(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 June 2011 (30.06.2011)

PCT

(10) International Publication Number
WO 2011/077282 A1

(51) International Patent Classification:
A46B 15/00 (2006.01) *A61C 17/22* (2006.01)

(21) International Application Number:
PCT/IB2010/055333

(22) International Filing Date:
22 November 2010 (22.11.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/289,476 23 December 2009 (23.12.2009) US

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,

[Continued on next page]

(54) Title: POSITION SENSING TOOTHBRUSH

(57) Abstract: The toothbrush includes a handle portion (12 or 55) and a brushhead portion (14 or 57) with a bristle set (20 or 53) at one end of the brushhead. At least one sensor (16 or 56 is located either on the handle of the toothbrush or on the bristle set back plate (54) of the toothbrush. When the sensor is located on the handle of the toothbrush, the position of the brushhead is determined by a processor (44 or 58) relative to the inside or outside surfaces of the teeth on the basis of the temperature detected by the sensor, either the outside environmental temperature or the skin temperature of the user. When the sensor is located on the bristle set back plate, the determination is made on the basis of the position of the bristle set relative to the cheek of the user.

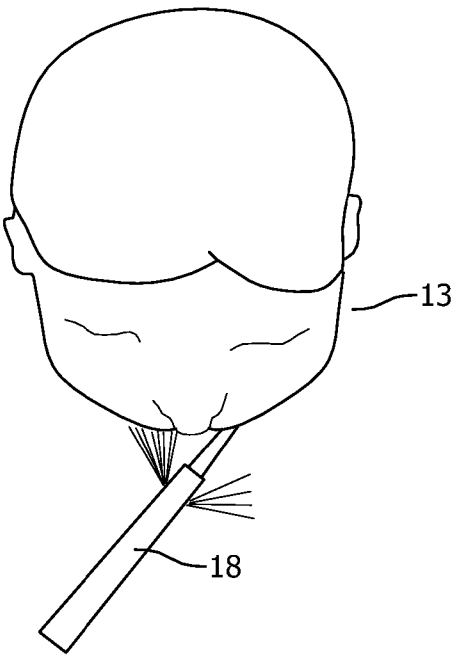

FIG. 7

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ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

POSITION SENSING TOOTHBRUSH

[001] This invention relates generally to toothbrushes, and more specifically concerns the determination of the position of the toothbrush bristles in the mouth, including how far the toothbrush is into the mouth, and whether the user is brushing the inside or outside surfaces of the teeth.

[002] Careful brushing of all the teeth in the mouth is important for good dental health. The teeth in each region of the mouth require careful and complete attention. In order to accomplish this, it is helpful to give feedback to users concerning how long a user brushes in each region of the mouth. This encourages the user to carefully brush all their teeth, spending sufficient time in each region. Previous arrangements for determining time spent in each region have utilized sensors to determine the position of the bristle set. However, such systems have the disadvantage of requiring a reference point or known starting position to determine the position of the bristle set in the mouth of the user, *i.e.* the position of the bristles relative to the teeth.

[003] Accordingly, it is desirable to provide reliable information back to the user concerning the position of the bristle set in the mouth, preferably with an inexpensive system. This will be helpful in overcoming incomplete brushing habits.

[004] In one embodiment, the toothbrush is capable of sensing the position of the bristle set position and a brushhead portion thereof relative to the tooth and comprises: a toothbrush which includes a handle portion and a brushhead portion with a bristle set at one end thereof for cleaning the teeth of a user; at least one sensor located on said toothbrush such that it is outside the mouth when the bristle set is in position to brush the teeth, the sensor being responsive to temperature, wherein the sensor is oriented such that it detects the temperature of the skin when the bristle set is in a position adjacent one of the outside or inside surfaces of the teeth, and detects the environmental temperature outside the mouth when the bristle set is in a position adjacent the other of the outside or inside surfaces of the teeth; a processor within the toothbrush responsive to the temperature information from the sensor for determining whether the bristle set is in position to brush the outside surfaces or inside surfaces of the teeth; and an indication

system responsive to the processor for indicating to the user the position of the bristle set relative to the teeth.

[005] In another embodiment, the toothbrush is capable of sensing the position of the bristle set portion thereof relative to the teeth, and comprises: a toothbrush which includes a handle portion and a brushhead portion, with a bristle set at one end thereof for cleaning the teeth of a user; at least one sensor located on a back member for the bristle set for providing orienting information of the sensor relative to the cheek of the user; a processor responsive to the orienting information to provide an output indicating whether the bristle set is positioned adjacent the outside surfaces of the teeth or the inside surfaces of the teeth; and an indicator system responsive to the processor for indicating to the user whether the bristle set is in position to brush the outside surfaces of the teeth or the inside surfaces of the teeth.

[006] In another embodiment, the toothbrush is capable of sensing how far a toothbrush penetrates into the mouth, and comprises: a toothbrush which includes a handle portion, a neck portion and a bristle set portion at a distal end of the neck portion for cleaning teeth of a user; a plurality of light sources positioned in a sequence along the neck portion of the toothbrush, the light sources oriented such that the relative number of lights within the mouth and outside of the mouth is indicative of the portion of the toothbrush which is in the mouth; and a receiver for receiving light from uncovered light sources outside the mouth, wherein the light sources are differentiated from one another by a selected characteristic, where the receiver includes a system for indicating to the user how far the toothbrush has penetrated into the mouth.

[007] Figures 1 and 2 are simple elevational views for a first embodiment of a toothbrush with one and two IR sensors.

[008] Figures 3-6 are simplified diagrams showing brushing coverage relative to a set of teeth.

[009] Figures 7-9 are illustrations of the position of the toothbrush in a user's mouth and the direction of the IR sensor.

[0010] Figure 10 is an elevational view of one variation of a second embodiment of the position sensor.

[0011] Figures 11 and 12 are brushing diagrams for the embodiment of Figure 10.

[0012] Figures 13 and 14 are elevational and top views of a further variation of the second embodiment.

[0013] Figure 15 is an elevational view of another variation of the second embodiment.

[0014] Figure 16 is an elevational view of a still further variation of the second embodiment.

[0015] Figure 17 is an elevational view of yet another variation of the second embodiment.

[0016] Figure 18 is a schematic view of a system for determining how far the toothbrush extends into the mouth.

[0017] Figures 1-9 illustrate the structure of a first embodiment of the toothbrush described herein and the possible positions of the bristle set portion of the toothbrush in the mouth. Sensors are used on the toothbrush handle, which is outside of the mouth during brushing, to determine the orientation of the bristle set relative to the teeth when the bristle set is in the mouth in particular, whether the bristles are in position for brushing the outside surfaces of the teeth or the inside surfaces of the teeth. In the embodiment of Figures 1-9, a toothbrush 10, typically a power toothbrush, which includes a handle portion 12 and a brushhead portion 14, includes at least one sensor 16 near the upper end 18 of handle 12. At the distal end of brushhead 14 is a bristle set 20, fixed to a bristle plate or back member 24. Sensors 16 in the embodiment shown are IR sensors, which are responsive to temperature. Figure 1 shows an arrangement with a single IR sensor, while Figure 2 shows two IR sensors, approximately 180° apart. While Figures 1 and 2 show the sensors in the toothbrush handle, they could be on the neck of the toothbrush, as long as the sensors remain outside of the mouth.

[0018] Figure 7 shows the toothbrush 10 in the mouth of a user 13. Figures 8 and 9 show a toothbrush 10 with two sensors 25 and 27 oriented so that when bristles 26 are oriented against the outside surfaces 28 of the teeth (Figure 9), sensor 25 is pointed away from the skin of the user toward the environment (arrow 32), measuring ambient temperature (72° F), while the other sensor 27 is pointed toward the skin of the user (arrow 36) and will measure body temperature

(98.6°F). When toothbrush 10 is positioned so that the bristles 25 are oriented against the inside surfaces of the teeth (Figure 8), sensor 25 will be pointing in the direction of the skin (arrow 37) and sensor 27 will be pointing toward the environment (arrow 38).

[0019] It should be understood that only one sensor can be used and still provide effective results, since in one orientation of the toothbrush, the sensor will read 98.6°F, while in the other orientation, the sensor will read the environment temperature, 72°F, for example. In either case, using two sensors or one, the temperature information obtained by the sensor(s) is applied to microprocessor 44 (Figure 1) within the toothbrush, wherein the microprocessor, having been programmed relative to the temperatures measured by the sensors and the position of the toothbrush, will make a determination of the position of the bristles. It will then send this information to a display device 42, which is typically, but not necessarily, separate from the toothbrush. The display, for instance, could be in a charger assembly for the toothbrush. It could be on a separate display or even on the toothbrush. The system could also provide an audible indication of bristle position. In any event, the system provides an indication to the user of the orientation of the bristles relative to the teeth.

[0020] Figures 3-6 illustrate the regions of the mouth that can be determined (inside tooth surfaces or outside tooth surfaces) by the arrangement discussed above and shown in Figures 1 or 2. Figure 3 shows the combined outside surfaces 37 and inside surfaces 38.

[0021] An accelerometer or inclinometer 45 can be added to the toothbrush 10, which, with the sensors, provides an ability of the toothbrush to distinguish four zones in the mouth, in particular, left and right sides of the mouth, and the inside and outside teeth surfaces. Figures 4 and 5 illustrate the coverage of a 180° difference in the inclination of the bristles when brushing the regions 39 and 40 (Figure 4), and regions 41 and 42 (Figure 5). Figure 6 illustrates the four zones together.

[0022] Further, the chewing surfaces of the teeth can also be identified by means of two additional temperature sensors positioned at approximately 90° to the original two temperature sensors. All of the temperature and accelerometer/inclinometer information is provided to the microprocessor 44, which determines which region of the teeth the bristles are directed toward or against. While IR sensors have been disclosed, other sensors and techniques could be used to

detect the presence of the face as approved to the environment. Those could include reflective or triangular IR sensing, capacitive sensing, proximity sensing, or even sonar (acoustic distance sensor) or laser sensing.

[0023] In the particular embodiment and variations thereof Figures 10-18, the object again is to determine whether the bristles and the toothbrush are oriented toward the outside or the inside surfaces of the teeth. These variations accomplish the bristle position determination relative to the interior surface of the cheek of the user. In each of the variations, a sensor assembly is positioned on the bristle back plate. When brushing the inside of the teeth, the sensor assembly will face the inside of the mouth away from the cheek, while when brushing the outside surfaces of the teeth, the sensor assembly will face the interior surface of the cheek. The different sensor output between these two positions is processed to provide an indication to the user of the position of the bristles. Figures 11 and 12 show a toothbrush 50, with a handle 35 and a brushhead 57, positioned in a user's mouth, shown generally at 52. In Figure 11, the bristles 53 are positioned against the inside surfaces of the teeth, such that the sensor 56 on the bristle back plate 54 faces the inside of the mouth. In Figure 12, the toothbrush 50 is oriented so that the bristles 53 are positioned against the exterior surfaces of the teeth. In this position, the sensor 56 faces the cheek of the user.

[0024] There are several embodiment variations disclosed herein relative to different sensors suitable for differentiating between the bristles facing the mouth region or facing the cheek of the user. Figure 10 shows one embodiment variation in which a bristle back plate 54 of the toothbrush 50 is equipped with an infrared temperature sensor 56. When the outside surfaces of the teeth are being brushed, sensor 56 will measure the temperature of the cheek. When brushing the inside surfaces of the teeth, sensor 56 will measure the temperature inside the mouth. Since there is a temperature difference, the two positions of the bristles can be distinguished. The measured temperature values determined by the sensor are provided to a microprocessor illustrated generally at 58 in the toothbrush 55, which is programmed via a look-up table or the like to provide an indication of the position of the bristles to a display 59 which, like the embodiments described above, can be part of a separate unit, such as a charging unit. The information is provided typically by IR (infrared) communication. The display could also

be on the toothbrush itself or another display device apart from a charger. It could be visual, audible or other type of indication.

[0025] In the variation of Figures 13 and 14, bristle back plate 60 is equipped with an optical fiber 62. The fiber 62 extends in a loop from the handle 64 of toothbrush 65 through the back of the bristle set and then back to the handle. At one end of the fiber 62, an LED 63 is mounted that provides light which moves through fiber 62. On the other end of the fiber is a light sensor 66 which measures the intensity of the light coming out of the fiber. When the outside surfaces of the teeth are being brushed, the optical fiber 62 will touch the cheek. Due to this cheek contact, there will be a change of the refractive index at the border of the fiber. Some light will now escape from the fiber and the light intensity sensed by light sensor 66 decreases compared to when the bristles are only adjacent the inside surfaces of the teeth. The sensor provides a different value of light intensity to the toothbrush microprocessor, depending upon whether the inside or outside surfaces of the teeth are being brushed. The microprocessor provides an indication of the position of the bristles to the user through a display or other communication means, as discussed above.

[0026] Figure 15 shows another variation, in which a metal plate 70 is mounted at the bristle back plate 72. Plate 70 is covered with a thin layer of plastic. The capacitance of metal plate 70 changes when the metal plate touches the cheek. The capacitance of the plate can be measured by a sensor. When brushing the outside surfaces of the teeth, the capacitance of the plate will be higher due to contact with the cheek. When the inside surfaces of the teeth are being brushed, the capacitance will be lower due to lack of skin contact. The capacitance sensor 72 provides the capacitance values to a microprocessor in the toothbrush, which will then provide an indication to the user of whether the inside or outside surfaces of the teeth are being brushed on a display such as disclosed above.

[0027] Still another variation is shown in Figure 16, wherein the bristle set back plate 80 contains an IR LED 82 and an IR detector 84. The detector 84 detects light that is emitted from the LED. When the back plate of the bristle set is in contact with the cheek, the IR LED 82 and IR detector 84 will be partly covered by the skin of the cheek. The light intensity measured by the detector 84 will be low. When the inside surface of the teeth are being brushed, the light

intensity detected by the detector will be higher. The light intensity information is provided to a microprocessor in the toothbrush, which in turn provides an indication to the user of whether the bristles are adjacent the inside or outside surfaces of the teeth. In addition, the sides of the bristle back plate can be equipped with an IR LED and detector combination 86, which will enable detection of additional toothbrush orientations.

[0028] Another variation is shown in Figure 17. The bristle back plate 90 contains a contact switch 94. When the outside surfaces of the teeth are being brushed, the bristle back plate will touch the cheek and switch 94 will be triggered, providing an indication of the position of the bristles relative to the teeth. When the inside surfaces of the teeth are being brushed, switch 94 will not be triggered. The signal (or lack thereof) from switch 94 will be processed by a microprocessor and an indication provided to the user of the position of the bristles in the mouth.

[0029] Figure 18 shows an embodiment which determines how far a toothbrush is inserted into the mouth. The toothbrush 100 is shown with a handle 105, a bristle set 107 and a plurality of LED light sources 102-102 positioned along the neck 104 of the toothbrush. In this embodiment, at least one but preferably two or more LEDs are provided. Each LED has a different emitting characteristic, such as a different frequency. The LEDs produce light which is transmitted to a receiver 106. In operation, as the toothbrush is inserted into the mouth, one or more of the LEDs will be covered, eliminating that characteristic from being transmitted and received by the receiver. The receiver determines the frequencies of light which it receives. That information is provided to a microprocessor, typically in the receiver, which calculates how far the toothbrush is positioned into the mouth. That information is then provided as a display 108, typically on the receiver. The elements on the neck of the toothbrush could also be temperature sensors. In this arrangement, no external light receiver is necessary.

[0030] As a variation of the embodiment of Figure 18, at least four infrared temperature sensors can be provided, with a 3-D accelerometer, in addition to the LEDs (or temperature sensors) on the neck of the toothbrush. The information from the various sensors can then be processed by the microprocessor to determine a specific region of the mouth being brushed.

[0031] Hence, several embodiments have been disclosed which provide information to the user concerning the position of the bristles in the mouth relative to the teeth. This allows the user to ensure appropriate brushing of all regions of the teeth.

[0032] Although preferred embodiments of the invention have been disclosed for purposes of illustration, it should be understood that various changes, modifications and substitutions may be incorporated in the embodiments without departing from the spirit of the invention, which is defined by the claims which follow.

Claims

1. A toothbrush capable of sensing the position of a bristle set portion thereof relative to the teeth, comprising:

a toothbrush (10) which includes a handle portion (12) and a brushhead portion (14) with a bristle set (20) at one end thereof for cleaning the teeth of a user;

at least one sensor (16) located on the toothbrush at such a location that it is outside the mouth when the bristle set is in position to brush the teeth, the sensor being responsive to temperature, or other skin characteristic, wherein the sensor is oriented such that it detects the temperature of the skin when the bristle set is in a position adjacent one of either the outside or inside surfaces of the teeth, and detects the environmental temperature outside the mouth or the absence of said other skin characteristic when the bristle set is in a position adjacent the other of the outside or inside surfaces of the teeth;

a processor (44) within the toothbrush responsive to the temperature information or information of the other skin characteristic from the sensor for determining whether the bristle set is in position to brush the outside surfaces or inside surfaces of the teeth; and

an indication system (42) responsive to the processor for indicating to the user the position of the bristle set relative to the teeth.

2. The toothbrush of claim 1, including two sensors approximately 180° apart on the handle, each responsive to temperature and oriented such that when one sensor is measuring the skin temperature, the other is measuring the temperature outside of the mouth and vice versa.

3. The toothbrush of claim 1, including an accelerometer or inclinometer, (45), wherein information from the accelerometer or inclinometer is provided to the processor which determines which side of the mouth the bristle set is located.

4. The toothbrush of claim 1, wherein the sensors are IR (infrared) sensors.

5. The toothbrush of claim 1, wherein the sensors are located on the handle of the toothbrush.

6. The toothbrush of claim 1, including two additional sensors for detecting the toothbrush being present relative to the teeth in the upper or lower jaws.

7. The toothbrush of claim 1, wherein the toothbrush is a power toothbrush.

8. The toothbrush of claim 1, wherein the indicator system is a visual display separate from the toothbrush.

9. A toothbrush capable of sensing the position of a bristle set portion thereof relative to the teeth, comprising:

a toothbrush (50) which includes a handle portion (55) and a brushhead portion (57), with a bristle set (53) at one end thereof for cleaning the teeth of a user;

at least one sensor (56) located on a back member (54) for the bristle set for providing orienting information of the sensor relative to the cheek of the user;

a processor (58) responsive to the orienting information to provide an output indicating whether the bristle set is positioned adjacent the outside surfaces of the teeth or the inside surfaces of the teeth; and

an indicator system (59) responsive to the processor for indicating to the user whether the bristle set is in position to brush the outside surfaces of the teeth or the inside surfaces of the teeth.

10. The toothbrush of claim 9, wherein the sensor is located on a back surface of the bristle set.

11. The toothbrush of claim 9, wherein the sensor is an IR temperature sensor to distinguish between the cheek and the interior of the mouth.

12. The toothbrush of claim 9, wherein the sensor is an optical fiber assembly (62) which differentiates between the interior of the mouth and the cheek by the intensity of light present at a receiver end (66) of the optical fiber from an LED source (63) at a transmittal end thereof.

13. The toothbrush of claim 9, wherein the sensor includes a capacitive element (70) and a system (72) for sensing the capacitance thereof, wherein the capacitance of the capacitive element increases when the bristle set is close to the cheek of the user as opposed to away from the cheek.

14. The toothbrush of claim 9, wherein the sensor is an infrared LED (82) and an infrared detector (84), wherein light intensity detected by the detector will decrease as the bristle set back member comes into contact with the cheek.

15. The toothbrush of claim 14, including additional infrared LEDs and infrared detectors (86) positioned on the back member for determination of additional bristle set positions relative to the teeth of the user.

16. The toothbrush of claim 9, wherein the sensor is a switch (94), which is activated when the bristle set back member contacts the cheek of the user.

17. A toothbrush capable of sensing how far a toothbrush penetrates into the mouth, comprising:

a toothbrush (100), which includes a handle portion (106), a neck portion (104) and a bristle set portion (107) at a distal end of the neck portion for cleaning teeth of a user;

a plurality of sensor members (102) positioned in sequence along the neck portion of the toothbrush, the sensor members oriented such that the relative number of sensor members within the mouth and outside of the mouth is indicative of the portion of the toothbrush which is in the mouth; and

a receiver (106) for receiving information from uncovered sensor members outside of the mouth, wherein the receiver includes a system (108) for indicating to the user how far the toothbrush has penetrated into the mouth from the sensor information.

18. The toothbrush of claim 17, wherein the sensor members are light sources, and the receiver is adapted to receive light from uncovered light sources, wherein the light sources are differentiated from one another by a selected characteristic

19. The toothbrush of claim 17, wherein the selected characteristic is frequency, such that the light sources emit different colored light.

20. The toothbrush of claim 19, wherein the light sources are infrared LEDs, each having a different emitting frequency.

21. The toothbrush of claim 17, wherein the sensor members are temperature sensors.

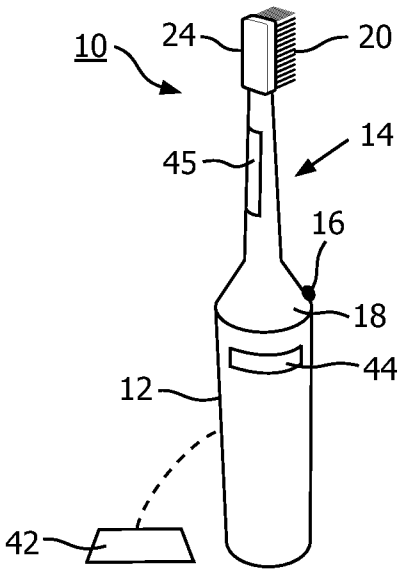

FIG. 1

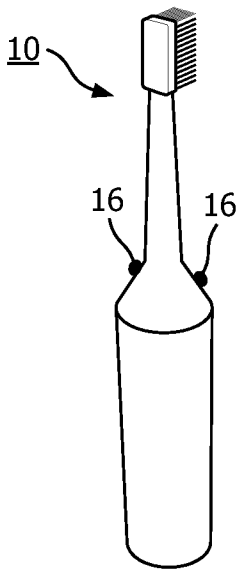

FIG. 2

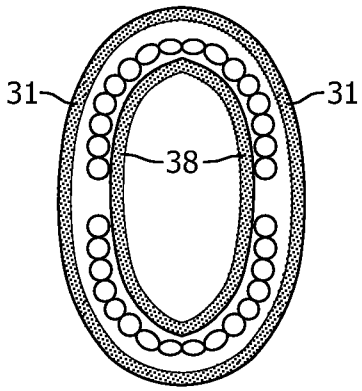

FIG. 3

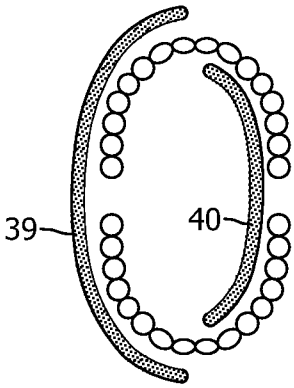

FIG. 4

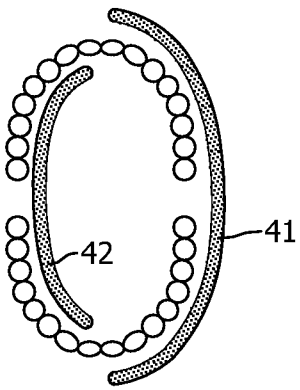

FIG. 5

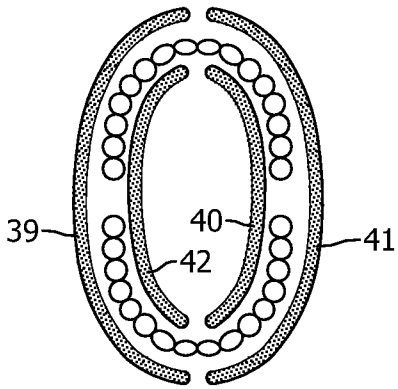

FIG. 6

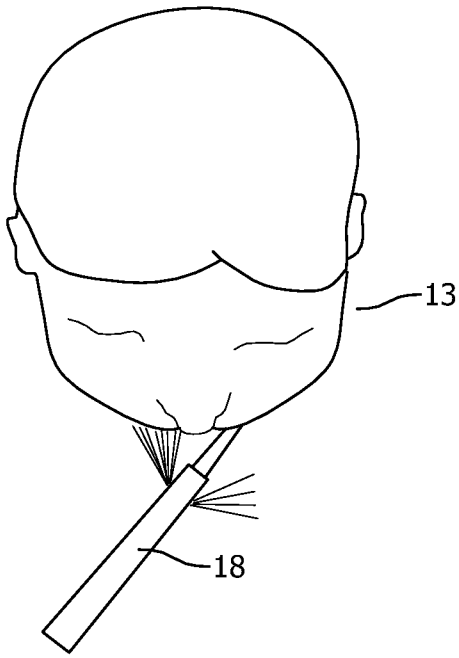

FIG. 7

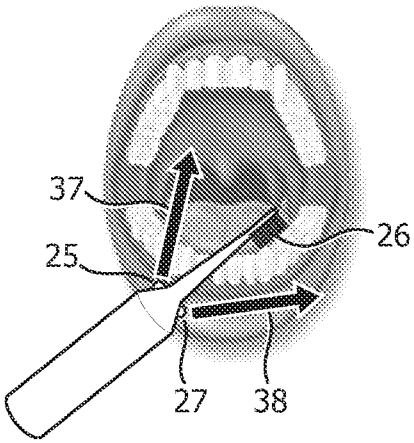

FIG. 8

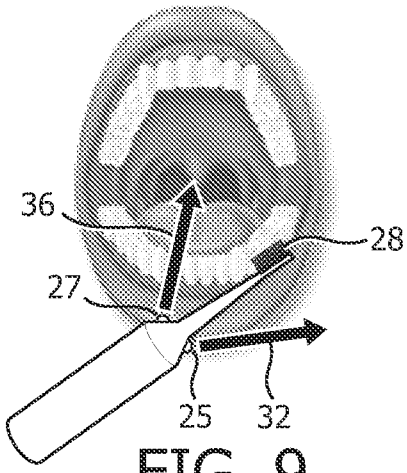

FIG. 9

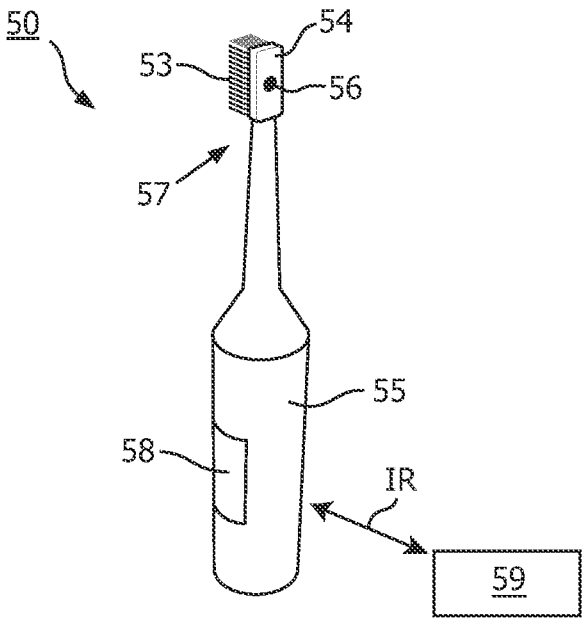

FIG. 10

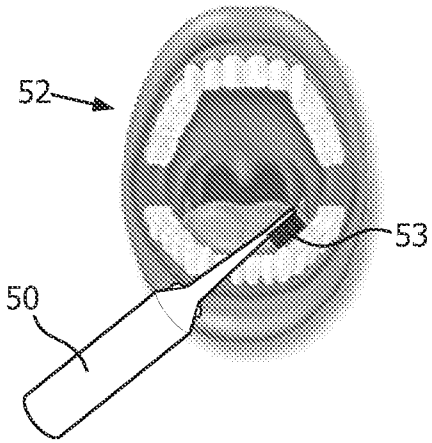

FIG. 11

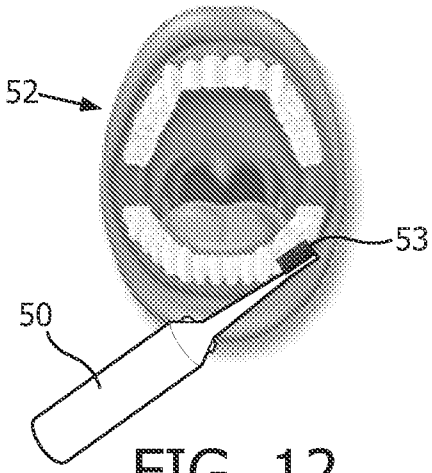

FIG. 12

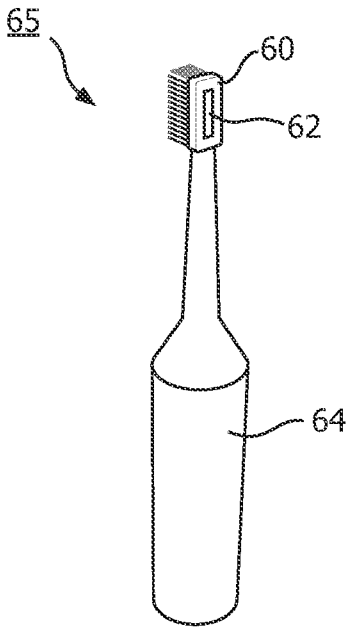

FIG. 13

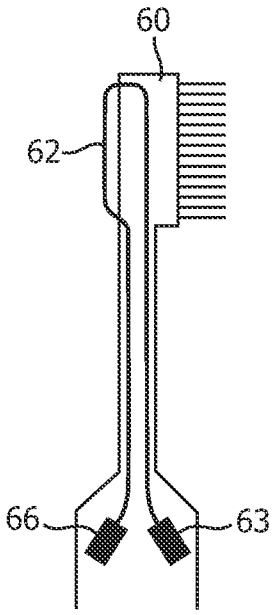

FIG. 14

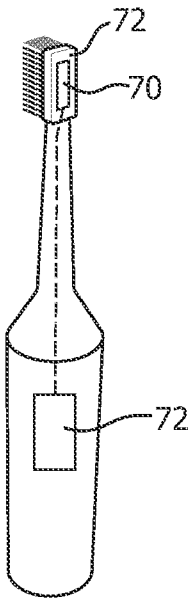

FIG. 15

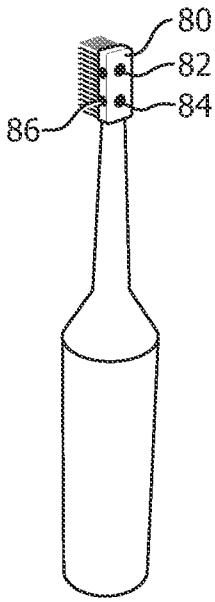

FIG. 16

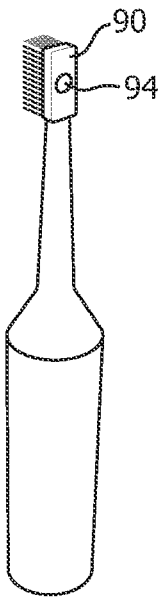

FIG. 17

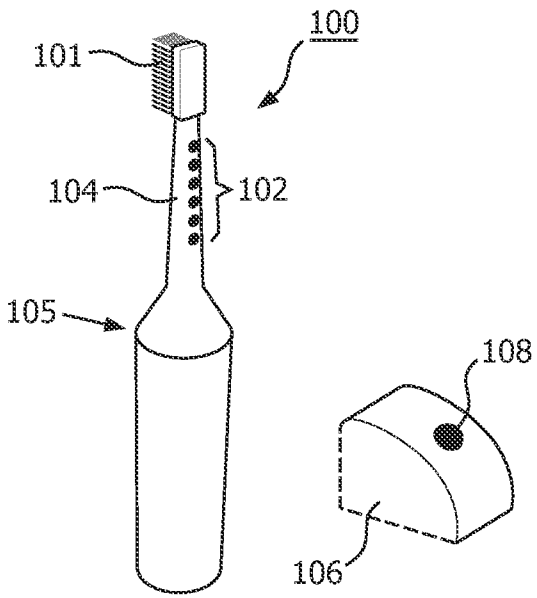

FIG. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/055333

A. CLASSIFICATION OF SUBJECT MATTER
INV. A46B15/00 A61C17/22
ADD.

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)
A46B A61C

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, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2007/112112 A1 (UMAGINATION LABS [US]; PARK SUNG K [US]; DAYTON DOUGLAS C [US]) 4 October 2007 (2007-10-04) page 9, line 31 - page 12, line 2; figures 1,4	17,21
A	US 2009/083924 A1 (SHEPHERD BENJAMIN GREGORY [US] ET AL) 2 April 2009 (2009-04-02) paragraph [0064]; figure 5	17,21

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 March 2011	15/03/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kunz, Lukas

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2010/055333

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1-16, 18-20
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 1-16, 18-20

CLAIMS 1-8
Independent claim 1 defines a toothbrush capable of sensing the position of a bristle set portion thereof relative to the teeth (see lines 1 and 2) including an indication system responsive to a processor for indicating to the user the position of the bristle set relative to the teeth (see lines 15 and 16). There are four possible positions for the bristle set relative to the teeth: on no surface of the teeth, on the chewing surface, on the outer or buccal surface and on the inner or lingual surface. The sensor means, which are solely functionally defined in lines 5 to 11 of independent claim 1, allow a distinction of whether the bristle set is on the left inner surface or the right outer surface on the one hand side or on the right inner surface or the left outer surface on the other hand side. A determination whether the bristle set is on the chewing surface of the teeth or not on any surface of the teeth is impossible. Even holding the toothbrush in front of the user's face would result in a determination that the bristle set is on a side surface of the teeth. Obviously, the claimed sensors do not lead to the result defined in the last two lines of independent claim 1. Therefore, independent claim 1 is so unclear that no reasonable search can be carried out. The features of claim 3 could resolve the ambiguity of whether the bristle set is on the left inner surface or the right outer surface and whether the bristle set is on the right inner surface or the left outer surface, respectively, but does not provide a resolution to the other ambiguities (wrong indication when the bristle set is in the front of a user's face, indication when the bristle set is on the chewing surface, indication when the bristle set is on no surface of the teeth). Claims 2 and 4 to 8 define no further features to resolve the above ambiguities. CLAIMS 9-16 Independent claim 9 defines a toothbrush capable of sensing the position of a bristle set portion thereof relative to the teeth (see lines 1 and 2) including an indicator system responsive to a processor for indicating to the user whether the bristle set is in position to brush the outside surfaces of the teeth or the inside surfaces of the teeth (see lines 10 to 12). For this purpose, at least one sensor is located on a back member for the bristle set for providing orienting information of the sensor relative to the cheek of the user (see lines 5 and 6). The specification discloses the following types of sensors: an IR temperature sensor (see claim 11), an optical fibre transmission sensor (see claim 12), a capacitive sensor (see claim 13), an IR emitter-receiver-sensor (see claim 14) and a switch (see claim 16), which is not a sensor. When brushing the teeth of the lower jaw / mandible, the backside of the brush head is either interfering with the cheek - when the bristle set contacts the outside surfaces of the teeth - or with the tongue - when the bristle set contacts the inside surfaces of the teeth. None of the disclosed sensors is able to distinguish an interference with the cheek and an interference with the tongue. Therefore, the claimed result is not reached by the claimed sensors and thus the set of claims 9 to 16 is so unclear that no search can be carried out. CLAIMS 18-20 According to independent claim 17, a plurality of sensor members are positioned in sequence along the neck

portion of the toothbrush. Sensor members are elements which trigger a signal upon reception of an environmental stimulant such as temperature, light, pressure etc. A light source is thus not a sensor member. Therefore, claims 18 to 20 are so unclear that no search can be carried out for them.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2010/055333

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007112112 A1	04-10-2007	CA 2647749 A1	04-10-2007
		EP 1998863 A1	10-12-2008
		JP 2009530043 T	27-08-2009
		US 2007270221 A1	22-11-2007
US 2009083924 A1	02-04-2009	NONE	