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(57)

ABSTRACT

A toothbrush head with having elongated projections made of an elastomer material, having an integral resiliently flexible elastomeric material wiper blade at the end remote from the head. Suitable constructions of projections and wiper blades are disclosed, and combinations with bristles. The wiper blades enhance oral hygiene.

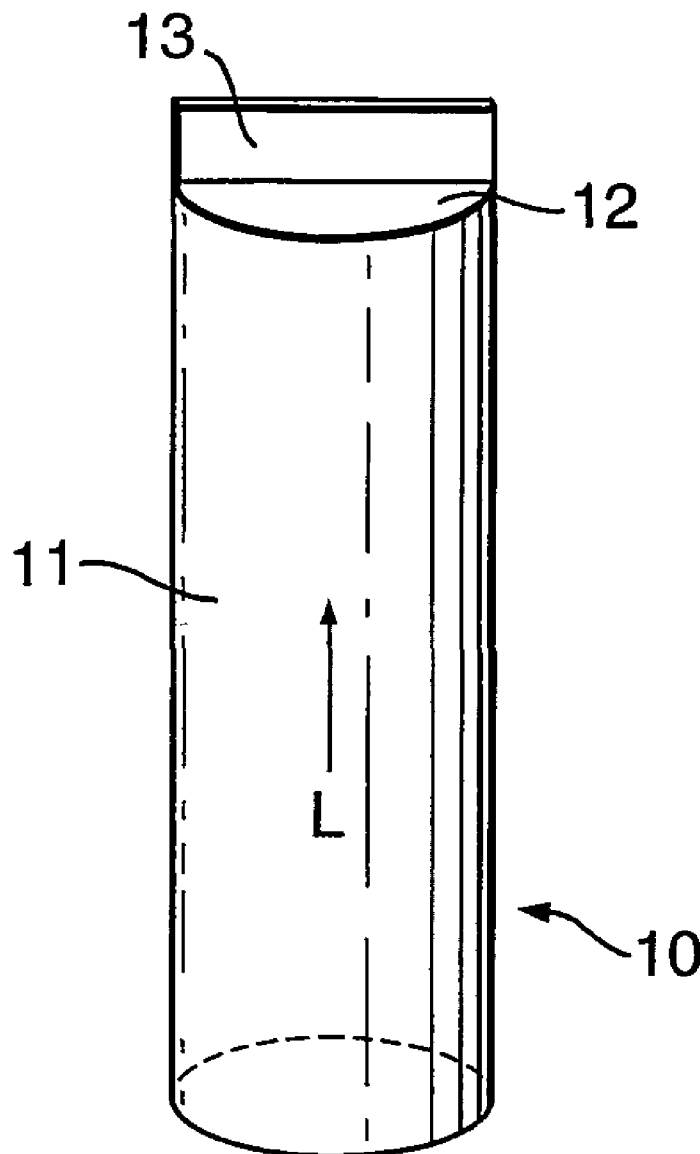
(21) Appl. No.: **10/381,571**(22) PCT Filed: **Sep. 25, 2001**(86) PCT No.: **PCT/EP01/11133**

Fig.1A.

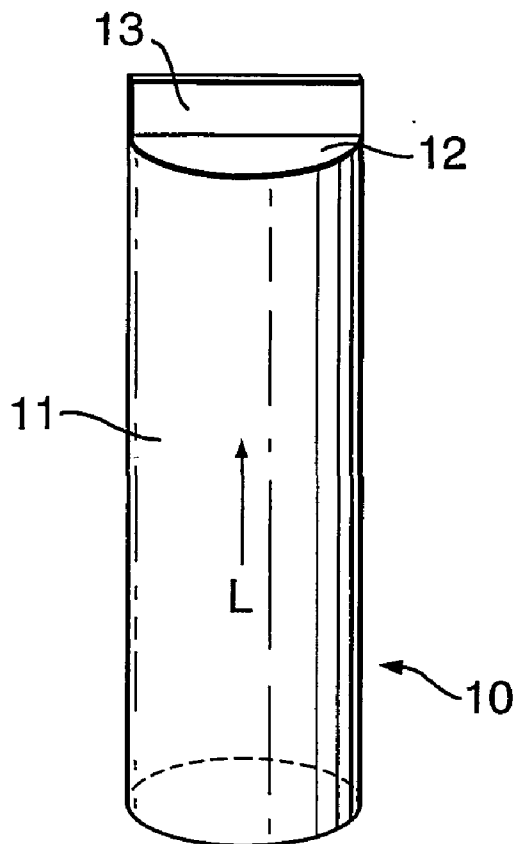


Fig.1B.

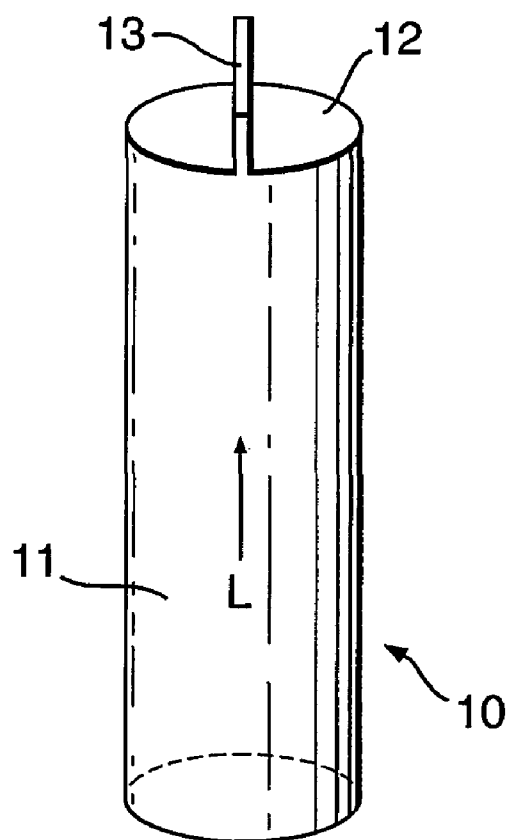


Fig.1C.

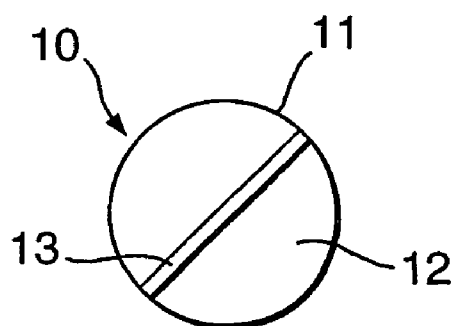


Fig.1D.

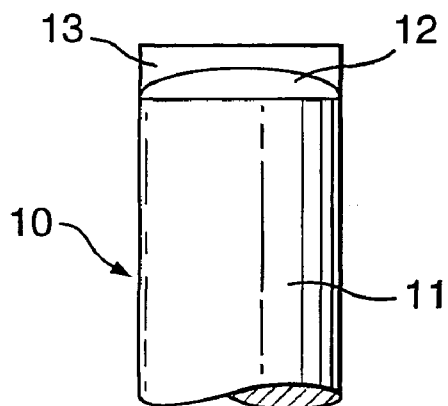


Fig.1E.

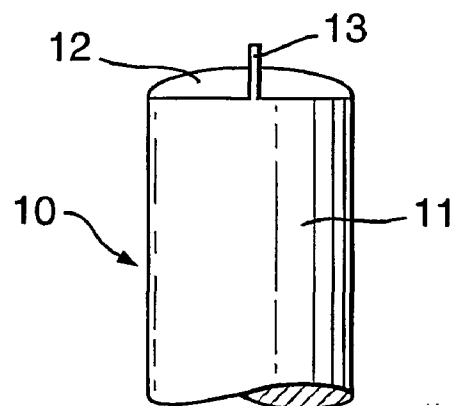


Fig.1F.

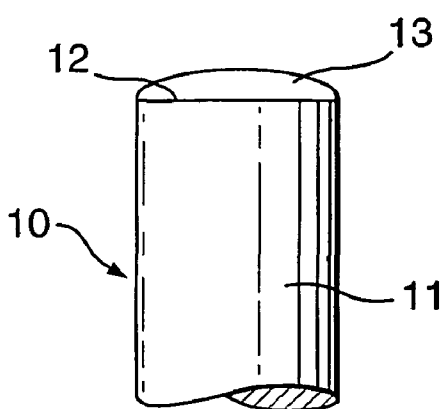


Fig.1G.

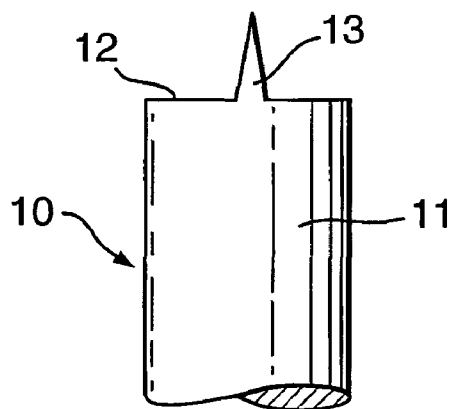


Fig.2A.

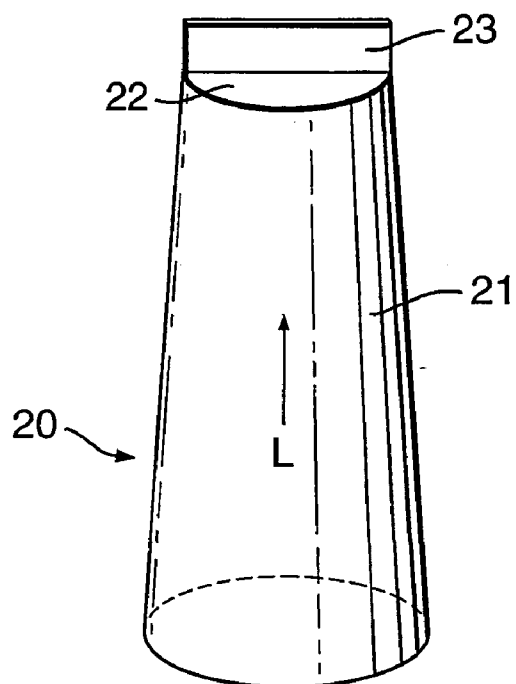


Fig.2B.

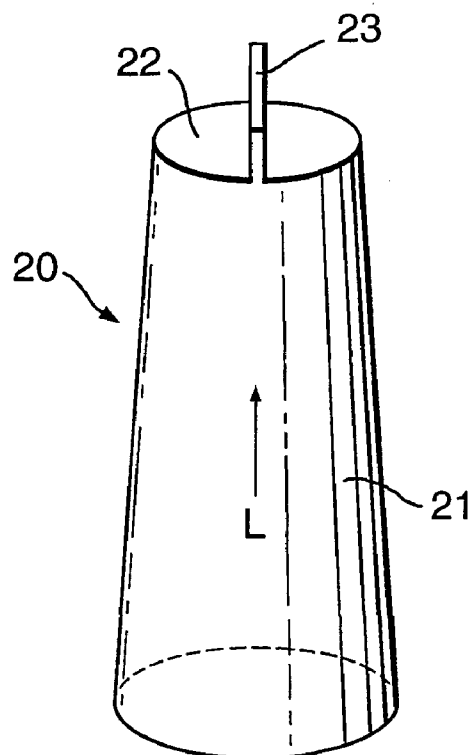
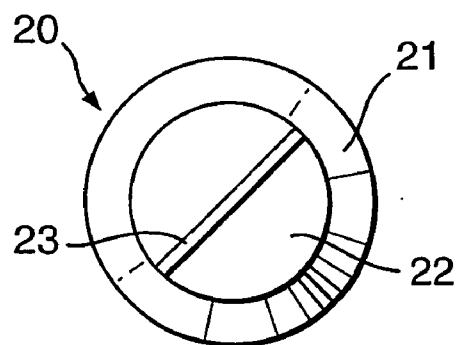
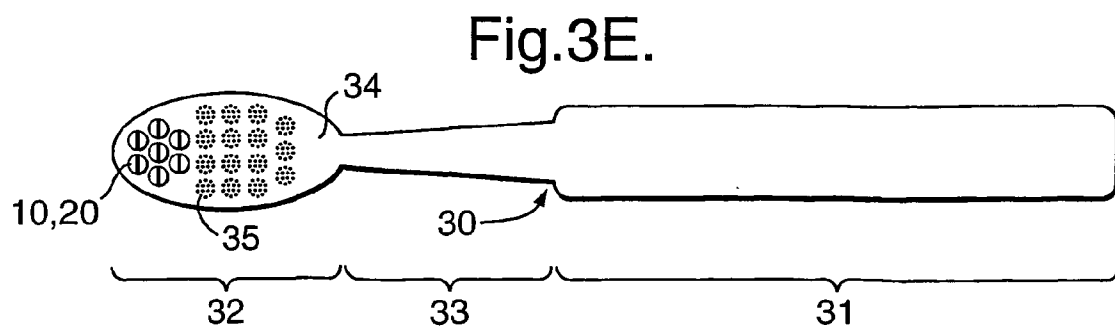
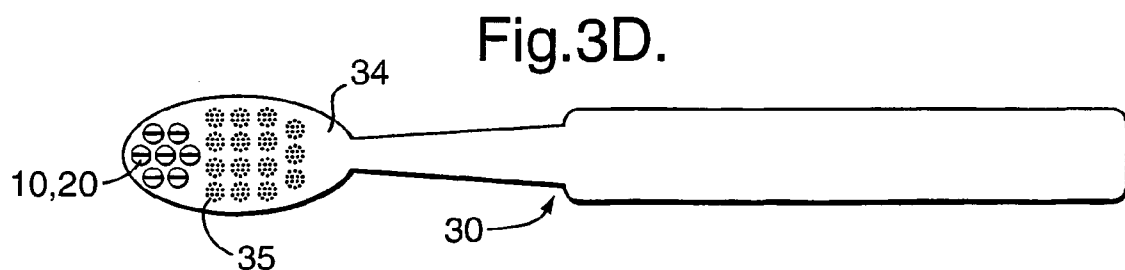
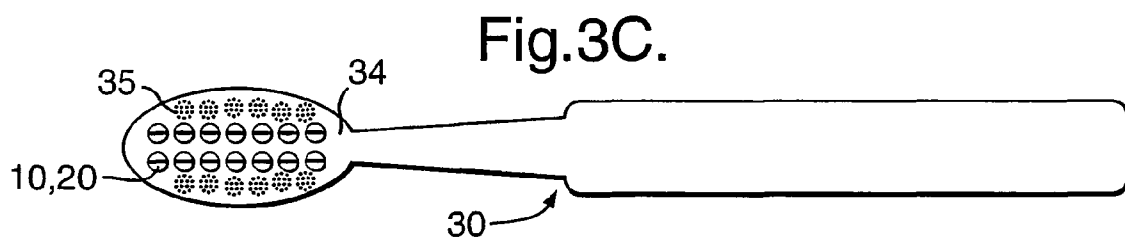
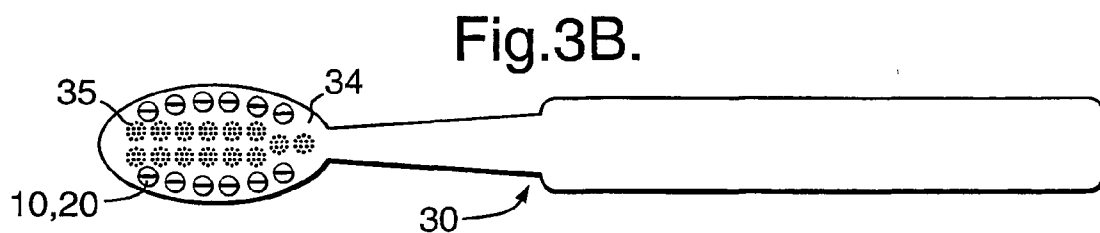
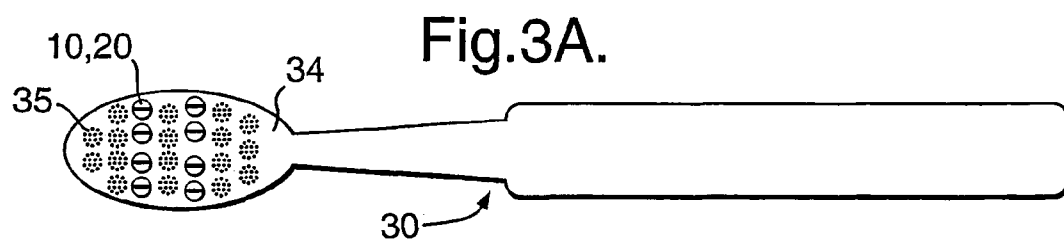
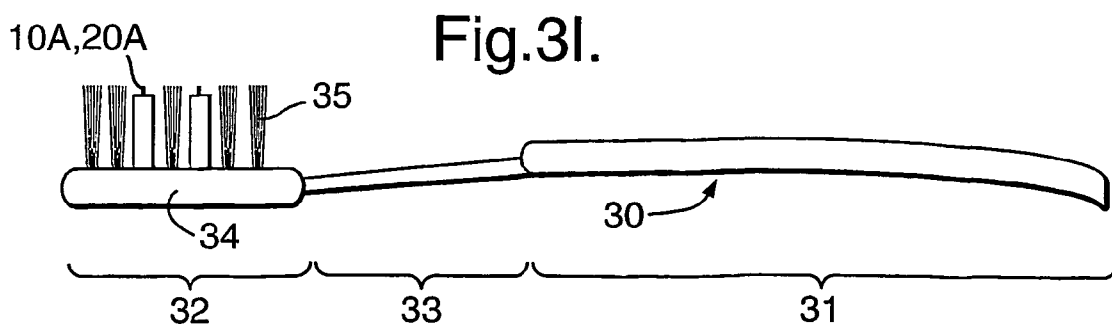
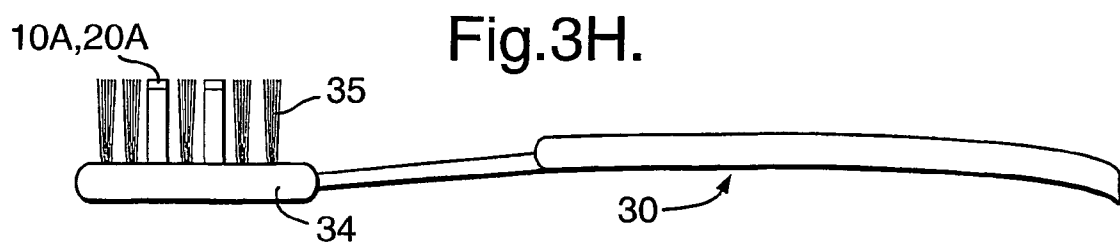
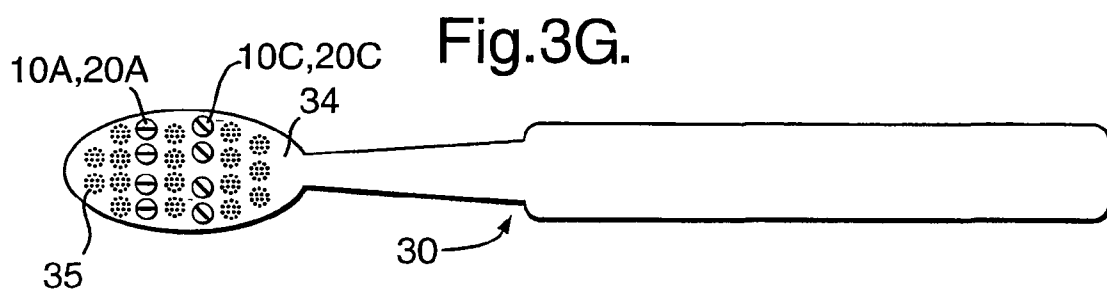
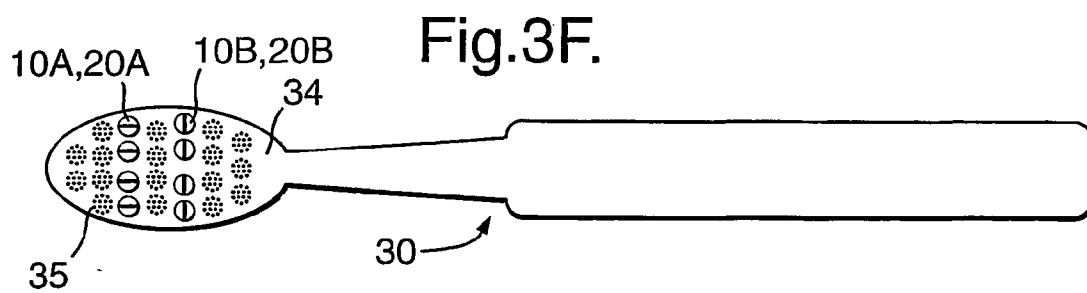


Fig.2C.







TOOTHBRUSH

[0001] This invention relates to toothbrush heads and to toothbrushes incorporating such a head.

[0002] Toothbrushes generally comprise a head and a handle, the head being either an integral part with the handle e.g. integrally moulded of plastic material together with the handle, or replaceably mountable at an end of the handle. Normally the toothbrush head has a face (the “bristle face”) on which are mounted bristle filaments, generally made of a relatively stiff fibre material e.g. the commonly used material Nylon, and generally projecting perpendicularly, or at a near-perpendicular angle from the bristle face. An example of such fibres are those sold under the trademark Tynex™ by Dupont.

[0003] Toothbrushes are known in which the ends of the bristles are profiled, for example into a point as disclosed in EP-A-0 596 633 into the shape of a flattened blade, e.g. as disclosed in U.S. Pat. No. 4,167,794.

[0004] Toothbrushes are known which in addition to or as an alternative to such bristle filaments have massage parts mounted on their head. Such massage parts are generally provided for massaging and stimulating the gums, and can also serve other functions such as cleaning and/or polishing the teeth. Often such massage parts are made of an elastomer, i.e. rubbery material and are elongate structures and generally project perpendicularly, or at a near-perpendicular angle from the bristle face, e.g. generally in the direction of the bristles when present. For example U.S. Pat. No. 4,277, 862 and DE 29512817 U1 disclose massage parts in the form of strips flanking the sides of the toothbrush head. WO-A-97/16995 discloses massage parts in the form of fine elastomeric filaments arranged on the face of the toothbrush head. EP-A-0 360 766A discloses massage parts in the form of cylinders having rounded knobs at their ends. GB-A-2 035 076 discloses massage parts in the form of cones having fine “horns” at their ends. U.S. Pat. No. 5,040,210 discloses massage parts in the form of cones or obliquely cut cylinders. WO-A-00/49911 discloses massage parts in the form of pyramids. WO-A-98/03097 discloses massage parts in the form of elastomeric strips with their width oriented across the head. In all of these disclosures the massage parts are made of soft rubbery material and their function is to gently clean the tooth surfaces and/or to apply a gentle massage to the user’s gums.

[0005] It is an object of this invention to provide a toothbrush having an improved gum massage and stimulation and tooth cleaning effect.

[0006] According to this invention a toothbrush head is provided, having a face from which projects at least one projection being elongated in a length direction generally perpendicular to the face and being made of an elastomer material, the projection characterised by;

[0007] having at its end remote from the head an integral resiliently flexible wiper blade of elastomer material, the wiper blade extending in a length direction generally parallel to the length direction of the projection, the wiper blade having a width direction generally perpendicular to the length direction of the projection and extending in its width direction across at least 50% of the cross section of the projection and having a thickness dimension in a thickness

direction perpendicular to its width direction which is 50% or less of its width dimension.

[0008] In a preferred embodiment the projection comprises an elongated cylindrical or frusto-conical body extending in a length direction from the face of the toothbrush head in a direction generally perpendicular to the face and terminating in an end surface remote from the face, the end surface being substantially planar or shallow convex, and the wiper blade is integrally formed with the body and extends in the length direction of the body from the said end surface.

[0009] The terms “cylindrical” and “conical” used herein include true cylinders and cones, i.e. having circular cross sections and straight sides (tapering in the case of a cone). These terms also include distorted cylindrical and distorted cone shapes, for example having distorted circular, e.g. oval cross sections, or polygonal cross sections, e.g. prism or pyramid shapes, for example with rounded corners. The terms also include shapes with other than longitudinally straight sides, e.g. concave or convex curved sides are also included. The long axis of the cylinder, or the base-apex direction of the cone is the longitudinal direction of the projection as referred to above. If the body is frusto-conical its narrow end is remote from the face.

[0010] Typical shallow convex shapes for the end surface include for example shallow cone shaped, shallow pyramidal shaped, shallow gable shaped, shallow polyhedral shaped or shallow domed.

[0011] A typical length for such a body is ca. 0.8-1.2 cm, i.e. approximating to the typical length of toothbrush bristles. A typical cross section is ca. 0.5-4 mm, such as 2-4 mm, preferably 3-4 mm. A frusto-conical body shape is preferred because such a shape facilitates removal of the projection from an injection mould if the projection is made by injection moulding e.g. of a thermoplastic elastomer (“TPE”). When the body is frusto conical in shape the conical slope of the taper is suitably up to 20°, preferably 10° or less.

[0012] Suitably the end surface of the body remote from the face is planar, e.g. perpendicular to the length direction of the body. If the remote surface is shallow convex then preferably its convex projection is at most 50% of the cross section of the end of the body remote from the face, preferably 25% or less, more preferably 10% or less.

[0013] The wiper blade is suitably a generally planar blade, with an edge remote from the face, although its thickness direction may deviate from planarity, e.g. by $\pm 10\%$, e.g. the thickness dimension may bulge or the blade may be curved in section as cut across its length direction. Suitably the greatest dimension (“width”) of the wiper blade extends across, preferably entirely across, the end surface of the body, i.e. perpendicular to the length direction of the body, preferably intersecting the central longitudinal axis of the body. Suitably the wiper blade has a width dimension parallel to the length direction of the projection which is less than the length direction of the wiper blade parallel to the length direction of the body, and its least dimension being its thickness perpendicular to its length and width. A suitable width: length ratio is in the range 1:3 to 1:20, preferably 1:3 to 1:10. A suitable thickness:width ratio is in the range 0.5 to 0.1, preferably 0.25-0.1.

[0014] Typically in shape as viewed in side view perpendicular to the length direction of the body and along the thickness direction of the wiper blade, the wiper blade may be generally rectangular. The cross section of the wiper cut across its thickness direction may be generally parallel sided, so that the wiper may be of a generally tetragonal shape. Alternative shapes, e.g. an arc such as a chord of a circle as viewed in side view perpendicular to the length direction of the body and along the thickness direction of the blade, may also be used. Also, the cross section of the wiper cut across its thickness direction may taper, e.g. being of a wedge shape narrowing away from the face of the toothbrush.

[0015] The projections may be made of known TPE materials which are known for use for the massage projections of known toothbrushes e.g. as discussed above. Suitable materials are soft elastomeric materials, e.g. having a hardness of less than 90 Shore A. Preferably the elastomeric material has a hardness from about 10 to about 90 Shore A, more preferably 50 Shore A or less, e.g. from about 14 to about 35 Shore A. Suitable materials are for example natural rubber, crosslinked polybutadiene, etc., an example of such a material being Santoprene™. Suitable elastomeric materials include those available under the trade names Megol and Santoprene, and silicone elastomeric materials may also be used. Other suitable elastomeric materials are disclosed in the state of the art referred to above.

[0016] The projections may be made by injection moulding. The projections may be made individually or may be made in groups, e.g. linked by an integrally moulded linker of the elastomeric material.

[0017] It is known to make two-component toothbrushes in which a plastic material "skeleton" is made first and then this skeleton is enclosed in a second injection mould cavity in which elastomer parts are then made in a second injection moulding step so that the elastomer and plastic materials bond. The elastomer projections of this invention may be made via such a two stage process.

[0018] For example a plastic material skeleton comprising at least the part to become the head of the completed toothbrush may first be made, having locations where one or more projection as described above is to be located in the completed toothbrush. This skeleton may have then be enclosed in a second injection mould cavity having cavity parts defining the shape of the one or more projection to be formed, and then fluid elastomeric material may be injected into the second injection mould, so that the one or more projection is formed as the elastomer sets solid. The conditions of pressure and temperature within the second mould may be such that the elastomer material bonds to the plastic material.

[0019] The one or more projection(s) of this invention may be positioned at any location on the toothbrush head. For example one or more projection may for example be arranged along one or more of the sides of the toothbrush head, at the end of the head remote from the handle, or a plurality of the projections may be arranged randomly, in rows oriented across the width of the head (i.e. perpendicular to the head-handle "length" axis) in lines oriented along the length of the head (i.e. parallel to the head-handle axis) in clusters, or otherwise. Such clusters may for example comprise arrays, e.g. rectangular arrays, or polygonal clus-

ters, and may be located at any place on the head, for example a cluster at the tip end of the head remote from the handle.

[0020] The wiper blade may be oriented in any orientation relative to the length and width direction of the toothbrush head. For example the projection(s) may be arranged with their width direction oriented generally parallel to the length direction of the head, or generally perpendicular to the length direction of the head, or at an angle between 0° and 90°, e.g. 45° to the length direction of the head. Two or more of the projections may have their wiper blades oriented differently, for example at 90° to each other.

[0021] The projections may be combined with bristles of a generally conventional nature. For example the toothbrush may have the above-described projections arranged around the edges of the head, with bristles extending from the face of the head, i.e. from the central area of the face between the projections. Alternatively the toothbrush may have the above-mentioned rows, lines and/or clusters of projections combined with rows, lines or clusters of tufts of bristles. For example rows or lines or groups of rows or lines of the said projections may alternate respectively with rows or lines, or groups of rows or lines of tufts of bristles. In such a combination the one or more projection may be substantially the same length as the conventional bristles, or alternatively the one or more projection may be longer or shorter than the conventional bristles.

[0022] The projections of the invention may also be combined with elastomer massage parts of other shapes, e.g. as conventionally known in the art.

[0023] The invention will now be described by way of example only with reference to the accompanying drawings.

[0024] FIG. 1 shows part of a projection of the invention having a generally cylindrical body.

[0025] FIG. 2 shows part of a projection of the invention having a generally frusto-conical body.

[0026] FIG. 3 shows toothbrushes having the projections of this invention.

[0027] Referring to FIG. 1 a projection is shown generally 10. FIGS. 1A and 1B are perspective views at right angles to each other, and FIG. 1C is a downwards view in the opposite direction to arrow designating the length direction "L" in FIG. 1A. The projection 10 is elongated in the length direction "L" generally perpendicular to the face (not shown in FIG. 1) of a toothbrush (not shown in FIG. 1). FIGS. 1D, 1E and 1F show side views perpendicular to the length direction "L" of alternate constructions of the part of the projection 10 remote from the face of the toothbrush. The projection 10 is made of an elastomer material such as Santoprene™.

[0028] The projection 10 comprises an elongated cylindrical body 11 extending in the length direction L and terminates in an end surface 12 remote from the face. The end surface 12 as shown in FIG. 1A is substantially planar.

[0029] The length of the body i.e. the dimension from the face of the toothbrush head (not shown) to the surface 12 is ca. 0.8-1.2 cm, and its cross section, i.e. the diameter of its circular section, is ca 2-4 mm, preferably 3-4 mm.

[0030] A wiper blade 13 is integrally formed with the body 11 and extends in the length direction "L" of the body from the said remote surface 12. The wiper blade as shown in **FIGS. 1A and 1B** is a generally planar blade having its greatest dimension ("width") extending entirely across the remote surface 12 of the body 11 perpendicular to the length direction of the body 11 and intersecting the central longitudinal axis in the length direction "L" of the body 11. The view in **FIG. 1A** is generally looking in the thickness direction of the wiper 13, the view in **FIG. 1B** is in the width direction of the wiper 13, and the view in **FIG. 1C** is looking in the length direction of the wiper 13. Therefore as viewed in side view perpendicular to the length direction of the body 11 and along the thickness direction of the blade 13, the wiper blade 13 is generally rectangular.

[0031] Referring to **FIGS. 1D and 1E** an alternative construction is shown in which the remote surface 12 of the body 11 is a shallow convex shape, i.e. shallow domed, bulging in the length direction "L" of the body 11. The wiper blade 13 is of a generally rectangular shape similar to that as shown in **FIGS. 1A, 1B and 1C**. The view in **FIG. 1D** is a side view perpendicular to the length direction "L" of the body 11 and perpendicular to the width direction of the blade 13, and along the thickness direction of the blade 13. The view in **FIG. 1E** is a side view perpendicular to the length direction "L" of the body 11 and perpendicular to the thickness direction of the blade 13, and along the width direction of the blade 13.

[0032] Referring to **FIG. 1F** an alternative construction is shown in which the remote surface of the body 11 is planar, and the wiper 13 is in the shape of an arc being a chord of a circle. The view in **FIG. 1F** is a side view perpendicular to the length direction "L" of the body 11 and along the thickness direction of the blade 13.

[0033] Referring to **FIG. 2** a projection is shown generally 20. **FIGS. 2A and 2B** are perspective views at right angles to each other, and **FIG. 2C** is a downwards view in the opposite direction to arrow designating the length direction "L" in **FIG. 2A**. The projection 10 has a body 21 which is frusto-conical in shape elongated in the length direction "L", with its narrow end remote from the face (not shown in **FIG. 2**) of a toothbrush (not shown in **FIG. 2**), the length direction "L" again being generally perpendicular to the face (not shown) of the toothbrush. The projection 20 is made of an elastomer material such as Santoprene™.

[0034] The projection 20 terminates in a surface 22 remote from the face, being the narrow end of the frusto-conical shape. The remote surface 22 as shown in **FIG. 2A** is substantially planar.

[0035] The length of the body 21 i.e. the dimension from the face of the toothbrush head (not shown) to the surface 22 is ca. 0.8-1.2 cm, and its cross section, i.e. the diameter of its circular section at its base end longitudinally opposite the surface 22, is ca 2-4 mm, preferably 3-4 mm.

[0036] A wiper blade 23 is integrally formed with the body 21 and extends in the length direction "L" of the body from the said remote surface 22. The wiper blade as shown in **FIGS. 2A and 2B** is again a generally planar blade having its greatest dimension ("width") extending entirely across the remote surface 22 of the body 21 perpendicular to the length direction "L" of the body 21 and intersecting the

central longitudinal axis in the length direction "L" of the body 21. The view in **FIG. 2A** is generally looking in the thickness direction of the wiper 23, the view in **FIG. 2B** is in the width direction of the wiper 23, and the view in **FIG. 2C** is looking in the length direction of the wiper 23, i.e. in the apex-base direction of the cone shape toward the base of the cone shape. Therefore in shape as viewed in side view perpendicular to the length direction "L" of the body 23 and along the thickness direction of the blade 23, the wiper blade 23 is generally rectangular.

[0037] In **FIGS. 1B, 1E and 2B** it is seen that the cross section of the wiper 13, 23 cut across its thickness direction is generally parallel sided, so that the wiper 13 of **FIGS. 1A to 1C** is generally tetragonal in shape. In **FIG. 1G** the cross section of the wiper 13 cut across its thickness direction tapers, so that the wiper 13 is generally wedge shaped.

[0038] Referring to **FIG. 3**, **FIGS. 3A to 3I** show toothbrushes 30 generally, having projections 10, 20 of the invention. Each toothbrush 30 comprises a handle 31 and a head 32, moulded integrally with the handle 31, with a neck region 33 in between. **FIGS. 3A to 3G** are plan views looking along the length direction "L" of the projections 10, 20. **FIGS. 3H and 3I** are side views looking generally perpendicular to the length direction "L" and to the longitudinal head-handle direction of the toothbrush.

[0039] Each head has a face 34 from which projects at least one projection 10, 20 as described above. In each of the heads 32 shown, tufts 35 of conventional toothbrush bristles, e.g. known Tynex™ filaments project in a direction generally perpendicular to the face 34.

[0040] As shown in **FIG. 3A**, projections 10, 20 are arranged in rows perpendicular to the longitudinal head-handle axis of the toothbrush 30. A row of tufts of bristles 35 is located between a pair of rows of the projections 10, 20, so that rows of projections 10, 20 and tufts 35 alternate longitudinally.

[0041] As shown in **FIG. 3B**, projections 10, 20 are arranged along the side edges of the head 32, with tufts 35 between the projections 10, 20 in the middle part of the face 34.

[0042] As shown in **FIG. 3C**, tufts 35 are arranged along the side edges of the head 32, with projections 10, 20 between the tufts 35 in the middle part of the face 34.

[0043] As shown in **FIG. 3D**, projections 10, 20 are arranged in a polygonal cluster 36, i.e. a hexagon of six projections surrounding a central projection, at the end of the head 32 remote from the handle 21. Between the cluster 36 and the handle 31 are rows of tufts of bristles 35.

[0044] In the toothbrushes 30 shown in **FIGS. 3A to 3D** the wiper blade 13, 23 of the projections 10, 20 are arranged with their width direction parallel to the longitudinal head-handle direction of the toothbrush 30. In **FIG. 3E** an arrangement of projections 10, 20 and tufts 35 similar to that of **FIG. 3D** is shown, with the difference that the wiper blade 13, 23 of each projection 10, 20 is oriented with its width direction perpendicular to the longitudinal head-handle direction of the toothbrush 30.

[0045] In the toothbrushes 30 shown in **FIGS. 3F and 3G** the arrangement of projections 10, 20 and tufts 35 is similar in plan to that shown in **FIG. 3A**. In **FIG. 3F** the wiper blade

13, 23 of the projections **10A, 20A** are arranged with their width direction parallel to the longitudinal head-handle direction of the toothbrush **30**, but the projections **10B, 20B** are arranged with their width direction perpendicular to the longitudinal head-handle direction of the toothbrush **30**. In **FIG. 3G** the wiper blade **13, 23** of the projections **10A, 20A** are arranged with their width direction parallel to the longitudinal head-handle direction of the toothbrush **30**, but the projections **10C, 20C** are arranged with their width direction at an angle of 45° to the longitudinal head-handle direction of the toothbrush **30**.

[0046] **FIGS. 3H and 3I** show side views of toothbrushes according to this invention, the arrangement of projections **10, 20** and tufts **35** being similar to that shown in plan in **FIG. 3A**. In **FIG. 3H** the wiper blades **13, 23** of the projections **10A, 20A** are arranged with their width direction parallel to the longitudinal head-handle direction of the toothbrush **30**. In **FIG. 3I** the wiper blades **13, 23** of the projections **10A, 20A** are arranged with their width direction perpendicular to the longitudinal head-handle direction of the toothbrush **30**. In **FIGS. 3H and 3I** the alignment of the projections **10, 20** generally perpendicular to the face **34** is seen, and the length of the projections **10, 20** being substantially the same as the bristles **35** is also seen.

[0047] In use the toothbrush **30** of the invention is used with a conventional toothbrushing technique, e.g. the known Bass technique. The wiper blades **13, 23** are flexible relative to the body **11, 21** and can assist in the removal of dirt etc from tooth surfaces.

1-20. (canceled)

21. A toothbrush head, having a face from which projects at least one projection elongated in a length direction generally perpendicular to the face and made of an elastomer material, the projection characterized by;

having an integral resiliently flexible wiper blade of elastomer material at its end remote from the head, the wiper blade extending in a length direction generally parallel to the length direction of the projection, the wiper blade having a width direction generally perpendicular to the length direction of the projection and extending in its width direction across at least 50% of the cross section of the projection and having a thickness dimension in a thickness direction perpendicular to its width direction which is 50% or less of its width dimension.

22. A toothbrush head according to claim 21 characterized in that the projection comprises an elongated cylindrical or frusto-conical body extending in a length direction from the face of the toothbrush head in a direction generally perpendicular to the face and terminating in an end surface remote from the face, the end surface being substantially planar or shallow convex, and the wiper blade is integrally formed with the body and extends in the length direction of the body from the said end surface.

23. A toothbrush head according to claim 21 characterized by an end surface of shallow cone shaped, shallow pyramidal shaped, shallow gable shaped, shallow polyhedral shaped or shallow domed.

24. A toothbrush head according to claim 21, characterized by a body of length ca. 0.8-1.2 cm, and a cross section of 0.5-4 mm.

25. A toothbrush head according to claim 21 characterized by a wiper blade of a generally planar blade, with an edge remote from the face, a length dimension being the greatest dimension of the wiper blade and extending across the end surface of the body perpendicular to the length direction of the body, and having a width dimension parallel to the length direction of the projection which is less than the length dimension, and a least dimension being the thickness perpendicular to its length and width.

26. A toothbrush head according to claim 25 having a width: length ratio in the range 1:3 to 1:20 and a thickness:width ratio in the range 0.5 to 0.1.

27. A toothbrush head according to claim 21 characterized by a shape as viewed in side view perpendicular to the length direction of the body and along the thickness direction of the wiper blade which is generally rectangular.

28. A toothbrush head according to claim 21 made of a thermoplastic elastomer material having a hardness of 10 to about 90 Shore A.

29. A toothbrush head according to claim 21, characterized by one or more projection arranged along one or more of the sides of the toothbrush head.

30. A toothbrush head according to claim 21, characterized by one or more projection arranged at the end of the head remote from the handle.

31. A toothbrush head according to claim 21, characterized by projections arranged in rows oriented across the width of the head.

32. A toothbrush head according to claim 21, characterized by projections arranged in lines oriented along the length of the head.

33. A toothbrush head according to claim 21, characterized by projections arranged in polygonal clusters.

34. A toothbrush head according to claim 21, characterized by projections arranged with width direction of their wiper blade oriented generally parallel to the length direction of the head.

35. A toothbrush head according to claim 21, characterized by projections arranged with the width direction of their wiper blade oriented generally perpendicular to the length direction of the head.

36. A toothbrush head according to claim 21, characterized by projections arranged with the width direction of their wiper blade oriented at an angle between 0° and 90° to the length direction of the head.

37. A toothbrush head according to claim 21, characterized by two or more of the projections with their wiper blades oriented differently to each other.

38. A toothbrush head according to claim 21 characterized by projections combined with bristles.

39. A toothbrush head according to claim 38 characterized by projections arranged around the edges of the head, with bristles extending from the central area of the face between the projections.

40. A toothbrush head according to claim 38 characterized by rows, lines and/or clusters of projections combined with rows, lines or clusters of tufts of bristles.

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