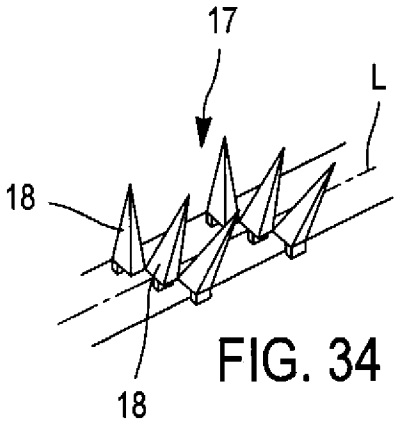

FIG. 34

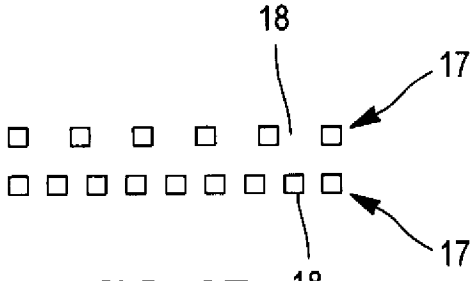

FIG. 37

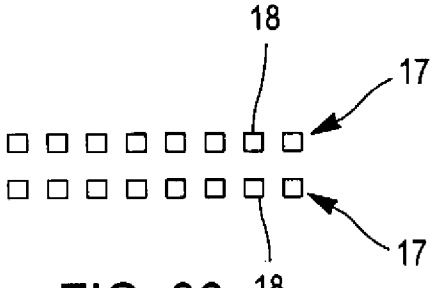

FIG. 36

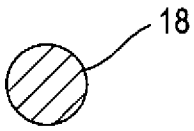

FIG. 38

FIG. 39

FIG. 40

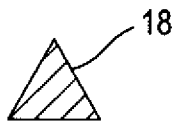

FIG. 41

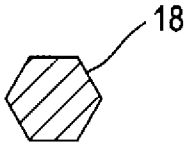

FIG. 42

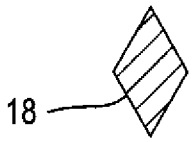

FIG. 43

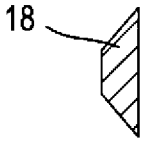

FIG. 44

FIG. 45

FIG. 46

FIG. 47

FIG. 48

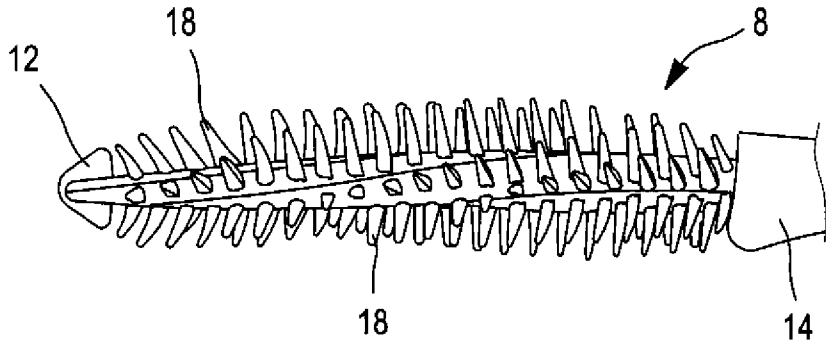

FIG. 49

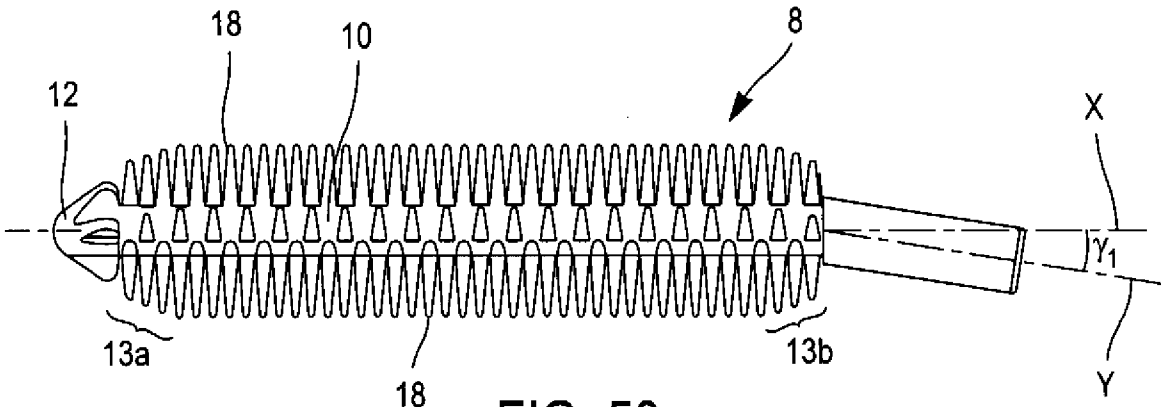

FIG. 50

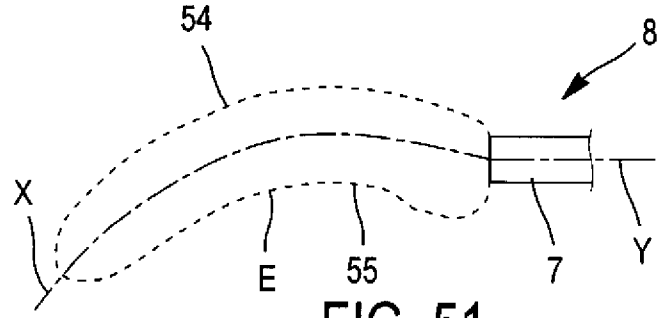

FIG. 51

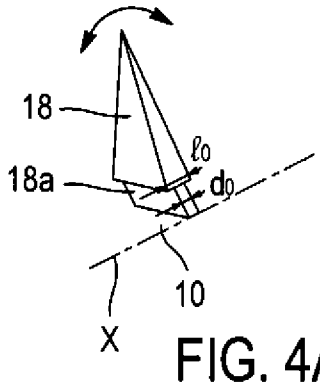

FIG. 4A

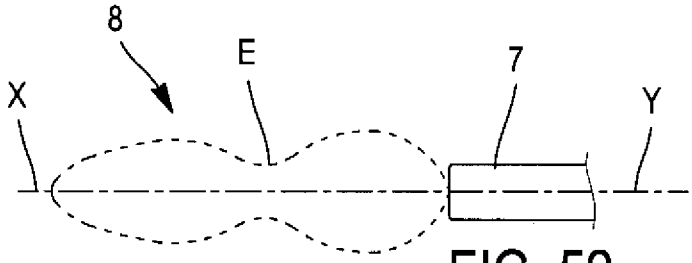

FIG. 52

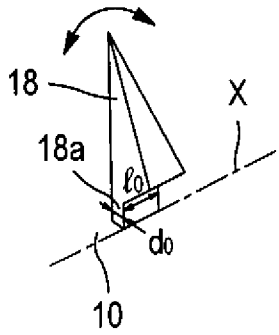

FIG. 4B

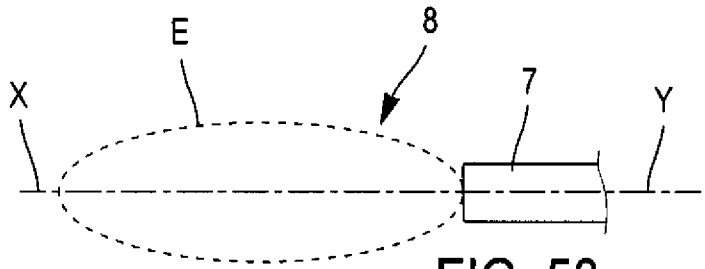

FIG. 53

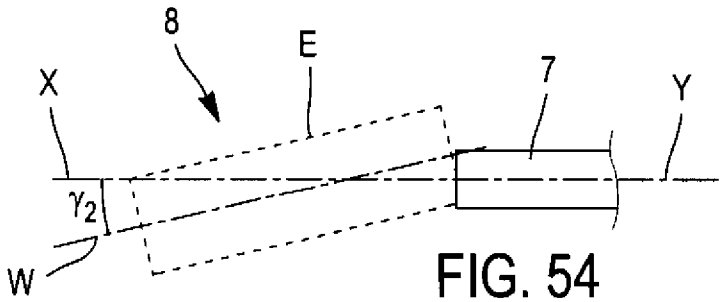

FIG. 54

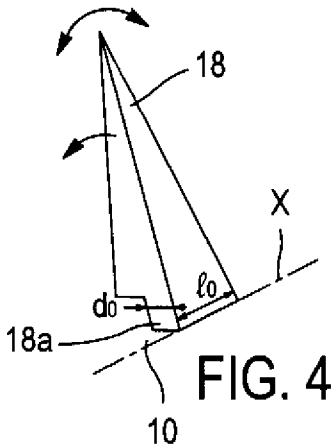

FIG. 4C

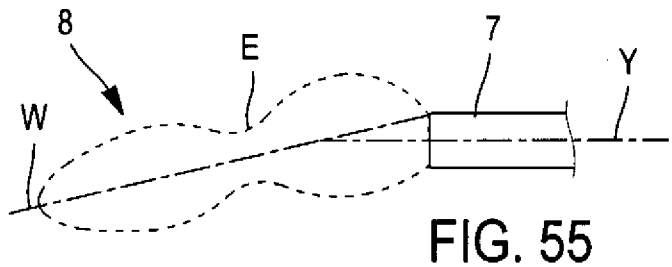

FIG. 55

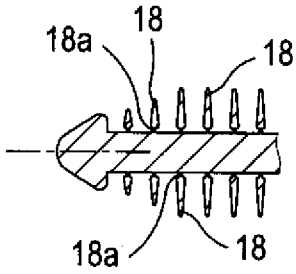

FIG. 56

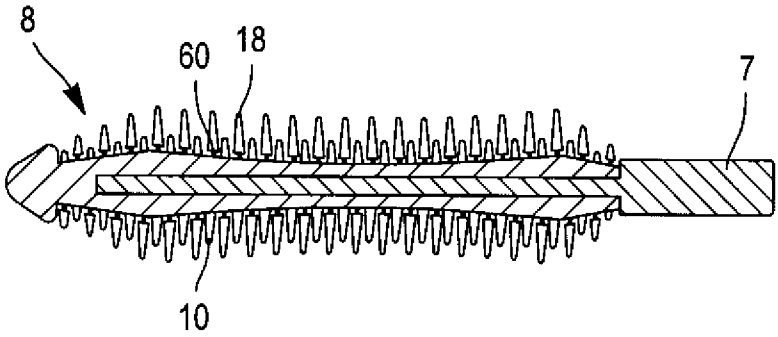

FIG. 57

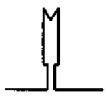

FIG. 58

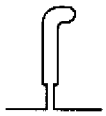

FIG. 59

FIG. 60

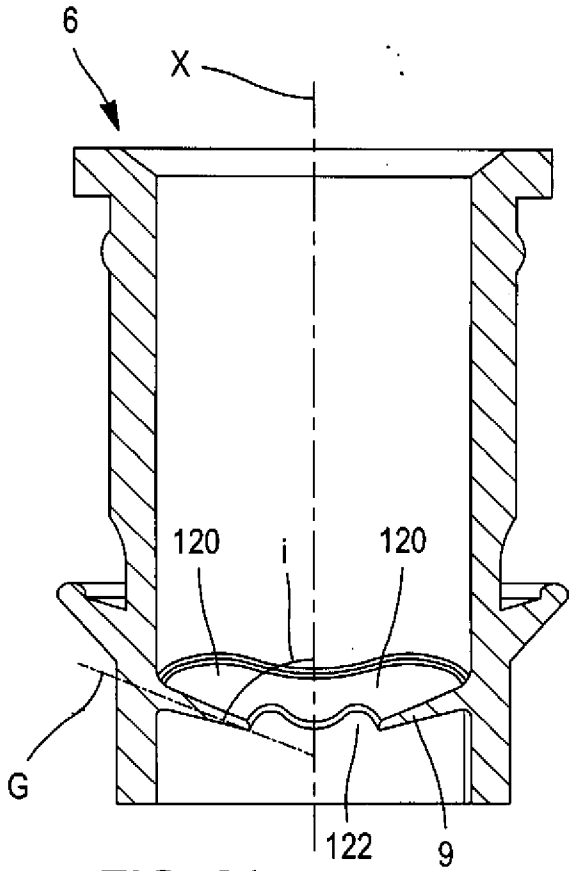

FIG. 61

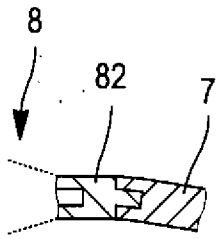

FIG. 62

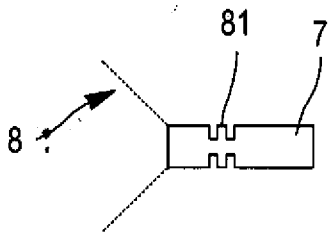

FIG. 63

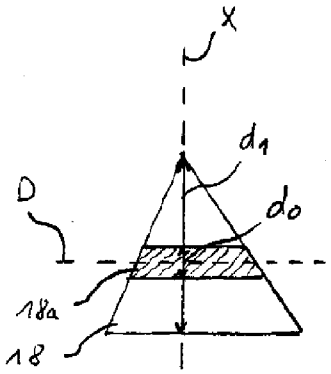

FIG. 64

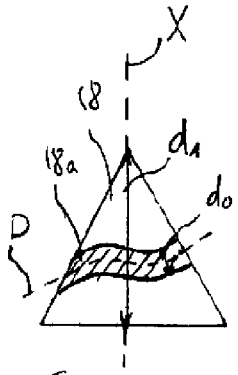

FIG 65

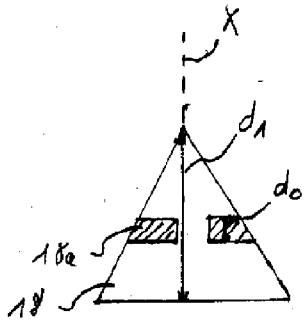

FIG. 66

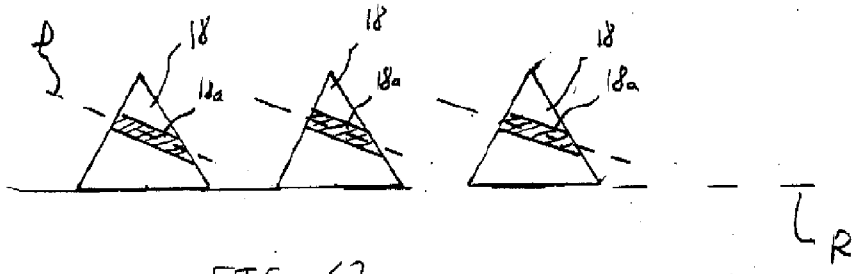

FIG. 67

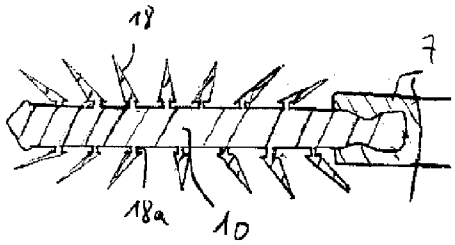

FIG. 68

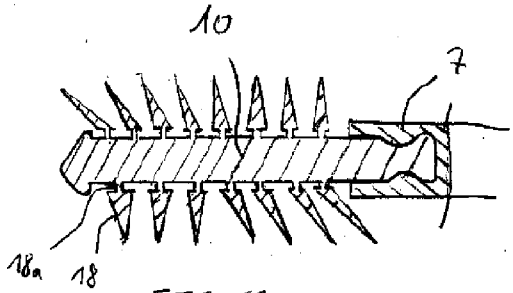

FIG. 69