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(54) **SPIRAL BRISTLE HAVING STRAND COMPONENTS WITH DIFFERENT ORAL CARE ADDITIVES, AND ORAL CARE IMPLEMENT COMPRISING THE SAME**

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See application file for complete search history.

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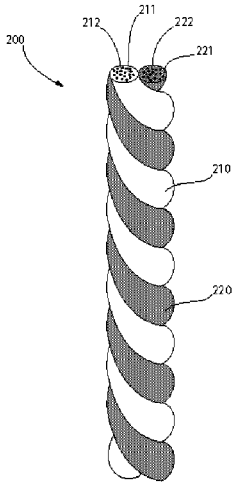
(57) **ABSTRACT**

An oral care implement including at least one spiral bristle. In one aspect, the invention can be an oral care implement having a handle; a head coupled to the handle; at least one bristle tuft extending from the head, the at least one bristle tuft comprising at least one spiral bristle comprising coextruded first and second strand components that are intertwined together to form the at least one spiral bristle; the first strand component comprising a first plastic and a first oral care additive; and the second strand component comprising a second plastic and a second oral care additive, Tine rein the first oral care additive is different than the second oral care additive.

23 Claims, 7 Drawing Sheets



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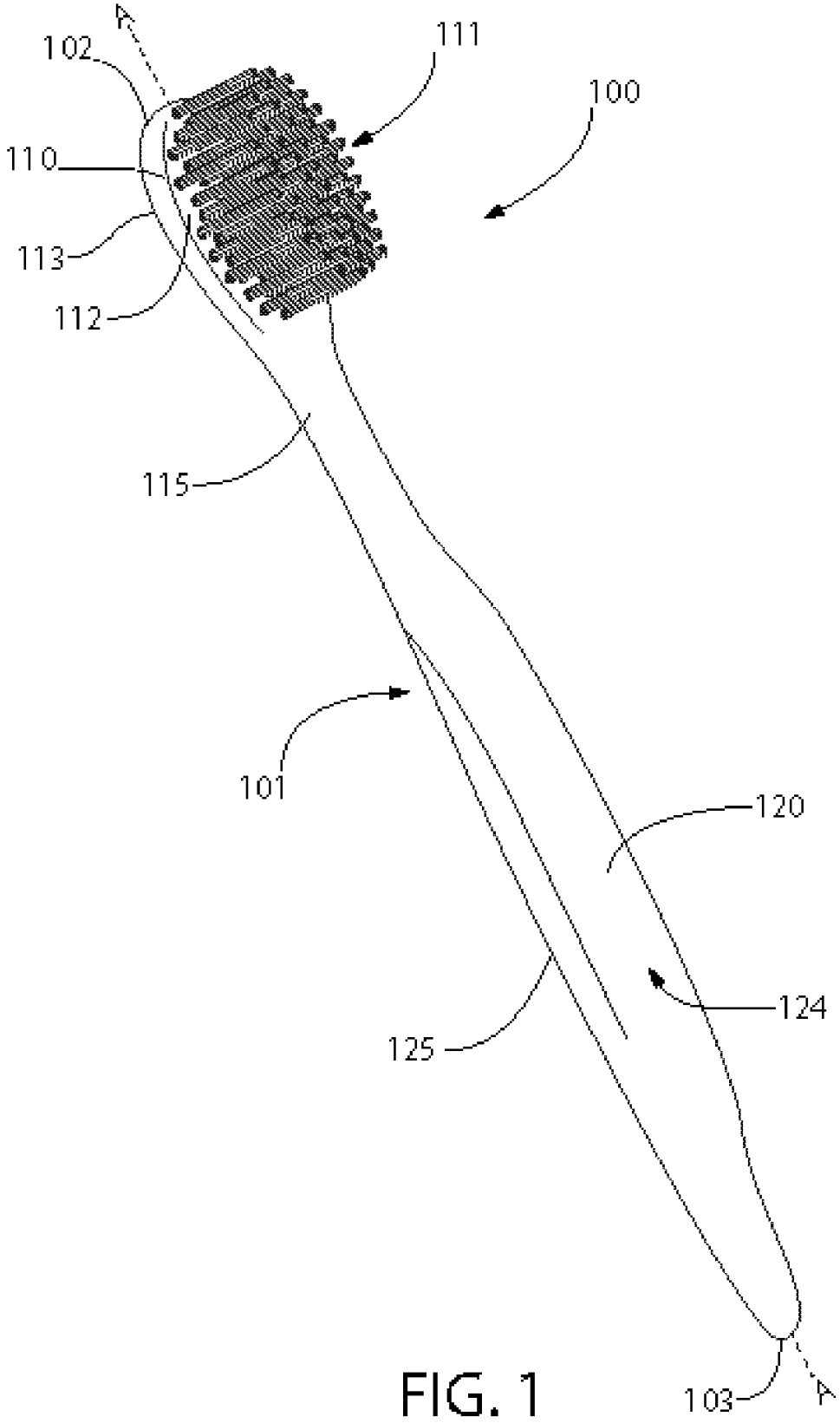

FIG. 1

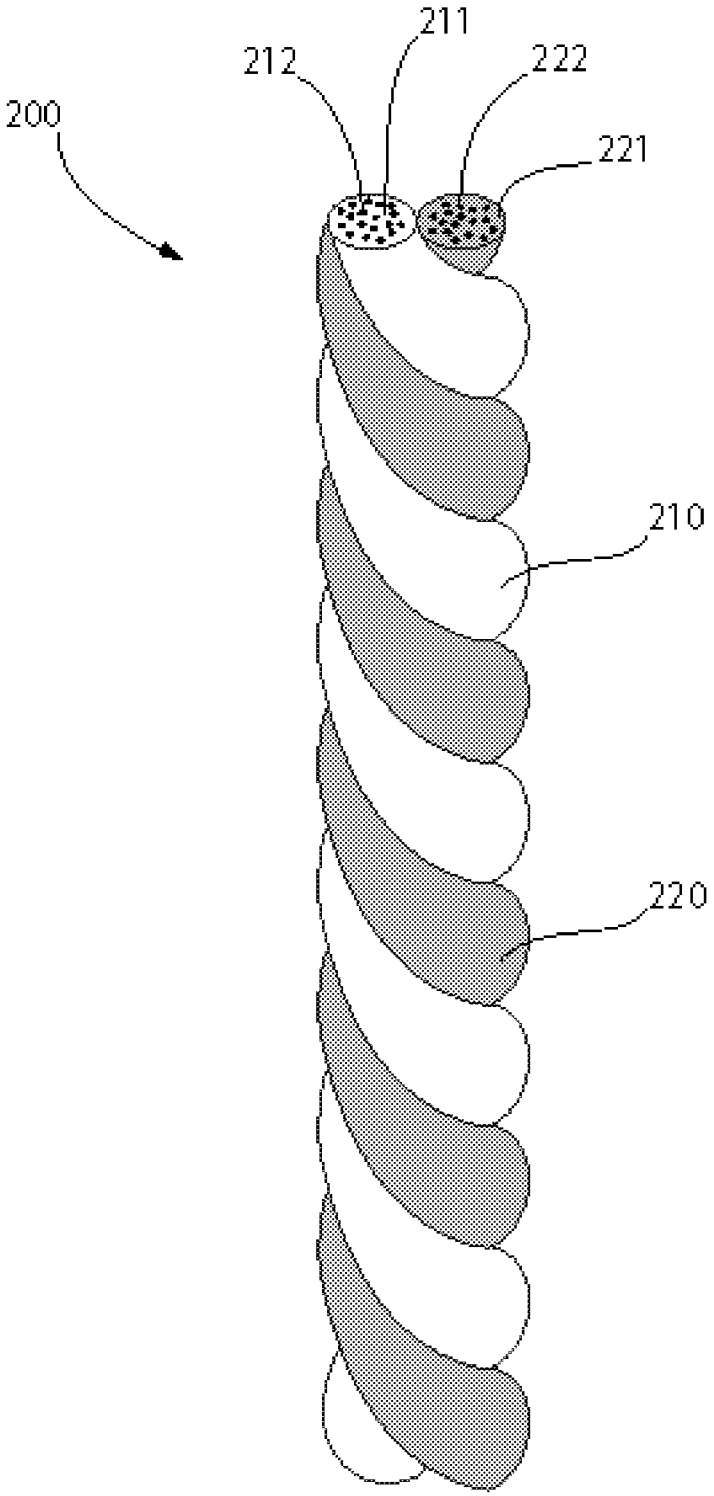

FIG. 2

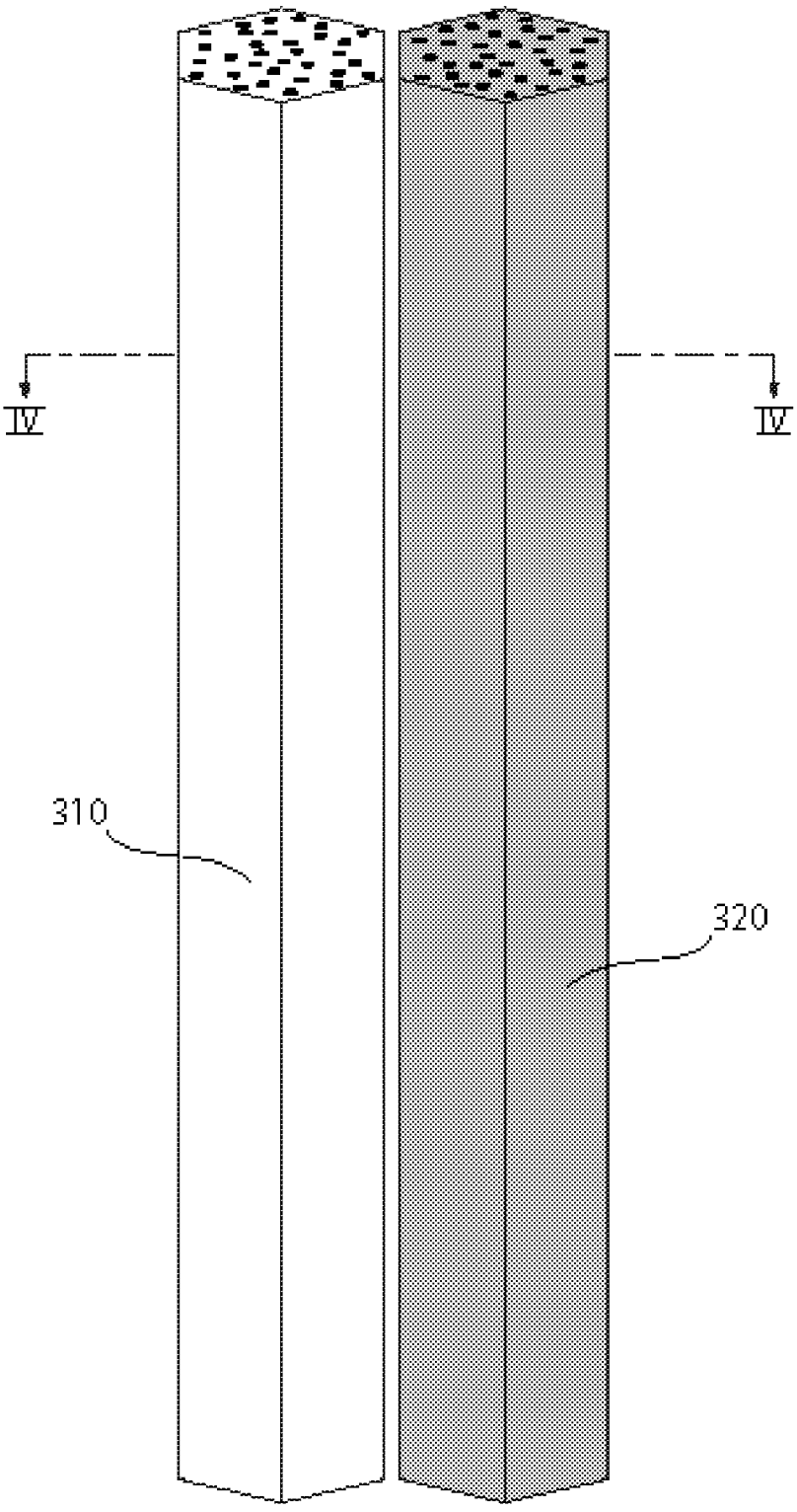

FIG. 3

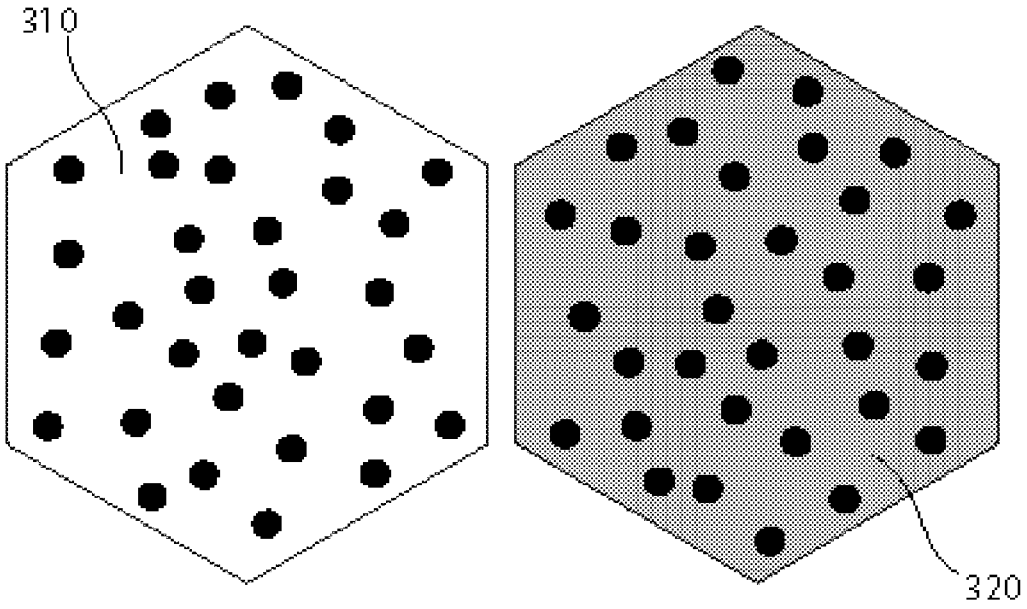

FIG. 4

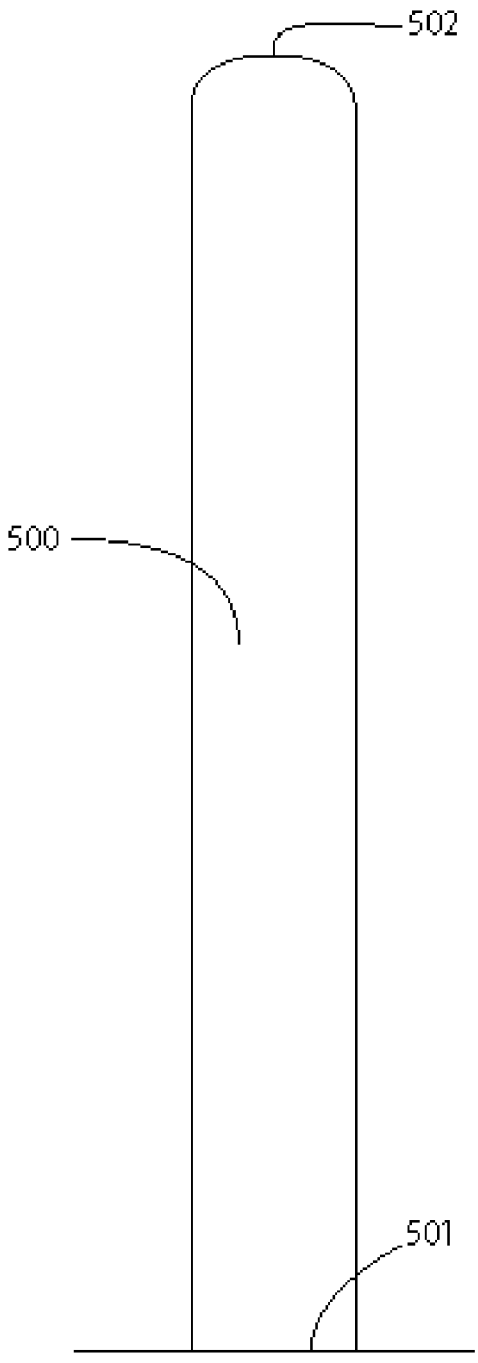

FIG. 5A

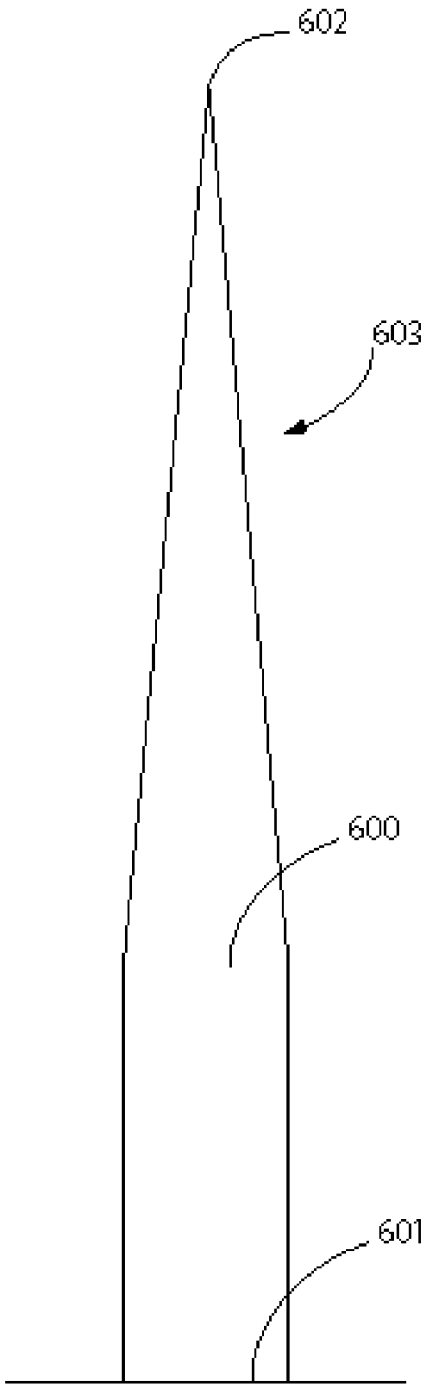

FIG. 5B

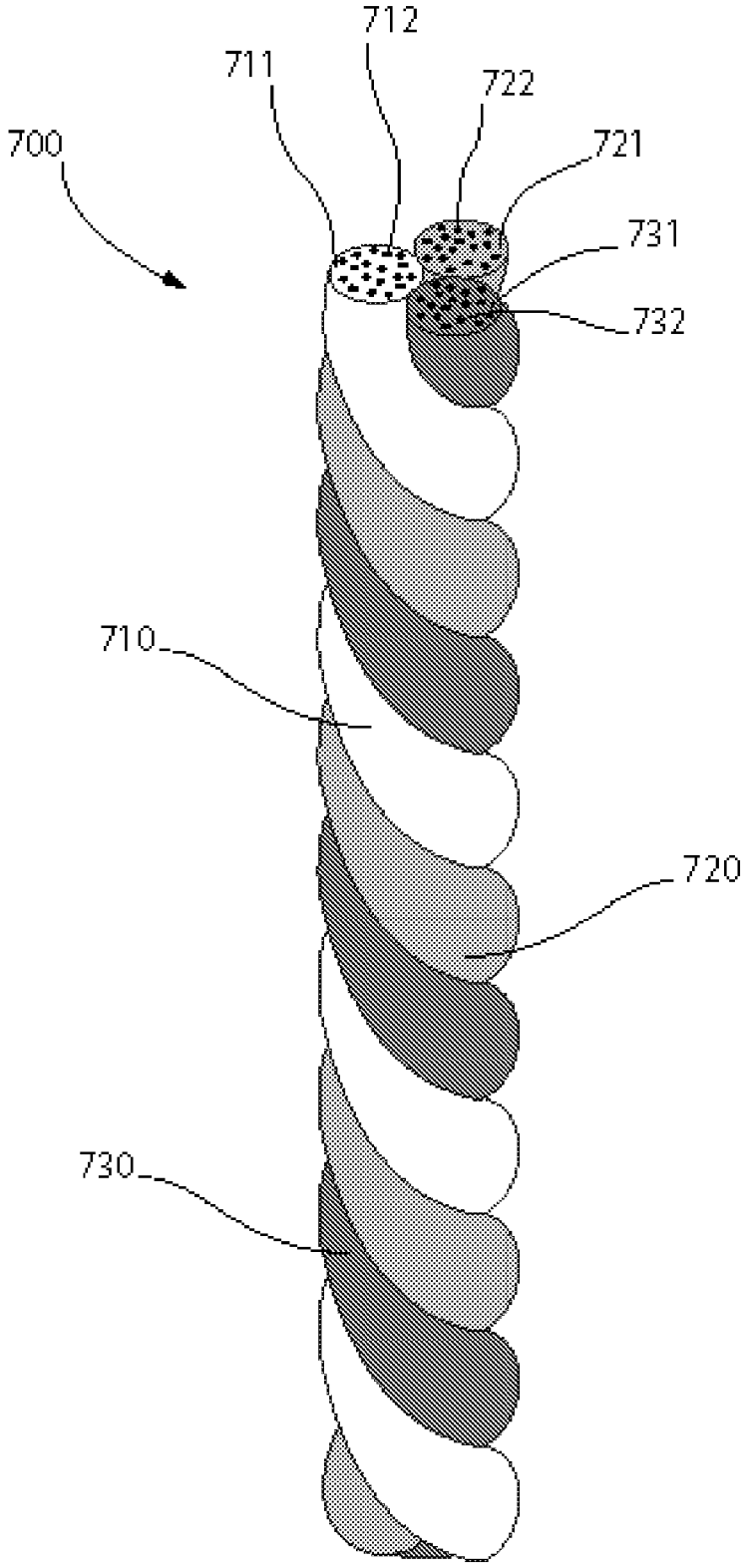

FIG. 6

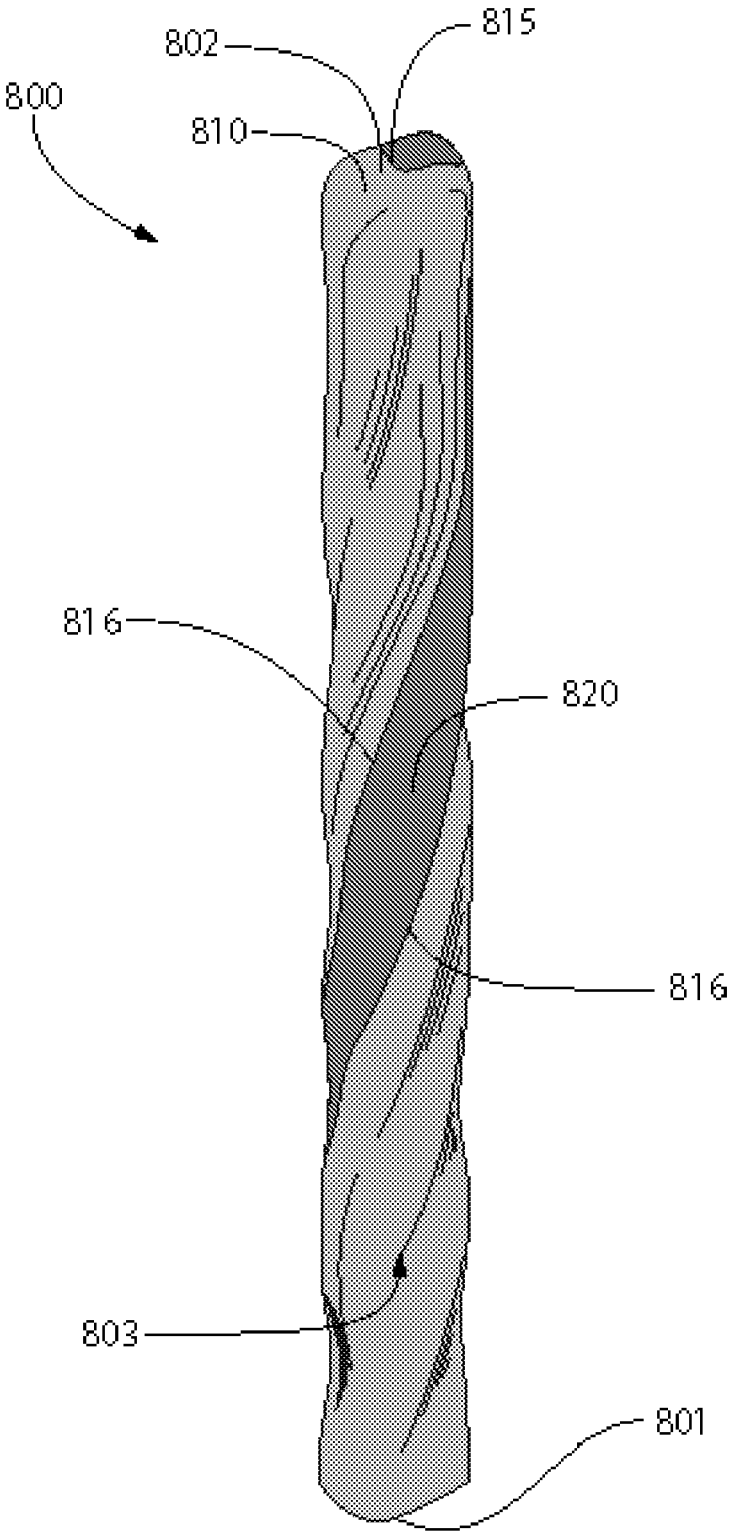

FIG. 7

SPIRAL BRISTLE HAVING STRAND COMPONENTS WITH DIFFERENT ORAL CARE ADDITIVES, AND ORAL CARE IMPLEMENT COMPRISING THE SAME

BACKGROUND

Toothbrushes are typically used by applying toothpaste or dentifrice to a bristle section on the head of the toothbrush, followed by brushing regions of the oral cavity (e.g., the teeth or soft tissue such as the tongue and/or gums) with the bristle section. Some toothbrushes have been equipped with internal reservoirs and systems for delivering dentifrice to a user's oral cavity. Other toothbrushes have been developed that include dentifrice that is pre-coated onto the bristles. However, in known toothbrushes only dentifrice or a single oral care additive is available for application to a user's oral cavity. Thus, a need exists for a toothbrush having multiple different oral care additives for application to a user's oral cavity.

BRIEF SUMMARY

Exemplary embodiments according to the present disclosure are directed to oral care implements that have at least one spiral bristle extending from the head thereof. The spiral bristle is formed by first and second strand components being intertwined together. In one embodiment each of the first and second strand components comprises a different oral care additive.

In one aspect the invention can be an oral care implement comprising a handle; a head coupled to the handle; at least one bristle tuft extending from the head, the at least one bristle tuft comprising at least one spiral bristle comprising coextruded first and second strand components that are intertwined together to form the at least one spiral bristle; the first strand component comprising a first plastic and a first oral care additive; and the second strand component comprising a second plastic and a second oral care additive, wherein the first oral care additive is different than the second oral care additive.

In another aspect, the invention can be a spiral bristle for an oral care implement comprising coextruded first and second strand components that are intertwined together; the first strand component comprising a first plastic and a first oral care additive; and the second strand component comprising a second plastic and a second oral care additive, wherein the first oral care additive is different than the second oral care additive.

In a further aspect, the invention can be an oral cane implement comprising: a handle; a head coupled to the handle; at least one bristle tuft extending from the head, the at least one bristle tuft comprising at least one spiral bristle comprising coextruded first and second strand components that are intertwined together to form the at least one spiral bristle; the first strand component comprising a first plastic and a first oral care additive; and the second strand component comprising a second plastic and being free of an oral care additive.

Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

FIG. **1** is a front perspective view of an oral care implement having spiral bristles according to an embodiment of the present invention;

FIG. **2** is a front perspective view of a spiral bristle in accordance with a first embodiment of the present invention;

FIG. **3** is a front perspective view of a first strand component and a second strand component of a spiral bristle in accordance with a second embodiment of the present invention;

FIG. **4** is a cross-sectional view along line IV-IV of FIG. **3**;

FIG. **5**A is a schematic illustration of a bristle having a rounded tip;

FIG. **5**B is a schematic illustration of a bristle having a tape red tip;

FIG. **6** is a front perspective view of a spiral bristle in accordance with a third embodiment of the present invention; and

FIG. **7** is a front perspective view of a spiral bristle in accordance with a fourth embodiment of the present invention.

DETAILED DESCRIPTION

The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

The description of illustrative embodiments according to principles of the present invention is intended to be read in connection with the accompanying drawings winch are to be considered part of the entire written description. In the description of embodiments of the invention disclosed herein, any reference to direction or orientation is merely intended for convenience of description and is not intended in any way to limit the scope of the present invention. Relative terms such as "lower," "upper," "horizontal," "Vertical," "above," "below," "up," "down," "top" and "bottom" as well as derivatives thereof (e.g., "horizontally" "downwardly," "upwardly," etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description only and do not require that the apparatus be constructed or operated in a particular orientation unless explicitly indicated as such. Terms such as "attached," "affixed," "connected," "coupled," "interconnected," and similar refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. Moreover, the features and benefits of the invention are illustrated by reference to the exemplified embodiments. Accordingly, the invention expressly should not be limited to such exemplary embodiments illustrating some possible non-limiting combination of features that may exist alone or in other combinations of features; the scope of the invention being defined by the claims appended hereto.

Referring first to FIG. **1**, an oral care implement **100** is illustrated in accordance with an embodiment of the present invention. In the exemplified embodiment, the oral care implement **100** is in the form of a manual toothbrush. However, in certain other embodiments the oral care implement **100** can take on other forms such as being a powered

toothbrush, a tongue scraper, a gum and soft tissue cleanser, a water pick, an interdental device, a tooth polisher, a specially designed ansate implement having tooth engaging elements or any other type of implement that is commonly used for oral care. Thus, it is to be understood that the inventive concepts discussed herein can be applied to any type of oral care implement unless a specific type of oral care implement is specified in the claims.

The oral care implement extends from a proximal end **103** to a distal end **102** along a longitudinal axis A-A. The oral care implement **100** generally includes an elongated body **101** comprising a head **110**, a neck **115** and a handle **120**. The handle **120** is an elongated structure that provides the mechanism by which the user can hold and manipulate the oral care implement **100** during use. The handle **120** comprises a front surface **124** and an opposing rear surface **125**. In the exemplified embodiment, the handle **120** is genetically depicted having various contours for user comfort. More specifically in the exemplified embodiment the handle **120** is bulbous shaped and has a larger diameter in a central region than near the proximal end **103** and neck **115**. Specifically a region of the handle **120** that would normally be gripped by a user's thumb has a width that is greater than a width of the neck **115**. Of course, the invention is not to be so limited in all embodiments and in certain other embodiments the handle **120** can take on a wide variety of shapes, contours and configurations, none of which are limiting of the present invention unless so specified in the claims.

In the exemplified embodiment, the handle **120** is formed of a rigid plastic material, such as for example without limitation polymers and copolymers of ethylene, propane, butadiene, vinyl compounds and polyesters such as polyethylene terephthalate. Of course, the invention is not to be so limited in all embodiments and the handle **120** may include a resilient material, such as a thermoplastic elastomer, as a grip cover that is molded over portions of or the entirety of the handle **120** to enhance the gripability of the handle **120** during use. For example, portions of the handle **120** that are typically gripped by a user's palm during use may be overmolded with a thermoplastic elastomer or other resilient material to further increase comfort to a user.

The head **110** of the oral care implement **100** is coupled to the handle **120** and comprises a front surface **112** and an opposing rear surface **113**. In the exemplified embodiment, the head **110** is formed integrally with the handle **120** as a single unitary structure using a molding, milling, machining or other suitable process. However, in other embodiments the handle **120** and the head **110** may be formed as separate components winch are operably connected at a later stage of the manufacturing process by any suitable technique known in the art, including without limitation thermal or ultrasonic welding, a tight-fit assembly, a coupling sleeve, threaded engagement adhesion, or fasteners.

In the exemplified embodiment, the head **110** of the oral care implement **100** is provided with a plurality of tooth cleaning elements **111** extending from the front surface **112**. Although in the exemplified embodiment all of the tooth cleaning elements **111** appear to be the same, the invention is not to be so limited in all embodiments. For example, in certain embodiments the tooth cleaning elements **111** include at least one bristle tuft comprising at least one spiral bristle. A single spiral bristle is formed by intertwining two or more strand components or strands together, which will be described in more detail below with reference to FIGS. **2-6**. A bristle tuft is a collection of bristles that are positioned together into a single tuft hole formed on the head **110**. Each bristle tuft may include, for example without limitation, only spiral bristles, a combination of spiral bristles and non-spiral bristles, or only non-spiral bristles. In certain embodiments, the oral care implement **100** may include one or more bristle tufts that include exactly one spiral bristle and other non-spiral bristles or one or more bristle tufts that include only spiral bristles. In still other embodiments, the tooth cleaning elements **111** may all be formed as bristle tufts that are formed solely of spiral bristles. Furthermore, in some embodiments the tooth cleaning elements **111** may include some bristle tufts that are formed solely of non-spiral bristles and some bristle tufts that are formed solely of spiral bristles, and the non-spiral bristle tufts and spiral bristle tufts may be positioned on the head **110** of the oral care implement **100** in an alternating or non-alternating fashion (i.e., alternating or non-alternating transverse rows of bristle tufts).

Other than including at least one bristle tuft comprising at least one spiral bristle, the exact structure, pattern, orientation and material of the remainder of the tooth cleaning elements **111** is not to be limiting of the present invention unless so specified in the claims. Thus, as used herein, the term "tooth cleaning elements" is used in a generic sense to refer to any structure that can be used to clean, polish or wipe the teeth and/or soft oral tissue (e.g. tongue, cheek, gums, etc.) through relative surface contact. Common examples of "tooth cleaning elements" include, without limitation, bristle tufts, filament bristles, fiber bristles, nylon bristles, spiral bristles, rubber bristles, elastomeric protrusions, flexible polymer protrusions, combinations thereof and/or structures containing such materials or combinations. Suitable elastomeric materials include any biocompatible resilient material suitable for uses in an oral hygiene apparatus. To provide optimum comfort as well as cleaning benefits, the elastomeric material of the tooth or soft tissue engaging elements has a hardness property in the range of A8 to A25 Shore hardness. One suitable elastomeric material is styrene-ethylene/butylene-styrene block copolymer (SEBS) manufactured by GLS Corporation. Nevertheless, SEBS material from other manufacturers or other materials within and outside the noted hardness range could be used.

The tooth cleaning elements **111** of the present invention can be connected to the head **110** in any manner known in the art. For example, staples/anchors, in-mold tufting (IMT) or anchor free tufting (AFT) could be used to mount the cleaning elements/tooth engaging elements. In certain embodiments, the invention can be practiced with various combinations of stapled, IMT or AFT bristles. In AFT, a plate or membrane is secured to the brush head such as by ultrasonic welding. The bristles extend through the plate or membrane. The free ends of the bristles on one side of the plate or membrane perform the cleaning function. The ends of the bristles on the other side of the plate or membrane are melted together by heat to be anchored in place. Any suitable form of cleaning elements may be used in the broad practice of this invention. Alternatively, the bristles could be mounted to tuft blocks or sections by extending through suitable openings in the tuft blocks so that the base of the bristles is mounted within or below the tuft block.

In the exemplified embodiment, the head **110** of the oral care implement **100** comprises a plurality of tuft holes (not visible) formed therein. A plurality of tufts of bristles are positioned within and affixed to the head **110** within each of the tuft holes. Each of the tufts of bristles includes a plurality of bristles, which can be single strand bristles, double strand spiral bristles, triple strand spiral bristles, etc. or various combinations thereof. Thus, one tuft of bristles may include one double strand spiral bristle and a plurality of single

strand bristles or only double strand spiral bristles or only triple strand spiral bristles or a combination of single strand bristles, double strand spiral bristles and triple strand spiral bristles. Additionally a single tuft hole may be filled with an elastomeric cleaning element or any of the other types of cleaning elements noted above. As noted above, in one embodiment at least one bristle tuft includes at least one spiral bristle, which may be a double, triple or otherwise strand spiral bristle. The details of the spiral bristle s will be discussed in more detail below with reference to FIGS. **2-6**.

Although not illustrated herein, in certain embodiments the head **110** may also include a soft tissue cleanser coupled to or positioned on its rear surface **113**. An example of a suitable soft tissue cleanser that maybe used with the present invention and positioned on the rear surface of the head **110** is disclosed in U.S. Pat. No. 7,143,462, issued Dec. 5, 2006 to the assignee of the present application, the entirety of which is hereby incorporated by reference. In certain other embodiments, the soft tissue cleanser may include protuberances, which can take the form of elongated ridges, nubs, or combinations thereof. Of course, the invention is not to be so limited and in certain embodiments the oral care implement **100** may not include any soft tissue cleanser.

Referring now to FIG. **2**, a spiral bristle **200** is illustrated in accordance with an embodiment of the present invention. The spiral bristle **200** comprises a first strand component **210** and a second strand component **220** that are intertwined together to form the spiral bristle **200**. In the exemplified embodiment, the first and second strand components **210**, **220** wind around one another five times apiece. However, the invention is not to be so limited and more or less spirals/windings can be used to form the spiral bristle **200**.

In the exemplified embodiment, the first and second strand components **210**, **220** are cylindrical shaped strands, although the invention is not to be so limited and the first and second strand components **210**, **220** can be any polygonal shape as will be discussed in more detail below with reference to FIGS. **3** and **4**. Furthermore, in certain embodiments one of the first and second strand components **210**, **220** may have grooves, ridges, pockets or recessed areas within which the other strand component is disposed when the first and second strand components **210**, **220** are intertwined together, as discussed in more detail below with reference to FIG. **7**. In certain embodiments, the first and second strand components **210**, **220** can be coextruded to form the spiral bristle **200**. In such an embodiment, the spiral bristle **200** may be considered to be a monofilament. In other embodiments, the first and second strand components **210**, **220** can be extruded separately from one another and then later twisted together to form the spiral bristle **200**. The exact manner of forming the spiral bristle **200** is not to be limiting of the present invention unless so specified in the claims.

Due to the nature of spiral bristle formation in that two or more strand components are intertwined together to form the spiral bristle, these strand components can be used to house, store or otherwise contain oral care additives including oral care agents. Each of the strand components that is used to form the spiral bristle can house the same oral care additive, a different oral care additive, or only one of the two or more strand components that forms a single spiral bristle can contain an oral care additive while the other of the two or more strand components may be devoid of an oral care additive. Thus, in certain embodiments two or more oral care additives can be housed separately on different strand components of a single spiral bristle and can be made to intermix during use of the spiral bristle (or oral care implement on which the spiral bristle is disposed). Intermixing of two or more oral care additives can be beneficial so that a chemical reaction occurs within a user's oral cavity and so that in some circumstances a third oral care additive or agent can be formed by the reaction of the first and second oral care additives within the user's oral cavity.

Referring still to FIG. **2**, in certain embodiments the first strand component **210** comprises a first plastic **211** and a first oral care additive **212** and the second strand component **220** comprises a second plastic **221** and a second oral care additive **222**, the second oral care additive **222** being different than the first oral care additive **221**. In the exemplified embodiment, the first strand component **210** is illustrated as a lighter color than the second strand component **220** to schematically illustrate that each of the first and second strand components **210**, **220** contains a different oral care additive. Although described herein as the first and second strand components **210**, **220** having different oral care additives, in certain embodiments each of the first and second strand components **210**, **220** may have the same oral care additive, or one of the first and second strand components **210**, **220** may be devoid of an oral care additive while the other of the first and second strand components has an oral care additive.

In certain embodiments, forming the first strand component **210** is achieved by melting the first plastic **211** and dispersing particles of the first oral care additive **212** within the melted first plastic **211**. The particles of the first oral care additive **212** are thereby mixed into the first plastic **211** so that the first strand component **210**, when formed, will contain the first oral care additive **212**. Similarly, forming the second strand component **220** is achieved by melting the second plastic **221** and dispersing particles of the second oral care additive **222** within the melted second plastic **221**. The particles of the second oral care additive **222** are thereby mixed into the second plastic **221** so that the second strand component **220**, when formed, will contain the second oral care additive **222**. As noted above, the first and second oral care additives **212**, **222** can be the same or different.

Upon cooling, the first and second melted plastics **211**, **221** will become hardened and the first and second oral care additives **212**, **222** will be housed, contained or dispersed within the respective first and second plastics **211**, **221**. Next, in certain embodiments the first and second plastics **211**, **221** can be coextruded to form the spiral bristle **200** from the first and second strand components **210**, **220**. Alternatively the first plastic **211** with the first oral care additive **212** therein can be formed into the first strand component **210** and the second plastic **221** with the second oral care additive **222** the rein can be separately formed into the second strand component **220** (either by separate extrusion processes or any other bristle strand forming process now known or later developed), and then the first and second strand components **210**, **220** can be twisted together to form the spiral bristle **200**. In either case, the spiral bristle **200** is formed from the first and second strand components **210**, **220**, each of which contains a different (or the same) oral care additive or agent therein. Of course, as noted above one of the two strand components **210**, **220** may be formed without dispersing an oral care additive therein if desired.

In other embodiments, the oral care additives need not be applied to the melted plastics in particle form. Rather, in other embodiments the oral care additives can be added to the respective strand components by forming the strand components with a tactile or sticky texture to hold the oral care additives thereon, or by forming the strand components with grooves, ledges, holes, hollows or other features and/or surface structure, shape or configuration that facilitates the

housing of a powder, liquid, gel, paste or other form of oral care additive. Regardless of the manner of forming the spiral bristle s with oral care additives therein, the oral care additives **212**, **222** are releasable from the first and second plastics **211**, **222** and from the first and second strand components **210**, **220** of the spiral bristle **200**, particularly during use of the oral care implement **100** as will be described in more detail below, in order to provide oral health benefits to a user.

Furthermore, in certain embodiments the oral care additives, in any form (i.e., particle, powder, liquid, gel, paste etc.), may be embedded or housed within or otherwise carried by one or more carriers winch are then formed into, housed or contained within the first and second strand components **210**, **220**. Specifically the first oral care additive **212** may be carried by a first carrier and the second oral care additive **222** may be carried by a second carrier. In one embodiment each of the first and second carriers may be one or more water-soluble polymers. In such an embodiment the oral care additives **212**, **222** may be carried by disposed within or embedded within the one or more water-soluble polymers, and then the water-soluble polymers can be added to the melted plastic that is used to form the first and second strand components **210**, **220** as described above. In this manner, the carriers will be mixed or formed into the plastic material that forms the first and second strand components **210**, **220**, the carriers carrying the oral care additives. In such embodiments, it may be desirable for the first carrier to have a higher melting point than the melting point of the first plastic **211** and for the second carrier to have a higher melting point than the melting point of the second plastic **221** so that the carrier or water-soluble polymer maintains its structure and retains the oral care additive therein when being added to the melted plastic. As the plastic cools and hardens, the carriers may then be contained or dispersed within the plastic as the plastic is formed into the individual strand components.

In certain embodiments, each of the first and second carriers can comprise one or more degradable or dissolvable capsules that can, contain or encapsulate the first and second oral care additives **212**, **222** therein. The capsules may be soluble in liquid, sue has saliva, to release the oral care additives **212**, **222** contained therein during use of the oral care implement **100**. Stated another way, the capsules degrade when subject to moisture and thus dissolve when mixed with the saliva of the user to release its contents. Alternatively the capsules may have frangible, thin walls that break, rupture or burst to release the oral care additives **212**, **222** contained therein during use due to being contacted by or rubbed against the user's teeth. In other embodiments, each of the first and second carriers can comprise one or more matrices that carry the first and second oral care additives **212**, **222**. Similar to the capsules, the matrices may also dissolve or break to release the oral care additives **212**, **222** contained therein during use of the oral care implement **100**. In other embodiments, one of the first and second carriers can comprise one or more capsules carrying the first oral care additive and the other of the first and second carriers can comprise one or more matrices carrying the second oral care additive, or each of the first and second carriers may comprise a combination of capsules and matrices that carry the respective oral care additives.

Using the carriers to house the oral care additives may assist in ensuring that the oral care additives are properly retained on the strand components and released into a user's oral cavity during use of the oral care implement **100**. Specifically in embodiments wherein the carriers are water-soluble polymers, such carriers/water-soluble polymers will degrade, shrink or dissolve in the user's saliva during use of the oral care implement, thereby releasing the oral care additives from the carriers and into a user's oral cavity. The solubility of such water-soluble polymers can be selected as desired to create a spiral bristle having immediate release of all of the oral care additives contained the rein or a timed release of the oral care additives contained therein.

In certain embodiments the first and/or second carriers maybe formed for timed or slow release of the oral care additives contained therein so that the benefits of the oral care additives can be obtained by the user over many uses of the oral care implement **100**. In one embodiment, the carriers may degrade over a period of three months so that upon the entire oral care additive having been released into the user's oral cavity during brushing, the user will know that it is time to replace the toothbrush. In certain embodiments, the strand components of the spiral bristle **200** may change color upon the oral care additive contained therein being depleted to visually communicate to a user that toothbrush replacement is needed. Thus, the spiral bristles **200** can serve as both oral care additive containment/dispensing structure s and as a wear indicator.

In other embodiments, the first strand component **210** may include first carriers (i.e., water-soluble polymers) that degrade or dissolve within a first temporal period of time and the second strand component **220** may include second carriers (water-soluble polymers) that degrade or dissolve within a second temporal period of time so that the oral care additives within the second carriers do not begin to be released until the entirety of the oral care additives within the first carriers have been released. Thus, the second carriers will not begin to dissolve until the entirety of the first carriers has dissolved, such that the first carriers will have a higher solubility than the second carriers. In other embodiments, the first and/or second carriers may completely erode, degrade, shrink or dissolve during a first use so that the entirety of the oral care additives contained therein is released into the user's oral cavity during a single use. In such embodiments, the oral care implement **100** may be a disposable or single use toothbrush.

The first and second oral care additives **211**, **221** can be any of a variety of oral care additives that provide proven benefits to a user's oral health. Such oral care additives include, without limitation, lotus seed; lotus flower, bamboo salt; jasmine; corn mint; camellia; aloe; gingko; tea tree oil; xylitol; sea salt; vitamin C; ginger; cactus; baking soda; pine tree salt; green tea; white pearl; black pearl; charcoal powder; nephrite or jade and Ag/Au+. The lotus seed is the extract from lotus seeds and is a natural herb for anti-heating and the prevention of gum bleeding. The lotus flower is the extract from the lotus flower and is a natural herb for anti-heating and the prevention of gum bleeding. Bamboo salt is the combination of a bamboo extract and salt and is used to diminish inflammation and has anti-bacterial effects. Jasmine is an extract from the jasmine flower and is a natural herb for anti-heating, preventing gum bleeding and for mouth freshening. Corn mint is an extract from a corn mint leaf and is a natural herb for anti-heating, anti-bacterial uses and mouth freshening. Camellia is an extract from the camellia flower and is a natural herb for anti-heating and the prevention of gum bleeding. Aloe is an extract from the aloe leaf and is a natural herb for inflammation reduction and has anti-bacterial effects. Gingko is an extract from the gingko leaf and is a natural herb for inflammation reduction and has anti-bacterial effects. Tea tree oil is an extract from a tea tree and is a natural herb for diminishing inflammation and has

anti-bacterial effects. Xylitol is an extract from plants such as corn, sugar cane, oak, birch, etc. and can be used for preventing tooth decay. Sea salt is an extract from the sea and can be used to reduce inflammation and has anti-bacterial effects. Vitamin C is an extract from food and can be used to prevent gum bleeding and as an antioxidant. Ginger is an extract from ginger and is a natural plant for diminishing inflammation and has anti-bacterial effects. Cactus is an extract from a cactus and it a natural plant for reducing inflammation and can be used as an antioxidant. Backing soda is a chemistry product and can be used as an enamel protectant. Pine tree salt is a mixture of the extract from pine trees and salt and is an ancient Chinese medicine for preventing inflammation and anti-heating. Green tea is an extract from the green tea leaf and is a natural herb to prevent halitosis and inhibit bacteria growth. White pearl is a kind of pearl powder and can be used for teeth whitening and teeth health improvement by calcium absorption. Black pearl is a kind of pearl powder that can be used for teeth whitening, cleaning and stain removal. Charcoal is made from an oak tree by carbonization and it helps to for moisture adjustment and to reduce the growth of bacteria. Nephrite (jade) is a kind of nephrite powder and can be used to prevent gum disease and boost the blood circulation of the gums. Ag/Au is an anti-bacterial additive contained in the Ag/Au ion (i.e., silver/gold) and can be used to inhibit bacterial growth. In certain embodiments, each of the first and second oral care additives are selected from a group consisting of a mixture of pine tree extract and sail, a tea leaf extract a pearl powder, a nephrite powder, a charcoal powder, and an antibacterial material. In some embodiments, the oral care additives are natural ingredients.

In certain embodiments, each of the first and second strand components **210**, **220** may have a different color to provide both a visual aesthetic and to communicate information about the oral care additive contained on that particular strand component to a user. Thus, for example, a spiral bristle may include a first strand component that contains an orange flavored oral care additive and a second strand component that contains a lemon flavored oral care additive. In such an embodiment, the first strand component maybe orange in color and the second strand component may be yellow in color to visually communicate their respective flavors to a user. Similarly, a spiral bristle may include a first strand component that has a green tea extract and a second strand component that includes black pearl. In such an embodiment, the first strand component may be green in color and the second strand component may be black in color to visually communicate their respective oral care additives to a user. Similarly, the color blue can be used to inform a user that a particular strand component will provide a cooling trigeminal effect to the user, the color red can be used to inform a user that a particular strand component contains an oral care additive that will boost blood circulation, the color purple can be used to inform a user that a particular strand component contains an anti-inflammatory oral care additive, etc. Color-coding the strand components of the spiral bristles provides a desirable visual aesthetic as well as being informative for the user or consumer. The oral care implement on which the spiral bristles are contained may include a color-coded key on its handle, head, packaging or on a separate instruction/information sheet that is provided with the oral care implement to inform the user of the message that the various colored strand components are intended to convey.

In certain embodiments, any of one or more of the above oral care additives can be included into each of the first and second strand components **210**, **220** that are used to form the spiral bristle **200**. However, in certain embodiments one of the above oral care additives is included into the first strand component **210** and a second one of the above oral care additives is included into the second strand component **220**, the second one of the above oral care additives being different than the first one of the above oral care additives. In certain embodiments, the first and second oral care additives may each have an agent that is selected so that during brushing the agents of the first and second oral care additives mix together to form a third oral care additive or agent. Specifically, prior to brushing the first oral care additive will remain chemically isolated from the second oral care additive despite the first and second oral care additives being on the same spiral bristle **200** because the first oral care additive is formed into or carried by the first strand component **210** and the second oral care additive is formed into or carried by the second strand component **220**. During brushing, the first and second strand components **210**, **220** will get which enables the first oral care additive **212** (or a portion thereof) to be released from the first strand component **210** and the second oral care additive **222** (or a portion thereof) to be released from the second strand component **220**. When the first and second oral care additives **212**, **222** are simultaneously released, the agents within those oral care additives may intermix within the user's oral cavity to form a third agent in some embodiments.

Intermixing of the first and second oral care additives within the user's oral cavity can be beneficial in certain instances. Specifically, certain agents, medicaments, anesthetics, antimicrobial agents, polishes, whiteners and other miscellaneous agents, substances and chemicals lose effectiveness over time. Thus, it may be desirable to apply such substances substantially immediately after their formation. Using the strand components **210**, **220** of the spiral bristle **200** as the structures on which the oral care additives are housed facilitates this intermixing within the user's oral cavity.

As noted above, the two oral care additives can be selected so that they form a third oral care additive or agent upon intermixing within a user's oral cavity. Some reactions that may be used include: (1) mixing a base with an acid to form a neutral; (2) mixing a base with a curing agent to form an epoxy resin; (3) mixing Bisphenol F with Epichchlorhydin to form diglycidyl ether of bisphenol A (epoxy resin); (4) mixing calcium carbonate with hydrogen peroxide to form peroxide; (5) mixing water with hydrogen peroxide to form peroxide; (6) mixing potassium nitrate with stannous fluoride to form a sensitivity agent; (7) mixing chlorhexadine with silica to form an antimicrobial agent; (8) mixing cetylpyridinium chloride with silica to form an antimicrobial agent; (9) mixing triclosan with pyrophosphate to form an antimicrobial agent; and (10) mixing a first flavor with a second flavor to form a third flavor. Thus, various oral care additives/agents can be formed that are known for tooth wintering, cleaning, antimicrobial, antibacterial, taste or other desired effects.

As noted above, the first strand component **210** is formed of the first plastic **211** and the second strand component **220** is formed of the second plastic **221**. In certain embodiments, each of the first and second plastics **211**, **221** is the same. In such embodiments, both of the first and second plastics **211**, **221** may be erodible by an etchant or neither of the first and second plastics **211**, **221** may be erodible by the etchant. However, in other embodiments the first and second plastics **211**, **221** are different. In one particular embodiment the first plastic **211** is erodible by an etchant and the second plastic

221 is chemically resistant by the etchant. Furthermore, in one embodiment the first plastic 211 is a polyester, such as polybutylene terephthalate (PBT), and the second plastic 221 is a polyamide, such as nylon. Of course, the invention is not to be limited by the particular materials that are used to form the first and second strand components 210, 220 unless so specified in the claims.

Referring now to FIGS. 3 and 4, a first strand component 310 and a second strand component 320 are illustrated as separate structures that have not been intertwined to form a spiral bristle. Thus, FIG. 3 does not illustrate a spiral bristle, but rather just the strand components 310, 320 that can be intertwined together to form a spiral bristle. In this embodiment each of the first and second strand components 310, 320 has a hexagonal transverse cross-sectional shape. Of course, as discussed above the invention is not to be so limited and the first and second strand components 310, 320 can take on any polygonal shape as desired. The first and second strand components 310, 320 may have the same polygonal shape in some embodiments and may each have a different polygonal shape in other embodiments.

Referring to FIGS. 5A and 5B, schematic illustrations are provided for spiral bristles. Specifically FIG. 5A depicts a spiral bristle 500 (the spirals of which are not illustrated for clarity) having a first end 501 and a free end 502. The free end 502 of the spiral bristle 500 is rounded. FIG. 5B depicts a spiral bristle 600 (the spirals of which are not illustrated for clarity) having a first end 601 and a free end 602. The free end 602 of the spiral bustle 600 is tapered. Specifically the spiral bristle 600 has a conical end portion 603 which includes the free end 602 and that decreases in transverse cross-sectional area moving toward the free end 602 of the spiral bristle 600. In the exemplified embodiment the spiral bristle 600 begins to taper at a distance from the first end 601 that is approximately one-third of the height of the spiral bristle 600, and the free end 602 of the spiral bristle 600 is pointed rather than rounded. The exact nature, degree, amount and location of the taper is not to be limiting of the present invention unless so specified in the claims. Either one or both of the spiral bristles 500, 600 can be used on the oral care implement 100 described above so that the spiral bristles can be rounded or tapered to achieve a desired cleaning result and mouth feel. The spiral bristles 500, 600 having rounded and tapered free ends 502, 602, respectively can be used as a part of the same tuft of bristles or different tufts of bristles on the same toothbrush head if desired.

In certain embodiments, the spiral bristle 600 having the tapered free end 602 can be formed by forming the first and second strand components of the spiral bristle 600 out of a plastic that is erodible by an etchant. In such embodiments, a chemical tapering process can be used to taper the spiral bristle 600 which includes dipping the spiral bristle 600 into an etchant to erode portions of the first and second strand components to taper the conical end portion 603 of the spiral bristle 600. Such a process leads to a conically tapering spiral bristle. In other embodiments, only one of the strand components may be formed of a plastic material that is erodible by an etchant and the other one of the strand components may be chemically resistant against the etchant. In such an embodiment the first strand component will erode and taper when dipped into an etchant and the second strand component will maintain its structure when dipped into the etchant. This can create a single spiral bristle that has one tapered strand component and one non-tapered strand component. This can be accomplished by forming the first strand component out of a pollster such as PBT and forming the second strand component out of a polyamide such as nylon, as described above. Although the tapering is described above as a chemical tapering, the invention is not to be so limited. In other embodiments, the spiral bristle 600 can be mechanically tapered by any means known in the art.

Referring now to FIG. 6, a spiral bristle 700 in accordance with another embodiment of the present invention will be described. The spiral bristle 700 comprises a first strand component 710, a second strand component 720 and a third strand component 730 that are intertwined together to form the spiral bristle 700. In certain embodiments, each of the first, second and third strand components 710, 720, 730 can be coextruded and intertwined together to form the spiral bristle 700. The first strand component 710 can include a first plastic 711 and a first oral care additive 712, the second strand component 720 can include a second plastic 721 and a second oral care additive 722, and the third strand component 730 can include a third plastic 731 and a third oral care additive 732. In certain embodiments, the third oral care additive 732 may be different than the first and second oral care additives 712, 722, which are also different from each other. Thus, the spiral bristle 700 may include three different oral care additives to provide three different benefits to a user. Of course, the invention is not to be so limited in all embodiments and in certain other embodiments one or more of the oral care additives on the different strand components can be the same, or one or more of the strand components maybe devoid of an oral care additive. Each of the first, second and third strand components 710, 720, 730 can be formed in the manner described above with regard to the spiral bristle 200.

Although not depicted, spiral bristles can also be formed having more than three strand components (i.e., four, five, six or more strand components), each of winch has a different oral care additive or any combination of the same and different oral care additives. Thus, using the inventive spiral bristles described herein, an oral care implement can be created that can dispense/release many different oral care additives into a user's oral cavity simultaneously. A combination of different two strand component (or more strand component) spiral bristles can be utilized on the same oral care implement head wherein each strand component has different oral care agents. For example, an oral care implement may include tooth cleaning elements disposed in transverse rows on the head. Each transverse row may include bristle tufts including spiral bristles such that the spiral bristles in one transverse now include different oral care additives than the spiral bristles in each other or each adjacent transverse row. A virtually unlimited number of different combinations of the spiral bristles described herein are possible.

Referring now to FIG. 7, another embodiment of a spiral bristle 800 is illustrated. The spiral bristle 800 has a first strand component 810 and a second strand component 820. Each of the first and second strand components 810, 820 are illustrated in different grayscale to illustrate that each of the first and second strand components 810, 820 can have different oral care additives therein. The oral care additive can be dispersed within the first and second strand components 810, 820 of the spiral bristle 800 in any of the manners discussed above. In this embodiment the spiral bristle 800 has a smooth continuous outer surface 803 despite being formed by two separate strand components 810, 820. Specifically, the first strand component 810 is formed with a recess 815 within which the second strand component 820 fits like a lock-and-key. Thus, the first and second strand components 810, 820 are complementarily shaped so that when coextruded or otherwise made to form the spiral bristle

800, the spiral bristle 800 has the smooth outer surface 815. Stated another way, the seams 816 between the first and second strand components 810, 820 are flush so that there are no bumps, ridges or the like at the region of interconnection between the first and second strand components 810, 820. This is achieved due to the complementary shapes of the first and second strand components 810, 820 and can be achieved by coextruding the first and second strand components 810, 820 to form the spiral bristle 800 in certain embodiments. Although illustrated as having a constant exterior diameter, in certain embodiments the spiral bristle 800 may be tapered such that the exterior diameter decreases from its base 801 to its tip 802, such as discussed above with reference to FIG. 5B.

In certain embodiments, various combinations of the different types of spiral bristles discussed above can be used on a single toothbrush head. Thus, screw-type spiral bristles comprising two strand components such as depicted in FIG. 2, screw-type spiral bristles comprising three strand components such as depicted in FIG. 6, and smooth surface spiral bristles such as depicted in FIG. 7 can be disposed on the same toothbrush head, either in the same tuft hole or in different tuft holes. Thus, various combinations of the different embodiments disclosed herein can be utilized in a single invention.

Furthermore, although the invention has been described herein with regard to an oral care implement having at least one bristle tuft having at least one spiral bristle, in certain embodiments the inventive concept described herein is the spiral bristle itself. Thus, the invention can simply be a spiral bristle including coextruded first and second strand components that are intertwined together wherein the first strand component comprises a first plastic and a first oral care additive and the second strand component comprises a second plastic and a second oral care additive, the second oral care additive being different than the first oral care additive.

As used throughout ranges are used as shorthand for describing each and every value that is within the range. Any value within the range can be selected as the terminus of the range. In addition, all references cited herein are hereby incorporated by referenced in their entireties. In the event of a conflict in a definition in the present disclosure and that of a cited reference, the present disclosure controls.

While the invention has been described with respect to specific examples including presently preferred modes of carrying out the invention, those skilled in the art will appreciate that there are numerous variations and permutations of the above described systems and techniques. It is to be understood that other embodiments may be utilized and structural and functional modifications may be made without departing from the scope of the present invention. Thus, the spirit and scope of the invention should be construed broadly as set forth in the appended claims.

What is claimed is:

1. An oral care implement comprising:

a handle;

a head coupled to the handle;

at least one bristle tuft extending from the head, the at least one bristle tuft comprising at least one spiral bristle comprising coextruded first and second strand components that are intertwined together to form the at least one spiral bristle;

the first strand component comprising a first plastic and a first oral care additive; and

the second strand component comprising a second plastic and a second oral care additive, wherein the first oral care additive is different than the second oral care additive.

2. The oral care implement according to claim **1** wherein each of the first and second plastics is erodible by an etchant.

3. The oral care implement according to claim **1** wherein the at least one spiral bristle has a conical end portion that decreases in transverse cross-sectional area moving toward a free end of the at least one spiral bristle.

4. The oral care implement according to claim **1** wherein the first and second plastics are different, and wherein the first plastic is erodible by an etchant and the second plastic is chemically resistant against the etchant.

5. The oral care implement according to claim **4** wherein the first plastic is a polyester and the second plastic is a polyamide.

6. The oral care implement according to claim **5** wherein the first plastic is PBT and the second plastic is nylon.

7. The oral care implement according to claim **1** wherein each of the first and second strand components has a polygonal transverse cross-section.

8. The oral care implement according to claim **1** wherein the first oral care additive is in the form of particles that are mixed into the first plastic; and wherein the second oral care additive is in the form of particles that are mixed into the second plastic.

9. The oral care implement according to claim **1** wherein the first oral care additive comprises a first agent and the second oral care additive comprises a second agent that is different than the first agent, wherein intermixing of the first and second agents produce a third agent.

10. The oral care implement according to claim **1** wherein each of the first and second oral care additives are selected from a group consisting of a mixture of pine tree extract and salt, a tea leaf extract, a pearl powder, a nephrite powder, a charcoal powder, and an antibacterial material.

11. The oral care implement according to claim **1** wherein the at least one spiral bristle further comprises a third strand component coextruded and intertwined with the first and second strand components, the third strand component comprising a third plastic and a third oral care additive, wherein the third oral care additive is different than the first and second oral care additives.

12. The oral care implement according to claim **1** wherein the first oral care additive is carried by a first carrier and the second oral care additive is carried by a second carrier, wherein the first carrier has a higher melting temperature than the first plastic and the second carrier has a higher melting temperature than the second plastic.

13. A spiral bristle for an oral care implement comprising:

first and second strand components that are intertwined together;

the first strand component comprising a first plastic and a first oral care additive; and

the second strand component comprising a second plastic and a second oral care additive, wherein the first oral care additive is different than the second oral care additive.

14. The spiral bristle according to claim **13** further comprising a third strand component coextruded and intertwined with the first and second strand components, the third strand component comprising a third plastic and a third oral care additive, wherein the third oral care additive is different than the first and second oral care additives.

15. The spiral bristle according to claim 13 wherein the spiral bristle comprises a conical end portion that decreases in transverse cross-sectional area moving toward a free end.

16. The spiral bristle according to claim 13 wherein the first oral care additive is in the form of particles that are mixed into the first plastic; and wherein the second oral care additive is in the form of particles that are mixed into the second plastic.

17. The spiral bristle according to claim 13 wherein the first oral care additive and the second oral care additive are releasable from the first and second plastics respectively when subject to saliva.

18. The spiral bristle according to claim 13 wherein the first oral care additive comprises a first agent and the second oral care additive comprises a second agent that is different than the first agent, wherein intermixing of the first and second agents produce a third agent.

19. The spiral bristle according to claim 13 wherein the first oral care additive is carried by a first carrier and the second oral care additive is carried by a second carrier.

20. The spiral bristle according to claim 19 wherein each of the first and second carriers is water-soluble.

21. The spiral bristle according to claim 19 wherein at least one of the first and second carriers comprises one or more capsules.

22. The spiral bristle according to claim 19 wherein at least one of the first and second carriers comprises one or more matrices.

23. An oral care implement comprising:

a handle;

a head coupled to the handle;

at least one bristle tuft extending from the head, the at least one bristle tuft comprising at least one spiral bristle comprising coextruded first and second strand components that are intertwined together to form the at least one spiral bristle;

the first strand component comprising a first plastic and a first oral care additive; and

the second strand component comprising a second plastic and being free of an oral care additive.

* * * * *