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Fischer et al.

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(54) **TOOTHBRUSH AND PROCESS FOR PRODUCING SUCH A TOOTHBRUSH**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
A46B 7/06 (2006.01)
A46B 9/04 (2006.01)
A46D 3/00 (2006.01)

(52) **U.S. Cl.**
USPC 300/21; 15/110; 15/167.1; 15/201

(58) **Field of Classification Search**
USPC 15/110, 167.1, 201; 300/21
See application file for complete search history.

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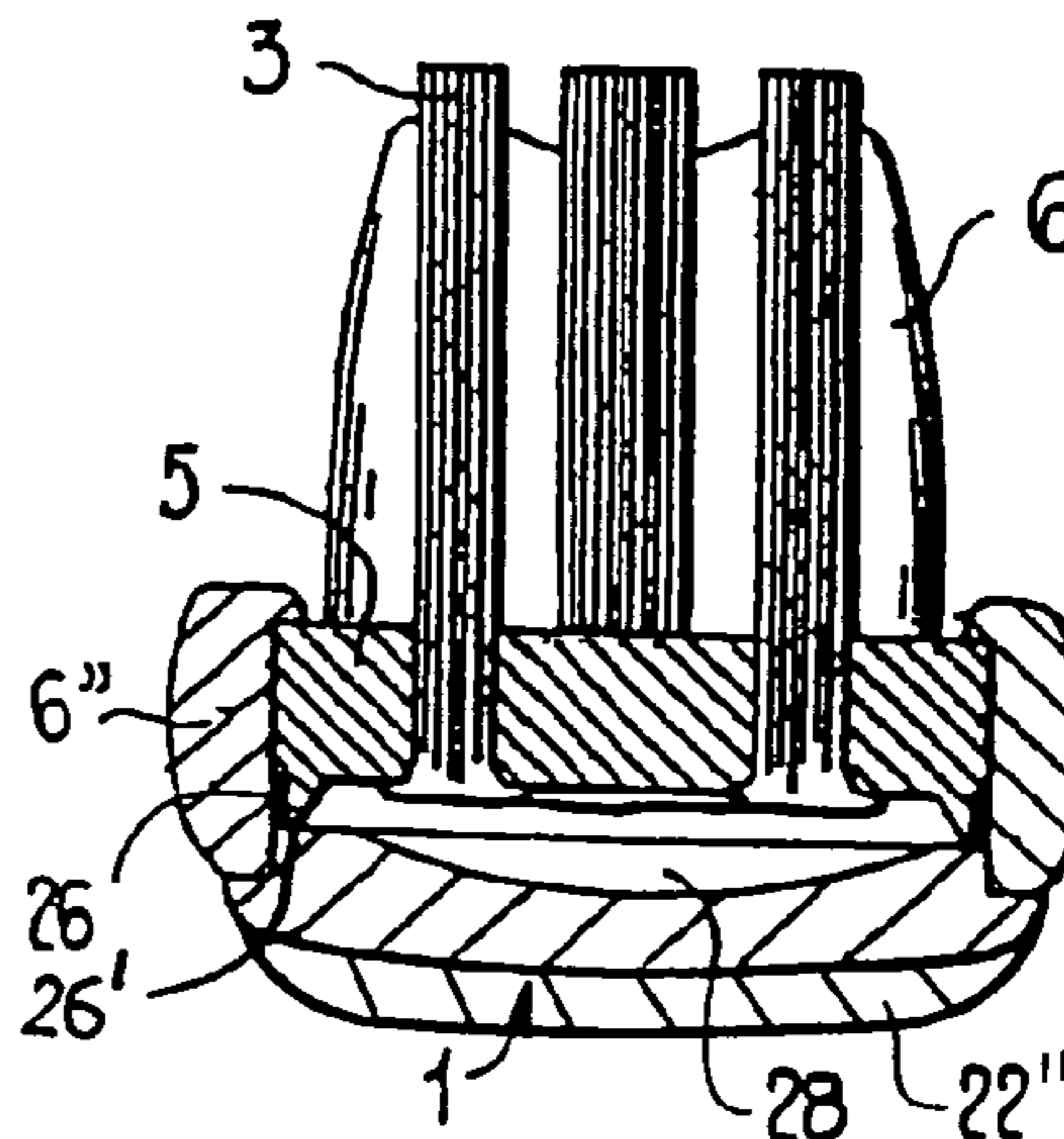
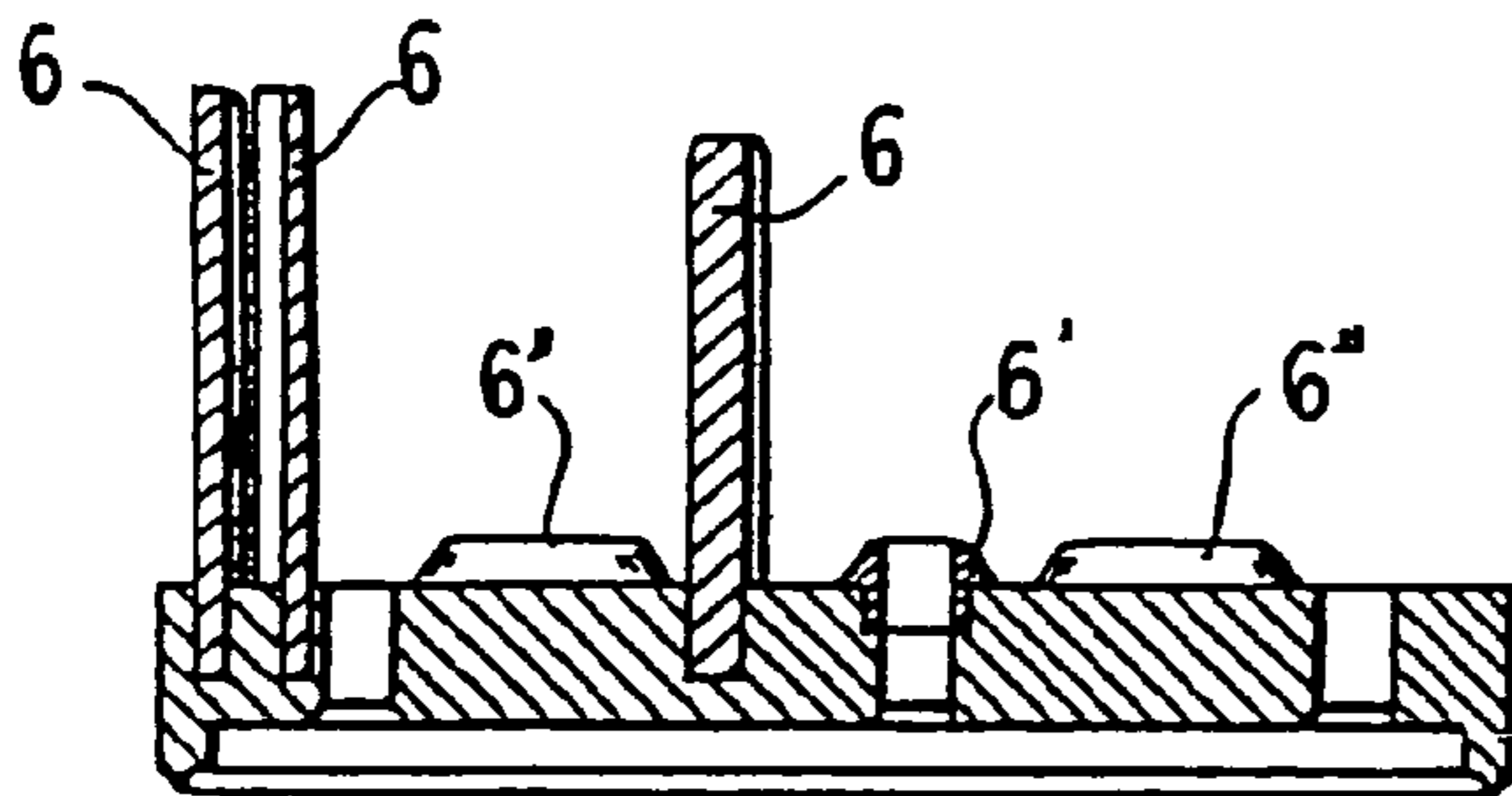
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(57) **ABSTRACT**

The invention relates to a toothbrush having a handle and a head part, on which bristle filaments and at least one flexible cleaning element are arranged. According to the invention, the at least one flexible cleaning element is arranged on a carrier element which consists of a hard material and is connected to the head part. The invention also relates to a process for producing such a toothbrush.

18 Claims, 12 Drawing Sheets



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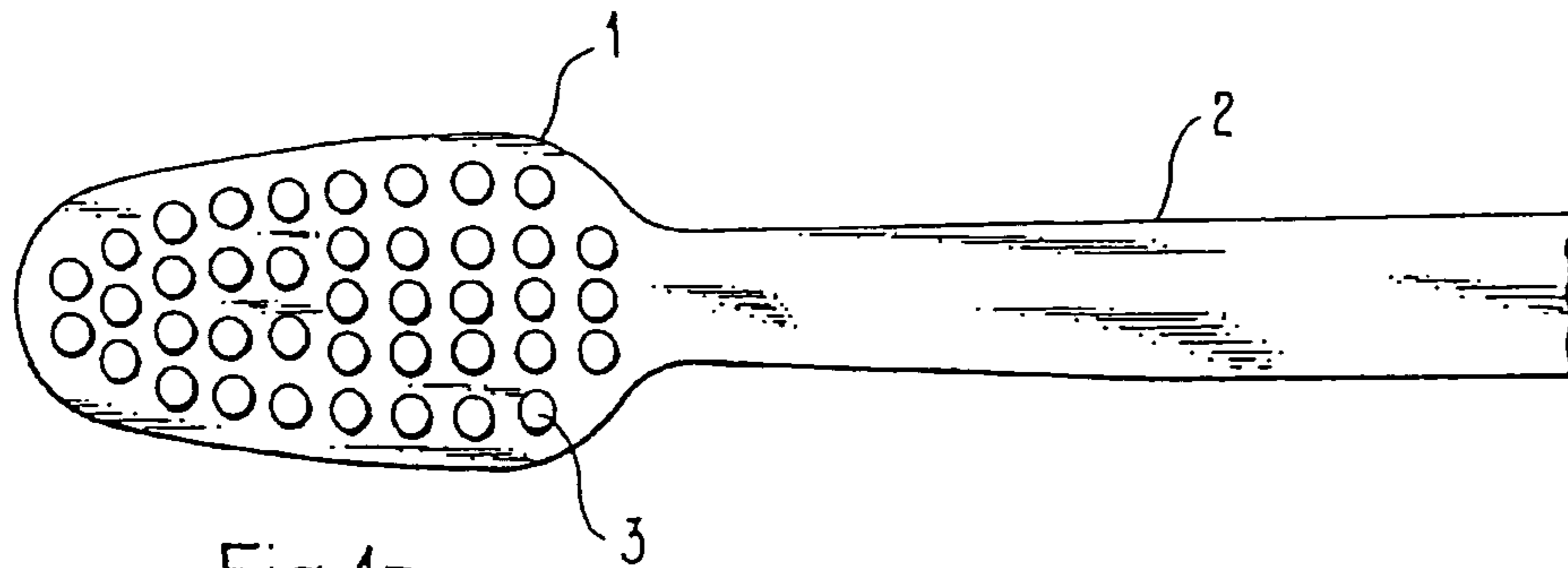


Fig. 1a

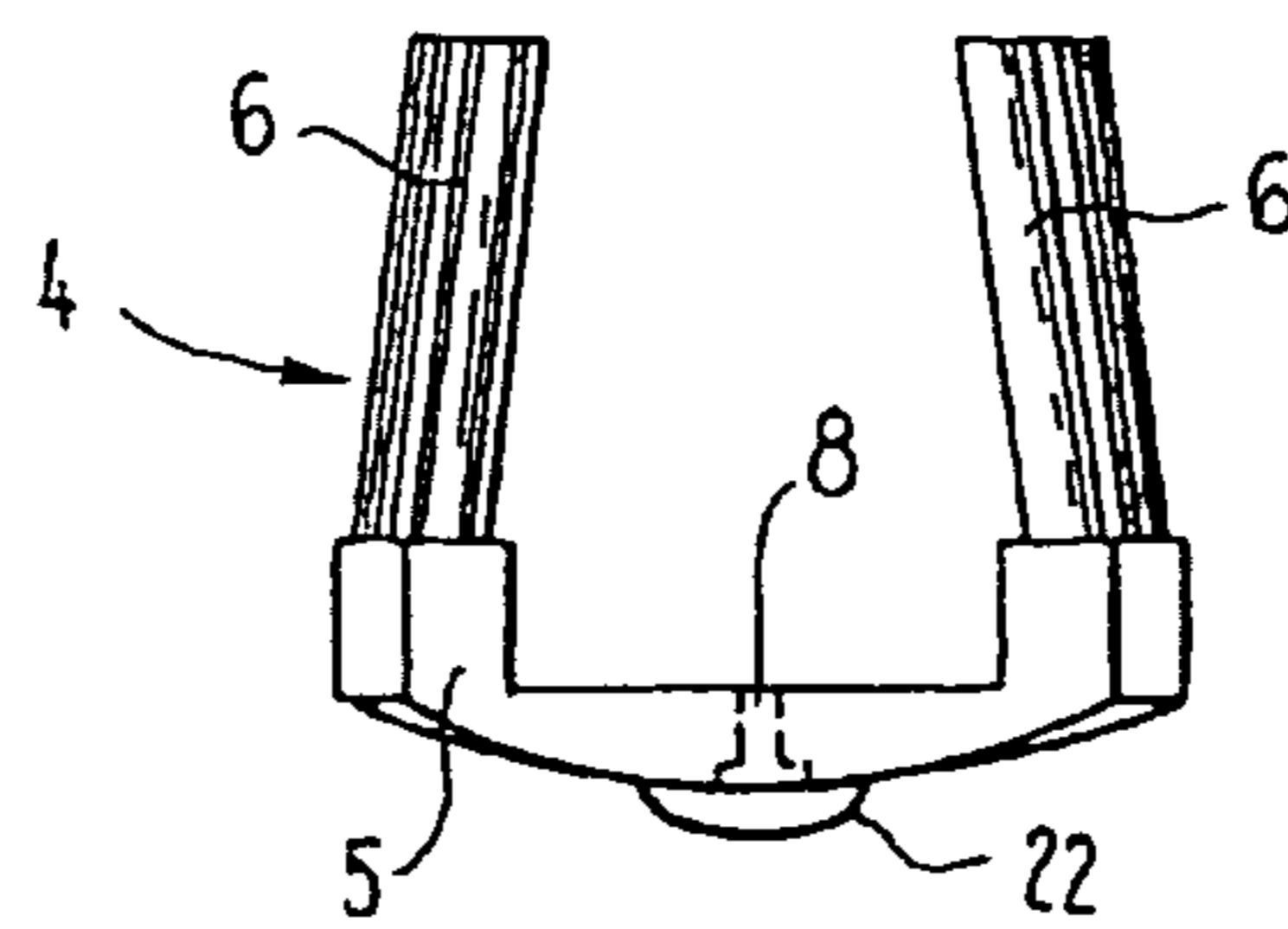


Fig. 1b

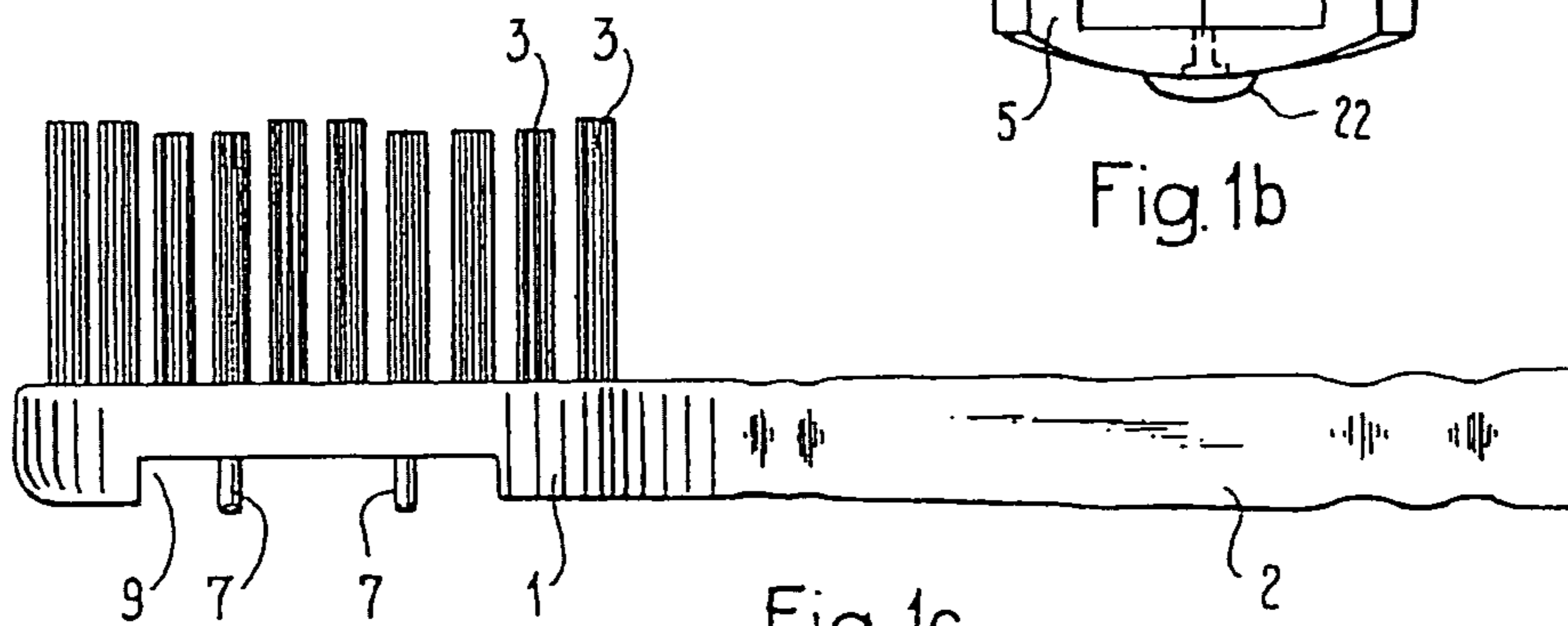


Fig. 1c

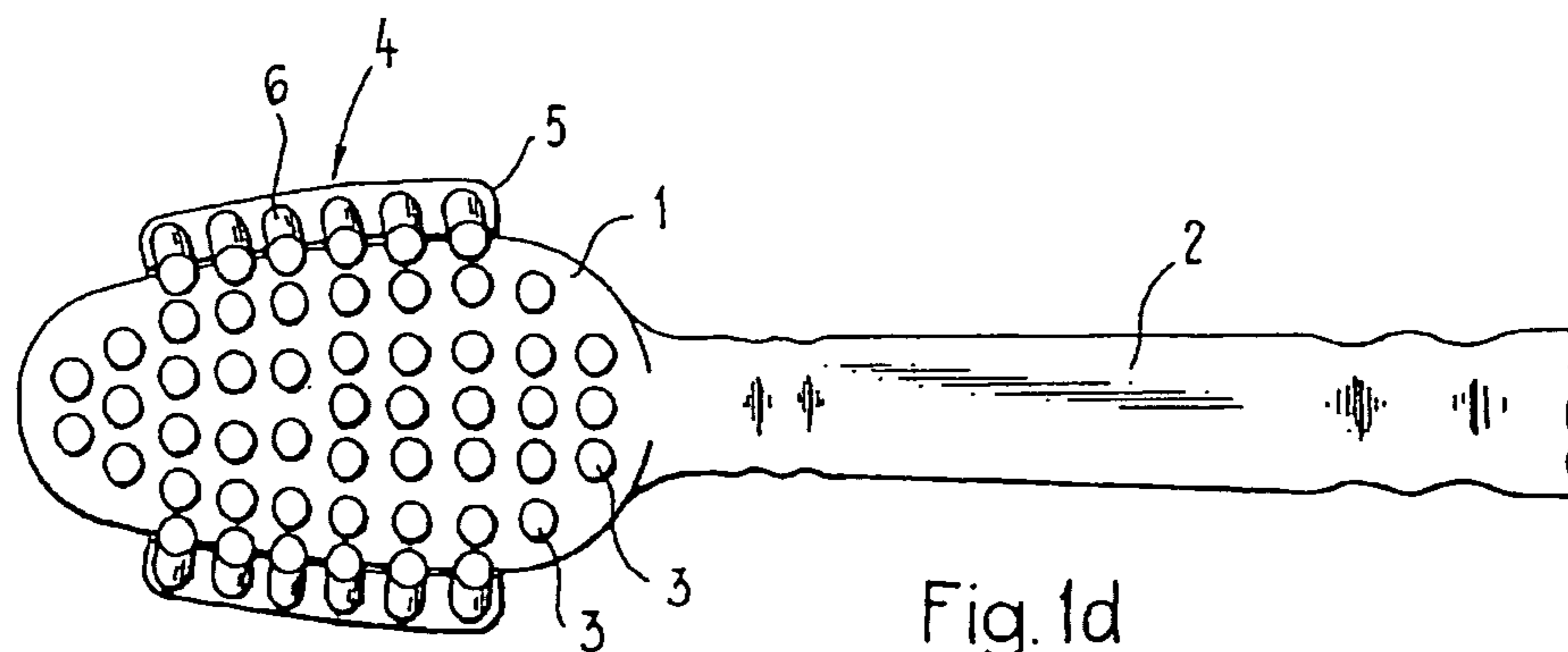


Fig. 1d

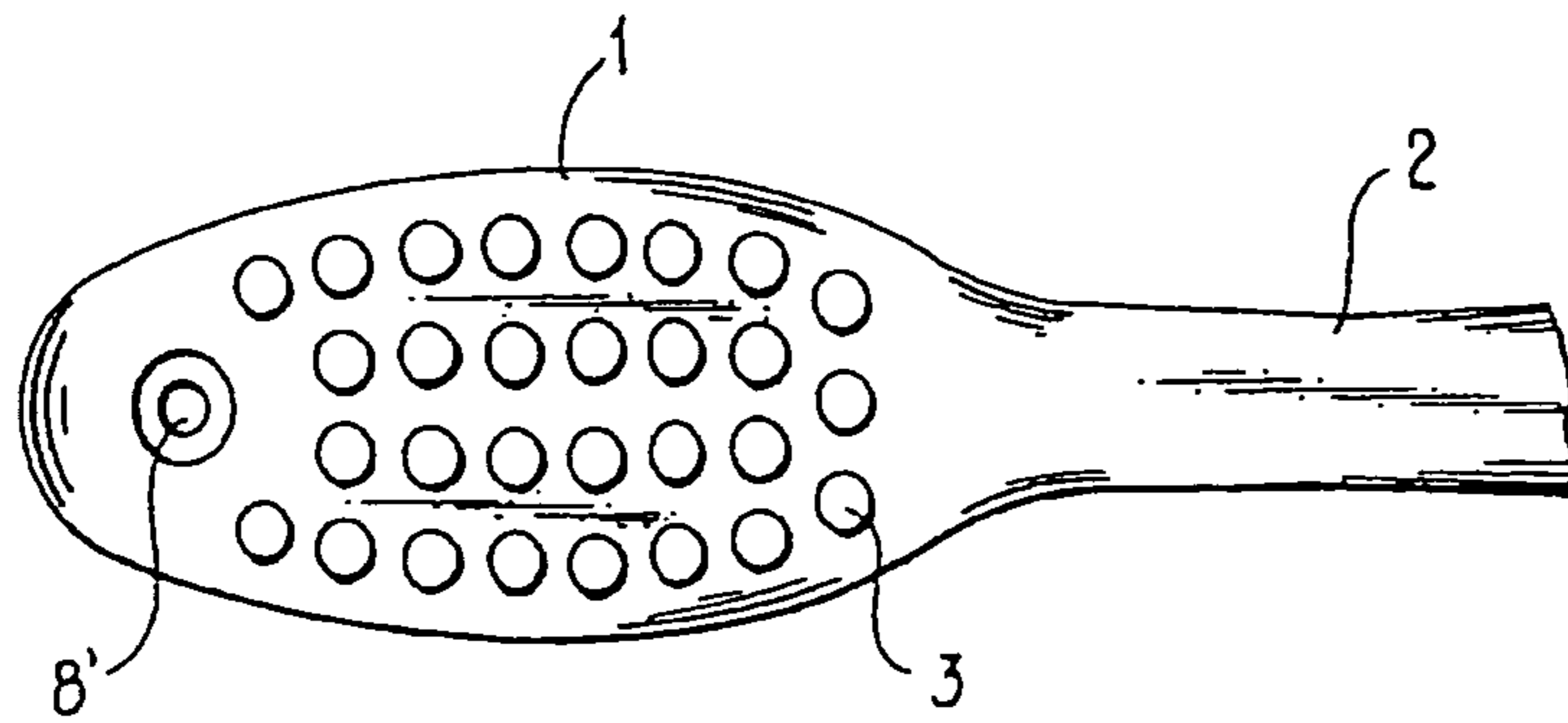


Fig. 2a

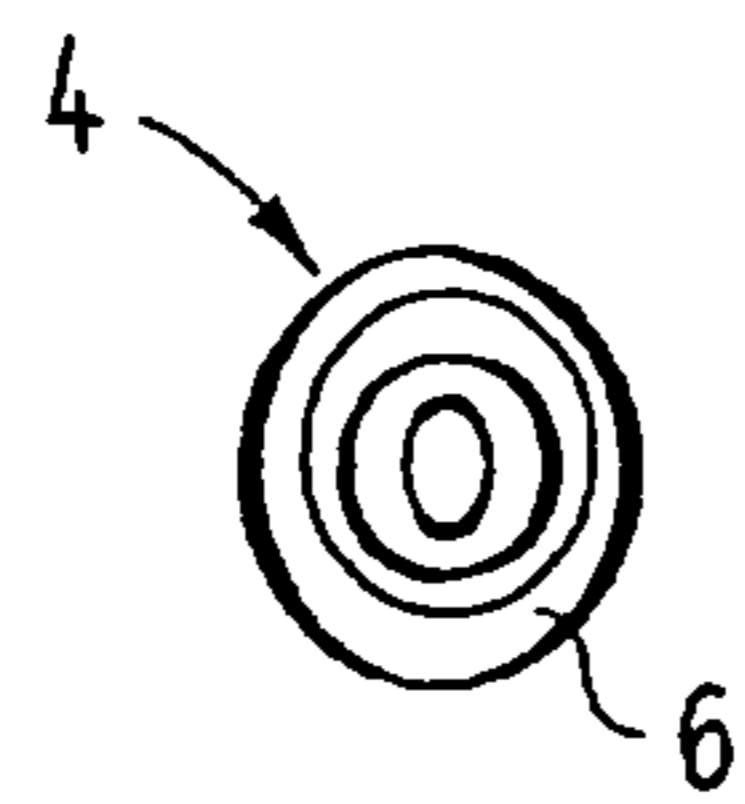


Fig. 2b

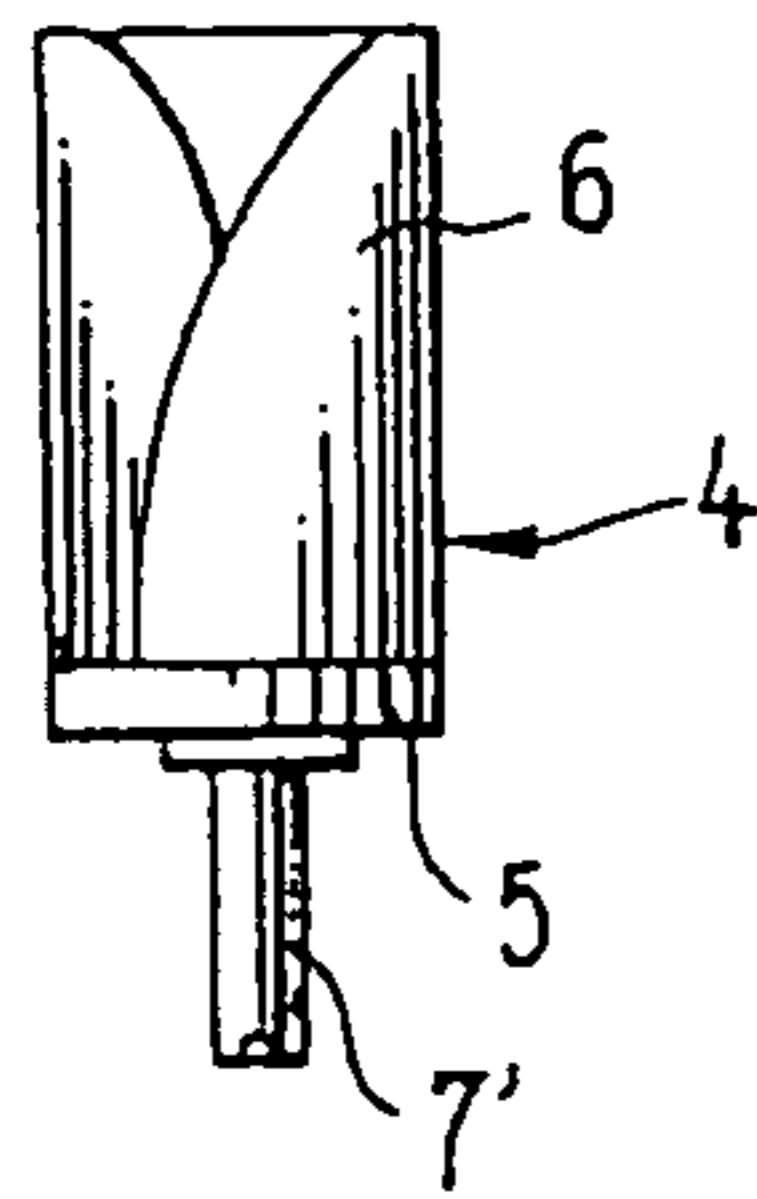


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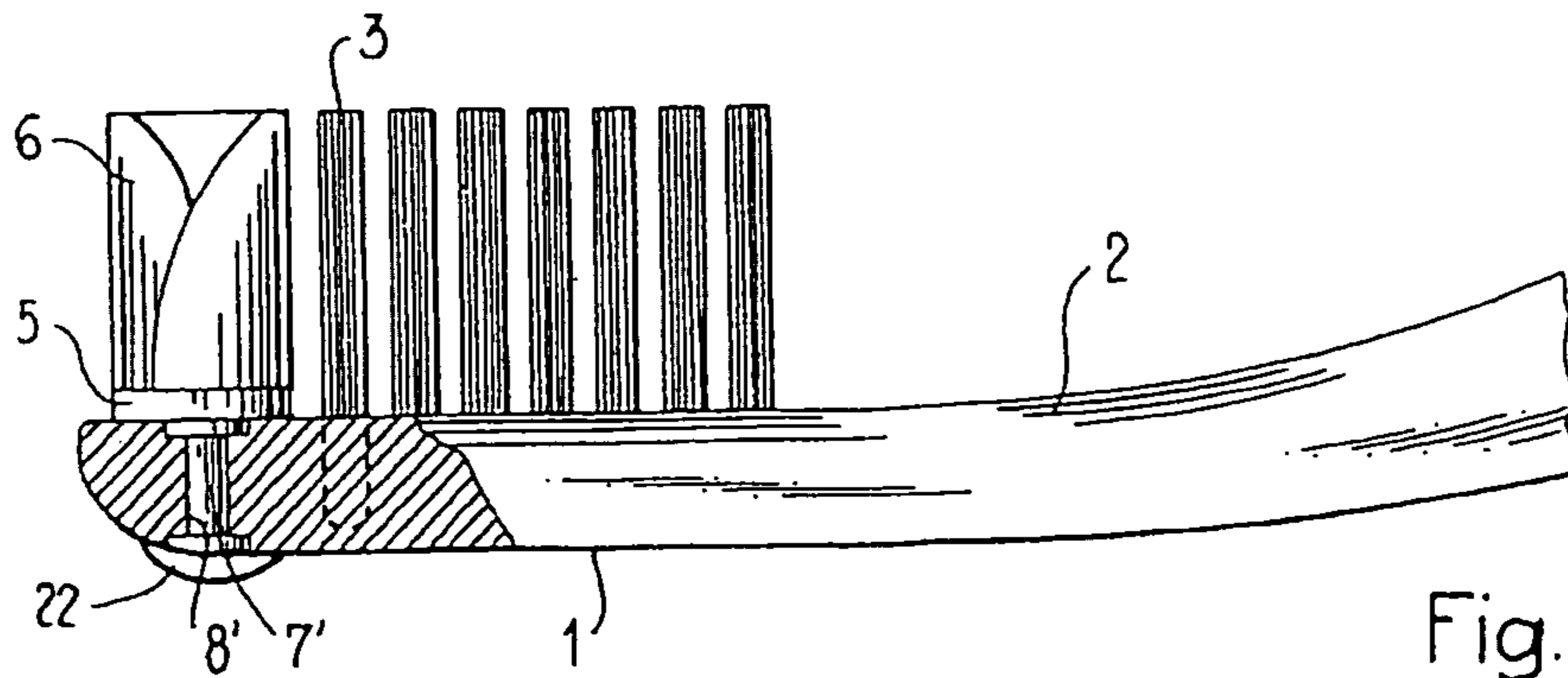


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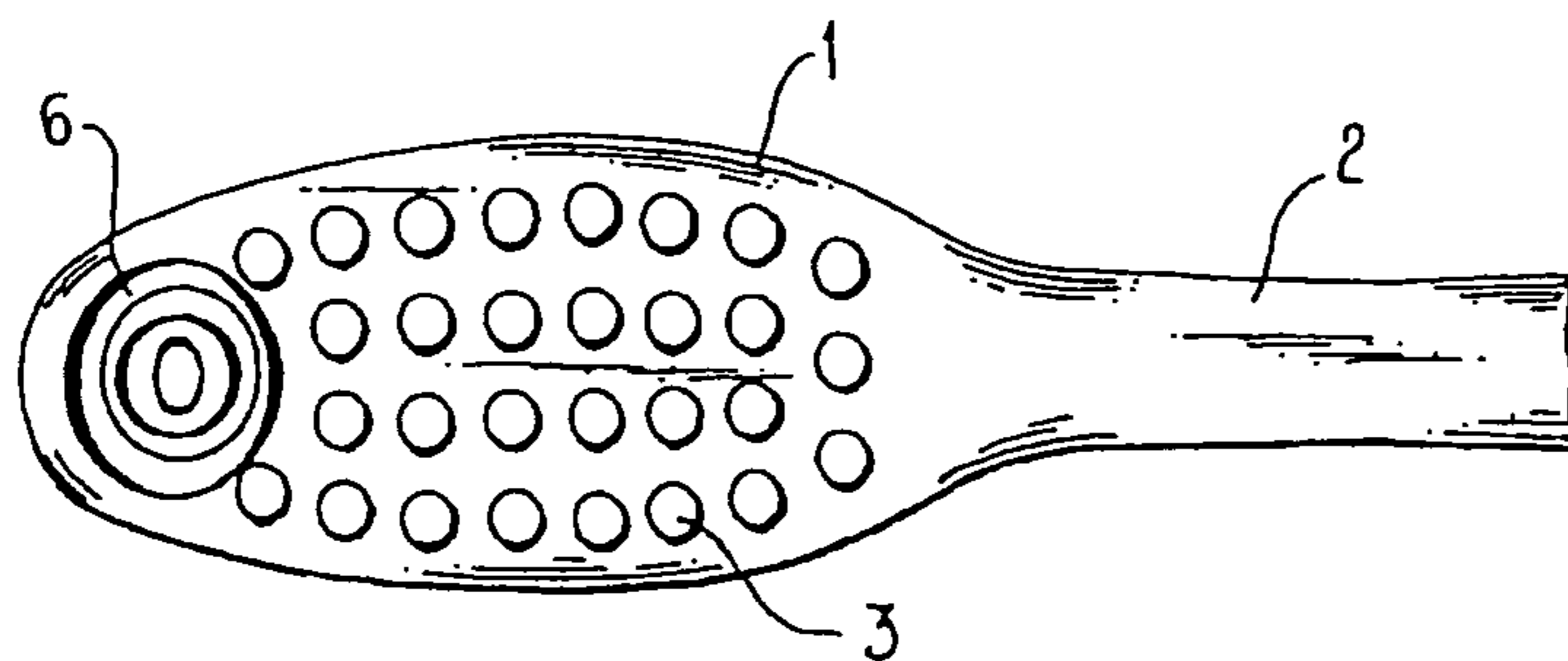


Fig. 2e

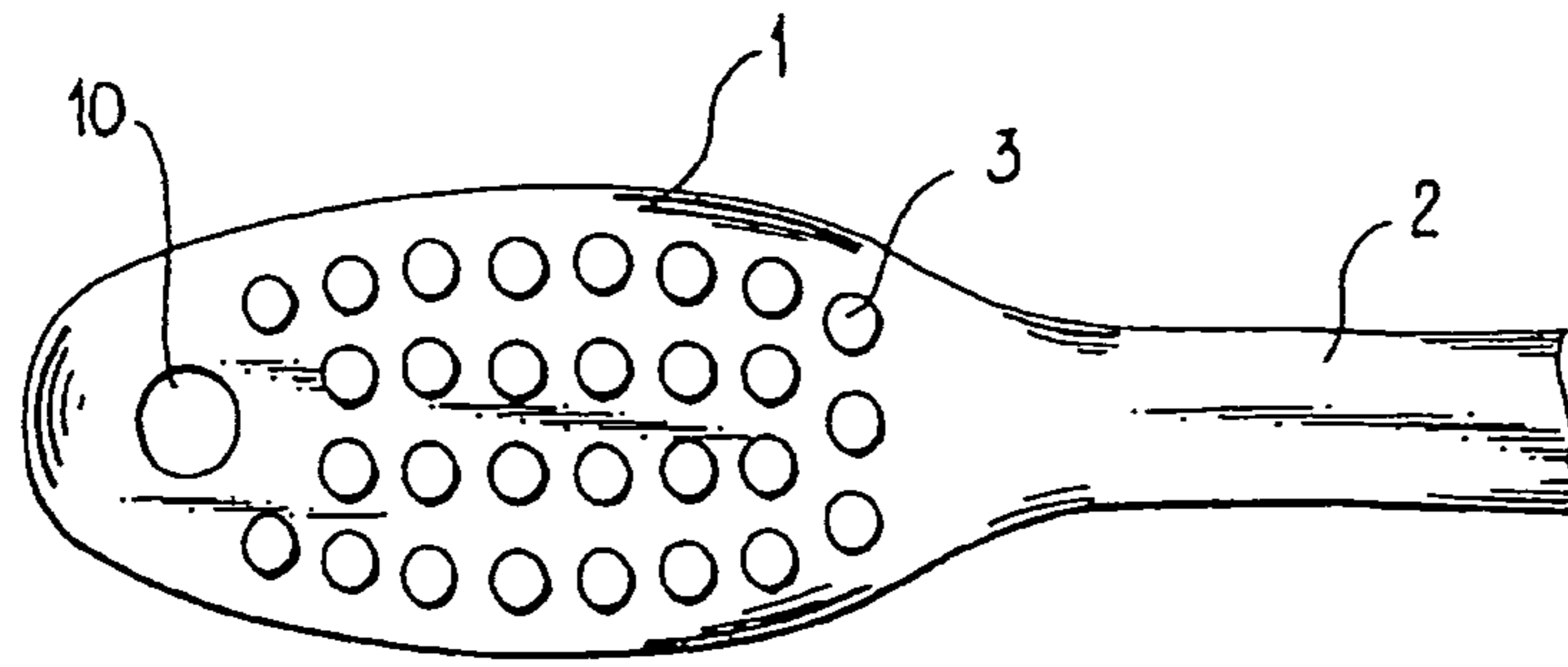


Fig. 3a

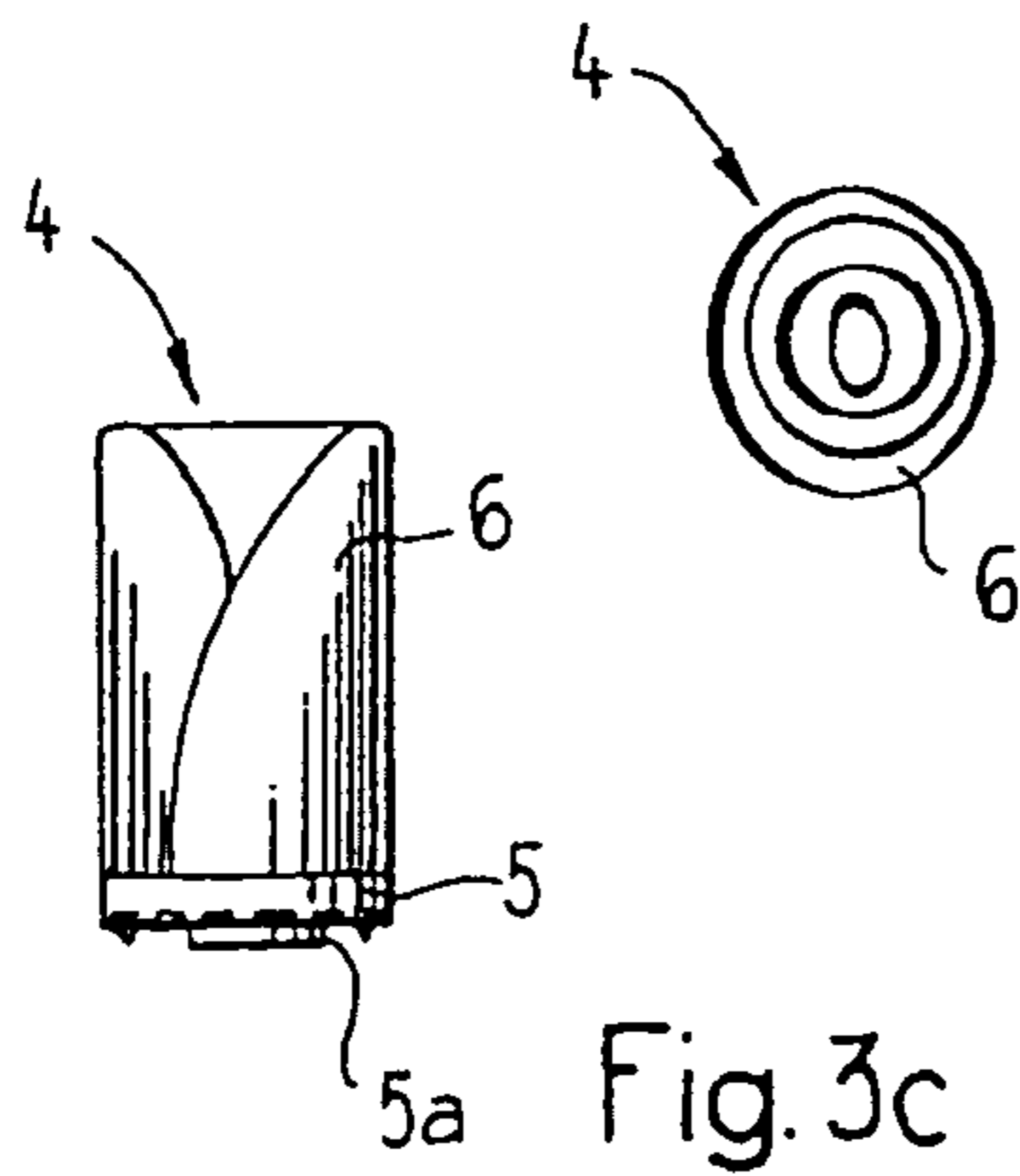


Fig. 3b

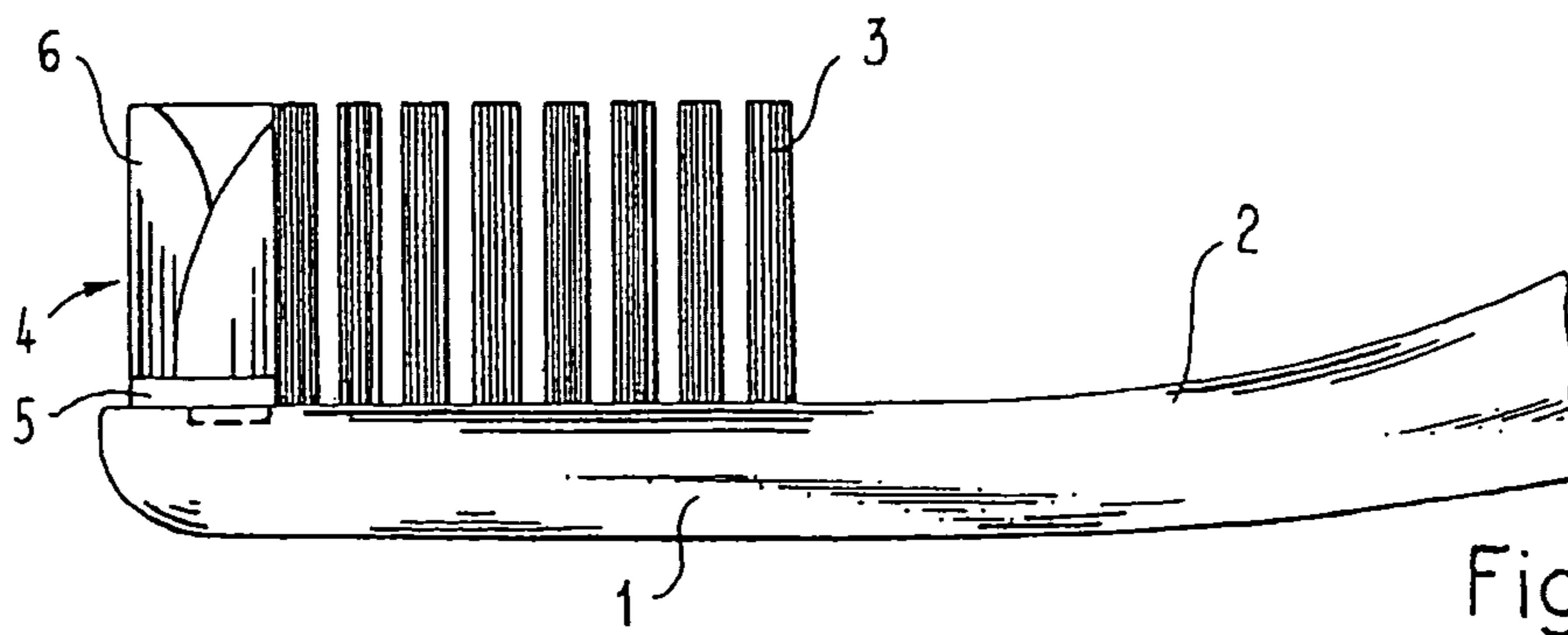


Fig. 3d

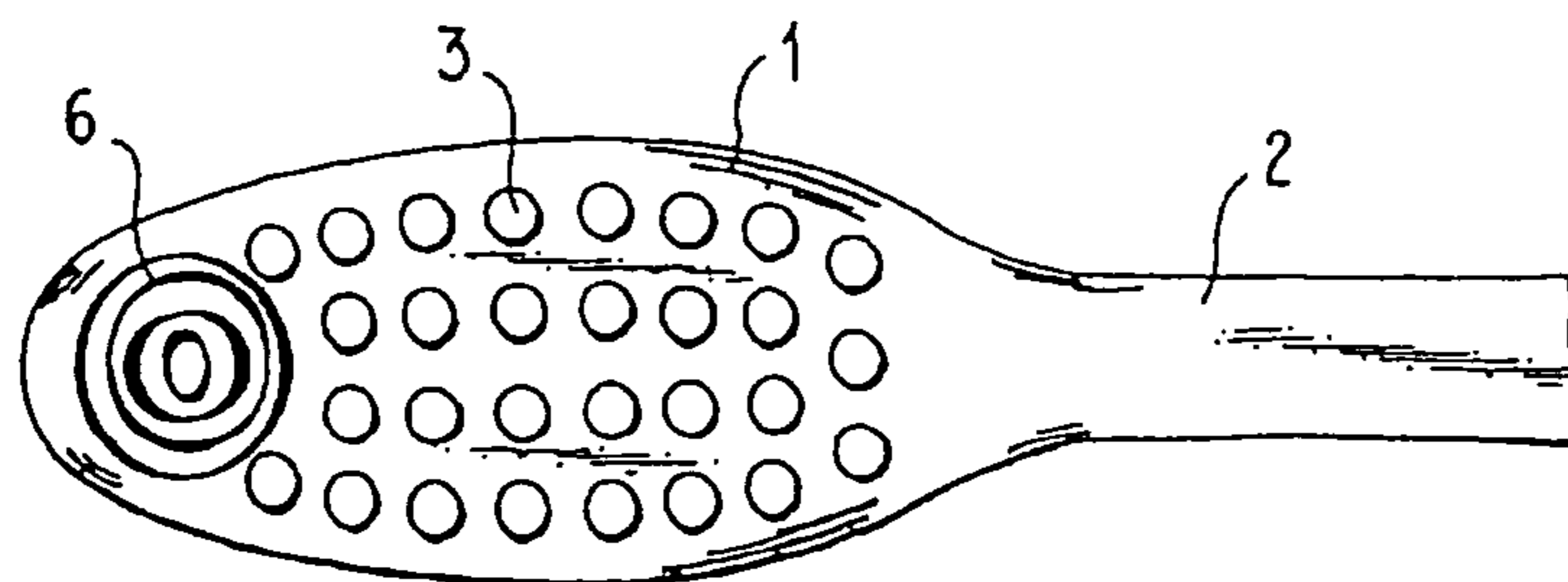
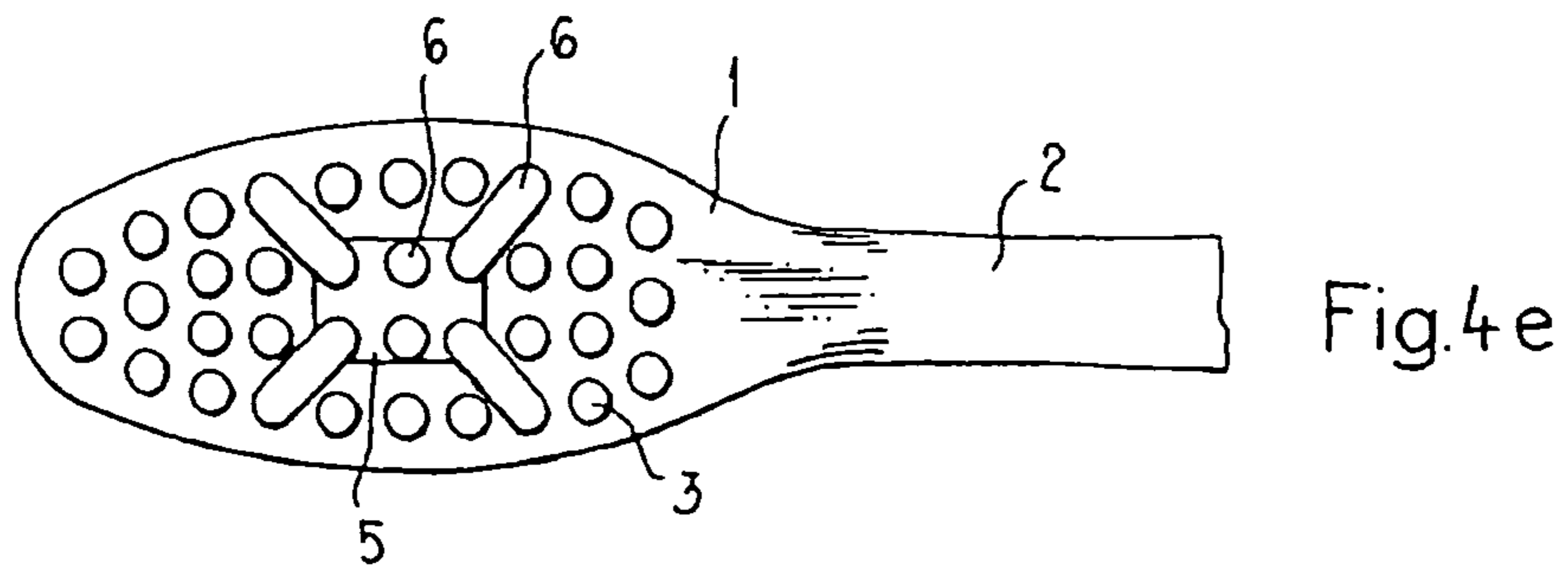
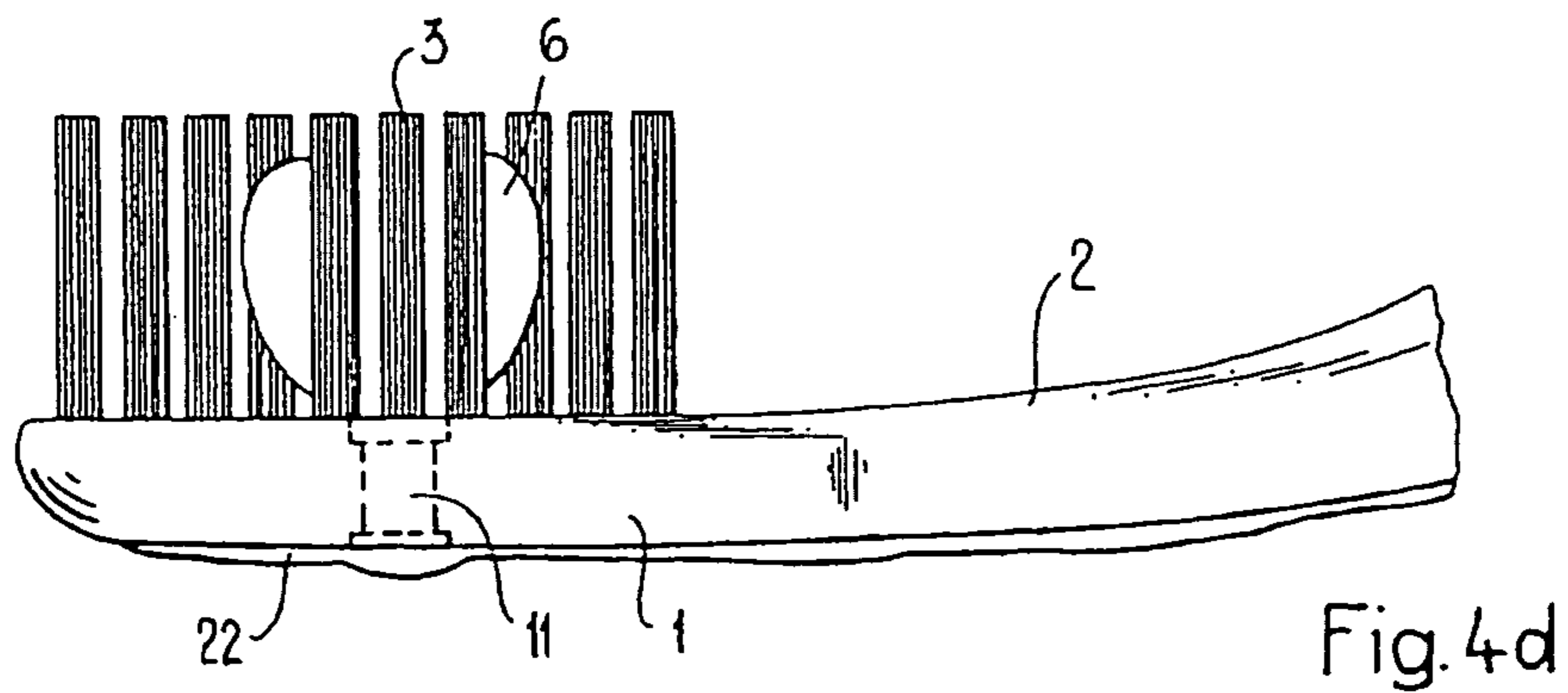
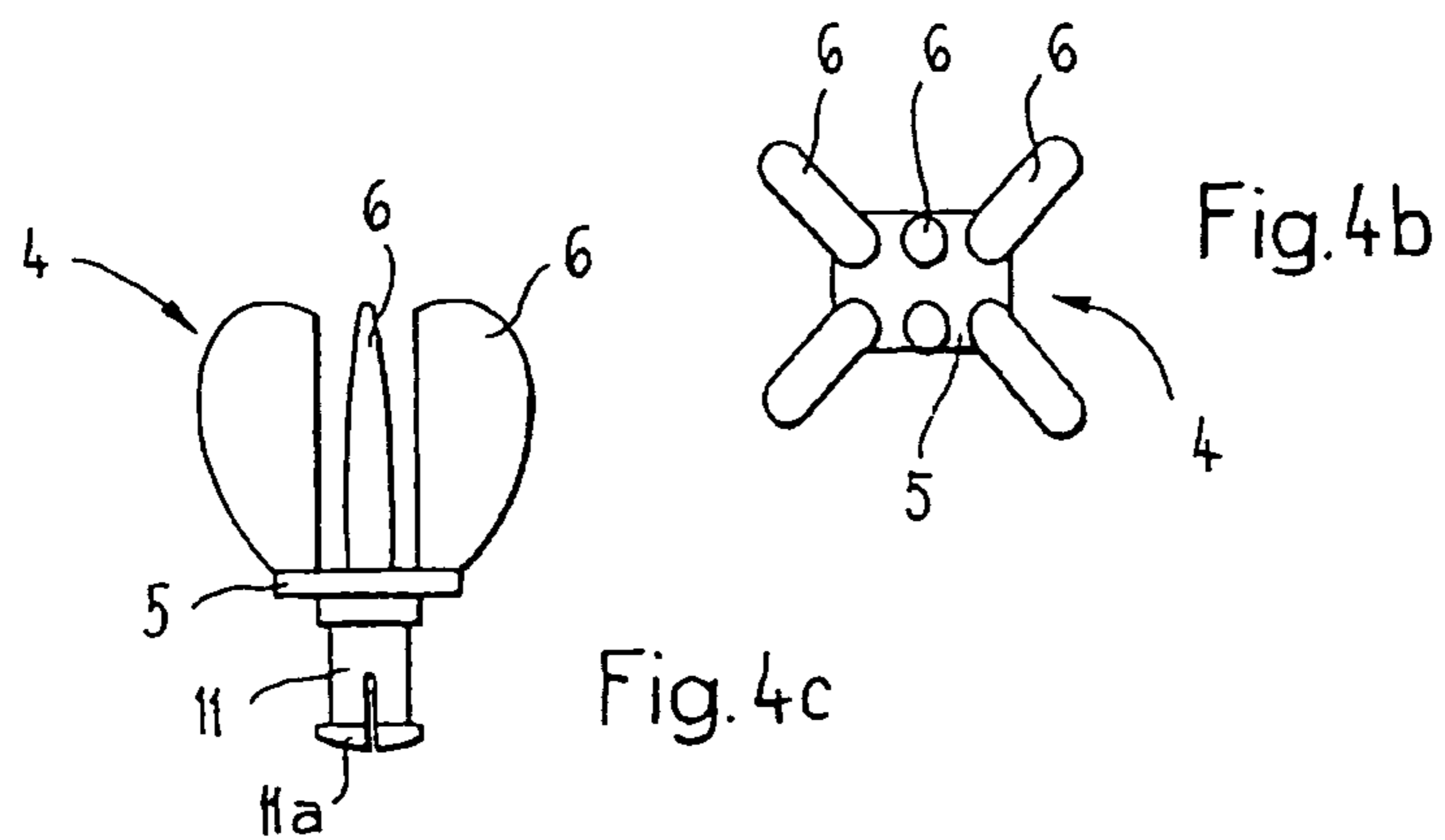
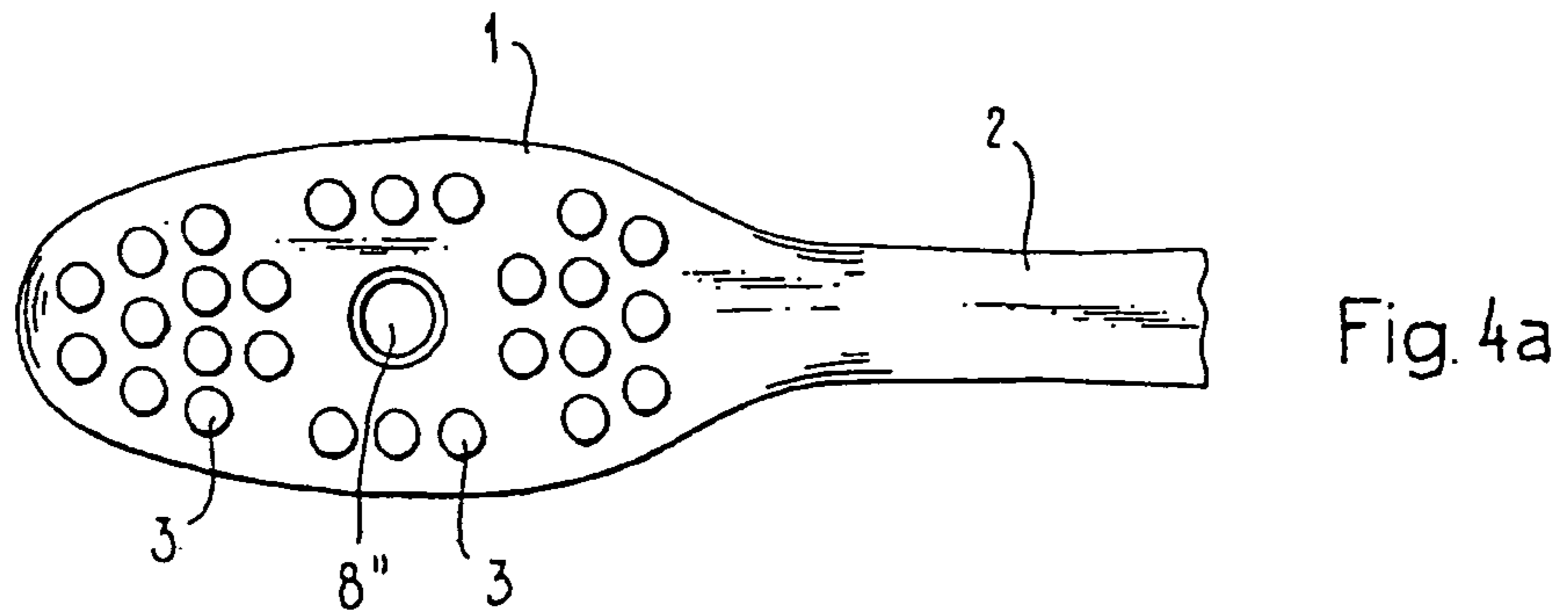


Fig. 3e



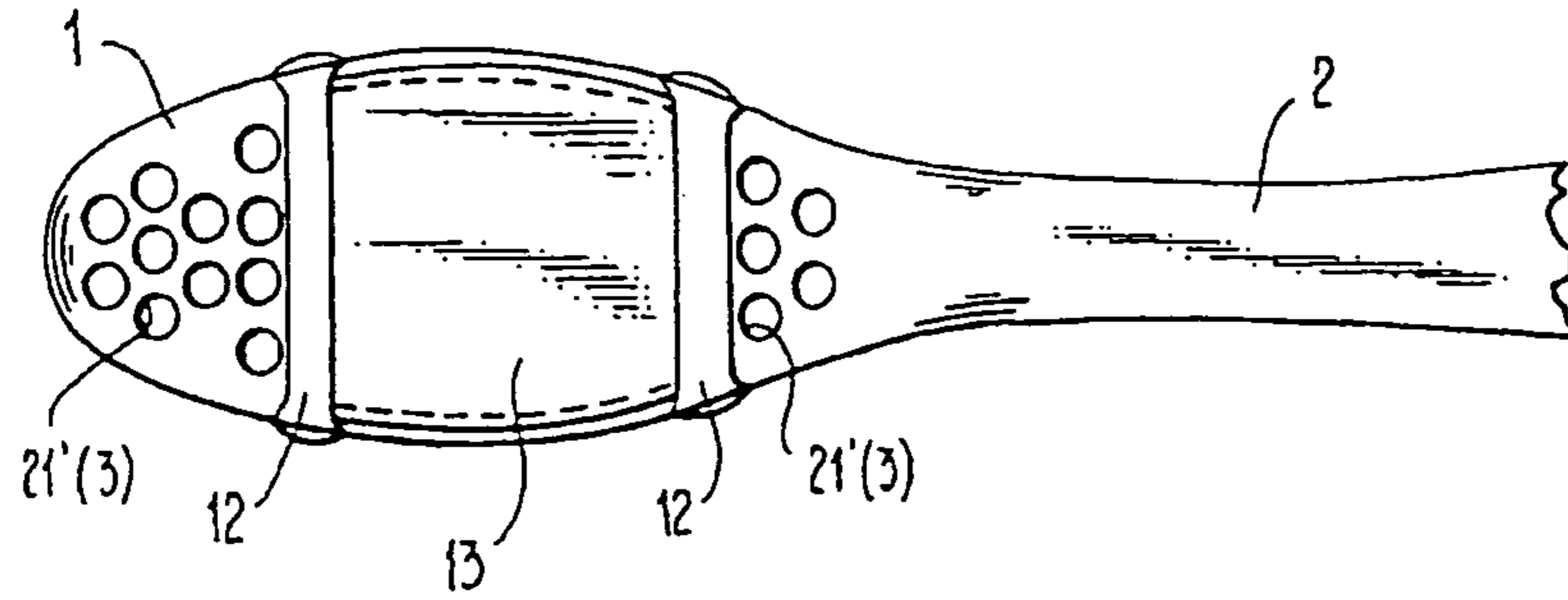


Fig. 5a

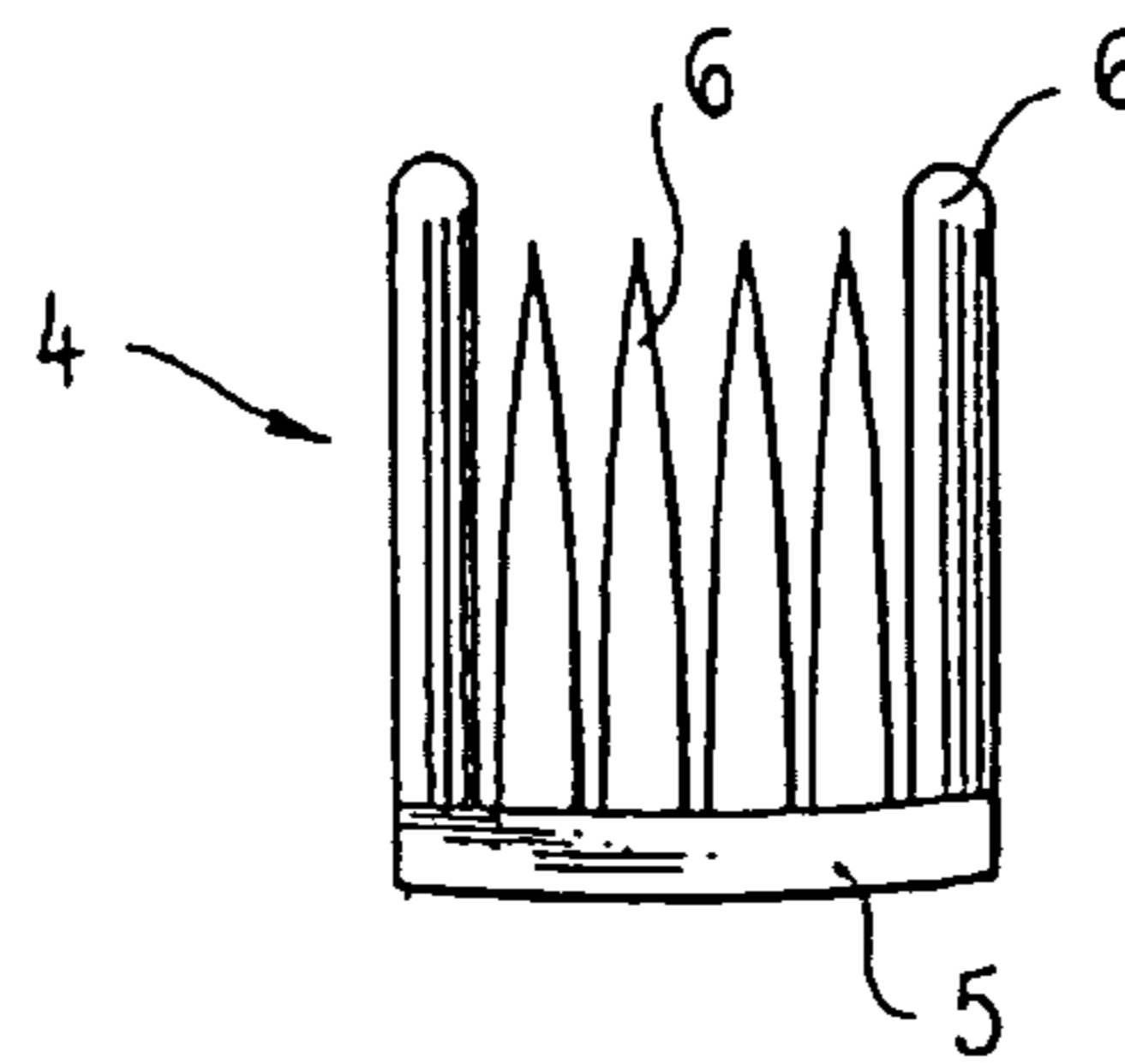


Fig. 5b

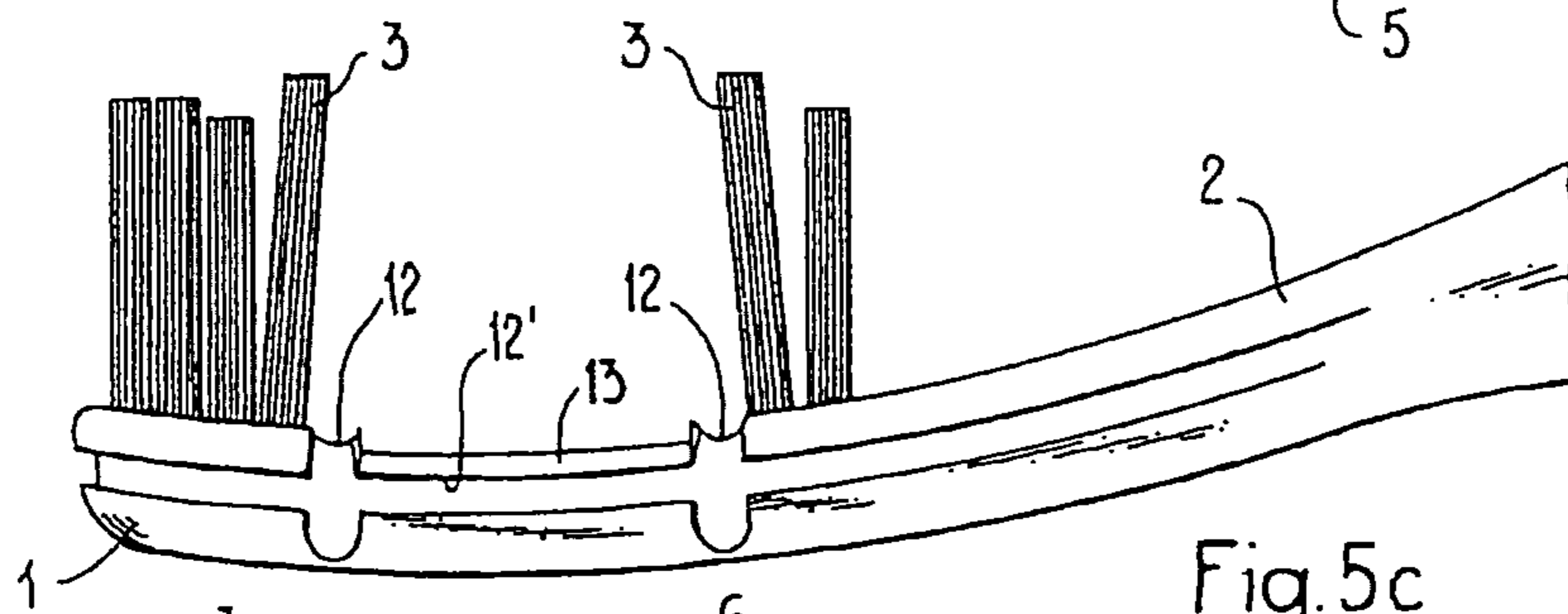


Fig. 5c

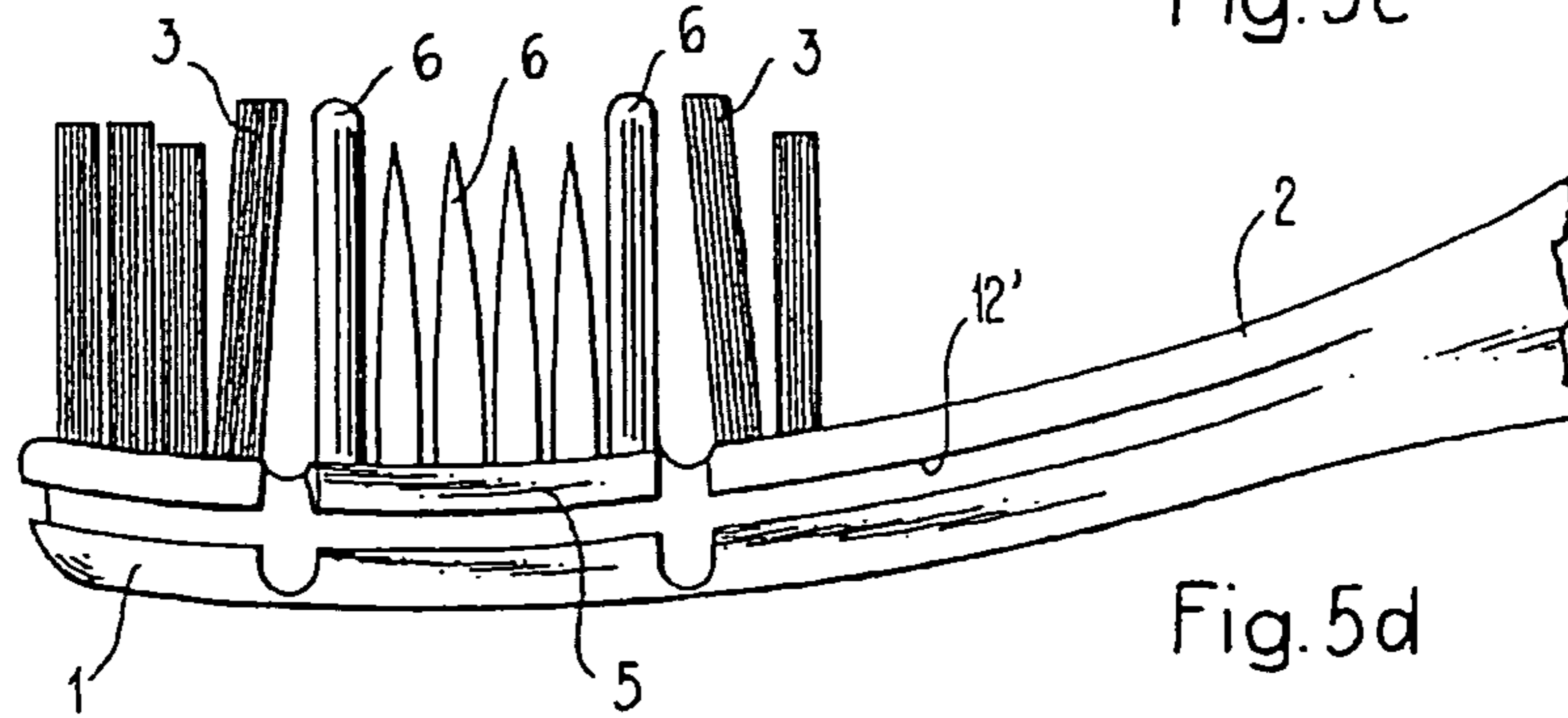


Fig. 5d

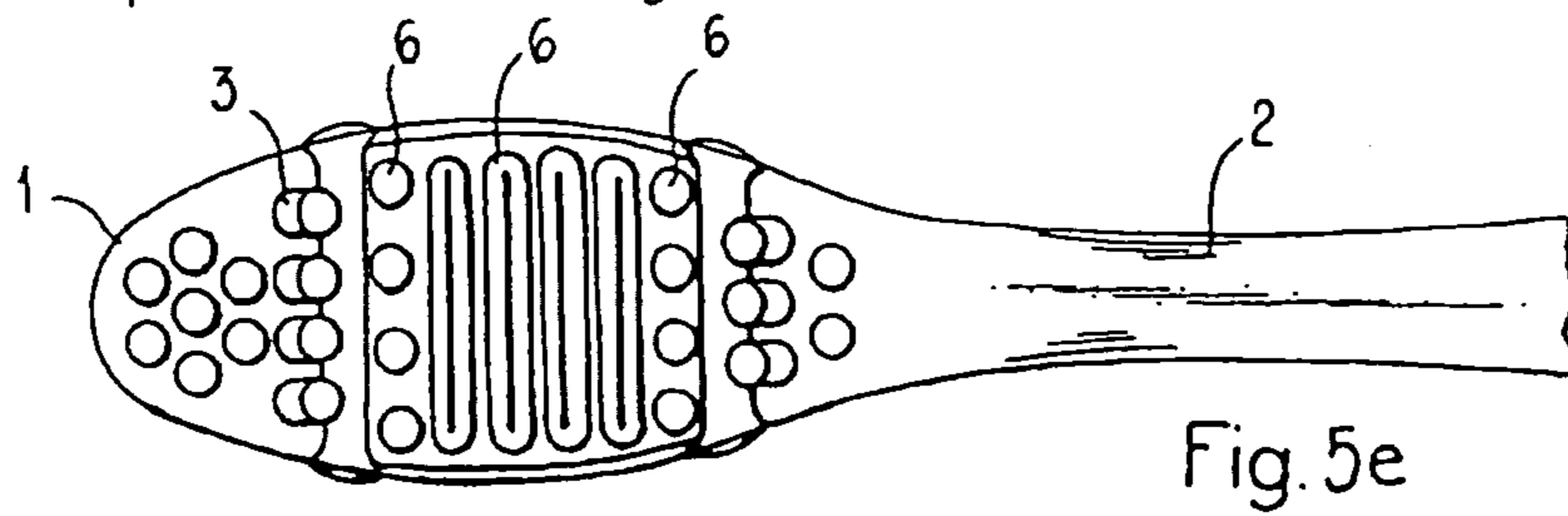


Fig. 5e

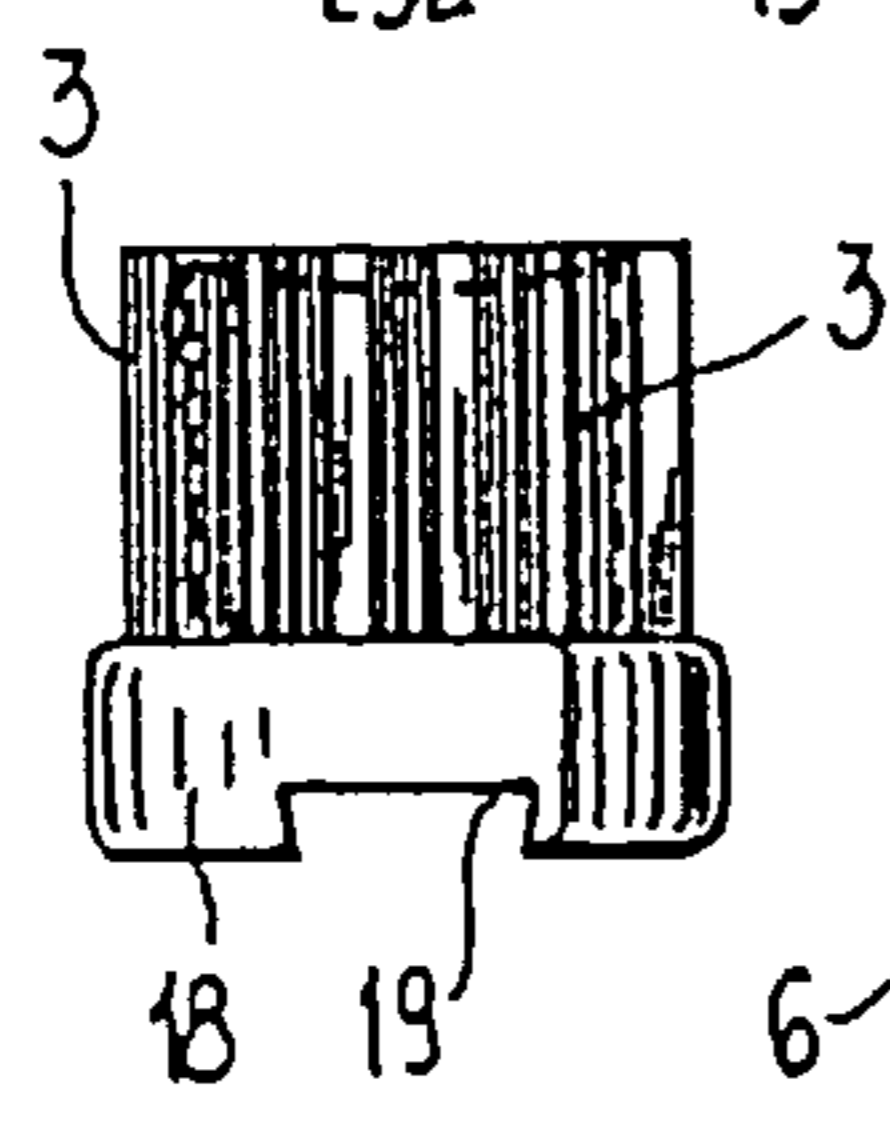
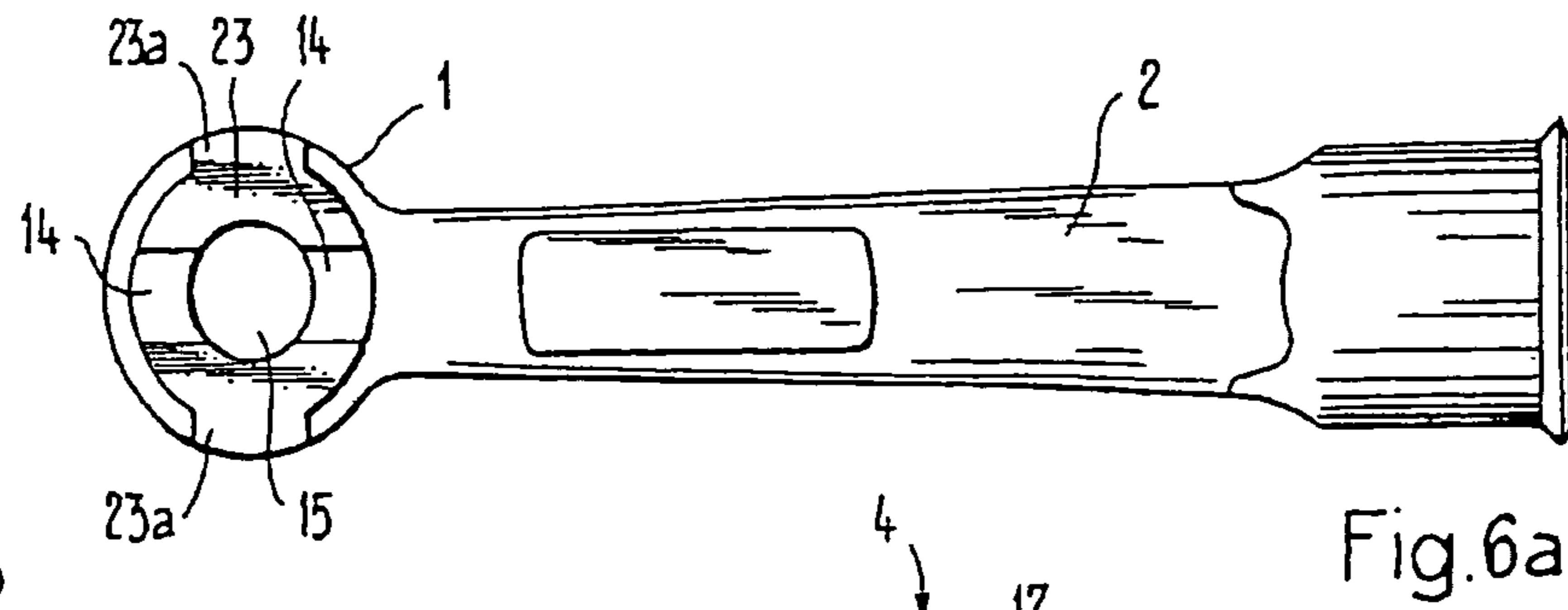


Fig. 6c

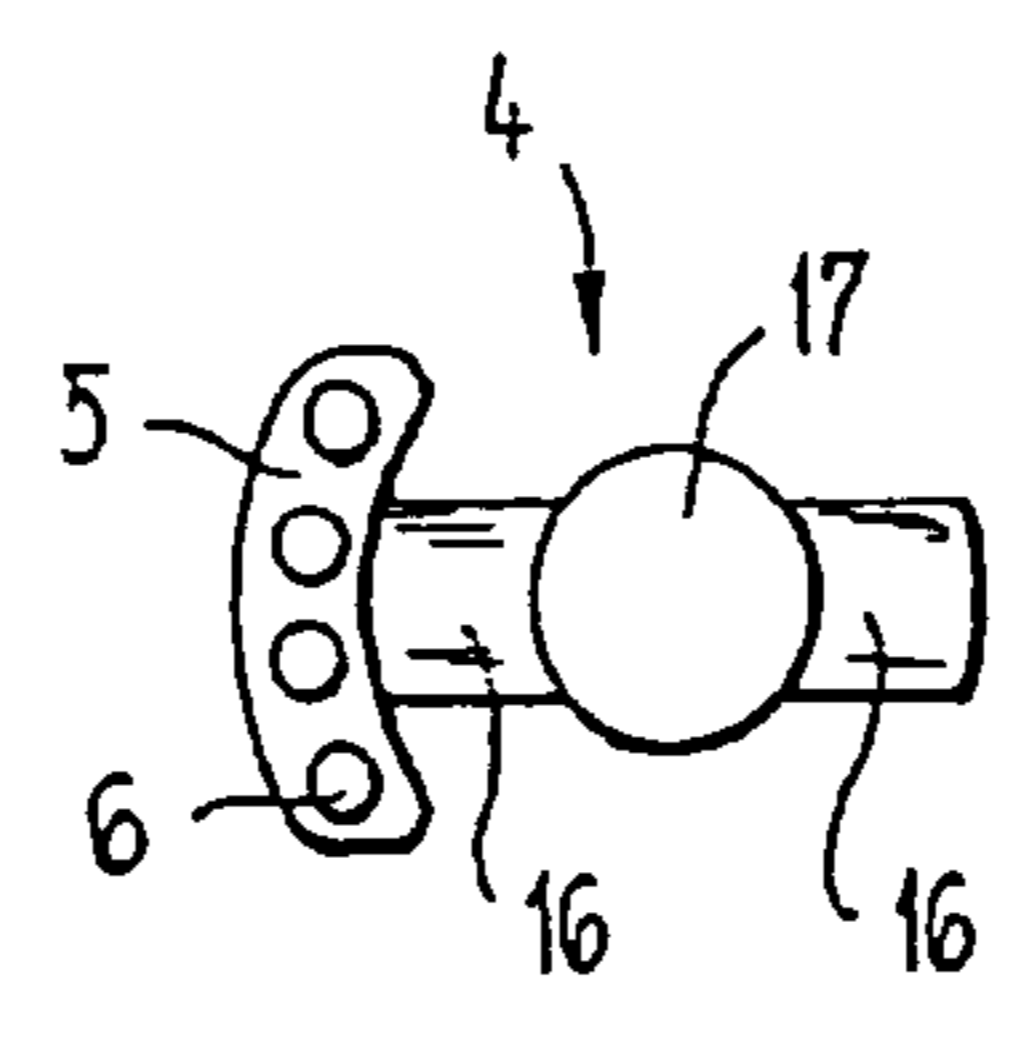


Fig. 6b

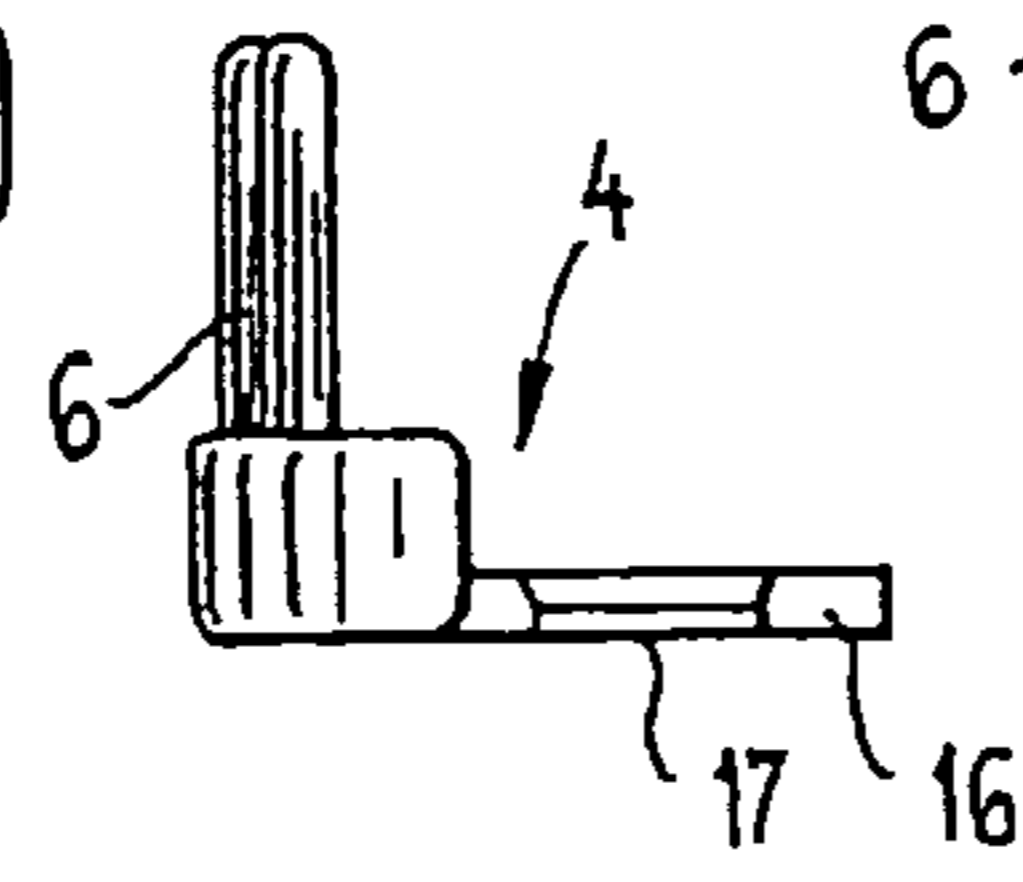


Fig. 6d

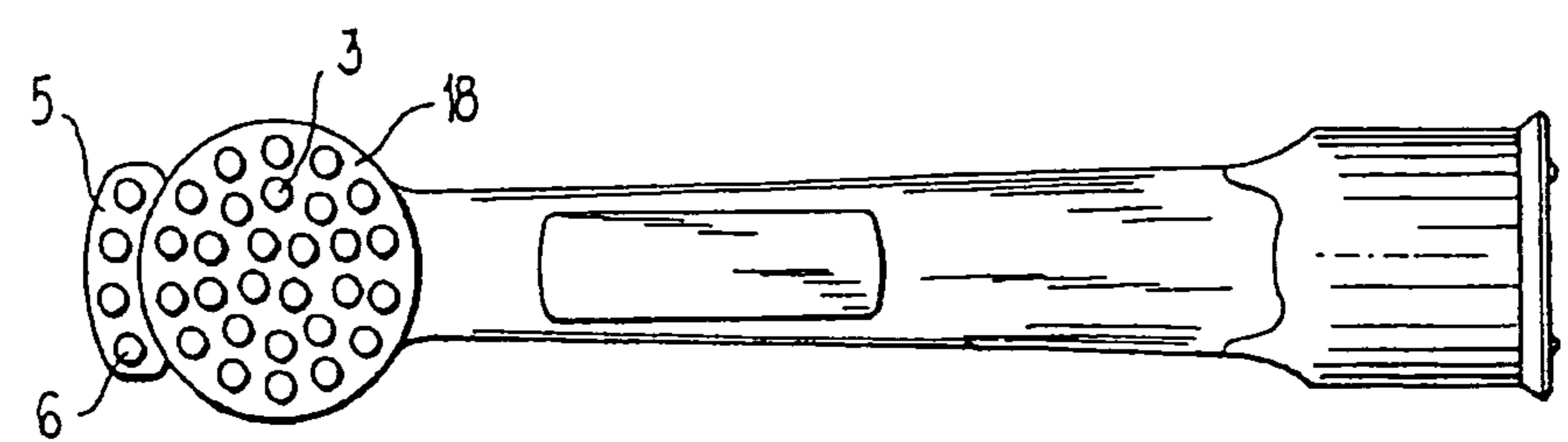


Fig. 6e

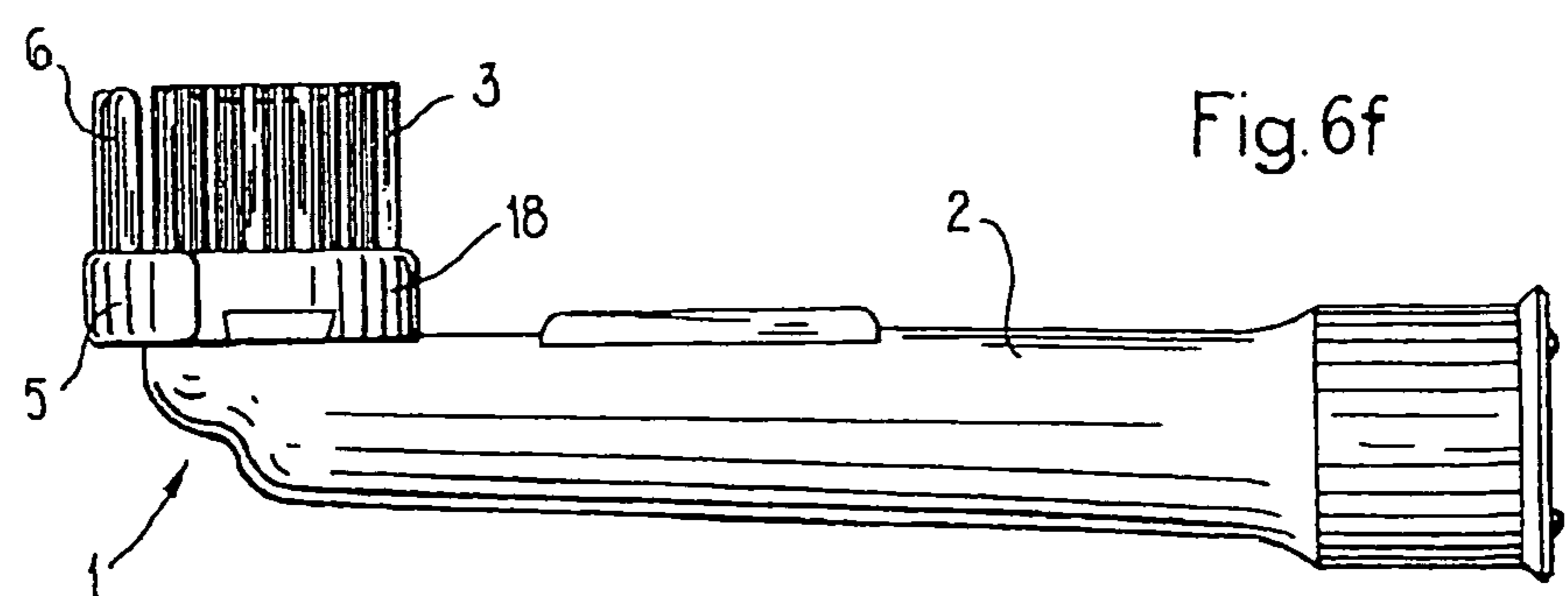
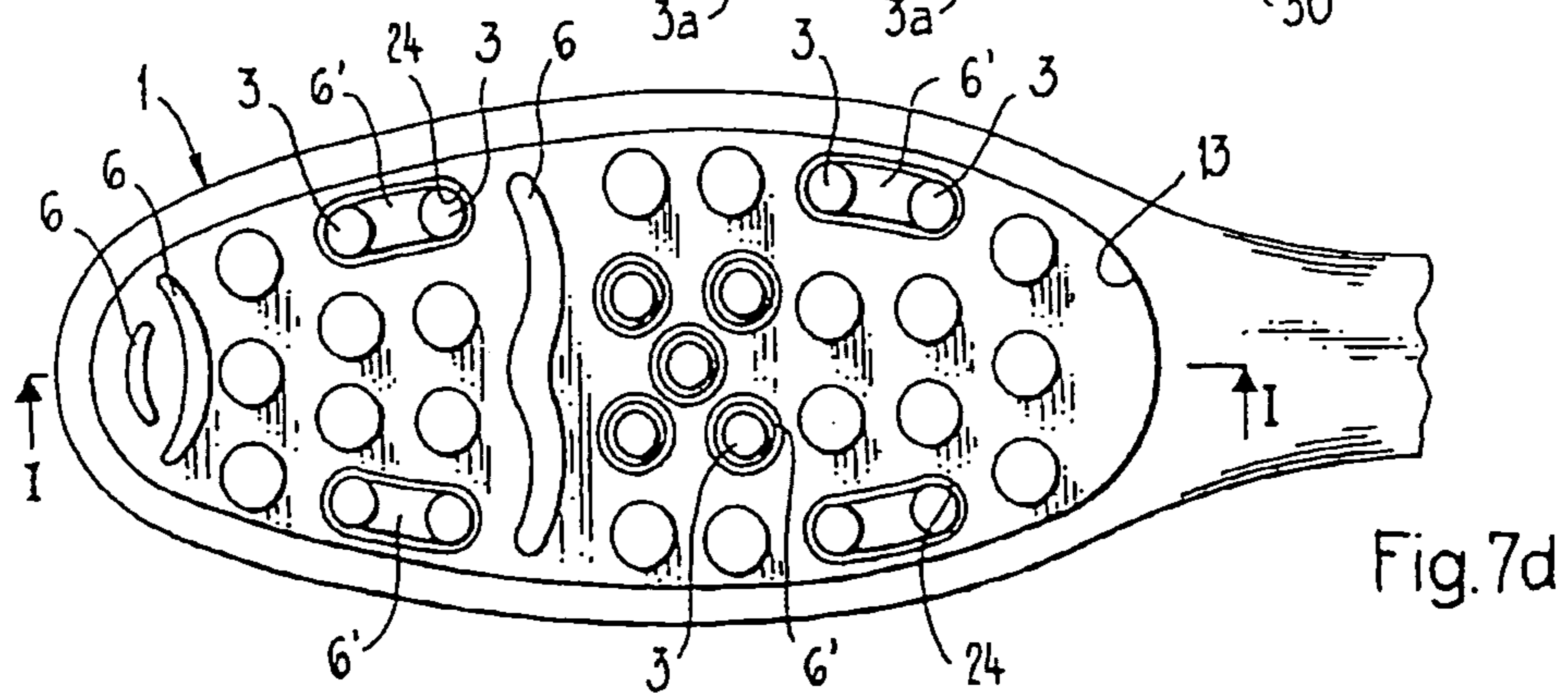
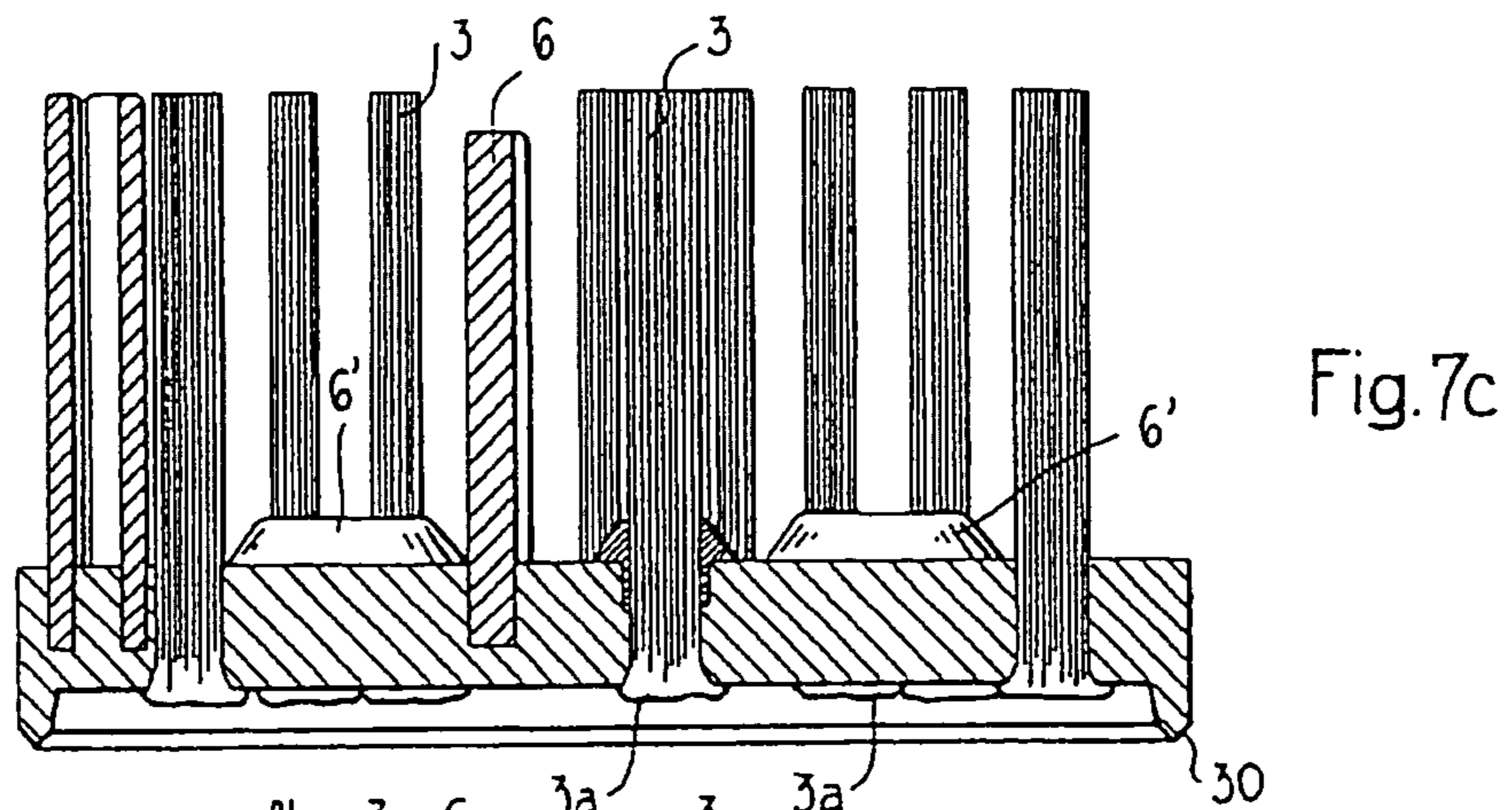
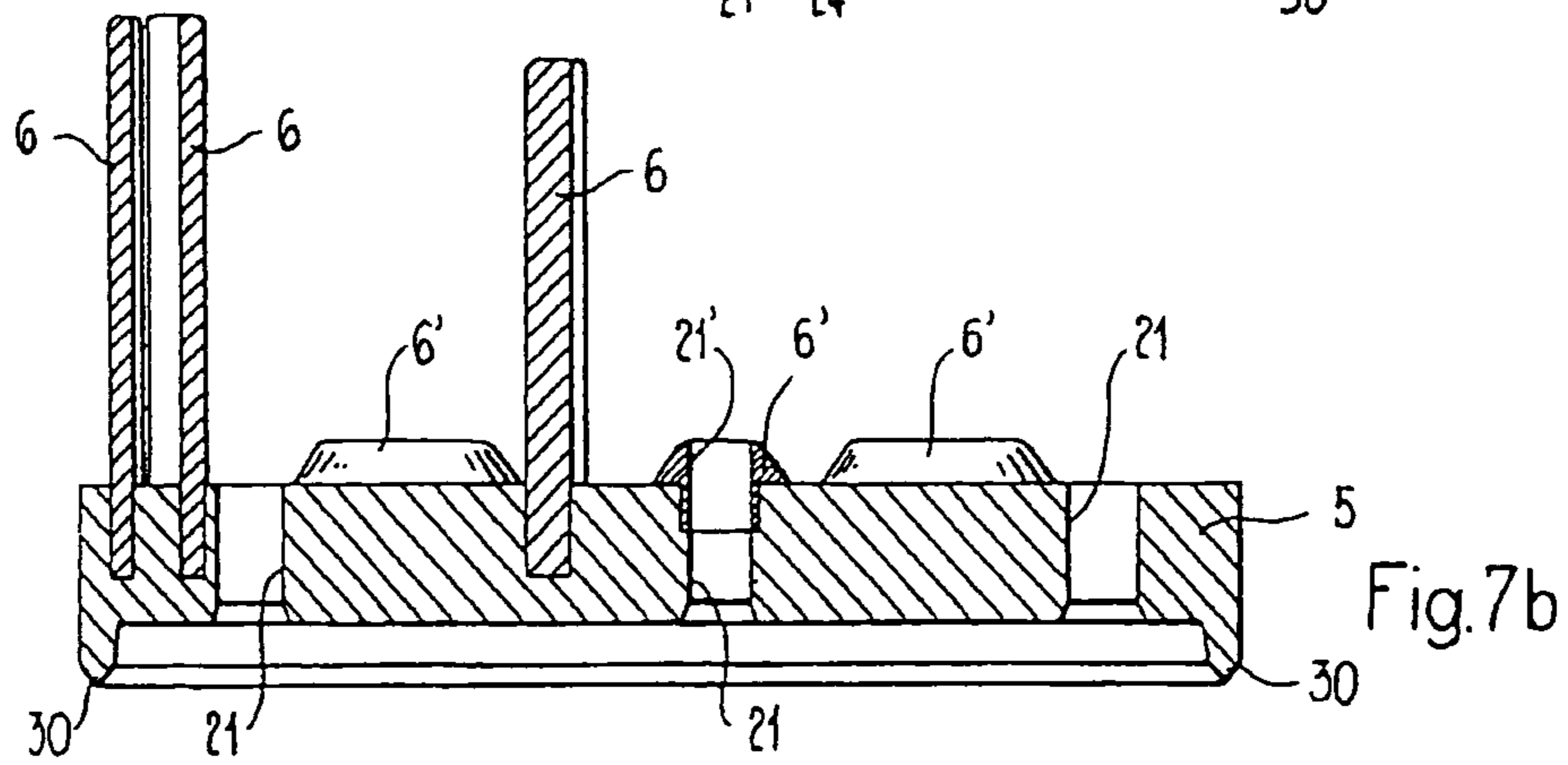
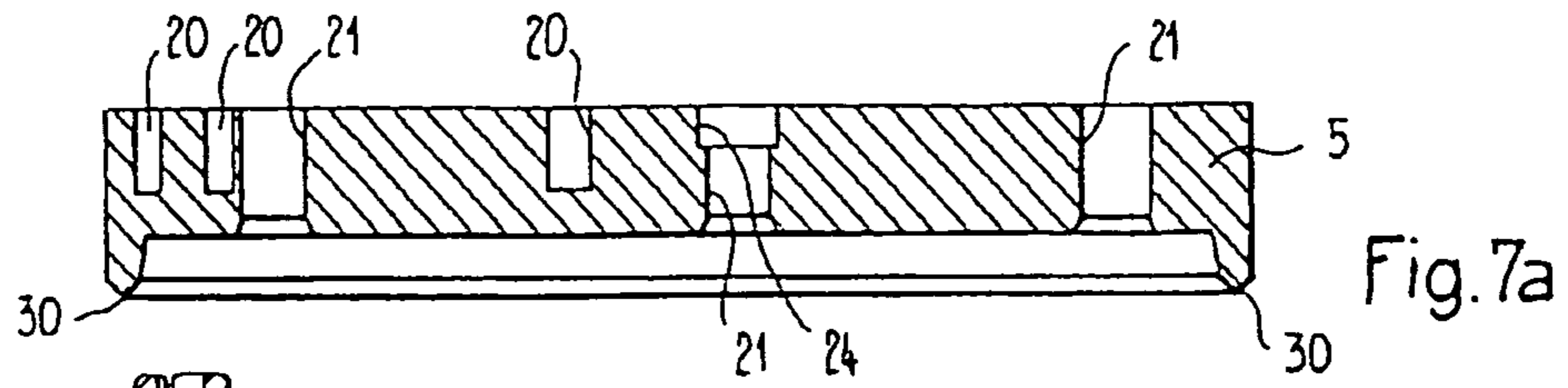


Fig. 6f



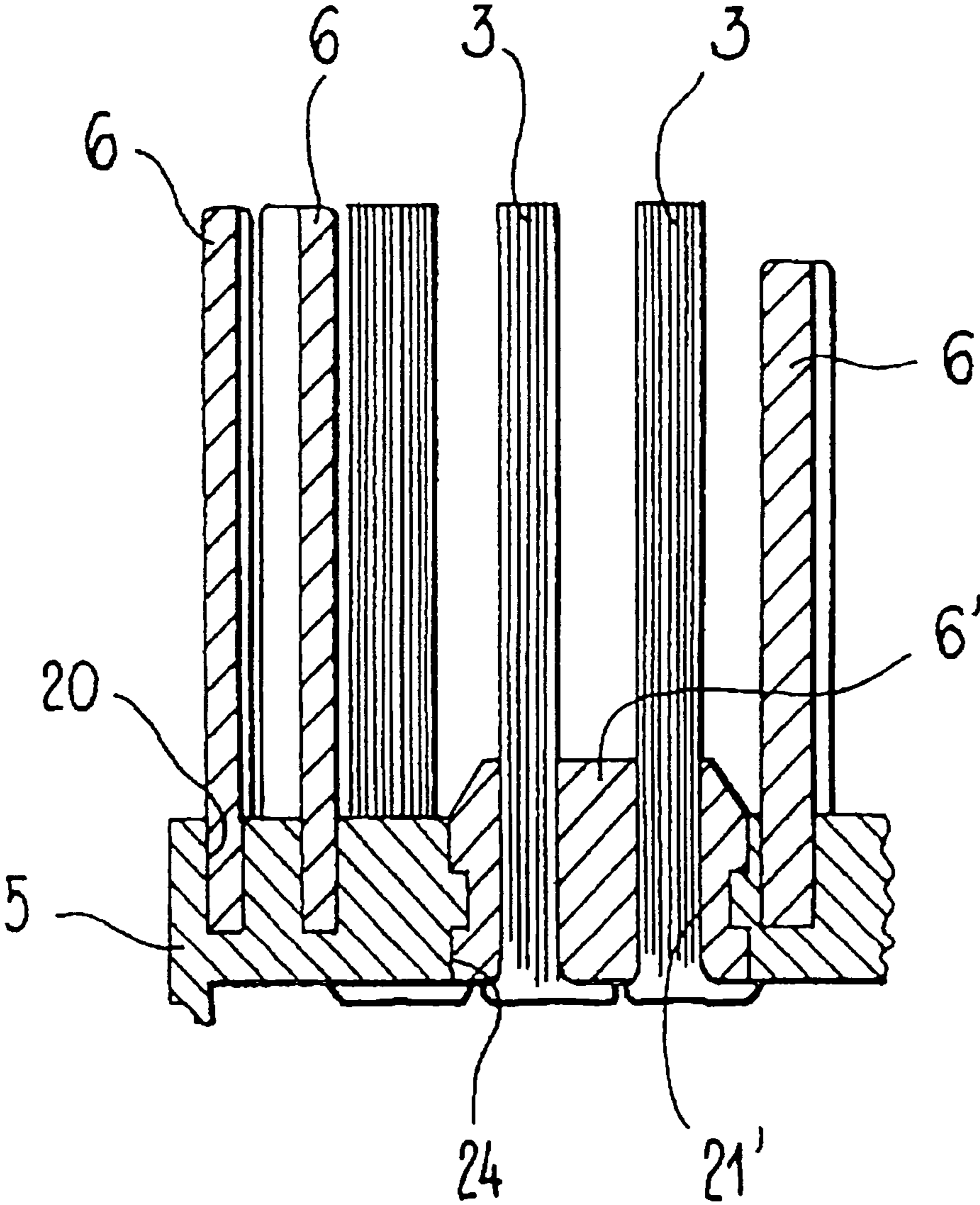
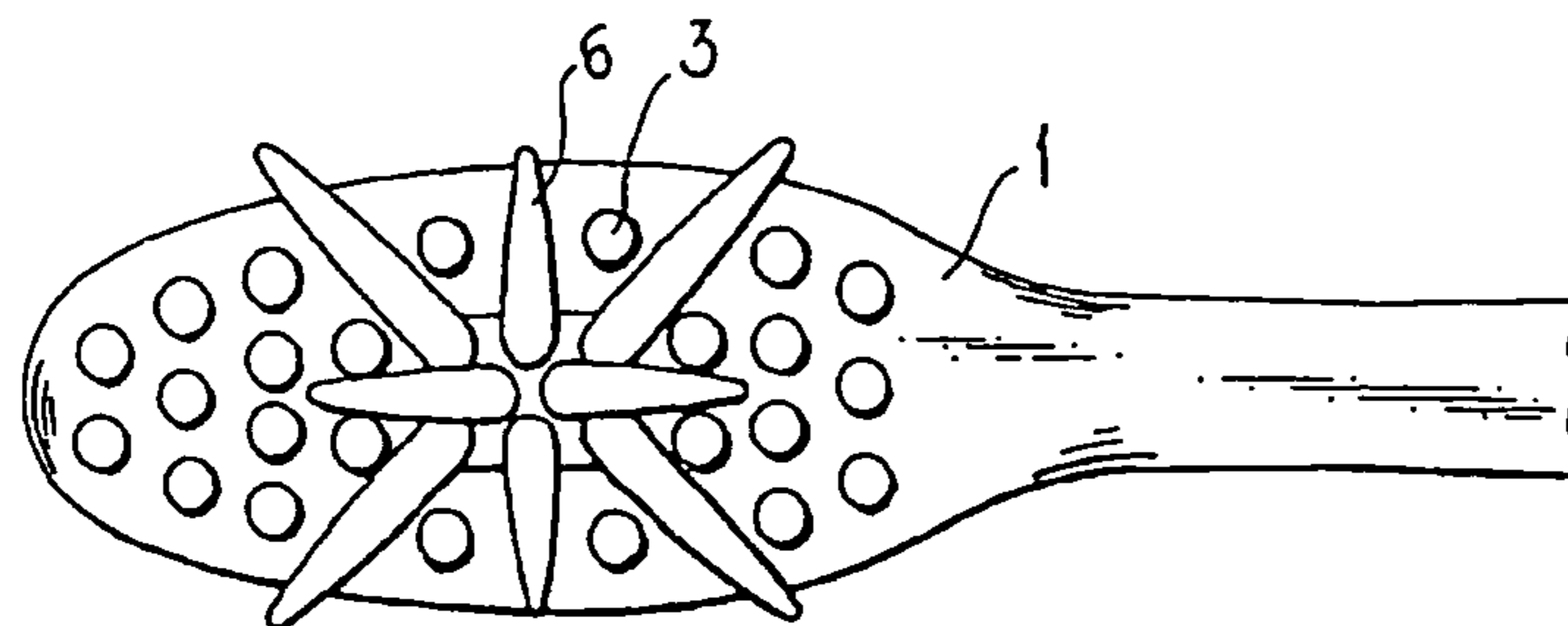
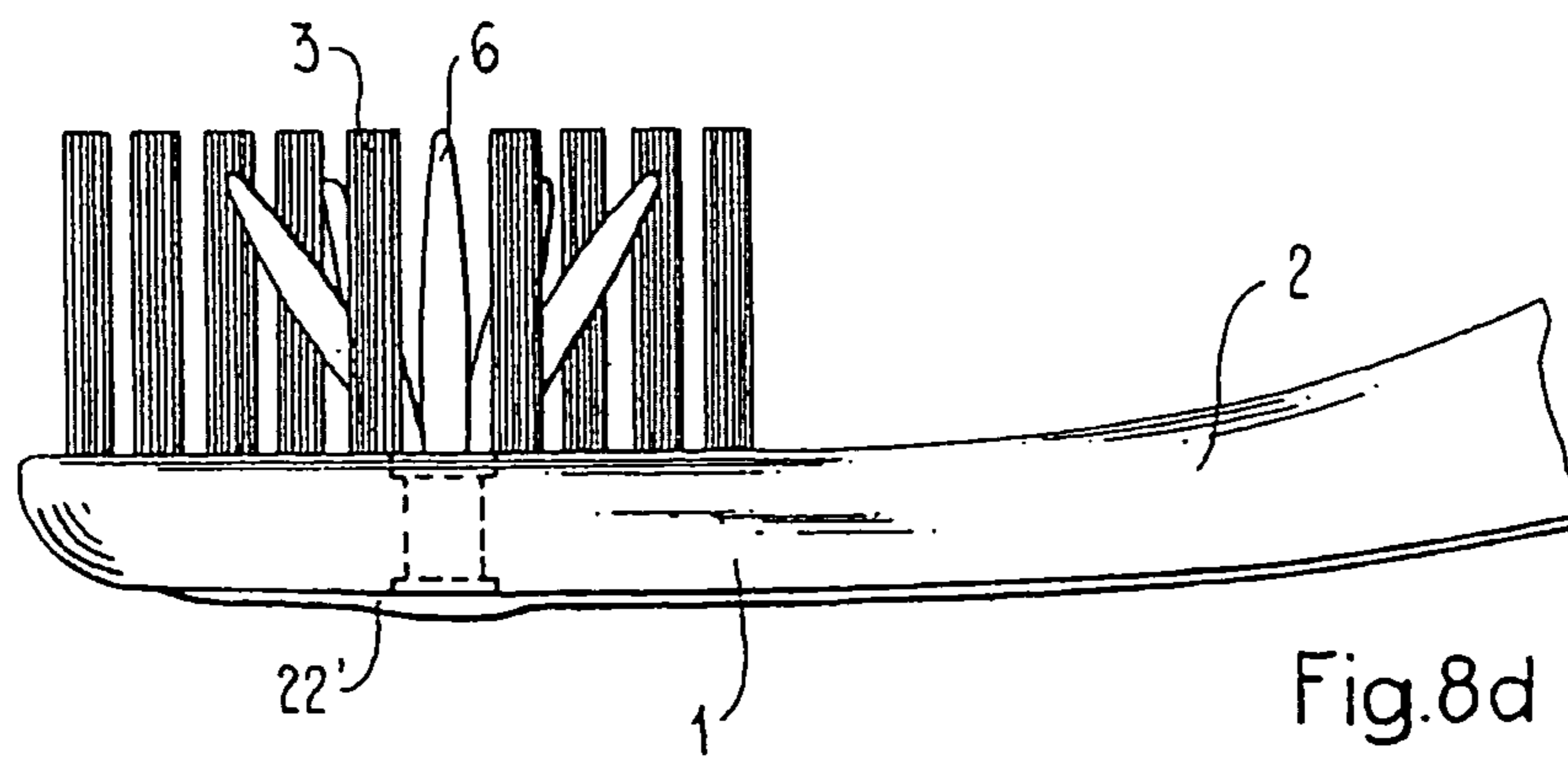
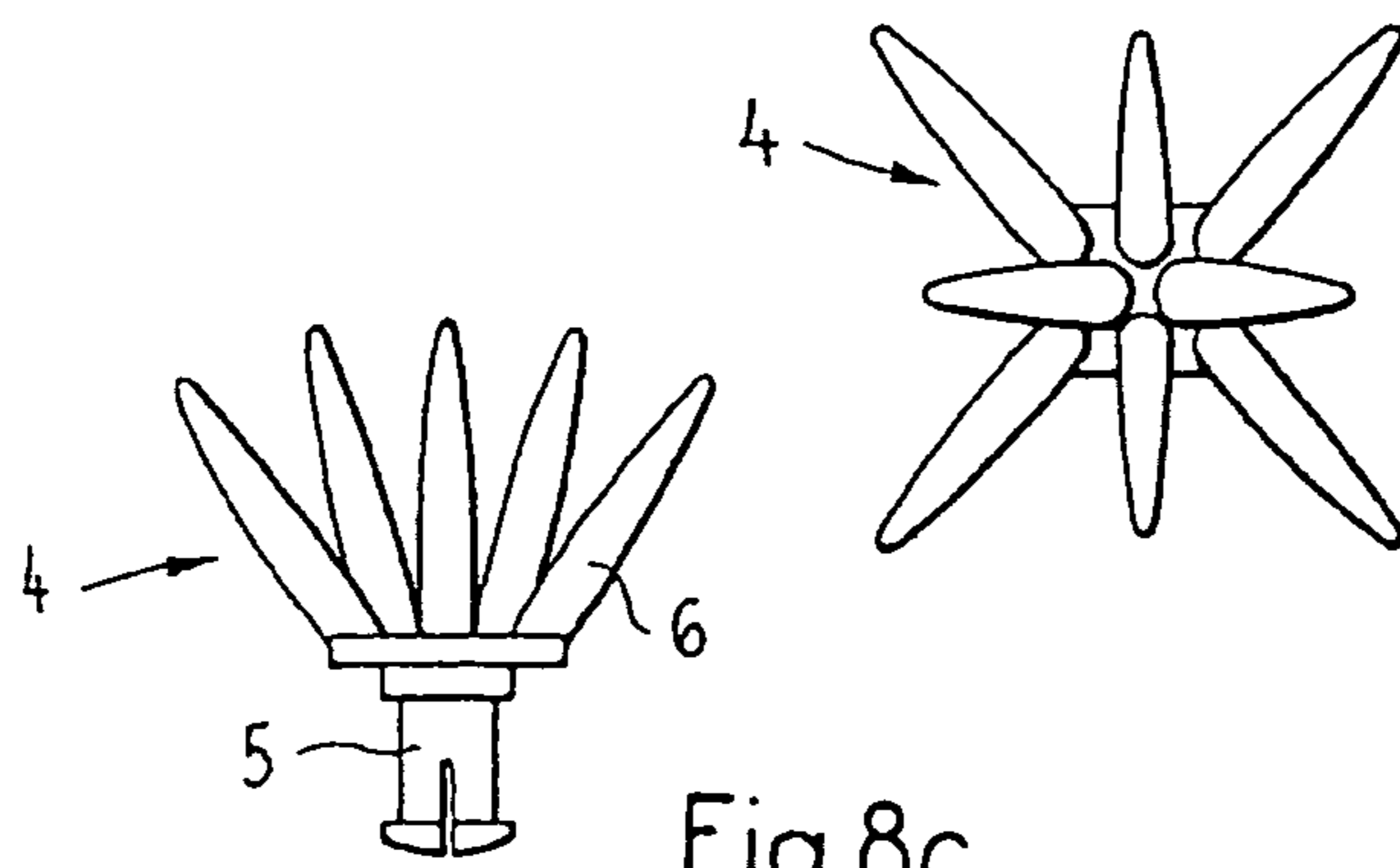
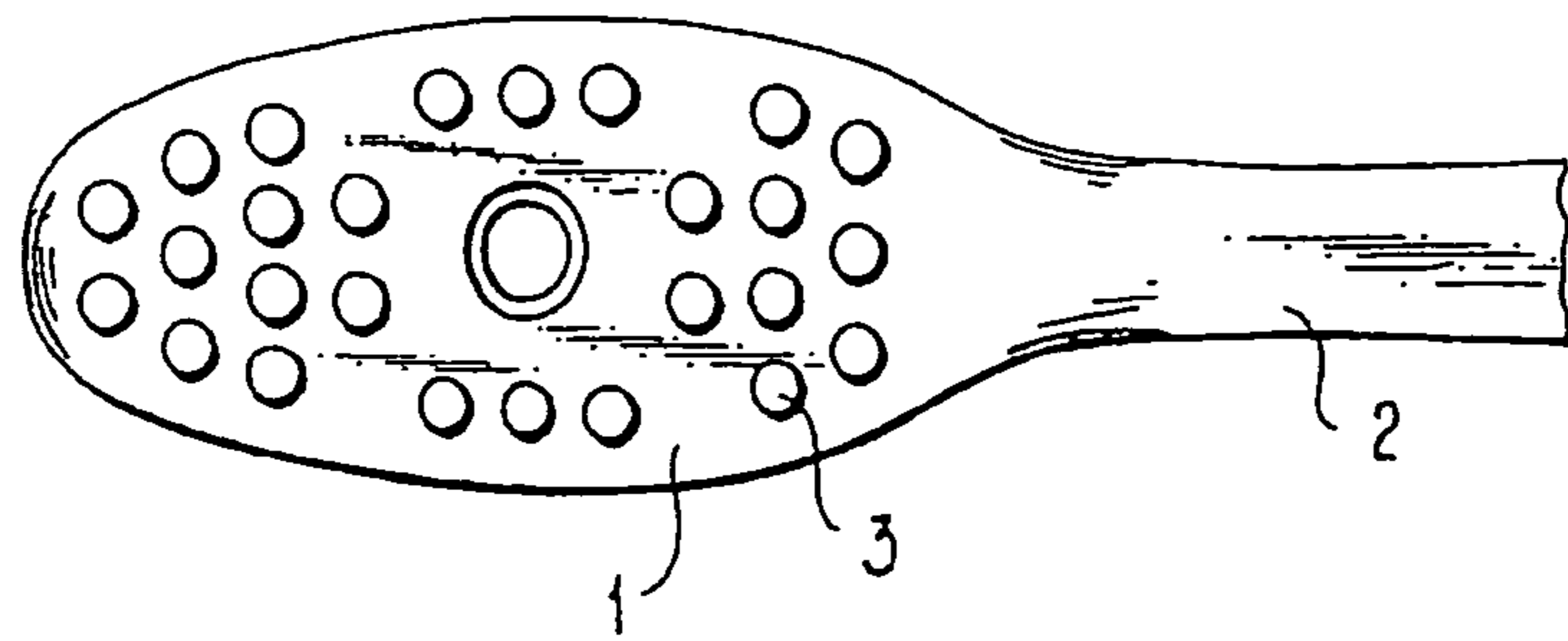


Fig.7e



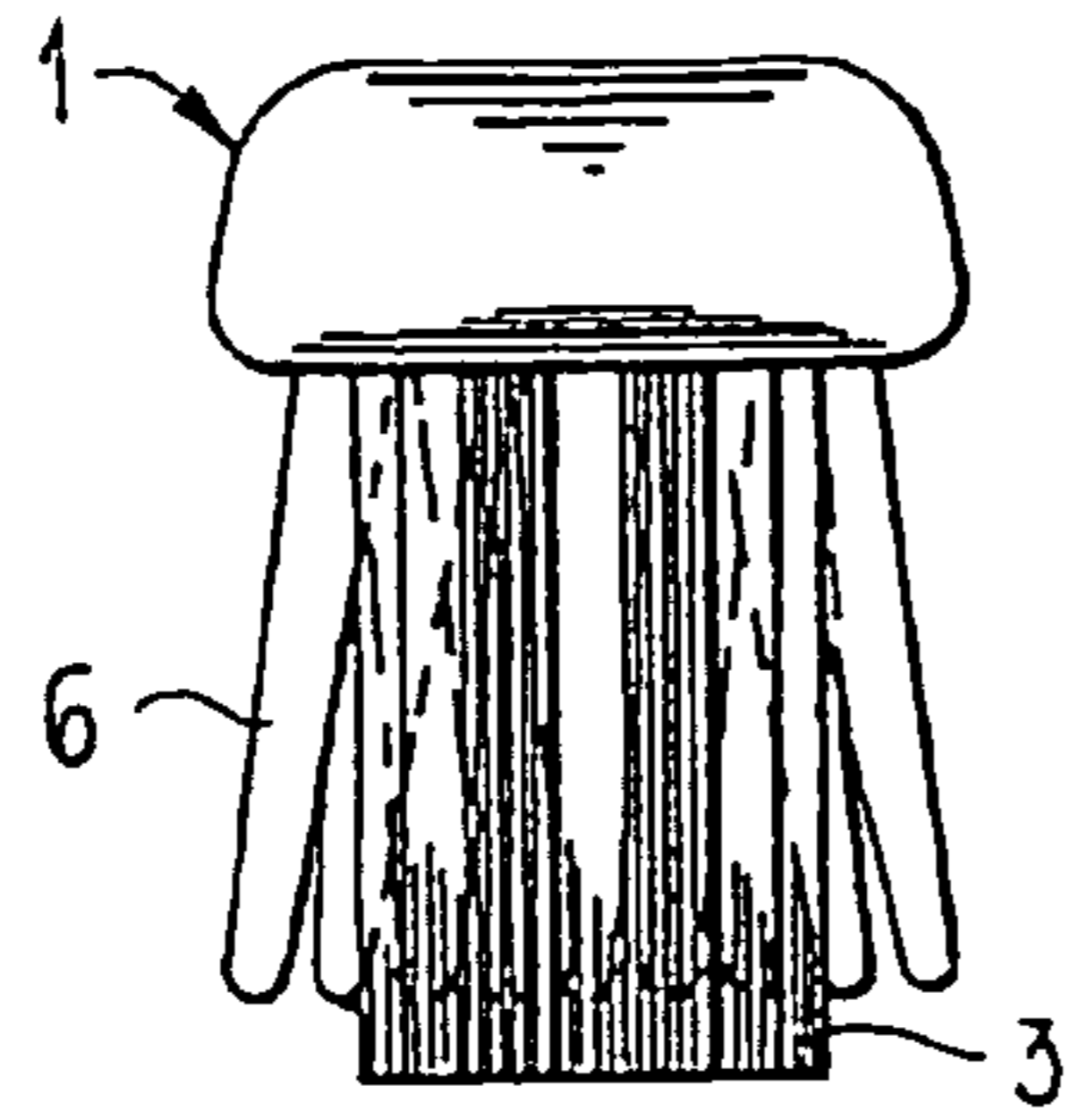


Fig. 9a

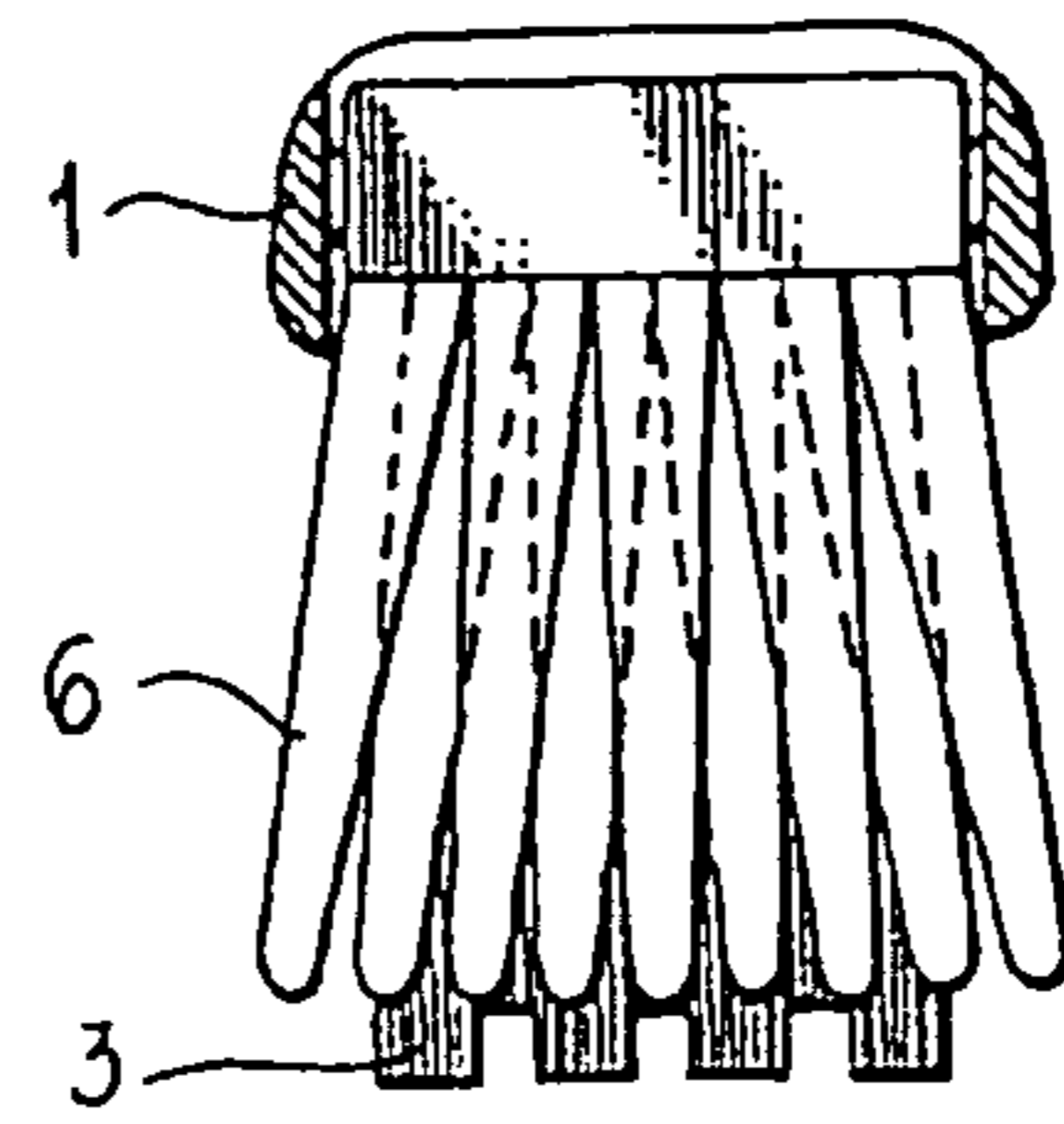


Fig. 9b

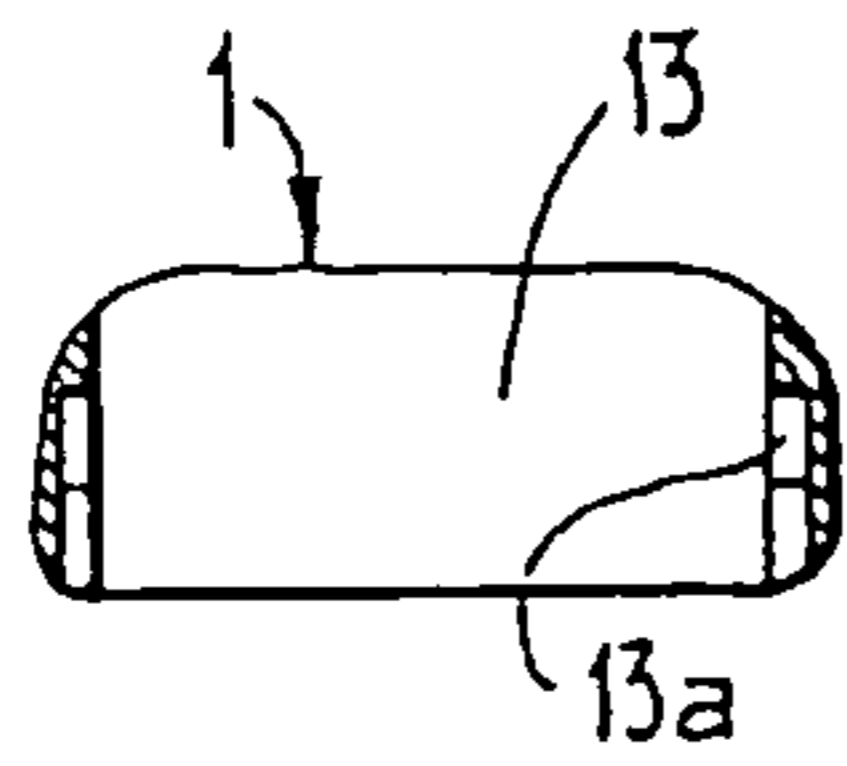


Fig. 9c

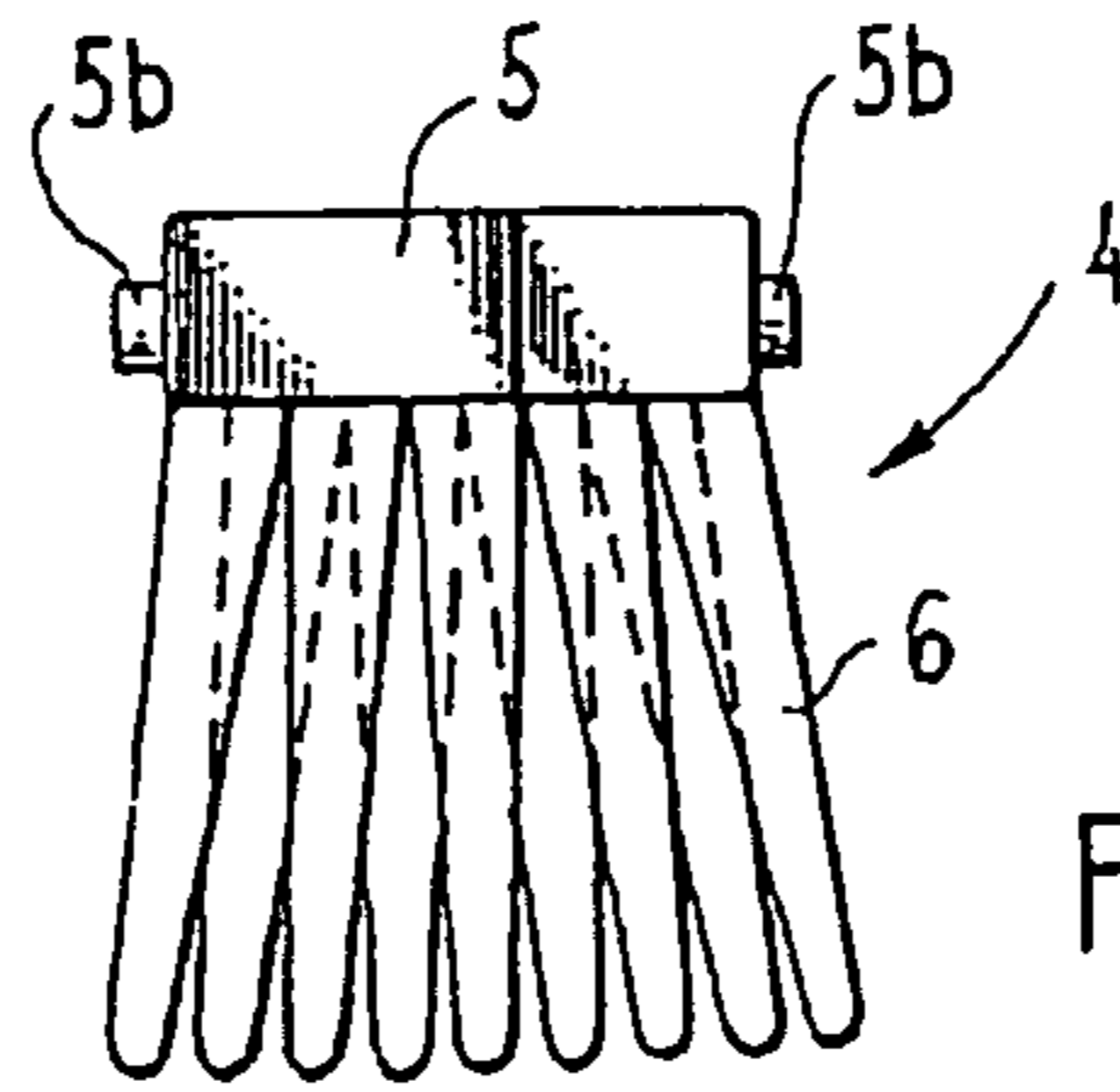


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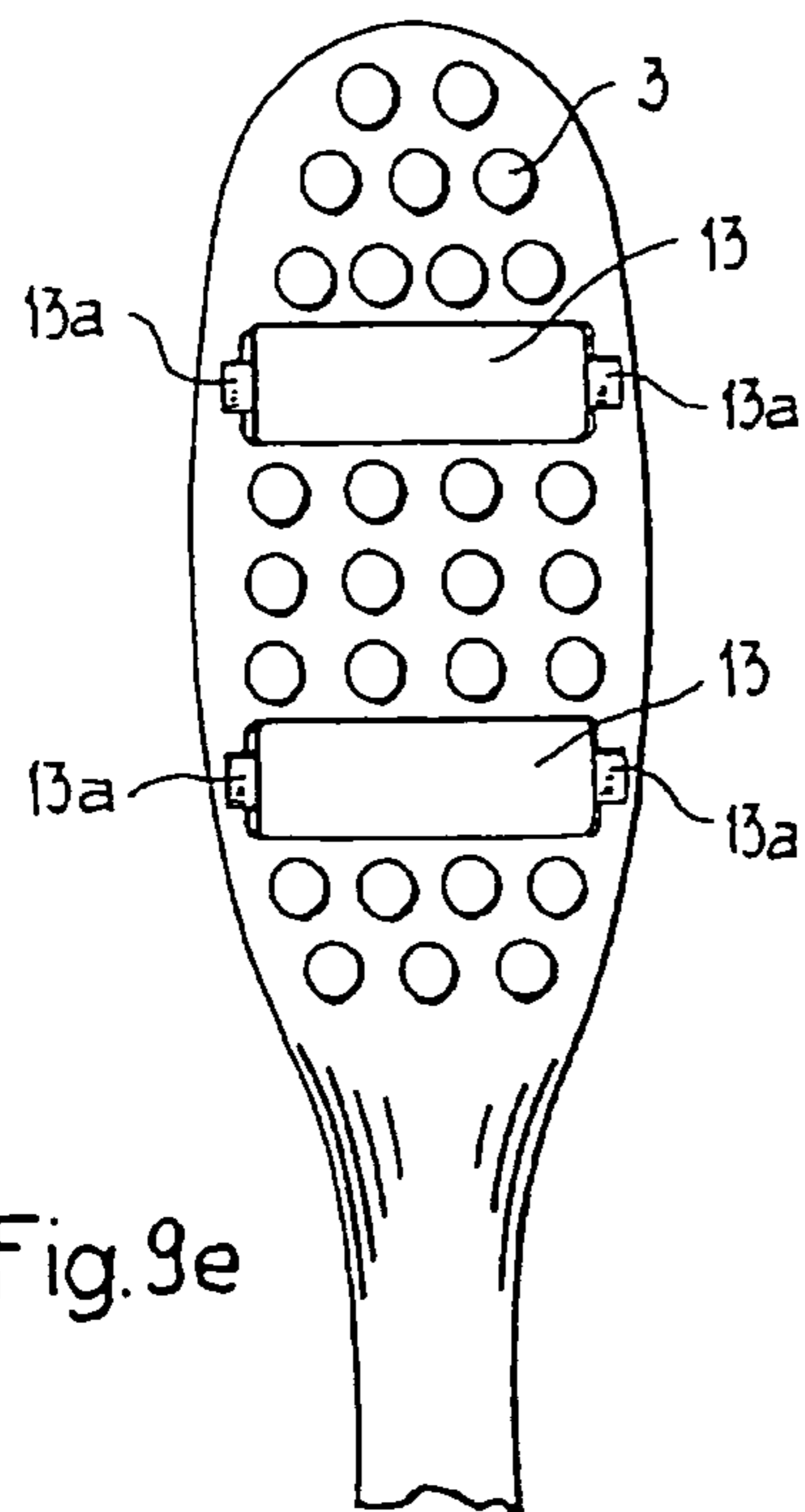


Fig. 9e

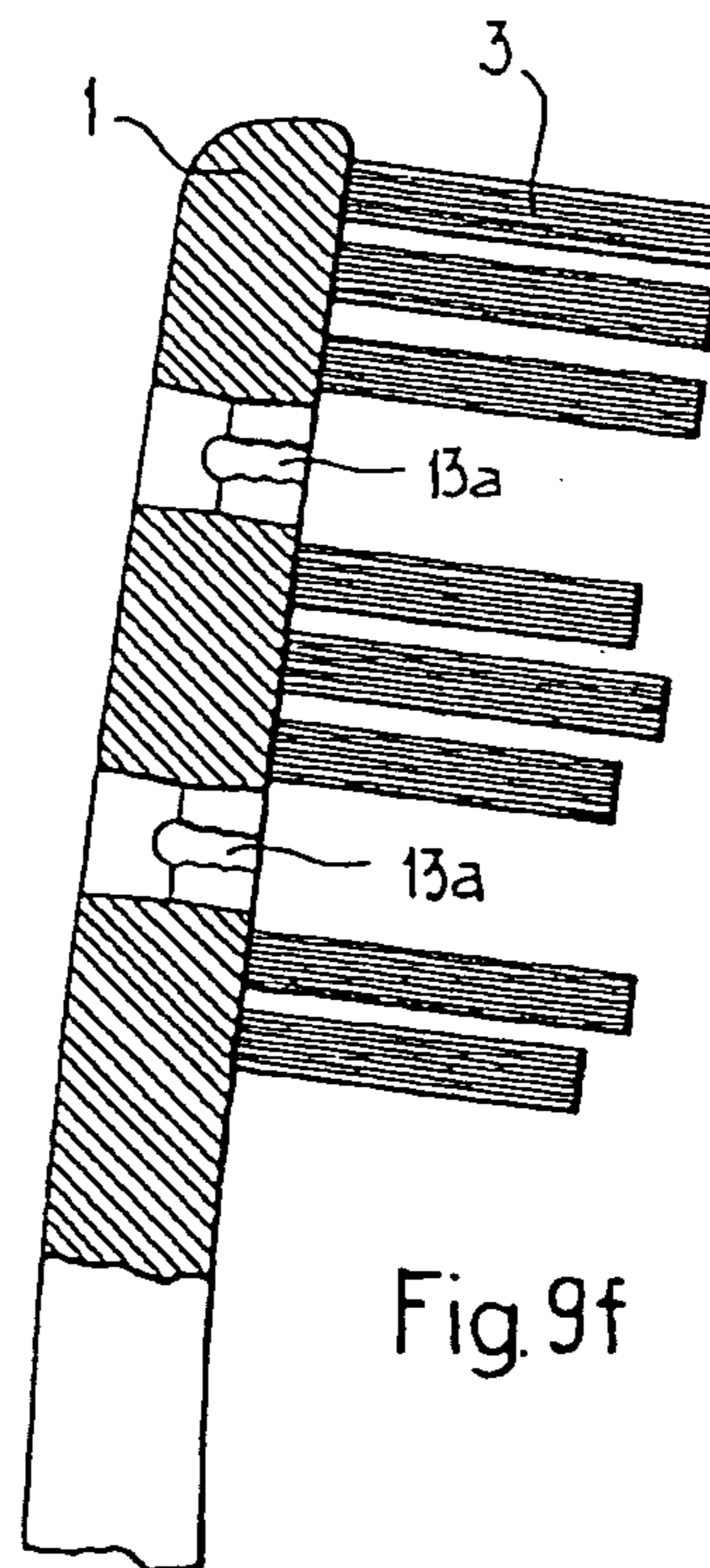


Fig. 9f

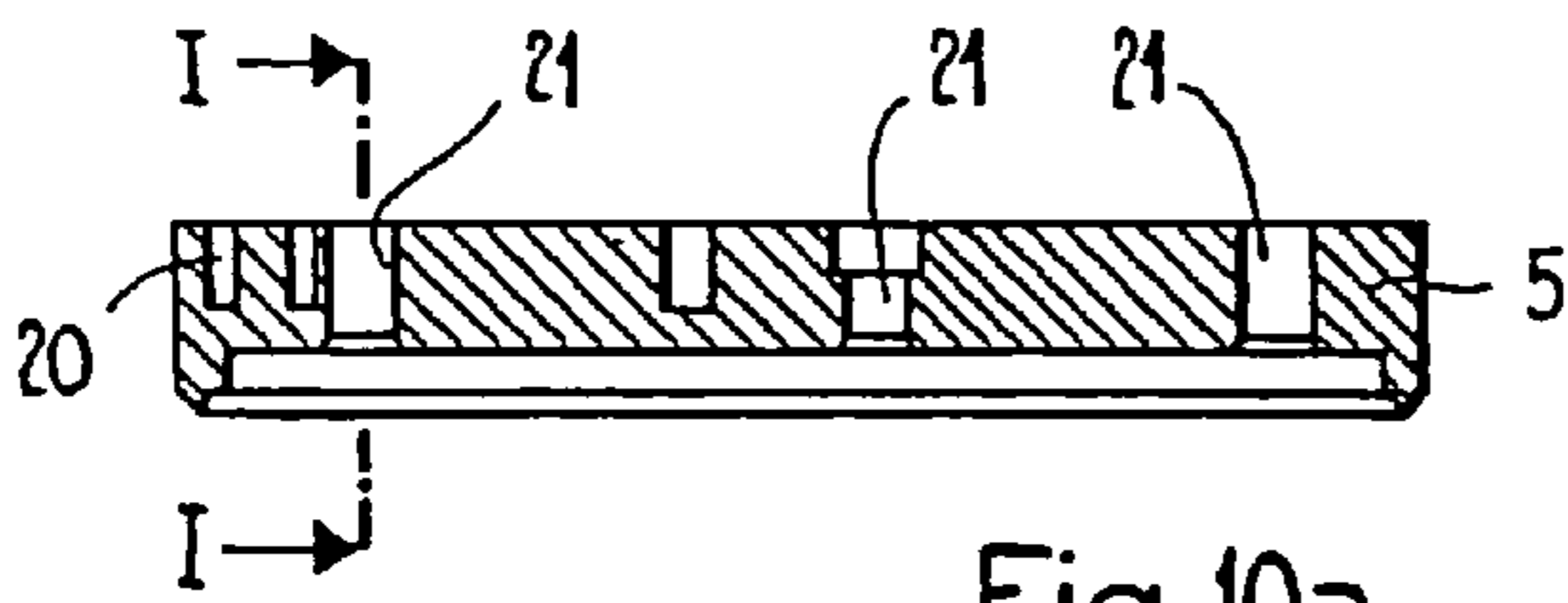


Fig. 10a

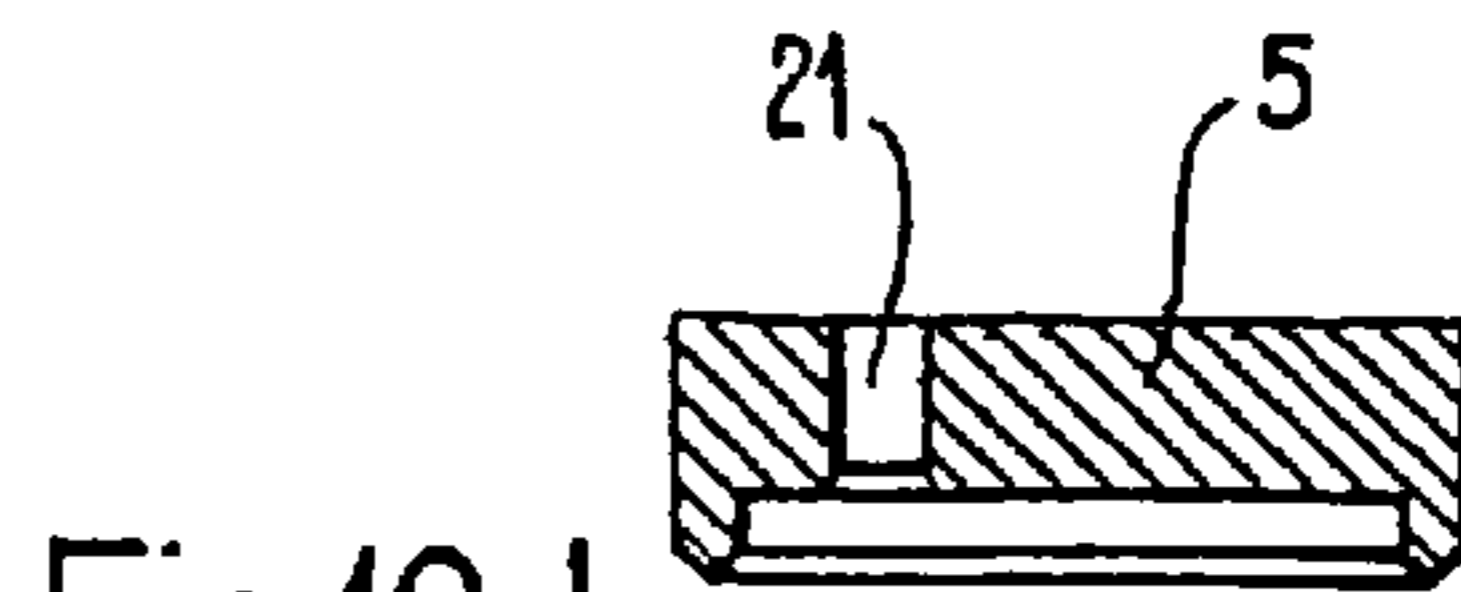


Fig. 10d

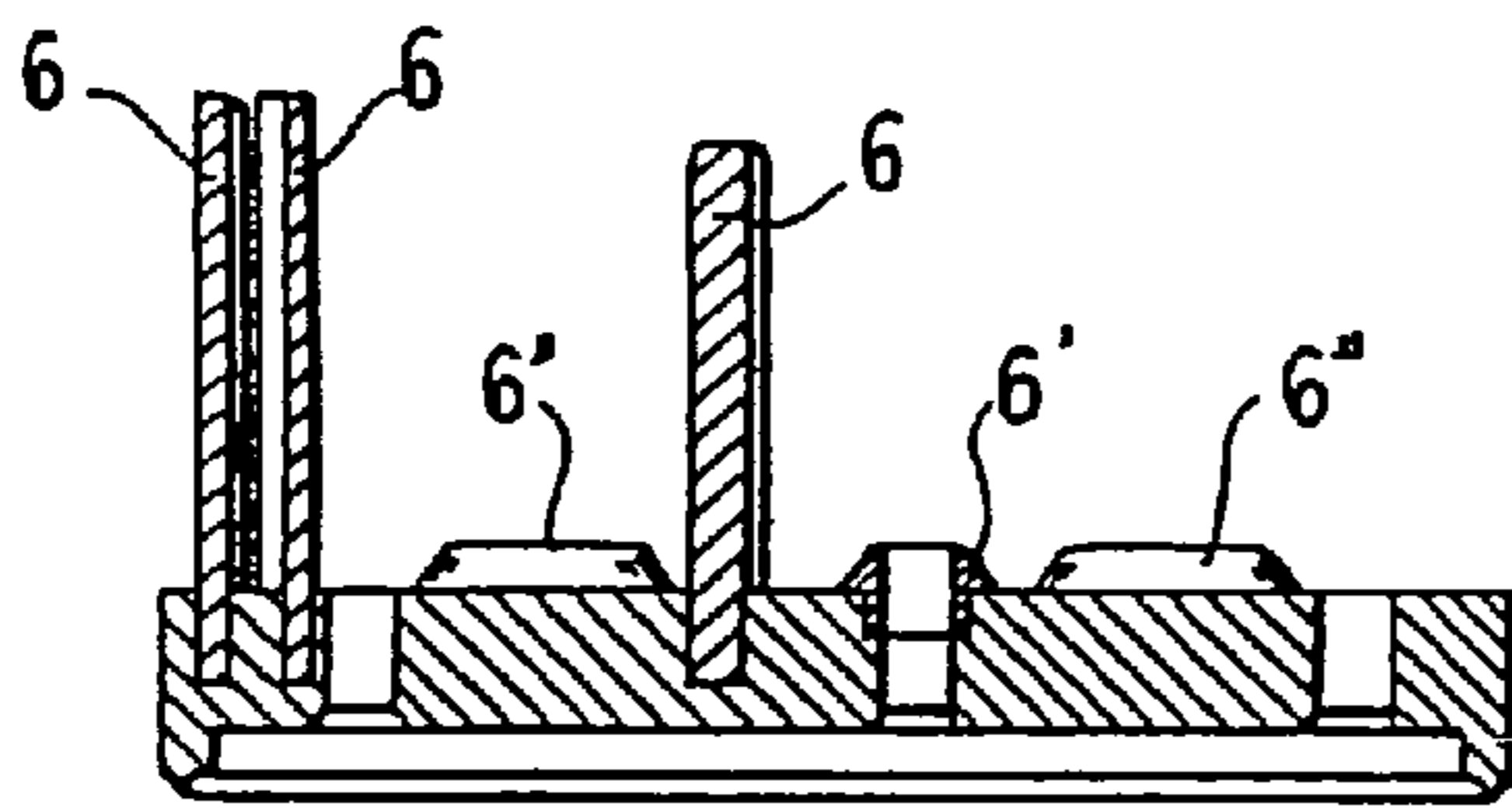


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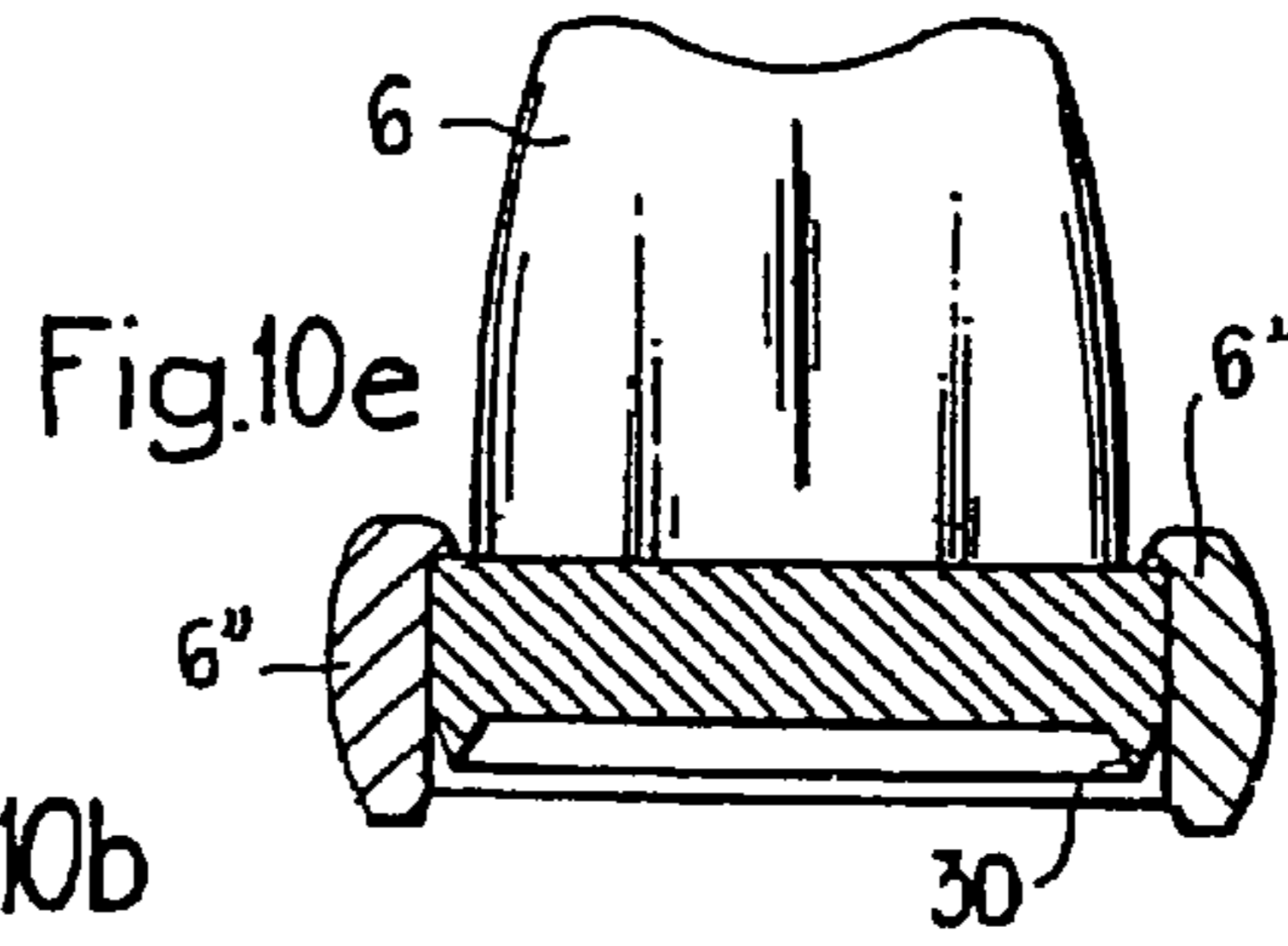


Fig. 10e

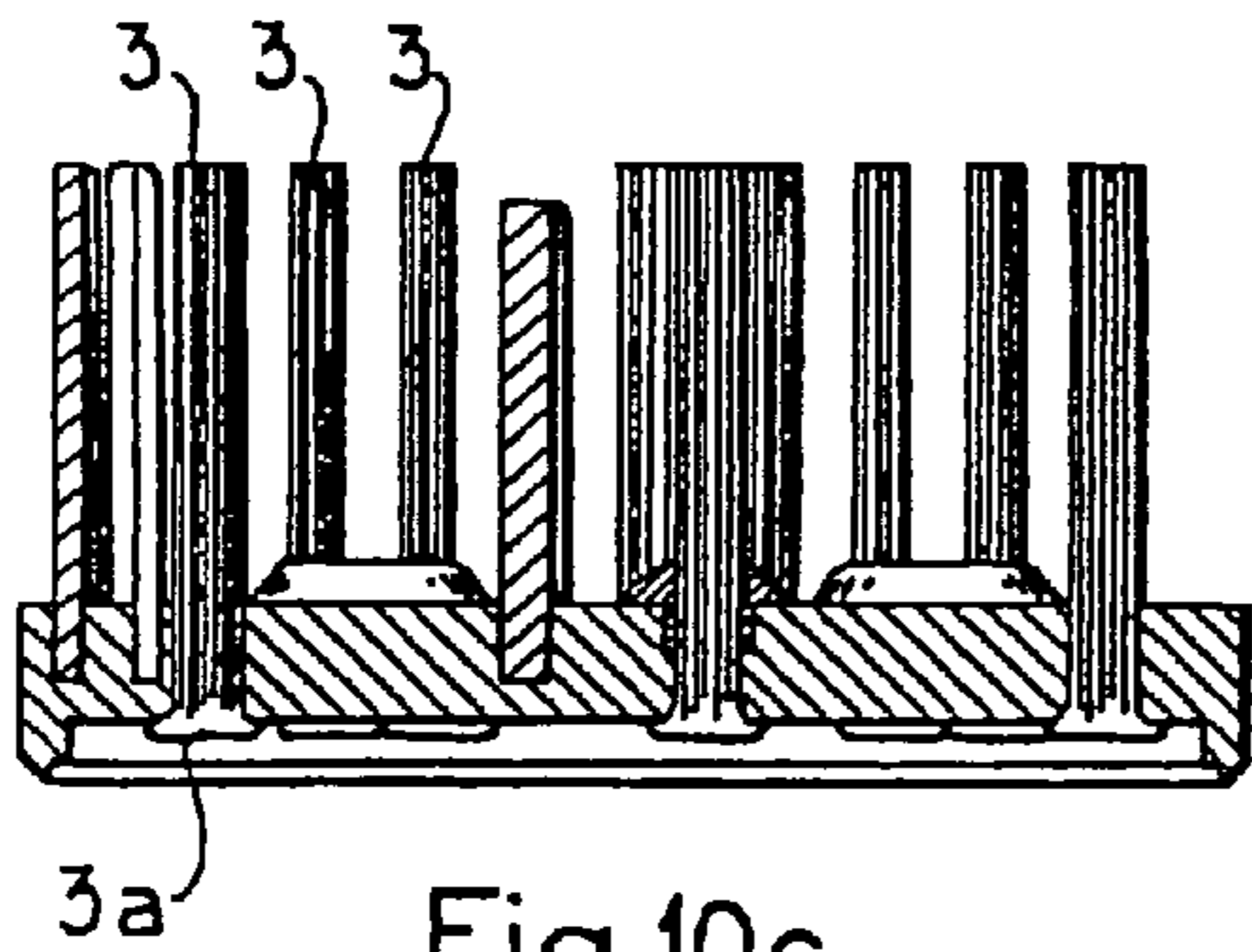


Fig. 10c

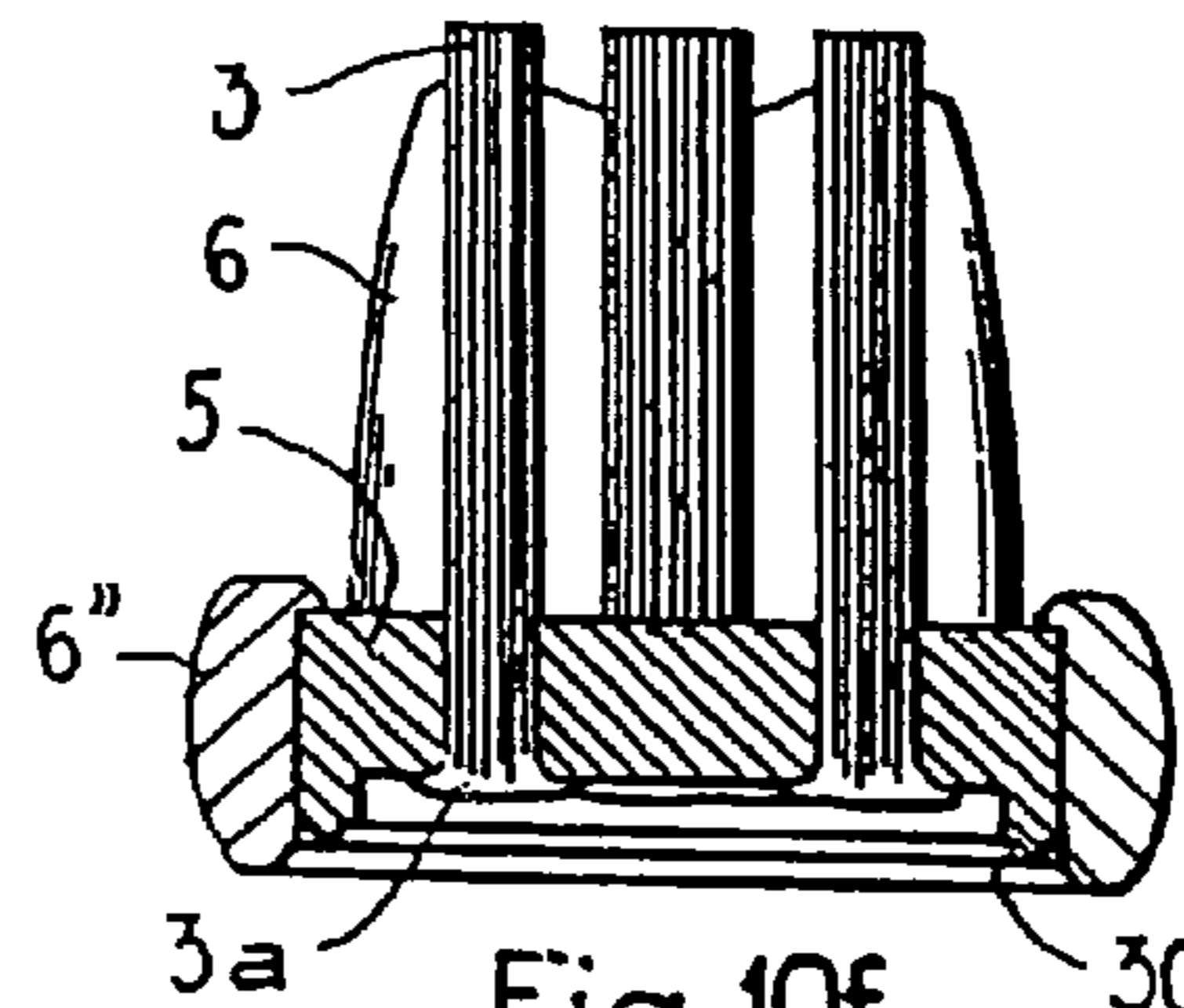


Fig. 10f

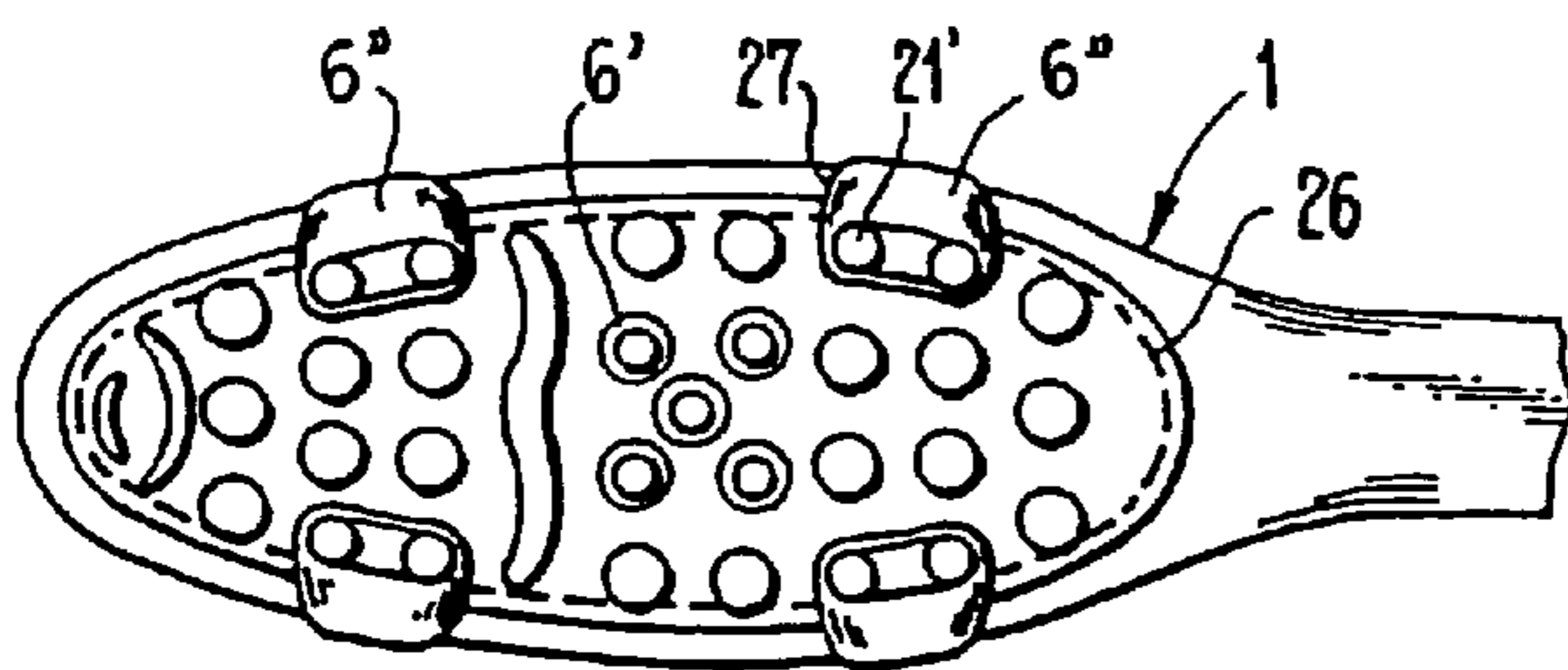


Fig. 10h

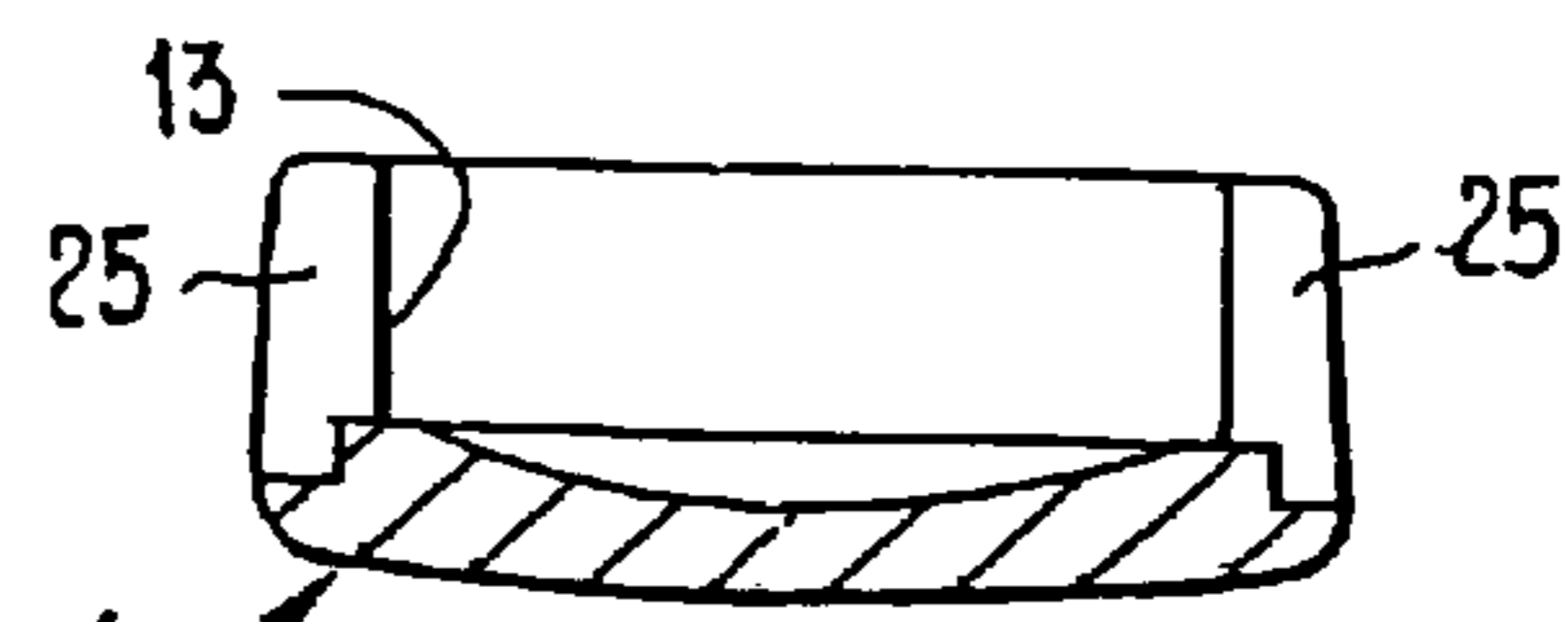


Fig. 10g (AMENDED)

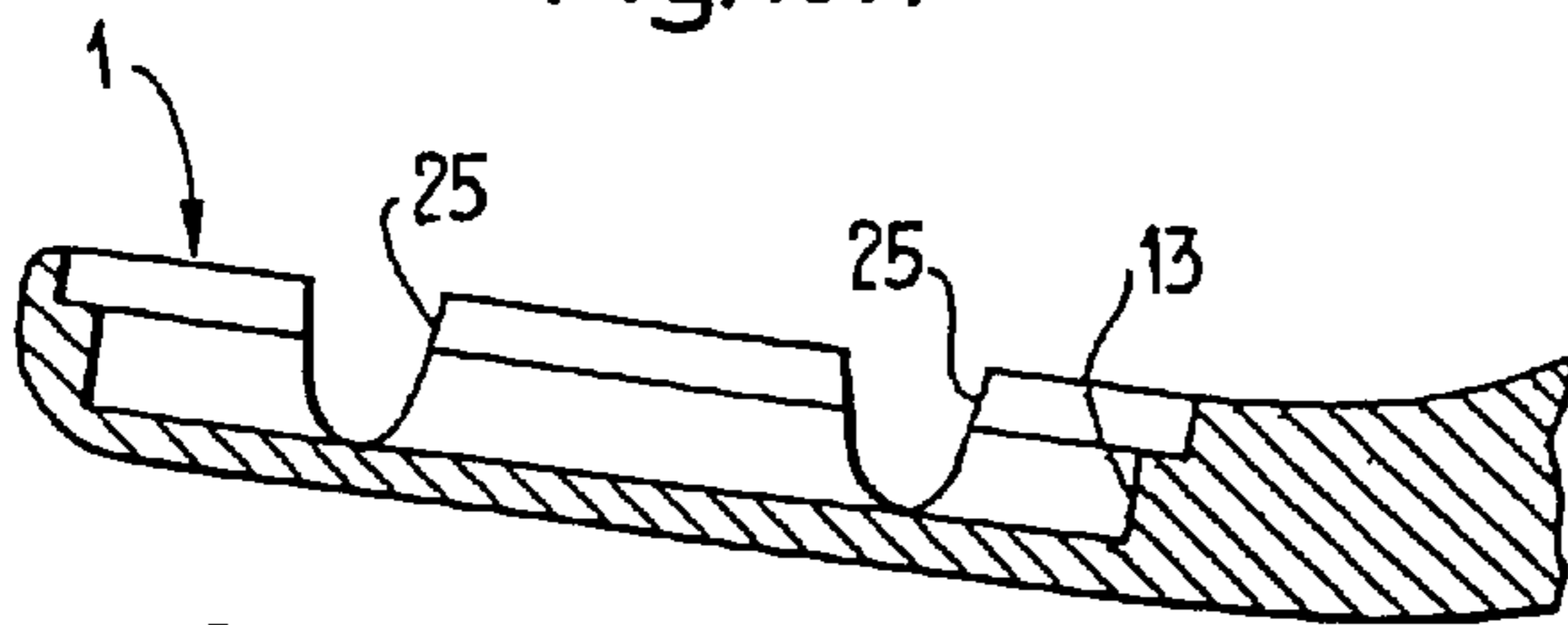


Fig. 10j

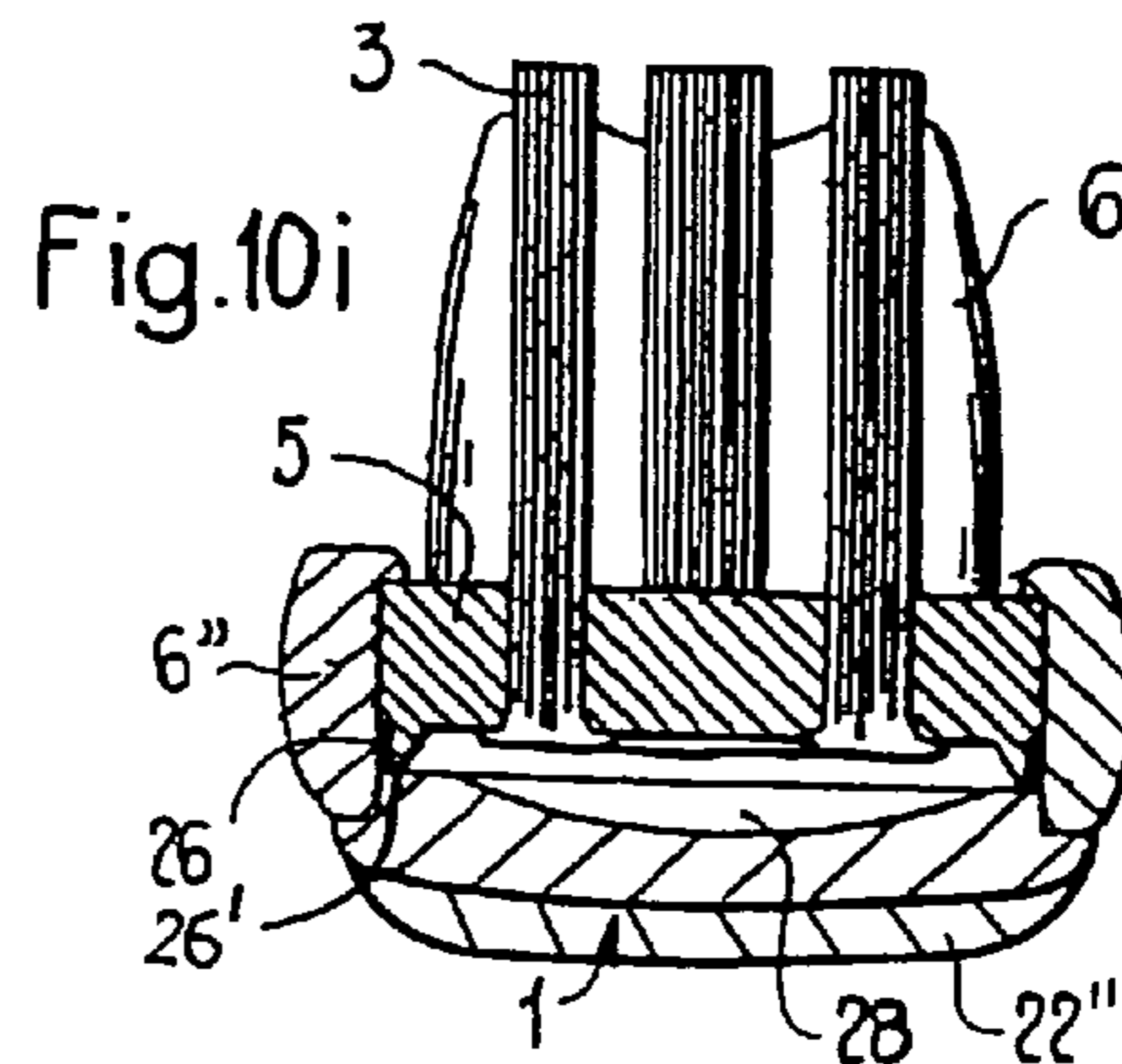


Fig. 10i

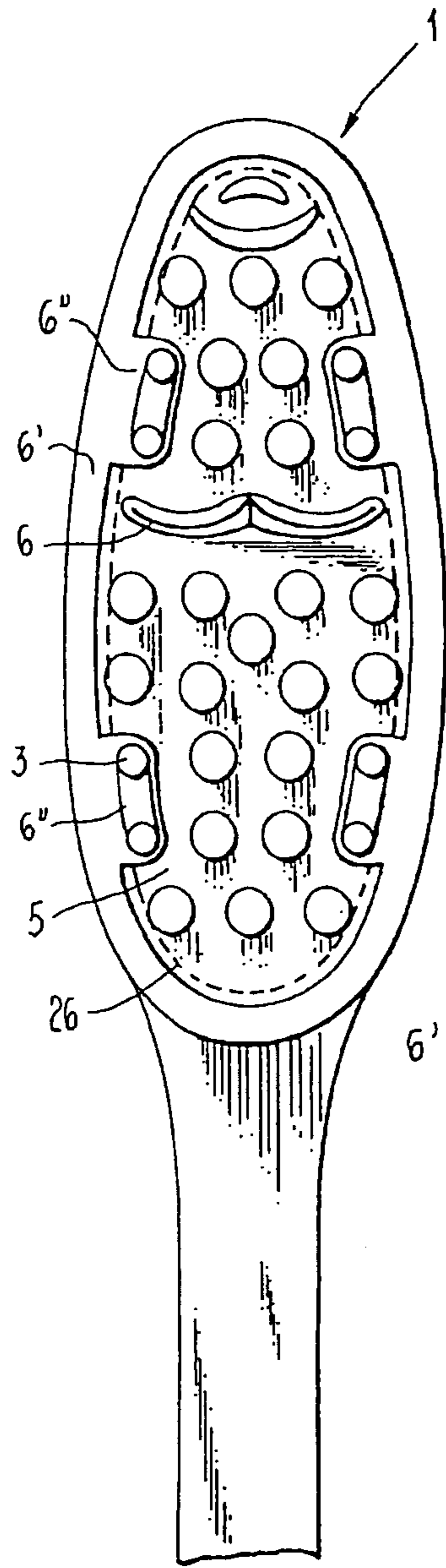


Fig. 11a

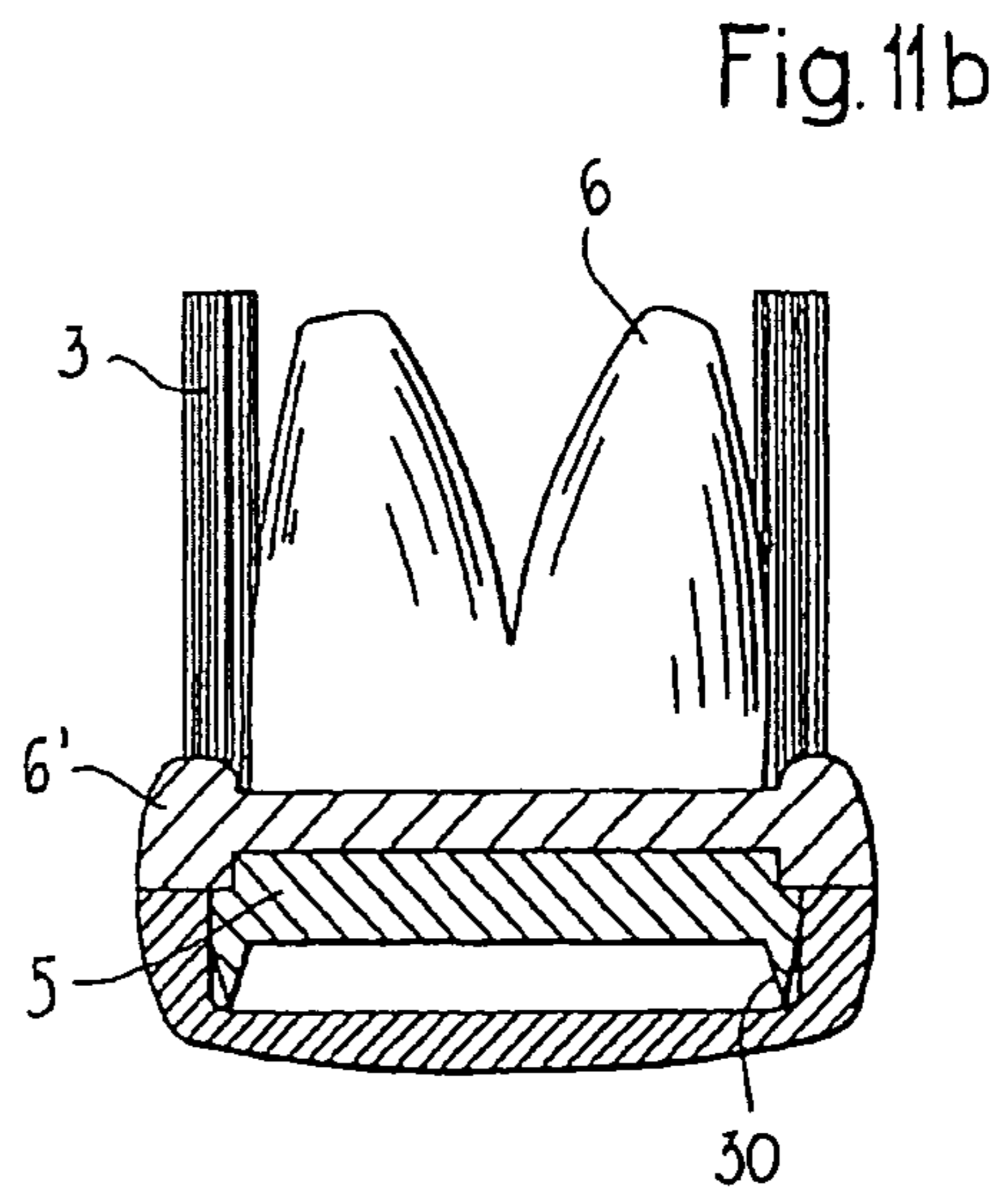


Fig. 11b

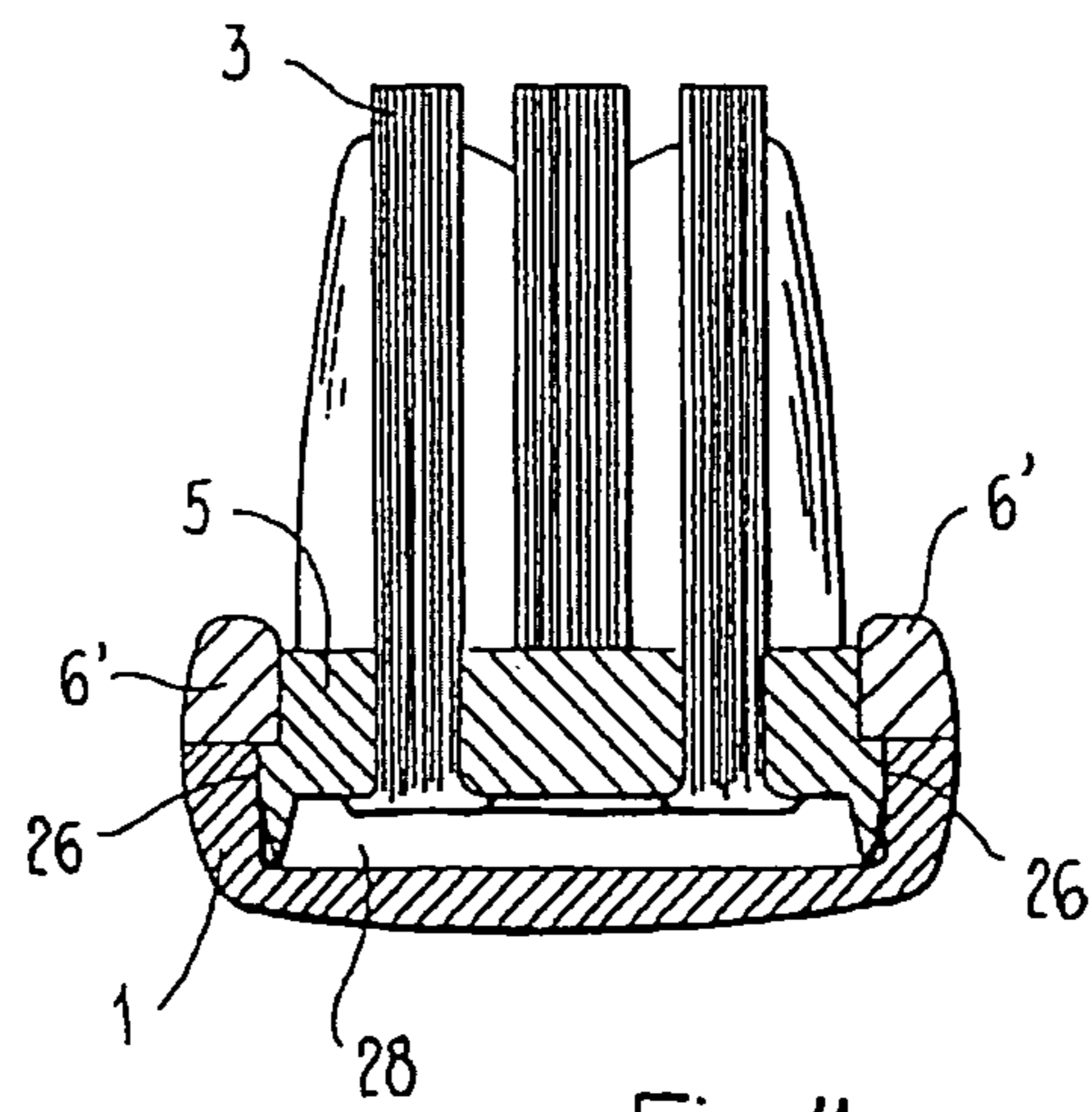


Fig. 11c

**TOOTHBRUSH AND PROCESS FOR
PRODUCING SUCH A TOOTHBRUSH**

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This application is a Reissue Application of U.S. Pat. No. 7,174,596, issued Feb. 13, 2007 and Divisional of U.S. patent application Ser. No. 12/379,186 filed Feb. 13, 2009, which is also a Reissue of U.S. Pat. No. 7,174,596.

The invention relates to a toothbrush and for a process which is intended for producing the same.

Toothbrushes with a conventional bristle arrangement comprising clusters of bristle filaments, e.g. made of a polyamide (PA) or polyester (PBT), and an additional flexible structure are known, for example, from WO 00/64307 and WO 01/21036. The conventional bristles here serve for customary teeth-cleaning purposes, while the flexible structure can perform different functions, e.g. massaging the gums, damping the cleaning movement, removing plaque, polishing the tooth surface, suspending the bristles in an elastic manner and/or sealing non-welded locations. WO 00/64307 discloses a toothbrush with rod-like flexible cleaning elements which are of approximately the same length as the conventional clusters of bristles and are arranged on the periphery of the head part of the toothbrush. In the case of WO 01/21036, elastic cleaning elements are of sheet-like, e.g. undulating, configuration and are arranged within the conventional bristle arrangement. In the case of WO 00/64307, a plurality of the flexible cleaning elements are connected to one another via a material bridge made of the same material. Following the operation of covering the head part of the toothbrush with conventional bristles, the cleaning elements are produced by virtue of the head part being encapsulated by injection molding. The disadvantage here is that the bristle filaments have to be prepared for use, e.g. by virtue of the clusters of bristles being rounded or a predetermined profiling being produced, before the flexible structure is produced. Renewed insertion into the injection mold is then necessary in order to produce the flexible structure. It is possible here for the clusters of bristles to be damaged or contaminated. The elastic-structure shapes which it is possible to produce are limited, inter alia, for demolding reasons.

The object of the invention is to provide a toothbrush, with conventional bristles and a flexible structure, which is straightforward to produce. The intention is also to specify a corresponding production process.

According to the invention, in the case of a toothbrush of the type mentioned in the introduction, at least one flexible structure, e.g. a cleaning element, is arranged on a carrier element which consists of a hard material. This carrier element is connected to the head part. Such a toothbrush has production-related advantages since the additional part, i.e. the carrier element provided with the flexible structure, can be produced separately and straightforwardly connected to the head part.

The connection between the carrier element and the head part may be produced mechanically by clamping or snap-fitting or riveting, chemically by adhesive bonding, by ultrasonic welding, or thermally by welding or other methods of supplying heat. It is preferred, in terms of production, for the carrier element to consist of the same material as the head part since, in this case, only one hard component need be provided

for producing the brush and there is no need to ensure material compatibility. This is advantageous, in particular, for ultrasonic welding.

The arrangement of the flexible structure on a carrier element consisting of a hard material has the following advantages: the additional part may be produced, and prepared for use, separately from the rest of the toothbrush body, comprising the handle and head part. In a straightforward further step, the carrier element is connected to the head part, it being possible to use any of the abovementioned connecting methods and the hard carrier element preferably being formed in adaptation to said head part. The carrier element may be formed, for example, such that, during the later connecting step, it engages around the head part in a clamping manner. On account of the hard carrier element, the additional part is easy to handle and can be gripped considerably more easily than an additional part produced entirely from a flexible material.

The additional part is small in comparison with the rest of the toothbrush. The necessary molds are thus also small and cost-effective. The basic toothbrush body and the bristle covering may be produced using a standard mold even if they are later provided with different additional parts. In order to produce toothbrushes with different additional parts, all that is necessary is to exchange the additional part and/or the corresponding mold therefor, which can be done in a straightforward and cost-effective manner.

A further advantage of producing the additional part and basic body separately is that it is possible to realize any desired shapes of flexible cleaning elements, e.g. even those which cross over the conventional bristles, come into contact therewith or displace the same when the additional part is inserted. The separate production does not pose any problems for the demolding of the flexible structure. It is possible to produce geometries by injection molding which would be extremely difficult to demold if the cleaning element were fitted directly on the bristle-covered head part.

Up until now, the flexible structure, for production-related reasons, has been produced from the same material as any flexible components on the handle part. The invention provides a greater degree of freedom for the material of the structure, with the result that it is possible to use, for example, a different degree of hardness.

A non-releasable connection between the additional part and the head part prevents the additional part from detaching during use and eliminates the risk of swallowing.

The conventional bristles are fastened, for example, directly on the head part, on a bristle plate acting as a further carrier element, or also on the carrier element for the flexible cleaning elements, all variants having advantages. During the operation of fastening the bristles on the head part or on the bristle plate, the flexible structure and the conventional bristles may be prepared independently of one another for later use before the head part and additional part are assembled, with the result that they do not damage or contaminate one another.

Fitting both conventional bristles and the flexible structure on the carrier element has the advantage that any desired spatial arrangement of the two components is possible. A carrier element which is prepared in this way may be connected to different basic toothbrush bodies for finishing purposes, with the result that it is possible to realize a large number of different toothbrushes with only a small number of basic bodies.

The conventional bristles, in both cases, may be prepared for use before or after the flexible structure is fitted. If the two components are provided on the carrier element, it is prefer-

able first of all for the flexible structure, including any cleaning elements, to be integrally formed and then for the carrier element to be covered with bristles, which may be guided, for example, through cutouts in the soft or hard component.

Producing the additional part, i.e. the carrier element with one or more flexible cleaning elements, preferably takes place by two-component or multi-component injection molding. In this case, a non-releasable connection is preferably produced between the components.

The flexible structure is preferably also arranged, e.g. molded, laterally on the carrier element, in which case, in the assembled state, it terminates laterally with the outer contour of the head part or projects beyond the same. It serves, for example, for sealing non-welded locations, for massaging the gums, e.g. by way of molded-on elastic elements which project slightly, or as impact protection during cleaning.

The flexible cleaning element preferably consists of an, in particular, thermoplastic elastomer, e.g. of natural or synthetic rubber. The material used for the basic toothbrush body is preferably used for the carrier element, in particular polypropylene, styrene-acrylonitrile, polyester, acrylonitrile-butadiene-styrene (ABS) or Isoplast®, an engineering thermoplastic polyurethane. The Shore A hardness of the soft component is preferably less than 90 and particularly preferably below 50.

The carrier element is particularly preferably covered with bristles by AFT (Anchor Free Tufting) technology. In this case, first of all, the hard-material carrier plate is produced with the flexible structure, in particular by two-component injection molding. Then, the bristle filaments are guided through cutouts in the carrier plate and/or in the flexible structure and, for fastening on the carrier plate and/or the flexible structure, are welded or adhesively bonded by way of their rear ends, which in the application case are directed toward the brush head. This has the advantage that it is possible to realize largely any desired bristle arrangements, in particular even sheet-like bristle structures. The carrier element is connected to the head part, in particular, by means of ultrasonic welding, e.g. as is described in DE 200 06 311 U.

Since elastomeric material, in particular a thermoplastic elastomer, on account of the pronounced damping of the ultrasonic vibrations, can only be welded ultrasonically to a limited extent, the welding surface between the carrier element and head part is preferably kept at least partially free of the flexible component. For this purpose, the injection point of the soft component is preferably selected to be on the bristle-carrying side of the carrier element, in order that no material bridges from the soft component reduce the size of the welding surface. However, for the case where flexible elements are intended to be arranged in the region of the welding surface, they are preferably positioned to the side of the longitudinal axis of the toothbrush. This likewise produces non-welded locations laterally on the carrier element, while it is possible to weld the longitudinally front and rear regions between the carrier element and head part. This ensures that the carrier element is held well since the front and rear regions, in particular, and, to a lesser extent, the side regions, are subjected to loading by the cleaning movement and the corresponding leverages. Merely punctiform welding with non-welded locations may also be used specifically, in order that the brush head and carrier element can be moved in relation to one another and a certain level of flexibility of the brush head as a whole is thus achieved.

It is also possible for the flexible structure, in the manner of a sealing lip, to serve for the additional sealing of non-welded locations. As a result, the space between the carrier element and the head part is advantageously sealed against the ingress

of water. It is thus not possible for any germs to accumulate in this region, and the brush is more hygienic. In order to achieve a reasonable sealing function, the Shore A hardness of the soft component is preferably less than 50.

Examples for the invention are described hereinbelow and illustrated in the drawings, in which, purely schematically:

FIGS. 1a-d show views of a toothbrush according to the invention in various assembly stages, the additional part being fastened on the head part by riveting;

FIGS. 2a-e show views of a further toothbrush of which the additional part is fastened by riveting;

FIGS. 3a-e show views of a toothbrush of which the additional part is fastened by welding;

FIGS. 4a-e show views of a toothbrush of which the additional part is fastened by means of a snap-fitting connection;

FIGS. 5a-e show views of a further toothbrush of which the additional part is fastened by a snap-fitting connection;

FIGS. 6a-f show views of a toothbrush in the case of which the additional part is fastened in a clamping manner;

FIGS. 7a-e show the production of a toothbrush by AFT;

FIGS. 8a-e show views of a further toothbrush of which the additional part is fastened by a snap-fitting connection;

FIGS. 9a-f show views of a further toothbrush, of which the additional part is fastened on the head part with play;

FIGS. 10a-j show the production of a further toothbrush by AFT; and

FIGS. 11a-c show views of a toothbrush with a lateral surround made of flexible material.

All of the toothbrushes illustrated have a basic body with a head part 1 and a handle part 2, which is only partially illustrated. An additional part 4 with a plurality of flexible cleaning elements 6 of different shapes, which are connected to a carrier element of likewise different shapes, is connected to the head part 1 when the toothbrush is in the finished state. The head part 1, furthermore, is provided directly (FIGS. 1-5) or indirectly (FIG. 6) with clusters 3 of conventional bristle filaments. The materials and arrangements of the clusters of bristles 3 may vary. It is only the special features of the individual exemplary embodiments which are discussed hereinbelow, and elements which correspond to one another are provided with the same designations.

FIGS. 1a and c show a toothbrush of which the head part 1 has already been provided with clusters of bristles 3. The additional part 4 illustrated in FIG. 1b has a sectionally U-shaped carrier element 5 made of a hard material, in particular the same plastic which has been used for producing the head part 1 and/or the entire basic body. Flexible cleaning elements 6, in this case in the form of straight rods, are firmly connected to the carrier element 5. The cleaning elements 6 are inclined slightly out of the vertical, toward one another, and enclose an angle of from 5 to 30° with the vertical. In this way, the elastic cleaning elements 6 come into contact with the conventional clusters of bristles 3 (FIG. 1d) and may even cross over (not illustrated) the latter. Using conventional production processes, such a position can only be realized with high-outlay displacement methods.

The carrier element 5 is adapted in shape to a cutout 9, visible in FIG. 1c, in that region of the head part 1 which is directed away from the clusters of bristles 3. Also located in this region are pins 7, which can be plugged through a hole 8 in the carrier element 5. The pins 7 are cold-formed or hot-formed and thus permanently fixed in the hole 8. FIG. 1d shows a plan view of the finished toothbrush.

For reasons of esthetics or hygiene, the bottom region of the hole 8 or of the head part 1 as a whole may be covered by a protective layer 22 made of soft plastic (cf. FIG. 2d). The boundary regions between the carrier element 5 and the head

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part 1 are likewise preferably covered by soft plastic. An example of the material used for this purpose is the soft material which is also used for the handle region of the toothbrush. The protective layer is preferably molded on during the production of the handle part by multi-component injection molding. It is also possible, however, for the plastic layer to be integrally formed directly on the carrier element.

A further example of a toothbrush of which the additional part 4 is connected to the head part 1 by riveting is illustrated in FIGS. 2a-e. The additional part, in this case, comprises a plate-like carrier element 5 to which sheet-like flexible cleaning elements 6 are connected in the form of a rosette. The carrier element 5 has a pin 7' by means of which the additional part 4 can be plugged through a correspondingly prepared hole 8' in the front end of the head part and can be fixed by virtue of the pin 7' being deformed. The flexible cleaning elements 6 are located in the region of the tip of the head part 1. The bristle arrangement with individual clusters of bristles 3 follows in the direction of the handle part 2. A protective layer 22 covers the region of the hole 8'.

FIGS. 3a-e show a further example of a toothbrush, which ends up similar to a toothbrush according to FIG. 2. The additional part 4 with a plate-like carrier element 5 and rosette-like flexible cleaning elements 6, in this case, is connected to the head part 1 by welding. For this purpose, the front region of the head part has a plate-like cutout into which the carrier element 5 is permanently introduced, by way of a correspondingly structured underside 5a, by means of ultrasonic welding. FIG. 3d shows a side view of the finished toothbrush, and FIG. 3e shows the plan view of the combined bristle arrangement comprising conventional clusters of bristles 3 and flexible cleaning elements 6.

The additional part 4 of the toothbrush illustrated in FIGS. 4a-e is fastened in the center of the head part 1 by means of snap-fitting. The additional part 4 comprises a rectangular carrier element 5 with wing-like flexible cleaning elements 6 arranged at its corners. Two rod-like cleaning elements 6 are also located on the carrier element 5 (FIGS. 4b and c). As is illustrated in FIG. 4a, the head part 1 has a central hole 8", through which a resiliently configured extension 11 on the carrier element 5 is plugged. The additional part 4 and head part 1 are connected to one another by a snap-fitting connection which, on account of the enlarged cross section at the bottom end 11a of the extension 11, cannot readily be released. The bristle arrangement of the conventional clusters of bristles 3 is configured such that the wing-like cleaning elements 6 are positioned between the conventional clusters of bristles 3, as is illustrated in FIGS. 4a and 4e. The additional part 4 is produced separately and then inserted into the head part 1 with the prepared bristle arrangement. It is thus also possible to realize structures of the flexible cleaning elements 6 which engage through the convention bristle arrangement, such as the diagonally arranged wing-like elements from FIGS. 4b-e or the fanned-out pin-like cleaning elements, oriented in different directions in space, from FIG. 8. For reasons of hygiene or esthetics, the underside of the head part 1 is covered by a layer 22 made of flexible material.

FIGS. 5a-e show a further example of a snap-fitting connection between the additional part 4 and the head part 1 of a toothbrush according to the invention. Within the bristle arrangement made of conventional clusters of bristles 3, the head part 1 has a prepared region 13 for accommodating the additional part 4. This region 13 comprises a depression with a groove 12 running on the border of the latter in each case, perpendicularly to the alignment of the handle 2, said groove 12 providing the head part 1 with a certain level of elasticity or resilient action, as do also the grooves 12' running on the

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lateral border of the head part. The prepared region 13 is slightly smaller than the basic surface area of the carrier element 5, with the result that the latter can be fitted into the region 13 in a clamping manner. As can be seen from the plan view in FIG. 5e, the additional part has both rod-like cleaning elements and sheet-like cleaning elements arranged transversely to the alignment of the handle 2.

FIGS. 6a-f show a further example of a toothbrush according to the invention, in this case a plug-on toothbrush for an electric teeth-cleaning unit. The conventional clusters of bristles 3 are fastened on a separate bristle plate 18 which, in the assembled state, is connected to the matching head part 1 of the toothbrush or a disc 23 which is fastened in a rotatable or pivotable manner thereon. The flexible cleaning elements 6, which are rod-like in this case, are fastened on a carrier element 5 which is slightly curved in plan view and has a sheet-like extension 16, which is oriented essentially perpendicularly to the alignment of the cleaning elements 6. The additional part 4 can be introduced, by way of said extension 16, into a correspondingly shaped groove 14 in the disc 23. Arranged in the center of the head part 1 and of the groove 14 is a round cutout 15, in which a corresponding mating element 17 on the extension 16 of the additional part 4 engages. The additional part 4 and head part 1 are thus connected to one another in a well-fitting and clamping manner. At its bottom end, the bristle plate 18 has a groove 19 by means of which the bristle plate 18 can be fastened on the disc 23 or the lateral extensions 23 thereof. In the embodiment illustrated, the additional part 4 is moved along by the disc 23. As an alternative, it is possible for the additional part 4 to be fastened directly on the head part 1 and not to rotate as well.

FIGS. 7a-e show an example of the production of a toothbrush by means of AFT technology. FIGS. 7a-c show sectional views of the carrier element 5 in various process stages, to be precise before being provided with flexible cleaning elements 6 and conventional clusters of bristles 3 (FIG. 7a), following the application of the flexible material (FIG. 7b) and following the application of the bristles (FIG. 7c). The outer shape of the carrier element 5 is adapted to the dimensions of a prepared region 13 in the form of a shallow cutout in the head part 1 of the toothbrush. The carrier element 5 has prepared regions 20, into which the flexible cleaning elements 6 are fitted, in particular molded. Furthermore, the carrier element 5 has cutouts 24, which are filled wholly or partially with flexible material 6', see also the detail from FIG. 7e. The carrier element 5 also contains holes 21, through which clusters of bristles 3 are plugged and are fastened on the rear side by virtue of their rear ends 3a being incipiently melted. The elastic material regions 6' have further holes 21' which likewise serve for accommodating clusters of bristles 3, which are fastened in the same way. The material regions 6' can accommodate one or more clusters of bristles 3. The clusters of bristles 3 anchored in the elastic material 6' are thus anchored or suspended in a particularly elastic manner. Further clusters of bristles 3 are fastened directly on the carrier element 5. The carrier element 5 fitted with clusters of bristles and the flexible structure 6, 6' is then inserted into the prepared region 13.

The edge 30 of the carrier element 5, this edge in the application case being directed towards the base of the cutout 13, is tapered, just as in the example from FIGS. 10 and 11. This tapering edge 30 serves, during ultrasonic welding for connection to the head part 1, as an energy concentrator and a material reservoir for material which is to be liquefied.

The AFT technology manages without anchors or clips for fastening the bristle filaments, which instead are welded directly on the carrier plate. This means that the width of a

cluster of bristles is not determined by the anchor, with the result that it is also possible to realize finer structures, in particular also sheet-like bristle arrangements.

It is technically also possible, in the case of AFT, to prepare the bristle filaments for use before they are fitted on the carrier plate. The variant which is realized at present, however, is that where the bristles are only machined once they have been fitted on the carrier plate.

FIGS. 8a-e show a variant of the toothbrush from FIG. 4. The bristle arrangement made of conventional clusters of bristles 3 corresponds to FIG. 4. The additional part 4 has a plurality of pin-like cleaning elements 6 which diverge in the form of a star and engage through the conventional clusters of bristles 3 (FIGS. 8d and e). The fastening mechanism corresponds to FIG. 4. A layer [22] 22' made of flexible material covers the underside of the head and handle parts 1, 2.

FIGS. 9a-f show a further example of a toothbrush according to the invention. The head part 1 has a prepared region 13 for the carrier element 5 of the additional part 4, said region being larger than the carrier element 5 itself. The region 13 is, for example, a hole which passes all the way through the head part 1, see sectional drawings from FIGS. 9b, d and e. The region 13 has two lateral grooves 13a, the shape of which is adapted to the shape of two lateral extensions 5b of the carrier element 5. The latter is inserted into the head part 1 and latches there. The play of the carrier element 5 within the region 13, which allows lateral displacement and/or a pivoting movement about the axis defined by the extensions 5b, results in a particular level of elasticity or resilient action of the additional part 4. The rear side of the head part 1, again, may be covered by a layer of soft material.

FIGS. 10a-j show a further example of a toothbrush produced by means of AFT. FIGS. 10a-c correspond to FIGS. 7a-c and each show the carrier plate 5 in various process stages. FIGS. 10d-f show the same carrier plate 5 in section along line I-I indicated in FIG. 10a. The centrally arranged flexible element 6 is sheet-like or sail-like and is undulating in plan view (FIG. 10h). As is illustrated in FIGS. 10e and f, the flexible structure comprises laterally integrally formed regions 6" which, in the assembled state (FIG. 10h), bound the toothbrush head 1 laterally and terminate more or less flush with the outer contour of the head part. They serve, for example, as impact protection and/or for additionally massaging the gums. The regions 6" likewise have holes 21' for accommodating clusters of bristles 3, which are thus suspended in an elastic manner and are particularly compliant during cleaning.

The carrier element 5 provided with conventional bristles 3 and the flexible structure 6, 6', 6" is inserted into a cutout 13 in the brush head 1. The brush head 1 is illustrated in various views without the carrier element 5 in FIGS. 10g and j and with the carrier element 5 inserted in FIGS. 10h and i. On its lateral border, the brush head 1 or the cutout 13 has lateral openings 25, which are adapted to the lateral flexible regions 6" previously molded on the carrier element 5.

The carrier element 5 is connected to the brush head 1 by means of ultrasonic welding. The welding surface 26 is indicated by dashed lines. In order to realize the welding, the carrier element has, on its bottom border, a welding border 26' which, during assembly, rests on the base of the cutout 13, the contact surface defining the welding surface 26. The welding border 26' melts under the influence of ultrasound, with the result that the two parts 5 and 1 are connected to one another.

Since elastomeric material can only be welded ultrasonically to a limited extent, the welding surface 26, as far as possible, is kept free of this material, for example as in the case of the toothbrush from FIG. 7 or, with only minimal

interruptions, as in the case of the toothbrush from FIG. 10. The aim, in both cases, is to seal the cavity 28 between the carrier element 5 and head part 1 to the full extent, in order to prevent the ingress of water and germs. For this purpose, the injection point of the flexible material is preferably selected to be on the bristle-carrying front side of the carrier element 5, in order that no unnecessary material bridges reduce the size of the welding surface 26. If further flexible elements 22" are provided on the head part 1, in particular on the rear side thereof, they are positioned such that they do not reduce the size of the welding surface 26. For example, these elements and the corresponding injection point are located fully within that region on the rear side of the head part 1 [(not illustrated)] which is defined by the welding surface 26. The entire contact surface between the head part 1 and carrier element 5 is preferably welded over at least 25%, particularly preferably along the periphery of the head (line 26).

In the example from FIG. 10, the flexible regions 6' interrupt the welding surface 26, with the result that non-welded locations 27 are produced there. These are advantageously arranged on the side of the head part 1, while the longitudinally front and rear regions of the carrier element 5 are firmly welded to the head part 1. This ensures that the carrier element 5 is held securely since the front and rear regions are subjected to an extremely high level of loading by the cleaning movement and corresponding leverages.

The non-welded locations 27 are sealed by the flexible regions 6" here in the manner of a sealing lip, with the result that only a very small amount of water, if any at all, can penetrate into the cavity 28. For a good sealing function, material with a Shore A hardness of 50 or less is preferably selected. Non-welded locations between the head part and carrier element may also be used specifically, in order to achieve a certain level of flexibility between the two hard components.

FIG. 11 shows various views of a further example of a toothbrush produced by AFT, in this case, with two sail-like flexible cleaning elements 6. The carrier element 5 is fully enclosed, around its periphery, by flexible material 6', which, in the assembled state (plan-view illustration FIG. 11a) fully encloses the outer periphery of the head part 1 on the top side and serves as impact protection. In regions 6", the soft material serves as a mount for lateral clusters of bristles 3 which are guided through the flexible material 6'.

As can be gathered from FIG. 11c, the hard components (carrier element 5 and head part 1) come into contact with one another along a surface 26 beneath the soft component in the region 6' and can be welded here by means of ultrasound. The welding surface 26 is interrupted by the lateral regions 6", although, as has been described above, a sufficient retaining action is achieved. The cavity 28 beneath the carrier element 5 is sealed by the flexible regions 6" and the locations welded along the surface 26.

The method of welding and sealing the components which has been described above with reference to FIGS. 10 and 11 may also advantageously be used for other toothbrushes.

The invention claimed is:

[1. A toothbrush head, comprising:

a bristle-carrying head part;

bristle filaments and a cutout provided through the head part, the cutout including a bottom opening that is of a larger cross-section than an intermediate section of the cutout; and

a flexible, non-bristle cleaning element arranged on a carrier element, the cleaning element being made of a first material and the carrier element being made of a second, harder material, the carrier element including a base and

a resiliently configured extension, the base having a cross-section larger than the intermediate section of the cutout, and the extension having an intermediate portion and a bottom with a cross-section that is larger than the intermediate portion of the extension and the intermediate section of the cutout, the bottom of the extension being resiliently inserted through the intermediate section of the cutout and into the bottom opening to prevent ready release of the carrier element from the head part by a snap-fit connection.]

[2. The toothbrush head according to claim 1, wherein the connection is sufficient to prevent detaching of the carrier element from the head part during use of the toothbrush.]

[3. The toothbrush head according to claim 1, wherein the connection is non-releasable.]

[4. The toothbrush head according to claim 1, wherein play between the carrier element and the head part at the cutout allows movement of the carrier element and the flexible cleaning element during use of the toothbrush.]

[5. The toothbrush head according to claim 1, wherein the flexible cleaning element is arranged to massage gums of the user.]

[6. The toothbrush head according to claim 1, wherein the flexible cleaning element is made from a thermoplastic elastomer.]

[7. The toothbrush head according to claim 1, wherein the flexible cleaning element includes rubber.]

[8. The toothbrush head according to claim 1, wherein the flexible cleaning element has a Shore A hardness of less than 90.]

[9. The toothbrush head according to claim 1, wherein the material of the carrier element is a polypropylene, styrene-acrylonitrile, acrylonitrile-butadiene-styrene, polyurethane or polyester.]

[10. The toothbrush head according to claim 1, wherein the flexible cleaning element and the carrier element are produced by two-component or multi-component injection molding and mated with a non-releasable connection.]

[11. The toothbrush head according to claim 1, wherein the flexible cleaning element is inclined out of the vertical to come into contact with at least one of the bristle filaments.]

[12. The toothbrush head according to claim 1, wherein the flexible cleaning element crosses over at least one of the bristle filaments.]

[13. The toothbrush head according to claim 1, wherein the flexible cleaning element has a rod-like shape.]

[14. The toothbrush head according to claim 1, wherein the carrier element is harder than the flexible cleaning element.]

[15. The toothbrush head according to claim 1, wherein the cutout extends entirely through the head part.]

[16. The toothbrush head according to claim 1, wherein the head part includes a plurality of cutouts and a plurality of flexible cleaning elements and carrier elements.]

[17. The toothbrush head according to claim 1, further comprising a handle connected to the head part.]

[18. A toothbrush head, comprising:

a bristle-carrying head part;

bristle filaments and a cutout provided on the head part;

a flexible, non-bristle cleaning element arranged on a carrier element, the carrier element being of a harder material than that of the flexible cleaning element, the carrier element including an extension that extends into the cutout and is connected to the head part by a not readily releasable snap-fit connection of the carrier element within the cutout; and

play between the carrier element and the head part at the cutout allows pivoting movement of the carrier element about an axis.]

[19. The toothbrush head according to claim 18, wherein the axis is substantially perpendicular to the longitudinal axis of the head part.]

[20. The toothbrush head according to claim 18, wherein the connection is sufficient to prevent detaching of the carrier element from the head part during use of the toothbrush.]

[21. The toothbrush head according to claim 18, wherein the flexible cleaning element is made from a thermoplastic elastomer.]

[22. The toothbrush head according to claim 18, wherein the flexible cleaning element includes rubber.]

[23. The toothbrush head according to claim 18, wherein the flexible cleaning element has a Shore A hardness of less than 90.]

[24. The toothbrush head according to claim 18, wherein the harder material of the carrier element is a polypropylene, styrene-acrylonitrile, acrylonitrile-butadiene-styrene, polyurethane or polyester.]

[25. The toothbrush head according to claim 18, wherein the flexible cleaning element is inclined out of the vertical to come into contact with at least one of the bristle filaments.]

[26. The toothbrush head according to claim 18, wherein the flexible cleaning element has a rod-like shape.]

[27. The toothbrush head according to claim 18, wherein the cutout is provided through the head part and includes an end opening that is of a larger cross-section than an intermediate section of the cutout.]

[28. The toothbrush head according to claim 18, further comprising a handle connected to the head part.]

[29. The toothbrush head according to claim 18, wherein the head is also formed from a material that is harder than the flexible, non-bristle containing cleaning element so that a hard material to hard material snap-fit connection is formed.]

[30. The toothbrush head according to claim 18, wherein the carrier extension is a snap-fitting element, and the snap-fitting element and the carrier form a single-piece body of the harder material.]

[31. The toothbrush head according to claim 18, wherein the not-readily releaseable snap-fit connection is formed by one of the extension and the head part resiliently deforming.]

[32. The toothbrush head according to claim 18, wherein the cleaning element is non-releasably attached to the carrier element through two component or multi-component injection molding.]

[33. The toothbrush head according to claim 18, wherein the head involves a plurality of cutouts and a plurality of snap-fit carrier elements.]

[34. A process for producing a toothbrush head comprising:

providing a head part with a cutout and with bristle filaments, the cutout having a bottom end opening that is of a larger cross-section than an intermediate section of the cutout;

providing a flexible, non-bristle cleaning element coupled to a carrier element, the cleaning element being made of first material and the carrier being made of a second, harder material;

providing the carrier element with a base having a cross-section larger than the intermediate section of the cutout and an extension having an intermediate portion and a resiliently configured bottom with a cross-section that is larger than the intermediate section of the extension and the intermediate section of the cutout;

inserting the bottom of the extension through the intermediate section of the cutout and into the bottom end opening; and

connecting the carrier element to the cutout of the head part in a not-readily releasable snap-fit connection.]

[35. The process as claimed in claim 34, wherein the connecting occurs after the toothbrush head is provided with the bristle filaments.]

[36. The process as claimed in claim 34, wherein the bristle filaments provided on the head part are processed prior to connecting the carrier element to the cutout of the head part.]

[37. The process as claimed in claim 34, wherein the processing includes at least one of rounding, cutting and machining processing operations.]

[38. The process as claimed in claim 34, wherein the flexible cleaning element and the carrier element are produced by two-component or multi-component injection molding.]

[39. The process as claimed in claim 34, further comprising:

providing the toothbrush head part with a handle.]

[40. The process according to claim 34, further comprising inserting the carrier element into the cutout from a bristle bearing front face of the head part.]

[41. A process for producing a toothbrush head of a toothbrush comprising:

providing a head part with a cutout and bristle filaments;

providing a non-bristle cleaning element of a first material coupled to a carrier element of a second, harder material, the carrier element being formed with an extension;

inserting the extension into the cutout;

connecting the carrier element to the cutout of the head part by a not readily releasable snap-fit connection of the carrier element within the cutout; and

providing play between the carrier element and the head part at the cutout that allows pivoting movement of the carrier element about axis.]

[42. The process as claimed in claim 41, wherein the connecting occurs after the toothbrush head is provided with the bristle filaments.]

[43. The process as claimed in claim 42, wherein the bristle filaments provided on the head part are processed prior to connecting the carrier element to the head part.]

[44. The process as claimed in claim 43, wherein the processing includes at least one of rounding, cutting and machining processing operations.]

[45. The process as claimed in claim 41, wherein the flexible cleaning element and the carrier element are produced by a two-component or multi-component injection molding.]

[46. The process as claimed in claim 45, wherein the flexible cleaning element is produced from a thermoplastic elastomer or rubber and the carrier element is produced from a polypropylene, styrene-acrylonitrile, acrylonitrile-butadiene-styrene, polyurethane or polyester.]

[47. The process as claimed in claim 45, wherein the material of the flexible, non-bristle containing cleaning element and the harder material of the carrier are chosen to be compatible with each other to produce a non-releasable connection in the two component or multi-component injection molding process.]

[48. The process according to claim 41, further comprising:

providing the toothbrush head part with a handle.]

[49. The process according to claim 41, further comprising inserting the carrier element into the cutout from a bristle bearing front face of the head part.]

50. *A toothbrush, comprising:*
a handle;

a head part;

a flexible structure made from a soft material;

a plate-like carrier element having a front side, a rear side and bristle receiving cutouts;

5 *the carrier element being of a harder material than that of the flexible structure and connected to the head part such that the rear side of the carrier element faces a front side of the head part; and*

bristle filaments guided through the bristle receiving cutouts, rear ends of the bristle filaments being melted, welded or adhesively bonded on the rear side of the carrier element;

wherein the flexible structure is provided on the head part and a corresponding injection point of the flexible structure is located on a rear side of the head part.

15 *51. The toothbrush as claimed in claim 50, wherein a contact surface defining a welding surface between the carrier element and the head part is kept free from the soft material of the flexible structure.*

52. The toothbrush as claimed in claim 51, wherein at least one flexible region interrupts the welding surface, with the result that non-welded locations are present.

20 *53. The toothbrush as claimed in claim 52, wherein the head part comprises at least one lateral opening having a shape adapted to the at least one flexible region arranged laterally on the carrier element.*

54. The toothbrush as claimed in claim 50, wherein at least one further flexible structure is attached to the plate-like carrier element.

25 *55. The toothbrush as claimed in claim 54, wherein bristle receiving cutouts are provided in the further flexible structure.*

56. The toothbrush as claimed in claim 50, wherein a play between the carrier element and the head part allows movement of the carrier element during use of the toothbrush.

57. The toothbrush as claimed in claim 50, wherein a non-releasable connection is provided between the carrier element and the head part.

30 *58. The toothbrush as claimed in claim 57, wherein the non-releasable connection is achieved by clamping, snap-fitting, riveting, adhesive bonding, welding, ultrasonic welding or the supply of heat.*

35 *59. The toothbrush as claimed in claim 50, wherein the carrier element consists of the same material as the head part.*

60. The toothbrush as claimed in claim 50, wherein the material of the carrier element is polypropylene, styrene-acrylonitrile, acrylonitrile-butadienestyrene, polyurethane or polyester.

40 *61. The toothbrush as claimed in claim 50, wherein an injection point of a flexible material is located on the carrier element within a region defined by a connecting border between the carrier element and the head part.*

62. The toothbrush as claimed in claim 61, wherein contacting locations between the head part and the carrier element are covered with the flexible material.

45 *63. The toothbrush as claimed in claim 61, wherein the flexible material includes natural or synthetic rubber.*

64. The toothbrush as claimed in claim 61, wherein the flexible material includes a thermoplastic elastomer.

65. The toothbrush as claimed in claim 61, wherein the flexible material has a Shore A hardness of less than 90.

50 *66. A process for producing a toothbrush with a handle, a head part and a flexible structure made from a soft material, comprising:*

providing a plate-like carrier element having a front side
 and a rear side and made from a harder material than
 that of the flexible structure;
 providing a plurality of bristle filaments and guiding them
 through bristle receiving cutouts in the carrier element; 5
 fastening rear ends of the bristles filaments on the rear side
 of the carrier element by melting, welding or adhesive
 bonding;
 connecting the carrier element to the head part in a non-
 releasable manner such that the rear side of the carrier 10
 element faces a front side of the head part; and
 injecting the soft material to an injection point on a rear
 side of the head part to provide the flexible structure on
 the head part.
 67. A process for producing a toothbrush with a handle, a 15
 head part and a flexible structure made from a soft material,
 comprising:
 providing a carrier element with at least one cleaning
 element and having a front side and a rear side and made
 from a harder material than that of the flexible structure; 20
 connecting the carrier element to the head part in a non-
 releasable manner such that the rear side of the carrier
 element faces a front side of the head part; and
 injecting the soft material to an injection point on a rear 25
 side of the head part to provide the flexible structure on
 the head part.

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