A brush suitable for use as part of a product dispensing container which includes various characteristics which provide desirable product performance during use.
BRUSH FOR USE WITH A COMPOSITION

CROSS REFERENCE TO RELATED APPLICATION(S)

[0001] This application claims priority to U.S. Provisional Application No. 61/490,133, filed May 26, 2011, the subject of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] Brushes of various materials and types have been known in the art. Brushes have been used to apply materials, smooth finishes, provide energy to surfaces, and the like. While there have been many uses of brushes, their basic design and configuration has remained fairly unchanged over time.

[0003] Cosmetic brushes are also prevalent within the brush industry. These are often used to apply compositions, including powders, liquids, and other forms of beautifying products, to the skin. Slave preparation brushes are also known in the brush industry. These brushes are used in combination with slave preparations to apply and “froth” these preparations by entraining air within the compositions. Many brushes, including cosmetic and shave preparation brushes, contain bristles made of natural hair products, such as badger or boar’s hair. These brushes may produce an odor that is considered to be unacceptable by many consumers. Moreover, these brushes typically entrain the product meant to be applied within the brush. This entrapment of product results in unsatisfactory application of product, waste of usable product, as well as an increased opportunity for bacteria buildup.

[0004] Further, dispensing containers with brushes have also been disclosed. See, e.g., U.S. Patent Publ. Nos. US2010/0239358A1, 2009/0263175; 2009/0263174; and 2005/0045200; and U.S. Pat. Nos. 6,003,523; 4,252,455; and 4,603,992.

[0005] There are many brushes on the market for various suggested uses. One type of brush which is commercially available is the shaving brush which has been widely used to prepare shave preparations for application onto skin prior to shaving. One problem with these types of brushes is how they deform under pressure, such as when the brush is applied against a surface such as skin, and a force there applied onto the brush. Many brushes may deform in an undesirable configuration, such as having bristles fold over or the entire brush bend to one side, or they may be undesirably stiff and/or create an unpleasant feel upon contact with skin. The present invention arrives at a specific embodiment where the combination of physical dimensions and bristle type allow for a desirable response when applied to a surface under pressure.

[0006] Many of these shaving brushes can also be used to actually generate lather from a bar of soap from a post foaming gel shave prep which can be dispensed from a pressurized container. These brushes can include stand alone brushes, as well as brushes which are used as part of product dispensing containers or systems. Many of these brushes, however, may not provide the desired medium to agitate and form a foaming composition, such as a shaving preparation. Further, many brushes may be somewhat messy when used to agitate and form the foaming composition. Another benefit desired of brushes is for a brush which has the right combination of characteristics to allow it to perform better during use, by creating less mess and facilitating distribution and delivery of any product better.

SUMMARY OF THE INVENTION

[0007] One aspect of the present invention provides for a brush comprising a base, and a plurality of bristles, said plurality of bristles having a distal end and a proximal end. When said distal end is attached to the base and said proximal end forms a skin contacting region; wherein said plurality of bristles have an average length from about 0.1 to about 2 inches; wherein said plurality of bristles comprises at least one bristle having a diameter of from about 0.001 inches to about 0.01 inches; wherein said plurality of bristles comprises at least one bristle comprising a material having a Young’s modulus of from about 0.2 GPa to about 9 GPa; and wherein said brush has a bristle concentration of from about 0.5 bristle per mm² to 25 bristles per mm² Without intending to be bound by theory, it is believed that this type of brush can provide improved characteristics such as bristle response when applied to a surface such as skin.

[0008] Another aspect of the present invention provides for a brush comprising: a base having a top surface comprising a non-flat region, and a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is attached to the top surface of said base and said proximal end forms a skin contacting region. In one aspect the non-flat region comprises a concave region, wherein said plurality of bristles comprises at least one crimped bristle, wherein at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.020 inch, wherein said crimped bristle has a crimp frequency of from about 3 to about 7 crimps per inch, and wherein said brush has a bristle concentration of from about 1 bristle per mm² to 25 bristles per mm². The bristles can be single tufted. Without intending to be bound by theory, it is believed that this type of brush can provide less mess due in part to the presence of the concave region as well as the crimped bristles. Further, it is believed that this type of brush can provide enhanced performance during use, including aspects of improved foaming when used with post foaming gels.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 illustrates a side planar view of a brush head in accordance with at least one embodiment of the present invention.

[0010] FIG. 2 illustrates the bottom view of the brush head shown in FIG. 1.

[0011] FIG. 3 illustrates a side planar view another brush head in accordance with at least one embodiment of the present invention.

[0012] FIG. 4 illustrates the bottom view of the brush head shown in FIG. 3.

[0013] FIG. 5 illustrates the top view of the brush head shown in FIG. 3.

[0014] FIG. 6 illustrates a side planar view another brush head in accordance with at least one embodiment of the present invention.

[0015] FIG. 7 illustrates an elevated perspective view of the brush head shown in FIG. 5.

[0016] FIG. 8 illustrates a side planar view another brush head in accordance with at least one embodiment of the present invention.
FIG. 9 illustrates an elevated perspective view of the brush head shown in FIG. 5.

FIG. 10 illustrates a top view of a dispensing tube which can be used in a brush head in accordance with the present invention.

FIG. 11 illustrates a top view of another dispensing tube which can be used in a brush head in accordance with the present invention.

FIG. 12a illustrates a brush having a top surface of the base which is flat.

FIG. 12b illustrates a brush having a top surface of the base which is concave.

FIGS. 13a and 13b illustrate two side views of brushes having non-flat surfaces forming concave regions.

FIG. 14 illustrates a crimped bristle extending out of a base.

FIG. 15 illustrates a side view of several different types of bristles.

DETAILED DESCRIPTION OF THE INVENTION

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm”.

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this written document conflicts with any meaning or definition of the term in a document incorporated by reference, the meaning or definition assigned to the term in this written document shall govern.

While the specification concludes with the claims particularly pointing and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description.

The devices, apparatuses, methods, components, and/or compositions of the present invention can include, consist essentially of, or consist of, the components of the present invention as well as other ingredients described herein. As used herein, “consisting essentially of” means that the devices, apparatuses, methods, components, and/or compositions may include additional ingredients, but only if the additional ingredients do not materially alter the basic and novel characteristics of the claimed devices, apparatuses, methods, components, and/or compositions.

All percentages and ratios used herein are by weight of the total composition and all measurements made are at 25°C, unless otherwise designated. A degree is a planar unit of angular measure equal in magnitude to 1/360 of a complete revolution.

All measurements used herein are in metric units unless otherwise specified.

As used herein, the term “substantially non-parallel” means that the objects compared have a difference in angle of at least about 15 degrees.

As used herein, the term “substantially parallel” means that the objects compared have a difference in angle of less than about 15 degrees.

As used herein, the term “substantially perpendicular” means that the objects compared are within about 15 degrees of from being perpendicular.

As used herein, the term “surface” means an area whereby the composition is capable of being applied. As it relates to shaving compositions, the surface relates to portions of the skin capable of growing hair, including the face, scalp, underarm, pubic area, and the like.

The current invention relates to a brush which can be used as stand alone brush or a brush head for use with a package for dispensing a product. The brush comprises a base; a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is attached to the base and said proximal end forms a skin contacting region; wherein said plurality of bristles have an average length of from about 0.1 to about 2 inches; wherein said plurality of bristles comprises at least one bristle having a diameter of from about 0.001 inches to about 0.01 inches; wherein said plurality of bristles comprises at least one bristle comprising a material having a young’s modulus of from about 0.2 GPa to about 9 GPa; and wherein said brush has a bristle concentration of from about 0.5 bristle per mm² to 25 bristles per mm². Without intending to be bound by theory, it is believed that a brush having the characteristics defined herein provides desirable response when applied to a surface under pressure which can be demonstrated by various attributes, including but not limited to feel on skin, bristle splaying when the brush is applied against a surface under pressure such that the bristles deform, and even surface treatment and potential cleaning or exfoliation. It is believed that this type of brush has specific characteristics including a desirable bristle length, bristle elastic modulus, bristle concentration and diameter, or bristle density to give the right combination of resistance and give to make it particularly useful for treating skin, particularly as a shaving brush, even more particularly as a brush head for a product dispensing container.

In another embodiment, the invention relates to a brush which can also be used as a stand alone brush or as part of a product dispensing package or system, said brush comprising: a base having a top surface comprising a non-flat region, and a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is attached to the top surface of said base and said proximal end forms a skin contacting region. In one aspect the non-flat region comprises a concave region, wherein said plurality of bristles comprises at least one crimped bristle, wherein the at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.020 inch, wherein said crimped bristle has a crimp frequency of from about 3 to about 7 crimps per inch, and wherein said brush has a bristle concentration of from about 1 bristle per mm² to 25 bristles per mm². Without intending to be bound by theory, it is believed that the concave region facilitates collection of any excess product which may travel down the bristles. Further, the concave region can provide greater flexibility in the bristles since more of the bristle could be exposed above the top surface compared to a flat surface. Depending on the specific degree of bristle density and concentration, however, the periphery of the concave surface can provide a collaring affect on the bristles, which may also be desirable. Further,
the crimped bristles are believed to facilitate foaming of foaming products such as post foaming shave preps because the crimps allow for more air to be mixed into the composition during agitation and contact.

[0038] Where the brush is used as part of a package for dispensing a product, a product dispensing tube can be included to deliver product from a pressurized reservoir into the brush through the base. In another embodiment, the brush can be removable or fixedly attached to a handle or holder which may not be part of a dispensing container. In one embodiment, the base of the brush may have an elongated shape which can act as a handle with various grip regions.

[0039] Without wishing to be bound by theory, it is believed that the bristle density being greater at the distal end than at the proximal end facilitates the transport of composition from the distal end to the proximal end of the bristles. This feature results in a brush that is easier to use, with reduce messiness. The brush of the present invention is also easier to clean, as only small amounts of composition are able to enter the distal end of the bristles, thus removing the need to remove these materials. As the proximal end is less dense, cleaning on this end is further facilitated by this end of the bristles.

[0040] Further, in one embodiment, the flow path is defined by a discrete region of low bristle population. A region of low bristle population means that within said discrete region, the number of bristles per area is measurably lower than the bristles per area surrounding at the distal end of the dispensing tube. In one embodiment, the number of bristles per area is at least about 20% less, alternatively at least about 40% less, alternatively at least about 50% less, alternatively at least about 75% less than the number of bristles per area surrounding the region. Bristle population can be calculated on by square mm or square cm of area. In one embodiment, the region of low bristle density is free or essentially free of bristles. By “essentially free of bristles” it is meant that no bristles are formed in the region. It will be understood by those in the art that bristles are flexible and can bend into the region intended as the flow path. Allowing bristles to bend into the flow path is within the scope of the invention. In one embodiment, the flow path maintains a substantially consistent shape from the base to the skin contacting region.

[0041] In one embodiment, the flow path also comprises one or more dispensing tubes which can extend for a portion of said flow path. In one embodiment the dispensing tube forms the portion of the flow path as it immediately exits the dispensing container and extends for some distance above the base but below the contacting region. Those of skill in the art will understand that the flow path can continue beyond the dispensing tube as the brush extends away from the base. Without intending to be bound by theory, it is believed by providing a flow path which is made of both a dispensing tube and a region of low bristle population, the brush head facilitates the transport of composition from the base to the skin contacting region. In one embodiment, the region of low bristle population is in fluid communication with said dispensing tube such that composition dispensed through said dispensing tube continues to travel the same general path away from the base. In one embodiment, the dispensing tube is made from an elastomeric material which is flexible, such as rubber.

[0042] In one embodiment, at least a portion of the dispensing tube can have an interior structure run for at least a portion of the length of the dispensing tube. Non-limiting examples of suitable interior structures includes one or more dividing walls, thereby creating two half circles within the tube, or three, or four passages within the dispensing tube. Without intending to be bound by theory, it is believed that providing said one or more dividing walls can help direct flow of the composition away from the base towards the exit orifice, ultimately towards the skin contact region of the brush head. In one embodiment, said one or more dividing walls can create a tube within a tube. This may be particularly useful if multiple types of compositions are used in the container.

Base

[0043] The base of the current invention can be made of any material capable of functionally attaching bristles. In one embodiment, the base is made from a material selected from plastic, metal, composites, porcelain, glass, or combinations thereof. One of ordinary skill would be readily able to select a material suitable for making a base.

[0044] The base of the current invention is functionally attached to the distal end of the plurality of bristles. One of ordinary skill recognizes that there are many attachment mechanisms that may be employed to fix the plurality of bristles to the base. It is contemplated that the bristles are attached to the base by mechanical, chemical, and/or heat based mechanisms. One of ordinary skill would readily know how to attach the bristles of the present invention to the base.

[0045] In one embodiment, the base is functionally attached to a container. The container of the present invention relates to any vessel that can hold a composition for an indefinite period of time. The container of the present invention may be made by any number of materials, including plastics, metals, and the like. The container contains any composition that is to be applied with the brush. In one embodiment, the brush is removable attached to the container. In such an embodiment, the composition is directly applied to the skin or the brush is placed in the composition within the container and applied to the surface.

[0046] An alternate embodiment of the base comprises a dispensing device. The dispensing device is fluidly attached to the base and capable of transmitting a composition outside of the container through the base between the plurality of bristles whereby the composition is capable of being applied to a surface. In one embodiment, the dispensing device is capable of dispensing the composition in a direction that is substantially parallel to the plurality of bristles. In an alternate embodiment, dispensing device is capable of dispensing the composition in a direction that is substantially non-parallel to the plurality of bristles. Moreover, the dispensing device is capable of dispensing the composition in a direction that is substantially perpendicular to the plurality of bristles. It is believed that when the composition is dispensed in a manner substantially perpendicular to the plurality of bristles, the delivery of the composition within the bristles of the brush becomes more uniform in addition to providing the composition additional air entrainment opportunities. Further, the transport of the composition through the plurality of bristles is aided by the bristle density driving the composition to the proximal end of the plurality of bristles, as well as the hydrophobic nature of the bristles.

Top Surface of Base

[0047] The base comprises a top surface which is functionally attached to the distal end of said plurality of bristles. In
one embodiment, the top surface has at least one region which is non-flat. This non-flat region can have a concave shape, a convex shape, or a combination there of, where the top surface can be wavy or otherwise rounded. In one embodiment the top surface forms a planar surface which is defined as a flat plane upon formed from the periphery of the base, upon which the brush would rest if it were inverted to rest on the top surface (in the absence of the non-flat region and the plurality of bristles). Those of skill in the art will understand that the top surface may not have a fully connected periphery. Further, in one embodiment where the top surface of the base is flat, the planar surface would be the same flat plane running through the top surface.

[0048] In one embodiment the concave shape forms a well having a maximum distance from the planar surface of from about 0.5 mm to about 25 mm, or from about 7 mm to about 20 mm, or from about 12 mm to about 17 mm, or from about 14 mm to about 15 mm. The depth of the well, as defined herein, is determined along the central axis of the brush from the deepest point of the well to the planar surface. Depending on the desired shape of the proximal end of the bristles (i.e. a rounded, flat, or tiered surface for contacting the surface to be treated) and the desired length(s) of the bristles, a concave shape can provide increase or decreased bristle flexibility. Because the concave shape forms a depression in the top surface from which the bristles extend, more of the bristle can be exposed if the bristle length and the brush shape are to be kept constant compared to a brush having a base with a flat surface. On the other hand, if the proportion of bristles extending above the base is kept constant (compared to a brush with base having a flat surface), the bristle may bend and deform similarly but portions of the well applying radial pressure onto the plurality of bristles may result in a collaring affect, making the plurality of bristles more resilient to deformation from contact to the surface.

[0049] The presence of a concave shape can also provide an additional benefit of forming a receiving region for any composition which may travel back down the bristles towards the base. This can be particularly desirable to minimize the occurrence of composition traveling down the brush back down into and over the base. Those of skill in the art will understand that the deeper the well, the more composition can be collected without spilling over. Deeper wells, however, can act as a collar around the bristles potentially restricting them from bending during contact with a treatment surface. If the depth of the well impacts the bending behavior of the bristles, the bristle length can be manipulated so the desired amount of bristle extends beyond the planar surface. For example, a deep well can be used in conjunction with longer bristles so more of the bristle resides above the planar surface. As such, the deep well can collect more material but the bristles can still bend more freely while minimizing the collaring affect.

[0050] In one embodiment, the non-flat region can form a convex shape which could bulge out of the planar surface. The convex shape can have a similar distance as the wells, described herein, except that the distance would extend away from the base, as opposed to into the base as for concave shapes. Convex shaped bases can also allow for greater bristle flexibility. For example, in comparison to a brush having a base with a flat top surface, a brush with similar length bristles and a base having a convex shaped top surface can have bristles which spread out more when at rest and can potentially also splay or flair out more when contacted against a surface. In another embodiment, if shorter bristles were used, and the shape of the brush were kept constant, the bristles could be made to be stiffer but still keep the same brush shape because the convex region allows for a shorter distance between the distal and proximal ends of the bristle.

[0051] Additionally, convex shapes can allow for shorter distances between the proximal end of the bristle to the distal end. Without intending to be bound by theory, it is believed that concave and convex shapes can be desirable for different intended end uses. For example, concave regions can allow for relatively longer bristles which can allow for more flexibility. Concave regions, however, can allow for shorter bristles. Where bristles are using having a uniform length, varying the non-flat region can allow differing amounts of the bristle to be embedded within the base, while keeping a desirable shape on the distal end (for example a flat distal end, or a rounded distal end). Those of skill in the art will understand that the selection of surface shape, bristle length, and brush shape can be varied to arrive at different brushes having different resilience to deformation from contact to a surface such as skin.

[0052] In one embodiment, the well can be shallow having a depth of from about 0.5 mm to about 8 mm, or from about 4 mm to 7 mm, or about 5 mm to about 6 mm. In another embodiment, the well can be deep, having a depth of from about 8 mm to about 20 mm, or from about 10 mm to about 15 mm, or about 11 mm to about 13 mm. Further, in one embodiment, the non-flat region can form one or more partial or whole concave or convex shaped rings about the center of the brush. The non-flat region can also form corrugated surface with the ridges and valleys running as parallel lines or in concentric circles.

Brush Shape

[0053] The brush of the present invention has a shape that facilitates usage, particularly on the face. In one embodiment, the outer shape of the cross-section of the brush, as defined by determining the cross-section of the bristles parallel to the base of the brush, is oblong in shape. By being oblong in shape, the cross-section has a first dimension that is longer than a second dimension, e.g., an overall length longer than the width. Oblong shapes include oval, oblong circles, rectangles, ellipse, and the like. In another embodiment, the outer shape of the cross-section of the brush is a circle, square, or regular polygon. It is contemplated that the corners of any polygon could be rounded. Other shapes, such as a "D" shape are also contemplated.

[0054] In one embodiment the proximal end of the brush is substantially parallel to the base. In an alternate embodiment, the proximal end of the brush comprises its highest bristles substantially in the center. The bristles then decrease in height from the center toward the edges in a curvilinear, stepped, angled, and/or arched manner. In one embodiment, the difference between the average height of the bristles in the center of the brush and the average height of the bristles on the edge of the brush is from about 0.1 inches to about 0.5 inches, in an alternate embodiment from about 0.1 inches to about 0.5 inches. It is believed that having bristles of decreasing height allows the user to vary the amount of bristles that contact the surface by varying the application force. Such a mechanism results in an increase in mechanical action, leading to increased lather generation by the brush.

[0055] It is also contemplated to have a substantially angled edge, such as a squared edge, on at least one portion of the
brush. Such an edge is capable of providing increased control of the brush action by being shaped to enter into tighter portions of a surface.

Bristles

[0056] The current invention includes a plurality of bristles. These the distal end of the plurality of bristles is functionally attached to the base. In one embodiment, at least one of said plurality of bristles comprises a hydrophobic material. In another embodiment, at least one of said plurality of bristles comprises hydrophilic material. In yet another embodiment, the plurality of bristles comprises a material selected from the group consisting of a hydrophobic material, a hydrophilic material, and a mixture thereof. Particularly preferred materials would be those which are hydrophobic, especially when the composition is water based. Without wishing to be bound by theory, it is believed that the hydrophobic nature of the plurality of bristles, in combination with the plurality of bristles having a greater bristle density at the distal end than at the proximal end, work synergistically to transport composition toward the proximal end of the plurality of bristles and onto a surface. This composition transport results in an improved brush usage experience as well as a more efficient and clean brush operation.

[0057] In one embodiment, any hydrophilic material is selected to make the plurality of bristles. Hydrophilic plastics are well suited for the current invention. In one embodiment, nylon is a hydrophilic plastic utilized for the plurality of bristles. In one embodiment, the hydrophilic material used to make at least a portion of said at least one bristle is selected from the group consisting of nylon, a natural hair (including but not limited to badger hair), polybutylene terephthalene, polyester, or polybutylene terephthalate. Other known natural or synthetic brush material may also be used.

[0058] Regarding the use of bristles, material and physical properties of bristles can impact brush performance, including skin feel and latherability, for example. In one embodiment, the bristle diameters are from about 0.001 to about 0.01 inches, in an alternate embodiment from about 0.002 to about 0.006 inches, in alternate embodiment from about 0.003 to about 0.004 inches. The bristles of the present invention have an average length of from about 0.1 to about 2 inches, or up to about 1.75 inches or up to about 1.3 inches, in an alternate embodiment from about 0.3 to about 1.0 inches, in an alternate embodiment from about 0.5 to about 0.9 inches. The sizing of the bristles should be such that the bristles should not fold over or collapse during use; while allowing the bristles to return to substantially their original shape. Individual bristles can have the same length or varying lengths. In one embodiment, at least one of said bristles has a length of from about 0.5 inches to about 2 inches, preferably from about 1.0 inch to about 1.8 inches, more preferably from about 1.3 inches to about 1.5 inches. The length of the bristle is measured as the distance of the bristle protruding out of the portion of the base from which it extends. Any portion of the bristle embedded within the base would not be measured in determining bristle length. Those of skill in the art will understand that the bristle may bend even in an at rest position. The bristle length, as defined herein is determined as a linear measurement of the bristle in an unstressed and generally straight orientation not accounting for any deformations along the bristle such as crimps. To measure bristle length, the bristle can be removed from the base and allowed to lay on a flat surface so any general curvature due to gravity or contact from other bristles is alleviated. The portion of the bristle which was embedded into the base is not considered, and the remainder of the bristle (from the base contacting distal end to the surface contacting proximal end is calculated as the length). Crimps and other intentional manufacturing deformations to the bristle are not taken into account when measuring bristle length.

[0059] In one embodiment, the brush comprises a recess at the skin contacting region of the brush similar to the cavity described in U.S. Patent No. 2005/0045200 to Zeunik. In one embodiment, the composition flow path extends from said base and discharges into said recess. The recess is a discrete region of the brush where the height of the underlying bristles is lower than the average length of the rest of the bristles forming the rest of the brush. As such, recess forms the brush is formed. Without intending to be bound by theory, it is believed that that allowing composition to travel from the container through the base and ultimately into the recess allows the user to dispense a desired amount of composition without fear that the composition will spill over or fall off the tip of the brush. In one embodiment, the recess is formed by crimping a plurality of said bristles such that they do not extend as far from the base as the bristles surrounding the recess. In another embodiment, the recess is formed by a combination of crimped bristles or relatively shorter bristles.

[0060] In one embodiment, the composition dispensing tube comprises a dispensing orifice which opens into the portion of said recess facing said base. The dispensing orifice can be formed by part of the dispensing tube or formed from the region of low bristle population. In one embodiment, the recess has a depth of from about 0.010 inch to about 1 inch, alternatively from about 0.05 inches to about 0.5 inches, alternatively from about 0.2 inches to about 0.4 inches. Those of skill in the art will understand that the dimensions of the recess can be varied as long as the recess can act to receive a volume of composition prior to contact with skin. In one embodiment, the recess has a shape which is selected from the group consisting of a circle, ellipse, oval, triangle, square, rectangle, star, moon, a letter or number, and so forth. In one embodiment, the shape of the recess is generally the same as the shape of the brush.

[0061] In one embodiment, the brush head had a central axis, and a cross sectional plane which is perpendicular to said central axis, wherein the cross sectional plane defines a recess cross section area and a brush cross section area, wherein the recess cross section area is from about 10% to about 75% of said brush cross section area, alternatively from about 25% to about 50%, alternatively from about 30% to about 40%.

[0062] In one embodiment, the plurality of bristles forms said fluid flow path. In one embodiment the fluid flow path comprises a dispensing tube, a region which is free or essentially free of bristles, or a combination thereof.

[0063] Various treatments of the proximal end of the plurality of bristles are contemplated for use with this brush. In one embodiment, end rounding, tipping, tapering, and the like are used to provide a user acceptable feel to the plurality of bristles.

[0064] It is contemplated that bristles of various hues and/or colors can be utilized within brush. For example, colors may serve the function of showing where bristles of increasing and/or decreasing hardness are. Colors may also be used to indicate brand, brand name, style, and/or other aesthetic
measures. Color may also be used to indicate the benefit of the associated composition, e.g., green bristles for indicating aloe, and the like.

Bristle Density

[0065] The brush of the present invention comprises a plurality of bristles, wherein the bristle density of the distal end is greater than the bristle density of the proximal end. The bristle density is determined by determining the sum of the cross-sectional area of the individual bristles and dividing it by the cross-section defined by the outermost bristles, which inherently includes void space between the bristles; then determining the percentage.

[0066] As an exemplary calculation, for a circular patch having a 0.2 inch radius containing 10,000 bristles, each bristle having a diameter of 0.002 inches, the bristle density would be calculated as follows:

\[
0.002 \text{ inch diameter}^2 = 0.0001 \text{ inch}^2
\]

\[
\text{(radius of one bristle)}
\]

\[
p \times 0.001 \times 2 = 0.00000314 \text{ inches}^2
\]

\[
\text{(cross-sectional area of one bristle) \rightarrow } p \times (\text{bristle radius}^2)
\]

\[
0.00000314 \times 10,000 = 0.0314 \text{ inches}^2
\]

\[
\text{(cross-sectional area of 10,000 bristles) \rightarrow } \pi \times (\text{cross-sectional area of single bristle}) \times \text{the total number of bristles}
\]

\[
\pi \times 0.2^2 = 0.126 \text{ inches}^2
\]

\[
\text{(total area including bristles and void areas) \rightarrow } \pi \times (\text{radius of circular patch}^2)
\]

\[
0.0314 \times 0.126^* = 0.00512 \times \text{25%}
\]

\[
\text{(bristle density \rightarrow cross-sectional area of 10,000 bristles) / total area}
\]

[0067] In one embodiment, the bristle density is greater at the distal end than it is at the proximal end. In one embodiment, the bristle density at the distal end of the plurality of bristles is from greater than 30 to about 80%, in an alternate embodiment from about 35 to about 70%, in an alternate embodiment from about 40 to about 60%, in an alternate embodiment from about 45 to about 55%. In one embodiment, the bristle density at the proximal end of the plurality of bristles is from 10 to at most 30%, in an alternate embodiment from about 15% to about 28%, in an alternate embodiment from about 19 to about 26%.

Bristle Concentration

[0069] In another embodiment, the brush has a bristle concentration of from about 0.5 bristle per mm² to 25 bristles per mm², or from about 1 bristle per mm² to about 10 bristles per mm². The bristle concentration, as defined herein, is a measure of the number of bristles per unit area (i.e., the cross section of the area formed by the outermost bristles). Whereas the bristle density considers the area of a bristle, the bristle concentration only considers the number of bristles in a given area.

[0070] In one embodiment, the brush can have a low bristle concentration, of from about 1 bristle per mm² to about 5 bristle per mm². In another embodiment, the brush can have a higher bristle concentration of from about 5 bristle per mm² to about 20 bristle per mm².

[0071] In another embodiment, the bristle concentration can vary as you travel from the distal end of the bristles to the proximal end. In one embodiment, the proximal end can form the largest cross section of the brush. In one embodiment, the brush comprises a bristle concentration ratio from distal end to proximal end of from about 1:1 to about 20:1, or from about 1:1:1 to about 5:1, or from about 1:5:1 to about 4:1, or from about 1:8:1 to about 2.5:1.

[0072] In another embodiment, however, the largest cross section of the brush can be somewhere between the distal and the proximal ends. In this embodiment, the bristles would be curved so they bow out somewhere between the ends of the bristles. A similar bristle concentration ratio can exist but this would be from distal end to the widest cross section.

[0073] In one embodiment, the bristle concentration at distal end can be 5,000 bristles per an area of 1860 mm² resulting in a bristle concentration of 2.69 bristles per mm². The bristle concentration at the widest cross section can be 5,000 bristles per an area of 4,400 mm², resulting in a bristle concentration of 1.14 bristles per mm². The ratio of bristle concentration from distal end to widest cross section would thus be 2.4:1.

[0074] In one embodiment, the bristle concentration at distal end can be 25,000 bristles per an area of 1860 mm² resulting in a bristle concentration of 13.44 bristles per mm². The bristle concentration at the widest cross section can be 25,000 bristles per an area of 4,400 mm², resulting in a bristle concentration of 5.68 bristles per mm². The ratio of bristle concentration from distal end to widest cross section would thus be 2.4:1.

Crimped Bristles

[0076] One mechanism to create additional voids within the bristles is to splay or flair out the bristles. In one embodiment, splay is created by utilizing wavy or crimped bristles as at least part of the plurality of bristles. Crimped bristles are bristles having a substantially periodic waveform with a crimp depth (peak to peak amplitude, from peak to trough) and crimp frequency. The crimped bristle comprises a crimp depth from about 0.005 inch to about 0.03 inches, alternatively from about 0.010 inch to about 0.020 inch. The crimped bristles comprise a crimp frequency of from about 2 to about 10 crimps per inch, alternatively from about 3 to about 7 crimp per inch.

[0077] Without wishing to be bound by theory it is believed that the larger space between crimped bristles allows each bristle to fluctuate further when the brush is being rubbed against the intended surface. This space allows the bristles to provide increased mechanical action and enhances the aeration of the composition. When used with a shaving composition, this mechanical action creates additional lather, lifts the hair on the surface for easier cutting, and aids exfoliation of the skin.

Bristle Composition

[0078] In one embodiment, the bristles are made of a composition which is flexible yet resilient to allow for repeated
uses. In one embodiment, the bristle comprises a material having a young’s modulus of from about 0.2 GPa to about 9 GPa, or from about 1 GPa to about 5 GPa, or from about 2 GPa to about 4 GPa. Where stiffer brushes or portions of the brush are desired a bristle comprising a material having a young’s modulus of from about 4 GPa to about 9 GPa can be used. Where softer more pliable brushes or portions of the brush are used, the material can have a young’s modulus from about 0.2 GPa to about 4 GPa. In another embodiment, the brush comprises varying types of bristles which can be grouped into various regions. For example, in one region of the bristles can include the stiffer bristles, such as around the outer edges of the brush. Another region of the bristles can have a group of softer or more pliable bristles. This region of bristles could be located towards the center of the brush. In another embodiment the stiffer or softer regions of bristles can be used to form one or more rings in the brush, concentric or not.

Another embodiment of the present invention provides for a brush, wherein the plurality of bristles comprises a bristle resistance of from about 1 to about 6 grams. Yet another embodiment provides for brush, wherein the plurality of bristles is hydrophobic and can be made of nylon or polybutylene terephthalate (PBT).

Bristle Tip

In one embodiment, at least one of said bristles comprises a tapered or rounded tip. Non treated bristles can also be included. In one embodiment, the plurality of bristles comprises any combination of tapered, rounded or untreated bristles. The tapered end would be one where the cross section of the bristle gradually decreases as it approaches the proximal end. For example, in one embodiment, a tapered bristle has a gradual decrease in the cross section of the bristle starting at about 10 mm from the terminal end of the bristle, or about 6 mm, or about 3 mm. Without intending to be bound by theory, it is believed that the longer the tapering, the softer the bristle may feel when placed in contact with skin. A rounded end would be one where the edges of the proximal end of the bristle are rounded.

In one embodiment, the tapered bristle is made of polybutylene terephthalate. Non-limiting examples of commercially available tapered bristles from various bristle suppliers such as Tae Geuk Corp. of South Korea, Tony Microfilaments which markets Acra sharp tapered bristles, Cixi Jieda Nanometer Compound Materials Co. of China which markets polyester tapered bristles, and Samyang PBT Manufacturing Company of Korea which markets PBT Tapered bristles made up of PBT Monofilaments. In another embodiment, where a rounded tip bristle is desired, the bristle can be made of nylon or PBT.

Bristle Placement

In one embodiment, the plurality of bristles can be grouped as a single tuft. A tuft of bristles, as defined herein is a region where the bristles are placed together or in close proximity. In another embodiment, the plurality of bristles are grouped into more than one tuft, for example from about 4 to about 100 tufts. These tufts can be separated by regions of the base where no bristles are placed. Non-limiting examples of brushes having multiple tufts are available in US2009263174A1 at Fig. 1 and US2009263174A1 at Fig. 1. An example of a brush having a single tuft is disclosed in US2010/0239358A1 at Fig. 7.

Without intending to be bound by theory, it is believed that multi-tufted brushes can create voids between the tufts where composition can run down and collect. In certain embodiments, where multi-tufting of bristles is combined with a concave region on the non-flat surface of the base, the gaps can actually be used in combination with the well to more discretely collect any excess composition which may travel down the bristles towards the base during or after use.

In comparison, a brush having a single tuft may not have these voids where the composition will travel down and collect. Further, where the bristle density of the distal end is greater than the bristle density of the proximal end, the lower bristle density towards the proximal end may help drive composition towards the portion of the brush which is used as a contacting surface.

Composition

The composition of the present invention comprises any composition capable of being applied and/or distributed with a brush. In one embodiment, the compositions of the present invention include personal care compositions, including cosmetics, lotions, body washes, shampoos, shave preparations including but not limited to gels, foams, oils, sprays aerosol and non-aerosol formulations, and creams, and the like. Additional exemplary compositions which can be used also include: hair conditioners or treatments, hair, body or surface cleansers, exfoliants, and skin treatment preparations (acne, anti-aging, sun protection, etc.) and possibly anti-perspirants or deodorants. Examples of these and other suitable compositions are known in the art and are available commercially. The compositions may further comprise aerosol, pressurized gas, mechanically pressurized, and/or non-pressurized compositions. Shave preparations of the gel, foam, and creamy types are also contemplated.

Exemplary brush heads for use with composition dispensing devices are illustrated in Figs. 1-9. For Figs. 1-2 the brush heads 100 has a plurality of bristles 102 and a base 104. The bristles form a skin contact region 129 which is opposite said base. In the illustrated embodiment, the brush 100 comprises a dispensing tube 106 that is fluidly connected to the base 104 and capable of transmitting a composition outside of the container through the base 104 between the plurality of bristles 132. Composition flowing through said dispensing tube and the region of the plurality of bristles forms the flow path 130. Although Fig. 1 shows the dispensing tube flowing into the brush, the fluid flow path can be made entirely of the region of bristles. In one embodiment, the region of bristles 132 is a region of low bristle population as defined above. The dispensing devise 106 comprises at least one entrance orifice 112 and at least one exit orifice 108. Stabilizers 110 can be utilized to secure the base 104 of the brush 100 to a container (not shown).

Fig. 3 shows another embodiment, where the dispensing tube comprises a central axis 140. At least a portion of said dispensing tube is not parallel to said central axis. In one embodiment, a portion of the dispensing tube forms an angle of from about 0° to about 90°, or from about 30° to about 60, or about 45°, with said central axis. The dispensing tube shown in Fig. 3 includes two dispensing arms 136 which form roughly 90° with said central axis. In one embodiment, more than two dispensing arms are included. Further, the dispensing tube can also include additional exit orifice 138 which can be positioned anywhere along said dispensing tube.
such that composition dispensed will be able to travel through said brush. As explained above, when a dispensing tube is provided in the brush, the area above said dispensing tube would typically be free of any bristles. In FIG. 3, the area above said dispensing arms would be free of bristles because any bristles formed there below would need to be pushed out of the way to accommodate the dispensing arms. As such, the skin contacting region can have a region of low bristle population 120 generally above the dispensing tube and/or dispensing arms. The bristle density at the proximal end would still be lower than the bristle density at the distal end. FIG. 4 shows a bottom view of the brush head of FIG. 3. FIG. 5 shows a top view of that same brush head, showing the region of low bristle population 120 being visible from the top and potentially exposing said dispensing arms and/or dispensing tube.

The crimp depth 236 can be about 0.55 mm+0.15 mm. The frequency of crimps can be 5 crimps per inch.

FIG. 15 illustrates a side view of four different types of bristles. Bristle 230 has an untreated tip. Bristle 231 has a tapered tip where the length of tapering can be about 6 mm+1 mm. Bristle 232 has a more rounded tapered tip. Bristle 233 has a rounded tip. One or both ends of the bristles can be treated by any one of the these treatment methods.

Another embodiment of the present invention provides for a brush for providing a composition to a surface comprising: a base; a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is functionally attached to the base; wherein the distal end has a bristle density less than 55 bristles per square inch. FIG. 6 further shows an example of a crystal lattice structure 212. The base can be an article such as a toilet paper roll configuration.

Another embodiment of the present invention provides for a brush, wherein the distal end has a bristle density from about 55% to about 45% or from about 10% to about 50%. Another embodiment of the present invention provides for a brush, wherein the plurality of bristles comprises at least one crimped bristle. Another embodiment of the present invention provides for a brush, wherein the at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.030 inch and a crimp frequency of from about 3 to about 7 crimps per inch.
numerical limitations were expressly written herein. Every minimum numerical limitation given throughout this specification will include every higher numerical limitation, as if such higher numerical limitations were expressly written herein. Every numerical range given throughout this specification will include every narrower numerical range that falls within such broader numerical range, as if such narrower numerical ranges were all expressly written herein.

[0103] All documents cited in the Detailed Description of the invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this written document conflicts with any meaning or definition of the term in a document incorporated by reference, the meaning or definition assigned to the term in this written document shall govern.

[0104] While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:
1. A brush comprising:
   a) a base, and
   b) a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is attached to the base and said proximal end forms a skin contacting region;
   c) wherein said plurality of bristles have an average length of from about 0.1 to about 2 inches;
   d) wherein said plurality of bristles comprises at least one bristle having a diameter of from about 0.001 inches to about 0.01 inches;
   e) wherein said plurality of bristles comprises at least one bristle comprising a material having a young’s modulus of from about 0.2 GPa to about 9 GPa;
   f) wherein said brush has a bristle concentration of from about 0.5 bristle per mm² to 25 bristles per mm²;
   g) wherein said brush forms a brush head which is operably attached to a product dispensing container including a composition, and
   h) wherein said brush comprises a dispensing tube in fluid communication with the product dispensing container and the brush.

2. The brush of claim 1, further comprising a bristle concentration ratio from distal end to proximal end of from about 1:1 to about 20:1.

3. The brush of claim 2, wherein said the cross sectional area of the plurality of bristles is not largest at the proximal end.

4. The brush of claim 1, wherein the plurality of bristles comprises at least one crimped bristle.

5. The brush of claim 4, wherein the at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.020 inch.

6. The brush of claim 5, wherein said crimped bristle has a crimp frequency of from about 3 to about 7 crimps per inch.

7. The brush of claim 1, wherein said plurality of bristles forms a recess having a depth of from about 0.010 inch to about 1 inch.

8. The brush of claim 1, wherein at least one of said plurality of bristles comprises a material selected from the group consisting of: nylon, a natural hair, polybutylene terephthalate, polyester, polybutylene terephthalate, and mixtures thereof.

9. The brush of claim 1, wherein the compositions is selected from the group consisting of: cosmetics, lotions, body washes, shampoos, shave preparations, and mixtures thereof.

10. The brush of claim 1, wherein at least one of said bristles comprises a tapered tip at the proximal end.

11. The brush of claim 1, wherein at least one of said bristles comprises a rounded tip at the proximal end.

12. A brush comprising:
   a) a base having a top surface comprising a non-flat region, and
   b) a plurality of bristles, said plurality of bristles having a distal end and a proximal end, wherein said distal end is attached to the top surface of said base and said proximal end forms a skin contacting region.

13. The brush of claim 12, wherein said non-flat region comprises a concave region, a convex region, or a combination there.

14. The brush of claim 12, wherein the non-flat region has a depth of from about 0.5 mm to about 25 mm.

15. The brush of claim 12, wherein said plurality of bristles comprises at least one crimped bristle.

16. The brush of claim 15, wherein the at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.020 inch.

17. The brush of claim 15, wherein said crimped bristle has a crimp frequency of from about 3 to about 7 crimps per inch.

18. The brush of claim 15, wherein said brush has a bristle concentration of from about 1 bristle per mm² to 25 bristles per mm².

19. The brush of claim 12, wherein said non-flat region comprises a concave region, wherein said plurality of bristles comprises at least one crimped bristle, wherein the at least one crimped bristle comprises a crimp depth from about 0.010 inch to about 0.020 inch, wherein said crimped bristle has a crimp frequency of from about 3 to about 7 crimps per inch, and wherein said brush has a bristle concentration of from about 1 bristle per mm² to 25 bristles per mm².

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