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(54) **Support device for interdental brush and similar tools for oral hygiene**

(57) An interdental brush device for interdental cleaning is disclosed, of the type comprising a handle (1) and at least a head (2) supporting an interdental brush

(3), wherein said handle (1) and said head (2) are mutually engaged in a rotating manner according to an axis inclined by a certain angle (β) with respect to the longitudinal axis (X-X) of the handle.

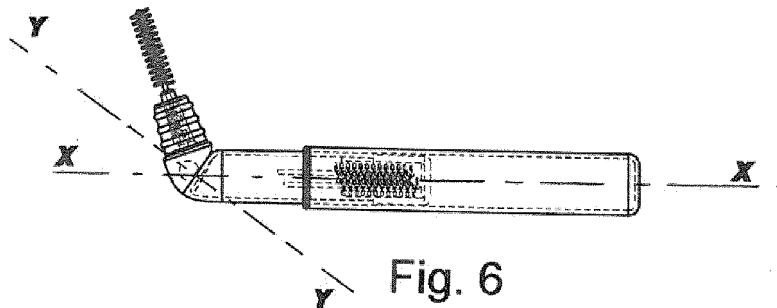


Fig. 6

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Description

Field of the invention

[0001] The present invention relates to a support device for an interdental brush for interdental cleaning and a manufacturing method thereof.

Background art

[0002] It is known that interdental brush devices for interdental cleaning are largely available on the market, which in general consist of a suitably shaped arm, called "handle", at the free end of which a small brush body is mounted, called in short "interdental brush".

[0003] Essentially two interdental-brush devices exist on the market, and precisely a "standard"-type, the handle of which has virtually the size of a tooth brush and carries the interdental brush interchangeably, and a "pocket"-type, the handle of which is markedly smaller, virtually maneuverable by the finger tips.

[0004] The cleaning part, that is the actual interdental brush, comprises a portion of thin stem wherefrom a plurality of brushed depart, which are apt to the cleaning action. The stem is normally in the shape of a twisted metal wire, between the coils of which the brushes remain locked.

[0005] Due to evident hygiene and functional reasons, it is suitable for the interdental brush to be replaced often. For such purpose, at least in standard devices, a mounting head shaped so as to allow easy mounting and removing of the interdental brush is normally provided, albeit with the required safety (to prevent the interdental brush from becoming accidentally detached and being ingested). In pocket device instead, due to construction economy and to the low economic impact of the handle, the interdental brush is often not replaceable.

[0006] Known traditional devices are illustrated, for example, in US 4,319,377, wherein a device is illustrated with an interdental brush oriented at 90° with respect to the handle; the interdental brush is locked on an end of the handle thereof through a threaded bush. A similar arrangement is provided also in US 4,222,143 and EP 311,937. A further similar arrangement is proposed in document EP 537,663, in the name of the same Applicant.

[0007] In all these devices, the fastening of the interdental brush to the handle is accomplished through a stem appendix which is brush-free, in the following referred to as shank of the brush. Such devices exploit the wide deformability of such shank, which is introduced into a crosswise through-hole of the handle and then bent by about 90° against the handle and locked there by a tightening element.

[0008] This approach comprises some drawbacks which make it inapplicable to the sector of pocket devices. As a matter of fact, on the one hand the crosswise bulk of an interdental brush which extends at 90° with respect

to the handle is incompatible with the requirements of pocket devices. On the other hand, the necessary 90°-bending of the metal shank of the interdental brush causes a marked deformation of the material, which makes this solution unviable if removal of the interdental brush is provided whenever the device must be put away.

[0009] Some other interdental brushes of prior art provides for a removable head. US5394584 discloses an interdental brush where the brushed head may be snap fitted to a handle through a spherical joint; the axis of brush shank is fixed with respect to the longitudinal axis of the handle; in another embodiment, the brush axis can be tilted by 90° through a rotation along an axis which is perpendicular to the handle longitudinal axis. A similar arrangement, resulting in a 90° tilting of the head, is disclosed in DE20310334U1. Some different coupling connections are also provided in the field of toothbrushes, where however the technical problem to be addressed is different, since the array of brushes shall be kept always substantially aligned to the longitudinal axis of the handle, for proper action by the hands of the user. For example, US 4654922 discloses a toothbrush having coupling means between a bristled head and a handle; coupling means are suited to allow the user to change the tilt angle between the center axis of the handle and the longitudinal axis of the head. DE19625878 discloses a toothbrush, where a double joint connection is provided between the handle and the brushed head: the teaching is toward keeping the same attitude of the brush component with respect to the handle (substantially aligned with the longitudinal axis of the handle), but shifting its position. Pocket or travel interdental brush devices are typically of an actual small size, so much so that they can for example be arranged in a jacket pocket. The interdental brush replacement is not provided, they must also be economic enough to be able to be discarded entirely after use.

[0010] Due to the bulk reasoned mentioned above, the interdental brush is traditionally mounted at the end of a support rod, with the stem aligned with the rod itself, and then protected by a closed-end tubular cap. When in use, the cap engages with the free end of the rod and acts as a handle; when not used, the cap engages with the end carrying the interdental brush and covers it, protecting it from outside agents.

[0011] Also this pocket device is not devoid of drawbacks. Firstly, when the interdental brush must be discarded - because consumed, damaged, aged or in any case for hygiene reasons - the entire device must be discarded comprising the interdental brush device, with recycling problems, since the complex of plastic and metal materials. Moreover, the interdental brush device which projects aligned with the rod handle implies difficulties in the cleaning maneuvers of the interdental gaps; that substantially unlike the standard devices, wherein the interdental brush projecting crosswise to the handle allows to arrive more easily and more effectively also between the innermost teeth of the oral cavity.

Technical Problem

[0012] The problem at the bottom of the present invention is to propose a support device for an interdental brush which eliminates the drawbacks set forth above. In particular it is meant to provide a pocket interdental brush device which can exploit a rectilinear configuration, hence with a small crosswise bulk, but which at the same time allows to arrange the brush orthogonal to the longitudinal axis, in a simple way free from involuntary displacements/removals.

Summary of the invention

[0013] The above object is accomplished through an interdental brush device having the features mentioned in claim 1. In particular, according to an aspect of the invention, it is provided a pocket interdental brush device for interdental cleaning, comprising a handle rod and at least a head supporting an interdental brush mutually connected through coupling means, said handle rod and said head abutting each other through respective ends where said coupling means are located in the shape of a spherical or cylindrical head of one of the handle rod or the head which engages with a corresponding seat having a complementary spherical or cylindrical cavity of the other of the handle or the head, wherein said coupling means are rotation-symmetry coupling means, said handle rod and said head are mutually connected through said coupling means in a rotating manner along an axis having an angle in the range from about 30° to about 70°, preferably of the order of 45°, with respect to the longitudinal axis of the handle rod, said handle rod and said support head are arranged abutting each other through respective parallel slipping planes inclined according to an angle complementary to said angle with respect to the longitudinal axis of the handle, and at least said spherical or cylindrical head and corresponding seat of the coupling means are manufactured by moulding in two steps of at least part of the one on the other, with two mutually incompatible plastic materials.

[0014] The dependent claims describe preferential features of the invention.

Brief description of the drawings

[0015] Further features and advantages of the invention are in any case more evident from the following detailed description of a preferred embodiment, given purely as a non-limiting example and illustrated in the attached drawings, wherein:

fig. 1 is an elevation side view of the interdental brush device according to the present invention;
fig. 2 is an exploded view of the same device of fig. 1;
fig. 3 is a longitudinal section view of the same device

of fig. 1;

fig. 4A is an enlarged, longitudinal section view of the head portion of the device of fig. 1 and taken according to a plane orthogonal to the one of fig. 3;
fig. 4B is an exploded partial elevation side view, according to the embodiment of fig. 1;

fig. 4C is a section view taken along the line AA-AA of fig. 4B;

fig. 4D is a section view taken along the line BB-BB of fig. 4C;

fig. 4E is a section view taken along the line CC-CC of fig. 4D;

fig. 5 is a view similar to the one of fig. 1, but with an interdental brush device closed by the cap thereof and only visible in transparency;

fig. 6 is an elevation side view, partly in transparency, similar to the one of fig. 1, but with the head rotated by 90°;

figs. 7A and 7B are elevation side views partly in transparency, of an alternative embodiment, in a closed and in an exploded attitude, respectively; and figs. 8A and 8B are top plant and elevation side views, respectively, partly in transparency, of a further alternative embodiment.

Detailed description of preferred embodiments

[0016] As shown in the drawings, the device according to the invention comprises a handle rod 1, which ends with a support head 2 of an interdental brush 3; a tubular cap 4 is furthermore provided which may also be applied (fig. 1) at the distal end of the handle rod (i.e. the opposite end to that whereon the interdental brush is installed) to act as extension of handle 1.

[0017] In fig. 2 handle rod 1, head 2, interdental brush 3 with a bristle-free extension 3a thereof, referred to in the following as shank 3a, and cap 4 are equally shown. Fig. 2 furthermore shows a bush with trunco-conical cavity 2a, the usefulness of which will be shown in detail further below.

[0018] Handle rod 1 is preferably in the shape of a hollow cylindrical body, closed at the distal end by a small plug 5: handle 1 hence acts also as container for a stock of replacement interdental brushes 3'.

[0019] Plug 5, which closes the container of spare interdental brushes 3', easily engages with handle 1, with a reduced-diameter, upper part 5a thereof; as a matter of fact, this part has a diameter which tightly adapts to the inner tubular cavity of the handle. This container function is also made possible by the fact that handle 1 is sufficiently long to offer gripping for a hand's fingers.

[0020] According to a fundamental feature of the present invention, and as better shown in the views of figs. 2 and 3, the proximal end of handle 1 end with an abutment plane 1a inclined by a certain angle (β) with respect to the longitudinal axis X-X of the handle, from which a rotation-symmetry coupling means projects, namely in the shape of a spherical head 1b. In other

words, the coupling means allow a rotation according to a rotation axis inclined by angle β' , complementary to β , with respect to the longitudinal axis X-X of the handle.

[0021] Inclination angle β of the abutment plane preferably lies in the range 20°-60°, better about 45°. Complementary angle β' is hence 70°-30°, preferably in the order of 45°.

[0022] Accordingly, the body of head 2 has an abutment surface 2j arranged on a plane B₂-B₂ also forming the same angle (β) with respect to its longitudinal centre line X-X, i.e. the axis along which the brush shank lies. In the body of head 2 a coupling seat is obtained complementary with spherical head 1b, so that when spherical head 1b and the seat thereof in body 2 are mutually coupled, a mutual rotation is allowed of head 2 with respect to handle 1 about an axis Y-Y perpendicular to parallel planes B₁-B₁ and B₂-B₂. In this coupled condition, head 2 rotates with respect to handle 1 with the two surfaces 2j and 1a in mutual sliding/slipping contact, but axial disconnection is prevented by the spherical coupling.

[0023] Due to this contact on an inclined surface, preferably by 45° with respect to axis X-X, as well as to the engagement of spherical head 1b in the spherical seat in head 2, it is possible to cause head 2 to rotate with respect to handle 1 about an axis Y-Y and hence to bring head 2 in the position shown in fig. 6, wherein the interdental brush projects crosswise to the axis X-X of the handle, according to an angle advantageous for cleaning in the oral cavity.

[0024] According to a preferred embodiment of the invention, head 2 extends into a trunco-conical appendix 2b, whereon a trunco-conical bush 2a is applied (figs. 3 and 4) so as to determine coupling means for a removable interdental brush.

[0025] More precisely, as visible in figs. 4A-4E, appendix 2b has a generically trunco-conical outer shape and comprises a longitudinal bore 2c, which opens in a hole at the distal end, apt to act as housing for the shank of an interdental brush.

[0026] The appendix is furthermore sectioned from side to side by an L-shaped slit 2d, as clearly visible in figs. 4A, 4C and 4E. Slit 2d has an arm 2d' aligned to the longitudinal axis of the appendix and an arm 2d" crosswise thereto. The inner surface of longitudinal arm 2d' is preferably provided with teeth or other rough elements which increase the friction coefficient thereof.

[0027] With this slit, the appendix body substantially takes up the shape of a flexible hook, suited to yield slightly imparting a radial pressure from the outside. In other words, an elastically yielding flap 2f is defined, connected cantilever-like to the end part of the appendix; that is, flap 2f of appendix 2b bends around a small hinge bridge 2g.

[0028] The yielding under pressure causes a narrowing of the longitudinal arm of slit 2d' which is suitable to tighten the shank of an interdental brush inserted therein. As a matter of fact, while bore 2c forms a seat for the introduction of shank 3a, flap 2f with hinge 2g makes this

seat deformable and hence tight-tenable on shank 3a in order to retain interdental brush 3.

[0029] On the side opposite to flap 2f, where the body of head 2 is solid and resistant, a halt peg 2e is obtained, the usefulness of which will be illustrated further below.

[0030] Bush 2a has a closed eyelet 2a' accordingly wherein halt peg 2e is housed. Eyelet 2a' is elongated in a longitudinal direction and has two end widenings which determine two residence positions of halt peg 2e.

[0031] Bush 2a furthermore has an inner conical hole, meant to couple with the conical surface of appendix 2b.

[0032] In the application step, bush 2a is pushed onto the appendix from the distal end to the proximal end, until it partly overcomes peg 2e which then snaps inside eyelet 2a'. In this condition, the bush can be shifted between two extreme positions, determined by the two residence positions taken up by the peg within eyelet 2a'. Bush 2a may hence take up a loose open position, when it is at a distance from appendix 2b, or an engaged/closed position, when it is coupled with interference with appendix 2b. In this second condition, the bush elastically pushes flap 2f towards bore 2c, so as to narrow the seat in which the shank of an interdental brush 3 is inserted.

[0033] In order to replace interdental brush 3, when worn, bush 2a is pushed outwards from appendix 2b, until it reaches the travel end determined by peg 2e, so as to allow the elastic return of flap 2f which is free to move away from shank 3a, leaving interdental brush 3 free, which may be removed.

[0034] Once worn interdental brush 3 has been discarded, a new interdental brush is introduced and bush 2a is caused to slide backwards until bringing it again in the lock position shown in figs. 1 and 4, with eyelet 2a' again abutting against peg 2e.

[0035] It must furthermore be noted that cap 4 may be used without distinction to close the head part of the device (fig. 5), so as to protect the interdental brush without having to remove it every time, or as extension of the handle (fig. 1) so as to make the use thereof more comfortable. For such purpose, preferably handle body 1 has a narrow flange or circumferential rib 1c which acts as halt surface of cap 4 in both modes of use.

[0036] With a pocket interdental brush device thus configured it is possible to perform interdental cleaning as comfortable as with standard interdental brush devices of the known art.

[0037] The advantages of the interdental brush device according to the present invention are thus evident, which - on the one hand - is basically small and hence easy to carry on a journey, however, without losing the advantage of the use of a crosswise-extendable interdental brush device like the one of the standard devices of the prior art.

[0038] On the other hand the drawbacks set forth at the beginning are removed, in particular through a tightening means, i.e. bush 2a, which accomplishes a secure retaining of the interdental brush, but at the same time has a short work travel; the "choke" tightening of the in-

terdental brush avoids to apply yielding deformations of the shank, which is hence theoretically mountable/removable for a plurality of times; wide compartments where dirt may pile are not provided; there is no dangerous exhibition, in whatever condition, of the sharp end of part 3a of the interdental brush; it is always possible to send to the landfill sole interdental brush 3, because any other part of the interdental brush device according to the invention is reusable.

[0039] It must also be highlighted that, according to a further preferred feature of the invention, the joint coupling means are obtained by co-moulding of incompatible plastic materials. In other words, head 2 is co-moulded on a previously manufactured handle 1, with a choice of materials and temperatures which leads to no welding between the parts, but allows instead to accomplish a precise coupling (to the advantage of the regularity of the rotation movement) and a highly stable one (to the advantage of the safety of use).

[0040] The term "incompatible" is used here to indicate that a first material does not weld or does not bond, due to physical or chemical features, to a second material. That implies both a non-affinity between the materials, and a sufficient melting temperature difference to prevent one from deforming the other. As just mentioned, the moulding can thus be accomplished in two steps, of a first material A in an own mould thereof and then of a subsequent material B which, at least in part, exploits as mould the component moulded with material A. For example, in a first step the handle is moulded with a type-A material, and in a second step it is moulded - at least partly above material A - the head with a type-B material, which does not bind to the type-A material. In other words, in this second step a mould is used for head 2 which is defined, at least in part, by the other component, i.e. by plane 1a and by the spherical head 1b of handle 1; thereby having the certainty that, after the moulding of the type-B material to form head 2, this material B embraces spherical head 1b, perfectly matching the shape thereof but without binding thereto. Thereby the free rotation of head 2 with respect to handle 1 remains possible.

[0041] The assembly of handle 1 and head 2 as unitary complex is hence obtained, already assembled in the two subsequent moulding steps, without further mounting operations. In addition thereto the housing of spherical head 1b in the seat thereof is obtained by precision and hence allows to maintain over time the mutual attachment of these two parts.

[0042] As A material, a plastic material of the aromatic polyester group (for example PC polycarbonate, PET Poly-ethyl-teraphtalate, PBT polyethylen-teraphtalate), of the polyamides homopolymers and copolymers (for example PA6, PA66, PA12) may be used, which all have a relatively high melting point (for example above 215-225°C), while for B material use may be made of plastic materials of the polyolefin group (for example PE-LD, PE-HD, PP homopolymer and copolymer), vinyl polymers (for example polymers of homopolymer styrol,

such as PS or MS; copolymer polystyrols such as SAN or ABS; polymers of vinyl chloride such as PVC), methacrylic polyacrylic polymers (for example PMMA, methacrylate-(acrylonitrile)-butadien-styrene copolymer) which have a relatively low melting point (for example below 185-195°C). As a consequence, upon moulding, material B will have a temperature insufficient to cause part of the handle previously formed with material A to melt, ensuring that the connection does not deform.

[0043] In figs. 7A and 7B a further embodiment is shown, wherein the interdental brush is integral with the interdental brush head. In this case the interdental brush is not removable and the head appendix is devoid of the tightening bush.

[0044] The interdental brush may be obtained in a conventional way, by fastening the bristles to a twisted metal wire, and then coupled with the head by overmoulding of the plastic material on the interdental brush shank.

[0045] Moreover, the interdental brush may be obtained by injection of plastic material, for example by manufacturing integrally the stem and head part and then injecting therein the material meant to form the filaments or bristles of the interdental brush.

[0046] In figs. 8A and 8B a further embodiment is shown, wherein both ends of the handle have orientable heads with respective interdental brushes. In such case, the inclined planes Y-Y and Y'-Y' of the two orientable heads are mutually parallel or even intersecting, so as to define two different inclination angles of the two interdental brushes with respect to the longitudinal axis X-X of the handle. The handle body is provided accordingly with two protection caps 4 and 4' for the two interdental brushes at the ends thereof.

[0047] However, it is understood that the invention must not be considered limited to the particular arrangements illustrated above, which represent only an exemplifying embodiment thereof, but that different variants are possible, all within the reach of a person skilled in the field, without departing from the scope of protection of the invention, as defined by the following claims.

Claims

1. Pocket interdental brush device for interdental cleaning, comprising a handle rod (1) and at least a head (2) supporting an interdental brush (3) mutually connected through coupling means, said handle rod (1) and said head (2) abutting each other through respective ends where said coupling means are located in the shape of a spherical or cylindrical head (1b) of one of the handle (1) rod or the head (2) which engages with a corresponding seat having a complementary spherical or cylindrical cavity of the other of the handle (1) or the head (2), **characterized in that** said coupling means are rotation-symmetry coupling means, said handle rod (1) and said head (2) are

mutually connected through said coupling means in a rotating manner along an axis having an angle (β') in the range from about 30° to about 70°, preferably of the order of 45°, with respect to the longitudinal axis (X-X) of the handle rod,

said handle rod (1) and said support head (2) are arranged abutting each other through respective parallel slipping planes (1a, 2j) inclined according to an angle complementary to said angle (β') with respect to the longitudinal axis (X-X) of the handle, and **in that**

at least said spherical or cylindrical head (1b) and corresponding seat of the coupling means are manufactured by co-moulding in two steps of at least part of the one on the other, with two mutually incompatible plastic materials.

2. Device as in claim 1, wherein said interdental brush (3) is removably mounted and said head (2) comprises a tightening bush (2a) which is apt to retain a shank (3a) of said interdental brush (3).
3. Device as claimed in claim 2, wherein said head (2) extends into a trunco-conical appendix (2b), wherein a deformable seat (2d, 2f) for the housing of said shank (3a) is formed and whereon said tightening bush (2a) is coupled.
4. Device as claimed in claim 3, wherein said bush (2a) is slidably mounted between at least two travel end positions on said appendix (2b), in one of said travel end positions determining the deformation of said deformable seat (2d, 2f) so as to tighten inside said shank of the interdental brush (3).
5. Device as claimed in claim 4, wherein said appendix (2b) has a small peg (2e) projecting crosswise and apt to be introduced into an eyelet (2a') of said bush (2a) to determine travel end positions thereof.
6. Device as claimed in claim 4 or 5, wherein said appendix (2b) has a longitudinal bore (2c) for the housing of the shank of the interdental brush (3) and said deformable seat is in the shape of an L-shaped slit (2d) which determines a hook-shape of said appendix with a flexible flap (2f).
7. Interdental brush device as claimed in claim 6, **characterized in that** said flap (2f) is flexible around a hinge-type elastic bridge (2g) arranged at the distal end of said appendix (2b).
8. Interdental brush device as claimed in any one of the preceding claims, wherein said handle rod (1) is hollow and closed - at the end opposite to said head (2) - by a plug (5), between the handle rod (1) and the plug (5) a housing for spare interdental brushes (3) being formed.
9. Interdental brush device as claimed in any one of the preceding claims, wherein said handle rod (1) is associated with a tubular cap (4), apt to engage with the handle rod (1) at either one of the ends thereof, in a first one forming a protection sleeve of said interdental brush (3) and in a second one forming an extension of the handle rod (1).

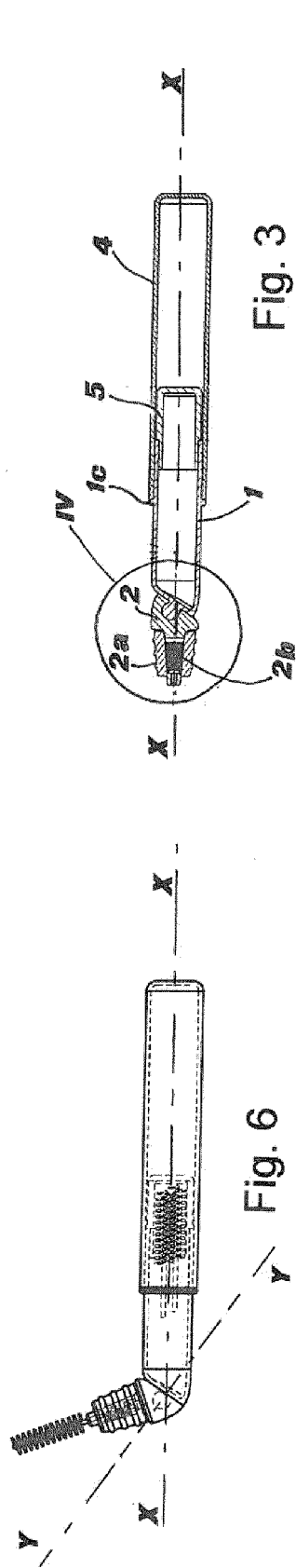


Fig. 1

Fig. 3

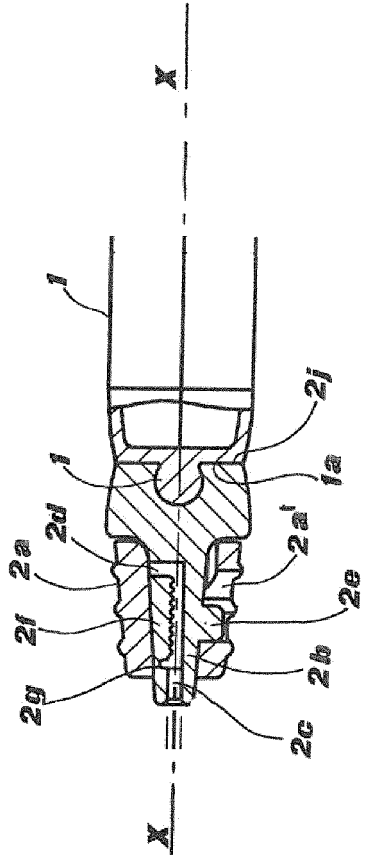


Fig. 4A

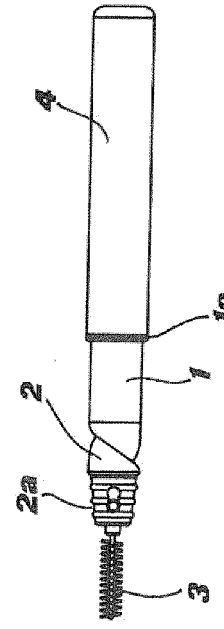


Fig. 6

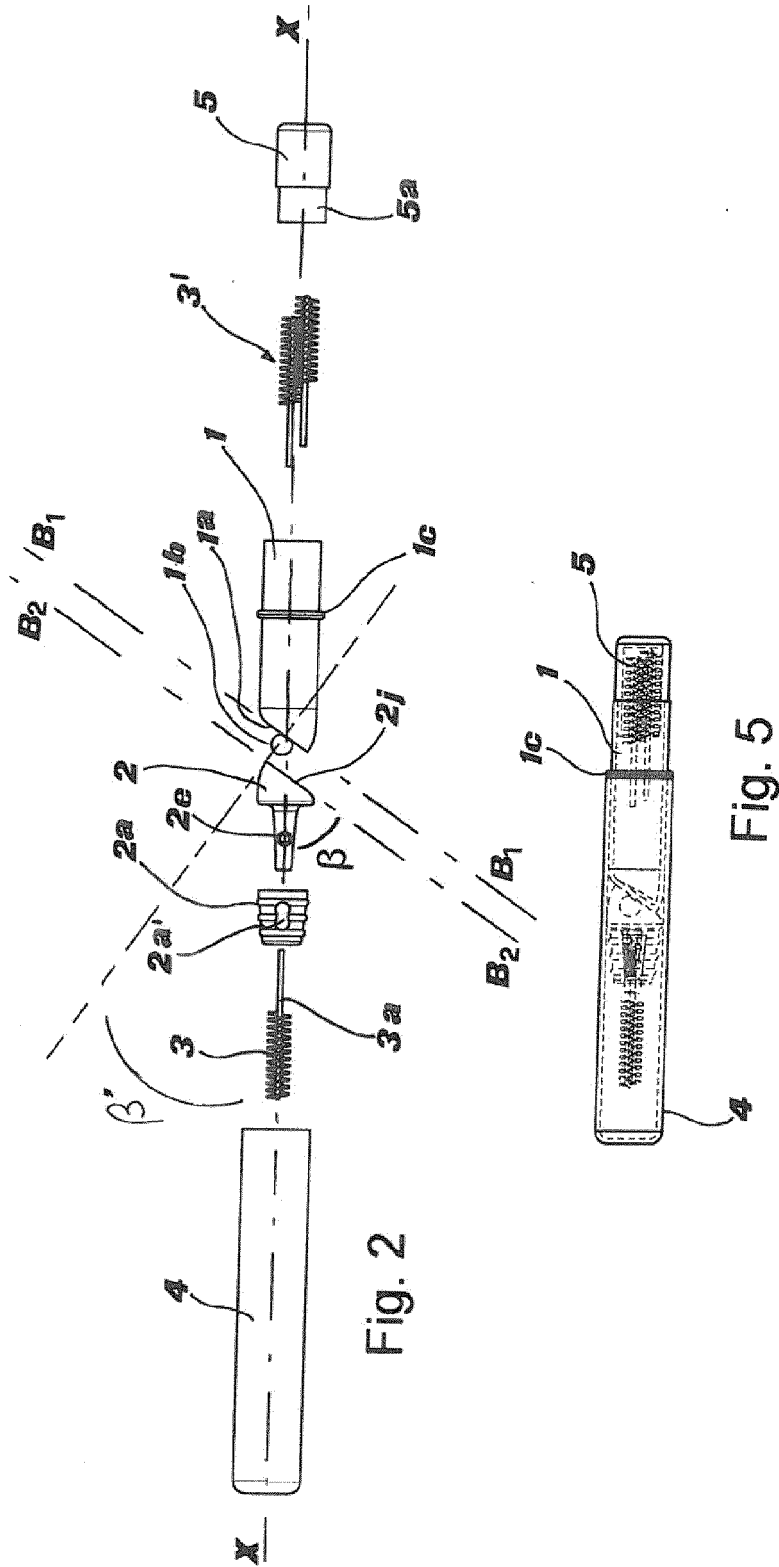


Fig. 2

Fig. 5

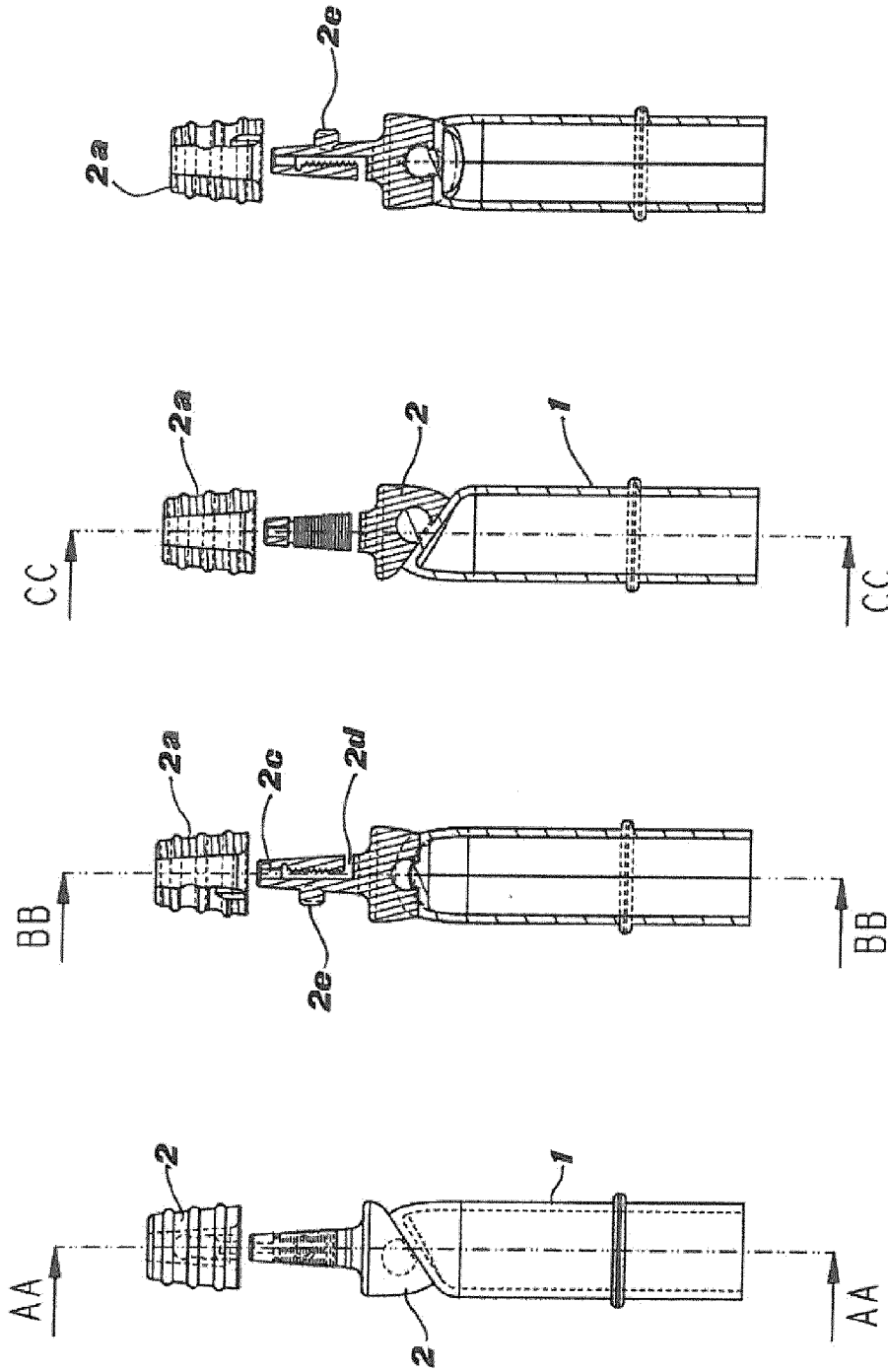


Fig. 4E

Fig. 4D

Fig. 4C

Fig. 4B

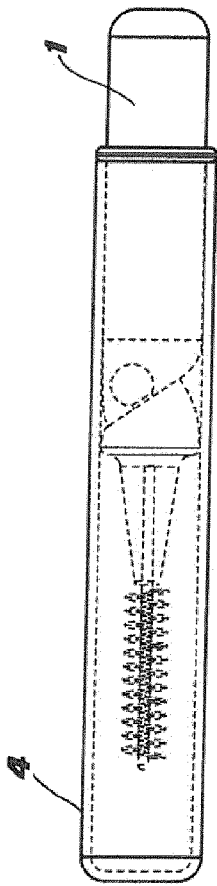


Fig. 7A

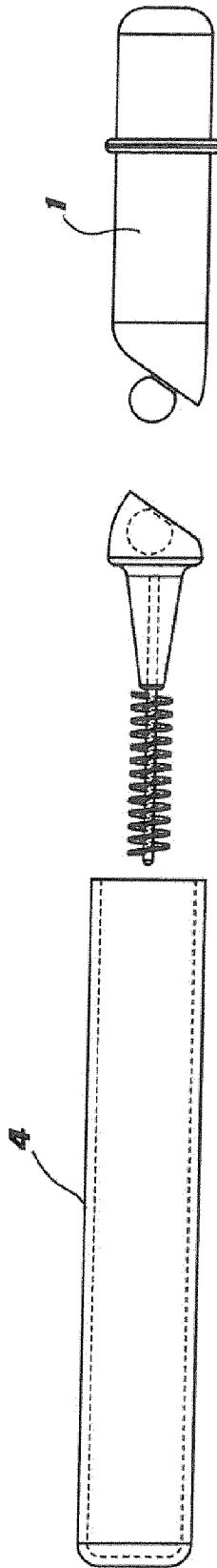


Fig. 7B

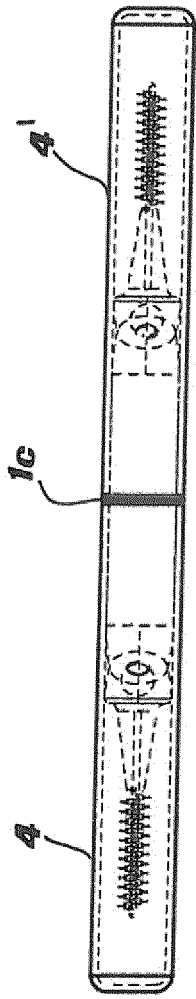


Fig. 8A

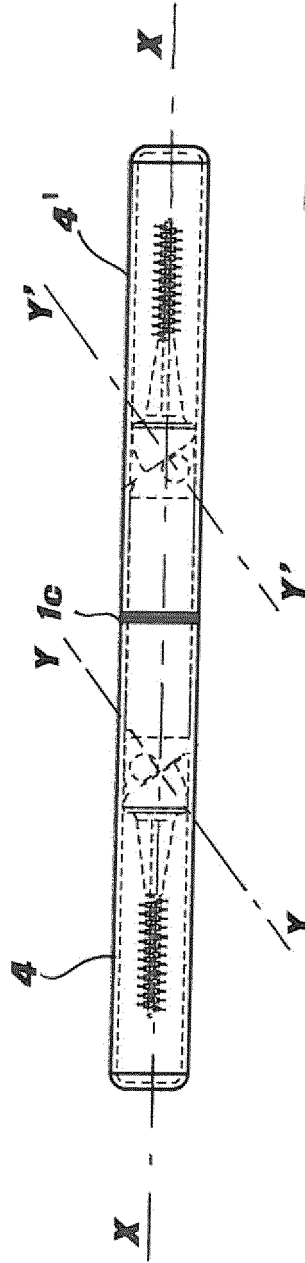


Fig. 8B



EUROPEAN SEARCH REPORT

Application Number
EP 13 17 7053

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 196 25 878 A1 (PURNER) 2 January 1998 (1998-01-02)	1-7	INV. A46B5/00
Y	* the whole document *	8,9	
Y	----- DE 203 10 334 U1 (WELTER' S CO) 18 September 2003 (2003-09-18) * figures 1,4,5 *	8,9	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) A46B A61C
Place of search The Hague		Date of completion of the search 20 November 2013	Examiner Raybould, Bruce
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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REFERENCES CITED IN THE DESCRIPTION

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