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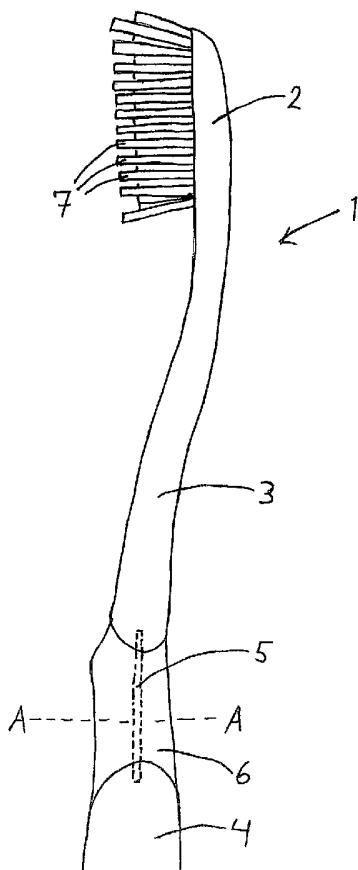
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[Continued on next page]

(54) Title: TOOTHBRUSH WITH LEAF SPRING FOR ENSURING CORRECT PRESSURE



(57) Abstract: A toothbrush (1) is described which is designed to suddenly cause a reduction of the brush contact pressure of the brush head (2) on a tooth and/or gum surface when the toothbrush user applies excessive force to the toothbrush, and wherein the pressure reduction is effected by a spring device (5) having a curved cross-section, and wherein the toothbrush is made of a first, rigid plastic material and optionally a second, elastically yielding plastic material.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Toothbrush with leaf spring for ensuring correct pressure.

The present invention relates to a toothbrush that is designed to suddenly cause a reduction of the brush contact pressure of the brush head on a tooth and/or gum surface
5 when the toothbrush user applies excessive brushing force.

When teeth are brushed, it is important that the toothbrush is not pressed too hard against the teeth and gums thereby damaging them.

10 There are already known toothbrushes with a flexible neck, where the bristled head and the neck of the toothbrush are flexed backwards in relation to the handle according to the brushing pressure. A disadvantage of such toothbrushes is that it is not easy for the user to know when he or she is brushing too hard. See for instance EP371293 and FR2053885.

15 Furthermore, EP371293 and EP281017 describe toothbrushes with spring devices in the neck.

For a toothbrush to be practically useful, it must be comfortable for the user to use and
20 must not have a larger head and neck than can be moved around comfortably inside the mouth.

The object of the present invention is to provide a toothbrush that makes the user aware of when he or she is brushing too hard and at the same time prevents excessively hard
25 brushing. In addition, the toothbrush should basically not be significantly larger than today's standard toothbrushes.

This is achieved with a toothbrush that is designed to cause flexing of the brush head when the brush contact pressure exceeds a specified brush contact pressure on a tooth
30 and/or gum surface when the toothbrush user applies excessive brushing force to the toothbrush, and wherein the flexing is effected by a spring device, wherein the toothbrush is made of a first rigid plastic material, and wherein the toothbrush is characterised in

- that the spring device is located in the toothbrush handle; and
- 35 - that the spring device consists of at least one metal spring leaf having a curved cross-section.

The spring device causes a sudden reduction of the brush contact pressure of the brush head on a tooth and/or gum surface.

In a second embodiment, the spring device consists of two or more spring leaf lamellas.

5

Other features and embodiments of the invention are disclosed in the other, dependent claims.

It is the curved shape of the spring device that helps to give the toothbrush the desired
10 function. The curve of the spring leaf or leaves means that it/they are subjected to
tensile and compressive forces when the brush is loaded. When the maximum moment
that the curvature of the spring leaf or leaves is/are capable of withstanding is exceeded,
it or they will yield to the forces and collapse so that the curvature is straightened out.
When the brush is relieved of pressure, the spring stiffness will cause the spring leaf or
15 leaves return to a curved shape and the brush return to its original shape.

The invention will be explained in more detail with reference to the attached drawings,
wherein,

Figure 1 is a view of one embodiment of the toothbrush according to the invention;

20 Figure 2 shows the toothbrush from Figure 1 which has just been subjected to excessive
brushing force;

Figure 3 is a cross-sectional view of the brush in Figure 1 taken along the line A-A;

Figure 4a shows an "open" part of a second embodiment of the toothbrush according to
the invention:

25 Figure 4b shows an enlarged section of Figure 4a;

Figure 5 shows an embodiment with an extended outermost lamella; and

Figure 6a shows a two-piece embodiment of the toothbrush according to the invention;

Figure 6b shows another embodiment of a two-piece toothbrush according to the
invention;

30 Figure 7 is a graph showing the relation between force of deflection and deflection for a
toothbrush according to the invention;

Figure 8a shows an unloaded curved spring leaf;

Figure 8b shows a curved spring leaf that has been subjected to an excessive load.

35 It will be appreciated that the drawings merely illustrate typical exemplary
embodiments and should not be regarded as defining the limits of the invention.

Figure 1 shows one possible embodiment of a toothbrush 1 according to the invention having a head 2, a neck 3 and a handle 4. Bristles 7 are arranged on the head 2. The spring device 5 is located in the handle 4 close to the neck 3. The handle 4 and the neck 3 are made of a rigid first plastic material, whilst the spring device 5 is encased by an elastically yielding second plastic material 6. In the embodiment shown in Fig. 3, the spring device consists of two parallel spring leaf lamellas 5', 5". The spring device in this case is encased by the elastic second plastic material 6. The spring device may consist of several parallel spring leaves depending on the magnitude of the brush contact pressure that is to cause the toothbrush head 2 and neck 3 to flex suddenly relative to the handle 4.

Figure 2 shows the toothbrush from Figure 1 after it has just been used with excessive brushing force. The force on the brush has released the spring device 5, so that the head 2 and neck 3 have been moved backwards, whereby the brush pressure is reduced, in that angle between the handle and the neck suddenly becomes larger. The spring device 5 will then ensure that the head and neck are moved back to the original position as shown in Figure 1 when the user ceases to exert excessive pressure. The sudden change in the form of the toothbrush will be noticeable to the user as the angle of action for the user's hand relative to the surface he or she wishes to brush will be wrong.

As can be seen from Figures 1 and 2, the spring device 5 is located in the handle 4 close to the area between the neck 3 and the handle 4. During use the toothbrush user will often place a thumb in this area. The location of the spring device 5 in the handle means that the buckle the toothbrush is given when the user brushes too hard will be outside the user's mouth. Furthermore, if the spring device 5 is encased in an elastic second plastic material, this material will not have to be introduced into the mouth, which is agreeable for the user.

Figures 4a and 4b illustrate possible ways of fastening one or more spring leaf plates 5 to each other and to the handle 4 and to the intermediate section leading to the neck 3 on the toothbrush 1. In this case, the neck 3 is connected to the spring device 5 via notches 11 in the spring device 5. The handle 4 is fastened to the spring device in that the rigid first plastic material is passed through a hole 10 in the spring device 5. It will be understood that the spring device can of course be fastened in the same way, either via a hole or notches in the plate, to both the handle 4 and the neck 3. The spring device can also be secured in other ways than those shown here,

In one embodiment of the invention the second plastic material is transparent and an outermost one of the lamellas is provided with markings and/or decoration, not shown in the drawings. In addition, the outermost lamella 5''' can extend past the other lamella or lamellas towards the free end of the handle, as shown in Fig. 5.

5

In a two-piece version of the toothbrush that is shown in Figure 6a, the handle is split into a short separate end portion 4' to which the neck 3 is fastened and the rest of the handle 4''. The spring device 5 has a portion that projects from the short end portion adapted for releasable engagement with a suitably arranged portion on the remaining
10 part of the handle 4''. In one possible embodiment, there may be provided, as shown, a connecting collar 14 of the second plastic material. The collar may be located on the separate end 4' and/or on the remaining part of the handle 4''. Figure 6b shows a second embodiment of a two-piece toothbrush. In this embodiment the spring device 5 is arranged in the rest of the handle 4'' and this handle part is adapted for releasable
15 engagement with the short end portion 4' and the neck 3.

Figure 7 is a graph showing the relation between deflection and force of deflection for a toothbrush according to the invention. The graph shows clearly how an excessive force triggers a sudden reduction in the force of deflection continues. The term "deflection"
20 in this context means the flexing of the toothbrush head 2 and neck 3 relative to the handle 4 when a compressive force is applied to the bristles 7.

Figures 8a and 8b show how a curved spring leaf in unloaded state (Figure 8a) when subjected to an excessive load (Figure 8b) is given a "break" so that the curve is
25 straightened out. When the load is reduced, the spring leaf will return to its original form (Figure 8a).

The toothbrush according to the invention could be made in the form of either a manual toothbrush or an electromechanically operated toothbrush.

P a t e n t c l a i m s

1.

A toothbrush (1) that is designed to cause flexing of the brush head (2) when the brush
5 contact pressure exceeds a certain brush contact pressure on a tooth and/or gum surface
when the toothbrush user applies excessive brushing force to the toothbrush, and
wherein deflection is effected by a spring device (5), wherein the toothbrush is made of
a first rigid plastic material,
characterised in

- 10 - that the spring device (5) is located in the toothbrush handle (4); and
- that the spring device (5) consists of at least one metal spring leaf having a
curved cross-section.

2.

15 A toothbrush as disclosed in claim 1, characterised in that the spring device (5)
suddenly causes a reduction of the brush contact pressure of the brush head (2) on a
tooth and/or gum surface.

3.

20 A toothbrush as disclosed in claim 1 or 2, characterised in that the spring device (5) is
located close to an intermediate area between the toothbrush handle (4) and neck (3).

4.

A toothbrush as disclosed in one or more of claims 1-3, characterised in that the spring
25 device (5) has a buckle point located in the toothbrush handle (4) close to the toothbrush
neck (3).

5.

A toothbrush as disclosed in one or more of claims 1-4, characterised in that the spring
30 device (5) consists of two or more spring leaf lamellas.

6.

A toothbrush as disclosed in one or more of claims 1-5, characterised in that it
comprises a second, elastically yielding material (6) and the spring device (5) is at least
35 partly encased by the second material (6).

7.

A toothbrush as disclosed in claim 5, characterised in

- that the lamellas of the spring device are mechanically joined together at at least one point.

5

8.

A toothbrush as disclosed in claim 3, characterised in

- that the mechanical joining is effected by the first material which extends through hole (10) or notch (11) in the plates.

10

9.

A toothbrush as disclosed in one or more of claims 5-8, characterised in

- that the second material (6) is transparent; and
- that an outermost one of the lamellas is provided with markings and/or decoration.

15

10.

A toothbrush as disclosed in claim 9, characterised in

- that a decorated part of said lamella extends in the longitudinal direction past the other lamella or lamellas in the direction of the free end of the handle.

20

11.

A toothbrush as disclosed in one or more of claims 1-9, characterised in

- that the toothbrush consists of two detachable parts formed of respectively the toothbrush handle (4'') and a separate short portion (4') of the handle to which the toothbrush neck (3) and head portion (2) are fixed; and
- that said spring device (5) has a portion that projects from the short end portion (4') of the handle or the rest of the handle (4'') and is designed to be inserted into a suitable second end area on the rest of the handle (4'') or a suitable end area on the short end portion (4') of the handle and to form releasable engagement therewith.

30

12.

A toothbrush as disclosed in claim 11, characterised in

- that said end area of the handle and/or the end of the rest of the handle is provided with a connecting collar (14) of said second material.

35

[Received by the International Bureau on 19 November 2003 (19.11.03):
original claims 1-12 replaced by amended claims 1-10 (2 pages)]

P a t e n t c l a i m s

1.

A toothbrush (1) that is designed to cause flexing of the brush head (2) relative to the
5 toothbrush handle (4) when the brush contact pressure exceeds a certain value on a tooth
and/or gum surface when the toothbrush user prior thereto applies excessive brushing
force to the toothbrush, deflection being made possible by a spring device (5), and
wherein a substantial part of the toothbrush head (2), neck (3) and handle (4) is made of
a first, rigid plastic material, characterised in

- 10 - that the spring device (5) consists of at least one metal spring leaf having a curved
cross-section for suddenly reducing the brush contact pressure when said value is
exceeded, and
- what the spring device (5) is located in the toothbrush handle (4) and with spring
buckle point located in the toothbrush handle (4) close to the toothbrush neck (3).

15

2.

A toothbrush as disclosed in claim 1, characterised in that the spring device (5) is
located close to an intermediate area between the toothbrush handle (4) and neck (3).

20 3.

A toothbrush according to claim 1 or 2, characterised in that the spring device (5)
consists of at least two superimposed spring leaf lamellas.

4.

25 A toothbrush as disclosed in claim 1, 2 or 3, characterised in that the spring device (5) is
at least partly encased by a second, elastically yielding plastic material (6).

5.

A toothbrush as disclosed in claim 3, characterised in

- 30 - that the lamellas of the spring device are mechanically joined together at at least one
point.

6.

A toothbrush as disclosed in claim 5, characterised in

- 35 - that the mechanical joining is effected by the first material which extends through
hole (10) or notch (11) in the lamellas.

7.

A toothbrush as disclosed in one or more of claims 4-6, characterised in

- that the second material (6) is transparent; and
- that an outermost one of the lamellas is provided with markings and/or decoration.

5

8.

A toothbrush as disclosed in claim 7, characterised in

- that said outermost lamella extends in longitudinal direction past remaining of the lamellas in direction of a free end of the handle.

10

9.

A toothbrush as disclosed in one or more of claims 1-8, characterised in

- that the toothbrush handle consists of two detachable parts formed of respectively a long, rear handle (4'') and a short forward part (4') of the handle to which the toothbrush neck (3) and thereby the toothbrush head (2) are fixed; and
- that the spring device (5) has a portion that projects from the forward part (4') of the handle or from the rear part of the handle (4''), and that the spring device (5) with a portion thereof is designed to be inserted into and from a releasable engagement with a suitably adapted second end area on the rear part (4'') of the handle or a suitably adapted end area on the forward portion (4') of the handle.

15

20

10.

A toothbrush as disclosed in claim 9, characterised in

- that said end area of the forward part of the handle and/or the end area of the rear part of the handle is provided with a connecting collar (14) of said second, elastically yielding plastic material.

25

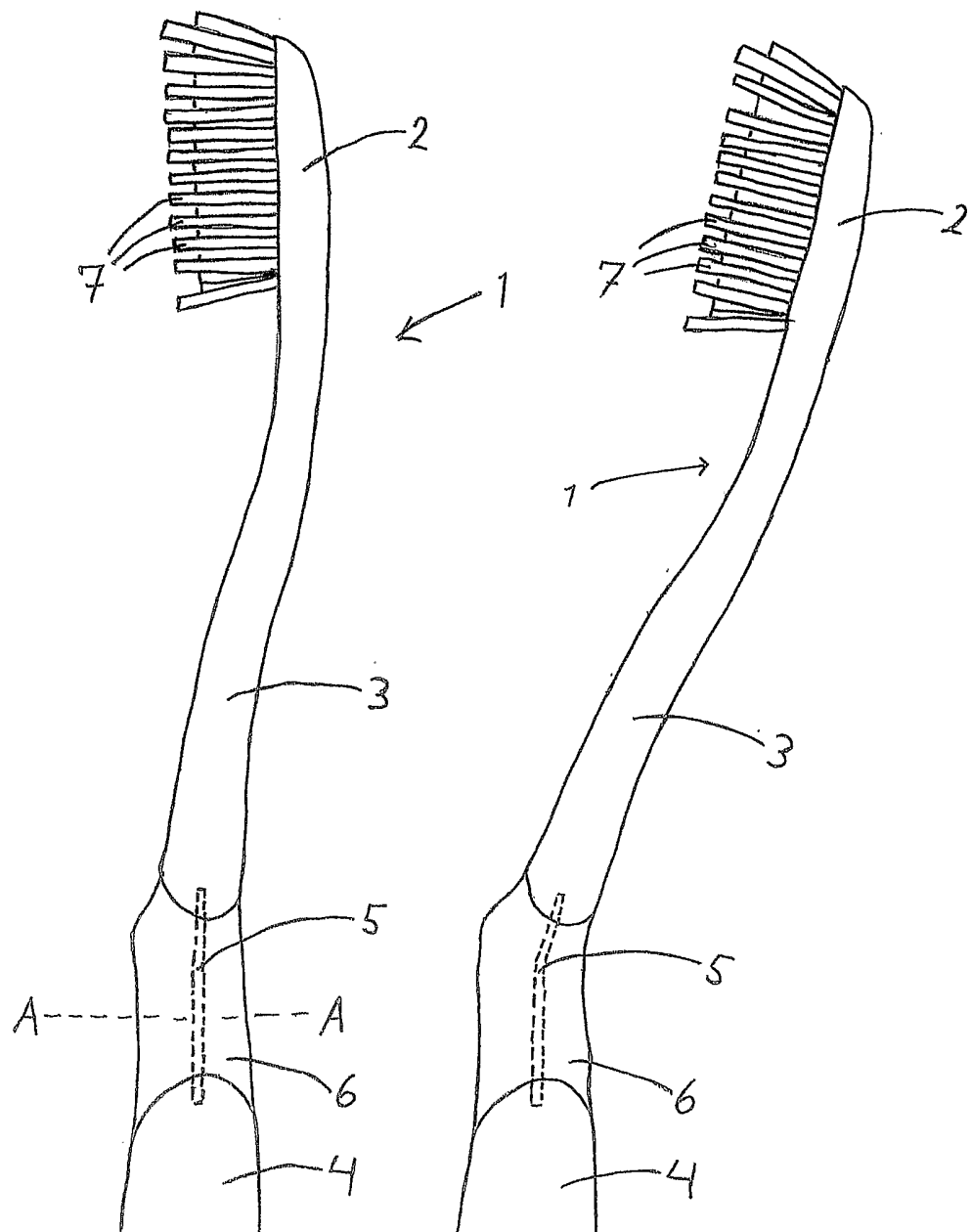


Fig. 1

Fig. 2

Fig. 3

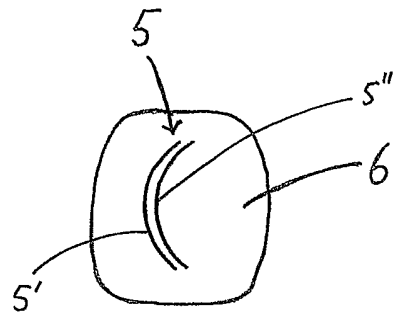
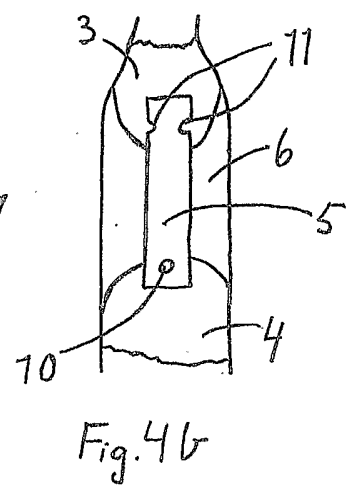
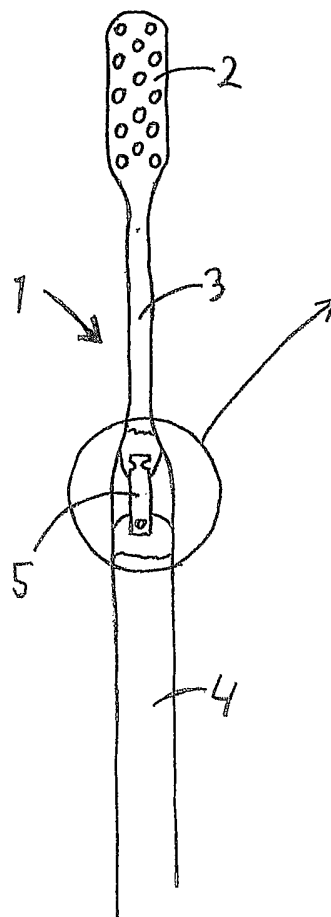
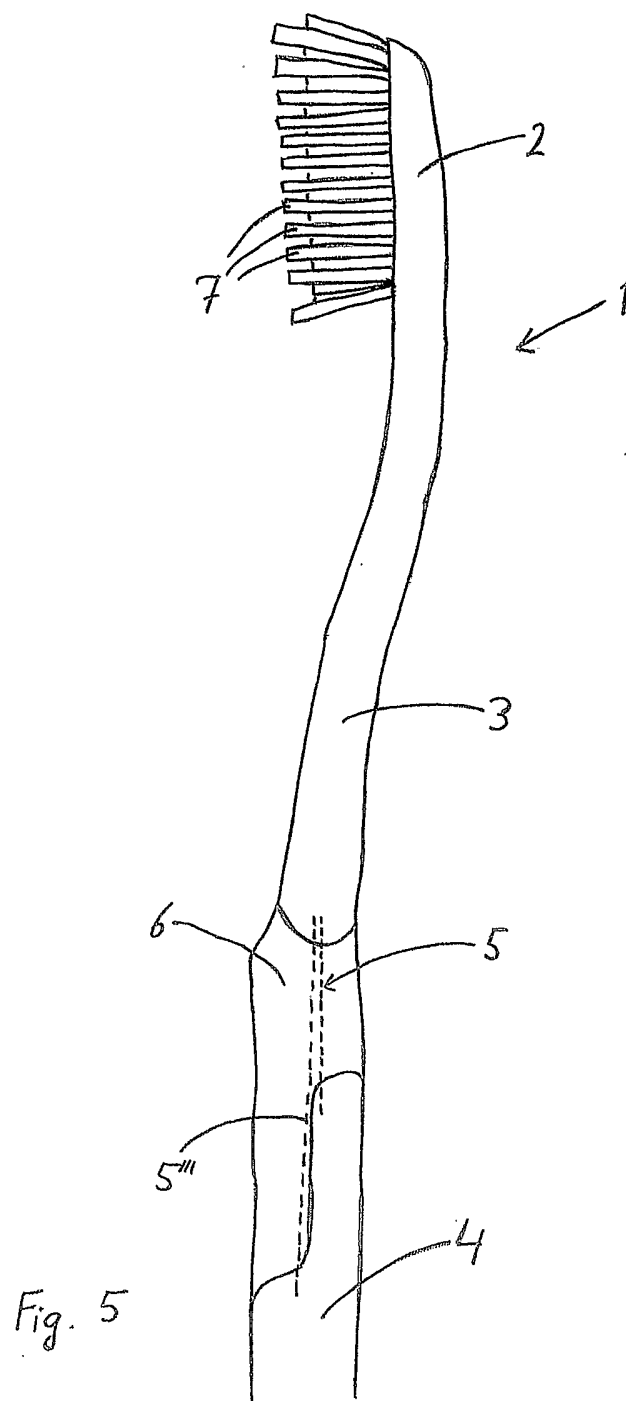


Fig. 4a





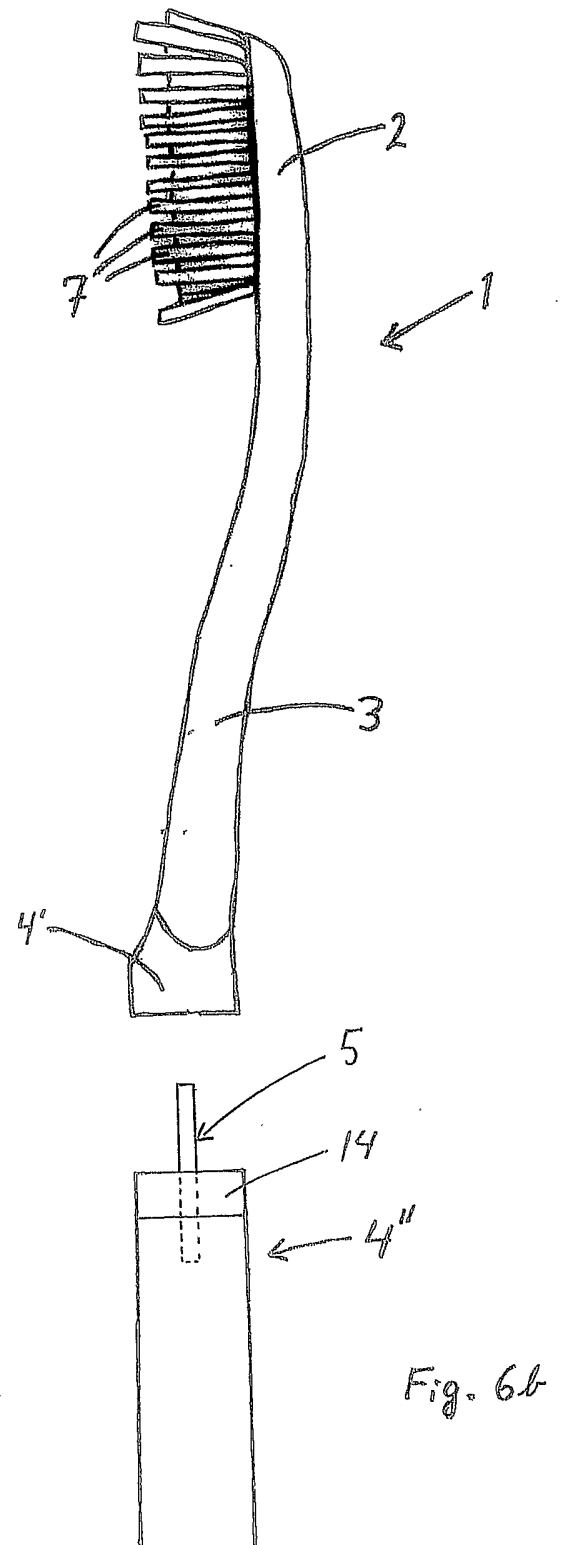
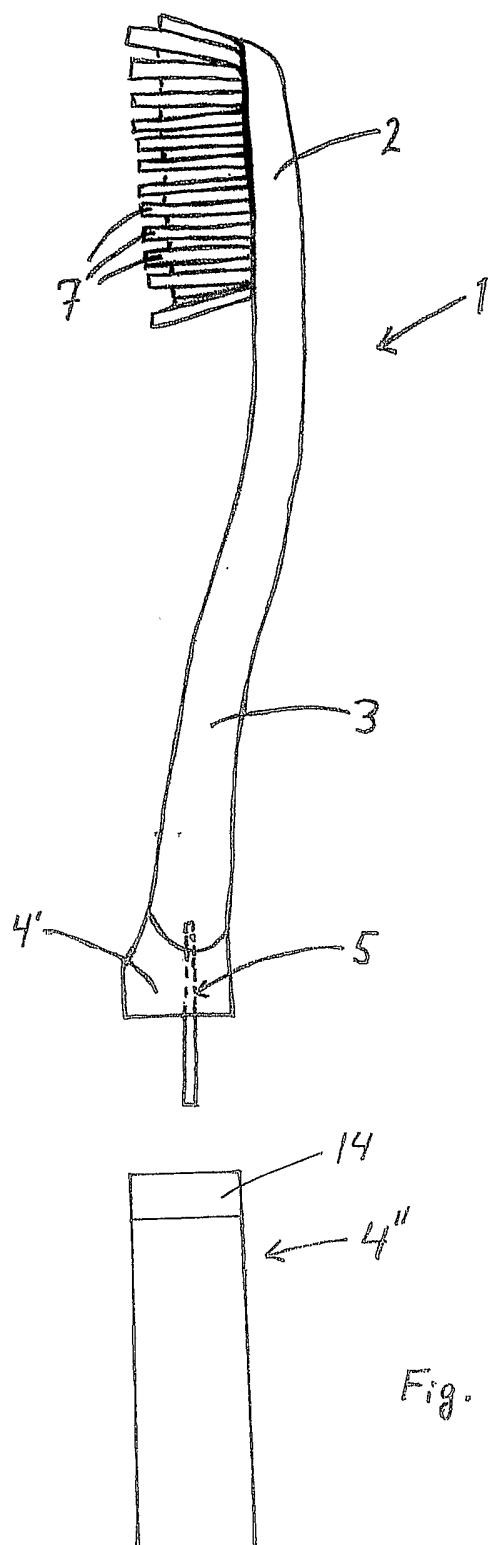


Fig. 7

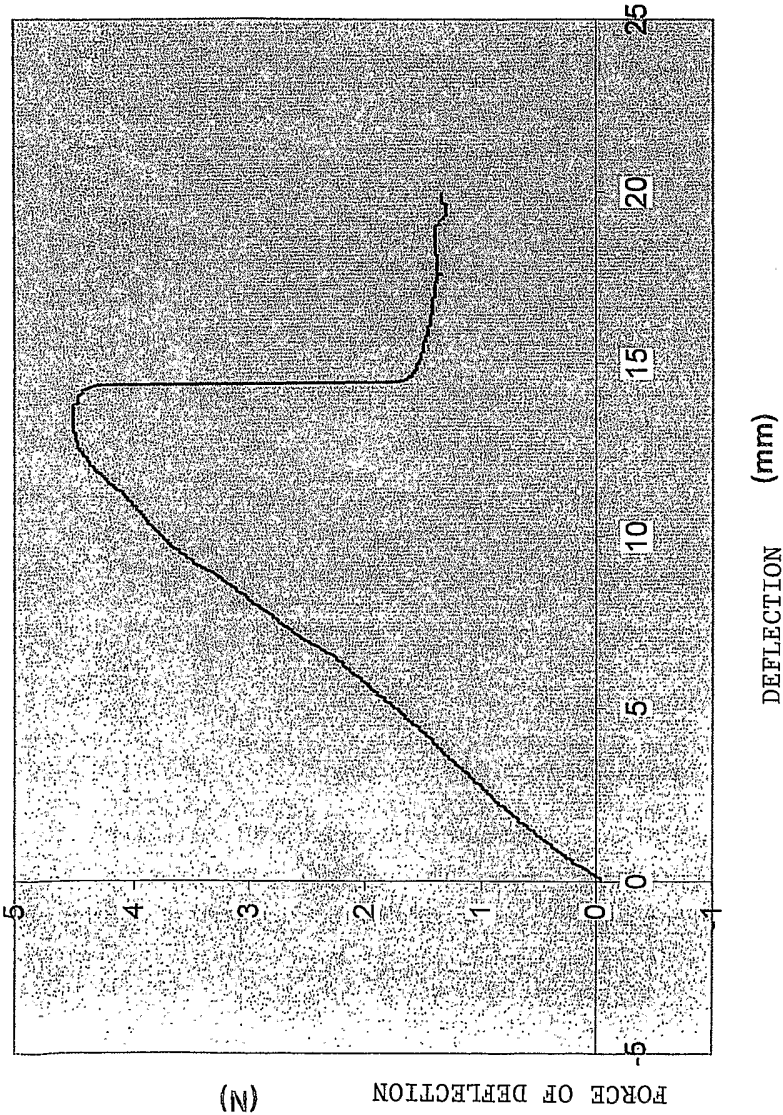


Fig. 8a

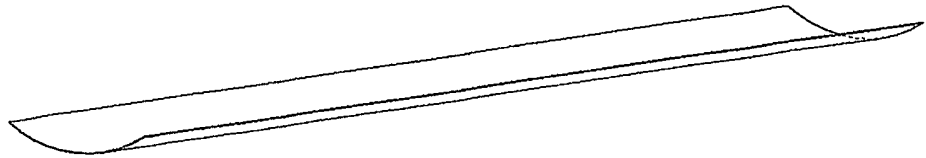
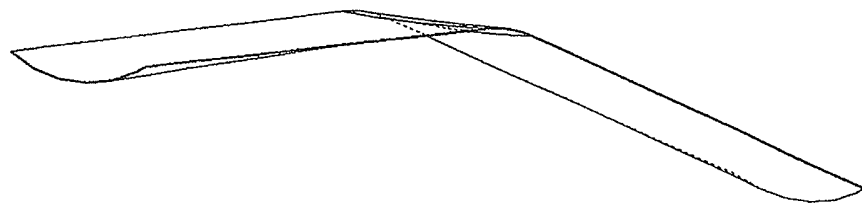


Fig. 8b



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A46B 15/00, A46B 5/06

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)

IPC7: A46B

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
15 Sept. 2003	16 -09- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jörgen Klöfver / MRo Telephone No. +46 8 782 25 00

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