

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 September 2011 (09.09.2011)

(10) International Publication Number
WO 2011/107907 A1

(51) International Patent Classification:
A46B 9/04 (2006.01)

(21) International Application Number:
PCT/IB2011/050774

(22) International Filing Date:
24 February 2011 (24.02.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/714,562 1 March 2010 (01.03.2010) US

(72) Inventor; and

(71) Applicant : SIMOVITZ, Marius [IL/IL]; 5 D'Israeli,
34333 Haifa (IL).

(74) Agent: DR. MARK FRIEDMAN LTD.; Moshe Aviv
Tower, 54th Floor 7, Jabotinsky St., 52520 Ramat Gan
(IL).

(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,
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).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

(54) Title: MULTI-TOOTH-SURFACE BRUSHING DEVICE

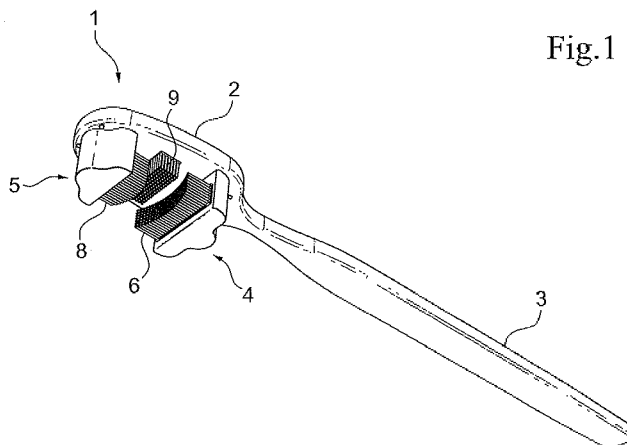


Fig.1

(57) Abstract: A multi-tooth-surface brushing device for improving cleaning capacity by maximizing bristle contact with the lingual, the vestibular and the occlusal tooth surfaces simultaneously throughout the entire brushing process.

WO 2011/107907 A1

MULTI-TOOTH-SURFACE BRUSHING DEVICE

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to toothbrushes and, in particular, it is
5 concerned with improving cleaning capacity by providing brush head
configuration directed at maximizing bristle contact with the lingual, the
vestibular and the occlusal tooth surface simultaneously throughout the entire
brushing process.

It is well known that proper dental hygiene is not a simple matter and
10 requires manipulating the brush head into proper orientations to access all of
the tooth surfaces requiring brushing. Many brushers simply lack the desire to
invest the required effort, or the awareness of what proper brushing requires,
and/or the time and the patience.

US Patent 3, 146, 478 teaches a toothbrush having a rotatable bristle
15 configuration directed at brushing plurality of tooth surfaces simultaneously.
However, the bristles do not provide the abrasive cleaning action normally
provided by the bristle stiffness because the bristles are configured to rotate as
they glide over the teeth. US Patent 6,343,396 teaches a tooth cleaning device
is which the bristles provide the required abrasive action; however, since the
20 bristles are mounted in a single rotatable carriage, the bristles do maintain
contact with the differing lingual and vestibular tooth curvatures.

Therefore, there is a need for a toothbrush configured to clean each of
the tooth surfaces in a manner maintaining optimal contact with lingual,
vestibular, occlusal tooth surfaces simultaneously.

25

SUMMARY OF THE INVENTION

The present invention is multi-tooth-surface brushing device for
brushing lingual, vestibular, occlusal tooth surfaces simultaneously.

According to the teachings of the present invention there is provided a multi-tooth-surface brushing device for brushing a plurality of tooth surfaces simultaneously includes (a) a handle having a head, and (b) at least two opposing brushes pivotably mounted on said head so that when a user's vestibular tooth surface contacts a first of said two opposing brushes, said first
5 vestibular tooth surface contacts a first of said two opposing brushes, said first brush aligns with a vestibular-curvature and when a user's lingual tooth surface contacts a second of said two opposing brushes, said second brush aligns with a lingual-curvature.

According to a further feature of the present invention the two opposing
10 brushes have bristles of varying length, wherein the bristles of the first brush collectively form a substantial concave brushing surface and the bristles of the second brush collectively form a substantial convex-brushing surface.

According to a further feature of the present invention the bristles are disposed at a slope in which an unattached end of the bristles is more distant
15 from the head than an end of the bristles attached to a bristle support of each of the opposing brush heads.

According to a further feature of the present invention the second brush is implemented as having a length less or equal to or less than one-half of a length of the first brush.

According to a further feature of the present invention, there is also
20 provided a third brush disposed in the head opposite a space in between the bristles of the opposing brushes.

There is also provided according to the teachings of the present invention, a method for brushing vestibular and lingual tooth surfaces
25 simultaneously by way of a toothbrush including a handle and a head having least two opposing brushes pivotably mounted on the head so that when a user's teeth are in contact with a brushing surface of each of the opposing brushes, each of the two opposing brushes independently aligns with contours of tooth surfaces in a dental arch includes bringing the brushing surfaces of the
30 at least two opposing brushes in contact with vestibular and lingual tooth

surfaces so that the toothbrushes independently align with contours of the tooth surfaces in the dental arch.

There is also provided according to the teachings of the present invention, a method for assembling a multi-tooth-surface brushing device
5 having two opposing brushes for brushing vestibular and lingual tooth surfaces simultaneously includes: (a) providing a toothbrush handle including a head, the head having two pins rigidly attached for pivotal mounting of the two opposing brushes, each pin including at least one flange for securing each of the brushes to one of the two pins, (b) providing two brushes, each of the
10 brushes including a bristle support having a bore of a diameter greater than a diameter of the pins, the bore including at least one annular groove disposed in a wall of the bore corresponding to the at least one flange, and (c) inserting each one of the two pins into the bore disposed in each of the brushes so that the at least one flange is seated in the at least one annular groove thereby
15 enabling independent rotation of each of the brushes held securely on the pins.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

20 FIG. 1 is an isometric bottom-view of a two-brush embodiment of a multi-surface tooth brushing device.

FIG. 2 is an isometric bottom-view of three-brush embodiment of a multi-surface tooth brushing device.

25 FIG. 3 is an schematic bottom-view depicting the brushing surface curvatures formed by the bristles and the relative lengths of the brushes of the multi-surface tooth brushing device.

FIGS. 4 and 5 are isometric bottom-views of two-brush embodiment of a multi-surface tooth brushing device depicting the independent pivotal action of each of the brushes.

FIGS. 6 and 7 are schematic, top partial-transparent-views of the multi-surface tooth brushing device surface cleaning device depicting the independent pivotal action of each of the brushes as the device is moved along the dental arch.

5 FIG. 8 is an isometric bottom-view of three-brush embodiment of a multi-surface tooth brushing device depicting sloping bristles.

FIG 9 is a schematic side-view of the device of FIG. 7 depicting bristles disposed at an angle sloping away from the toothbrush head.

10 FIG. 10 is an isometric bottom-view of a two-brush embodiment of the multi-surface tooth brushing device depicting pins on which the pivotal brushes rotate.

FIG. 11 is an isometric, partial cut-away bottom-view of a set of two opposing pivotal brushes and a bore in which the pins of FIG. 9 are disposed.

15 FIG. 12 is an isometric, exploded bottom-view of a set of two opposing pivotal brushes and corresponding pins.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is multi-tooth-surface brushing device with improved cleaning capacity by maximizing bristle contact with the lingual, the vestibular and the occlusal tooth surface simultaneously throughout the entire brushing process.

The principles and operation of the method according to the present invention may be better understood with reference to the drawings and the accompanying description.

25 Turning now to the figures, Figure 1 depicts a non-limiting, exemplary embodiment of a multi-tooth-surface brushing device respectively. The brushing device, generally designated **1**, includes head **2**, handle **3**, a first pivotally mounted brush **4** and associated bristles **6**, second pivotally mounted brush **5** and associated bristles **8**. The three-brush embodiment depicted in
30 Figure 1 further includes third brush **9** statically mounted on head **2** opposite

the space defined between bristles 6 and 8. Figure 2 depicts an analogous two-brush embodiment. The three-brush embodiment enables global scrubbing in which each of the vestibular, the lingual, and the occlusal tooth surfaces are cleaned simultaneously.

5 Figure 3 depicts two brushing surface geometries; brushing surfaces 10 and 11 are both formed from bristles of varying length. Bristles 6 vary in length to collectively form a curvature approximating the vestibular curvature 12 of the dental arch and bristles 8 vary in length to collectively form a curvature approximating the lingual curvature 13 of the dental arch as shown in
10 Figures 6 and 7.

 Figure 3 also depicts an additional feature of the present invention in which brush 5 has a length less than the length of brush 4. The reduced length of brush 5 advantageously enables a user to brush difficult-to-access molars. Furthermore, the shorter brush provides for a brushing surface having a
15 curvature more closely fitting the lingual-tooth-surface curvature. In a non-limiting, exemplary embodiment, the brush length of brush 5 is half or less than half of the brush length of brush 4; however, it should be appreciated that any embodiment in which the length of one brush is less than the opposing brushes is included within the scope of the present intention.

20 Figures 4 and 5 illustrate the independent, bi-directional rotation of brushes 4 and 5. When a user brings brushing surface of brush 4 in contact with the vestibular tooth surfaces 12, brush 4 pivots into best-fit alignment with vestibular tooth surface 12 and similarly, when the brushing surface of brush 5 contacts the lingual tooth 13 surface, brush 4 independently pivots into a
25 best-fit alignment with lingual tooth surface 13 as shown in 6-7. As the individual moves head 2 along either the mandibular or maxillary dental arch, brushes 4 and 5 continue to pivot independently and simultaneously into a best fit alignment with the changing vestibular and lingual tooth surface curvatures, thereby maximizing tooth scrubbing. It should be noted that embodiments
30 having three, four or any plurality of pivotal brushes are included in the scope

of the present application as well as brushes having bristle lengths of varying lengths collectively forming any type of curved brushing.

Figures 8 and 9 depict an additional feature directed at improving cleaning effectiveness. As is known in the field of dental hygiene, ideal scrubbing is accomplished when the bristles contact the teeth at an angle of about 45 degrees relative to the substantially vertical plane defined by the teeth. To this ends, bristles 6 and 8 are perpendicularly fastened to bristle support 18. Bristle support 18 has a sloping surface to which the bristles are fastened so that bristles 6 and 8 are disposed at about a 45 degree angle relative to head 2 in a non-limiting, exemplary implementation. A variant embodiment having bristles fastened to a non-sloping bristle support (not shown) is also included in the scope of the present invention. Furthermore, it should be appreciated that an embodiment in which bristles are disposed in a non-parallel manner relative to head 2 is included within the scope of the present invention.

As shown in Figures 8 and 9, bristles 8 and 6 vary in length as a function of their distance from head 2 to ensure that all of the sloping bristles contact the tooth surface.

Figures 10 and 11 depict a non-limiting pivot arrangement of brushes 4 and 5 on pins 21 rigidly attached to head 2. Brushes 4 and 5 each have an upwards bore 23 extending into the height of brushes 4 and 5. The bore diameter is slightly larger than the pin diameter to ensure brush rotation on pins 21. Each of brushes 4 and 5 is held permanently on pins 21 by way of a flange 25 disposed on each pin 21 that pivotally engages annular groove 24 disposed in the inner surface of bore 23. It should be noted that a configuration having a plurality of flanges and corresponding plurality of annular grooves is included within the scope of the present invention. Brush rotation is limited by way of plurality of small protrusions 22 protruding upwardly from head 2 so as to block brush rotation. In a non-limiting embodiment each brush has no more than 180 degrees of freedom rotation. In a variant embodiment angular brush rotation is regulated by a flange and groove arrangement as is known to those

skilled in the art. The brushing device is assembled by sliding brushes 4 and 5 over pins 21 until flanges 24 are seated in the corresponding annular grooves disposed in the bore wall.

5 It should be noted that both manual and powered toothbrushes are included within the scope of the present invention.

In a non-limiting, exemplary embodiment the handle is manufactured from hard plastic formed by injection molding whereas the bristles are manufactured from nylon and fastened to the brush head as is known to those skilled in the art. It should be noted that any polymeric material and other
10 manufacturing process typically used in the art are included in the scope of the present invention.

It will be appreciated that the above descriptions are intended only to serve as examples, and that many other embodiments are possible within the scope of the present invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A multi-tooth-surface brushing device for brushing a plurality of tooth surfaces simultaneously comprising:
 - (a) a handle having a head; and
 - (b) at least two opposing brushes pivotably mounted on said head so that when a user's vestibular tooth surface contacts a first of said two opposing brushes, said first brush aligns with a vestibular-curvature and when a user's lingual tooth surface contacts a second of said two opposing brushes, said second brush aligns with a lingual-curvature.
2. The multi-tooth-surface brushing device of claim 1, wherein said two opposing brushes have bristles of varying length, wherein said bristles of said first brush collectively form a substantial concave brushing surface and said bristles of said second brush collectively form a substantial convex-brushing surface.
3. The multi-tooth-surface brushing device of claim 2, wherein said bristles are disposed at a slope in which an unattached end of said bristles is more distant from said head than an end of said bristles attached to a bristle support of each of said opposing brush heads.
4. The multi-tooth-surface brushing device of claim 3, wherein said second brush is implemented as having a length less or equal to or less than one-half of a length of said first brush.
5. The multi-tooth-surface brushing device of claim 2, further comprising a third brush disposed in said head opposite a space in between said bristles of said opposing brushes.
6. A method for brushing vestibular and lingual tooth surfaces simultaneously by way of a toothbrush including a handle and a head having least two opposing brushes pivotably mounted on said head so that when a

user's teeth are in contact with a brushing surface of each of said opposing brushes, each of said two opposing brushes independently aligns with contours of tooth surfaces in a dental arch comprising bringing said brushing surfaces of said at least two opposing brushes in contact with vestibular and lingual tooth surfaces so that said toothbrushes independently align with contours of the tooth surfaces in the dental arch.

7. A method for assembling a multi-tooth-surface brushing device having two opposing brushes for brushing vestibular and lingual tooth surfaces simultaneously comprising:

- (a) providing a toothbrush handle including a head, said head having two pins rigidly attached for pivotal mounting of the two opposing brushes, each pin including at least one flange for securing each of said brushes to one of said two pins;
- (b) providing two brushes, each of said brushes including a bristle support having a bore of a diameter greater than a diameter of said pins, said bore including at least one annular groove disposed in a wall of said bore corresponding to said at least one flange; and
- (c) inserting each one of said two pins into said bore disposed in each of said brushes so that said at least one flange is seated in said at least one annular groove thereby enabling independent rotation of each of said brushes held securely on said pins.

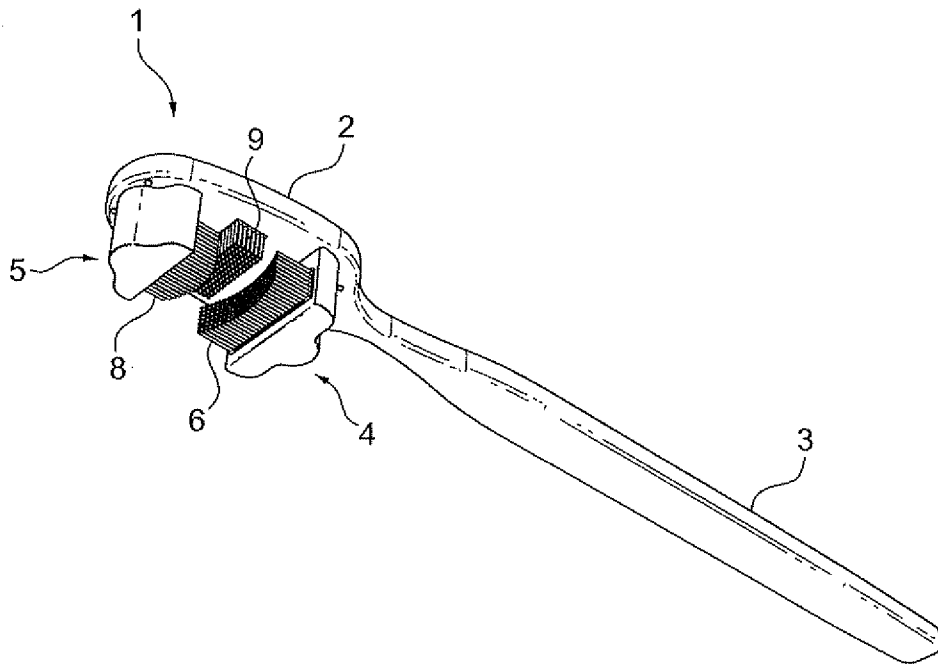


Fig.1

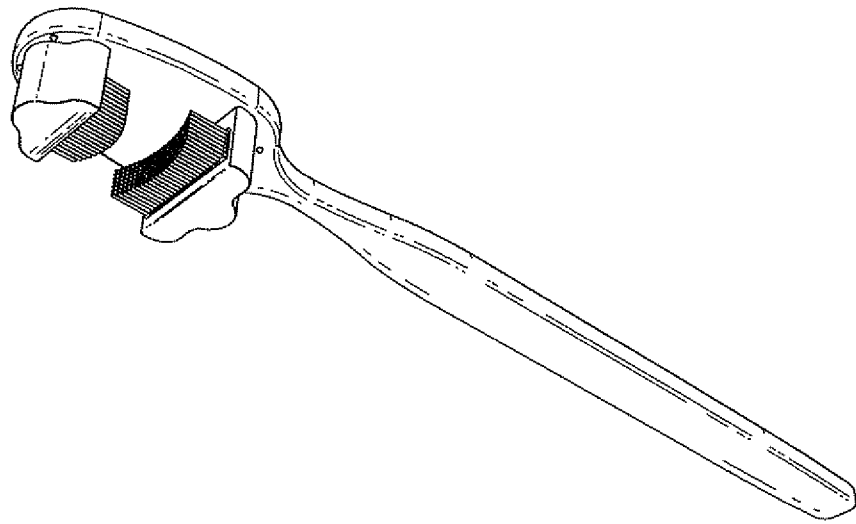


Fig.2

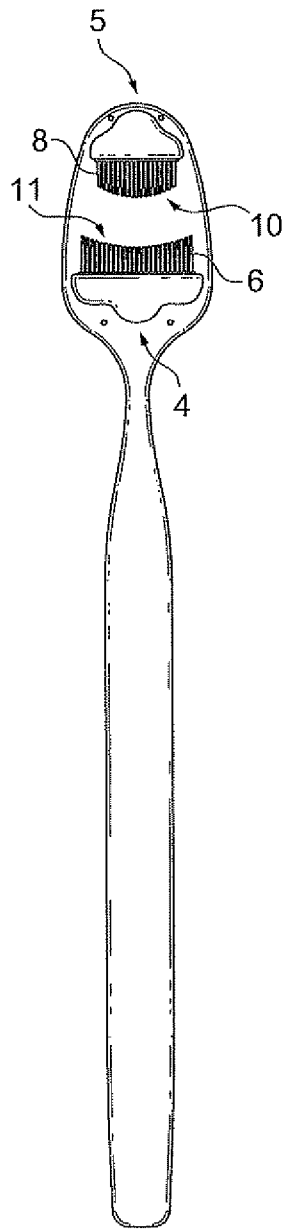


Fig.3

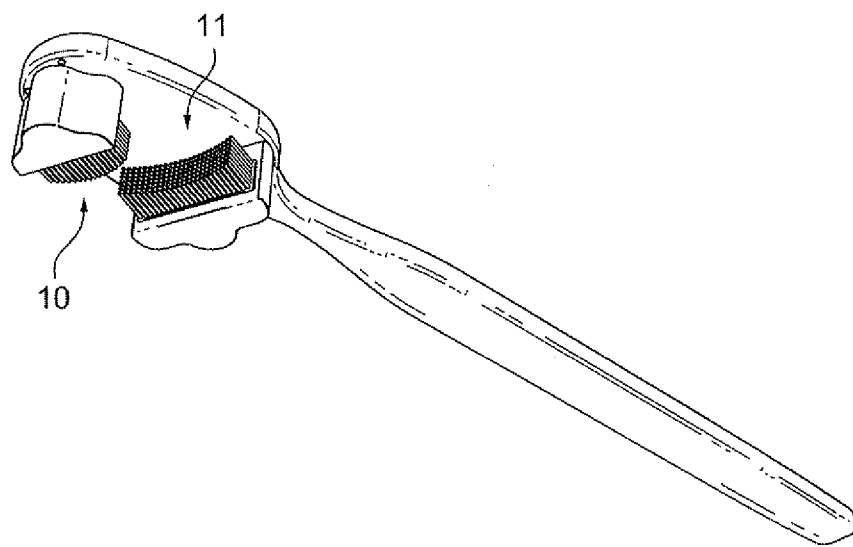


Fig.4

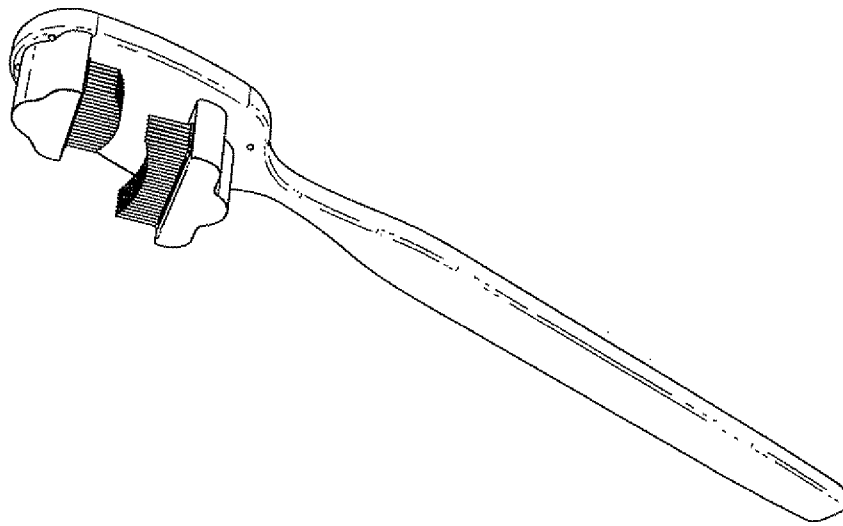


Fig.5

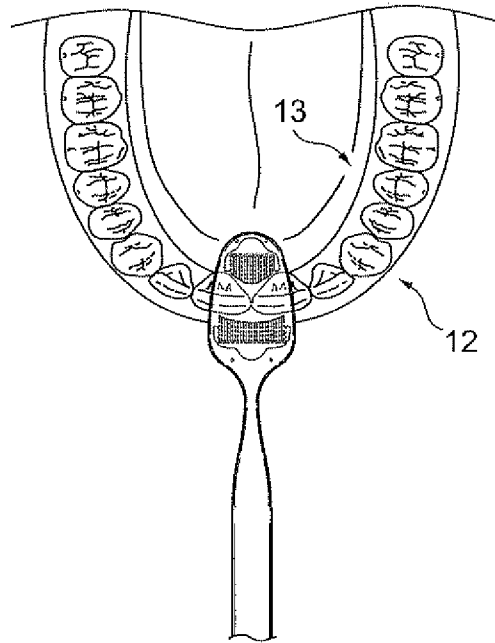


Fig.6

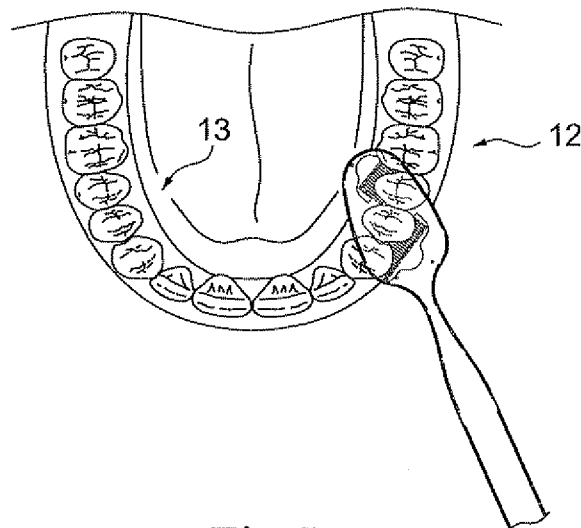


Fig.7

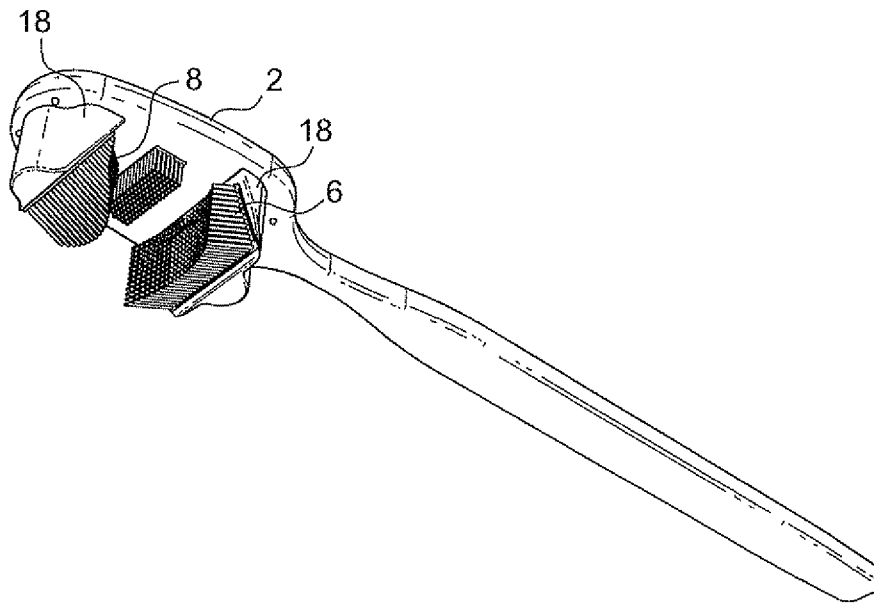


Fig.8



Fig.9

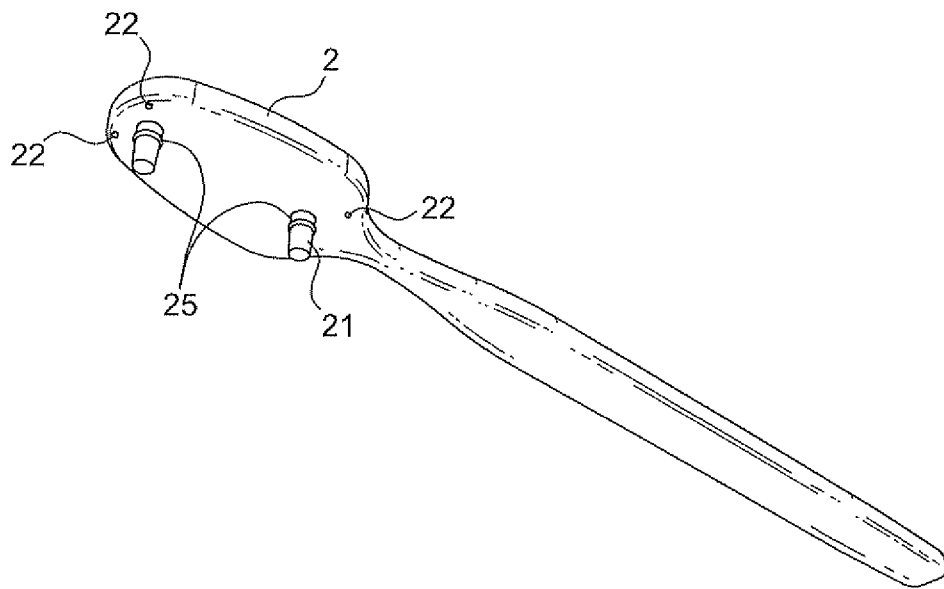


Fig.10

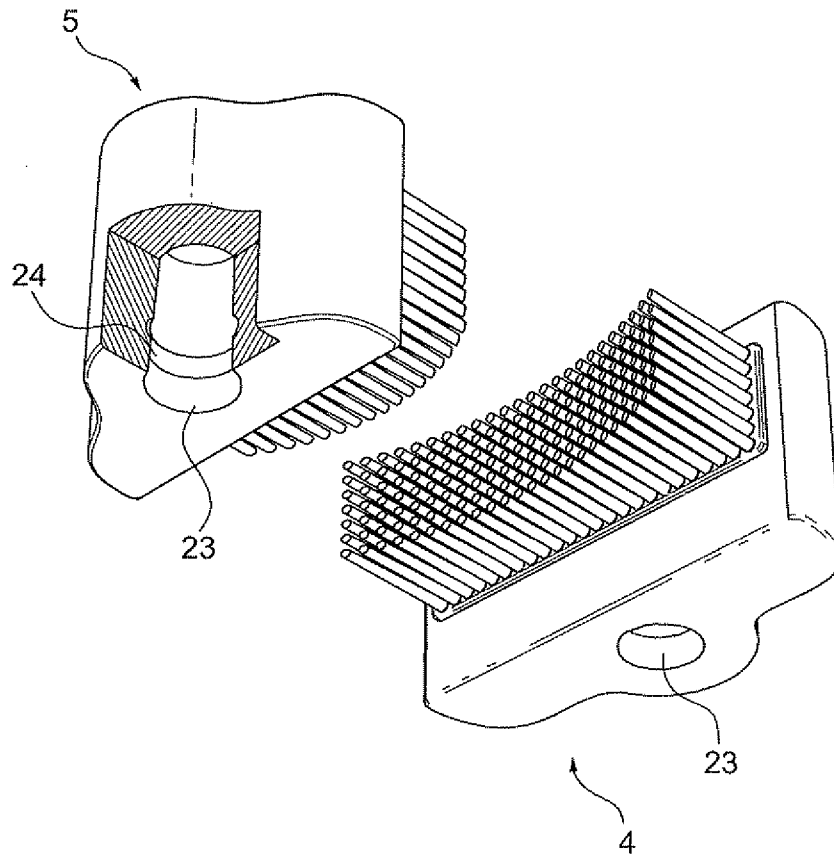


Fig.11

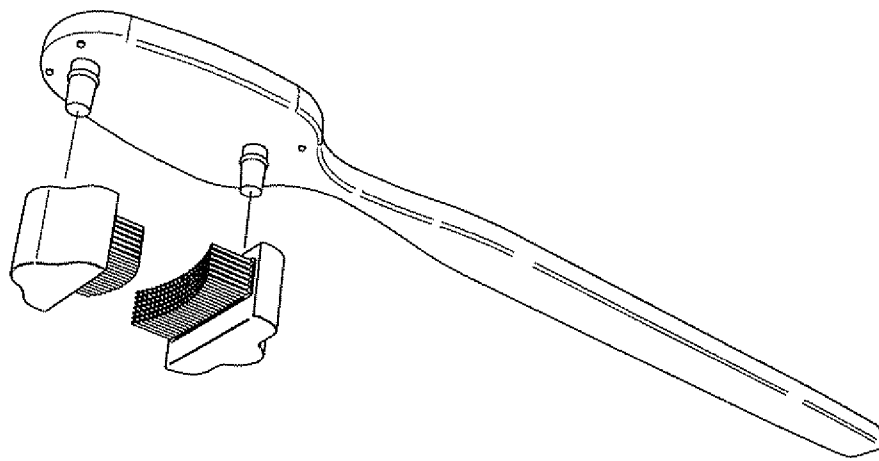


Fig.12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 11/50774

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A46B 9/04 (2011.01)

USPC - 15/167.2

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)

IPC(8) - A46B 9/04 (2011.01)

USPC - 15/167.2

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

USPC - 15/1,104,001,159.1,160,167.1; 433/25,141,215,216,229

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

Databases: USPTO PubWEST(PGPB,USPT,EPAB,JPAB); Google Scholar

Search terms: tooth, toothbrush, dental, pivot, vestibular, buccal, convex, concave, triple-headed, double-headed, ball and socket, bristle, parallel, swivel, angle

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,994,039 A (HADARY) 30 November 1976 (30.11.1976); fig 1-7, 19-22; col 2 ln 11-42, col 3 ln 30-60	1-7
Y	US 5,327,607 A (WAGNER) 12 July 1994 (12.07.1994); fig 4, 7-8; col 3 ln 35-68, col 4 ln 1-32, col 5 ln 28-32	1-7
A	US 2007/0039112 A1 (KO et al.) 22 February 2007 (22.02.2007); fig 11	1-7
A	US 2007/0283519 A1 (MOSS) 13 December 2007 (13.12.2007); fig 9A-9C; para [0007]-[0011]	1-7
A	US 2009/0106923 A1 (DEPUYDT et al.) 30 April 2009 (30.04.2009); para [0022]-[0025]	1-7

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 08 June 2011 (08.06.2011)	Date of mailing of the international search report 27 JUN 2011
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774