A cosmetics brush has an applicator rod with a molded polymer applicator core at the distal end thereof, the applicator core having a substantially circular cross-sectional shape, a plurality of spaced apart tuft-receiving blind openings, and there may be multiple rows and spirals. The bristle tufts may have different bristle fibers.
INSERTED BRISTLE COSMETICS BRUSH

RELATED APPLICATION

[0001] This application claims priority to my U.S. Provisional Application Ser. No. 60/844,151, filed Sep. 11, 2006.

BACKGROUND OF INVENTION

[0002] The invention herein relates to cosmetics brushes, and particularly to mascara brushes with inserted bristle construction that permits wide flexibility in design parameters and improved performance.

[0003] Cosmetics applicators, and particularly mascara brushes, have primarily been made in one of two types of construction. By far, the majority of mascara brushes are made with a twisted wire core that captures bristle fibers. Bristles are thereby deployed in a double helix extending from the twisted wire core. Enhancements have been realized by selection of bristle size and material, the number of bristles, mixtures of bristles, and a wide variety of trim options, but twisted wire brushes still have the underlying limitation of a fixed helical deployment of the selected bristles.

[0004] The other basic type of construction is molding the entire brush, including the bristles. This is expensive and not entirely successful, particularly in providing desirable characteristics of the bristles. There have also been proposals to provide cosmetics brushes by inserting bristles into an applicator rod; however, this has not resulted in a commercially acceptable brush.

[0005] Accordingly, there is a need for improved cosmetics brushes, and especially mascara brushes, that avoid the design limitations of twisted wire brushes as well as the limitations inherent in molded bristle brushes.

SUMMARY OF THE INVENTION

[0006] It is a principal object of the invention herein to provide an improved cosmetics brush, and particularly an improved mascara brush.

[0007] It is a further object of the invention herein to provide an improved cosmetics brush, and particularly a mascara brush, that achieves flexibility in selecting design parameters.

[0008] In carrying out the foregoing objects of the invention herein, cosmetics brushes include an applicator rod having an applicator core at distal end thereof, the applicator core having a substantially circular cross sectional shape, and a plurality of tuft-receiving blind openings formed in the applicator core at selected locations. A plurality of bristle tufts, each formed of a plurality of bristle fibers folded into a U-shaped configuration under an anchor, are respectively received in the tuft-receiving blind openings formed in the applicator core. The anchors are embedded in the applicator core across the tuft-receiving openings to hold the bristle tufts therein.

[0009] According to further aspects of the invention, at least some of the tuft-receiving blind openings are offset from nearby blind openings along the axis of the applicator core. Blind openings may be provided in rows along the applicator stem, and openings for two, three, four, six, eight or any other number of rows of bristle tufts may be provided. The rows may be evenly spaced about the applicator core, or may be grouped and/or separated. The positioning of tuft-receiving openings and bristle tufts is not limited to rows; however, rows are advantageous by forming longitudinal channels therebetween that accumulate mascara or other cosmetics products.

[0010] The bristle tufts may be configured in a spiral path, wherein the pitch of the spiral is selected for good product application. Multiple spiral paths of bristle tufts may be deployed on the applicator core, and the multiple spiral paths may have independent pitches, pitches that vary along the length of the paths, opposite pitches, or any other selected configuration. In one aspect, spiral paths may cross.

[0011] The tuft-receiving blind openings may be deployed in varying density or proximity, to achieve a greater density and proximity of bristle tufts in selected areas of a cosmetics brush. The depth of the tuft-receiving openings is approximately twice the diameter thereof.

[0012] In further aspects of the invention, bristle fibers made of various selected materials and sizes may be utilized for the bristle tufts, and bristle tufts having selected number of bristles are also provided. Different material, size and number of bristle fiber may be utilized for the bristle tufts in different tuft-receiving openings, including in adjacent tuft-receiving openings.

[0013] In further aspects of the invention, the tuft-receiving blind openings may be shaped to provide a desired configuration of the extending bristle tufts. The openings may be molded, machined, cut by EDM techniques, or otherwise formed in the applicator core. This aspect of the invention may be utilized to provide a mascara brush with bristle tufts in an application deployment and further bristle tufts in a combing deployment.

[0014] The foregoing and other objects and aspects of the invention will in part be recognized by those skilled in the art and will in part appear from the following description of the preferred embodiments and the claims, taken together with the drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0015] FIG. 1 is a perspective view of a cosmetics brush, namely a mascara brush, according to the invention herein;

[0016] FIG. 2 is a perspective view of the applicator rod and applicator core of the mascara brush of FIG. 1;

[0017] FIG. 3 is a side elevation view of the mascara brush of FIG. 1;

[0018] FIG. 4 is a side elevation view, partially in section and partially cutaway, of the applicator rod and applicator core of the mascara brush of FIG. 1, in the orientation of the mascara brush as shown in FIG. 3;

[0019] FIG. 5 is a side elevation view of the mascara brush of FIG. 1, rotated 90 degrees from the orientation of the mascara brush as shown in FIG. 3;

[0020] FIG. 6 is a side elevation view, partially cut away, of the applicator rod and applicator core of the mascara brush of FIG. 1, in to the orientation of the mascara brush as shown in FIG. 5;

[0021] FIG. 7 is an end view of the mascara brush of FIG. 1 in the orientation of the mascara brush as shown in FIG. 3;

[0022] FIG. 8 is an enlarged cross sectional view of the applicator core of the mascara brush of FIG. 1, taken along the lines 8-8 of FIG. 4;

[0023] FIG. 9 is an enlarged fragmentary view of the mascara brush of FIG. 1, being assembled;

[0024] FIG. 10 is a fragmentary view of the mascara brush of FIG. 1, showing a mounted bristle tuft;
FIG. 11 is a fragmentary sectional view of the mascara brush of FIG. 1, taken along the lines 11-11 of FIG. 10;

FIG. 12 is a perspective view of a wiper for the mascara brush of FIG. 1;

FIG. 13 is a bottom view of the wiper of FIG. 12;

FIG. 14 is a sectional view of the wiper of FIG. 12, taken along the lines 14-14 of FIG. 13;

FIG. 15 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 16 is a side elevation view of the mascara brush of FIG. 15;

FIG. 17 is a side elevation view of the applicator rod and applicator core of the mascara brush of FIG. 15, in the orientation of the mascara brush as shown in FIG. 16;

FIG. 18 is a side elevation view of the mascara brush of FIG. 15, shown rotated 90 degrees from the orientation of the mascara brush as shown in FIG. 16;

FIG. 19 is a side elevation view, partially cut away, of the applicator rod and applicator core of the mascara brush of FIG. 15, in the orientation of the mascara brush as shown in FIG. 18;

FIG. 20 is an end view of the mascara brush of FIG. 15 in the orientation of the mascara brush as shown in FIG. 16;

FIG. 21 is a cross sectional view of the applicator core of the mascara brush of FIG. 15, taken along the lines 21-21 of FIG. 17;

FIG. 22 is a perspective view of a wiper for the mascara brush of FIG. 15;

FIG. 23 is a bottom view of the wiper of FIG. 22;

FIG. 24 is a sectional view of the wiper of FIG. 22, taken along the lines 24-24 of FIG. 23;

FIG. 25 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 26 is a fragmentary perspective view of the mascara brush of FIG. 25 being assembled;

FIG. 27 is a side elevation view of the mascara brush of FIG. 25;

FIG. 28 is an end view of the mascara brush of FIG. 25;

FIG. 29 is a top fragmentary view of the applicator rod and applicator core of the mascara brush of FIG. 25;

FIG. 30 is a bottom fragmentary view of the applicator rod and applicator core of the mascara brush of FIG. 25;

FIG. 31 is a sectional view of the applicator rod of the mascara brush of FIG. 25, taken along the lines 31-31 of FIG. 29;

FIG. 32 is a perspective view of a wiper for the mascara brush of FIG. 25;

FIG. 33 is a bottom view of the wiper of FIG. 32;

FIG. 34 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 35 is a side elevation view of the mascara brush of FIG. 34;

FIG. 36 is another side elevation view of the mascara brush of FIG. 34, rotated 90 degrees from the orientation of the mascara brush shown in FIG. 35;

FIG. 37 is an end view of the mascara brush of FIG. 34;

FIG. 38 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 39 is a side elevation view of the mascara brush of FIG. 38;

FIG. 40 is a side elevation view of the mascara brush of FIG. 38, rotated 90 degrees from the orientation of the mascara brush shown in FIG. 39;

FIG. 41 is an end view of the mascara brush of FIG. 38;

FIG. 42 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 43 is a side elevation view of the mascara brush of FIG. 42;

FIG. 44 is a side elevation view of the mascara brush of FIG. 42, rotated 90 degrees from the orientation of the mascara brush shown in FIG. 43;

FIG. 45 is an end view of the mascara brush of FIG. 42;

FIG. 46 is a perspective view of another cosmetics brush, namely a mascara brush, according to the invention herein;

FIG. 47 is a side elevation view of the mascara brush of FIG. 46;

FIG. 48 is an end view of the mascara brush of FIG. 46;

FIG. 49 is a fragmentary sectional view of the mascara brush of FIG. 46, taken along the lines 49-49 of FIG. 48;

FIG. 50 is a fragmentary sectional view of the mascara brush of FIG. 46, taken along the lines 50-50 of FIG. 48; and

FIG. 51 is a fragmentary sectional view of the mascara brush of FIG. 46, taken along the lines 51-51 of FIG. 46.

The same reference numerals refer to the same elements throughout the various Figures.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference to FIGS. 1-11, a cosmetics brush 10, which is more particularly a mascara brush, generally comprises an applicator rod 12 extending from a head 14 to an applicator core 16 at the distal end of the applicator rod 12, with a plurality of bristle tufts 20 inserted and secured in the applicator core 16. With reference to FIGS. 3, 5 and 7, the bristle tufts 20 are arranged in six rows 22-27 extending along the axis of the applicator rod 12 and applicator core 16. The applicator core 16 is characterized by a substantially circular cross sectional shape, permitting multiple design options in positioning the bristle tufts 20, as will become apparent from the description of the mascara brush 10 and the other cosmetics applicators/mascara brushes described below.

With reference to FIGS. 2, 4, 6 and 8, the applicator rod 12 and the head 14 are integrally molded, with the head 14 being sized for insertion into the cap of a cosmetics package, as is well known in the art. The head 14 may be of any desired configuration to mount to a cap, and the head 14 may be a simple rod end for insertion in an opening in a cap. The applicator core 16 is preferably integral with the applicator rod 12, the applicator core 16 being the distal portion of the applicator rod 12 having bristle tufts 20 secured in
tuft-receiving blind openings 34 formed therein. The applicator core 16 may also be molded as a separate piece and attached to the applicator rod 12, if desired. The preferred materials for the applicator core 16 are polypropylene, acetal, ABS, PVC and nylon, and acetal and polypropylene are, for instance, well adapted for the formation of the tuft-receiving blind openings 34 and for receiving and retaining the bristle tufts 20 therein. The materials for the applicator rod 12 and applicator core 16 are, of course, the same when the applicator rod 12 and applicator core 16 are integral, and may be any desired moldable material if the applicator rod 12 and applicator core 16 are formed in individual parts. The applicator core 16 has a substantially circular cross-sectional shape and a diameter Dp of 0.141 inches (3.58 mm), and may be in a range of from about 0.12 inches (3.04 mm) to about 0.19 inches (4.83 mm).

[0069] The rows 22-27 of bristle tufts 20 are spaced at 60 degree intervals about the applicator core 16, as best seen in FIG. 7. Two of the rows 24 and 27 have ten bristle tufts 20, and the remaining rows 22, 23, 25 and 26 have nine bristle tufts 20. The bristle tufts 20 of each of the rows are staggered or axially offset with respect to the bristle tufts 20 of adjacent rows as best seen from the offsets O in the positions of the tuft-receiving blind openings 34 shown in FIGS. 4 and 6 and more fully set forth below. This achieves a uniform distribution of bristles about and along the applicator core 16.

[0070] With reference to FIGS. 9-11, each bristle tuft 20 is formed of a plurality of bristle fibers 30 which are folded under an anchor 32 into a U-shaped configuration and inserted in a blind opening 34 formed in the applicator core 16. The anchor 32 seats in the applicator core 16 across the blind opening 34 and clamps the bristle fibers to the bottom of the blind opening 34, to secure the bristle tuft 20 in the applicator core 16. Because of the U-shaped configuration of the bristle fibers 30, each bristle fiber 30 forms two bristles 36 of a bristle tuft 20, each bristle 36 having a bristle end or tip 38.

[0071] With reference to FIGS. 10 and 11, one of the openings 34 having a bristle tuft 20 mounted therein is shown. The opening 34 is formed radially in the applicator core 16, which has a circular cross section with a diameter Dp of 0.141 inches (3.58 mm). The opening 34 has a diameter Dp of 0.031 inches (0.80 mm) and a depth Dp of approximately 0.062 inches (1.6 mm). It is preferred that the opening 34 have a depth Dp of approximately twice the diameter Dp thereof, for holding the bristle fibers 30 and anchor 32.

[0072] The openings 34 may be formed in the applicator core 16 in one of several ways. First, the openings 34 may be formed as a part of the molding process when the applicator core 16 is molded, and the applicator core 16 and openings 34 of mascara brush 10 are formed by molding. This has the advantage of providing pre-formed openings that are available for inserting bristle tufts 20, thus eliminating an additional step of forming the openings immediately prior to inserting bristle tufts 20. However, molds for forming an applicator core 16 with openings 34 molded therein are expensive and provide pre-selected fixed locations of the openings 34, such that forming the openings 34 by a molding process is generally cost effective only when a large number of mascara brushes of a particular design will be manufactured. A second way of forming the openings 34 is by machining or drilling, and the openings 34 can be drilled by processing machinery that is also used in inserting the bristle tufts. The processing machinery generally has to operate at lower speeds when a drilling step is included, with a consequent lower production rate; however, the positions of the openings can be programmed and hence easily adjusted, such that drilling the openings permits making mascara brushes of various designs without investment in multiple molds. As a variation of drilling, the openings can also be performed by hot electrode cutting techniques, also known as EDM, which have the further advantage of achieving openings of various shapes.

[0073] With reference to FIGS. 9-11, the bristle tufts 20 of mascara brush 10 are formed from bristle fibers 30 that are folded into a U-shaped configuration, wherein each individual fiber forms two bristles 36 with the bristle ends 38. In the mascara brush 10, the bristles are 0.006 inch diameter hollow nylon fiber, and seven bristle fibers 30 are used to provide fourteen bristles 36 per bristle tuft 20. A tolerance of ±1 bristle fiber per opening is acceptable. Seven fibers and fourteen bristles result in a moderately bushy bristle tuft, with some flaring. The anchor 32 secures the bristle fibers to the bottom of the blind opening 34, so the opening 34 accommodates from a few bristles to as many as can be packed in. It will, therefore, be understood that bristles of various sizes and materials may be utilized with the selection of bristle size and material and the number of bristles being made to work with particular cosmetic product formulations. For instance, nylon, polypropylene, ECT or other polymers, and steel, hair and other natural fibers may be used as bristle material. The bristle fibers may be solid, hollow, wavy, grooved or have any other configuration now known or yet to be developed, and may be further modified such as by having milled or split bristle ends. The bristle fibers may be thin, e.g. on the order of 0.0025 inches, or may be thick, e.g. on the order of 0.010 inches or more.

[0074] The bristle fibers and number of bristles in each bristle tuft may be varied from opening 34 to opening 34. Thus, the bristle tufts 20 in each row 22-28 of bristle tufts 20 may have a different makeup along the row. Also, the makeup of the bristle tufts 20 may be varied from row to row. Additionally, differing bristle tufts 20 may be provided in different areas or zones of the applicator core 16. The ability to select the characteristics of each bristle tuft and to place selected bristle tufts in desired locations on the applicator core 16 is a major improvement over twisted wire brushes.

[0075] Still referring to FIGS. 9-11, the bristle fibers 30 forming the bristle tufts 20 are held in the openings 34 by a corresponding plurality of anchors 32. Anchors 32 are preferably cut from brass ribbon stock, and have a rectilinear shape with dimensions of about 0.0393 inches (1 mm) in height H, 0.046 inches (1.168 mm) in length L, and 0.0059 inches (0.15 mm) in thickness T when used with an opening 34 having a diameter of 0.031 inches (0.78 mm) and depth of 0.062 inches (1.6 mm). Thus, each end of the anchor 32 extends beyond the side walls of an opening 34 by about 0.008 inches (0.2 mm) and the ends of the anchor are pressed into the applicator core material to secure the anchor and clamp the bristle fibers 30 against the bottom of the opening 34. The thickness T of the anchor is thin with respect to the height, with the thickness T preferably about 10-20% of the height H. This permits the anchor to be inserted in the applicator core 16 with minimal distortion of the opening 34 and provides ample room for bristles. In FIGS. 10 and 11,
the length L of anchor 32 is shown generally aligned with the axis of the applicator rod 12 and applicator core 16, but it may be placed in other orientations as well, particularly to facilitate the positioning and proximity of openings 34 in design variations. It will also be understood that the size of opening 34 may be varied, particularly to accommodate fewer or thinner bristle fibers, and that the size of anchor 32 is selected to cooperate with the dimensions of the opening 34 in which it is inserted.

With reference to FIGS. 4 and 6, the openings 34 in the rows 22-27 of the mascara brush 10 are spaced apart from adjacent openings in the same row by spacing S of approximately 0.106 inches (2.7 mm). The openings 34 in one row are also offset with respect to openings 34 in adjacent rows. To illustrate, an opening 34a in row 23 is offset by offset distance O from opening 34b in row 24, offset distance O being 0.035 inches (0.9 mm). The offset O is both a design choice to achieve a desired distribution of bristles by locating bristle tufts 20 in desired locations and also for purposes of maintaining the strength of the applicator core 16, keeping in mind that the applicator core has a diameter Dx of 0.141 inches (3.58 mm) and the openings have a depth of 0.062 inches (1.6 mm), such that two juxtaposed openings leave a small amount of applicator core material between them as best seen in FIG. 8. When a larger diameter applicator core is utilized, or when openings of lesser depth are utilized, all of the openings may be juxtaposed or overlapped, if desired, for purposes of selecting bristle tuft placement.

The ends 38 of the bristles 36 are trimmed to provide bristles 36 of a desired length, which in the mascara brush 10 described is 0.13 inches (3.3 mm). Those skilled in the art will recognize that the length, type and number of bristles may be changed, with corresponding adjustments to the opening size if necessary to properly hold the selected bristles, as required to satisfactorily apply mascara or other cosmetics having various properties, including particularly the viscosity thereof.

In summary, the mascara brush 10 has an applicator rod 12 with an applicator core 16 at the distal end thereof. Six rows 22-27 of bristle tufts 20 are deployed in blind openings 34 and extend outwardly from the applicator core 16. Each bristle tuft has a population of seven (plus or minus due to manufacturing tolerance) bristle fibers 30 formed in a U on an anchor 32 to present about fourteen bristles 36 with distal bristle ends 38. The bristle material is 0.06 inch hollow nylon and is trimmed to a length of 0.13 inches. This brush is suitable for many mascara formulations, but can easily be modified in the kind, number and length of the bristles in each bristle tuft 20, and can be further modified by positioning of the openings 34 in which the bristle tufts 20 are received. While the mascara brush 10 has openings 34 and bristle tufts 20 deployed in rows, they may be deployed in any pattern about the applicator core 10, and because the applicator core 10 has a circular cross section, the bristles may have uniformity of length about the applicator core 16 wherever they are placed.

The mascara brush 10 has many advantages, among which are consistency of bristle placement and bristle population, and accuracy in transforming design parameters into production brushes. The consistency of bristle population and placement achieves a brush that permits eyelashes to flow through the bristles smoothly, enhancing product transfer from the bristles to eyelashes. The control over placement of bristle tufts may be used to eliminate the inherent pitch of helical bristle rows associated with the twisted wire mascara brushes, and this also contributes to smooth flow through interaction between the eyelashes and bristles. When the bristle tufts are configured in longitudinal rows, channels are formed between the longitudinal rows in which a supply of mascara accumulates. This functions to maintain a supply of product for application and to maintain the bristles in a moist condition which is necessary for transfer of mascara to eyelashes. Because the bristles are maintained in moist condition and do not dry out quickly, several passes of the brush through the eyelashes can be made without reloading the brush, with each subsequent pass adding a thin additional coat of mascara while also providing combining action, which is a desirable attribute in applying mascara.

Mascara brushes are inserted into a bottle having the mascara stored therein, and are withdrawn from the bottle with a supply of mascara to be applied. A wiper is positioned at the neck of the bottle to wipe excess mascara from the brush as it is withdrawn and also to seal or substantially seal against the applicator rod when the bottle is closed. FIGS. 12-14 illustrate a wiper 40 for use with the mascara brush 10. The wiper 40 is characterized by a 6 point star-shaped wiper opening 42 defined by pentahedral guides 44. The bases of the pentahedral guides 44 are integral with the cylindrical sidewall 46 of the wiper 40 and the pentahedral guides 44 form a center of opening 42 sized to accommodate the applicator rod 12. The rows 22-27 of bristle tufts 20 of the mascara brush 10 are aligned by the pentahedral guides 44 so that the rows of bristle tufts pass through the points of the six-pointed star opening 42, with the pentahedral guides 44 removing excess mascara from the bristles 36 as the mascara brush 10 is withdrawn.

Another cosmetics applicator in the form of a mascara brush 60 is shown in FIGS. 15-21. The mascara brush 60 generally comprises an applicator rod 62 having a head 64 and an applicator core 66 on the distal end thereof. The applicator rod 62 and head 64 are the same or similar to the applicator rod 12 and head 14 of mascara brush 10 described above, and may be made from the same selection of materials and by the same techniques.

The mascara brush 60 further includes bristle tufts 70 mounted in eight longitudinal rows 72-79 in openings 84 in applicator core 66, and deployed at 45 degree intervals about the applicator core 66, which has a substantially circular cross section.

Each of the rows 72-79 has six bristle tufts 70 inserted in six openings 84. The diameter Dx of openings 84 is 0.031 inches (0.78 mm) and the depth Dz is 0.062 (1.56 mm) inches. The openings 84 in each row 72-79 are spaced apart by a distance S of 0.157 inches (4 mm). Corresponding openings in adjacent rows are staggered or offset by distance O, which is 0.039 inches (1 mm). The rod and applicator core have a diameter Dx of 0.141 inches (3.58 mm).

The bristle tufts 70 are each formed of six bristle fibers 80 folded and anchored as described above to provide twelve bristles per tuft. The bristle fibers 80 are preferably 0.006 inch hollow nylon fiber and are trimmed to a length of 0.14 inches (3.6 mm). Thus, the mascara brush 60 has different characteristics than the mascara brush 10 described above, because of the increased number of rows of bristle tufts 70 with fewer but slightly longer bristles per tuft and the difference in spacing between the bristle tufts 70.
rows 72-79. The design flexibility in providing cosmetics brushes with different characteristics is facilitated by the circular cross section of the applicator cores 16 and 66, and the blind openings 34 and 84 for mounting bristle tufts 20 and 70, which permits bristle tufts to be located anywhere on the surface of an applicator core independently of other bristle tufts. Further differences may be implemented by selection of materials for bristle fibers and the length and trim of the bristles. Providing the different design parameters is simply a matter of the placement, size, spacing and number of openings, and the material types, sizes, numbers and lengths of bristles to be inserted therein. This mascara brush 60 illustrates the flexibility of providing mascara brushes having different design parameters, but is only representative of one of the many variations that may be achieved. Brushes with different design parameters enjoy the advantages discussed herein.

With reference to FIGS. 22-24, a wiper 90 is provided for the mascara brush 60. It is similar to the wiper 40 described above for mascara brush 10, but has an eight-pointed star shaped opening 92 defined by eight spaced apart pentahedral guides 94. The guides 94 align the rows 72-79 of bristle tufts 70 with the points of the star shaped opening 92 and the wiper 90 removes excess mascara from the bristle tufts 70 as the mascara brush 60 is pulled through the wiper 90.

FIGS. 26-31 illustrate another cosmetics applicator 100 according to the invention herein, which is a combination mascara brush and comb. The cosmetics applicator 100 generally comprises an applicator rod 102, a head 104 and an applicator core 106. The applicator rod 102 and applicator core 106 are integrally molded and have a substantially circular cross sectional shape, with a diameter Dp of about 0.141 inches. The applicator core 106 has a small flat face 108, which is an optional feature of an applicator core that nevertheless has a substantially circular cross sectional shape. The applicator core 106 has a row 112 of bristle tufts 110 inserted therein and together configured as a brush for applying mascara, and a second row 116 of bristle tufts 114 together configured as a comb for separating eyelashes after mascara has been applied. The cosmetics applicator 100 thereby also demonstrates the flexibility in using the technique of inserting bristle tufts into tuft-receiving openings in an applicator core to provide unique design parameters; namely, different opening and bristle tuft distributions in different areas or zones of a brush, and could also use different bristle fibers in different areas or zones of a brush.

The applicator rod 102 and head 104 are preferably integrally molded and the head 104 is adapted for insertion into the cap of a cosmetics bottle. The applicator core 106 is preferably integrally molded at the distal end of the applicator rod 102, but may be a separately molded piece attached to the applicator rod 102, if desired. As noted above, the applicator core 106 has a substantially circular cross section and the applicator rod 102 has the same circular cross section, for facilitating wiping as well as accommodating the brush design.

The brush 112 of the cosmetics applicator 100 is provided by the row of bristle tufts 110. As best seen in FIGS. 26, 27 and 30, each bristle tuft 110 is elongated generally along the axis of the applicator rod 102 and applicator core 106. This is achieved by providing a row 10 of elongated tuft-receiving blind openings 122 in the applicator core 106. With reference to FIGS. 30 and 31, eleven tuft-receiving openings 122 are provided. Each opening is 122 has a width W of 0.016 inches (0.4 mm) and a length L of 0.063 inches (1.6 mm), and a depth D of approximately 0.067 inches (1.7 mm). The openings 122 are deployed at an angle A of about 17 degrees with respect to the axis of the applicator rod 102 and the applicator core 106, so that an end of one tuft-receiving opening 122 is axially adjacent an end of the next adjacent tuft-receiving opening 122. The angle A may be varied, as desired, but is preferably selected so that the openings are generally aligned with the longitudinal axis of the core. This configuration provides a substantially continuous population of bristles forming brush 112 along the length of the applicator core 106, as seen in FIG. 27, as well as other Figs., and is an example of how shaped openings, such as elongated openings 122, can be used to establish a desired deployment of bristles.

With reference to FIG. 26, the bristle tufts 110 are formed by bending bristle fibers under an anchor 130 and inserting the fibers and anchor 130 into an opening 122. In the cosmetics applicator 100, each bristle tuft 110 is made of 12-14 bristle fibers 128, providing 24-28 bristles 129, i.e. each bristle fiber 128 forms two bristles 129 extending from under the anchor 130. The bristle fibers are 0.006 inch hollow nylon. Each anchor 130 has a length L of 0.032 inches (0.8 mm) and is oriented crosswise with respect to the elongated openings 122 in which it is inserted, i.e. the anchors extend 0.008 inches beyond the ends of the openings 122 on each side. This is desirable to achieve firm seating of the anchors 130 with minimal distortion of the applicator core 106. After the bristle tufts have been inserted, the bristles are trimmed to a desirable length, which may be about 0.13 inches (3.3 mm).

The comb function of the cosmetics applicator 100 is provided by the row 116 of bristle tufts 114 deployed on the diametrically opposite side of the applicator rod 102 and applicator core 106 from the brush row 112 of bristle tufts 110. Each comb bristle tuft 114 is elongated, with the long dimension of the comb bristle tufts 114 oriented across the axis of the applicator core 106, as best seen in FIGS. 29 and 31.

This is achieved by providing a row of elongated comb tuft-receiving openings 132 wherein each opening has a width W of about 0.016 inches (0.4 mm) and a length L of about 0.063 inches (1.6 mm). The elongated comb tuft-receiving openings 132 are deployed transverse to the axis of the applicator core 106. The depth D of the comb bristle tuft openings 132 is about 0.067 inches (1.7 mm). The comb bristle tuft openings 132 are spaced apart distance S, which is about 0.079 inches (2.0 mm) on center. As best seen in FIG. 26, each comb bristle tuft 114 is formed by bending a plurality of bristle fibers 136 about an anchor 134, and inserting the folded bristle fibers and anchor 134 into an opening 132, as described above. The bristle fibers are 0.006 inch hollow nylon fiber, and 12-14 bristle fibers are used providing 24-28 bristles 138 in each inserted comb bristle tuft 114. The anchor 134 has a length of about 0.032 inches, extending 0.008 inches on either side of opening 132. A stiffer or more flexible comb function may be provided by selecting different bristle materials or sizes.
bristle tufts 114 of the cosmetics applicator 100 are spaced-apart, and are therefore especially well adapted for combing eyelashes.

[0093] With reference to FIGS. 32 and 33, a wiper 140 is shown having an internal configuration complementary to the cosmetics applicator 100. Thus, the wiper 140 defines a wiper opening 142 having a rounded central portion 144 for receiving the rod 102 and two diametrically extending wiper slots 146, 148 for wiping the brush bristle tufts 110 and comb bristle tufts 114. The slots 146, 148 have the same size, so that the cosmetics applicator 100 may be inserted with the comb 116 or brush 110 in either slot. However, the slots 146, 148 act more vigorously on the comb bristle tufts 114 because they are oriented across the slots, wherein the comb 114 is wiped more cleanly and carries less mascara, as is compatible with the combing function.

[0094] FIGS. 34-51 illustrate further variants of cosmetics brushes made by inserting bristle tufts into tuft-receiving blind openings in an applicator core having a substantially circular cross section. Thus, the cosmetic brushes shown in FIGS. 34-51 also demonstrate to the freedom of design parameters achieved by this construction.

[0095] FIGS. 34-37 depict a mascara brush 150, having an applicator rod 152 extending from a head 154 with an applicator core 156 at the distal end thereof. The applicator core has a four rows 160-163 of bristle tufts.

[0096] Rows 160 and 162 are diametrically opposed, and are made up of bristle tufts 164 spaced apart along the axis of the applicator core 156. Bristle tufts 164 are made of bristle fibers folded about an anchor and secured in openings in the applicator core 156, as discussed above. The bristle fibers are 0.003 inch solid nylon, and about 28×2 bristle fibers are inserted in each opening. Thus, there are 52-60 bristles and bristle ends in each bristle tuft 164.

[0097] Rows 161 and 163 of bristle tufts are also diametrically opposed to each other and deployed to 90 degrees about the applicator core 156 from rows 160 and 162. The bristle tufts 166 making up of rows 161 and 163 are also made of bristle fibers folded about an anchor and secured in openings in the applicator core, as described above, but are made of different material than the bristle tufts 164. The material for the bristle fibers is preferably 0.004 inch nylon, and about 20×2 bristle fibers are used in each opening, providing about 36-44 bristles and bristle ends, wherein the rows 161, 163 have different product application and combing capabilities than the rows 160, 162. It should be noted that the rows 160-163 may also be made of bristle tufts wherein alternate adjacent bristle tufts are made of different bristle fibers, to provide a further design variation in the application and combing capabilities of the brush 150.

[0098] With reference to FIGS. 38-41, another cosmetics brush, namely, a mascara brush 170, is illustrated. The mascara brush 170 also has an applicator rod 172 with a head 174 at one end thereof and an applicator core 176 at the distal end thereof. A first row 180 of bristle tufts 182 is deployed in a spiral or helical configuration about the applicator core 176. A second row 184 of bristle tufts 186 is also deployed in a spiral or helical path about the applicator core 176, but with an opposite pitch from the first row 180. Therefore, the rows 180 and 184 of bristle tufts cross at points C and diverge to leave relatively open areas of the applicator core 176 between the crossing points C. The bristle tufts may have any desired bristle fibers, and are secured in openings by anchors, similar to the way bristle tufts are secured in other cosmetics applicators described above.

[0099] With reference to FIGS. 42-45, a mascara brush 190 is illustrated, having an applicator rod 192 with a head 194 on one end thereof and an applicator core 196 on the distal end thereof. As perhaps best seen in FIG. 45, the mascara brush 190 has eight rows 200-207 of bristle tufts 210. As best seen in FIGS. 42 and 43, the bristle tufts in each of the rows is offset with respect to the bristle tufts of other rows.

[0100] The bristle tufts are made of bristle fibers folded over anchors and inserted into tuft-receiving blind openings, as discussed with respect to the other cosmetics applicators. The material for the bristle fibers may be selected to cooperate with the particular mascara formulation with which the brush is to be used, and this consideration is very important in selecting a bristle fiber with material for any of the brushes disclosed herein. The bristle fibers in the mascara brush 190 are trimmed so that the brush profile tapers toward the distal end of the applicator core.

[0101] Another cosmetics brush 220 is shown in FIGS. 46-51. It has an applicator rod 222 with a head 224 at one end and an applicator core 226 of substantially circular cross-section at the distal end. The cosmetics brush 220 has three rows 230-232 of bristle tufts adapted for application of mascara, and a row 236 of bristle tufts 238 adapted for combing eyelashes after mascara has been applied thereto.

[0102] As best seen in FIG. 48, the central row 231 is made up of alternating bristle tufts 234 and 235 and extends along the axis of the applicator rod 222 and applicator core 224. Row 231 is flanked by the rows 230, 232 of bristle tufts 234, which are deployed at 45-degree angles to the central row 231. This provides a 90-degree sector of bristle tufts, suitable for applying mascara. For this purpose and as shown in FIG. 49, each bristle tuft 234 is formed of twelve (±1) bristle fibers 240 which are 0.005 inch diameter hollow nylon fibers. The fibers 240 are folded over anchors 242 and inserted in blind tuft-receiving openings 244, as best seen in FIG. 49 and similar to the formation and securement of bristle tufts described above. This creates twenty-four (±2) bristles 244 per tuft 234 that are relatively soft and in bushy deployment, for good application of mascara. The bristle tufts 235, shown in FIG. 51, are made up of six bristle fibers 246 providing twelve bristles 248 which are 0.012 inch diameter structured fibers that act to separate lashes during application. Bristle tufts 234 and 235 alternate along row 231.

[0103] The cosmetics brush 220 has another row 236 of bristle tufts 238, spaced apart and aligned along the axis of the applicator core diametrically opposite row 231 of bristle tufts 234. Thus, the row 236 of bristle tufts 238 is also symmetrically positioned with respect to all three rows 230-232 of bristle tufts 234, 235. The row 236 of bristle tufts 238 is positioned for performing a combing function, and is further adapted to do so by selection of a bristle fiber material stiffer than the bristle fibers 240. With reference to FIG. 50, a bristle tuft 238 has ten (±1) bristle fibers 250 that are 0.008 solid nylon, folded over anchor 242 and inserted into a blind tuft-receiving opening 244 to provide twenty (±2) bristles 252. The combing bristle tufts 238 may be spaced more closely than is shown in FIGS. 46 and 47, if desired.
Accordingly, cosmetics applicators have been described that admirably achieve the objects of the invention herein. It will be appreciated that the cosmetics applicators described are illustrative of the invention, and that changes may be made without departing from the spirit and scope of the invention, which is limited only by the following claims.

1. A cosmetics brush comprising:
   A) an applicator rod having a molded polymer applicator core at the distal end thereof; the applicator core having a substantially circular cross-sectional shape;
   B) a plurality of spaced apart tuft-receiving blind openings formed in the applicator core in selected locations thereon; and
   C) a plurality of bristle tufts each formed of a plurality of bristle fibers folded into a U-shaped configuration about an anchor and received in a respective one of the tuft-receiving blind openings, the anchors extending across the tuft-receiving blind openings and having ends embedded in the applicator core to secure the bristle tufts therein.

2. A cosmetics brush as defined in claim 1 wherein the plurality of blind openings have a circular cross section and extend radially inwardly into the applicator core.

3. A cosmetics brush as defined in claim 2 wherein the depth of the blind openings is about two times the diameter of the blind openings.

4. A cosmetics brush as defined in claim 3 wherein the anchors are substantially rectilinear, having a length, height and thickness.

5. A cosmetics brush as defined in claim 4 wherein the anchors have a thickness which is about 10% to 20% of their height.

6. A cosmetics brush as defined in claim 4 wherein the applicator core has an axis and the anchors have length deployed generally along the axis of the applicator core.

7. A cosmetics brush as defined in claim 6 wherein the holes have a diameter of about 0.03 inches and a depth of about 0.06 inches.

8. A cosmetics brush as defined in claim 7 wherein the anchors have a length of about 0.04 inches, a height of about 0.045 inches and a thickness of about 0.0066 inches.

9. A cosmetics brush as defined in claim 8 wherein at least some of the bristle tufts comprise about 12 bristle fibers each having a diameter of about 0.06 inches.

10. A cosmetics brush as defined in claim 8 wherein the bristle tufts comprise bristle fibers each having a diameter in a range of about 0.0025 inches to about 0.012 inches.

11. A cosmetics brush as defined in claim 1 wherein the blind openings are formed by the molded configuration of the applicator core.

12. A cosmetics brush as defined in claim 1 wherein the blind openings are formed by drilling the applicator core.

13. A cosmetics brush as defined in claim 1 wherein the blind openings are formed by EDM process.

14. A cosmetics brush as defined in claim 1 where at least some of the blind openings have a non-circular cross-sectional shape.

15. A cosmetics brush as defined in claim 14 wherein at least some of the openings are elongated.

16. A cosmetics brush as defined in claim 1 wherein the applicator core has a diameter in the range of about 0.120 inches to 0.190 inches.

17. A cosmetics brush as defined in claim 16 wherein the applicator core has a diameter of about 0.140 inches.

18. A cosmetics brush as defined in claim 16 wherein the applicator core is made from one of polypropylene, acetate, ABS, PVC and nylon.

19. A cosmetics brush as defined in claim 1 wherein the applicator core is made from one of polypropylene, acetate, ABS, PVC and nylon.

20. A cosmetics brush as defined in claim 1 wherein the applicator core has a longitudinal axis and some of the plurality of blind openings and bristle tufts are deployed spaced apart in a first row along the longitudinal axis.

21. A cosmetics brush as defined in claim 20 wherein the others of the plurality of blind openings and bristle tufts are deployed in a second row spaced apart along the longitudinal axis of the applicator core, diametrically opposite the first row.

22. A cosmetics brush as defined in claim 21 wherein the blind openings and bristle tufts received therein of the second row are offset with respect to the blind openings and bristle tufts received therein of the first row.

23. A cosmetics brush as defined in claim 20 wherein the blind openings and bristle tufts received therein are deployed in four rows along the longitudinal axis of the applicator core.

24. A cosmetics brush as defined in claim 23 wherein the four rows are deployed at about 90 degree intervals about the applicator core.

25. A cosmetics brush as defined in claim 23 wherein two of the four rows of blind openings of bristle tufts received therein are diametrically opposed and the other two rows of blind openings and bristle tufts received therein are respectively deployed at about 45 degrees from one of the diametrically opposed rows.

26. A cosmetics brush as defined in claim 23 wherein there are more than four rows of blind openings and bristle tufts received therein deployed spaced apart along the axis of the applicator core, and the rows are substantially equally spaced about the applicator core.

27. A cosmetics brush as defined in claim 26 wherein there are six rows of blind openings and bristle tufts received therein.

28. A cosmetics brush as defined in claim 26 wherein there are eight rows of blind openings and bristle tufts received therein.

29. A cosmetics brush as defined in claim 26 wherein the blind openings and bristle tufts received therein of each row are offset from the blind openings and bristle tufts received therein of an adjacent row.

30. A cosmetics brush as defined in claim 21 wherein one of the rows of blind openings comprises elongated blind openings generally aligned with the longitudinal axis of the applicator core, and the second row of blind openings comprises elongated blind openings deployed generally across the longitudinal axis of the applicator core.

31. A cosmetics brush as defined in claim 1 wherein the blind openings and bristle tufts received therein are deployed in at least one spiral row about the applicator core.

32. A cosmetics brush as defined in claim 1 wherein the blind openings and bristle tufts received therein are deployed in at least two spiral rows about the applicator core.

33. A cosmetics brush as defined in claim 32 wherein the two rows have opposite pitches.

34. A cosmetics brush as defined in claim 1 wherein at least some of the bristle tufts have different bristle fibers.
35. A cosmetics brush as defined in claim 34 wherein at least some of blind openings and bristle tufts received therein are deployed spaced apart in two rows along the axis of the applicator core and the bristle tufts of the two rows have different bristle fibers.

36. A cosmetics brush as defined in claim 1 wherein different areas of the applicator core have different densities of blind openings and bristle tufts received therein.

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