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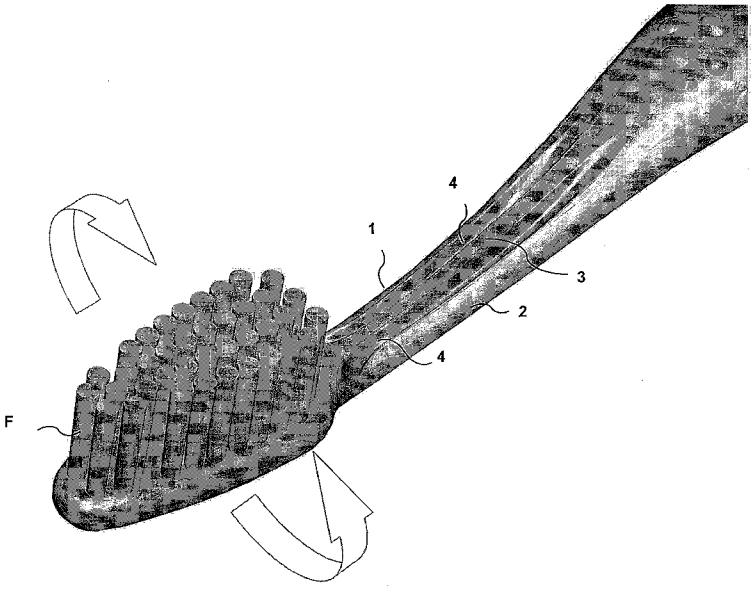
(54) **Title:** TOOTHBRUSH WITH A HEAD ABLE TO SWING UNDER TORSION




(57) **Abstract:** A toothbrush is disclosed of the type comprising a body of plastic material made of at least a first skeleton component and at least a second filler component of elastomeric material wherein a handle portion (P) and a head portion (T) may be identified, the latter being provided with cleaning tufts (F), between which a neck portion (C) is provided, wherein the neck portion (C) comprises two elongated side arms (1, 2) and a central core element (3), arranged between the two arms, which belong to said first skeleton component and which are substantially aligned with a longitudinal axis of the toothbrush, in the gap between the two side arms (1, 2) and the central core (3) said second filler component (4) being arranged.

WO 2008/017996 A2

# TOOTHBRUSH WITH A HEAD ABLE TO SWING UNDER TORSION

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## Field of the Invention

The present invention concerns a toothbrush, in particular a toothbrush with a able to swing head.

## Background Art

As known, in the last decade the toothbrush market has seen the development of a huge variety of toothbrushes of the most diverse and unusual shapes, both with the intent of making this object more functional, and of making it more appealing and innovative to the consumers' eyes, who have become ever more demanding when it comes to technology and appearance.

Many of the improvements obtained in this sector were made possible also by resorting to high-tech moulding stations of plastic materials and tufting stations, which nowadays allows to develop highly complex toothbrushes.

Among the components which have captured most the designers' attention, the tufted head portion of the toothbrush has been the subject of a number of improvements, which have increased the cleaning effectiveness and handling thereof.

In particular, various solutions have been offered wherein the head is capable of swinging in a more or less pronounced manner with respect to an axis transversal to the toothbrush handle. Some examples are represented by US 4 488 328, US 5 054 154, US 4 829 621, EP 371 293, WO 00/70997, as well as EP 648 448 in the name of the same Applicant.

Bending of the head, especially in the plane parallel to the tufts, has always been considered the most advantageous flexion to second the arched structure of the dental arc and hence to aid effective teeth cleaning and an even distribution of the pressure imparted by the hand on the handle.

Recently it has been found that also a crosswise swinging of the head may appeal to the user.

Among the many known toothbrushes, there are hence some allowing a lateral bend of the head (i.e. in a perpendicular direction to the tufts) and even a moderate freedom of rotation about the main longitudinal axis of the toothbrush. Among these,

for example, EP 604 425, EP 613 636.

However, so far the problem of obtaining a toothbrush with a flexible head under torsion, i.e. swinging about the main longitudinal axis, has not been addressed with systematicity and rigour, although some clinical trials and market surveys have highlighted that there would be the need for such a product.

The object of the present invention is hence that of providing a flexible-head toothbrush, wherein the head may elastically swing with respect to an axis parallel to the main longitudinal axis and wherein such rotation may be caused in the desired way, without significantly affecting the bending of the head along the other transversal axes of the toothbrush and without weakening the structural resistance of the same.

Summary of the Invention

Such object is achieved through a toothbrush as described in its essential features in the accompanying main claim.

In particular, according to a main aspect of the invention, a toothbrush is provided of the type comprising a body of plastic material made of at least a first skeleton component and at least a second filler component of elastomeric material, wherein a handle portion and head portion are defined, the latter being provided with cleaning tufts, among which there is provided a neck portion comprising two elongated side arms between which there is arranged a central core element, which belong to the first skeleton component and are substantially aligned to a longitudinal axis of the toothbrush, the second filler component being arranged at least in the gaps between the two side arms and the central core.

Other inventive aspects of the invention are described in the dependent claims.

Brief Description of the Drawings

Further features and advantages of the toothbrush according to the invention will in any case be more evident from the following detailed description of a preferred embodiment of the same, given by way of example and illustrated in the accompanying drawings, wherein:

fig. 1 is an elevation side view of the toothbrush

according to the invention;

fig. 2 is a top plan view, or a ventral-side view, of the toothbrush of fig. 1;

fig. 3 is a cross-section view taken along the line III-III of fig. 1;

fig. 4 is a cross-section view taken along the line IV-IV of fig. 1;

fig. 5 is a partial pictorial view of the sole end portion of the toothbrush according to the invention;

fig. 6 is a partial pictorial view, in a sectioned perspective, of the end portion of the toothbrush according to the invention;

figs. 7 and 8 are partial top plan (or ventral side) and bottom plan (or back side) pictorial views, respectively, of the toothbrush of the invention still lacking the elastomeric component; and

fig. 9 is a perspective, partial pictorial view of the same toothbrush component illustrated in figs. 7 and 8.

Detailed Description of a Preferred Embodiment

As clearly illustrated in fig. 2, a toothbrush consists in a manner known per se of a handle portion P, of a neck portion C and of a head portion T, wherein a plurality of cleaning tufts F are inserted.

The toothbrush is made of plastic material and through co-moulding techniques which allow to join firmly and in an aesthetically appealing manner two or more different components. As can be appreciated, the handle portion has a general ergonomic shape and a series of patterns, even in relief, which are made possible by this known injection moulding technology for plastic material and which make it particularly appealing for the user.

In the specific case, the toothbrush is advantageously made of two co-moulded components, a first skeleton component of a more resistant material, such as polypropylene, and a second, softer filler component, such as an elastomeric material.

According to the invention, the neck portion C consists of two elongated side arms 1 and 2 between which a central core 3

lies, all these elements being moulded out of polypropylene or in any case skeleton plastic material. The filler material, as shown in figs. 3 and 4, is a softer material 4 such as elastomer.

Between the two side arms 1 and 2 and the central core 3 there is a gap sufficient to allow a wide movement of core 3 with respect to arms 1 and 2: this movement is elastically dampened and restrained by the presence of elastomeric material 4 in such gap.

In the preferred embodiment illustrated in figs. 3, 4 and 6, the two side arms have a cross profile with a curved outline, more open towards the upper side of the toothbrush. Hence in the lower part (back side), the section profile of the arms comes closer to the base of central core 3 and the mutual distancing is smaller than in the upper part (ventral side).

Preferably, the distance between the central core and the two side arms is at least of 0.5 mm (for example in correspondence of the dimension d in fig. 3) and, for at least half the height of central core 3, it is over 1 mm.

As visible in the cross-sections of figs. 3 and 4, the elastomeric filler material 4 fully closes the gap between the two arms 1 and 2 in the back side, joining the overall surface of the section along an even and continuous curved line with that of the side arms. On the contrary, in the ventral upper part, filler material 4 does not join evenly the surfaces of side arms 1 and 2 and of central core 3, but forms a sort of double meniscus which is symmetrical to central core 3, with a ventral concaveness which extends for a good portion of the neck portion forming two symmetrical recesses (clearly visible in fig. 5).

Moreover, according to the preferred embodiment shown, central core 3 extends integrally from the skeleton component of head T, and freely inserts cantilevered between the two arms 1 and 2 (see figs. 7-9); viceversa, the two arms 1 and 2 project integrally from the skeleton portion of the handle, extend along the two sides of core 3, and end cantilevered at a short distance from the head.

In order to consolidate the central core with the side arms - especially before the second elastomeric component is moulded - three flimsy connection bridges $P_1$-$P_3$ are also provided, made of the same plastic material as the skeleton, which connect the end of core 3 with the surrounding skeleton component and the ends of arms 1 and 2 with core 3.

Seen from a different perspective, it can be appreciated that the two arms 1 and 2 depart from the handle forming a fork accommodating the central core 3, said core inserting freely into said fork: the bridges $P_1$-$P_3$ establish a flimsy connection between the fork and the central core. In order to nevertheless allow an adequate swinging of the core within the fork, bridges $P_1$-$P_3$, in addition to being flimsy and thin, join to the lower (back) part of core 3 (see fig. 9) where the torsion axis is substantially located, as will be highlighted further on.

The construction of this neck portion is clearly visible in fig. 9, wherein only the skeleton plastic component (for example polypropylene) is shown, which is moulded first and whereon the second elastomeric component is subsequently moulded.

This arrangement, together with the fact that central core 3 - as visible in the drawings - has a thin section in the direction of its width and hence a low inertia under torsion (despite a good inertia to flexion on the lateral plane of the toothbrush), produces the desired degree of elasticity under torsion of the head, as shown by the arrows of fig. 5.

The swinging under torsion of the head, under the pressure stress imparted during the cleaning of the dental arc, is elastically guided and dampened by the elastomeric material inserted between the two arms 1 and 2 and the core 3. At the same time the height of arms 1 and 2 and of core 3, as well as the overall width of neck portion C, nevertheless offer - as desired - a significant bending inertia along the two orthogonal axes crosswise to the longitudinal axis of the toothbrush, so as to keep within reasonable limits the yield of the head along these axes.

Hence the toothbrush according to the invention has a head which can easily swing under torsion along the longitudinal axis

thereof, but has a conventional behaviour - not excessively yielding - along the two main bending axes, which fully meets the object set forth in the preliminary remarks.

In the preferred embodiment shown, the gap between the core and the side arms - wherein the elastomeric material 4 is found - is not constant across the entire height of core 3, as highlighted by the difference between distance d and distance D in fig. 3. Therefore, the elastic support of core 3 is advantageously differentiated across its height and hence the torsion axis does not fall on the centre of gravity of the core. In particular, since the cross section profile of the side arms (as visible in figs. 3 and 4) is arched and widens towards the upper part, the side yield of core 3 is greater in the upper part than in the lower part of the section: hence the rotation axis under torsion is shifted downwards (i.e. towards the back) with respect to the centre of gravity of the section area, even though it is still centred on the lateral symmetry axis.

This effect is heightened by the presence of bridges $P_1$-$P_3$ which, as seen, join the core in correspondence of the lower part thereof.

This results in the swinging under torsion of the head occurring about an axis shifted towards the back side of the toothbrush and of the head, hence in the proximity of the root of the tufts of bristles, which makes the elastic swinging of the head on the dental arc pleasant and effective.

However, it is intended that the invention is no limited to the particular arrangement illustrated above, which represents only a non-limiting example of the scope of the invention, but that a number of variants are possible, all within the reach of a person skilled in the field, without departing from the scope of the invention.

For example, regardless of what is specifically disclosed and illustrated in the drawings as an example, the thickness and the nature of the elastomeric material filling the two gaps between the side arms and the central core may be chosen as desired, namely with a view towards adjusting as desired the elastic reaction of the head to torsion and the position of the

rotation axis. As a result of the amount and of the location of the elastomeric material employed, the two ventral recesses may be even more pronounced, or they may be evident on the back side or even disappear completely.

Moreover, the elastomeric material in the two gaps may be different from the elastomeric material employed for the rest of the toothbrush and hence more or less soft to guarantee the swinging of the head regardless of the features of the rest of the toothbrush.

In the above the description, reference has been made to polypropylene as a skeleton component and to thermoplastic elastomeric material (TPE) as an elastic filler material, but it is intended that also other plastic materials may be used, provided the one (the skeleton component) has mainly an adequate structural resistance and the other (the filler component) is sufficiently elastic - at least compared to the skeleton component - to allow to obtain the desired elasticity under swinging. The same skeleton material of the head and of the handle may differ: in this case, the elastomeric material may be compatible with both materials, with one only of the two, or with neither of them (which would not allow a proper bonding between the materials, implying to obtain the mounting of the tool through suitable mechanical engagement devices).

Finally, a similar operation to the one shown is possible with an arrangement complementary to the described one, i.e. wherein the core element projects integrally from the handle and the two side arms are integral with the skeleton component of the head.

CLAIMS

1) Toothbrush of the type comprising a body of plastic material made of at least a first skeleton component and at least a second filler component of elastomeric material, wherein a handle portion (P) and a head portion (T) can be identified, the latter being provided with cleaning tufts (F), between which a neck portion (C) is provided, characterised in that the neck portion (C) comprises two elongated side arms (1, 2) and a central core element (3), arranged between the two arms, which belong to said first skeleton component and which are substantially aligned with a longitudinal axis of the toothbrush, said second filler component (4) being arranged at least in the gaps between the two side arms (1, 2) and the central core (3).

2) Toothbrush as claimed in claim 1), wherein the gaps between said arms (1, 2) and said central core element (3) progressively widen from the back side to the ventral side of the toothbrush.

3) Toothbrush as claimed in claim 1) or 2), wherein said side arms (1, 2) have an arched cross section which widens towards the ventral side of the toothbrush.

4) Toothbrush as claimed in any one of the preceding claims, wherein said core element (3) is shaped as an elongated, thin profile, with the main axis aligned with the direction of extension of said cleaning tufts (F).

5) Toothbrush as claimed in any one of the preceding claims, wherein said core element (3) projects integrally from the skeleton component of the head (T) of the toothbrush, inserting itself cantilevered between said two arms (1, 2), without becoming joined to the skeleton portion of the handle (P).

6) Toothbrush as claimed in any one of the preceding claims, wherein said side arms (1, 2) project integrally from the skeleton component of the handle (P), ending up cantilevered in the proximity of the skeleton portion of said head (T) without joining thereto.

7) Toothbrush as claimed in claim 5) or 6), wherein between said central core (3) and said arms (1, 2) there are provided connection bridges ($P_1$, $P_2$, $P_3$) of the same material as said skeleton component.

8) Toothbrush as claimed in claim 7), wherein said connection bridges ($P_1$, $P_2$, $P_3$) are thin and join to the lower (back side) portion of said core element (3).

9) Toothbrush as claimed in any one of the preceding claims, wherein said gaps are at least 0.5 mm wide.

10) Toothbrush as claimed in any one of the preceding claims, wherein said second filler component (4), in the ventral part of the gaps between the core element (3) and the two side arms (1, 2), is arranged as a concave meniscus.

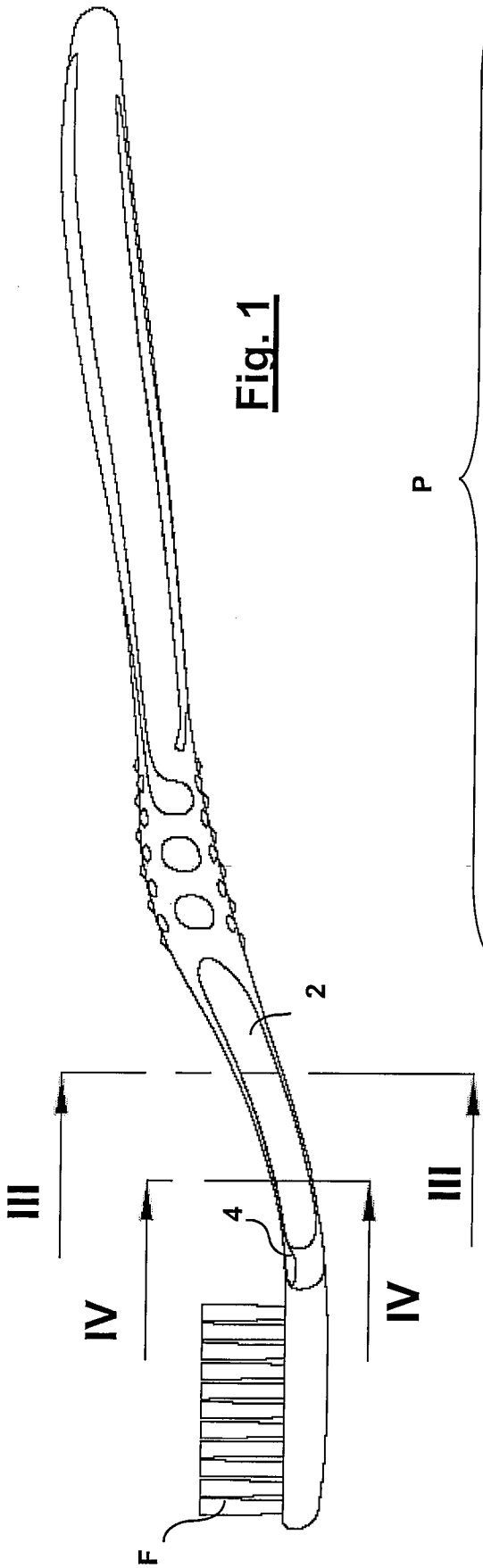


Fig. 1

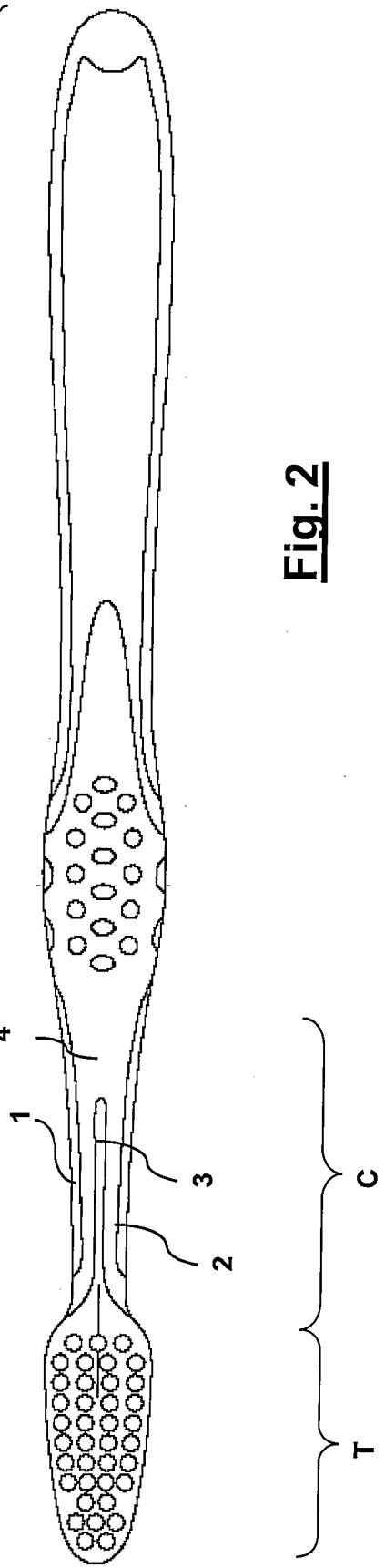


Fig. 2

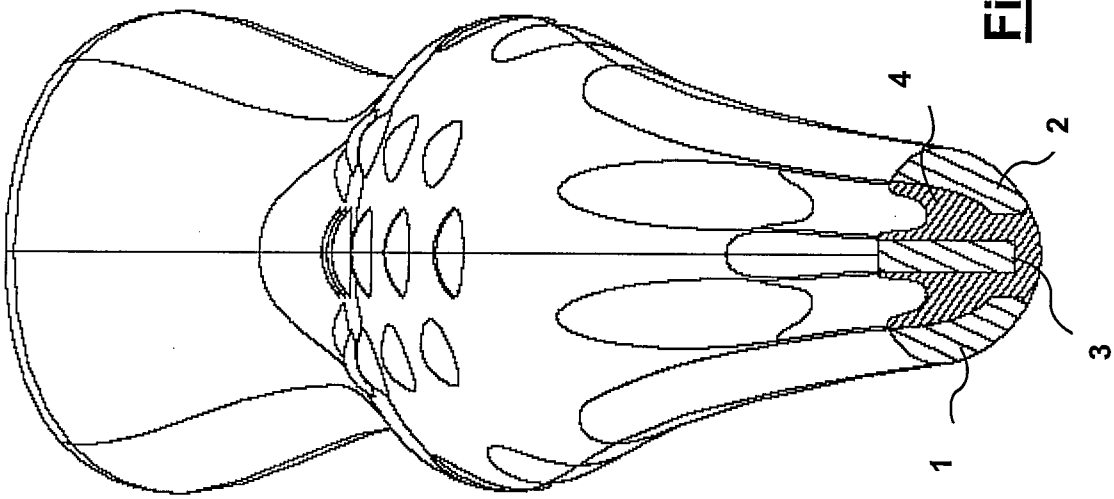


Fig. 4

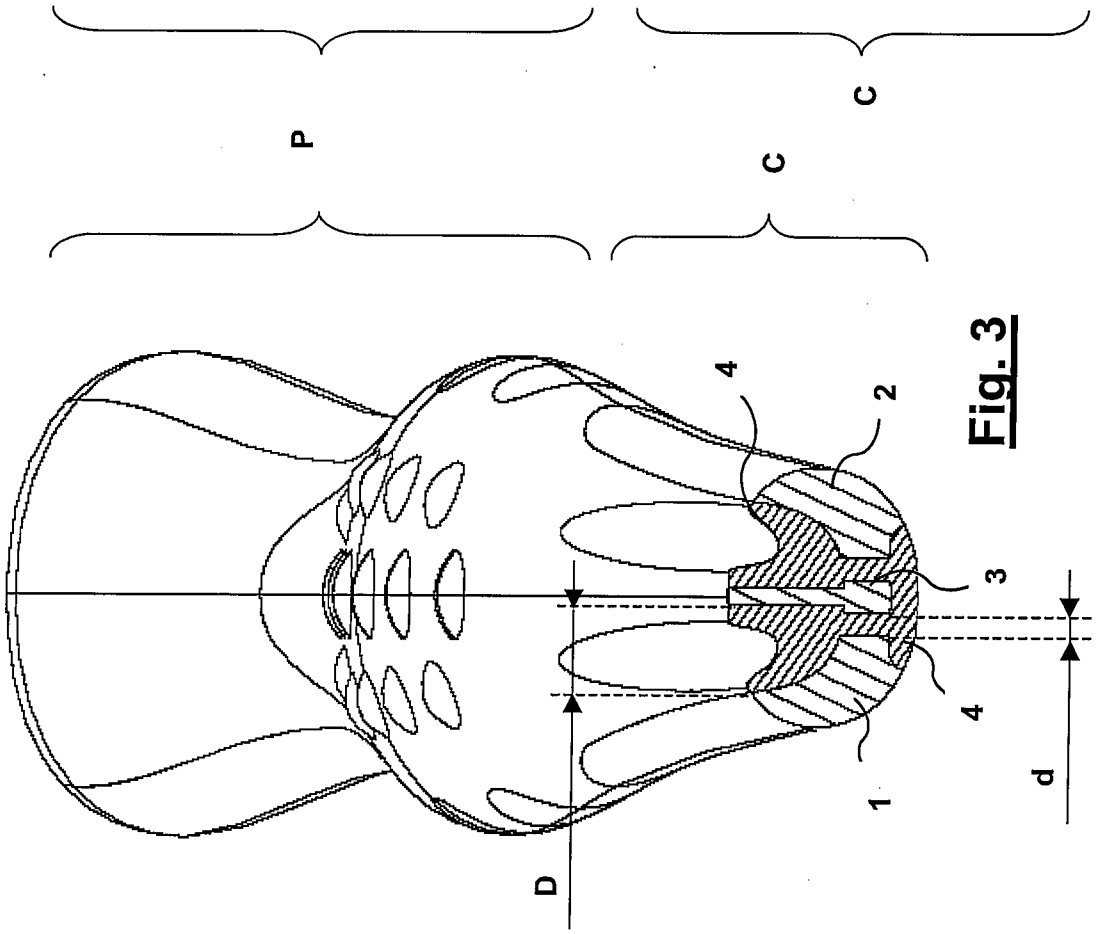


Fig. 3

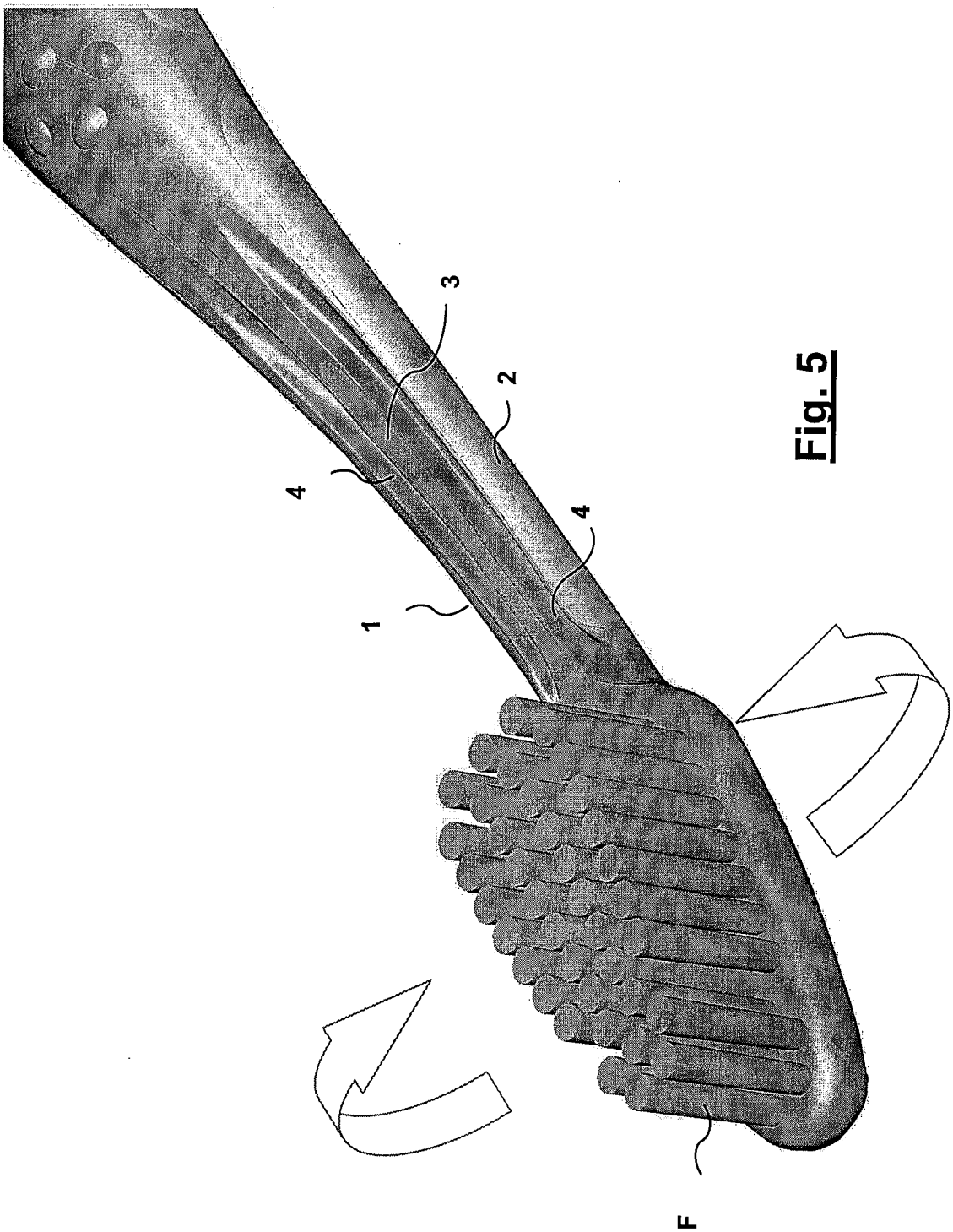


Fig. 5

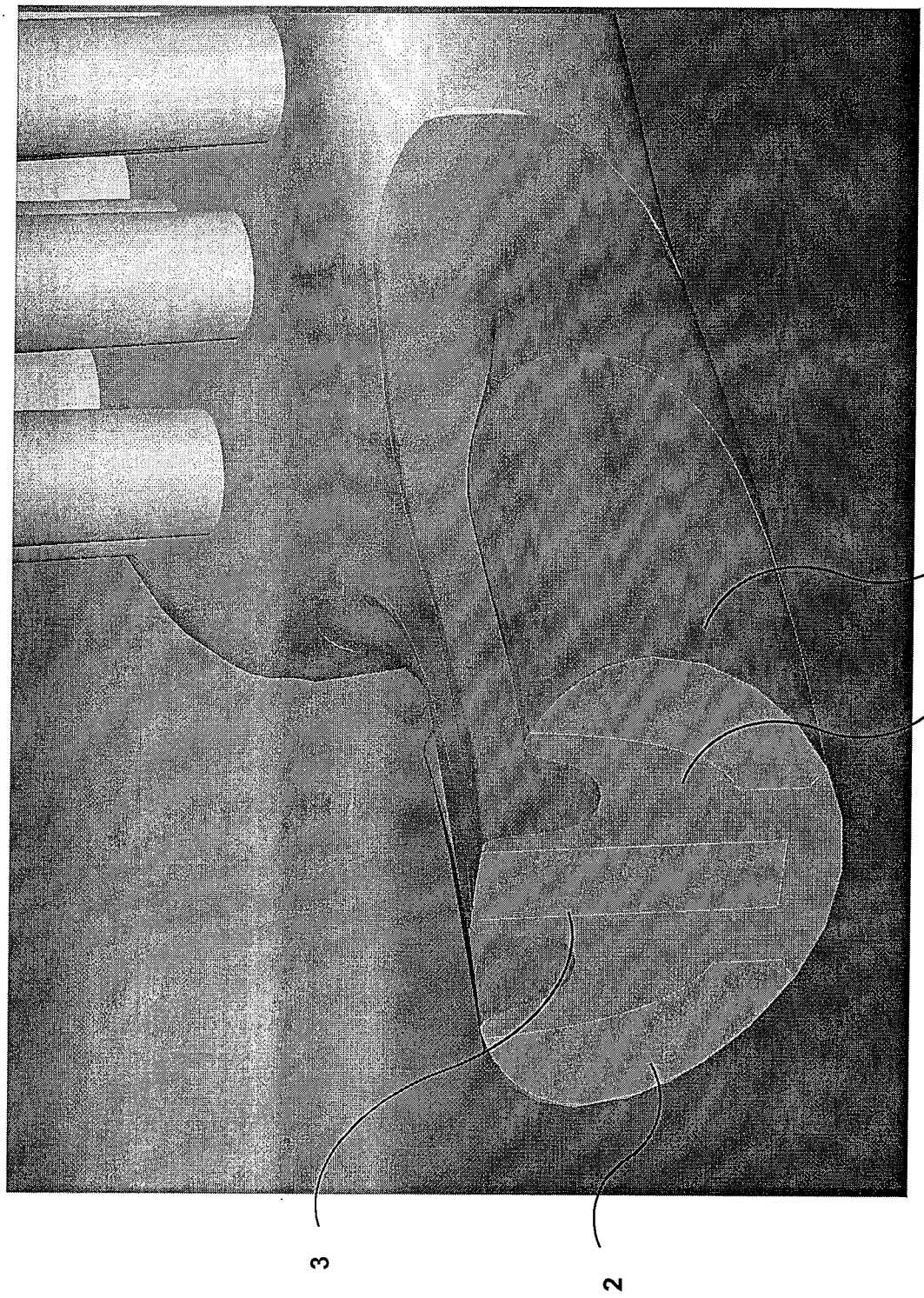


Fig. 6

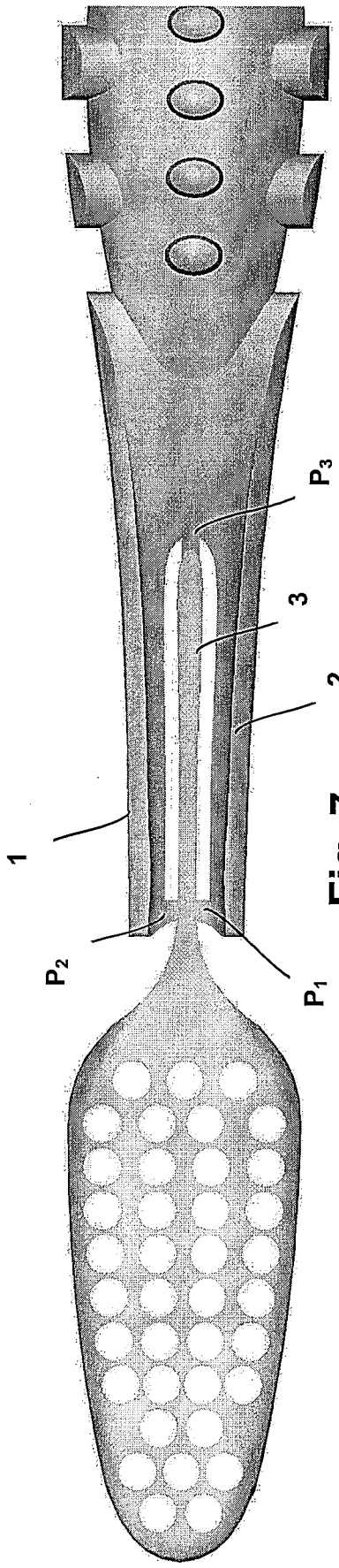


Fig. 7

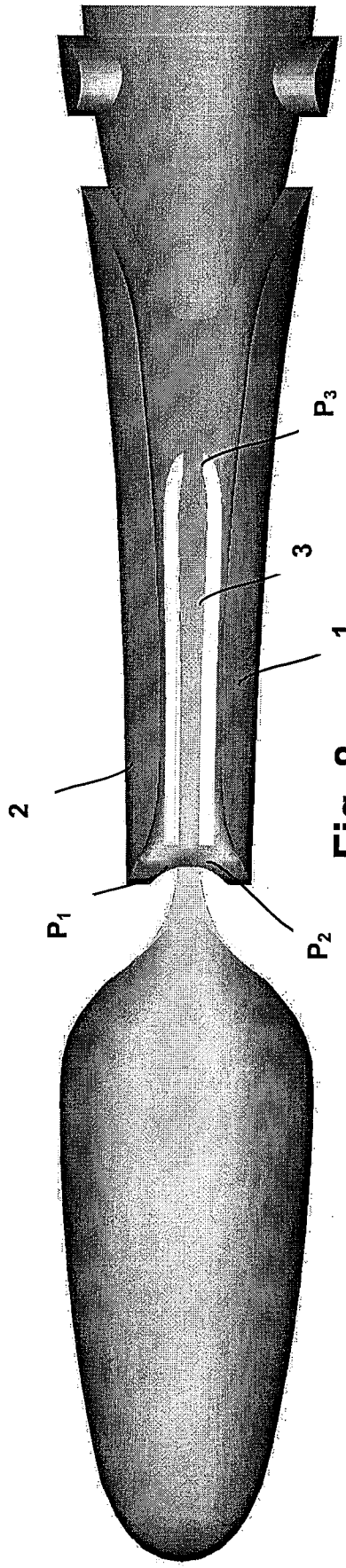


Fig. 8

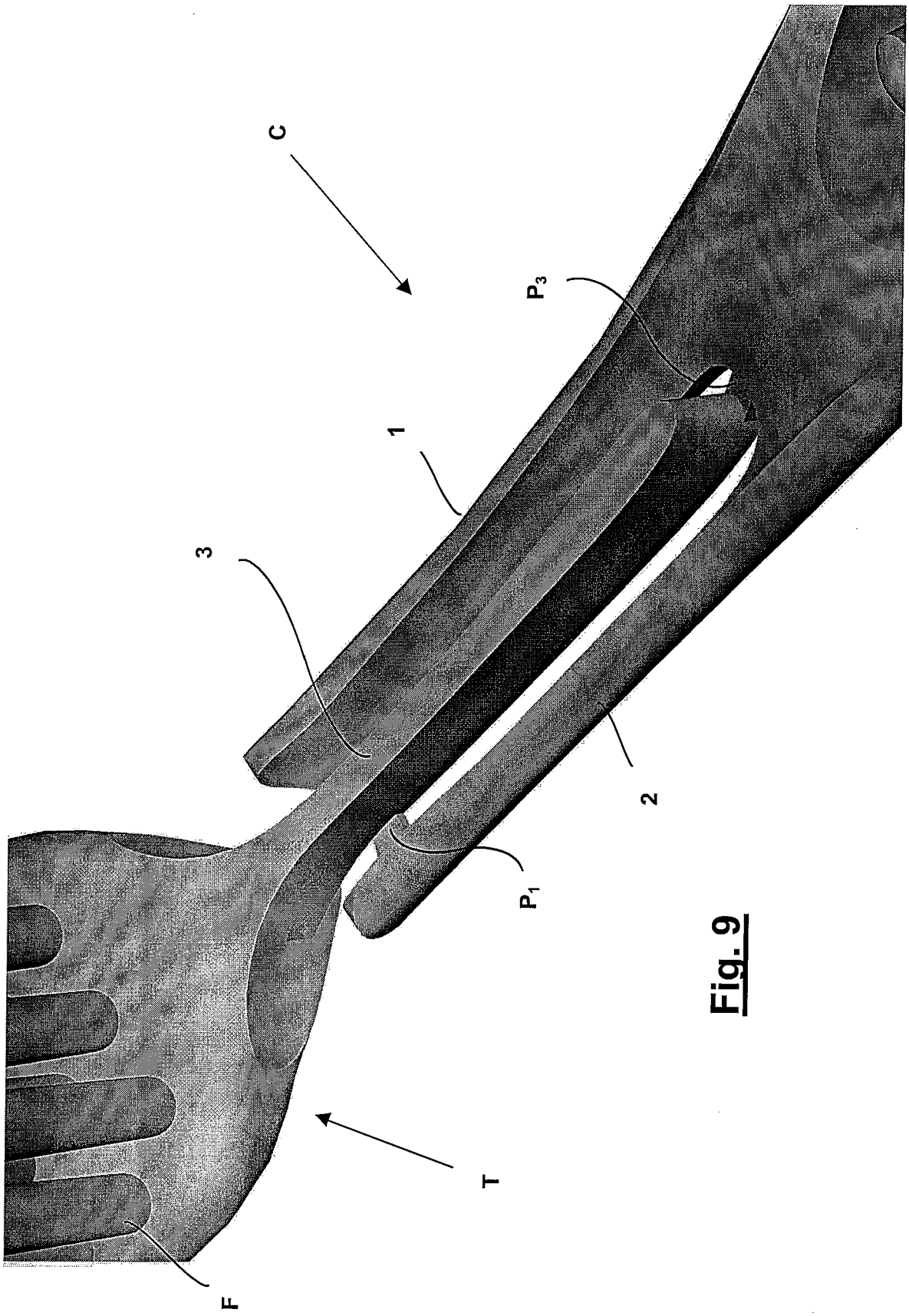


Fig. 9