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(57)

ABSTRACT(75) Inventor: **Fritz Alfons Rueb**, Schonau (DE)

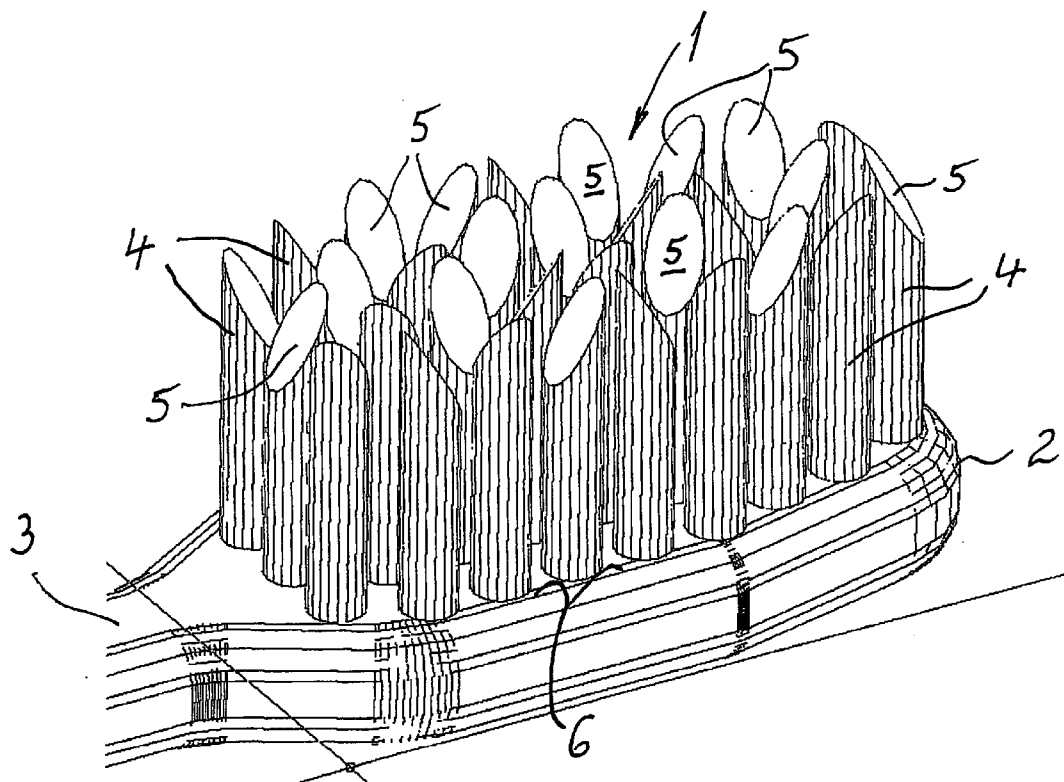
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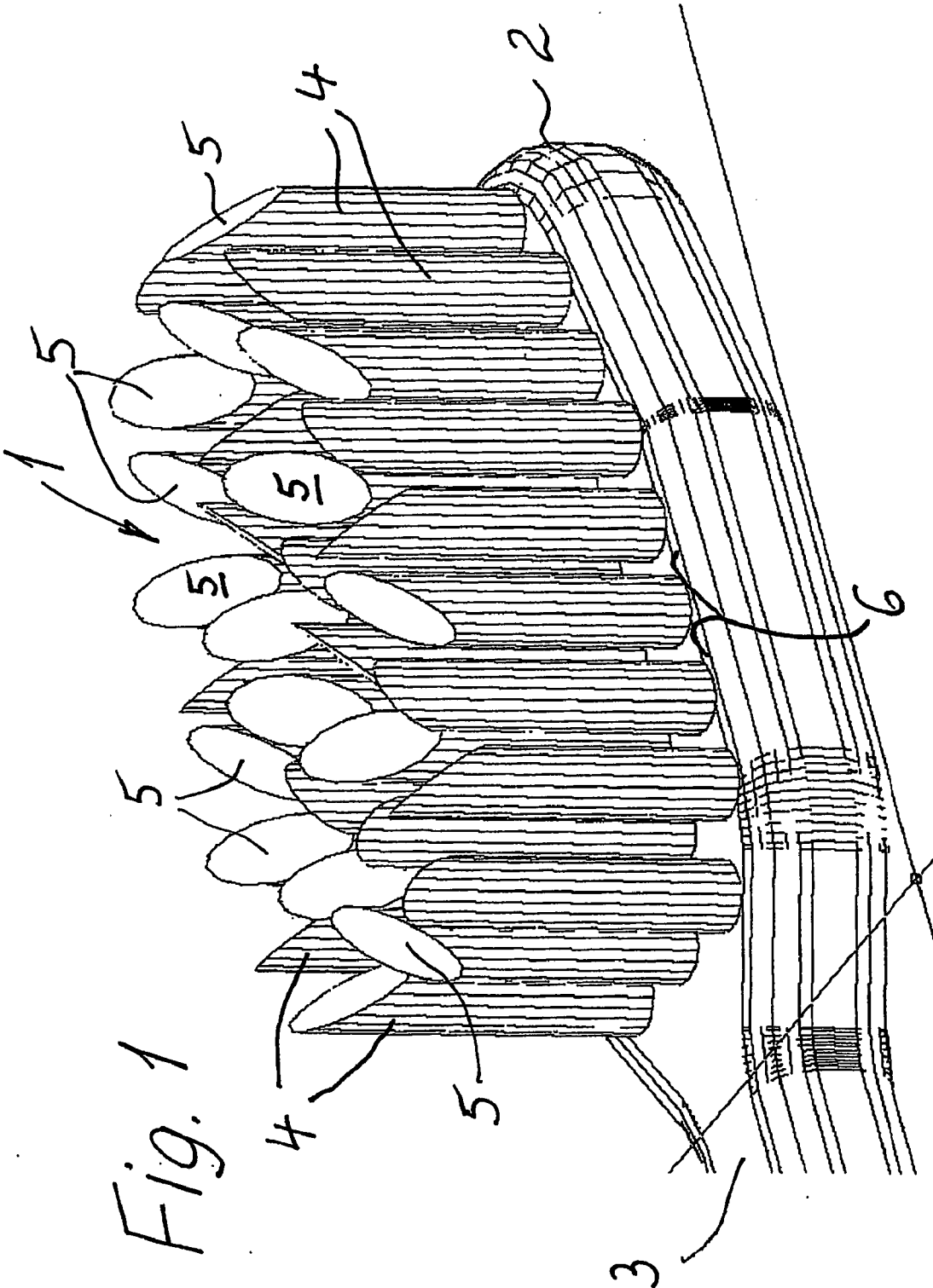
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A toothbrush in the form of a manual toothbrush having a rectangular bristle array (1) or in the form of an electric toothbrush having a round bristle array (1), formed from individual bristle bundles (2), arranged adjacent to each other on a brush head and standing erect at approximately right angles thereto is provided. At least some of the individual bristle bundles (4) are at least partly inclined or roof-shaped with respect to a plane approximately parallel to the brush head (2), such that bristles in the bristle bundles (4) stand to differing heights whereby the terminal surfaces arranged at the applied ends of the bristle bundles (4) are embodied as inclined surfaces (5) or as partly inclined surfaces. The bristle bundles (4) are arranged in a line adjacent to each other along imaginary straight or curved connecting lines, or for round brushes, along segmental or circular connection lines. At least individual, and preferably large groups or all of the bristle bundles (4) in the bristle array (1) are arranged with the inclined surfaces (5) thereof rotated to varying degrees relative to each other and to the connecting line(s), such that a number of differently oriented inclined surfaces are provided for cleaning teeth so that a particular inclined surface is in a favorable orientation to engage in an interdental space between teeth for thorough cleaning





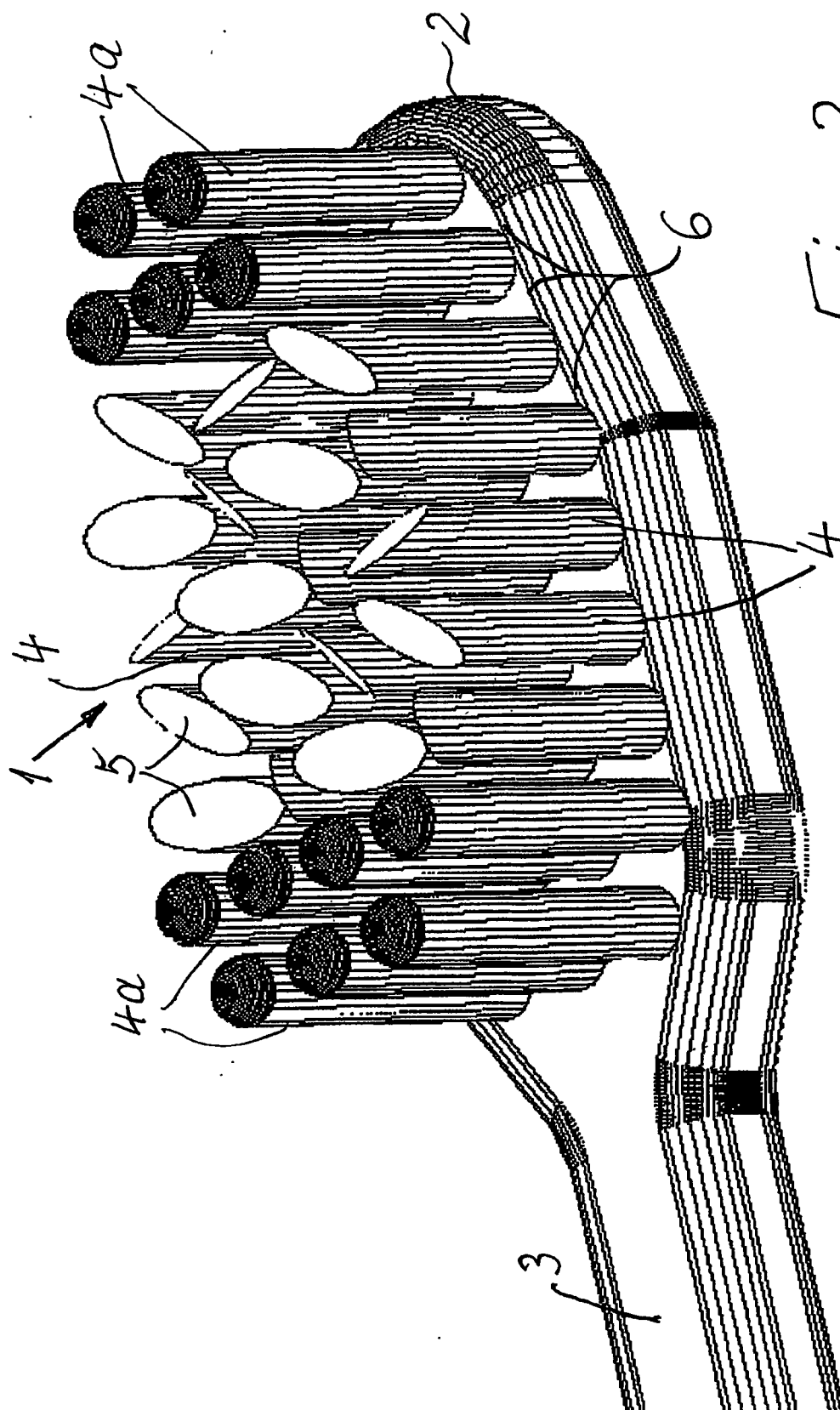


Fig. 2

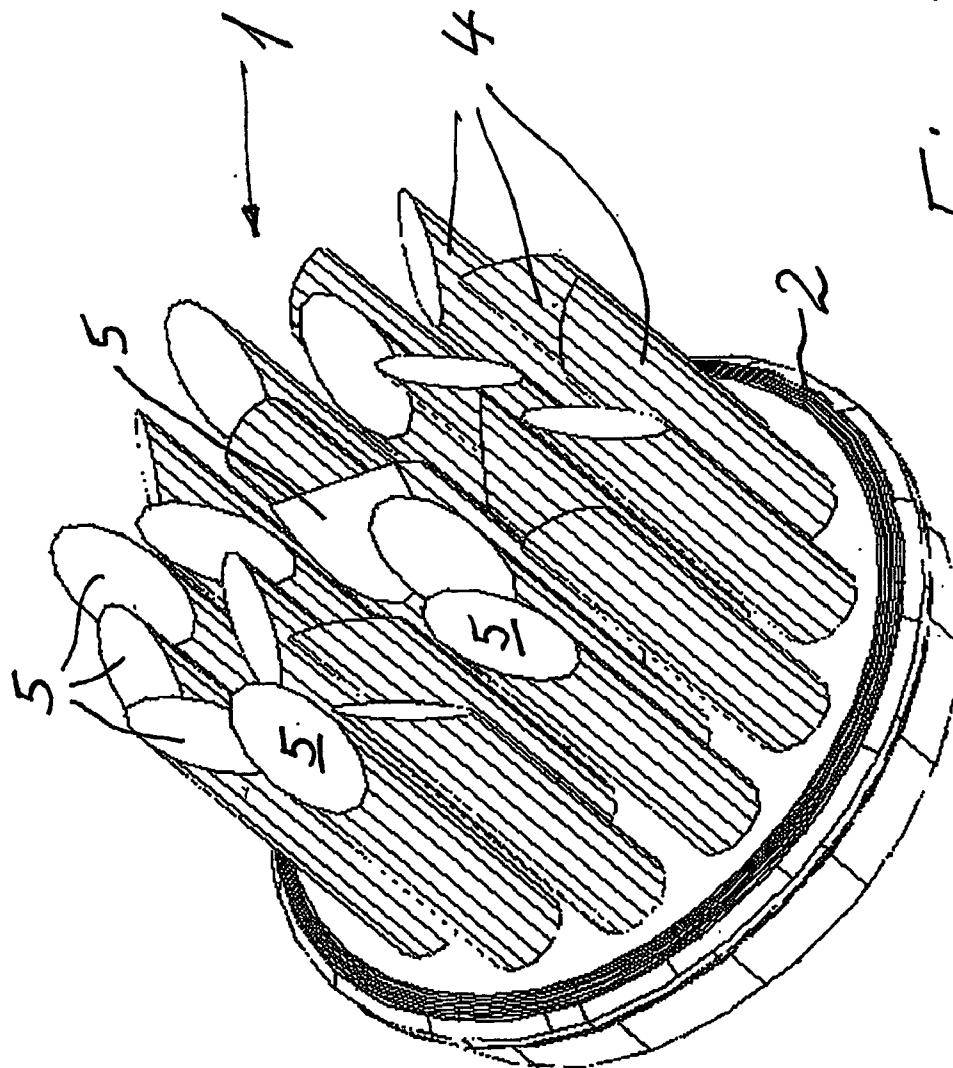
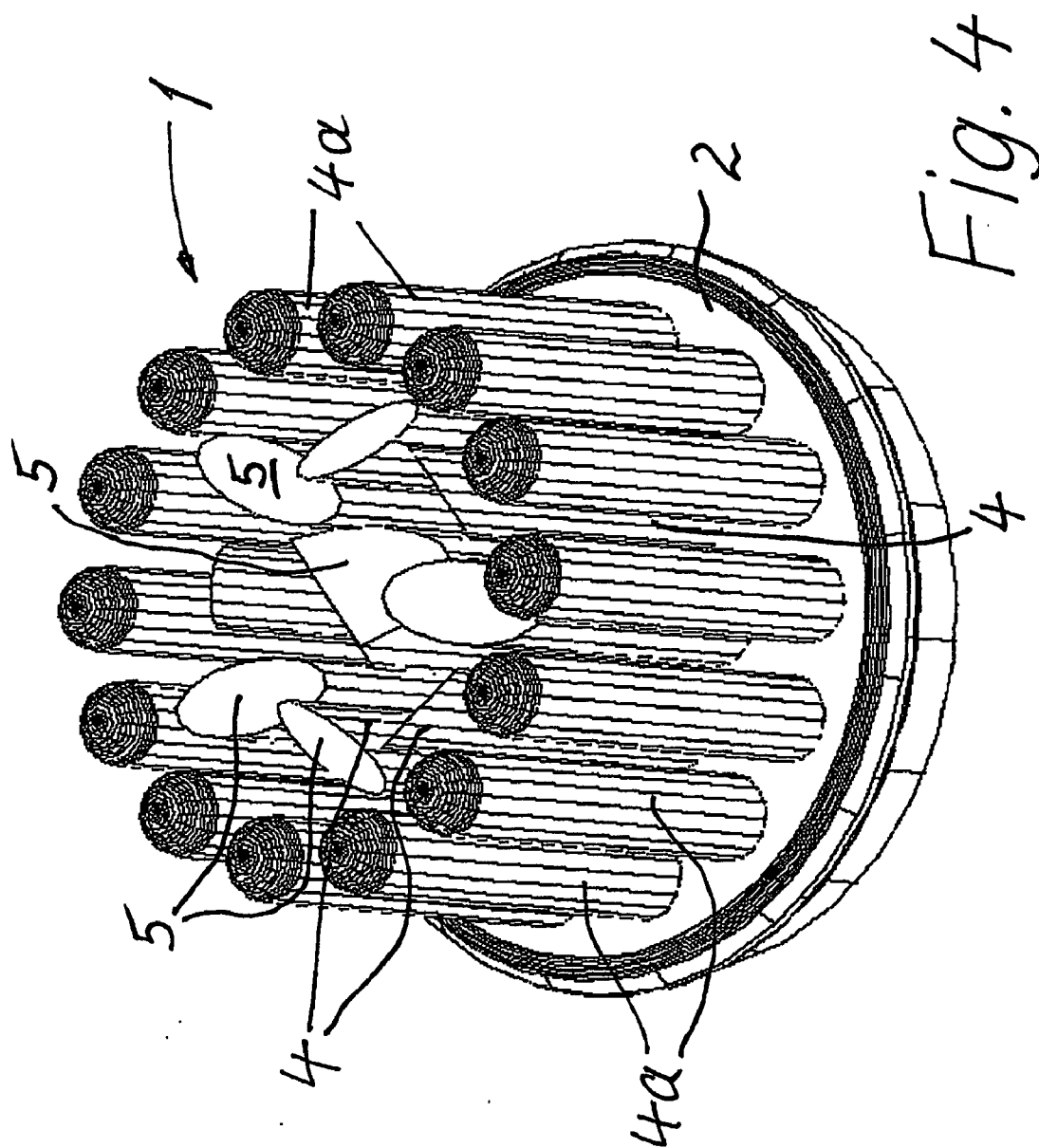
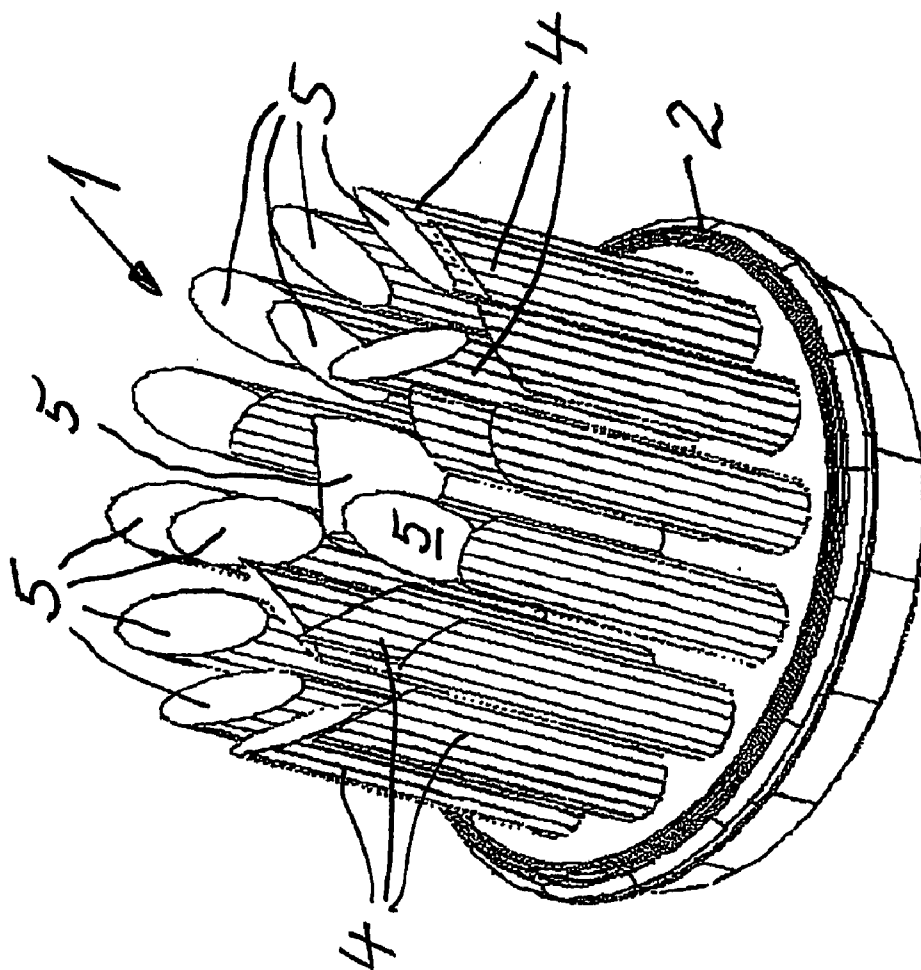


Fig. 3





TOOTHBRUSH WITH BRISTLE ARRAY

BACKGROUND

[0001] The invention relates to a toothbrush with an elongated, square, and/or round bristle array, which is formed from individual bristle bundles or bristle tufts, wherein at least individual bristle bundles are at least partially inclined and/or shaped like a roof on the use end facing away from the brush head relative to a plane extending approximately parallel to the brush head, such that bristles of these bristle bundles stand at different heights, so that the terminal surfaces arranged at the end of these bristle bundles are formed as inclined surfaces or as partially inclined surfaces. These bristle bundles are arranged adjacent to each other along imaginary straight connecting lines or especially arc-shaped connecting lines or, for round bristles, e.g., for electric toothbrushes, circular arc-shaped connecting lines or circular connecting lines on the brush head.

[0002] Such toothbrushes are known in a wide variety of shapes as manual toothbrushes or as electric toothbrushes, for which a handle is attached to the brush array.

[0003] In addition to classical brush arrays, for which the use ends of all bristle bundles lie in a common plane, numerous proposals have been made to improve and make more effective the cleaning of the curved tooth surfaces and especially also the interdental spaces between adjacent teeth. With typical toothbrushes, the cleaning is often inadequate primarily in the interdental spaces and also in the transitions to the interdental spaces of dentures.

[0004] Numerous proposals have been based on the feature of embodying the brush array of a manual toothbrush such that it has a wave-like or zigzag profile seen from the side in the hope that the higher standing regions of such a brush array will penetrate into the interdental spaces.

[0005] From EP 1 112 009 A1, e.g., a brush head of a manual toothbrush is known, for which bristle bundles of differing lengths are arranged one behind the other seen in the longitudinal direction and here they are beveled so that the front-most, rear-most, and in-between the center bristle bundle have the greater height and bristle bundles located in-between have a smaller height, wherein simultaneously bevels are arranged on the use ends such that seen from the side two groove-like indentations are formed in this bristle array. The inclined surfaces of the beveled bristle bundles are here each turned by 180° relative to each other, so that in neighboring regions they are facing each other or facing away from each other.

[0006] From U.S. Pat. No. 6,260,227 a manual toothbrush is known, for which on the two imaginary connecting lines extending in the longitudinal direction of this bristle array and extending along the entire toothbrush, bristle bundles are arranged in a line, which are each beveled in the opposite sense alternately, i.e., the bristle bundles are similarly arranged with their bevels each turned 180° relative to each other. Between these outer lines with bristle bundles beveled on the use ends, there are other bristle bundles with less or even no bevel.

[0007] All of these toothbrushes with more or less usefully profiled surfaces of the bristle arrays must assume that a user will move the toothbrush relative to his teeth very precisely

and simultaneously press the toothbrush in such a way that longer bristles actually penetrate into the interdental spaces and the shorter bristles simultaneously exert pressure on the curved surfaces of the teeth.

[0008] If one considers that the way a toothbrush is used, whether it is a manual toothbrush or an electric toothbrush, depends on the habits and anatomy of the user, and each person holds the corresponding handle or grip at a different angle in their mouth, it becomes clear that the given orientation of the inclined surfaces at the use ends of the bristle bundles makes the bristles penetrate into the interdental spaces ineffectively or not at all, when the brush is held too inclined relative to the profile of the teeth. This produces an accordingly worse cleaning effect.

[0009] This also applies for electric toothbrushes, because the user also grips this kind of toothbrush arbitrarily and holds it in his mouth in a way that is the most comfortable for him. Because when such toothbrushes are used it cannot be recognized how crossing grooves or the like formed by inclined bristle bundles will be oriented relative to the teeth, the desired effect is fulfilled at best by chance and as a rule only inadequately.

SUMMARY

[0010] Therefore, there is the object of creating a toothbrush of the type mentioned in the introduction, whether it is a manual toothbrush or an electric toothbrush, which the user can insert nearly arbitrarily into his mouth, i.e., which can even be held and used at various angles relative to its handle, and which nevertheless enables effective cleaning of the teeth surfaces and the interdental spaces or the transitions in-between.

[0011] To achieve this apparently contradictory task, for such a toothbrush of the type mentioned in the introduction, at least individual bristle bundles of the bristle array are arranged with their inclined surfaces turned relative to each other and relative to the connecting lines by different angles, which deviate from 90° and 180°.

[0012] Therefore, in contrast to the known solutions, the inclined surfaces are not arranged relative to each other, so that together they form a roof shape or a groove, but instead they are arranged relatively randomly, so that for the use of such a brush at different or even changing angles of the handle relative to the teeth, inclined surfaces nevertheless always exert pressure on the teeth in the transition to the interdental space and in this space and also outside this space on the teeth surfaces, wherein the user is aided in that the bristles of the bristle bundles are flexible, so that an inclined surface nearly penetrating right into an interdental space penetrates and glides completely into this space through the pressure of the brush.

[0013] Through the relatively random mutual arrangement of inclined surfaces, there are also always inclined surfaces that penetrate "correctly" into the interdental spaces, which are especially important for cleaning, and thus the cleaning effect is improved, even though the surface of the bristle array is not made to resemble as much as possible the relief of the inner or outer sides of the teeth.

[0014] Thus, in an apparently contradictory way, not copying the relief of a set of teeth but using bristle bundles provided with inclined surfaces produces a good cleaning

effect in the interdental spaces. Through the more or less irregular mutual relative positional rotation of the inclined surfaces, the likelihood is increased that such inclined surfaces penetrate into the interdental spaces and achieve a certain cleaning effect in these spaces, especially when a typical, relatively long brushing period is maintained by the user.

[0015] Here, it is especially favorable when bristle bundles directly adjacent to each other within the bristle array are arranged rotated relative to each other with their inclined surfaces. The more bristle bundles this applies to, the greater the likelihood that, for nearly any individual angle of approach of the toothbrush, one or more bristle bundles can optimally engage and clean the corresponding interdental spaces between two teeth.

[0016] Another configuration of the invention can be provided in consideration of the fact that such bristle arrays include a plurality of bristle bundles, so that individual bristle bundles that are directly adjacent to each other or else that are set apart by bristle bundles located in-between are arranged with their inclined surfaces rotated relative to each other and/or relative to an imaginary connecting line by 90° and/or by 180°, but other bristle bundles of the bristle array are arranged rotated by one or more different angles.

[0017] Thus, the distribution of the inclined surfaces of the individual bristle bundles can be varied even more in their mutual relative position and rotation and, e.g., “pairs” of bristle bundles can be produced within the entire bristle array, for which the highest points of the inclined surfaces can be directly next to one another, when these two bristle bundles belonging to the pair are arranged with their inclined surfaces rotated relative to each other by 180°. However, simultaneously such a “pair” can be arranged overall relative to other bristle bundles with inclined surfaces rotated by an angle deviating from 180° or 90°. The same applies for bristle bundles with angles of 90°, wherein a relative rotation of adjacent bristle bundles by varying angles within the entire bristle array can lead to the fact that bristle bundles at a greater distance from each other are arranged with their inclined surfaces relative to each other at an angle of 90° or also 180°. This can contribute to the fact that a plurality of bristle bundles provided with inclined surfaces at the use ends are distributed over the bristle array rotated more or less randomly relative to each other and thus there are always “ideally oriented” bristle bundles available to the user for cleaning his teeth for different, individual holds of the brush relative to his teeth. Here, this effect can be provided either by rotating adjacent bristle bundles by an equal, relatively small angle relative to each other, so that to some extent there is a row of bundles rotated within this row by the same angle relative to the adjacent bristle bundle, or an essentially random rotation arrangement can be applied.

[0018] In consideration of the fact that teeth-cleaning instruments with only a few bristle bundles for specific cleaning of interdental spaces have already become known, the provided arrangement of bristle bundles with beveled use surfaces in different mutual positions can be viewed as more favorable for cleaning interdental spaces, because the user no longer has to have the “specific goal” of hitting the corresponding interdental spaces, because the plurality of differently oriented bristle bundles leads to the feature that with very great likelihood “correctly oriented” bristle

bundles always appear at the individual interdental spaces when the user uses his toothbrush in a typical but individual way and moves it along his teeth, especially with up and down movements.

[0019] A further embodiment of the toothbrush according to the invention, whether it is operated by hand or electrically, which also primarily has the goal of good contact with the teeth surfaces adjacent to the interdental spaces, can be realized for a toothbrush according to the invention in that bristle bundles provided in its bristle array with inclined surfaces or diagonal surfaces and bristle bundles with somewhat horizontal, rounded, and/or pointed or otherwise contoured use surfaces are combined with each other and such differently shaped bristle bundles are arranged directly adjacent to each other within the bristle field and/or as groups, within which groups equal or similar bristle bundles are combined. Within at least one group, bristle bundles with inclined surfaces are arranged, which are arranged rotated relative to each other or relative to their imaginary connecting lines by angles deviating from 90° or 180°.

[0020] For example, in one manual toothbrush, the elongated bristle array could have at its two ends, thus at the end facing the handle and the end opposite the handle, a group of bristle bundles, which at their ends form a flat or rounded or pointed or otherwise shaped use surface, thus do not belong to the bristle bundles with inclined use surfaces, while intermediate bristle bundles with inclined surfaces arranged relative to each other according to the invention could be provided. The middle region of a bristle array of such a toothbrush could then be helpful primarily for cleaning the interdental spaces, while the adjacent regions are used predominantly for cleaning the teeth surfaces.

[0021] Especially in an electric toothbrush with round bristle array, bristle bundles arranged in repeating cycles could be embodied in groups in the described way.

[0022] Thus, on one hand, one or two regions of the bristle array, for an elongated bristle array especially the regions of this bristle array at a distance from each other in the longitudinal direction, could be provided with bristle bundles, whose ends are rounded, pointed, or provided with a straight terminal surface, and between these groups of bristle bundles at least one group with inclined or roof-shaped bristle bundles are arranged, which are arranged rotated in orientation at least partially relative to each other according to the invention. However, as an alternative or in addition, groups of bristle bundles with flat, rounded, or pointed use surfaces could also be provided between groups of bristle bundles with inclined use surfaces, which are arranged rotated relative to each other.

[0023] One special configuration of the invention which is especially suitable for electric toothbrushes, could be provided in that, for a toothbrush with bristle bundles arranged on one outer circle and other bristle bundles arranged inside this circle, the bristle bundles arranged on the outer circle and/or in its interior have on their free ends an inclined surface and are arranged rotated at least partially by different angles relative to the circle, on which they are arranged, so that the inclined surfaces are pointed partially towards the center of the bristle array, partially to the outside, partially in the circumferential direction or intermediate positions.

[0024] For round bristle arrays, which execute oscillating semi-rotating movements in alternating, opposite directions

on electric toothbrushes, it is known to provide overall an approximately groove-shaped contour of the bristle array. The invention with the already described effects deviates from these toothbrushes in that in contrast to such a regular contour, an irregular overall surface of the bristle array is consciously provided by bristle bundles with inclined surfaces rotated differently relative to corresponding connecting lines, namely circles, so that their inclined surfaces have different orientations, such that a surface contour adapted as closely as possible to a groove is not produced, although the corresponding bristle bundles of such a bristle array with differently oriented inclined surfaces can have different lengths. Thus, such an oscillating toothbrush can also have the effect that the user always provides favorably oriented bristle bundles with inclined surfaces in the region of the interdental spaces according to individual orientation of the bristle array within his mouth and relative to his teeth, without having to specifically try for this result, which requires considerable skill.

[0025] Similarly to all of the previously described configurations, this configuration takes advantage of the fact that for a bristle bundle with inclined an use surface, whose surface area is increased, the individual bristles are effective not only with their typically rounded end surfaces, but also with the adjacent regions of these end surfaces, and there is also good access to the teeth surfaces.

[0026] The bristle bundles of the bristle array provided with inclined surfaces are arranged within the bristle array rotated relative to each other such that planes extending through the bristle bundles arranged not parallel to each other but instead differently oriented inclined surfaces of adjacent bundles or in a common crossing or longitudinal row of the bristle array or also arranged on a circle intersect each other and form an angular space with each other.

[0027] In many cases, the bristle bundles of the bristle array of toothbrushes are each approximately the same length, so that overall a common plane is produced at the use ends of the bristle bundles. In addition, profiled sections are known, through which the differently shaped envelope surfaces form the use ends of the bristle bundles. The toothbrush according to the invention can also be provided for a configuration of the invention in that the length of individual bristle bundles extending opposite the bristle body is approximately the same and the other bristle bundles have different sizes. Thus, bristle bundles of different lengths can be combined within the bristle array in a suitable way.

[0028] The angle of the inclined surfaces formed on the end of the bristle bundles can be the same or different at least for individual bristle bundles relative to other bristle bundles. Thus, the angle can ensure that individual bristle bundles come into contact according to the angle of the handle of the toothbrush through the user in an optimum way with the teeth and the interdental spaces and have a corresponding good cleaning effect, wherein, due to the flexibility of the bristles, the adaptation to the interdental spaces can be improved even more in this case and also in the previously described cases.

[0029] The cross section of the bristle bundle can be approximately circular or different from a circle. Bristle bundles with circular or also with cross sections that are different from a circle are known and the arrangement according to the invention of the inclined surfaces of such

bristle bundles in a position rotated relative to each other can use both round bristle bundles and also bundles with profiled cross sections, wherein round bristle bundles have the advantage that the mutually rotated arrangement can be performed independent of the correspondingly round receiver openings in the brush body and can also optionally be changed very simply in production, because the receiver openings in the brush bodies do not have to be adapted correspondingly.

[0030] The cross section of at least individual bristle bundles can be polygonal or rectangular, especially square, and the inclined surfaces arranged at the use end of such individual bristle bundles can likewise be polygonal or rectangular, which is realized corresponding to the contours of the bristle bundle, wherein the sides of the polygons or rectangles can be rotated in the vertical projection of the bristle bundles one over the other or relative to each other such that the highest position of the inclined surface is shorter than the side length of the polygon or rectangle and is arranged at a corner of the polygonal or rectangular bristle bundle cross section. Primarily in a case, in which the inclined surface is oriented relative to the cross section of the bristle bundle, so that its highest point is arranged in a corner of the polygonal cross section, in practice a tip is generated, opposite which the inclined surface and its borders fall away at an angle, so that such a tip can penetrate deep into interdental spaces, even if the inclined surface does not exactly agree with the adjacent tooth surface. Thus, a corresponding basic cleaning, especially also in the region of the interdental spaces, can be realized.

[0031] In the above, when inclined surfaces are mentioned, typically flat inclined surfaces are meant, but it is also possible for the inclined surface(s) of at least one bristle bundle to be curved convexly or concavely in one or more directions. If the inclined use surface has, e.g., a concave curvature, then an even more improved adaptation to the convex curvature of a tooth surface is possible. In addition, the highest region of the inclined surface can be pointed and fine accordingly and can thus penetrate deeply into an interdental space.

[0032] In a special arrangement, bristle bundles arranged one next to the other can extend to different heights relative to the brush body or can have different lengths, wherein especially within individual rows equal-length bristle bundles are arranged and the inclined surfaces of the bristle bundles of such a row and/or can be arranged partially rotated relative to each other in an adjacent row with different bristle bundle lengths. Here, a wide variety of different combinations in terms of not only corresponding relative rotational angles of the individual bristle bundles about their longitudinal axes, but also lengths and inclination angles of the inclined use surfaces is possible to provide a bristle array, which increases the likelihood that optimum pressure is exerted on the tooth surfaces, the transitions to the interdental spaces, and finally also the interdental spaces themselves as frequently as possible while brushing for a wide variety of individual applications of the toothbrushes, whether they are operated by hand or electrically.

[0033] Primarily from the combination of individual or several of the previously described features and means, a toothbrush is produced with a bristle array, for which the user himself does not have to try to find the best possible

orientation of the bristle array relative to his teeth, which is difficult, but instead for which the likelihood is considerably increased that at the widest range of angles of the toothbrush relative to the teeth certain bristle bundles always reach an optimum position relative to the teeth and primarily to the interdental spaces and have a correspondingly good cleaning effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] In the following, embodiments of the invention are described in more detail with reference to the drawings. Shown in partially schematic representations are:

[0035] **FIG. 1** is a perspective view of the bristle array of a manual toothbrush with an elongated bristle array with a plurality of round cross-sectional bristle bundles, which all have an inclined surface at their use ends and are arranged rotated relative to each other or to imaginary connecting lines between them by angles different from 90° and 180° about their longitudinal axes.

[0036] **FIG. 2** is a view corresponding to **FIG. 1** of a manual toothbrush, for which bristle bundles with inclined surfaces arranged at their use ends are combined with bristle bundles, which are overall rounded at their use ends.

[0037] **FIG. 3** is a perspective view of a circular brush body with a corresponding bristle array for use in an electrically driven toothbrush with approximately equal-length bristle bundles, which have a round cross section and are beveled at their use ends and are arranged rotated relative to each other or to the circular connecting lines of the individual bristle bundles by angles different from 90° and 180°, wherein a central bristle bundle is beveled twice on the use surface, such that a roof-shaped use surface is produced.

[0038] **FIG. 4** is a view corresponding to **FIG. 3**, for which the bristle bundles arranged on an outer circle as the imaginary connecting line have rounded use ends and only the bristle bundles located within this circle are beveled on their use ends, as well as

[0039] **FIG. 5** is a view of an embodiment, for which the bristle bundles arranged next to each other on the outer circle connecting them are beveled, but all bundles with this inclined surface are oriented somewhat perpendicular to their connecting circle and the bristle bundles located within this circle are arranged rotated relative to each other and/or relative to the outer bristle bundles by an angle different from 90° and 180° and also relative to corresponding connecting lines.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0040] In the following description of the various embodiments, matching parts or objects are identified with the same reference numbers even if they have a different configuration but matching function.

[0041] **FIGS. 1 and 2** each show a bristle array designated in its entirety with **1** and the associated brush body **2**, but not the entire handle **3**, instead only a part of the handle, from a manual toothbrush.

[0042] **FIGS. 3-5** show brush body **2** with circular contours and correspondingly round bristle arrays **1**, which are used in electrically driven toothbrushes.

[0043] Therefore, all of the figures show the essential parts of the corresponding toothbrushes, wherein either a longitudinal or a round bristle array **1** can be provided, which is formed from individual bristle bundles **4**, which are arranged next to each other on a brush body **2** and project from this body, said bristle bundles being formed of individual bristles.

[0044] In the embodiments according to **FIGS. 1, 3, and 5**, all of the bristle bundles **4**, in the embodiments according to **FIGS. 2 and 4**, in a still to be described way individual bristle bundles **4** on the use end facing away from the brush body **2** are beveled relative to a plane extending approximately parallel to the brush body **2**, such that bristles of these bristle bundles **4** extend to different heights, so that the terminal or use surfaces arranged on the use end of these bristle bundles **4** are formed as inclined surfaces **5** or also as partially inclined surfaces.

[0045] For example, in the center of the round bristle array **1** according to **FIGS. 3-5**, a central bristle bundle **4** is shown, for which two inclined surfaces arranged at an angle lead to a roof-shaped use end **5**, which could also be the case for other bristle bundles **4**.

[0046] The individual bristle bundles **4** are arranged along imaginary connecting lines in rows, wherein for the embodiments according to **FIGS. 1 and 2**, the longitudinal edge **6** of the bristle body **2** in the region of the bristle array **1** represents or forms such an approximately arc-shaped connecting line, parallel to which other imaginary connecting lines exist extending in the longitudinal direction between bristle bundles **4** arranged there. Furthermore, one can clearly see rows of bristle bundles, which are thus adjacent to each other on imaginary straight lines and which extend generally perpendicular to the longitudinal extent direction.

[0047] The round bristle arrays **1** according to **FIG. 3** clearly show imaginary circular lines, especially an outer circular line, on which the outer bristle bundles are arranged in a row, which then also produces the outer envelope circle of this bristle array **1**. In the interior of such an outer circle a second tighter circle is present, on which other bristle bundles **4** are arranged, wherein the outer circle and this inner circle are concentric to each other. In the common center, another bristle bundle **4** is then located, which is beveled like a roof at the use end in the illustrated embodiments.

[0048] By comparing individual bristle bundles **4** within the corresponding bristle array **1** of the various embodiments, one can see that at least some of these bristle bundles **4** are arranged rotated with their inclined surfaces **5** relative to each other and relative to the mentioned and described imaginary connecting lines by different angles, wherein these angles deviate from 90° and from 180°. Primarily, bristle bundles **4** directly adjacent to each other within the corresponding bristle array **1** are arranged rotated with their inclined surfaces **5** relative to each other, i.e., the inclined surfaces **5** of these bristle bundles are each oriented in a somewhat different direction, but not directly opposite each other and also not at right angles to each other. If one draws diameter lines through the highest points of the inclined surfaces, these diameter lines would be arranged offset relative to each other.

[0049] If one takes into account **FIG. 5**, one can see that the bristle bundles **4** arranged next to one another on the

outer circle of the round bristle array **1** are not rotated but instead arranged uniformly relative to their circular connecting line, thus they all have the same orientation relative to the imaginary connecting circle. For these outer bristle bundles **4** and their inclined surfaces **5** of the embodiment according to **FIG. 5**, the feature of the mutually rotated arrangement for a simultaneously rotated arrangement relative to the connecting line is not fulfilled, but possibly for the bristle bundles **4** located in the interior of this outer circle.

[0050] Primarily for the relatively large number of bristle bundles **4**, individual bristle bundles **4** directly adjacent or at a distance due to bristle bundles **4** located in-between can be arranged relative to each other with their inclined surfaces **5** rotated relative to each other and/or relative to an imaginary connecting line by 90° or also by 180° , wherein then however, other bristle bundles **4** of the bristle array **1** are arranged rotated by one or more different angles. Primarily due to a plurality of bristle bundles **4** it can occur by chance that through the mutual rotation arrangement bristle bundles **4** are also arranged with their inclined surfaces **5** by 90° or by 180° relative to each other, wherein, however, simultaneously other bristle bundles **4** are fixed rotated relative to each other with their inclined surfaces **5** by different angles about their longitudinal extent axis.

[0051] In all figures it is clear that the inclined surfaces **5** are oriented very differently, thus many planes are produced by such inclined surfaces **5**, which intersect each other and form angular spaces and thus exert pressure when the bristle array **1** is brought onto a tooth in different ways such that it is especially favorable for cleaning the teeth surfaces and the interdental spaces.

[0052] While the embodiments according to **FIGS. 1, 3, and 5** show bristle arrays **1**, for which all of the bristle bundles **4** at the use ends have inclined surfaces **5**, which can also be formed with roof shapes, **FIGS. 2 and 4** show embodiments, for which in the bristle array **1** with inclined surfaces **5** or bristle bundles **4** provided with angled surfaces are combined such that their use surfaces are shaped differently. In both embodiments, these bristle bundles **4a** not provided with inclined surfaces **5**, but rather the use ends are rounded, but could also be pointed or contoured with a horizontal, flat surface or in another arbitrary shape.

[0053] Such bristle bundles **4a** are arranged directly adjacent to each other within the bristle array **1** and simultaneously as groups, within which groups the same or similar bristle bundles **4a** are combined. This can be seen especially clearly in **FIG. 2**, wherein on both sides of a group of bristle bundles **4** with inclined surfaces **5** such bristle bundles **4a** are provided with a differently contoured use surface. In this case, a group of bristle bundles **4** is provided with inclined surfaces **5** as a closed group, although also bristle bundles **4** could be mixed in an irregular manner with bristle bundles **4a**.

[0054] For the embodiment according to **FIG. 4**, an inner group of bristle bundles **4** with inclined surfaces **5** from another group of bristle bundles **4a** is combined with differently contoured, namely rounded, use surfaces, which are arranged on a circle outside around the bristle bundle **4** with inclined surfaces **5**.

[0055] In this combination arrangement of different bristle bundles **4** and **4a** according to **FIGS. 2 and 4**, however, the

bristle bundles **4** provided with inclined surfaces **5** are each arranged rotated relative to each other or relative to an imaginary connecting line by angles that are different from 90° or 180° .

[0056] For the elongated bristle array **1** according to **FIG. 2**, the regions of this bristle array **1** at a distance from each other in the longitudinal direction are provided with bristle bundles **4a**, whose use ends are rounded, but could also have a different contour, and in-between there is a group of bristle bundles **4** with beveled or also roof-like use surfaces.

[0057] In **FIG. 4**, as already explained, on the outer circle of this round bristle array **1** there are bristle bundles **4a** with rounded use surfaces and in the interior of the circle there are bundles with inclined surfaces, wherein these are in turn oriented rotated by different angles. The inclined surfaces **5** are partially turned towards the center of the bristle array **1**, partially outwards, partially in the circumferential direction, or also in intermediate positions, which also applies for the inner bristle bundle within the outer circle according to **FIG. 5**.

[0058] However, it should be mentioned that bristle bundles **4** with inclined surfaces **5** and bristle bundles **4a** could also be mixed with each other.

[0059] **FIG. 5** could be viewed as a special case of the embodiment from **FIG. 4**, because bristle bundles **4** arranged on the outer circle are provided with inclined surfaces **5**, which, however, are not rotated differently relative to the connecting circle, but instead are all oriented radially towards the center. Therefore, together with the bristle bundles **4** within this circle there are numerous constellations produced between individual bristle bundles, whose inclined surfaces are rotated relative to each other by angles that are different from 90° and 180° relative to each other about their longitudinal axes, oriented perpendicular to the brush body **2**.

[0060] In all embodiments it is provided that the cross section of the bristle bundles **4** and **4a** is somewhat circular and uniform, but this cross section could also deviate from a circle and could be, e.g., polygonal or rectangular, especially square, whereby different additional effects can be achieved in combination with inclined surfaces.

[0061] Round cross-sectional bristle bundles **4** and **4a**, however, simplify the fitting of a brush body **2** with corresponding receiver openings, because the receiver openings remain independent of the bundle shapes in all cases, whether by which angle the associated bristle bundles are inserted rotated relative to each other or relative to connecting lines and thus also to the brush body **2**.

[0062] It should also be mentioned that in all embodiments, the bristle bundles **4** and **4a** of the bristle array **1** have matching lengths, thus they extend by the same amount relative to the brush body **2**.

[0063] However, it would also be possible to deviate from this configuration and to combine bristle bundles **4** and **4a** of different lengths in a suitable way.

[0064] Furthermore, deviating from the embodiments, individual or all inclined surfaces **5** of the various bristle bundles **4** could be curved convexly or concavely in one or more directions instead of the flat shape illustrated in the embodiments. The inclined surfaces **5** could also be shaped

like a ball or groove or also parts of cylinders or hollow cylinders, wherein this could also change in terms of the individual bristle bundle 4 of the bristle array 1.

[0065] By taking into account the bristle arrays 1 according to the various embodiments, and primarily for those according to FIGS. 1, 3, and 5, it is made clear that through the relative irregularity of the mutual arrangement of inclined surfaces 5 or the different angles, which enclose the planes extending through them in space, there are correspondingly many possibilities and thus a high likelihood that such an inclined surface 5 penetrates with its highest edge into an interdental space independent of how a user exactly inserts and moves the toothbrush with the corresponding bristle array 1 in his mouth. In contrast to regular contours of bristle arrays, which require a correspondingly precise movement relative to the individual teeth, in order to be effective in the desired way, the user is free in the way he grips and above all at what angle he holds the handle of an electric or manual toothbrush and also possibly how he moves and changes the brush while brushing—preferably up and down. In the course of such brushing of his teeth, bristle numbers with their inclined surfaces are always brought along the row of teeth into a favorable position relative to the teeth and the interdental spaces and can then penetrate into these correspondingly deep and realize a basic cleaning effect.

[0066] The toothbrush can have an elongated bristle array 1, especially for a manual toothbrush, and a round bristle array 1 for an electrically driven toothbrush, which is formed from individual bristle bundles 4 arranged next to each other on a brush body 2 and projecting relative to this body essentially at a right angle. Here, at least individual bristle bundles 4 are at least partially beveled or formed with a roof shape on the use end facing away from the brush body 2 opposite a plane extending approximately parallel to the brush body 2, such that bristles of these bristle bundles 4 have different lengths, so that the terminal surfaces arranged at the use end of these bristle bundles 4 are formed as inclined surfaces 5 or as partially diagonal surfaces, wherein these bristle bundles 4 are arranged adjacent to each other in rows along imaginary straight or arc-shaped or for round brushes along circular-arc or circular connecting lines on the brush body 2. At least individual, especially larger groups or also all of the bristle bundles 4 of this bristle array 1 are arranged rotated with their inclined surfaces 5 relative to each other and relative to the connecting lines by different angles, so that a plurality of differently oriented inclined surfaces are available when the teeth are being cleaned and the likelihood is great that such an inclined surface penetrates in a favorable orientation primarily in an interdental space and basically cleans the teeth.

1. Toothbrush comprising an elongated, rectangular, and/or round bristle array (1), which is formed from individual bristle bundles (4) or bristle tufts arranged next to each other on a brush body (2) and extending away from the body, at least some of the bristle bundles (4) on a use end facing away from the brush body (2) are at least partially beveled and/or formed with a roof shape relative to a plane extending approximately parallel to the brush body (2), such that bristles of the at least some of the bristle bundles (4) extend at different lengths, so that terminal surfaces arranged at the use ends of the at least some of the bristle bundles (4) are formed as inclined surfaces (5) or as partially diagonal

surfaces, wherein the at least some of the bristle bundles (4) are arranged adjacent to each other along imaginary straight or arc-shaped connecting lines, or for round brushes circular-arc or circular connecting lines on the brush body, wherein the at least some of the bristle bundles (4) of the bristle array (1) are arranged with the inclined surfaces (5) rotated relative to each other and relative to the connecting lines by different angles, which are different from 90° and 180°.

2. Toothbrush according to claim 1, wherein at least half of the bristle bundles of the bristle array are rotated relative to the connecting lines by differing angles that deviate from 90° and 180°.

3. Toothbrush according to claim 1, wherein within the bristle array (1), the bristle bundles (4) directly adjacent to each other are arranged with the inclined surfaces (5) rotated relative to each other.

4. Toothbrush according to claim 1, wherein the bristle bundles (4) directly adjacent to each other or spaced apart by other ones of the bristle bundles (4) located in-between are arranged with their inclined surfaces (5) rotated relative to each other and/or relative to the imaginary connecting line by 90° and/or 180°, but other ones of the bristle bundles (4) of the bristle array (1) are arranged rotated by one or more different angles.

5. Toothbrush according to, wherein in the bristle array (1), the bristle bundles (4) provided with the inclined surfaces (5) or diagonal surfaces and bristle bundles (4a) with approximately horizontal, rounded, and/or pointed use surfaces are combined with each other and such differently shaped ones of the bristle bundles (4a) within the bristle array (1) are directly adjacent to each other and/or are arranged as groups, within said groups equivalent or similar bristle bundles (4a) are combined, wherein within at least one group of the bristle bundles (4) with inclined surfaces (5) are arranged, which are arranged opposite each other or rotated relative to their imaginary connecting lines by angles that are different from 90° or 180°.

6. Toothbrush according to claim 5, wherein one or two regions of the bristle array, for an elongated bristle array especially the regions of the bristle array at a distance from each other in a longitudinal direction, are provided with the bristle bundles (4a), whose ends are rounded, pointed, or are provided with a straight terminal surface or contoured in a different way, and between the groups of bristle bundles (4) there is at least one group with bristle bundles, which are beveled or shaped like a roof and which are at least partially rotated relative to each other.

7. Toothbrush with bristle bundles arranged on an outer circle and other bristle bundles arranged in an interior of the outer circle according to claim 1, wherein the bristle bundles (4) arranged on the outer circle and/or in the interior of the outer circle have the inclined surface (5) on free ends thereof and are at least partially arranged rotated relative to the circle, on which they are arranged, by different angles, so that the inclined surfaces (5) point partially towards a center of the bristle array (1), partially outwards, partially in a circumferential direction, or in intermediate positions.

8. Toothbrush according to claim 1, wherein the bristle bundles of the bristle array provided with inclined surfaces are arranged rotated relative to each other, such that planes extending through the inclined surfaces of bristle bundles (4) that are adjacent or arranged in a common row intersect one another and form an angular space with each other.

9. Toothbrush according to claim 1, wherein a length of the individual bristle bundles (4, 4a) projecting relative to the brush body is approximately the same size and that of others is different.

10. Toothbrush according to claim 1, wherein inclination angles of the inclined surfaces (5) formed at the ends of the bristle bundles (4) are equal or different, at least for individual bristle bundles (4), relative to other bundles.

11. Toothbrush according to claim 1, wherein a cross section of the bristle bundles (4, 4a) is approximately circular or deviates from a circle.

12. Toothbrush according to claim 1, wherein a cross section of at least some of the individual bristle bundles (4, 4a) is polygonal or rectangular, or square, and the inclined surfaces (5) arranged at the end of individual bristle bundles (4) is polygonal or rectangular, wherein sides of the polygon or rectangle in a vertical projection of the bristle bundles (4) overlap one another or are rotated relative to each other, such

that a highest point of the inclined surface (5) is shorter than a side length of the polygon or rectangle and is arranged at one corner of the polygonal or rectangular cross-sectional bristle bundle.

13. Toothbrush according to claim 1, wherein the inclined surface(s) (5) of the at least some of bristle bundle (4) is (are) curved convexly or concavely in one or more directions.

14. Toothbrush according to claim 1, wherein the at least some of the bristle bundles (4, 4a) arranged next to each other project at different distances from the brush body (2) or have different lengths, wherein equal-length bristle bundles (4) are arranged within individual rows and the inclined surfaces (5) of the bristle bundles (4) of said one of the rows and/or those of an adjacent row with ones of the bristle bundles of a different length are arranged at least partially rotated relative to each other.

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