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Method for Producing Brushes with Flexible Bristles and Brushes with Stiff Bristles

The present invention relates to a method for permanently mounting bristles, hairs, monofilaments, wires, and the like and/or tufts thereof in or on a handle, an application of the method for producing a specific shape of a brush with stiff bristles or a brush with flexible bristles, an application of the method for making a brush with flexible bristles and/or a brush with stiff bristles as well as a brush with flexible bristles or a brush with stiff bristles comprising a handle as well as hairs, bristles, monofilaments, or wires of a brush with flexible bristles or brush with stiff bristles held in or on a handle.

The manufacture of brushes with stiff bristles, brushes with flexible bristles, toothbrushes, and the like is performed in a wide variety of ways; thus for example, to manufacture paint brushes or cleaning brushes, the tufts of bristles or hairs are retained by phenol or epoxy resin materials in a receiving box or a handle.

In the case of smaller brushes, such as toothbrushes or precision cleaning brushes, as a rule monofilaments are held in a receptacle either by means of hot-melt materials or by so-called anchors. It is also known to introduce individual monofilaments or tufts thereof into receptacles in the shape of holes and to weld at the hole opening opposite the brush.

The known methods are either partially objectionable from the physiological standpoint or are expensive, or do not allow very small brushes to be manufactured. Thus it has been found especially in the manufacture of very small toothbrushes for electrical cleaning devices or for very fine cleaning brushes for example for precision mechanics, that with very small wall thicknesses for the brush bodies, the known fastening methods are

not suitable for retaining brush hairs, bristles, or monofilaments, etc. In addition, it is not possible with the known methods to shape the brush or to form the brush surface.

Hence, one goal of the present invention is to propose a method that does not suffer from the above disadvantages and which is especially suited for permitting the manufacture of very fine and/or very small brushes and to facilitate the shaping process in the manufacture of brushes with flexible bristles and brushes with stiff bristles.

According to the invention this goal is achieved by a method according to the wording of Claim 1.

It is proposed that in order to permanently mount bristles, hairs, or monofilaments or tufts thereof in or on a handle or in or on a receptacle, the bristles, hairs, monofilaments, or wires that are placed in or on the receptacle or the handle are connected to the receptacle or handle by welding. The welding is performed by means of wave or field lines applied and/or directed at the receptacle or handle.

These waves or field lines applied or directed to the receptacle stimulate either the hairs, bristles, monofilaments, or wires that are supplied on or in the receptacle or the handle, an insert element introduced onto or into the receptacle or the handle, and/or the receptacle or the handle, and heat the latter so that they are at least partially melted to produce the welded connection.

According to one preferred embodiment of the method according to the invention it is proposed that initially at least one insert element is placed on or in the receptacle, then the hairs, bristles, monofilaments, or wires are supplied, and then a high-

frequency field, an electrical, electromagnetic, and/or a magnetic field is produced in order to excite or heat the insert element so that the hairs, bristles, monofilaments, or wires in contact with the element and/or the receptacle are at least partially melted in order to produce the welded connection.

According to another variation on the method according to the invention it is proposed that initially the insert element is introduced into or onto the retaining element or the receptacle in order to be welded with it as it is excited by field or wave lines or to be joined mechanically or by adhesives. Then the hairs, bristles, monofilaments, or wires are introduced in the area of the insert element in or on the handle or receptacle, whereupon, by means of field or wave lines, the hairs, bristles, monofilaments, or wires, the insert element, and/or the handle or receptacle is/are excited in order to trigger possible additional welding under temperature conditions that may be changed by comparison with the first welding.

This two-stage method is preferably used when the hairs, bristles, monofilaments, or wires exhibit a very different melting behavior from the receiving part or the handle. In the case of highly different melting temperatures, there is a danger in the single-stage method that either the hairs, bristles, monofilaments, or wires or the handle or the receptacle would be damaged by heating it excessively.

Another advantage of this two-stage method consists in the fact that initially the handle or the receptacle can be provided with an insert element and then a supply of hairs, bristles, monofilaments, or wires can be added. The excitation of the insert element then takes place in this supply, whereupon only those hairs, bristles, monofilaments, or wires from the supply are welded to the insert element that are directly in contact

with it. In this way the manufacture of a brush with stiff bristles or a brush with flexible bristles can be highly simplified.

Another two-stage method according to the invention is similar and it proposes that initially the hairs, bristles, monofilaments, or wires are placed in an insert element which is excited and heated by field or wave lines in order to at least soften or begin melting the added bristles, hairs, monofilaments, or wires to make a welded connection with the insert element. Then this insert element with the hairs, bristles, monofilaments, or wires welded to it is placed on or in a handle or a receptacle and connected with the latter mechanically by gluing or by welding once more.

Additional preferred embodiments of the method according to the invention are characterized in dependent claims 5 to 12.

The methods defined according to the invention are especially suitable for producing a specific shape of a brush with stiff bristles or a brush with flexible bristles, in which the insert element is adapted specially to the shape of the brush with flexible bristles or brush with stiff bristles to be produced. The insert element, depending on the requirements, can be made convex, wavy, zigzag-shaped, conical, etc. whereby the ends of the hairs, bristles, or monofilaments projecting out of the receptacle form a contour that matches the insert element.

The insert element however can also have gaps in the form of holes or slots, which means that the brush with flexible bristles or brush with stiff bristles does not have any hairs, bristles, monofilaments, or wires at these gaps.

By using the above-mentioned insert elements, comprising gaps in the form of holes or slots, it is also possible to make brushes with stiff bristles or brushes with flexible bristles that have areas in which the hairs, bristles, monofilaments, or wires have a reduced density. This can also be achieved by using a plurality of insert elements spaced apart from one another. In the spaces between the insert elements, zones can be created that have no hairs, bristles, monofilaments, or wires, or zones with reduced density. The advantage of creating such areas or zones of reduced density consists in the fact that the flexibility of a brush with flexible bristles or a brush with stiff bristles can be considerably increased as a result.

Basically, the methods proposed according to the invention are generally suitable for manufacturing all kinds of brushes with flexible bristles or brushes with stiff bristles, for example paintbrushes, cleaning brushes, toothbrushes, precision cleaning brushes in mechanics, etc.

The methods according to the invention are especially suitable for making toothbrushes, both ordinary toothbrushes and those designed for use with an electrical tooth cleaning device.

The brushes with flexible bristles or brushes with stiff bristles manufactured according to the invention thus comprise a handle or receiving part or a receptacle as well as hairs, bristles, monofilaments, or wires of a brush with flexible bristles or a brush with stiff bristles that are held in the handle or receiving part, whereby at least one insert element is provided located in or on the receiving part or handle, which is located adjacent to the hairs, bristles, monofilaments, or wires held in the handle or receiving part, and with the hairs, bristles, monofilaments, or wires being held in or on the handle or receiving part by a welded connection.

Additional embodiments of the brushes with flexible bristles or brushes with stiff bristles defined according to the invention are characterized in dependent claims 19 to 23.

It makes no difference in this respect whether the hairs, bristles, monofilaments, or wires are of animal or plant origin or whether they are monofilaments made of polymer materials, like those manufactured for example from a synthetic polymer.

The invention will now be described in greater detail with reference to the attached figures.

Figures 1a to 1c show schematically the basic idea of the present invention for manufacturing a brush with flexible bristles or a brush with stiff bristles according to the invention;

Figures 2a and 2b show two examples of a brush with flexible bristles or a toothbrush manufactured according to the invention;

Figure 3 shows one possible application of the method according to the invention for making a specific contour of a brush with stiff bristles or a brush with flexible bristles according to the invention;

Figure 4 shows another example of one possible embodiment of a contour of a brush with flexible bristles or a brush with stiff bristles according to the invention;

Figures 5 and 6 show additional examples of the design of a contour for a brush with flexible bristles or a brush with stiff bristles according to the invention, comprising so-called gaps;

Figures 7a and 7b show one possible embodiment of a brush with flexible bristles or brush with stiff bristles according to the

invention as well as the manufacturing process according to the invention, shown schematically;

Figure 8 shows another possible method for manufacturing a brush with flexible bristles or brush with stiff bristles according to the invention;

Figures 9 and 10 show other examples of brushes with flexible bristles and brushes with stiff bristles manufactured according to the invention;

Figures 11 and 12 show examples of specific forms of a toothbrush for example for advertising purposes;

Figures 13a to 13d show possible heating element shapes for specific shaping of a brush with stiff bristles; and

Figures 14a to 14e show schematically the manufacture of a toothbrush with a specific shape for the brush head.

In Figures 1a to 1c, the method according to the invention is shown schematically and indicates how the hairs, bristles, monofilaments, and the like or tufts thereof of brushes with stiff bristles or brush with flexible bristles are permanently mounted in a receptacle.

A body 1 of a brush with stiff bristles or brush with flexible bristles comprises a receptacle 5 that is delimited laterally by walls 3 and has a bottom 7. An insert element 9 is provided for insertion into this receptacle 5, said element preferably being made in the form of a disk, foil, lattice, wire, ring, or plate, or as a molded body. Hairs, bristles, monofilaments, or wires 11 are also provided for insertion and permanent mounting.

In Figure 1b, both insert element 9 and the hairs or bristles or monofilaments 11 are shown inserted into receptacle 5. The body 1 of brush with flexible bristles or brush with stiff bristles is inserted into a coil 21, said coil being located in the vicinity of insert element 9. It is important to note in this regard that coil 21 should be located as close as possible to the external contour of body 1 of the brush with flexible bristles or brush with stiff bristles. By applying a current, such as an alternating current for example, through wire coil 21, a magnetic field is generated that changes its direction synchronously with the frequency of the alternating current.

If insert element 9 is an electrically conducting material, for example an electrically conducting metal such as iron or copper, an alternating voltage will be induced in the insert element traversed by the magnetic field or eddy currents will be produced in the insert element so that insert element 9 is heated. As a result of the strong heating of insert element 9, firstly the ends of the hairs, bristles, monofilaments, or wires inserted into receptacle 5 will be at least softened or slightly melted, as will bottom 7 of the receptacle. This produces a welded connection and the hairs, bristles, monofilaments, or wires are thus held firmly in receptacle 5.

In Figure 1c, the brush with stiff bristles or brush with flexible bristles that is eventually obtained according to the invention is shown, with the idea according to the invention being indicated schematically by the fact that, above insert element 9, a welded layer 10 is formed. Of course a welded connection can be produced between the insert element and brush body 1 as well.

In the method using inductive heating that is described with reference to Figures 1a to 1c, this is of course only an example that can be supplemented by additional suitable methods.

Thus it is possible for example to insert an insert element 9 that does not conduct or conducts only slightly and to heat it by using so-called dielectric or capacitive heating. Then insert element 9 together with two plate electrodes forms the lossy dielectric of a capacitor powered with high frequency. The dielectric losses cause insert element 9 to be heated uniformly.

Another possibility is to use a material that has mostly polar compounds as insert element 9. In this case the heating can be produced by microwaves. However the use of ultrasound or other suitable high-frequency waves or electrical, electromagnetic, or magnetic fields is possible by means of which suitable materials can be excited in order to heat them in this manner. Although inductive heating is described with reference to Figures 1a to 1c, the present invention is not limited in any way to this type of heating.

If neither the receiving part nor the brush hairs, bristles, monofilaments, or wires consist of a material that can be softened or melted or have a melting point that is too high, it is also possible to introduce a so-called intermediate support into the receptacle that rests directly above the insert element for example. This intermediate support then consists of a material that can be melted slightly by heating the insert element in order in this way to produce the welded connection between the hairs, bristles, monofilaments, or wires inserted into the receptacle, with the receptacle itself.

Another possibility consists in making the method according to the invention in two stages in which initially insert element 9

with hairs, bristles, monofilaments, or wires 11 is welded outside receptacle 5. Then insert element 9 together with the hairs, bristles, monofilaments, or wires welded to it is introduced into receptacle 5 in order again to be secured in the latter by welding, or by means of conventional adhesives or by using mechanical retainers. Thus it is possible for example to provide insert element 9 with lateral clamping elements which secure insert element 9 in the receptacle when it is inserted.

Yet another possibility consists in performing the method in two stages, but in which insert element 9 is initially connected with receptacle 5. This connection again can be made by welding, gluing, or mechanically. In a second step, the hairs, bristles, monofilaments, or wires are then introduced in order then to be welded into the receptacle by using the method described in connection with Figures 1a to 1c. By means of this latter two-stage method it is then possible to take the receptacle together with the insert element to a supply of hairs, bristles, monofilaments, or wires, to apply it, and then to fasten the necessary number by means of the welding method according to the invention. Then the receptacle with the insert element can be taken away from the supply once more and the required hairs, bristles, monofilaments, or wires are accordingly removed from the supply.

In regard to the method to be used for heating the insert element, it should also be noted that it basically involves methods that are known from the prior art. It is in the final analysis a question of optimization as to which method and which process conditions are selected. In the case of inductive heating it should be added that the heating of the insert element is dependent upon firstly the distance of the coil from the insert element, the number of turns, the wire material selected, the applied field strength or current density, and the time

during which the insert element is heated. Heating of the insert element however can be controlled by the selected form of insert element, since the weight, size, and selected material play an important role for example. Thus for example an annular insert element can be heated readily while a ring that is interrupted at one point is practically impossible to heat.

However these factors also make it possible to control the heating of the insert element or to establish a temperature range to which the insert element is to be heated. In addition, reference should be made to the prior art from which the above-mentioned methods and procedures are best known.

Figure 2a shows a brush with flexible bristles 1' produced according to the invention comprising a handle 2' as well as a thin-walled receptacle 3' into which the hairs 11' of the brush with flexible bristles are inserted. The melted layer 10 by means of which the hairs 11' of the brush with flexible bristles are held can be seen above insert element 9.

Figure 2b shows a toothbrush 1" manufactured according to the invention that has a specially shaped handle 2", suitable for example for use of this toothbrush on an electrical tooth cleaning device. Once again the individual bristles or monofilaments 11" are held by a welded connection 10 on insert element 9. These monofilaments for example can be polyamides or another polymer material that is usually used for manufacturing toothbrushes.

As described above, the method according to the invention is suitable for giving brushes with stiff bristles and brushes with flexible bristles a specific contour.

As is clearly evident from Figure 2b, a plurality of receptacles 5" is formed in toothbrush 1" into each of which an insert element 9 is fitted. Thus so-called gaps 4 are produced between the various receptacles 5" that have no insert element. In this way it is basically possible to make brushes that have a plurality of bristle tufts with gaps between them. It is also possible to make a toothbrush with gaps 4 so that the flexibility of the individual bristle tufts 11" is increased considerably, which is especially desirable in toothbrushes.

Figure 3 shows in a cross section how a brush with stiff bristles or a brush with flexible bristles can be made convex or projecting. Insert element 9 used in Figure 3 is likewise made convex or projecting, so that when hairs, bristles or monofilaments of the same length are used an external contour 12 that is convex or projecting can be produced. The manufacture of such a brush with flexible bristles or a brush with stiff bristles of this kind is performed by analogy with the method described for example with reference to Figures 1a to 1c.

Similarly in Figure 4 an insert element 9 of a different design is employed that is made zigzag-shaped for example, whereby brush 1 in Figure 4 has three receptacles 5. Again the outer contour 12 of the individual elements of the brush with stiff or flexible bristles is made zigzag-shaped.

The great advantage of providing this contour by means of an insert element consists in the fact that after the brush with stiff or flexible bristles is produced, the individual hairs, bristles, or monofilaments do not have to be cut in order to produce the desired external contour 12. Especially in the case of monofilaments it has been found that during cutting, the ends that project out of the receptacle are indented or frayed, which is undesirable especially in the case of toothbrushes, since the

gums can be injured by damaged bristles. In this case it is necessary after cutting to use a special grinding or melting method to round off the ends of the hairs, bristles, monofilaments, or wires projecting out of the receptacle, said method being relatively costly and cumbersome. According to the invention, there is no need for this additional step.

With the manufacturing method in use today for making brushes with flexible bristles and brushes with stiff bristles, in producing brushes with flexible and stiff bristles with special shapes, it is necessary as a rule to cut and grind the hairs, bristles, monofilaments, or wires before making the brush with flexible or stiff bristles, which is cumbersome. Brush shapes, like those shown in Figure 4, cannot be made with conventional methods.

In Figures 5 and 6, an insert element 9 is employed that has a hole or gap 13 in the middle. Insert element 9 in Figure 5 also comprises an indentation or groove 15. Accordingly, gap 13 is also located centrally in contour 12 of the brush with stiff bristles or brush with flexible bristles manufactured according to the invention, since no welding of the inserted hairs, bristles, or monofilaments can take place in the middle of hole 13. After the brush with flexible or stiff bristles according to the invention has been manufactured, the hairs, bristles, or monofilaments that are inserted into gap 13 automatically fall out again. Moreover, external contour 12 has a matching groove or indentation in the vicinity of indentation or groove 15.

Similarly in brushes with stiff bristles and brushes with flexible bristles, areas can also be produced with a lower hair, bristle or monofilament density. In this way, as already mentioned in connection with Figure 2b, the flexibility of a

brush with stiff bristles or a brush with flexible bristles can be increased.

Figures 5 and 6 however again show the advantage of the method according to the invention as mentioned with reference to Figure 4 when it comes to creating contours or brush shapes without the necessity of cutting and grinding hairs, bristles, monofilaments, wires, or the like before or after the brush with flexible or stiff bristles is manufactured.

Figure 7a shows a brush with stiff bristles or a brush with flexible bristles which comprises individual tufts 17. If as shown in Figure 1b a coil 21 is placed around body 1 of the brush with flexible or stiff bristles or the outside wall 3, the peripheral tufts 17 of hair or monofilament of the brush with flexible bristles would be melted to a greater degree at the inserted ends, since the insert elements would also be heated to a greater degree. Thus there would be a danger in the middle that no real melting would take place so that the hairs, bristles, or monofilaments would fall out again when manufacture was complete.

For this reason it is advantageous as shown in Figure 7b to rotate the coil 21 through approximately 90° , compared with the diagram in Figure 1b and to insert brush 1 with stiff bristles in the horizontal direction into coil 21. This in turn ensures that all the insert elements 9 are arranged equally spaced relative to coil 21. As a result these insert elements 9 will also be heated uniformly.

In Figure 8 another possibility is shown of how an insert element for the welding of the ends of the hairs, bristles, or monofilaments inserted in the receptacle of the brush with flexible bristles or the brush with stiff bristles can be

achieved. In Figure 8, hole-shaped contact points 24 to which electrodes or terminals 25 can be connected are provided in the lateral receptacle walls 3. If an electrical current 26 is applied to the electrodes or terminals 25, insert element 9 acts as a form of resistance element and is heated as a result. Welding of the hairs, bristles or monofilaments 11 takes place once more in known fashion and as described with reference to Figures 1a to 1c.

Figures 9 and 10 show two additional examples of a brush with flexible bristles or a brush with stiff bristles manufactured according to the invention, whereby no actual receptacle 5 is provided on handle 1 but where insert element 9 is mounted directly on a flat surface on the handle or the brush or hair body. Thus, no walls 3 are provided laterally with respect to insert element 9, as in the brushes with stiff bristles and brushes with flexible bristles shown in previous Figures 1 to 8. In Figure 9 the insert element is made plate-shaped in a single stage, while insert element 9 in Figure 10 is made in two layers, with the lower part being provided in order to be fitted into the handle or body 1 while the upper part is provided to hold hairs, bristles, monofilaments, or wires.

Again it is possible to join insert element 9 with the handle or body 1 by gluing, mechanically, or by welding, while the hairs, bristles, monofilaments, or wires of the brush with flexible bristles or brush with stiff bristles are joined with insert element 9 by welding. Once again a welding layer 10 is shown schematically which can also be produced however by means of the above-mentioned intermediate support, if welding of the hairs, bristles, monofilaments, or wires is not possible. Metal wires are mentioned as an example of this, which as a rule cannot be melted or softened by the method according to the invention. In this case it is definitely advantageous to use an intermediate

support, for example consisting of a hot-melt material that can be readily melted or softened.

In Figures 11 and 12 in a schematic top view, a toothbrush head of a toothbrush 1", 2" is shown, comprising bristle tufts 11" that have a specific concrete shape 12". In the case of Figure 11, it is a company name so that the toothbrush shown can be used for example for advertising purposes. In the case of Figure 12, bristle tuft 11" has the shape of comic figures so that the toothbrush 1" shown in Figure 12 is suitable for children for example.

Figures 13a to 13d show various heating elements 9 that can be used to produce special shapes.

Finally, with reference to Figures 14a to 14e, the manufacture of a toothbrush or a toothbrush head, shown schematically, will be described in order for example to give the brush head a shape similar to the brush head shown in Figure 11.

The process begins with a basic toothbrush body 2", having at one end a head receptacle 5", as shown in Figure 14a. The heating element 9 shown in Figure 14b is inserted into receptacle 5", with the bottom of receptacle 5" matching the corrugated shape of heating element 9. A receiving body 3" is placed on heating element 9 as shown in Figure 14c. This receiving body 3" has gaps or openings for insertion of toothbrush bristles 11" as shown in Figure 14d. Originally the toothbrush bristles 11" according to Figure 14d are of the same length, whereupon the insertion of bristles 11" through receiving body 3" into receptacle 5" produces shape 12" as already shown in Figure 14d. Finally the heating of heating element 9 according to the invention produces the toothbrush head or toothbrush 1" as shown in Figure 14e.

In the manufacturing method and designs of brushes with stiff bristles or brushes with flexible bristles according to the invention as shown in Figures 1 to 14, only examples are involved of course that can be supplemented or modified or changed in some way. Thus of course it makes no difference whether the hairs, bristles, monofilaments, and the like are of animal or plant origin or are synthetic polymers or materials. Examples include sisal, ramie, hog bristles, hairs of whatever kind, monofilaments made of metal, glass, polyamide, polyethylene, polyester, polypropylene, PVC, polystyrene, etc., or wires, threads, cables, strings, made of any synthetic or natural materials.

The inductive heating of the insert element is likewise only one possible example and other examples such as dielectric heating, heating using microwaves, ultrasound, etc. are possible variations for working the method according to the invention.

In the designs shown in Figures 3 to 6 as well as 11, 12, and 14, once again only examples are involved and any shapes or contours can be produced by appropriately shaping the insert element.

It is important that the fastening of the hairs, bristles, monofilaments, and the like in or on the receptacle or a handle of a brush with flexible bristles or a brush with stiff bristles is performed by welding, with the welding being performed by applying wave or field lines onto or into the receptacle or handle.



Claims

1. Method for permanent attachment of bristles, hairs, monofilaments, wires (11, 11', 11'') and the like or tufts thereof in or on a handle (1, 1', 1'', 5), characterized in that the bristles, hairs, monofilaments, or wires inserted in or on the handle are joined to the handle by welding, with the welding being excited or triggered by wave or field lines applied or directed to the handle and/or the bristles, hairs, monofilaments, or wires.
2. Method especially according to Claim 1, characterized in that the bristles, hairs, monofilaments, or wires (11, 11') added in or on the handle, an insert element (9), added in or on the handle and/or the handle (5, 7) are excited or heated and at least partially softened or melted by the wave or field lines in order to produce the welded connection.
3. Method especially according to one of Claims 1 or 2, characterized in that initially at least one insert element (9) is inserted into or onto the handle, then the bristles, hairs, monofilaments, or wires (11, 11') are added, and then a high-frequency field, an electrical, electromagnetic, and/or a magnetic field, is generated to heat the insert element so that the bristles, hairs, monofilaments, or wires in contact with the element and/or the handle is/are at least partially melted in order to produce the welded connection.
4. Method for permanent attachment of bristles, hairs, monofilaments, or wires and the like or tufts thereof in or on a handle (1, 1', 1'', 5), characterized in that bristles, hairs, monofilaments, or wires (11, 11') are initially inserted into an insert element (9), said element being excited and heated by field or wave lines in order to at least soften or partially melt



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the added bristles, hairs, monofilaments, or wires, to produce a welded connection to the insert element and in that the insert element, with the bristles, hairs, monofilaments, or wires welded therein, is placed on or in the handle and connected therewith mechanically, by gluing, or by welding once again.

5. Method for permanent attachment of hairs, bristles, monofilaments, wires, or the like or tufts thereof in or on a handle, characterized in that at least one insert element (9) is placed in or on handle (1, 1', 1", 5) in order to be welded to the latter when excited by field or wave lines or to be connected mechanically or by gluing and in that the hairs, bristles, monofilaments, or wires (11, 11') are introduced into or onto the handle in the vicinity of insert element (9) whereupon the hairs, bristles, monofilaments, or wires, the insert element, and/or the handle is/are excited by field or wave lines in order to trigger a possible additional welding under temperature conditions that are possibly altered with respect to the first welding.

6. Method especially according to one of Claims 1 to 5, characterized in that a material with good conductivity, especially a metallic material, is used as insert element (9), said material being heated by inductive heating, wherein the handle and/or the insert element is located in a primary coil that surrounds or approaches the handle and/or the insert element to generate so-called induced eddy currents or a rapidly alternating electromagnetic field.

7. Method especially according to one of Claims 1 to 5, characterized in that the heating of insert element (9) is produced by dielectric or capacitive heating, with a metallic or nonmetallic material that is a poor electrical conductor being used as the insert element, whereby the insert element together with two plate electrodes located externally on the handle and/or

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the insert element forms the lossy dielectric of a capacitor supplied with a high frequency.

8. Method especially according to one of Claims 1 to 5, characterized in that waves in the high-frequency range such as microwaves or ultrasonic waves are used to heat the insert element, with the insert element preferably being made of a polar material in the case of microwaves, said material being excited and heated by microwaves.

9. Method especially according to one of Claims 1 to 5, characterized in that insert element (9) is an electrical resistance element and that terminals (24) are provided to heat this element, laterally with respect to the insert element, for example on the neck part, in order to heat the electrical resistance element when connected to a flow of electric current.

10. Method especially according to one Claims 2 to 9, characterized in that an insert element (9) in the form of a disc, plate, lattice, ring, wire, or foil is used.

11. Method especially according to one of Claims 1 to 10, characterized in that the handle is a receptacle (5) with side walls (3) into which the hairs, bristles, monofilaments, or wires are introduced.

12. Method especially according to one of Claims 1 to 11, characterized in that an intermediate support is provided on the handle, said support being excited by the wave or field lines or being heated by an insert element that is mounted in or on the handle and is excited by the wave or field lines, and is at least partially melted in order to form the welded connection between the hairs, bristles, monofilaments, or wires and the handle.



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13. Application of the method according to one of Claims 2 to 12 to produce a specific shape for a brush with stiff bristles or a brush with flexible bristles (1), characterized in that insert element (9) is specially adapted to the shape (12, 12') to be conferred on the brush with flexible bristles or brush with stiff bristles.

14. Application especially according to Claim 13, characterized in that the insert element has gaps (13) in the form of holes or slots at which gaps, depending on the brush with flexible bristles or the brush with stiff bristles, there are either no hairs, bristles, or monofilaments, or a reduced density thereof.

15. Application especially according to one of Claims 13 or 14 to produce a shape of the brush with flexible bristles or brush with stiff bristles that has the appearance of a signature or a logo, especially suitable for providing the brush with flexible bristles or the brush with stiff bristles with an advertising message and/or to address an application or a certain target audience.

16. Application of the method according to one of Claims 1 to 12 to produce a brush with flexible bristles (1') or a brush with stiff bristles (1'').

17. Application especially according to Claim 16 for producing a toothbrush.

18. Application according to Claim 17 for producing a toothbrush comprising a toothbrush head with a special shape, especially representing a signature or a shape to address a certain target audience by means of the toothbrush.



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19. Application of the method according to one of Claims 1 to 12 for making a brush with flexible bristles (1, 1', 1'') or a brush with stiff bristles comprising areas with a higher density of hairs, bristles, monofilaments, or wires and areas or zones with a reduced density or areas and zones with gaps in order to increase the flexibility of the brush with flexible bristles or brush with stiff bristles.

20. Application of the method especially according to Claim 19 to produce a toothbrush.

21. Brush with flexible bristles or brush with stiff bristles comprising a handle (1, 1', 1'', 5) as well as the hairs, bristles, monofilaments, or wires (11, 11') of a brush with flexible bristles or a brush with stiff bristles held in or on a handle, characterized by at least one insert element (9) located in or on handle (1, 1', 1'', 5), said element being located adjacent to the hairs, bristles, monofilaments, or wires held in or on the handle and with the hairs, bristles, monofilaments, or wires (11, 11') being held in or on handle (5) by a welded connection (10).

22. Brush with flexible bristles or brush with stiff bristles especially according to Claim 21, characterized in that insert element (9) consists of a material that can be excited by wave or field lines.

23. Brush with flexible bristles or brush with stiff bristles especially according to one of Claims 21 or 22, characterized in that insert element (9) consists of an electrically conducting material, preferably a metal such as iron or copper.

24. Brush with flexible bristles or brush with stiff bristles especially according to one of Claims 21 to 23, characterized in



This Sheet Has Been Replaced



23

that insert element (9) is in the shape of a disc, plate, wire, ring, lattice, or foil.

25. Brush with flexible bristles or brush with stiff bristles especially according to one of Claims 21 to 24, characterized in that insert element (9) is made with a shape, said shape corresponding at least approximately to the shape of the shape (12) of the brush with flexible bristles or brush with stiff bristles, said shape being formed by the hairs, bristles, monofilaments, or wires.

26. Brush with flexible bristles or brush with stiff bristles especially according to one of Claims 21 to 25, characterized in that it is a toothbrush with a toothbrush head having a special shape, for example a signature or the shape of an object, suitable for addressing a special target audience.