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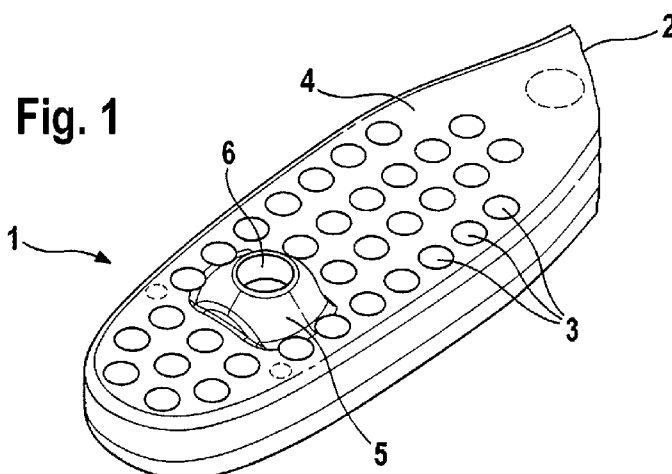
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(54) Title: ORAL CARE DEVICE WITH A FUNCTION ELEMENT



(57) Abstract: The invention is directed to an oral care device having a handle and a head connected or connectible thereto, on which oral care elements, in particular cleaning bristles and/or elastomer cleaning elements are provided, with an electrically operable function element being arranged on an outer surface of the head. To ensure ease of handling of the oral care device in spite of the function element accommodated in the head, it is proposed providing a ramp adjacent to the function element.



WO 2010/023643 A1

ORAL CARE DEVICE WITH A FUNCTION ELEMENT

This invention relates to an oral care device with the features of the prior-art portion of claim 1.

Known from the prior art are various oral care devices which are constructed in particular as toothbrushes and have an electrically operable function element such as an LED emitting light. In some of these cases efforts are made to arrange the LED within the toothbrush head so that said electrically operable function element is fully encapsulated in the toothbrush plastic and hence no moisture-related problems are encountered on the toothbrush head and the electrical components.

An oral care device of the type initially referred to is known in the art from WO 2008/059435. In this apparatus provision is made in the toothbrush bristle zone for an electrically operable function element in the form of an LED which is arranged to protrude from an outer surface of the head in the bristle zone. Efforts to arrange the function element as near as possible to the teeth to be cleaned can lead however to handling problems during oral care.

It is therefore an object of the present invention to provide an oral care device of the type initially referred to which, on the one hand, enables an arrangement of the electrically operable function element on the head as near as possible to the oral care site, for example, the teeth or the tongue, but on the other hand guarantees safe and user-friendly handling.

This object is accomplished by an oral care device with the features of claim 1.

By constructing a ramp directly adjacent to the function element it is assured that function elements arranged on the outer surface of the head are not experienced as disturbing even if the flexible oral care elements such as cleaning bristles reduce the distance between the outer surface of the head or the function element and the tooth or the tongue while cleaning the tooth or the tongue, respectively. If the toothbrush exerts excessive pressure against the teeth, the tooth is thus able to slide over the ramp without this leading to any interference along the variously protruding teeth while they are being cleaned.

The support taken by oral care elements is particularly little if a free space is provided above the function element. In addition, the electrically operable function element is arranged as near as possible to the teeth to be cleaned while at the same time the thickness of the head carrying the oral care elements is kept as small as possible, thus enabling an

agreeable cleaning of the teeth even with a small space between the inside of the cheek and the outer surface of the tooth.

In another advantageous aspect, the function element is arranged adjacent to and/or between the oral care elements. It is thus assured that the properties of the function element take effect in the immediate vicinity of the oral care elements. Alternatively, the function element may be arranged on a different outer side of the head on which no oral care elements are arranged.

In another advantageous embodiment, the function element is constructed as a light emitting source, in particular as an LED (light emitting diode), as a toothpaste conveyor, a sensor or an actuator for, for example, a sound or a movement or a vibration. The LED can be used, for example, as a supplier of energy for activating a substance in the toothpaste. Other energy-emitting function elements may also be contemplated. If the function element is constructed as a toothpaste conveyor, then particularly the toothpaste outlet is arranged adjacent to the ramp while the toothpaste conveying device is arranged as a rule inside the head or an adjacent region. If the function element is constructed as a sensor, then this can be, for example, a motion sensor which detects the 3D motion of the head by means of an inclination sensor, a speed sensor or an acceleration sensor. A contact force sensor may also be contemplated.

In another advantageous embodiment, the oral care elements are connected on a first - lower - level to the outer surface of the head or are tufted or injection-molded in the head. The function element extends to a second level which differs from the first level, in particular is raised relative to it. In this arrangement, the ramp is intended to bridge at least part of the difference in height between said first and said second level. It is thus assured that no abrupt difference in height exists between the second level of the raised surface of the function element and the first level of the head.

In another advantageous embodiment, the first and the second level are bridged by a surface ascending or descending in an oblique or arched configuration. The oral care elements are arranged or fastened on a plane of the head and the ramp is constructed to ascend or descend in an oblique or arched configuration relative to said plane. If the oral care elements are not arranged on a uniformly flat plane, then the first lower level is the level from which the ramp begins to extend from a foot region in the direction of the bristle ends.

In another advantageous embodiment, the function element is arranged partly in the head and partly projecting therefrom. The ramp thus prevents a 90° angle from being formed between the outer surface of the head and the projection of the function element and bridges

this region in direct adjacency to the function element by an oblique or arched or otherwise curved surface.

In another advantageous embodiment, the ramp and the head are injection-molded from the same plastic component. This affords particular ease of manufacture because an additional plastic component would add to the complexity of the production process. This single-component construction of the ramp relative to the head notwithstanding, other plastic components may be provided on the head or be injection-molded onto it.

In another advantageous embodiment, the ramp is injection-molded from a different plastic component than the head. If through intensive pressing of the toothbrush against the teeth the ramp comes into contact with the teeth, then there is no hard impact against the teeth.

In another advantageous embodiment, the ramp is constructed from a soft plastic material, in particular an elastomer such as TPE (thermoplastic elastomer), and the head from a hard plastic material, in particular PP or PE.

In another advantageous embodiment, the ramp is arranged directly around the function element at least in a radial direction. Hence at least one ramp is arranged in one direction in direct contact with and adjacent to the function element. In one variant, provision is made for one ramp each in two opposing directions on either side of the function element. In another variant, one ramp is arranged around the function element radially in all directions, in which arrangement the ramp can be constructed in a variously oblique or arched configuration in the different radial directions. The place at which the ramp is provided depends directly on the intended movement for cleaning the teeth so that a ramp is provided adjacent to the function element according to the intended cleaning direction. The number of ramp geometries required around the function element can also be provided dependent on the geometry of the rest of the head. Given an outer surface of the head on which the oral care elements are arranged and which already represents at least two different levels, it suffices in one variant for only one ramp to be provided between these two height levels. Said variant leads however to variously thick head geometries so that additional adaptations to the oral care device may become necessary.

In another advantageous embodiment, the function element is secured in the head by a press fit. The external diameter or the external geometry of the function element is therefore larger than its receiving opening provided in the head. An encapsulating solution against the ingress of liquid/moisture is thus obtained in simple manner. Other types of

securing the function element in the head, for example injection-molding, welding, adhesive-bonding or snap-fitting, are likewise possible.

In another advantageous embodiment, the oral care device is constructed as a manual or electric toothbrush and/or the function element as an LED which is arranged in protruding fashion in the cleaning region. This protrusion formed by the function element in the outer surface of the head is thus filled or bridged by the ramp. An outer surface is considered to be the fastening level of the oral care elements, hence, for example, the tufting surface.

In another advantageous embodiment, the oral care elements are arranged on the head above and spaced from the function element, such that a free region devoid of oral care elements is provided above the function element - approximately on a height with the ends of the oral care elements. If the function element is constructed as an LED, then it is assured that, for example, a light cone with an opening angle of at least 5 to 30° illuminates the tooth and the toothpaste largely unobstructed by cleaning bristles or elastomer cleaning elements. If the function element is constructed as a toothpaste conveyor, then an unhindered supply of the toothpaste to the tooth is thus guaranteed.

In another advantageous embodiment, the function element and the ramp are integrally made of one piece. In particular the function element and the ramp are formed of the same material. In one variant, the function element and the ramp form a prior assembled one-piece unit. In another variant, the ramp and the function element are manufactured separately, but as the result of being made from the same material they become one piece after being joined together.

In another advantageous embodiment, a tangent applied to the oblique or curved or arched ramp forms an obtuse angle with the outer surface of between 110 and 170°. In an alternative variant, said obtuse angle lies between 120 and 150°. In this arrangement, the tangent in a sectional representation of the ramp is applied against said ramp, whereby in the case of an oblique-plane surface of the ramp the tangent has several points of contact with the ramp. This results conversely in a gradient angle for the ramp 5 which lies between 10 and 70°, preferably between 30 and 60°.

Further objects, advantages, features and application possibilities of the present invention will become apparent from the subsequent description of embodiments with reference to the accompanying drawings. It will be appreciated that any feature described and/or represented by illustration, when used singularly or in any meaningful combination,

forms the subject-matter of the present invention, irrespective of their summary in the claims or their back-reference.

In the drawings,

FIG. 1 is a perspective view of the head of an oral care device, shown devoid of oral care elements, according to an embodiment of the invention;

FIG. 2 is a schematic representation of a first ramp;

FIG. 3 is a schematic representation of a second ramp;

FIG. 4 is a longitudinal sectional view of a head of an oral care device with electrically operable function element;

FIG. 5 is a top plan view of the head of the oral care device of FIG. 1 showing oral care elements and LED;

FIG. 6 is a longitudinal sectional view taken along the line A-A of FIG. 5;

FIG. 7 is a view of an enlarged detail within the circle A of FIG. 6;

FIG. 8 is a cross-sectional view of the head taken along the line C-C of FIG. 5; and

FIG. 9 is a side view of the head of FIG. 5.

FIG. 1 shows a perspective plan view of the head of an oral care device, which according to this embodiment is part of a manual toothbrush. As is customary with manual toothbrushes, the schematically represented breakaway line 2 leads into a neck portion and a handle portion (both not shown in the Figures). Installed in the neck portion are electric leads for operating an electric function element, said leads leading to an ON/OFF switch of a power supply and to other essential electric devices in the handle. The oral care elements provided for this embodiment are tufts of cleaning bristles which can be fastened in apertures 3 in the head 1 in every manner known in the art. According to the present embodiment, the tufts of cleaning bristles are anchored in the head using the anchor tufting method. Other oral care elements, for example, elastomer cleaning elements, which are fastened in or molded on the head, can be provided as an alternative or in addition. FIG. 1 shows only the head without these oral care elements, such as it leaves the die after the injection-molding process. The outer surface 4 of the head, on which the oral care elements can be fastened, has preferably in the front half of the head or in the front third of the distal end of the head a ramp 5 which is constructed such that it protrudes from the plane level of the outer surface in the direction of

the bristle ends. Provided inside the ramp 5 is a mounting hole 6 for the electrically operable function element. The function element is not shown in FIG. 1.

FIGS. 2 and 3 show schematically two of numerous possible embodiments of the ramp 5. The ramp 5a of FIG. 2 is equipped with circumferential inclined surfaces such as to produce a truncated cone as the ramp. A user's tooth surface, which through intensive pressing down of the surrounding bristles comes into contact with the outer surface 4 and the ramp 5a, slides from the outer surface 4 to the ramp along the obtuse angle α which equals between 110° and 170° . By comparison, FIG. 3 shows an obtuse convex configuration on which the outer surfaces of the ramp are arched outwardly. The initial angle β between the outer surface 4 and a tangent applied to the ramp 5b at the starting point of said ramp through the outer surface is smaller than the angle α with inclined surfaces according to FIG. 2. Although an obtuse angle significantly greater than 90° is also provided in this case with the angle β of FIG. 3, a user's tooth flank will slide less comfortably along this ramp than along a ramp with a larger obtuse angle α according to FIG. 2. Hence an obtuse angle over the ramp surface or a gradual transition from the outer surface 4 to the ramp 5 is preferred. The ramps presented schematically in FIGS. 2 and 3 are geometrically adapted preferably to the practical requirements of a toothbrush. For example, the ramp cannot be randomly flat and the angle α or β cannot be ideally obtuse with nearly 180° because then a tufting of bristles in a large plane region of the outer surface 4 of the head 1 would not be possible. Also, a role is played in the specific construction of the ramp by the tufting direction of the bristles or inclination of the bristle tufts toward the head and the user's intended cleaning direction.

FIG. 4 shows a longitudinal section through a head 1b. The ramp 5 is also provided for this head, although it is not shown in this Figure. FIG. 4 shows the installation of the electrically operable function element in the head 1b schematically. The electrically operable function element provided is an LED 8 whose connection wires with a wire connection 10 are equipped separately with an encapsulation 9 so that the electric connection wires of the LED 8 are protected from moisture ingress. The LED 8 is inserted from the rear through the brush head and a larger cavity 7 so that there is also space for accommodating the encapsulation 9 in the cavity 7. The electric wire 10 is passed through a hollow space in the toothbrush neck which connects the head to the handle. The LED 8 is pressed into the mounting hole 6, preferably with a press fit. According to this embodiment, both the LED 8 and the head 1b (or 1) are made from a hard plastic material so that a slightly smaller dimensioning of the mounting hole 6 compared to the outer diameter of the LED 8 suffices for guaranteeing said press fit. Alternatively, the LED 8 or the head 1, 1b is formed at least partly from a soft

plastic material such as TPE. The head material can be optionally transparent or translucent. The head 1b is sealingly closed from the rear with a cover 12 (see FIG. 6) following insertion of the LED and the encapsulation 9. The LED can be fastened in the head by any other method. An alternative production method involves, for example, injection-molding around the LED in the die in which the head 1 is injection-molded. As other alternatives, the LED can be welded in, fitted in, adhesive-bonded or cast in. Also, the LED (or the function element) can be installed from above (that is, from the bristle plane) or between halves of the head.

The cover 12 has in the interior of the head 1 on a section facing the LED rear side a region 16 which is in direct contact with the LED rear side. This region is constructed preferably as a rod-shaped protrusion on the inner side of the cover 12. It is thus assured, in addition or as an alternative to the press fit, that the LED 8 cannot be pressed into the interior of the head 1. Lateral shoulders on the side opposite the LED provide for its positive engagement with inner sections of the head so that said positive engagement also makes it impossible for the LED 8 to project out beyond the head.

Similar variants are possible for the construction of the ramp 5. Preferably, the ramp 5 is injection-molded in one integral piece with the head 1. Alternatively, the ramp is manufactured in an additional injection molding step, adhesive-bonded, joined, welded or snap-fitted. The ramp can be made from a hard or a soft plastic material.

FIG. 5 shows a top plan view of the head of the toothbrush of FIG. 1, in which the LED 8 is inserted in the mounting hole 6 and the bristle tufts 13 are secured in the apertures 3. In this representation too, only the head 1 of the toothbrush is shown, the neck adjoining the breakaway line 2. The neck connects in turn the handle to the head of the toothbrush. As becomes apparent from this top plan view, the region above the LED is devoid of oral care elements or bristle tufts 13. A large amount of light, obtained from the light intensity and the area to be illuminated, thus passes unhindered directly onto the teeth or the area of teeth provided with toothpaste. It is easier therefore to activate certain activating agents in a toothpaste provided specifically for this application. Because there are no oral care elements on the ramp 5 either, a sufficiently large region forms at the bristle ends for light to pass through unhindered even though, as proposed in this embodiment, bristle tufts are arranged at an inclination (see FIG. 5 and the side view of FIG. 9). A region with a diameter of 2 to 6 mm, in particular 3 to 4 mm, above the LED thus remains free of bristle ends. The light emitted from the LED can thus emerge unhindered in a light cone of 5 to 20°.

FIG. 6 shows a longitudinal section through the head 1 along the line A-A of FIG. 5. As becomes apparent from this representation, the LED is positioned with its vertical optical main axis perpendicular to the longitudinal axis 14 of the toothbrush. Alternatively, the LED can be positioned in the head at an angle, in particular to the longitudinal axis 14 of the toothbrush.

FIG. 7 shows an enlarged detail inside the circle A of FIG. 6 in order to present the region of the ramp 5 and the LED on an enlarged scale.

FIG. 8 shows a section through the head 1 along the line C-C, which forms a transverse axis to the main axis 14 of the toothbrush. The LED 8 protrudes approximately 2 mm beyond the plane tufting surface or outer surface 4. In this embodiment, the ramp protrudes between 1.5 and 2 mm beyond the plane tufting surface or outer surface 4. The angle of inclination of the ramp amounts to between 30 and 50° or 20 and 60° (= 180°-α or 180°-β) relative to the outer surface 4. These dimensional values can be varied. The ramp 5 according to the views of FIGS. 7 and 8 thus has oblique sides (see the schematic example in FIG. 2). The exact dimensions of the ramp 5 are constructed to be different or asymmetric in the four radial directions around the LED in order to enable the area directly adjacent to the ramp to be tufted with bristles. Although the ramp 5 along the longitudinal axis 14, as shown in FIG. 7, does not extend down to the outer surface 4 of the fastening plane of the bristle tufts 13, a sufficient protective function for the teeth is assured. By comparison, the ramp 5 extends in the transverse direction of the head with its inclined surfaces as far as the lower level of the outer surface 4 so that the protective effect in relation to the teeth is greater in this embodiment in the transverse direction than the protective effect in the longitudinal direction along the longitudinal axis 14. This is owed, among other things, to the fact that fewer supporting bristle tufts 13 are provided next to the ramp 5 in the transverse direction than in the longitudinal direction along the axis 14.

As becomes further apparent from FIG. 7, the LED projects up by a few tenths of a millimeter beyond the level of the ramp 5. Through the rounded form of the LED 8 this has no negative effects for the user. In one variant, the LED 8 is vertically positioned relative to the mounting hole 6 such that no gap is formed between the mounting hole 6 and the LED inside the ramp 5. Accordingly, the LED 8 can be positioned vertically along the optical longitudinal axis of the LED 8 such that it protrudes farther beyond the ramp 5 or is embedded deeper into the ramp 5 or has its top flush with the ramp 5. The optical radiation angle of the LED is thus varied. In this arrangement, the mounting hole 6 can be used as a light-reflecting or light-guiding duct for the light emitted from the LED. This effect can be amplified by lending a white color or more intensely reflecting properties to the plastic

surrounding the mounting hole 6 for the LED 8. In this way the fraction of diffused light can be increased.

FIG. 9 shows a side view of the head 1 of FIG. 5. The tufting pattern of this head is evident from FIG. 9 in combination with FIG. 5. Two outer rows of bristle tufts are inclined towards the handle, two inner rows are inclined towards the distal head end, and one front group of bristles is inclined likewise towards the distal head end. The ramp 5 can be combined with any other tufting pattern. Also possible is a combination of the ramp with a tongue scraper (on the rear side of the head).

The toothbrush head is manufactured preferably in the following sequence of processes or parts thereof. Injection-molding of the brush head 1, with the ramp 5 and the rest of the head geometry being formed from a hard plastic component. Next the head 1 is tufted with bristles. All known tufting methods are available for this. Preferably, the anchor tufting method is selected. Then the bristle ends are cut to the proper length and end-rounded. Next the LED 8 is installed through the mounting hole 6, and the inner cavity in the head 7 is closed off by the cover 12. The cover 12 is caused to fuse with the surrounding material preferably by laser welding, heated tool welding, ultrasonic welding or other thermal melting methods in order to obtain a sealing joint. Other closing methods such as snap-locking or adhesive-bonding are also possible.

In an alternative approach, a ramp is inserted into the mounting hole 6 after the head is injection-molded and tufted. Alternatively, the ramp is inserted after the injection-molding operation and then the head is tufted. In this case the ramp is constructed preferably from a different material than the head. Then the LED is inserted through the hole 6.

In another alternative approach, the brush head is injection-molded together with the LED and the wiring and then equipped with bristles or other cleaning elements.

In yet another alternative approach, the ramp and the remaining brush head 1 are manufactured by the two-component or multi-component injection molding method. In this case the ramp can be made from, for example, a soft plastic material and the head from a hard plastic material. All the above described approaches can be combined with each other at random.

CLAIMS

What is claimed is:

1. An oral care device having a handle and a head (1) connected or connectible thereto, on which oral care elements (13), in particular cleaning bristles and/or elastomer cleaning elements are provided, with an electrically operable function element (8) being arranged on an outer surface (4) of the head (1), characterized in that a ramp (5) is provided adjacent to the function element (8).

2. The oral care device according to claim 1, characterized in that the function element (8) is arranged adjacent to and/or between the oral care elements (13).

3. The oral care device according to at least one of the preceding claims, characterized in that the function element (8) is constructed as a light emitting source, in particular an LED, as a toothpaste conveyor, a sensor or an actuator for, for example, a sound or a movement or a vibration.

4. The oral care device according to at least one of the preceding claims, characterized in that provision is made for oral care elements (13) which are connected on a first level (4) to the outer surface (4) of the head, and that the function element (8) extends to a second level which differs from said first level (4), and that the ramp (5) bridges at least part of the difference in height between said first and said second level.

5. The oral care device according to at least one of the preceding claims, characterized in that the oral care elements (13) are arranged on a plane of the head (1) and the ramp (5) is constructed to ascend or descend in an oblique or arched configuration relative to said plane.

6. The oral care device according to at least one of the preceding claims, characterized in that the function element (8) is arranged partly in the head (1) and partly projecting therefrom.

7. The oral care device according to at least one of the preceding claims, characterized in that the ramp (5) and the head (1) are injection-molded from the same plastic component.

8. The oral care device according to at least one of the claims 1 to 6, characterized in that the ramp (5) is injection-molded from a different plastic component than the head (1).

9. The oral care device according to claim 8, characterized in that the ramp (5) is constructed from a soft plastic material, in particular elastomer, and the head (1) from a hard plastic material, in particular PP or PE.

10. The oral care device according to at least one of the preceding claims, characterized in that the ramp (5) is arranged directly around the function element (8) at least in a radial direction.

11. The oral care device according to at least one of the preceding claims, characterized in that the function element (8) is secured in the head (1) by a press fit.

12. The oral care device according to at least one of the preceding claims, characterized in that said oral care device is constructed as a manual or electric toothbrush and/or the function element (8) as an LED which is arranged in protruding fashion in the cleaning region.

13. The oral care device according to at least one of the preceding claims, characterized in that the oral care elements are arranged on the head (1) at a distance from the function element (8), such that a free region devoid of oral care elements is provided above the function element.

14. The oral care device according to at least one of the preceding claims, characterized in that the function element (8) and the ramp (5) are integrally made of one piece.

15. The oral care device according to at least one of the preceding claims, characterized in that the function element (8) is arranged in the half close to the distal end of the head (1).

16. The oral care device according to at least one of the preceding claims, characterized in that a tangent applied to the oblique or curved or arched ramp (5) forms an obtuse angle (α , β) with the outer surface (4) of between 110 and 170°, preferably between 120 and 150°.

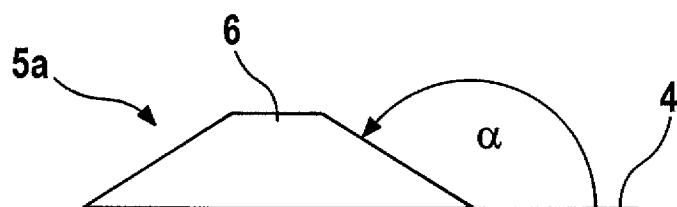
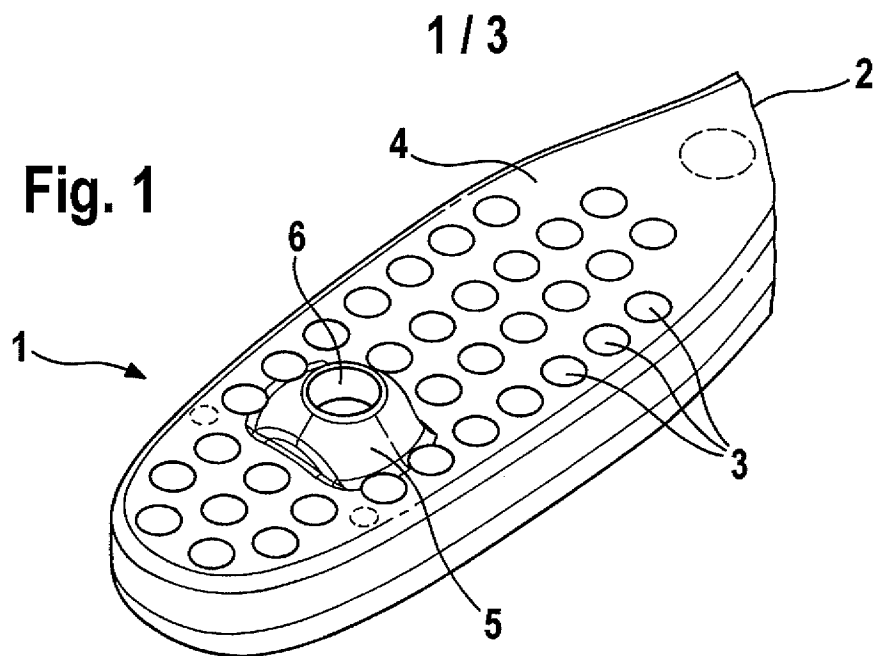


Fig. 2

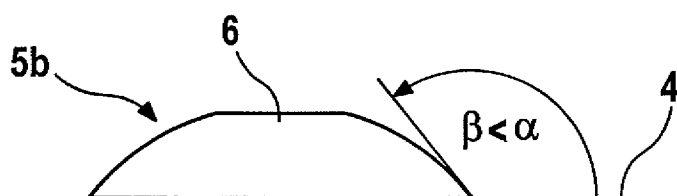
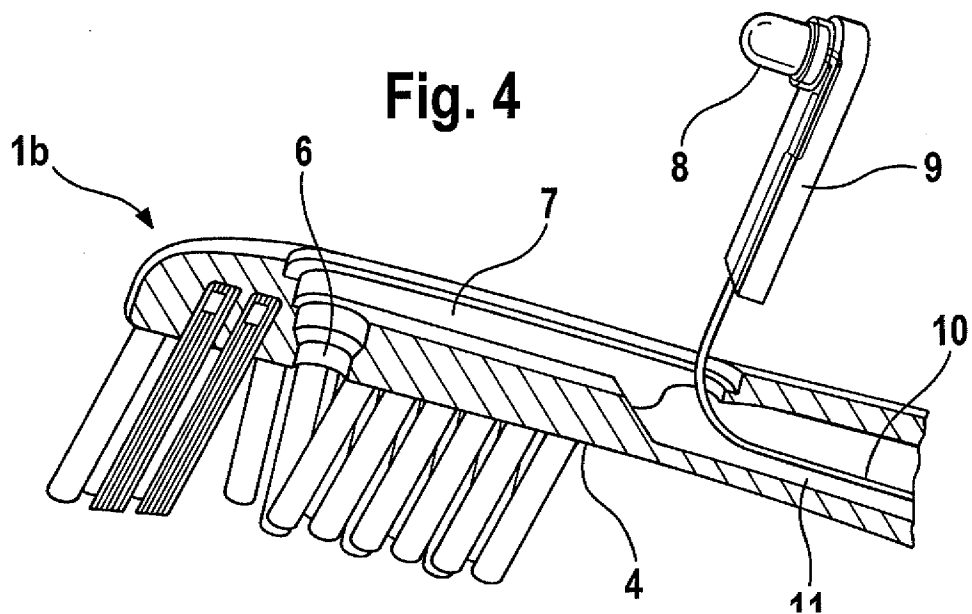


Fig. 3



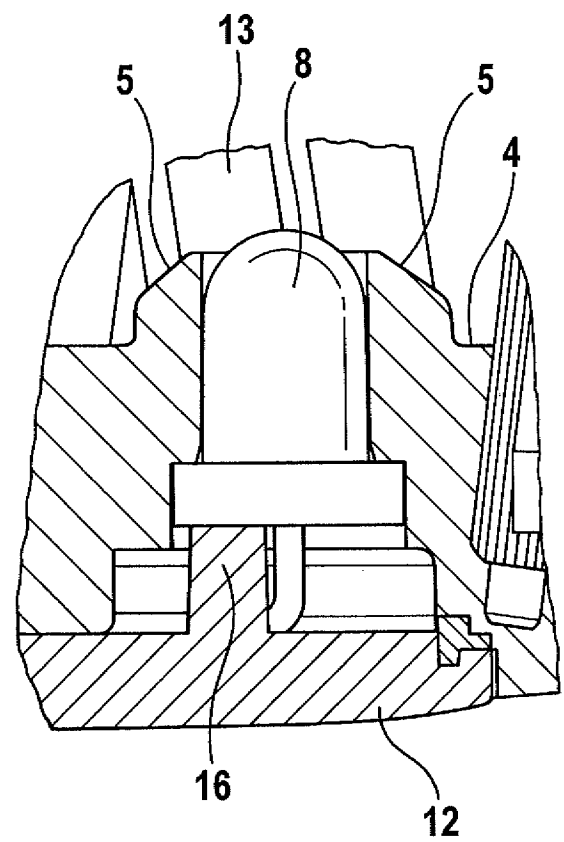
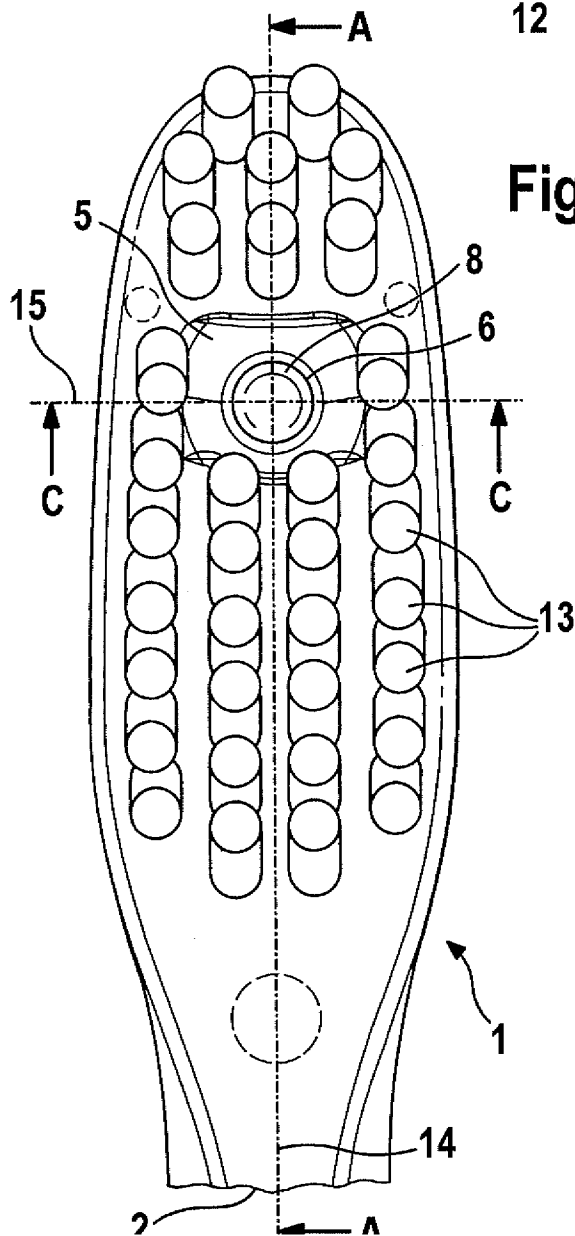
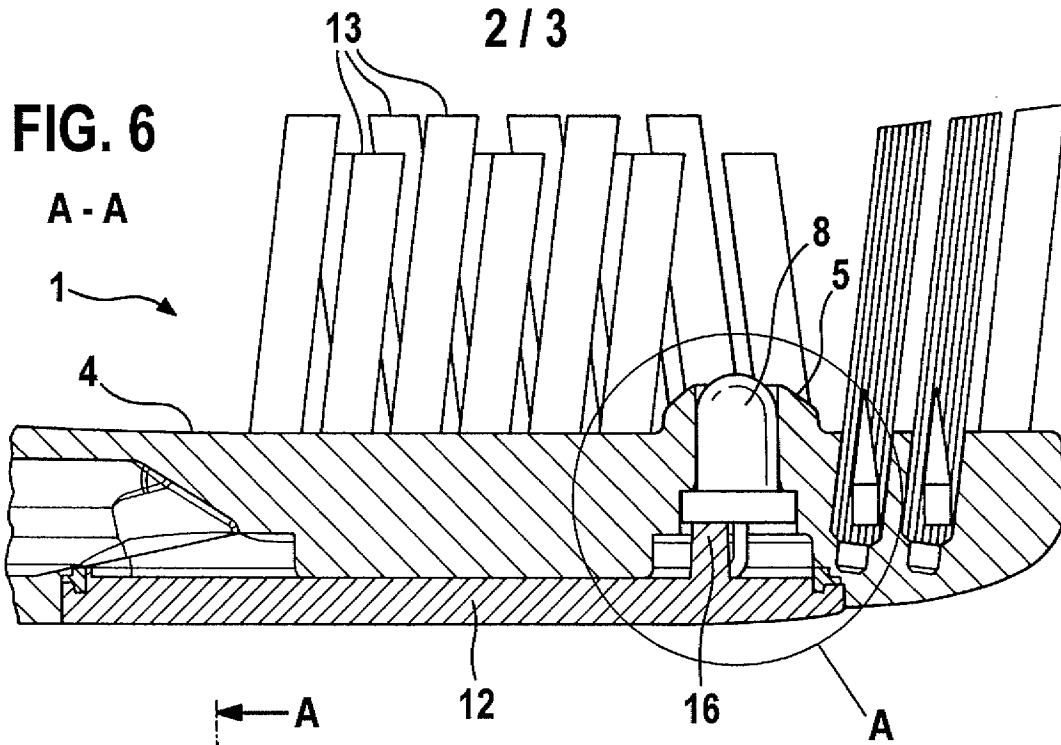


Fig. 7

3 / 3

FIG. 8
C - C

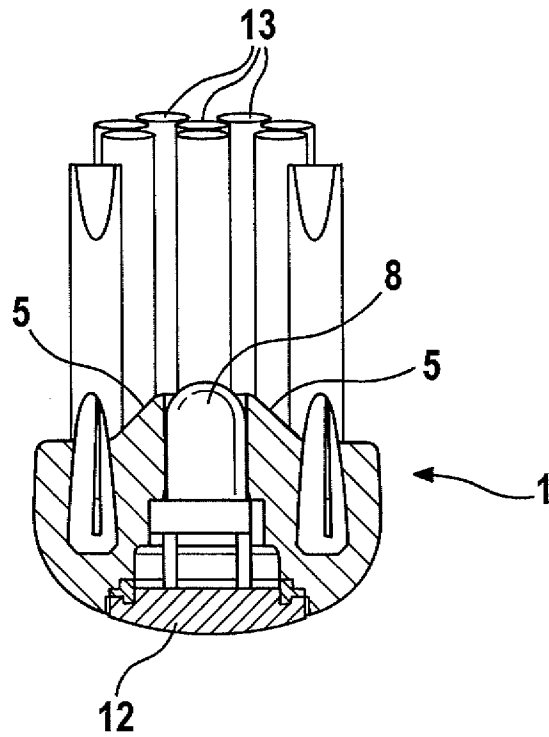
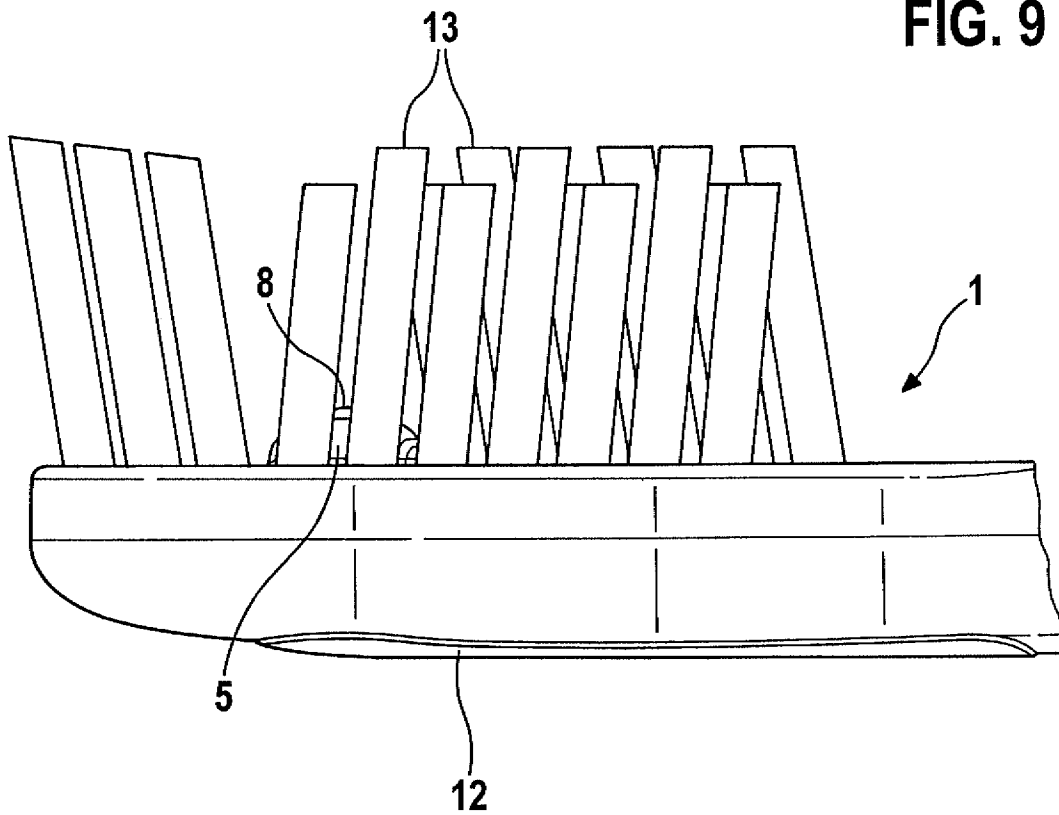


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/053812

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61C17/22 A46B9/04 A46B7/04 A46B9/06 A46B15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61C A46B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/011836 A1 (BREWER GERALD K [US] ET AL) 18 January 2007 (2007-01-18) paragraphs [0084], [0107] - [0110]; figures 1,3,4	1-6,8-14
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☐ Further documents are listed in the continuation of Box C.

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17 December 2009

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Information on patent family members

International application No

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