ORGANISATION AFRICAINE DE LA PROPRIETE INTELLECTUELLE (O.A.P.I.)

(19) (11) N° 11233 (51) Inter. Cl.[7] A46B 1/00 A46D 1/00

(12) BREVET D'INVENTION

(21) Numéro de dépôt: 9900278

(22) Date de dépôt: 10.12.1999

(30) Priorité(s): USA
16.06.1997 N° 60/049721
05.02.1998 N° 09/018987

(24) Délivré le: 12.06.2000

(45) Publié le: 20 NOV 2002

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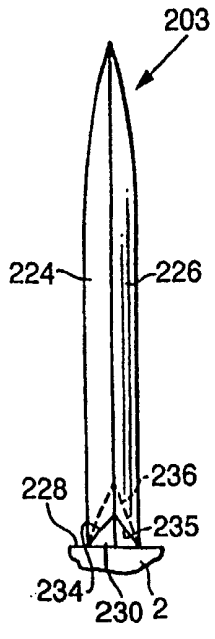
(54) Titre: Unitarily molded toothbrush.

(57) Abrégé:

A unitarily moulded toothbrush is provided including a head with bristles integrally moulded therewith, the bristles being integrally anchored to a top surface of the head and having a polygonal cross section defined by at least three faces, at least one of the faces gradually transitioning outward as a slope in an area near the head top surface to minimise breakage and deformation. Preferably the bristles have a triangular cross section with slopes of two of the faces being different from one another.



UNITARILY MOLDED TOOTHBRUSH

BACKGROUND OF THE INVENTION

Field of the Invention

The invention concerns a unitarily molded toothbrush manufacturable at low cost providing benefits both over known unitarily molded and non-unitarily manufactured traditional toothbrushes.

The Related Art

Millions of individuals around the world are too poor to afford a toothbrush. Even within industrialized countries, there exists a significant population for which this purchase is financially difficult.

No frills relatively low cost products are sold which resemble the expensive ones but without great detail in bristle configuration, handle aesthetics and mouthfeel of bristle tufts within the oral cavity. The bristles are neither sculpted into a shape complementary to the teeth nor the handle given any ergonomic feature. Yet virtually all commercial brushes whether low or high priced are produced by separately adding bristles to a head area anterior to the handle. Invariably the bristles are of a different material (e.g. nylon) than the material forming the head or handle. Two-piece construction greatly increases manufacturing costs. Special machinery is necessary to implant bristles into the head area. Unit production is thereby also relatively slow.

In a review of the art, it was found that certain airlines provide their first class passengers with pocket sized disposable toothbrushes. VARIG, the Brazilian airline, distributes on board a toothbrush described in U.S. Patent 4,408,920 (Walther et al.).

Bristles and part of the handle reportedly are injection molded together. Materials of construction are enumerated in the patent as being polyethylene, nylon, polyester or polypropylene, with the latter being preferred. Disposable travel brushes represent significant advances in providing low cost hygiene utensils to the general public at an affordable price. Nonetheless, further technical advances are necessary to improve the functional and ergonomic aspects of these products.

An even lower cost low density polyethylene toothbrush is reported in Brazilian Patent 6700603 developed by the University of Sao Paulo, and widely distributed in that country among school age children. Although inexpensively manufacturable, the bristles have a relatively short lifetime, especially when continuously used in a highly vigorous manner against teeth. Deformation and breakage of individual bristles is a significant problem.

A somewhat more sophisticated approach is reported in U.S. Patent 3,302,230 (Poppelmann) which describes a unitarily molded toothbrush fashioned from polyethylene of Melt Index ranging between 1.5 to 5 g/10 min. Improved massage of the gums and better retention of dentifrice is achieved through use of bristles with special polygonal cross-sections. Unfortunately, this patent, like the others does not address the issue of bristle breakage and deformation. Handle ergonomics are also sub-optimal.

Accordingly, it is an object of the present invention to provide a relatively low cost toothbrush manufacturable in a single step and of a unitary construction.

Another object of the present invention is to provide a relatively low cost toothbrush with bristles less prone to breakage or deformation.

Yet another object of the present invention is to provide a relatively low cost toothbrush with bristles that are gentle to the gum yet effective in reaching food debris even in difficultly accessible crevices between teeth.

Still another object of the present invention is to provide a relatively low cost toothbrush with a sufficiently flexible neck to allow bending of the bristle head relative to the handle thereby being ergonomically adjustable to a user's hand pressure.

These and other objects of the present invention will become more readily evident through the following summary and detailed discussion.

SUMMARY OF THE INVENTION

A unitarily molded toothbrush is provided including:

a head with bristles integrally formed with the head, the bristles being anchored to a top surface of the head and each having a polygonal cross-section defined by at least three faces, at least one of the faces gradually transitioning outward as a slope in an area near the head top surface to minimize breakage and deformation;

a neck with first and second ends, the first end connected to the head; and

a handle with front and rear ends, the front end connected to the second end of the neck, wherein the head, neck and handle are all formed of an identical plastic material.

Among different polygonal cross-sections, the most preferred is a triangular one.

Most effective for the present invention is the use of a polyolefin as the plastic material. Preferably the polyolefin is a low density polyethylene. This polymer is optimal because of its ready moldability, provision of a relatively rigid handle and yet

allowing bristles to be sufficiently flexible to minimize any harsh interaction with the gums.

While having one of the faces provided with a slope at its base minimizes breakage and deformation, it is advantageous to have at least two of the faces gradually transitioning outward in a slope. The slope may be gently curving. However, it is particularly effective that the slopes be straight.

A further refinement of the present invention is to have two of the bristle faces with slopes which are different from one another. Generally the slopes may be set at angles between 5 and 70°. When two of the faces have different slopes from one another, a first of these slopes may have a set of angles between 5 and 50° while the second of these slopes may have a set of angles between 55 and 80°. Most preferred is where the first slope is between 30 and 50° while the second slope is between 55 and 65°. Differences between first and second slopes may advantageously range from 5 to 40°.

Least breakage of bristles occurs where attachment to the head surface along one bristle face is sloped at approximately 45° and along another bristle face is sloped at approximately 60°. Although not wishing to be bound by any theory, it is believed that during injection a non-angled base or one having identical slope angles for a particular bristle will result in a cold flow. In other words, injected resin will become chilled before it traverses the relatively thin mold channel to reach deeper into an area forming the bristle point. Cold flow is considerably minimized by having differently angled slopes along an entrance of a bristle mold channel.

Tips of the bristles may either be pointed or rounded. Gentleness against gums and teeth is improved by rounding the top ends of the individual bristles.

Conventional molding and plastic injection equipment may be utilized for manufacture of toothbrushes according to the present invention. Formation of the

bristles occurs within a die mold plate wherein cavities are provided with the bristle design outline. The cavities will include angled or radiused mold sections near areas where the bristle design attaches to a surface of the head.

Advantageously the cavities may be honed, especially vapor honed. Not only is mold release improved but the honing imparts a texturized effect to the resultant bristle. Better cleaning and retention of dentifrice results from the texturization.

BRIEF DESCRIPTION OF THE DRAWING

The above features, advantages and objectives of the present invention will more fully be appreciated through the following detailed discussion, reference being made to the drawing in which:

Fig. 1 is a bottom perspective view of a toothbrush according to the present invention;

Fig. 2 is a top perspective view of the toothbrush according to Fig. 1;

Fig. 3 is a cross-sectional view of a bristle with radiused gently rounded attachment to a surface of the brushhead;

Fig. 4 is a front elevational view of a second embodiment of the bristle showing its attachment to a surface of the brushhead with two differently sloped transitions near the base of two faces of the bristle;

Fig. 5 is a rear elevational view of the bristle shown in Fig. 4;

Fig. 6 is a cross-sectional view of the second embodiment as shown in Fig. 4;

Fig. 7 is a cross-sectional view taken along line 7-7 of Fig. 6; and

Fig. 8 is a cross-sectional partial view of the bristle forming die mold plate.

DETAILED DESCRIPTION OF THE INVENTION

Now it has been found that bristle deformation and breakage can be minimized in a unitarily molded toothbrush by providing a gradually transitioning slope to polygonal cross-sectioned bristles in an area near a surface of the brushhead.

A preferred embodiment of the present invention is illustrated in Fig. 1. The toothbrush includes a head **2** having bristles **3**, a neck **5** with first and second ends **6**, **8** and a handle **10** with front and rear ends **12**, **14**. An ornamental faux pad **13** and gripping ridges **15** are shown in the preferred embodiment of Fig. 2, but need not be present for purposes of this invention.

Fig. 1 illustrates a recess **16** in an undersurface **18** of the toothbrush. The recess **16** along its perimeter is defined by a recess opening **20**.

Fig. 3 illustrates a cross-section along a longitudinal direction of a single bristle **103**. This bristle is triangular in horizontal cross-section having a flat rear face **122** and flanking side faces **124**, **126**. Near a base of the bristle in an area attached to the brushhead surface **128**, is a respective web **130**, **132** each with a radiused slope **134**, **136**.

Fig. 4 illustrates a second more preferred embodiment of the bristle attachment to the brushhead. Bristle **203** is also triangular in horizontal cross-section as seen in Fig. 7. The polygonal shape includes a rear face **222** and flanking side faces **224**, **226**. A web **230** near a base of the bristle attached to the brushhead surface **228** gradually transitions outward forming faces **234**, **235**. Fig. 5 illustrates the rear face **222** with a web **232** forming attachment to brushhead surface **228** along a different angled face **236**.

Fig. 6 illustrates the slope of face **234** as a 45° angle and the slope of face **236** as a 60° angle.

Fig. 8 illustrates a portion of the die mold plate wherein the bristles of the present invention are formed. A mold wall **30** forming faces **224** and **226** of the bristle has an entry surface **34**. A center mold wall **40** has surface **42** which forms face **222**. Near the resin entry point of the mold, surface **42** has a slanted surface **44** which allows formation of face **236** of the molded bristle **203**. Resin can flow angularly along path R1 and R2 past the gate surfaces **34** and **44**. Cold flow is minimized in this arrangement where the surfaces are acutely angled against one another.

While this invention have been shown and described in connection with particular preferred embodiments, various changes and modifications are readily available to those skilled in the art without departing from the basic scope and purview of this invention.

WHAT IS CLAIMED IS:

1. A unitarily molded toothbrush comprising:

a head with bristles integrally formed with the head, the bristles being anchored to a top surface of the head and each having a polygonal cross-section defined by at least three faces, at least one of the faces gradually transitioning outward as a slope in an area near the head top surface to minimize breakage and deformation;

a neck with first and second ends, the first end connected to the head; and

a handle with front and rear ends, the front end connected to the second end of the neck, wherein the head, neck and handle are all formed of an identical plastic material.

2. The toothbrush according to claim 1 wherein at least two of the faces gradually transition outward as slopes in an area near the head surface.

3. The toothbrush according to claim 1 wherein the slope is a straight slope.

4. The toothbrush according to claim 1 wherein the slope is a curved radiused slope.

5. The toothbrush according to claim 1 wherein two of the at least one faces gradually transition outward forming respective first and second slopes, the first of the slopes being differently angled than the second of the slopes.

6. The toothbrush according to claim 5 wherein the polygonal cross-section is triangular.

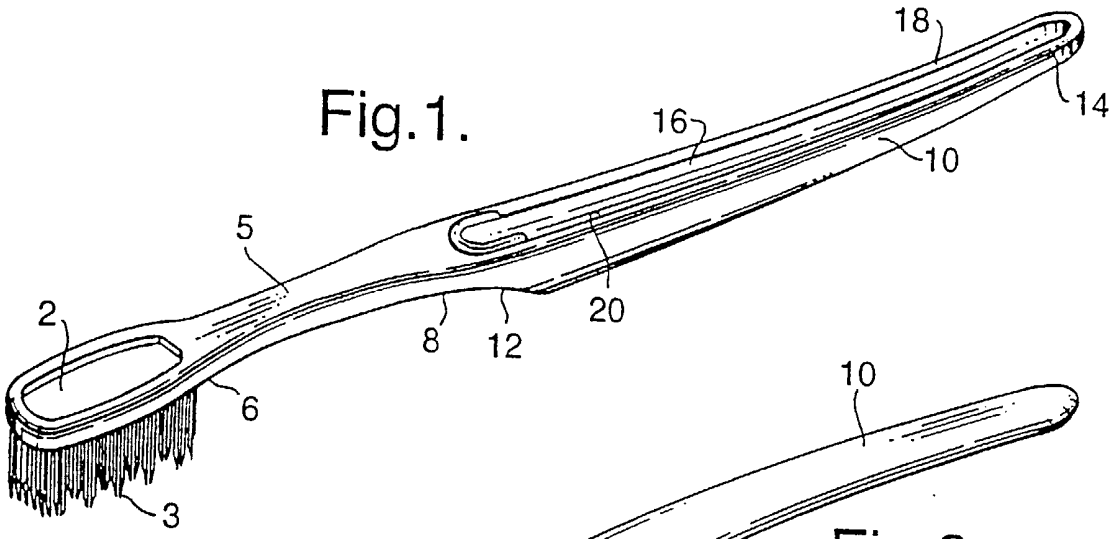
7. The toothbrush according to claim 5 wherein the first and second slopes are set at angles between 5 and 70°.

8. The toothbrush according to claim 5 wherein the first slope is set at an angle between 5 and 50° and the second slope is set at an angle between 55 and 80°.

9. The toothbrush according to claim 8 wherein the first slope is set at an angle between 30 and 50° and the second slope is set at an angle between 55 and 65°.

10. The toothbrush according to claim 5 wherein the difference in slope between first and second slopes range from 5 to 40°.

Fig.1.



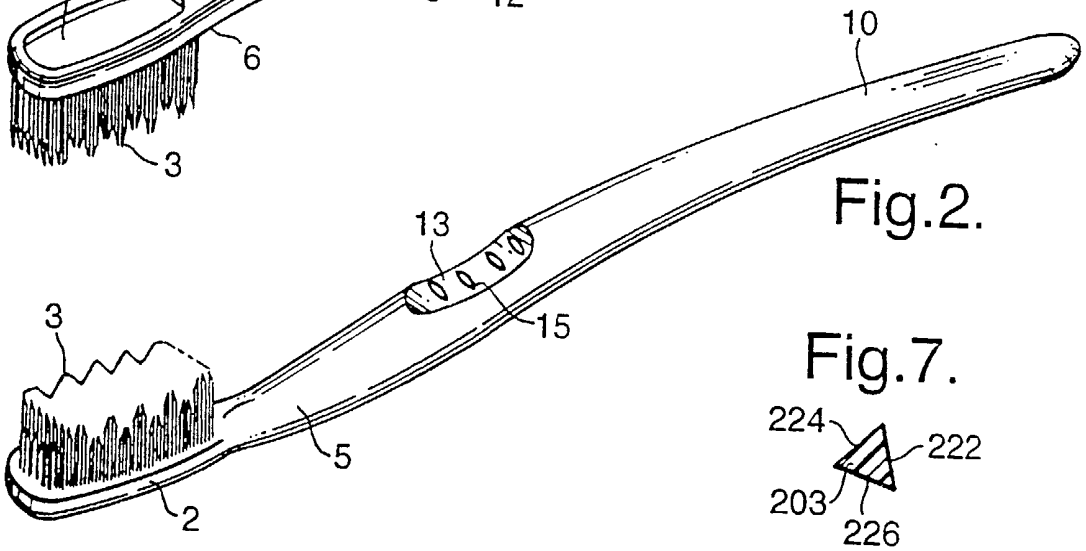


Fig.2.

Fig.7.

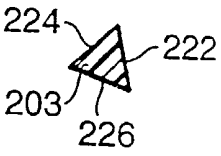


Fig.3.

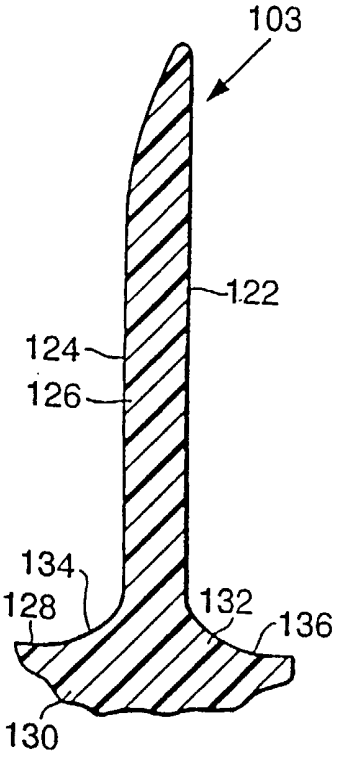


Fig.4.

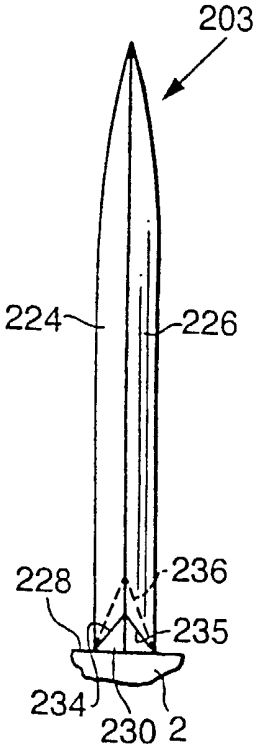


Fig.5.

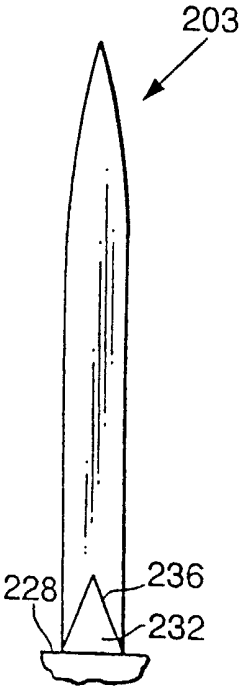


Fig.6.

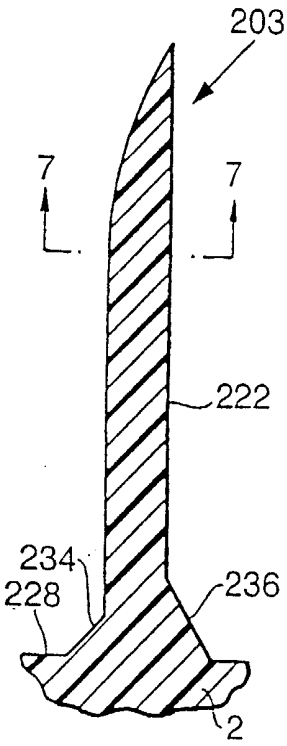


Fig.8.