A wire core brush composed of a core comprising at least two wires twisted together between which are held bristle-forming elements, which form bristles that protrude from the core, characterized in that the wire core brush has been produced in such a way that after the twisting, it has first bristles protruding from the core essentially in the radial direction with a first length and also has second bristles protruding from the core essentially in the radial direction with a second length that is greater than the first length so that the second bristles protrude beyond the first bristles essentially in the radial direction; after this, the brush has been pulled through a hot tube whose inner diameter and temperature are selected and matched to the residence time of the brush in the tube so that a section of the second bristles is permanently oriented essentially parallel to the longitudinal axis of the wire core.
TWISTED BRUSH WITH PARALLEL BRISTLES AT THE DISTAL END

FIELD OF THE INVENTION

[0001] The invention relates to a wire core brush.

BACKGROUND OF THE INVENTION

[0002] Wire core brushes in an extremely wide variety of embodiments have been part of the prior art for a long time.

[0003] Wire core brushes are produced in that a number of bristle-forming elements, usually in the form of filaments, i.e. in the form of fiber segments with a generally defined length, are inserted between at least two wires that are still parallel to each other at first. Then the wires are twisted together, as a result of which the filaments are clamped between the wires and permanently secured. Typically, the filaments are secured approximately in the region of their middle between the wires that are twisted together, so that each filament forms two bristles that protrude outward from the wire core. Generally, the filaments are clamped in bunches between the twisted wires so that each bunch of filaments composes two bristle bunches.

[0004] Wire core brushes are used for a wide variety of purposes and are also produced in widely varying sizes. Protection is claimed for all types and sizes of wire core brushes that use the invention explained below. Preferably, however, protection is claimed for cosmetic brushes and hair color brushes and in particular for brushes for applying mascara compound to the lashes of the eyelid.

[0005] Generally, wire core brushes have bristles that protrude more or less in the radial direction. The application properties are then largely determined by the density of the set of bristles, the length of the bristles, and the bristle geometry.

[0006] By contrast, the object of the invention is to create a wire core brush that has a perceptibly different application behavior than the wire core brushes known from the prior art.

SUMMARY OF THE INVENTION

[0007] A wire core brush is described herein whose bristle set has been given its particular application properties through the special treatment of the wire core brush.

[0008] The wire core brush according to the invention is composed of a core comprising at least two wires twisted together, bristle-forming elements, preferably in the form of filaments, are held between the wires and form bristles that protrude from the core. In order to give the brush its special application properties, it has been produced in such a way that after the twisting, it has first bristles protruding from the core with a first length and also has second bristles protruding from the core with a second length that is greater than the first length so that the second bristles protrude beyond the first bristles in the direction perpendicular to the core. After this, the brush has been subjected to an additional treatment that has permanently bent a section of the second bristles that comprises approximately 30% to 60% of the overall length of the second bristles. In many cases, this is achieved by pulling the brush through a hot tube whose interior diameter and temperature are selected and matched to the residence time of the brush in the tube so that the part of the second bristles extending beyond the first bristles in the direction perpendicular to the core is permanently oriented essentially parallel to the longitudinal axis of the wire core. This results in bristles whose first section situated close to the core is oriented in the normal way for wire core brushes, while the second section of the bristles that is farther away from the core is oriented essentially parallel to the longitudinal axis of the wire core. It is clear that such bristles, which are intrinsically bent by preferably 90°±25°, better still by 90°±15° exhibit a significantly different application behavior than the conventional, more or less straight or more or less continuously curved bristles of known wire core brushes.

[0009] The inner diameter of the tube and its temperature and residence time in the hot tube are selected so that the second, longer bristles, in an intermediate region, become soft enough that they can be permanently plastically deformed and as a result, are bent over as they pass through the tube so that their region protruding beyond the first bristles is oriented essentially parallel to the longitudinal axis of the wire core. The specific diameter and temperature values of the tube and the residence time of the brush in the tube or the speed with which the brush is continuously pulled through the tube depend on the individual case and cannot generally be established in advance. The specific values for the diameter, the temperature, and the residence time or speed, however, can be easily determined through customary testing as a function of the bristle material selected for the brush.

[0010] Ideally, care is taken that the second bristles, over at most a quarter of their length, are heated enough that the material of the bristles becomes permanently plastically deformed in this section. In other words, over the predominant part of their length, the second bristles are not heated enough to become permanently plastically deformed.

[0011] The inner diameter of the tube, its temperature, and the residence time of the brush or the speed are preferably selected so that the first bristles with the shorter length are not influenced at all or are not influenced significantly by the hot tube; preferably, sufficient care is taken to prevent the tips of these bristles from melting and possibly each forming a thickened region in the form of a small ball. If the pulling of the brush through the hot tube changes the orientation of the first bristles only slightly, for example in that these bristles tend to be inclined by up to 15°, preferably only by up to 10° in one direction in comparison to their original orientation, this does not represent a significant influence in the context of the invention. It is naturally closer to the ideal if the parameters are selected so that the first bristles are not influenced in a visible way. For the latter purpose, the inner diameter of the hot tube is preferably selected to be of generous enough dimensions that it is larger than the outer diameter of the bristle set composed of the first, shorter bristles.

[0012] The different lengths of the bristles that are required according to the invention can be achieved through the use of different length filaments or through a subsequent trimming of the bristle set after the twisting of the wires.

[0013] In addition to the object stated at the beginning, another object is to continuously prevent so-called “blobs.” This is understood to be the phenomenon that when pulling out a mascara brush, excess mascara compound collects in the region of its distal tip and also clogs the region around the stripper so that the repeated removal of the mascara applicator from its receptacle causes a vacuum to build up at the latter, which suddenly breaks the moment the mascara applicator has passed all the way through the stripper. This produces the undesirable “popping noise” and there is the risk of the mascara compound being sputtered. This object is attained by a wire core brush that has a core composed of at least two wires that are twisted together; between the wires, bristle-forming
elements, preferably in the form of filaments, are held, which form bristles protruding from the core; and at least some of the bristles have two sections, namely a first section that protrudes from the wire core in a straight line or essentially in a straight line, at an angle of 50° to 90° and better still, 70° to 90° relative to the longitudinal axis predetermined by the wire core and a second section that extends predominantly parallel to the longitudinal axis of the wire core; the first and second sections are connected to each other via a sharply curved intermediate section, namely a section within which the longitudinal axis of a bristle changes direction by an angle Β of 40° to 90° and whose length is less than ¼ and preferably less than ½ of the total length of the respective bristle. The total length of a bristle is understood to be the length of a bristle between its root, i.e. the point at which it is clamped between the wires, and its end oriented away from the root end. In the context of this description, a section of a bristle is considered to extend essentially in a straight line if its local curvature radius outside the root is overall ≥3 mm and preferably, is ≥6 mm.

[0014] It is particularly advantageous if only a part of the bristle set of the wire core brush is composed of such bent bristles. Ideally, this part of the bristle set is the one with which the distal end of the wire core brush is equipped, i.e. the end oriented away from the handle end. It is particularly advantageous if such bristles at the distal end of the bristle set make up about ⅓ to about ⅔ of the length of the overall bristle set.

[0015] The bristles, which according to the invention do not extend essentially at right angles to the wire core, but instead approximately parallel to it, surprisingly prevent the accumulation of mascara compound in the region of the distal end of the applicator, which causes the “blob,” or at the very least, they significantly reduce the tendency for this to occur.

[0016] Ideally, at least part of the sections of the bristles oriented parallel to the longitudinal axis of the wire core protrude beyond the distal end of the wire core brush and in this way, constitute elements that can be used, preferably like a paint brush, to apply a substance or can be used to perform a combing action, for example when combing eyelashes with a mascara compound applicator.

[0017] According to the invention, the bristles are preferably formed using filaments that are composed of a heat-deformable plastic. The diameter of the preferably round or at least essentially round filaments is preferably between 0.08 mm and 0.6 mm and ideally between 0.1 mm and 0.4 mm.

[0018] Preferably, wires are used, which, before the twisting, have a diameter of between 0.5 mm and 1.1 mm.

[0019] Other operating methods, advantages, and embodiment options ensue from the exemplary embodiment described in conjunction with the figures.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0020] In the drawings:

[0021] FIG. 1 shows a side view of an exemplary embodiment of the wire core brushes according to the invention.

[0022] FIG. 2 shows a perspective view of the exemplary embodiment from FIG. 1.

[0023] FIG. 3 shows a side view of a blank for producing the exemplary embodiment from FIG. 1, whose second bristles have not yet been heat treated.

[0024] FIG. 4 shows the blank from FIG. 3 as it is passing through the heated tube that is used to heat-form the second bristles.

[0025] FIG. 5 shows a detail of the front edge of the tube from FIG. 4 at the moment in which the last of the first bristles has been guided into the tube and the first of the second bristles is about to be guided into the tube.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0026] FIG. 1 shows an exemplary embodiment of the form of a mascara applicator for applying mascara compound to the eyelashes.

[0027] A mascara applicator 1 of this kind is comparatively small, the diameter D of its bristle field is preferably in the range from 3 mm to 8 mm. Viewed in the longitudinal direction 1 along the wire core, the bristle set of the mascara applicator preferably has a length L A of between 15 mm and 40 mm. In FIG. 1 on the left side, a section of the wire core is visible, which has no bristles and which is used to fasten the applicator to a handle or a wand attached to the handle.

[0028] The mascara applicator has a wire core 2 composed of at least two wires twisted together. Between themselves, the wires hold bristle-forming elements or filaments in a clamped fashion, which as a rule, protrude from both sides of the wire core and in this way, form two bristles.

[0029] Preferably, the whole group of bristles forms a helical configuration form, as shown in FIG. 1. This helical configuration does not necessarily have to be as clearly pronounced as the one shown in FIG. 1.

[0030] As is very clear from FIG. 1, for ¼ of its length, the bristle field is composed exclusively of first bristles 3. Preferably, aside from individual exceptions, all or at least most of the first bristles 3 protrude for their entire length from the wire core 2 essentially in the radial direction. This preferably means that all or most of these first bristles encompass an angle of 90°+/−25° or better still, an angle of 90°+/−15° with the longitudinal axis L of the wire core. FIG. 1 shows the situation in which the first bristles have remained entirely uninfluenced by the heat treatment of the second bristles. This is advantageous, but does not absolutely have to be the case. A slight inclination of the first bristles, in the example shown in FIG. 1, for example an average of approx. 5° toward the right, is tolerable as a side effect of the heat treatment of the second bristles.

[0031] Less than the last fourth of the bristle set at the distal end, i.e. the end oriented away from the later handle, is composed of second bristles 4, which clearly have a greater length than the first bristles. In another preferred embodiment, only the two turns or even only the one turn situated all the way at the distal end is/are provided with second bristles of this kind.

[0032] The peculiarity of these second bristles is the path along which they extend. As is clear, these bristles are essentially composed of two sections 5 and 7 extending in different directions, which are connected to each other via an intermediate section 6.

[0033] In their first section 5 close to the wire core, these second bristles essentially extend in the same way as the first bristles. To be precise, in their first section, the second bristles also protrude from the wire core 2 essentially in the radial direction; the expression “protrude radially” is defined in exactly the same way as above for the first bristles. The second section 7 of these second bristles located further away from the wire core is oriented so that the longitudinal axis of this section extends essentially parallel to the longitudinal axis L of the wire core. In any case, a path can be described as essentially parallel if the path of the longitudinal axis of the
brush in this second section deviates by less than 10° from the path of the longitudinal axis L of the wire core.

[0034] The first section 5 and the second section 7 of each second bristle, as clearly shown in FIG. 1, are connected to each other by means of an intermediate section 6. In this intermediate section 6, the bristle is sharply curved while in the other sections, it extends essentially in a straight line in the sense defined above.

[0035] The length of this intermediate section 6 is less than ¼ of the total length of the relevant second bristle. Within this intermediate section, the second bristle in this exemplary embodiment is bent by approximately 90°+/-5°.

[0036] FIG. 1 shows very clearly that the second sections of the second bristles oriented essentially parallel to the longitudinal axis L of the wire core protrude beyond the distal end of the wire core, preferably by at least 2 mm or better still, by at least 3 mm. Because of this, these bristles can be used like a paint brush, preferably so that the middle region surrounded by the bristles accommodates a supply of the compound to be applied, which is dispensed again once the bristles protruding beyond the distal end of the wire core are stroked like a paint brush across the surface to be treated.

[0037] Alternatively, these bristles can be used like a comb, which can be used, for example, to separate eyelashes that are stuck together.

[0038] FIG. 1 also clearly shows that the ends of the second bristles protruding beyond the distal end of the applicator have preferably been trimmed. This is evident from the fact that they all end at the same circular line. The fact that the bristles have been trimmed is clearly visible, particularly by comparison with FIG. 3.

[0039] FIG. 3 shows a blank for producing the wire core brushes according to the invention in the form of a mascara applicator. In this exemplary embodiment, the wire core was first equipped with filaments that were all of the same length, yielding a brush blank that initially had bristles that were all the same length.

[0040] In the next step, the brush blank was trimmed so that it has the form shown FIG. 3, in which it now has shorter first bristles 3 and longer second bristles 4. In the stage shown in FIG. 3, the longer bristles 4 have not yet been subjected to a heat treatment.

[0041] Alternatively, it is also possible to do without such a trimming if the wires that are to be twisted together are equipped from the beginning with filaments of different lengths. Another alternative is the modern technique in which the rotary motion accompanying the twisting action is simultaneously used to already trim the bristle set during the twisting stage.

[0042] FIG. 4 shows the next step, namely the way in which the orientation of the second bristles 4 is produced.

[0043] Preferably, a heated tube 8 is used for this purpose, through whose hollow interior the blank of the brush is pulled. As shown in FIG. 4, the first bristles can pass through the interior of the tube entirely or essentially unhindered and are therefore not significantly influenced by it.

[0044] The inner diameter of the tube is dimensioned so that the second bristles first come into contact with the end surface 9 of the tube and as a result, are inevitably bent as soon as the region provided with the second bristles travels into the heated tube.

[0045] As is clear from the very simplified depiction in the detail shown in FIG. 5, as this occurs, the second bristles come into very intensive contact with end surface 9 of the heated tube or with the region of the insertion bevel 10 that facilitates the insertion of the brush and are thus locally heated until they can be plastically deformed permanently. Once the bristles have been bent over for the first time, the part of these second bristles that only now, in the already bent state, travels into the tube comes into significantly less intensive contact with the tube wall and is therefore not heated excessively. As a result, approximately at the height of the outer diameter at which the first bristles end, the second bristles in the intermediate region 6, are sharply bent while the relatively long end of the second bristles, which in the beginning had extended beyond the diameter at which the first bristles end, remains largely straight and is therefore oriented so that its longitudinal axis extends essentially parallel to the longitudinal axis of the wire core.

[0046] The point at which the sharply bending intermediate region 6 is formed can be adjusted through a suitable dimensioning of the inner diameter of the heated tube. If the inner diameter of the tube is smaller than the outer diameter of the part of the bristle set predefined by the first bristles, then the intermediate region 6 is situated at least predominantly in the region of a diameter that is smaller than the maximum outer diameter of the bristle set predefined by the first bristles. If the inner diameter of the tube is larger than the outer diameter of the part of the bristle set predefined by the first bristles, then the intermediate region 6 is situated at least predominantly in the region of a diameter that is larger than the maximum outer diameter of the bristle set predefined by the first bristles.

[0047] Ideally, the inner diameter of the heated tube is chosen (i.e. preferably 10% to 25% smaller than the maximum outer diameter of the bristle section predefined by the first bristles) so that the region of the second bristles that is bent and extends essentially parallel to the longitudinal axis of the wire core is situated at a diameter that corresponds to essentially the maximum outer diameter of the part of the bristle set composed of the first bristles. This produces a brush with a continuous cylindrical outer contour and different bristle set regions that transition into each other essentially without an abrupt change in diameter.

[0048] It should also be noted that the heated tube is composed preferably not of one piece, but of at least two half-shells of the tube, between which the brush to be treated is inserted so that immediately after the assembly of the two half-shells, the bristle region composed of the first bristles is essentially completely enclosed by the tube. The pulling of the brush through the tube can then begin immediately, causing the second bristles that are to be treated to be immediately “bent over” without a significant time delay. Such a tube simplifies the manufacturing process significantly, eliminating the need to thread the brush into the intrinsically closed tube and the need to initially pull only the bristle set composed of the first bristles through the tube for a fairly long time (and expose them to heat), before the bending over of the second bristles finally occurs.

1. A wire core brush comprising:
   a core comprising at least two wires twisted together; and
   a plurality of bristle-forming elements held between the at least two wires, the plurality of bristle-forming elements forming bristles that protrude from the core;
   wherein the wire core brush has been produced in such a way that after twisting the at least two wires, the wire core brush has first bristles protruding from the core essentially in a radial direction with a first length and the
wire core brush also has second bristles protruding from the core essentially in the radial direction with a second length that is greater than the first length so that the second bristles protrude beyond the first bristles essentially in the radial direction; and after the twisting, the brush has been pulled through a hot tube whose inner diameter and temperature are selected and matched to a residence time of the brush in the tube so that a section of the second bristles is permanently oriented essentially parallel to a longitudinal axis of the wire core.

2. A wire core brush comprising:

a core comprising at least two wires twisted together; and

a plurality of bristle-forming elements held between the at least two wires, the plurality of bristle-forming elements forming bristles that protrude from the core;

wherein some of the bristles have two sections, namely a first section that protrudes from the core at an angle of 50° to 90° and a second section that extends essentially parallel to a longitudinal axis (L) of the core;

the first and second sections of the bristles are connected to each other via a sharply curved intermediate section within which a longitudinal axis of the bristle changes direction by an angle β of 40° to 90° and whose length is less than 1/5 of a total length of the bristle between a root end and an end oriented away from the root end.

3. The wire core brush according to claim 1, wherein the inner diameter and temperature of the tube are selected and matched to the residence time of the brush in the tube so that the first bristles are not deformed at all or are not deformed significantly.

4. The wire core brush according to claim 1, wherein the second bristles, which have a bristle section (7) that extends essentially parallel to the longitudinal axis of the core, form an outermost distal fifth of the bristle set.

5. The wire core brush according to claim 1, wherein the second bristles, which have a bristle section that extends essentially parallel to the longitudinal axis of the core, protrude beyond a remainder of the bristle set in a direction of the longitudinal axis of the core.

6. The wire core brush according to claim 1, wherein the bristles have a diameter of 0.08 mm to 0.3 mm.

7. The wire core brush according to claim 1, wherein each of the wires that is twisted into the wire core has a diameter of between 0.5 and 1.1 mm before the twisting.

8. The wire core brush according to claim 1, wherein a bristle set comprising the bristles is composed of 15 to 50 filaments per turn.

9. A method for manufacturing a brush comprising:

manufacturing a wire core brush with a bristle set composed of first and second bristles that are essentially of different lengths;

locally heating the second bristles in such a way that the second bristles become plastically deformable in a heated region; and

bending sections of the second bristles that extend beyond an imaginary envelope curve into a position in which a longitudinal axis of these sections extends essentially parallel to a longitudinal axis of a wire core.

10. The wire core brush according to claim 2, wherein the bristles have a diameter of 0.08 mm to 0.3 mm.

11. The wire core brush according to claim 2, wherein each of the wires that is twisted into the wire core has a diameter of between 0.5 and 1.1 mm before the twisting.

12. The wire core brush according to claim 2, wherein a bristle set comprising the bristles is composed of 15 to 50 filaments per turn.

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