



EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.07.2025 Bulletin 2025/27

(51) International Patent Classification (IPC):
A46B 5/00 (2006.01)

(21) Application number: **24189941.8**

(52) Cooperative Patent Classification (CPC):
A46B 5/0016; A46B 5/0037; A46B 5/0062

(22) Date of filing: **22.07.2024**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(71) Applicant: **Guzmán-Lugo, Eulogio A.**
00923 San Juan (PR)

(72) Inventor: **Guzmán-Lugo, Eulogio A.**
00923 San Juan (PR)

(74) Representative: **González López-Menchero, Álvaro Luis**
Protectia Patentes y Marcas, S.L.
C/ Almagro, 3 2^o izda.
28010 Madrid (ES)

(30) Priority: **29.12.2023 US 202318400788**

(54) **ERGONOMIC FLEXIBLE AND ADJUSTABLE BRUSHES**

(57) Ergonomic and flexible brushes for use in conventional processes such as commercial, residential, industrial, and artistic painting processes, as well as for cleaning and cosmetic applications, are disclosed. The functional section of the brush is connected to a flexible structure having a proximal end and a distal end. The distal end of the flexible structure is strongly

connected to the functional section of the brush and the proximal section is connected to a handle or, in the alternative, to a second functional section using preferably metal epoxy such as steel epoxy. The functional section of the brush may be positioned and repositioned in predetermined angled and/or twisted positions by simply bending the flexible structure of the brush.

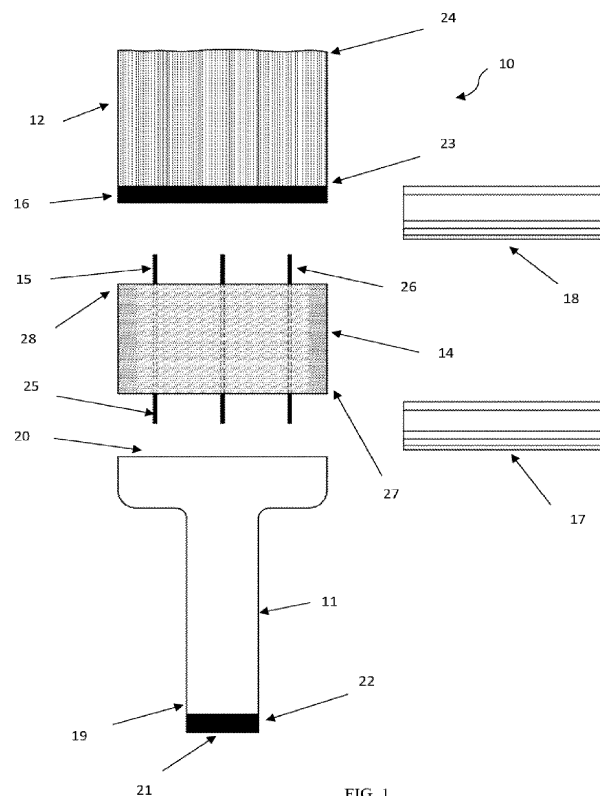


FIG. 1

Description

TECHNICAL FIELD

[0001] The invention relates to ergonomic and flexible brushes. It is particularly directed to brushes with a flexible and angle-adaptable section for use in conventional uses such as commercial, residential, and industrial painting, artistic painting, cleaning, and applying cosmetic products.

BACKGROUND OF THE INVENTION

[0002] As already well known, the commercial, residential, and industrial painting processes require coating the internal and external surfaces of structures-commerce, residential, and industrial structures - with a layer of paint, wherein brushes are one of the essential and necessary tools. Likewise, artistic painting is the process of applying paint, pigment color, or other medium to a surface to express the creativity of an artist. It also requires brushes, among other tools, for applying the color-providing substance. Similarly, the use of brushes is also well-known and required in cleaning and removing dust and debris and in applying cosmetic products, such as paints, powders, and the like, to different external parts of the human body.

[0003] Conventional brushes used in commercial, residential, artistic, and cosmetic activities are commercially available in a wide variety of sizes, lengths, and thicknesses. Said brushes share a common general structure comprising a handle section suitable for grabbing and manipulating the brush, which is connected or coupled to the head section that comprises a given material suitable to collect or retain and later transfer or dispersing or distributing the coating or painting substance to the intended surface or area.

[0004] The handle and the head section are coaxially positioned in a rigid position, or in simple words, in an aligned or straight and fixed position. Said configuration presents difficulties to the painter in reaching corners, and hard-to-reach surfaces such as interconnecting ceiling and wall areas. Said difficulties of working on areas and objects out of the worker's reach are well-known in the art and require the use of ladders, cradles, scaffolds, and the like. However, such options are considered time-consuming and inefficient since the workers must consistently move and reposition the working or painting materials to reach areas or objects out of reach. Furthermore, said alternatives usually result in highly insecure and potentially dangerous work conditions. Another main problem commonly present in the painting process is that the surface to be coated with a colored substance may be placed or oriented in various angular positions, or it may have a hard-to-paint contour configuration.

[0005] Similarly, in the use of conventional brushes in commercial and residential as well as in artistic painting and in the application of cosmetic products, the parallel

position of the head and handle section of the brushes forces the worker to assume a stressful posture while working. In other words, the worker must position his hands and arms in an awkward position that stresses and strains the body due to the lack of flexibility of the handle and head of the brushes. One consequence of such non-ergonomic positions -mainly when using the arm above shoulder level while doing a repetitive movement- generates musculoskeletal disorders caused by injuries in the joints, bones, and nerves that negatively affect the wrists, arms, shoulders, upper and lower back, and neck of workers. Some of the most common such disorders are Tendinitis, Carpal Tunnel Syndrome, Thoracic Outlet Syndrome, and back and neck pain, among others.

[0006] The prior art had presented a variety of alternatives to overcome the lack of flexibility of the conventional brushes. In some instances, holders for inserting or assembling conventional brushes to add flexibility to said brushes while in painting, as those disclosed in US patents 2,346,570; 2,469,050; 2,792,581; 3,413,034; 3,357,035; 3,994,037; 4,127,296; 4,525,889; 4,854,625; 5,056,952; 5,329,663; 8,566,999; and 8,839,480 had been presented as a variety of options.

[0007] In other instances, brushes with structures that allow the head brush or the brush functional section to be positioned in a nonlinear or noncoaxial position in reference to the handle section had been disclosed, such as those described in US patents 3,928,886; 7,472,447; 7,770,252, 8,595,883 and US publications 2005/0039281; 2007/0204418; 2017/0188692; 2019/0281966.

[0008] Another alternative has been directed to the incorporation of a selective velutinous material as the painting material, which is supported by a reticulated, sponge-like, thus absorbing foam and secured to the structure of the brush with a ferrule, as disclosed in US patents 10,791,824 and 10,888,151.

[0009] Regarding artistic brushes, an alternative wherein the structure of the brush has been modified to address the problem presented in US Patent Application Publication 2006/0248669. In this publication, an artistic brush has two bristles tuft as the functional section. On the other hand, extra grip cover for artistic brushes is disclosed in the US patent Application Publication 2012/0054986. The grip cover amplifies the diameter of the handle of the artistic brush in order to provide as more secure and comfortable grip of the artistic brush.

[0010] The prior art also discloses a series of devices with nonconventional and exclusive structures that allow the functional part of the brush to be positioned at different angles of a single plane or on other particular planes. Some of such devices are shown, for instance, in US patents 2,395,245; 4,528,714; 5,207,755; 8,132,978, and 9,486,060.

[0011] However, while the options already mentioned have their own merits, there is still a need to provide brushes having a general structure wherein their functional or head section is connected to a flexible and

adjustable section that allows the user to easily position the functional section at a preselected and predetermined angle in a fast and easy manner, that saves time, reduces costs, allows the painter to work much safely and to select a comfortable, healthier, and ergonomic body position while using said brushes in conventional uses.

SUMMARY OF THE INVENTION

[0012] This invention is directed to ergonomic, flexible, and adjustable brushes useful in the commercial, industrial, and residential painting processes, the artistic painting industry, in applying cosmetology products- paints, creams, powders, and the like- to different external parts of the human body, in maintenance and cleaning processes and in any other brushes used conventionally. In general, all the herein-disclosed brushes share typical sections in their structure. In the first place, all of the brushes disclosed here comprise an external flexible section and at least one internal elongated bendable member. Said internal elongated bendable member comprises a first end and a second end and is inserted through the interior of the said external flexible section while its first end is located outside of the proximal end of the external flexible section, and its second end is located at the distal end of the external flexible section. This assembly of the external flexible section and the internal elongated bendable member constitute essential part of the structure of all the herein-disclosed brushes. The first and second ends of the internal elongated bendable member are, in a general sense, points of connection between the external flexible section and other parts of the particular brushes. In the second place, in all of the herein disclosed brushes, at least one of the ends of said internal elongated bendable member is connected and secured to the functional section of the brush. As defined herein, the functional section is the brush section that comprises a functional material used for performing conventional activities. For instance, in commercial, industrial, and residential painting brushes, artistic brushes, and cosmetic brushes, the functional material is the material in the brush that is used to collect and further disperse a given chemical composition in a given and predetermined surface. Similarly, regarding cleaning brushes, said functional material corresponds to the brush section used to remove dust, dirt, or any other particles in a given area. In the third place, by means of the assembling of the external flexible section, the internal elongated bendable member and the functional section of the brush, the user of the brush is able to adapt said functional section to a suitable ergonomic angle and/or twisted position, depending on the particular circumstances of the determined process wherein the brush is being used and the specific position or contour of the surface wherein the chemical composition is required to be dispersed or dust or dirt is desired to be removed ergonomically, as explained below in further detail. In general terms, one of the ends of said external

flexible section is assembled to a functional section. At the same time, the other end may also be assembled to a handle or, in some instances, to a second functional section.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The foregoing and additional features and characteristics of the embodiments of the present invention will become more apparent from the following detailed description considered with reference to the accompanying drawings, which are used herein in a manner of example only, and wherein:

FIG. 1 shows an exploded view of an embodiment of a brush for use in commercial, residential, or industrial painting according to the invention.

FIG. 2 shows a perspective view of an embodiment of a brush for use in commercial, residential, or industrial painting, according to the invention, wherein the functional section is aligned to the handle.

FIG. 3 illustrates a perspective view of the embodiment of the brush shown in FIG. 2, wherein the functional section is angled with respect to the handle.

FIG. 4 illustrates a perspective view of the embodiment of the brush shown in FIG. 2, wherein the functional section is bent at about a perpendicular angle with respect to the handle section.

FIG. 5 illustrates a perspective view of the embodiment of the brush shown in FIG. 2, wherein the functional section is twisted.

FIGS. 6 to 11 show views of a variety of embodiments of brushes for use in commercial, residential, or industrial painting according to the invention.

FIG. 12 shows a perspective view of an embodiment of a brush for use in cleaning purposes according to the invention.

FIGS. 13 and 14 show perspective views of the embodiment of the brush illustrated in FIG. 12, wherein the functional section is positioned at different angles with respect to the handle.

FIG. 15 shows a perspective view of an embodiment of a brush for use in cleaning purposes according to the invention, illustrating a variation of the supporting base of the cleaning brush illustrated in FIG. 12.

FIGS. 16 and 17 show perspective views of the embodiment of the brush illustrated in FIG. 15, wherein the functional section is positioned at different angles with respect to the handle.

FIG. 18 shows a perspective view of an embodiment of a brush for use in artistic painting, according to the invention.

FIGS. 19 and 20 illustrate perspective views of the embodiment of the artistic brush shown in FIG. 18, wherein the functional section is in different angled positions with respect to the handle.

FIGS. 21-35 illustrate views of various embodiments of brushes for use in artistic painting, according to the invention.

FIG. 36 shows a perspective view of an embodiment of a brush for use in applying cosmetic products or in the cosmetology industry, according to the invention. FIG. 37 and 38 show a perspective view of the embodiment of the brush for use in applying cosmetic products or in the cosmetology industry, illustrated in Fig. 36, wherein the functional section is positioned at different angles with respect to the handle.

FIGS. 39-52 show views of various embodiments of brushes for use in applying cosmetic products or use in the cosmetic industry.

FIG. 53 shows a perspective view of another embodiment of a brush for use in cosmetic products or in the cosmetology industry comprising two functional sections, according to the invention.

FIG. 54 and 55 show a perspective view of the embodiment of the brush for use in cosmetic products or in the cosmetology industry, illustrated in Fig. 53, wherein the functional sections are positioned at different angles with respect to each other. FIG. 56 shows a perspective view of another embodiment of a brush for use in applying cosmetic products or in the cosmetology industry comprising a dual functional section, according to the invention. FIG. 57 and 58 show a perspective view of an embodiment of a brush for use in applying cosmetic products or in the cosmetology industry, illustrated in Fig. 56, wherein the functional sections are positioned at different angles with respect to each other. Fig. 59 shows an exploded perspective view of an embodiment of the brush for use in commercial, residential, or industrial painting according to the invention.

Fig. 60A shows a perspective view of the functional section and the external flexible section ready to be assembled in an embodiment of the brush for use in commercial, residential, or industrial painting, according to the invention.

Fig. 60B shows a top view of the handle ready to be assembled in an embodiment of the brush for use in commercial, residential, or industrial painting, according to the invention.

Figs. 61-64 shows a process to assemble the embodiment of the brush for use in commercial, residential, or industrial painting.

FIGS. 65A shows an exploded perspective view of an embodiment of an artistic brush according to the invention.

Fig. 65B shows a bottom view of the functional section of an embodiment of an artistic brush according to the invention ready to be assembled.

Fig. 66 shows the embodiment shown in Fig. 65A already assembled.

Fig. 67A shows an exploded perspective view of an

embodiment of a brush for use in cosmetic applications according to the invention.

Fig. 67B shows a bottom view of the functional section of an embodiment of a brush for cosmetic products application, according to the invention, which is ready to be assembled.

Fig. 68 shows the embodiment illustrated in Fig. 67A already assembled.

FIGS. 60 and 70 show perspective views illustrating the use of painting brushes according to the invention in commercial, residential, or industrial painting. FIG. 71 shows a perspective view illustrating the use of an artistic brush according to the invention.

FIG. 72 shows a perspective view illustrating the use of a brush in the process of applying cosmetic products according to the invention.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0014] Detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. It is thus to be understood that this invention is not limited to particularly exemplified structures, components, methods, or uses, as such may, of course, vary. The drawings are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. It is also to be understood that the terminology used herein is for the purpose of describing specific embodiments of the invention only and is not intended to limit the scope of the invention in any manner. It must be noted that, as used in this specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the content clearly dictates otherwise. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting but merely as a representative basis for the claims and/or as a representative basis for teaching one skilled in the art to employ the present invention in various ways.

[0015] In general terms, the instant invention comprises flexible, ergonomic, and adjustable brushes useful in conventional uses, such as in the commercial, residential, commercial painting processes, the artistic painting industry, in applying cosmetology products- paints, creams, powders, and the like- to different external parts of the human body, and in maintenance and cleaning processes.

[0016] All the herein-disclosed brushes share the following sections in their structure: a functional section, an external flexible section, and at least one internal elongated bendable member.

[0017] The functional section, as defined herein, is the section of the brush directly used for its conventional activities. It comprises a functional material and a supporting base.

[0018] The functional material is the material that conventionally is in direct contact with a given surface; for instance, regarding industrial, residential, and commercial brushes, the functional material is the section of the brush that is able to collect and retain the paint and is in direct contact with the surface wherein the paint is applied. Regarding cosmetic brushes, the functional material is the brush section that collects and retains the cosmetic product and is in direct contact with the human body wherein the cosmetic products are applied. Functional materials include animal hair, natural fibers, synthetic fibers or bristles, fabrics, soft foam, and the like.

[0019] The supporting base, which is defined herein as a base or support for the functional material, is made of solid and firm suitable material, such as wood, plastic, metal, or, in some instances, a solid already cured adhesive such as glue that may be surrounded and secured by a ferrule. The supporting base is connected to the functional material in order to maintain the arrangement, structure, and proper organization of said functional material. The supporting base may be externally exposed, or it may be internally located in the structure of the brush. Said functional section has a proximal end and a distal end.

[0020] The external flexible section, as herein defined, is a section of the brush that is externally visible and is made of a flexible, strong, bendable, tear-resistant, high-resilience, impermeable, solvent-resistant suitable material. It is made of plastic or a high-density foam and, even more preferably, high-density ethyl vinyl acetate foam, commercially available and known as EVA form.

[0021] The internal elongated bendable member as herein defined is an inner section having an elongated shape, made of a hard, flexible or semi-flexible, strong, bendable, corrosion-resistant, tear-resistant, splitting-resistant, resilience, solvent-resistant, impermeable suitable material having an excellent tensile strength that, once it has been bent, remains in the bent position or is able to stay in place but is easily repositioned by the user to any other predetermined position at the user's will. Preferably, it is made of a metallic material, most preferably copper, aluminum, annealed wire, galvanized steel, steel, carbon steel, stainless steel, or a combination thereof. Even more preferably, said internal elongated bendable member is made of low carbon steel, commercially available, and known as tie wire, which may or may not be PVC coated. The diameter of the tie wire suitable in the preparation of the herein disclosed brushes varies depending on several factors, such as the particular shape and size of the brush. It may be in a suitable range of 0.031 to 0.25 mm and, more preferably, in a range of 0.0625-0.078 mm.

[0022] The external flexible section and the internal elongated bendable member are integrated, thus providing a flexible structure that, once it is connected to the functional section, allows the user of the brush to adapt said functional section to a suitable ergonomic angle depending on the particular circumstances of the deter-

mined process wherein the brush is being used and the specific position or contour of the surface wherein the chemical composition is required to be dispersed or dust or dirt is desired to be removed, as explained below in further detail. In all embodiments, the distal end of said external flexible section is connected to a functional section via the supporting base. In some embodiments, the proximal end of the external flexible section is connected to a handle; in other embodiments, it is connected to a second functional section. All of these connections require a strong bond, which is achieved using an epoxy adhesive, preferably a metal epoxy and even more preferably steel epoxy.

[0023] FIG. 1 shows an exploded view of an embodiment of an ergonomic, flexible, and adjustable brush **10** for use in commercial, residential, or industrial painting, according to the invention. In general terms, it requires functional section **12** adhered to supporting base **16**, the external flexible section **14**, which is integrated to internal elongated bendable members **15** and handle **11**. Alternatively, lower ferrule **17** and upper ferrule **18** may also be incorporated into the structure of brush **10**.

[0024] Handle **11** comprises a body made of any suitable material, such as metal, wood, plastic, or a combination thereof. Said body comprises a first end **19** and a second end **20**. Handle **11** may have a variety of shapes and sizes. Indeed, conventional handles used in conventional painting brushes are suitable for use as handles according to the instant invention. In some embodiments, as the one illustrated in Figs. 1 and 59, it also comprises a threaded borehole **21** at the first end **19**, which is externally surrounded by a ferrule **22**. In such embodiments, the flexible brush **10**, may be adapted to a suitable threaded extension pole via said borehole **21**, wherein said ferrule **22** safely and firmly secured the fastening between the suitable extension pole and the flexible ergonomic brush.

[0025] The functional section **12** comprises a proximal end **23** and a distal end **24**. As in most commercial, residential, or industrial painting brushes, said functional section **12**, as previously defined herein, comprises any functional or painting material suitable to collect and/or retain and further disperse a given substrate on a predetermined surface. As in conventional painting, said functional or painting material comprises animal hair, natural fibers, synthetic fibers or bristles, fabrics, soft foam, or the like. Supporting base **16**, located at the proximal end **23** of functional section **12**, is used to add support and maintain the arrangement and stability of the functional or painting material in functional section **12**. Said supporting base **16** is made of solid and firm suitable material, such as wood, plastic, metal, or, in some instances, a solid already cured adhesive such as glue that may be surrounded and secured by a ferrule.

[0026] The internal elongated bendable member **15** is made of any flexible or semi-flexible, strong, bendable, corrosion-resistant, tear-resistant, splitting-resistant, resilience, solvent-resistant, impermeable suitable materi-

al having an excellent tensile strength that, once it has been bent, remains in the bent position or is able to stay in place but is easily repositioned by the user to any other predetermined position at the user's will. Preferably said internal elongated bendable member may be made of a metallic material, most preferably copper, aluminum, annealed wire, galvanized steel, steel, carbon steel, stainless steel, or a combination thereof. Even more preferably, said internal elongated bendable member is made of low carbon steel, commercially available, and known as tie wire, which may or may not be PVC coated. It comprises an elongated body inserted through the external flexible section **14** while allowing the first ends **25** and the second ends **26** of said internal elongated bendable member **15** to remain outside the external flexible section **14**.

[0027] The external flexible body **14** is made of any flexible, strong, bendable, tear-resistant, high resilience, impermeable, solvent-resistant suitable material. Preferably a plastic or high-density foam and, even more preferable, high-density ethyl vinyl acetate foam, commercially available and known as EVA foam. It comprises a proximal end **27** and a distal end **28**.

[0028] The structure of said brush **10** is assembled by attaching or connecting the second end **20** of the handle **11** to the proximal end **27** of the external flexible section **14** while inserting the first ends **25** of the internal elongated bendable members **15** inside the said second end **20** of the handle **11**. Similarly, said assembly also requires connecting or attaching distal end **28** of the external flexible section **14** to the functional section **12** via supporting base **16** while inserting second ends **26** of the internal elongated bendable members **15** into the functional section **12** via the supporting base **16**.

[0029] The mentioned connections or attachments wherein the proximal end **27** of the external flexible section **14** is connected to the handle **11** and the distal end **28** of the external flexible section **14** is connected to the functional section **12** via supporting base **16**, forming a single body of the brush **10** require powerful attachment or connection. It is achieved using a heavy-duty adhesive conventionally used for bonding materials of different natures or substrates, such as metals, wood, ceramic, and plastics. Among the heavy-duty adhesives used in the creation of said connections are epoxy adhesives, even more preferably, metal epoxy, and, even more preferably, commercially available steel epoxy. The use of epoxy adhesive provides an extremely strong rigid bonding, with high tensile strength, compression strength, impact strength, and resistance to water and chemical solvents and high temperatures.

[0030] Since said connections are sufficiently strong, the resulting brush **10** is suitable for use in commercial, residential, or industrial painting processes without the assistance of any other reinforcement. Nonetheless, lower ferrule **17** may be used to reinforce and further secure the connection between the second end **20** of the handle **11** and the proximal end **27** of the body of the external

flexible section **14** and, likewise, the use of upper ferrule **18** may be used to reinforce and further secure the connection between the distal end **28** of the external flexible section **14** the to the proximal end **23** of the functional section **12**. However, including said ferrules **17** and **18** in the structure of brush **10** may be considered convenient but optional. The scope of the invention also includes the use of a single ferrule, **17** or **18**, in any one of the cited connections. The herein disclosed parts and connections are suitable in the manufacture or preparation of ergonomic, flexible, and adjustable commercial, residential, or industrial painting brushes of any size and of any shape, as, for example, embodiments **29a**, **29b**, **29c**, **29d**, **29e**, and **29f** which are illustrated in Figs. 6-11.

[0031] Examples illustrating the flexibility and ergonomic adjustments of the resulting flexible brush **10** are shown in Figs. 2, 3, 4, and 5. In Fig. 2, a brush according to the invention is illustrated, having its functional section **12** aligned to handle **11**. Thus, the functional or painting material in functional section **12** -in this embodiment, shown as bristles-and the handle **11** are axially positioned. According to the invention, the brush user may position the functional section **12** in multiple predetermined angled positions with reference to the handle **11** by simply bending the external flexible section **14** of the brush **10**. The user of brush **10** may position the functional section **12** at a given and predetermined angle with reference to the handle **11**, as illustrated, for example, in Figs. 3 and 4. The user may also position the functional section **12** in a given predetermined twisted position, as illustrated in Fig. 5. Similarly, the user may adapt the position of the brush to multiple possible positions by bending or twisting the external flexible section **14**. The functional section **12** stays in the selected position unless the user changes said position. It maintains the said position even while it is used in painting since the pressure between the brush and the painting surface does not change or modify the position of the functional section **12**. In other words, the herein-disclosed brush maintains the angled and/or twisted positions set previously by the user while it is used in the painting process. Said angled and/or twisted positions are obtained after bending external flexible section **14** and staying in said bendable and/or twisted position. Brush **10** maintains its physical and structural integrity while being used in painting since the connections achieved by the use of the adhesive epoxy are extremely strong and the flexible but stays-in nature of the internal elongated bendable member **15**. Likewise, the strength of said bonding, in combination with the stays-in nature of the internal elongated bendable member **15**, allows the functional section **12** to retain its angled and/or twisted position regardless of the pressure of said functional section **12** against the surface being subjected to painting.

[0032] In order to switch the angle or position of the functional section **12**, the user must manually push and reposition the external flexible section **14** until the functional section **12** is repositioned to the new predeter-

mined position. In this manner, since the functional section 12 of the brush 10 is easily positioned and repositioned in multiple angled and twisted positions, the user is provided with a brush that is easy to use, flexible, ergonomic, and adjustable to facilitate the painting of any predetermined surface, including hard-to-reach surfaces.

[0033] Furthermore, since handle 11 has a threaded borehole 21 reinforced by the external ring 22 at its first end 19, the herein-disclosed brush 10 may be coupled to a painting pole. Once the functional section 12 has been fixed to a predetermined angled and/or twisted position, the user may easily paint high or out-of-reach surfaces from a safe place, thus avoiding using insecure stairs or unsafe platforms.

[0034] Similarly, as illustrated in Figs. 6-11, the scope of the instant invention embraces a wide variety of flexible and adjustable ergonomic brushes since the distal ends of the functional section may be shaped in different manners; for example, it may be triangularly shaped, as embodiments 29a and 29d illustrated in Figs. 6 and 9; or arranged in a linearly flat shape, as embodiments 29c, and 29e shown in Figs. 8 and 10; or it may have a diagonal or angular contour, as embodiments 29b and 29f as illustrated in Figs. 7 and 11, respectively. The scope of the instant invention includes integrating any suitable handle used in conventional painting brushes of different shapes and sizes.

[0035] The scope of the instant invention also comprises embodiments wherein the functional section comprises any suitable painting material, such as bristles, sponges, fabric, or foam, as the one illustrated in embodiment 29c in Fig. 8. Similarly, the scope of the invention also embraces handles that may have a borehole 21, as embodiments 29c, 29d, 29e and 29f illustrated in Figs. 8, 9, 10, and 11, respectively. It also embraces embodiments that do not include borehole 21 as in embodiments 29a and 29b, shown in Figs. 6 and 7, respectively.

[0036] The scope of the invention also embraces cleaning brushes, comprising the essential sections already disclosed for brushes for use in commercial, residential, or painting. Said essential sections are assembled in the same manner as previously disclosed for painting brush 10. For example, in Fig. 12, cleaning brush 30 is shown. It has a functional section 31, comprising multiple bristles 32; a handle 33; an external flexible section 34; an internal elongated bendable member 35; and a supporting base 36. As explained above for brushes for use in commercial, residential, or industrial painting, the second end 37 of the handle 33 is connected to the proximal end 39 of the external flexible section 34, and the distal end 40 of the external flexible section 34 is connected to the functional section 31 through supporting base 36. The internal elongated bendable member 35 is inserted into the external flexible section 34, and its first end 42 is inserted into the second end 37 of handle 33, while the second end 43 is inserted into the supporting base 36, thus connecting the external flexible section 34

with the functional section 31. As previously indicated, said connections are performed using an epoxy adhesive, preferably steel epoxy. The internal elongated bendable member 35 is not shown in Fig. 12 since it is internally inserted in brush 30, as explained previously for painting brush 10.

[0037] Figs. 13 and 14 illustrate brush 30, wherein the functional section 31 is in different angled positions due to the bending of the external flexible section 34. As in the painting brushes, by bending the external flexible section 34, the user may position and reposition the functional section 31 at a suitable position, depending on the predetermined surface or place to be cleaned.

[0038] In Fig. 15, a variation of brush 30 is shown, as brush 50, wherein the external flexible section 34a is more extensive than external flexible section 34 and wherein the supporting base 36a is shortened and does not have a T-shaped structure of the supporting base 36. External flexible section 34a and supporting base 36a provide a cleaning brush 50 that is able to be bent at a more acute angle than brush 30, and thus wherein the functional section 31a is able to reach and clean even the deepest hard-to-reach surfaces, such as areas between such keys on a keyboard and other similar sections in sophisticated electronic types of equipment. Other embodiments of the flexible, ergonomic, and adjustable cleaning brushes 30 and 50, having different sizes and shapes, are embraced within the scope of the instant invention.

[0039] The scope of the invention also embraces artistic brushes, comprising the essential sections already disclosed for brushes for use in commercial, residential, and industrial painting and brushes for use in cleaning, as previously discussed. For example, in Fig. 18, the artistic brush 60 is illustrated. It comprises a functional section 61, having multiple bristles 62; a handle 63, an external flexible section 64; an internal elongated bendable member 65; and a supporting base 66. As explained above for brushes for use in commercial, residential, or industrial painting and in cleaning brushes, the second end 67 of the handle 63 is connected to the proximal end 69 of the external flexible section 64, and the distal end 70 of the external flexible section 64 is connected to the functional section 61 through supporting base 66. Said connections require a strong adhesive such as an epoxy adhesive, preferably steel epoxy. The lower ferrule 75 is used to further secure the connection between handle 63 and external flexible section 64. Similarly, the upper ferrule 76 further secures the connection between external flexible section 64 and functional section 61. Upper ferrule 76 also houses the supporting base 66, which comprises an already cured adhesive that supports the arrangement of the painting material. The internal bendable member 65 is inserted into the external flexible section 64, and its first end 72 is inserted into the second end 67 of handle 63, while the second end 73 is inserted into functional section 61 via the supporting base 66. Internal elongated bendable member 65 and supporting base 66 are not shown in

Fig. 18 since both are internally located in brush 60. However, as discussed below, internal elongated bendable member 65 and supporting base 66 are illustrated in Figs 69A and 69B.

[0040] In Fig. 18, functional section 61 and handle 63 are aligned as in a conventional artistic brush. However, in Figs. 19 and 20 artistic brush 60 is illustrated as having its functional section 61 in angled positions with reference to the handle 63. Said angled positions are obtained after bending external flexible section 64. The painting brush stays in said bendable position. However, the user may position and reposition the functional section 61 in any suitable predetermined angled position by bending the external flexible section 64.

[0041] Brush 60 maintains its physical and structural integrity while being used in painting since the connections achieved by the use of the adhesive epoxy are extremely strong and the flexible and stays-in nature of the internal elongated bendable member 65. Likewise, the strength of said bonding, in combination with the stays-in of the internal elongated bendable member 65, allows the functional section 61 to retain its angled and/or twisted position regardless of the pressure of said functional section 61 against the surface being subjected to painting.

[0042] The scope of the instant invention embraces multiple artistic brushes, having handles of different shapes and styles and functional sections of different painting materials, comprising different shapes and arrangements while comprising the same essential structural sections of brush 60 previously disclosed, as illustrated in embodiments 75a-75s, shown in Figs. 21 through 39. As in artistic brush 60, all of these embodiments require an external flexible section 64a with a proximal end connected to a handle section 63a and a proximal end connected to the functional section 61a.

[0043] The herein-disclosed artistic brushes facilitate the artistic painting since the artist is able to, by bending the external flexible section, position the painting material of the functional section at a predetermined ergonomic and angled position. Such positions facilitate multiple linear and nonlinear painting strokes and avoid positioning the artist's wrist in uncomfortable angled positions, thus avoiding physical pain and the development of medical conditions such as carpal tunnel syndrome (CTS) or similar undesirable conditions. Furthermore, it helps artists already suffering from such conditions to reintegrate themselves into the artistic painting. The painter may select a particular artistic brush and bend its functional section at a predetermined ergonomic angle that provides a comfortable hand position while painting.

[0044] Furthermore, the scope of the invention also embraces cosmetic brushes comprising the essential sections already disclosed for brushes for use in commercial, residential, or industrial painting, brushes for use in cleaning, and artistic brushes. For example, in Figs. 36, 67A, and 68, the cosmetic brush 80 is illustrated. It has a functional section 81, comprising multiple bristles 82; a

handle 83; an external flexible section 84; an internal elongated bendable member 85; and a supporting base 86. As explained above, for brushes for use in commercial, residential, or industrial painting; as well as for cleaning brushes, and artistic brushes, the second end 87 of the handle 83 is connected to the proximal end 89 of the external flexible section 84, and the distal end 90 of the external flexible section 84 is connected to the functional section 81 through supporting base 86. As in the artistic brushes, the lower ferrule 95 is used to further secure the connection between handle 83 and external flexible section 84. Similarly, upper ferrule 96, besides further securing the connection between external flexible section 84 and functional section 81, also houses an already cured adhesive that acts as the supportive base 86. The internal elongated bendable member 85 is inserted into the external flexible section 84, and its first end 92 is inserted into the second end 87 of handle 83, while the second end 93 is inserted into the supporting base 86. As in the artistic brush, the internal elongated bendable member 85 and supporting base 86 are not shown in Fig. 36 since both are internally located in brush 80. However, internal elongated bendable member 85 and supporting base 86 are illustrated in Figs. 67A and 67B.

[0045] In Fig. 36, cosmetic brush 80 has its functional section 81 and handle 83 positioned in an aligned or straight position, as in a conventional cosmetic brush. However, in Figs. 37 and 38, cosmetic brush 80 is illustrated as having its functional section 81 in different angled positions with reference to the handle 83. Such angled positions are obtained after bending the external flexible section 84 as the user conveniently predetermines. Such angled positions may be reverted to a straight position, as illustrated in Fig. 36, or changed to any other bend position by simply bending the external flexible section 84 to the predetermined position. In other words, as previously explained for the other embodiments, the user may position and reposition the functional section 81 in any suitable predetermined angled position by bending the external flexible section 84.

[0046] Brush 80 maintains its physical and structural integrity while being used in applying cosmetic products since the connections achieved by the use of the adhesive epoxy are extremely strong and the flexible and stays-in nature of the internal elongated bendable member 85. Likewise, the strength of said bonding, in combination with the stays-in of the internal elongated bendable member 85, allows the functional section 81 to retain the angled position regardless of the pressure of said functional section 81 against the surface of the human body.

[0047] The scope of the instant invention embraces multiple cosmetic brushes, having handles of different shapes and styles. It also comprises different functional sections conventionally used in cosmetology, having different shapes and arrangements of the functioning material while comprising the same essential structural sections of brush 80 previously disclosed, as illustrated in

embodiments **99a-99n**, shown in Figs. 39 through 52. All embodiments 99a - 99n comprise an external flexible section **84a**, having a proximal end and a distal end; a handle **83a** connected to the proximal end of said external section **84a** and a functional section **81a** connected to the distal end of said external flexible section **84a**.

[0048] The scope of the present invention also embraces embodiments of flexible, ergonomic, and adjustable brushes, comprising a first functional section connected to the proximal end of the external flexible section and a second functional section connected to the distal end of said external functional section. Examples of said embodiments are shown in Fig. 53 and in Fig. 56. In Fig. 53, cosmetic brush **100** is illustrated, and it comprises an external flexible section **101** comprising a proximal end **102** and a distal end **103**; an internal elongated bendable member **104** comprising a first end **105** and a second end **106**; a first supporting base **107** connected to the first functional section **108** a second supporting base **111** connected to the second functional section **112**, a lower ferrule **116** and an upper ferrule **117**.

[0049] The proximal end **102** of the external flexible section **101** is connected to the first supporting base **107** which is connected to the first functional section **108**. Similarly, the distal end **103** of the external flexible section **101** is connected to the second supporting base **111** which is connected to the second functional section **112**. The internal elongated bendable member **104** is internally inserted into the external flexible section **101**, and its first end **105** is connected to the first supporting base **107**. Its second end **106** is connected to the second supporting base **111**. Internal elongated bendable member **104** is not shown in Figs. 53 since it is internally located inside brush **100**. The first functional section **108** and second functional section **112** have different types of functional materials **118** and **119**, respectively, useful in applying different cosmetic products, thus providing a double-functional or dual flexible, ergonomic, and adjustable cosmetic brush **100**. In Fig. 53, the functional sections **108** and **112** of the dual cosmetic brush **100** are illustrated axially, meaning in a straight position with respect to each other, and the external flexible section **101**. Said functional sections **108** and **112** may be adjusted to an angled position by bending the external flexible section **101**, thus providing angled positions like those illustrated in Fig. 54 and Fig. 55. Said cosmetic brushes are conveniently provided for use in applying cosmetic products, such as paints, creams, powders, and the other cosmetic activities, in a predetermined ergonomic angle that the user may choose and change or adjust to his or her convenience and comfort. Said angled positions are obtained after bending external flexible section **101**; the brush **100** maintains said bendable positions and its structural integrity while being used in the application of cosmetic activity since the bond connecting the external flexible section to the first and second functional sections via the supporting bases,

provided by using an adhesive epoxy such as steel epoxy, is extremely strong. It resists the pressure of the functional section during the cosmetic application while maintaining the whole structure of the brush **100**.

[0050] A similar dual-functional flexible, ergonomic adjustable brush **130** is illustrated in Fig. 56. Like the previous dual cosmetic brush already disclosed, cosmetic brush **130** comprises an external flexible section **131** comprising a proximal end **132** and a distal end **133**; an internal elongated bendable member **134** comprising a first end **135** and a second end **136**; a first supporting base **137**, and a first functional section **138**; a second supporting base **139**, a second functional section **140**, a lower ferrule **141** and an upper ferrule **142**.

[0051] The proximal end **132** of the external flexible section **131** is connected to the first functional section **138** through the first supporting base **137**. Similarly, the distal end **133** of the external flexible section **131** is connected to the second functional section **140** via a second supporting base **139**. The internal elongated bendable member **134** is internally inserted into the external flexible section **131**, and its first end **135** is connected to the first functional section **138** via the first supporting base **137**. Its second end **136** is connected to the second functional section **140** via the first supporting base **139**.

[0052] First supporting base **137** comprises an already cured glue or adhesive housed inside lower ferrule **141**. Likewise, the second supporting base **139** comprises already cured glue or adhesive enclosed or housed within upper ferrule **142**. Supporting bases **137** and **139** and internal elongated bendable member **134** are not shown in Fig. 56 since they are assembled internally in brush **130**. The first functional section **138** and second functional section **140** have different types of functional materials and shapes **145** and **146** useful in different cosmetic activities, thus providing a double-functional or dual flexible, ergonomic, and adjustable cosmetic brush.

[0053] The main difference between embodiment **100** and embodiment **130** is that the external flexible section **131** in embodiment **130** is more extensive than the external flexible section **101** in embodiment **100**. On the other hand, contrary to the supporting bases **107** and **111**, which are larger and externally located, in brush **100**, in embodiment **100**, supporting bases **137** and **139** in embodiment **130** comprise already cured glue or adhesive that are inside the ferrules **141** and **142**, respectively. Since embodiment **130** has a more extensive external flexible section **131**, it can be bent into a more acute angled position than embodiment **100**. It facilitates its use in some cosmetic activities. Furthermore, embodiment **130** may be bent and stored in very compact places, for instance, in ladies' purses.

[0054] A method to prepare flexible, ergonomic, and adjustable brushes for use in commercial, residential, and industrial painting is illustrated in Figs. 59 to 64. As illustrated in Figs. 59, 60A, and 60B, previous to assembling the flexible brush **10**, according to the invention, the functioning material of the functional section **12**, in this

case, bristles, is packed, arranged, and fixed to the supporting base **16** by conventional processes. For example, by arranging said bristles inside a mold and further adding adhesive to said mold and allowing the said adhesive to cure properly. Separating the already arranged bristles from the mold thus provides the functional section **12** assembled or connected to the supporting base **16**. The upper ferrule **18** is assembled to the already prepared functional section **12** by gluing it around its proximal end while the supporting base is housed by the upper ferrule **18**. However, in some cases, upper ferrule **18** may be assembled to the brush after the external flexible section **14** has already been connected to the functional section **12** via supporting base **16**.

[0055] The flexible, strong, bendable, tear-resistant, high resilience, impermeable, solvent-resistant material to be used as the flexible body of the external flexible section **14**, for instance, a flexible plastic is molded or a high-density ethyl vinyl acetate foam, known as EVA foam, is obtained by carving out and shaping a section of an EVA foam board and further smoothing its external surface by conventional methods to obtain the external flexible section **14**.

[0056] The flexible, strong, bendable, corrosion-resistant, tear-resistant, resilience, solvent-resistant, and impermeable, having excellent tensile strength material used as the internal elongated bendable member **15**; for instance, commercially available tie wire roll is straightened and cut in a predetermined size, depending on the size of the desirable brush, to obtain the internal elongated bendable members **15**. Similarly, handle **11** is prepared using molding plastic techniques or, alternatively, using wood as conventionally prepared for conventional painting brushes. Once the handle is ready, the lower ferrule **17** is then glued around the upper section of handle **20** by conventional methods.

[0057] As illustrated in Fig. 59, apertures or holes **16a** are performed through the supporting base **16**. Said perforations are suitable for receiving the second end **26** of each internal elongated bendable member **15**. Similarly, perforations **14a** are performed in the interior of the body of the external flexible section **14**, creating a channel **15a** suitable for receiving the internal elongated bendable member **15**. As shown in Fig. 59, each perforation **16a** on the supporting base **16** is aligned or substantially aligned to each channel **15a** created by perforations **14a** on the external flexible section **14**. As illustrated in Fig. 60B, wherein the top view of the second end **20** of handle **11** is shown, perforations **11a** are performed at the top side surface of the second end of handle **11**, wherein the first end **25** of the internal elongated bendable member **15** will be received. Each perforation **11a** on the top side of the second end **20** of the handle **11** is aligned to a given set of perforations **14a** on the external flexible section **14** and to the perforations **16a** on the supporting base **16**. Each set of aligned perforations **16a**, **14a**, and **11a** provides an internal channel ready to receive an internal elongated bendable member **15**.

[0058] As shown in Fig. 61, after the perforations **16a**, **14a**, and **11a** are ready, and each one of the internal elongated bendable member **15** is inserted through each one of the channels **15a** on the external flexible section **15**, a strong epoxy adhesive suitable to create an extremely strong bonding that is rigid, with high tensile strength, compression strength, and impact strength, and resistant to water and chemical solvents and high temperatures, such as steel epoxy, is spread on the top side of the handle and the proximal end **27** of the external flexible section **14**, thus connecting the second end **20** of the handle **11** with said proximal end **27** of the external flexible section **14** at the same time that each one of the first end **25** of the internal elongated bendable member **15** is inserted in the perforations **11a** on the top side of the second end **20** of the handle **11**. Once the steel epoxy is cured, steel epoxy is spread on the distal end **28** of the external flexible section **14** and in the supporting base **16**. In this manner, the distal end **28** of the external flexible section **14** is connected to the functional section **12** via supporting base **16**, at the same time that each one of the second ends **26** of the internal elongated bendable members **15** are inserted in the perforations **16a** on the supporting base **16**. In this manner, the functional section **12** is strongly connected to the external flexible section **14** via supporting base **16**. Once the connections are completed, and the steel epoxy is appropriately cured, the flexible brush **10** is obtained.

[0059] In an alternative process, ferrules **17** and **18** are assembled after the exterior flexible section has been connected to handle **11** and the functional section **12**. In this alternative process, ferrule **17** is installed and pressed around the connection of the handle **11** and external flexible section **14**. Ferrule **18** is installed and pressed around the connection between the opposite side of the external flexible section **14** and the functioning section **12**. This is because ferrules **17** and **18** are used to further secure the connection between the handle and the external flexible section and the connection between the external flexible section and the functional section since the assembled brush **10** without the ferrules **17** and **18** is completely functional.

[0060] In yet other alternative similar processes, the total number of internal elongated bendable members **15** may increase or decrease, depending on factors such as the shape of the handle **11** and the general shape and size of the brush. The scope of the invention embraces the use of multiple thin internal elongated bendable members **15** in the manufacture of the ergonomic, flexible, and adjustable brushes herein disclosed.

[0061] A similar process is used to assemble and produce artistic brushes, as illustrated in Fig. 65A, 65B, and 66. In fig. 65A, the different sections of brush **60** are illustrated, wherein an aperture or perforation **63a** is performed at the second end of handle **63**, and lower ferrule **75** is glued and pressed around the upper section **67** of handle **63**. The functional section **61** is then assembled to the supporting base **66** by the conventional

method of organizing the painting material: introducing said painting material into ferrule **76**, followed by adding adhesive or glue to keep said functional or painting material arranged and fixed to the ferrule. This way, the already-dried adhesive or glue becomes the supporting base **66**. Fig. 65B shows a bottom view of the ferrule **76** comprising supporting base **66** as the already dried adhesive or glue already died. Once said glue is dried, it becomes the supporting base **66**, and aperture **66a** is performed on said supporting base **66**. The external flexible section **64** is prepared from a molded plastic or high-density EVA foam board, and internal channel **65a** is perforated through ends **64a**, thus providing an internal channel suitable to receive an internal elongated bendable member **65**. Perforations **63a**, **66a**, and **64a** are aligned. The internal elongated flexible member **65** is prepared as previously disclosed, and it is inserted into the aperture internal channel **65a** on external flexible section **64** through opening **64a**. Then, the top side of the second end **67** of the handle **63** and the proximal end **69** of the external flexible section **64** are connected by applying steel epoxy; at the same time, the first end **72** of the internal elongated bendable member **65** is inserted in the perforation **63a** on the top second end **67** of the handle **63**. Once the epoxy adhesive is cured, steel epoxy is also applied on supporting base **66**, housed in upper ferrule **76** and on the distal end **70** of the external flexible section **64** in order to connect the functional section **61** to the external flexible section **64**; at the same time that the second end **73** of the internal elongated bendable member **65** is inserted in the perforation **66a** on the supporting base **66**. In this manner, functional section **61** is connected to the external flexible section **64**. The ferrules **75** and **76** are pressed to further secure the connections between the handle **63** and the external flexible section **64** and between the flexible external section **64** and the functional section **61** in order to provide flexible, ergonomic, and adjustable artistic brushes according to the invention.

[0062] In an alternative method, the single internal elongated bendable member **65** may be replaced by multiple thinner internal elongated bendable members, which may be assembled in the artistic brush **60** in the same described manner regarding the internal elongated member **65**.

As shown in Fig. 67A and 67B, the same process is used to prepare cosmetic brushes according to the invention, as illustrated in the preparation of cosmetic brush **80**, wherein handle **83**, internal elongated flexible member **84**, and functional section **81** are assembled as previously explained in the preparation of artistic brushes.

[0063] In operational terms, regarding the use of the flexible ergonomic and adjustable brush **10** for commercial, residential, and industrial painting according to the invention, the user may evaluate the nature of the surface, its contours, and its particular position; select the brush size to best fit the painting process and proceed to position the functional section **12** of the flexible brush **10**

to the best angled and/or twisted position with reference to the handle and his or her ergonomic comfort. Said angled position is obtained after bending or twisting the external flexible section **14**. Once a particular section of the surface is painted, the user may reposition the functional section **12** of the flexible brush **10** to an alternative position that best fits the following section of the surface to be painted and proceed with the painting process. The painting process is ergonomically facilitated by alternating the functional section **12** of the brush **10** at the convenience of the painter and considering the nature of the surface to be painted. Fig. 69 illustrates the use of commercial, residential, or industrial painting brush **10** according to the invention, wherein the painting wall **177**, which is perpendicular to the ceiling **178** and wherein brush **10** has been inserted into a suitable painting pole **180**, suitable to paint those high-to-reach surfaces. A similar illustration is presented in Fig. 70, wherein brush **10** is shown on painting surface **181** and used without a painting pole. In both instances, the external flexible section **14** is bent, providing functional section **12** in an angled position, facilitating the painting process.

[0064] The same or similar process may be followed when using the artistic brushes according to the invention, as, for example, illustrated in Fig. 71, wherein the painter has bent the external flexible section **64** of brush **60** to draw a curved contour of the image of an eye with the functional section **61** in a bent position and without bending his arm.

[0065] Similarly, Fig. 72 shows an example of applying a cosmetic product to the face of a person, using a cosmetic brush **80** according to the instant invention, wherein the external flexible section **84** has been bent to angle the functional section **81** of the brush **80** in order to apply a cosmetic product on a curved surface of a human face. As illustrated, the hand of the user is kept in a straight position since the functional section **14** is already angled to facilitate the application of the cosmetic product in a suitable ergonomic manner.

[0066] The present invention has been described in terms of particular embodiments and applications, in both summarized and detailed forms; it will be understood that many substitutions, changes, and variations in the described embodiments, applications, and details of the novel tool illustrated herein and of its operation can be made by those skilled in the art to adapt it to various usages and conditions, without departing from the spirit of this invention. As such, these changes and modifications are properly, equitably, and intended to be within the full range of equivalence of the following. While the invention has been described in conjunction with some embodiments, it is to be understood that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, the invention is intended to embrace all such alternatives, modifications, and variations falling within the spirit and scope of the appended claims.

Claims**1.** An ergonomic and flexible brush comprising:

a) a functional section comprising:

- i) a proximal end;
- ii) a distal end;
- iii) a functional material; and
- iv) a supporting base interconnected to and supporting the functional material at the proximal end of said functional section;

b) an external flexible section comprising a distal end and a proximal end;

c) at least one internal elongated bendable member comprising an elongated body having a first end and a second end; and

wherein the internal elongated bendable member is inserted through the interior of the external flexible section, the second end of the internal elongated bendable member is inserted and secured into the supporting base of the functional section, and the distal end of the external flexible section is connected and secured to the functional section via the supporting base.

2. The ergonomic and flexible brush, as recited in claim 1, wherein the functional material of the functional section is selected from natural hair, feathers, synthetic bristles, foams, fabric, or combinations thereof.**3.** The ergonomic and flexible brush, as recited in claim 1, wherein the functional material of the functional section is any material used in conventional activities such as industrial painting, artistic painting, cleaning, and the application of cosmetic products.**4.** The ergonomic and flexible brush, as recited in claim 1, wherein the external flexible section is made of an impermeable, dense, bendable, strong, flexible, and tear-resistant material.**5.** The ergonomic and flexible brush, as recited in claim 3, wherein the impermeable, dense, bendable, strong, flexible, and tear-resistant foam is ethyl vinyl acetate foam (EVA).**6.** The ergonomic and flexible brush, as recited in claim 1, wherein the internal elongated bendable member is a stay-in bendable, strong, flexible, and brake-resistant material.**7.** The ergonomic and flexible brush, as recited in claim 6, wherein the stay-in bendable, strong, flexible, and brake-resistant wire is made of plastic, stain steel, tie

wire, carbon-coated steel, aluminum, copper, or any combination thereof.

8. The ergonomic and flexible brush, as recited in claim 6, wherein the bendable, strong, flexible, and tear-resistant material is made of tie-wire.**9.** The ergonomic and flexible brush, as recited in claim 1, wherein the supporting base is made of a resilient, strong, rigid, and hard material selected from wood, metal, plastic, PVC, adhesive, or combinations thereof.**10.** The ergonomic and flexible brush, as recited in claim 1, wherein the connection of the distal end of the external body of the external flexible section and the functional section is further secured with a ferrule.**11.** The ergonomic and flexible brush, as recited in claim 1, further comprising a handle; said handle comprises a first end and a second end, wherein the second end of said handle is connected and secured to the second end of the internal elongated bendable member and is also connected and secured to the proximal end of the external flexible section.**12.** The ergonomic and flexible brush, as recited in claim 11, wherein the handle is made of a resilient, strong, rigid, and hard material selected from wood, metal, plastic, PVC, or combinations thereof.**13.** The ergonomic and flexible brush, as recited in claim 11, wherein the connection of the external flexible section with the handle and the functional section comprises a strong metal epoxy.**14.** The ergonomic and flexible brush, as recited in claim 13, wherein the connection of the external flexible section with the handle and the functional section comprises steel epoxy.**15.** The ergonomic and flexible brush, as recited in claim 11, wherein the connection of the proximal end of the external flexible section and the handle is further secured with a ferrule.**16.** The ergonomic and flexible brush, as recited in claim 11, further comprising a threaded borehole at the first end of the handle.**17.** The ergonomic and flexible brush, as recited in claim 1, further comprising a second functional section comprising:

- i) a proximal end;
- ii) a distal end;
- iii) a functional material; and
- iv) a supporting base interconnected to and

supporting the functional material at the proximal end of said second functional section; and

wherein the said second functional section is connected and secured to the second end of the internal elongated bendable member and to the proximal end of the external flexible section via its supporting base. 5

18. The ergonomic and flexible brush, as recited in claim 17, wherein the connection of the external flexible section with the first functional section and the second functional section comprises a metal epoxy. 10

19. The ergonomic and flexible brush, as recited in claim 17, wherein the connection of the external flexible section with the first functional section and the second functional section comprises a steel epoxy. 15

20. The ergonomic and flexible brush, as recited in claim 17, wherein the connection of the second functional section and the proximal end of the external flexible section via the second supporting base is further secured with a ferrule. 20 25

21. An ergonomic and flexible brush comprising:

a) a functional section comprising:

- i) a proximal end;
- ii) a distal end;
- iii) a functional material; and
- iv) a supporting base interconnected to and supporting the functional material at the proximal end of said functional section; 30 35

b) an external flexible section comprising a distal end and a proximal end; 40

c) at least one internal elongated bendable member comprising an elongated body having a first end and a second end;

d) a handle comprising a first end and a second end;

e) a first ferrule; 45

f) a second ferrule, and

wherein the internal elongated bendable member is inserted through the interior of the external flexible section, the second end of the internal elongated bendable member is inserted and secured into the supporting base of the functional section, the distal end of the external flexible section is connected and secured to the functional section via the supporting base, the first end of the internal flexible member is inserted and secured into the second end of said handle and the proximal end of the external flexible section is connected and secured to 50 55

the second end of said handle; and wherein the first ferrule further secures the connection between the second end of the handle and the proximal end of the external flexible section, and the second ferrule further secures the connection between the distal end of the external flexible section and the functional section.

22. An ergonomic and flexible brush comprising:

a) a first functional section comprising:

- i) a proximal end;
- ii) a distal end;
- iii) a functional material; and
- iv) a supporting base interconnected to and supporting the functional material at the proximal end of said functional section;

b) an external flexible section comprising a distal end and a proximal end;

c) at least one internal elongated bendable member comprising an elongated body having a first end and a second end;

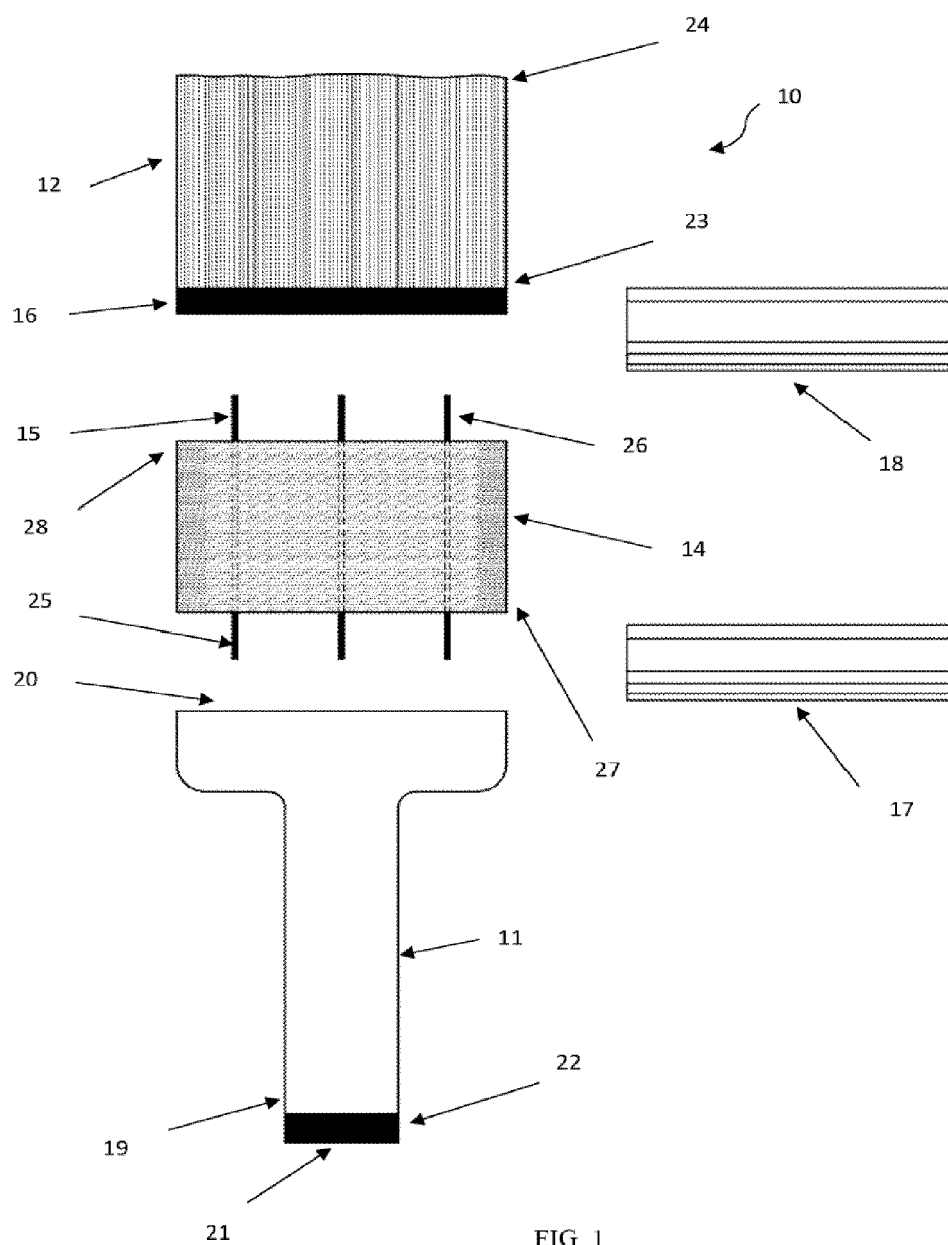
d) a second functional section comprising:

- i) a proximal end;
- ii) a distal end;
- iii) a functional material;
- iv) a supporting base interconnected to and supporting the functional material at the proximal end of said second functional section; and

e) a first ferrule;

f) a second ferrule, and

wherein the internal elongated bendable member is inserted through the interior of the external flexible section, the second end of the internal elongated bendable member is inserted and secured into the supporting base of the first functional section, the distal end of the external flexible section is connected, and secured to the first functional section via the supporting base, the first end of the internal elongated bendable member is inserted and secured into the supporting base of the second functional section, and the proximal end of the external flexible section is connected and secured to the second functional section via its supporting base; and wherein the first ferrule further secures the connection between the second functional section and the proximal end of the external flexible section, and the second ferrule further secures the connection between the distal end of the external flexible section and the second functional section.



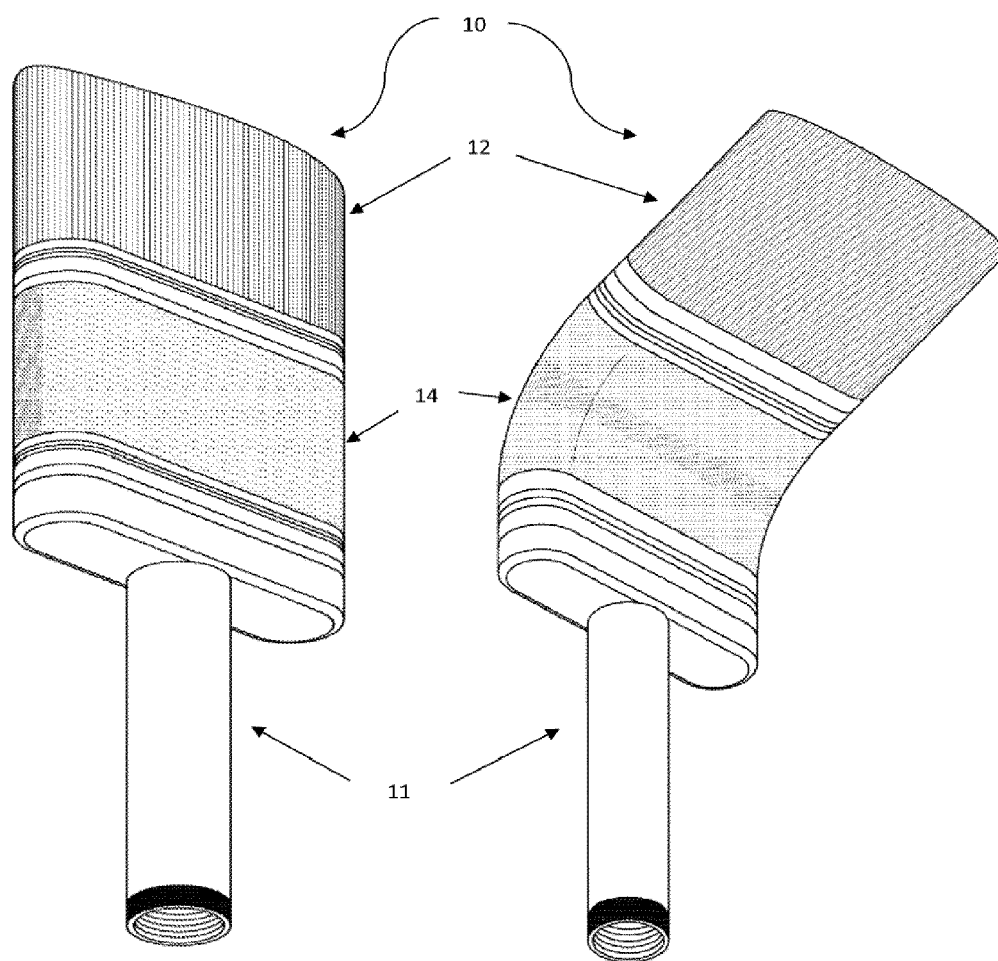


FIG. 2

FIG. 3

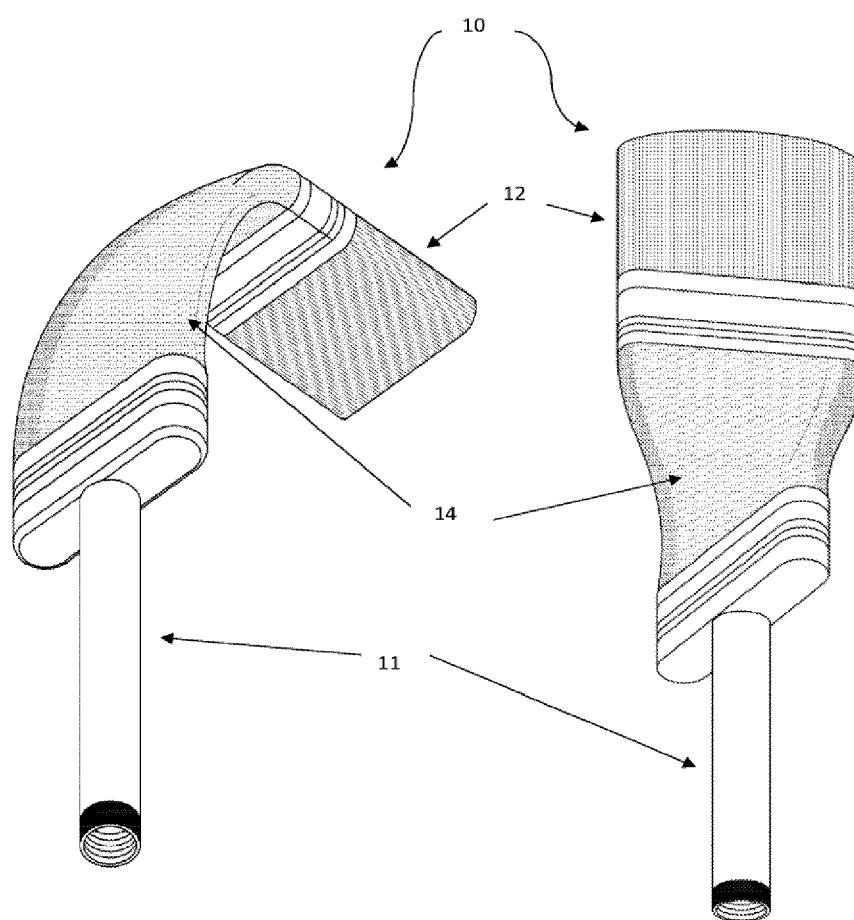
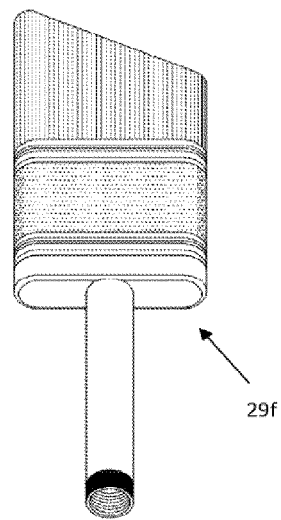
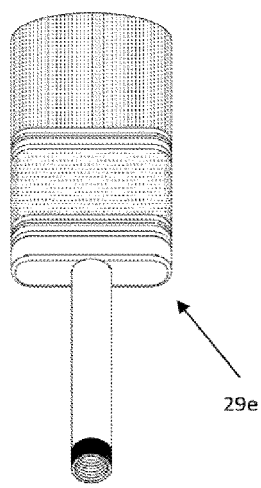
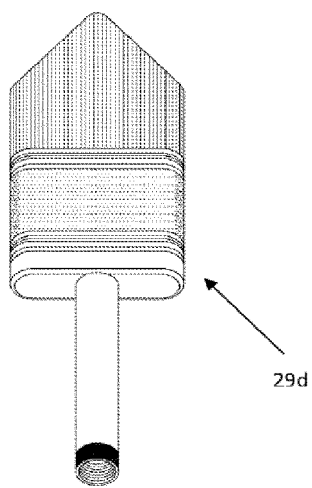
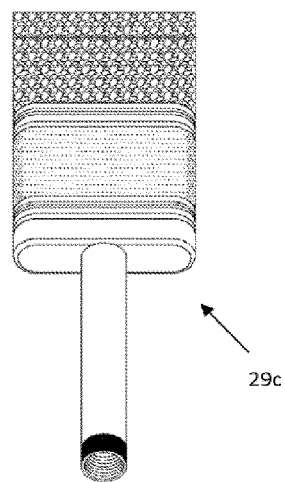
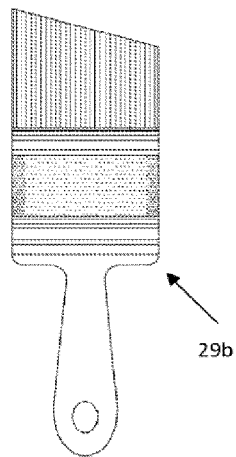
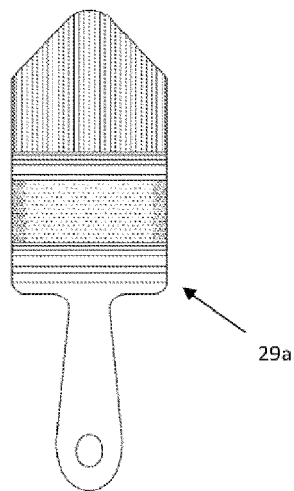
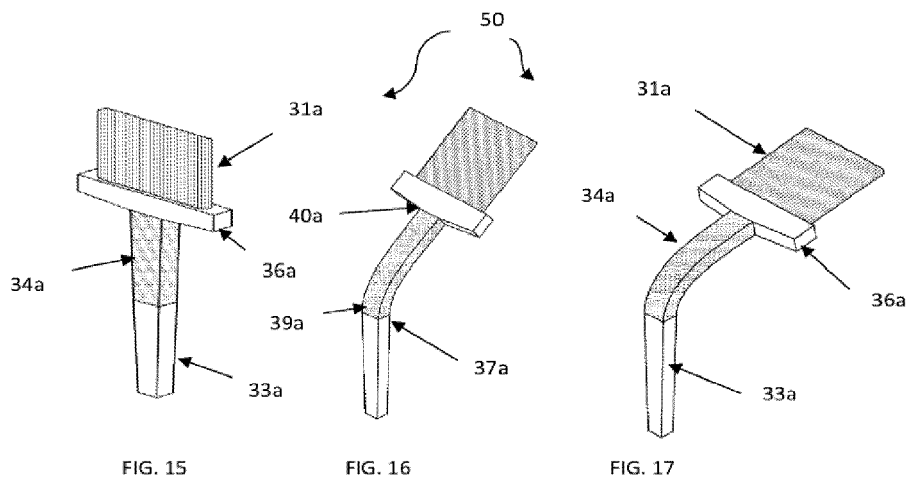
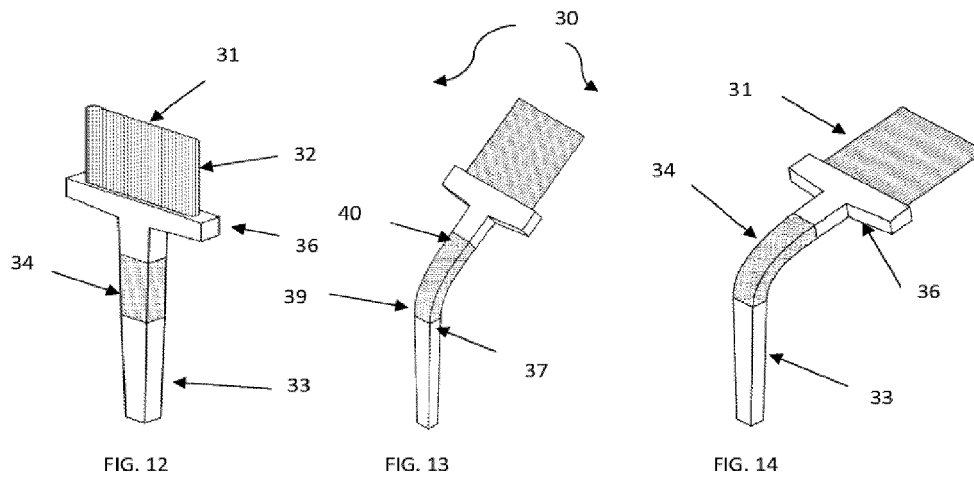


FIG. 4

FIG. 5





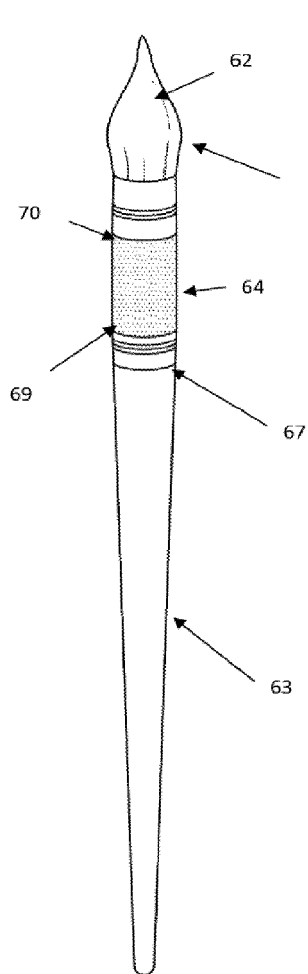


FIG. 18

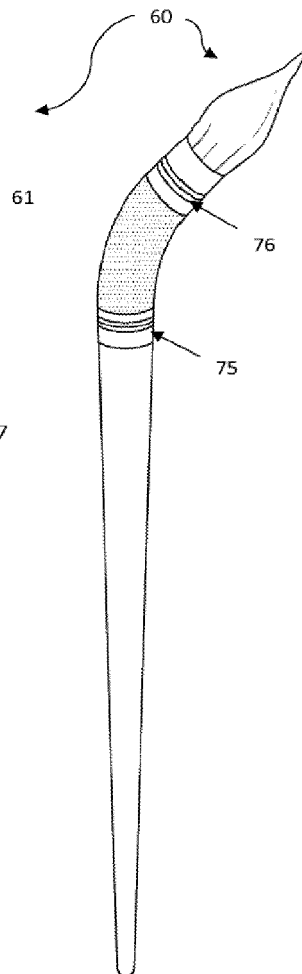


FIG. 19

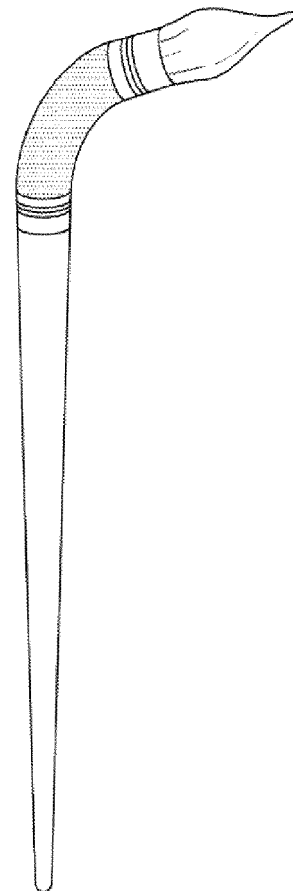
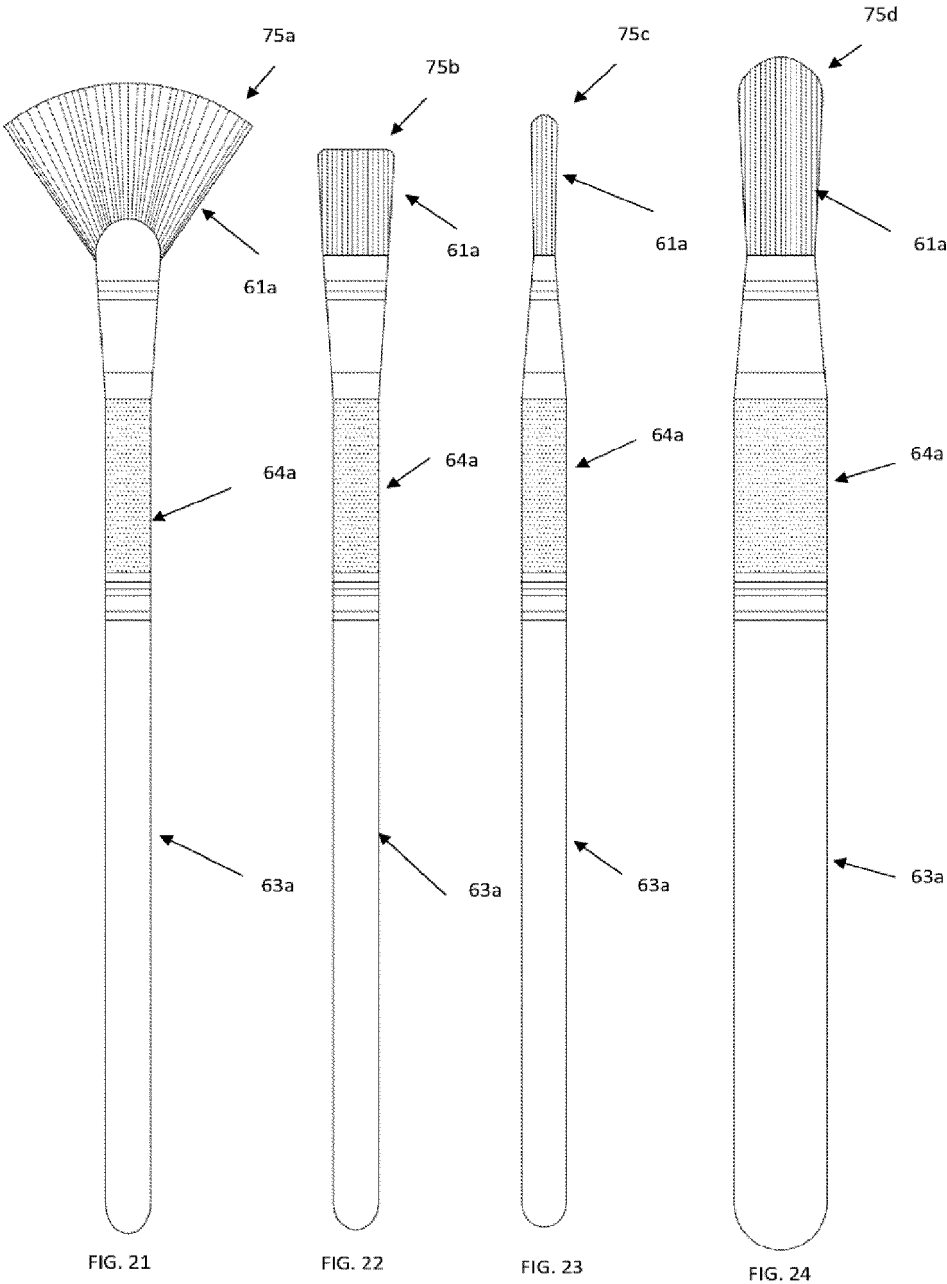
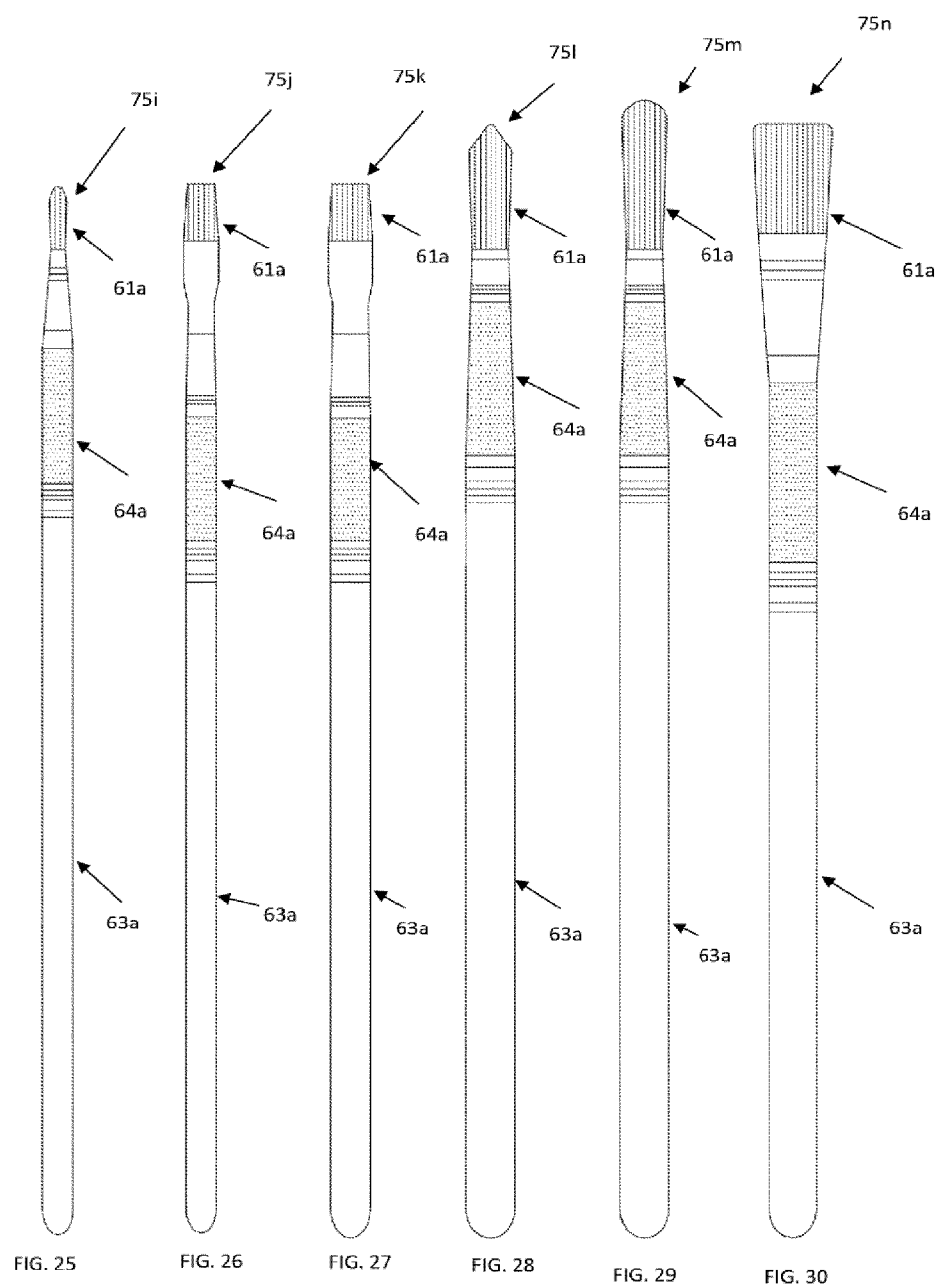
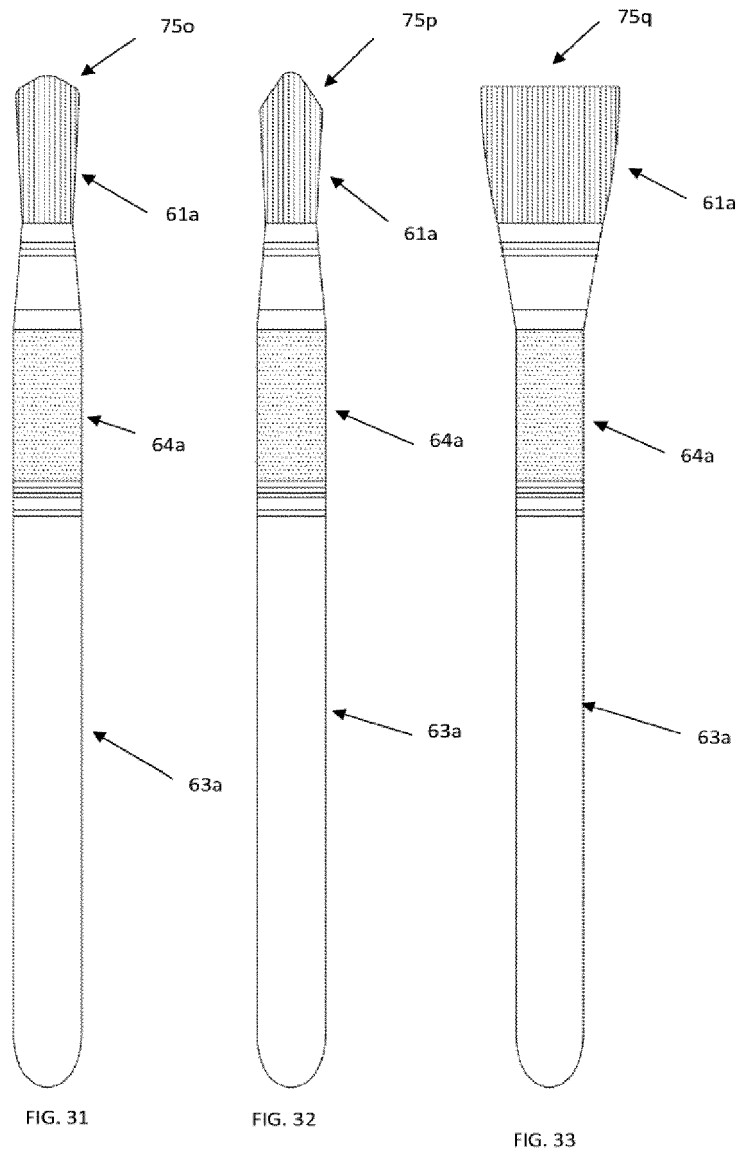


FIG. 20







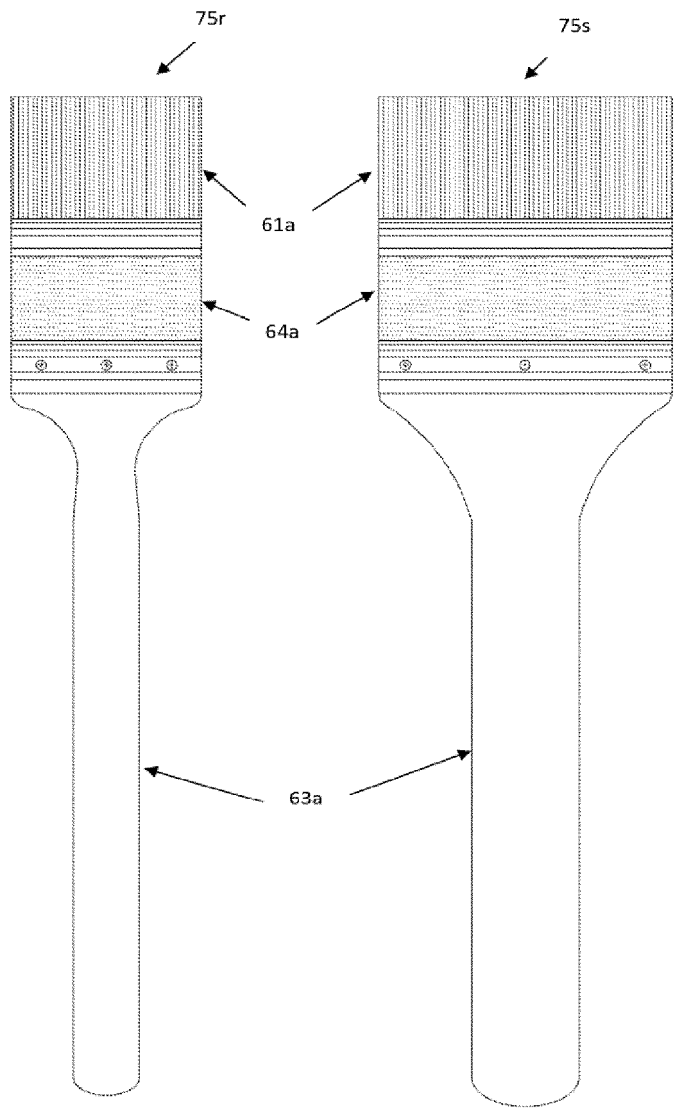
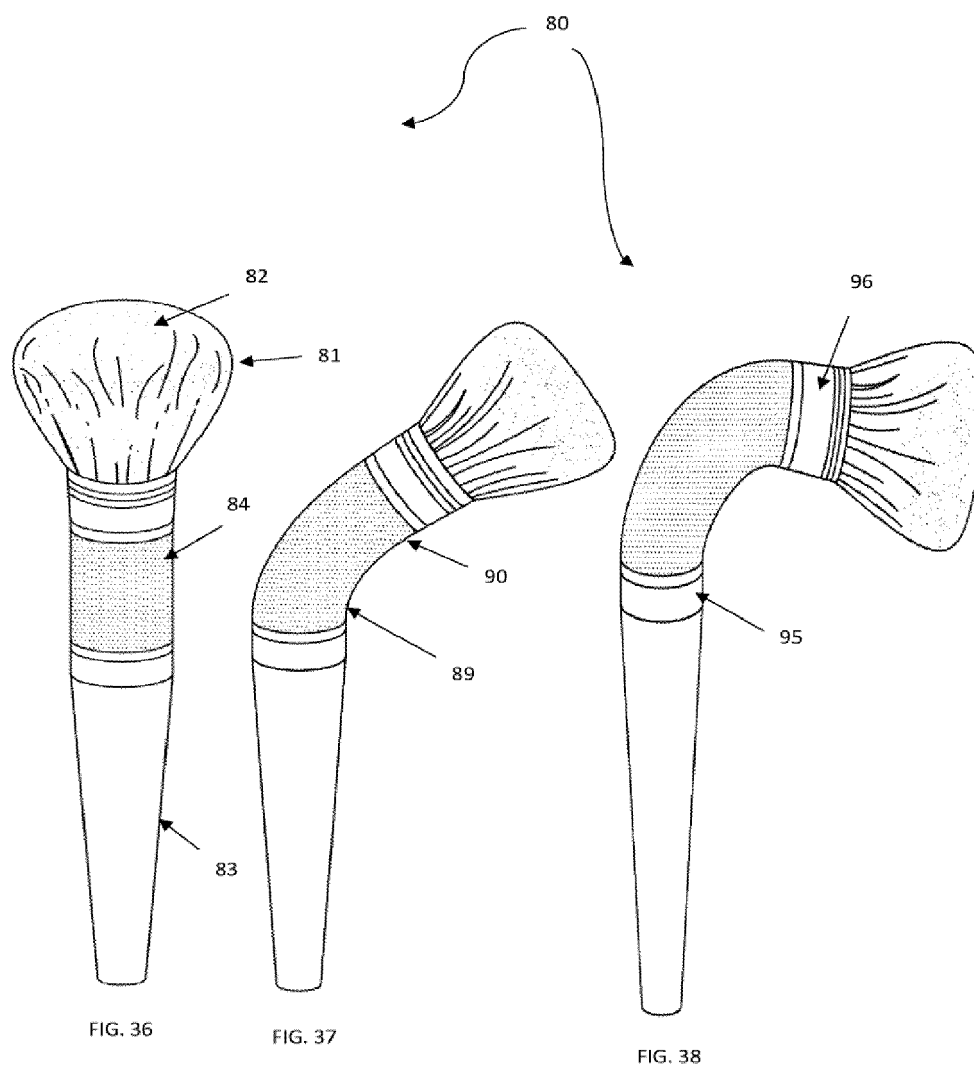
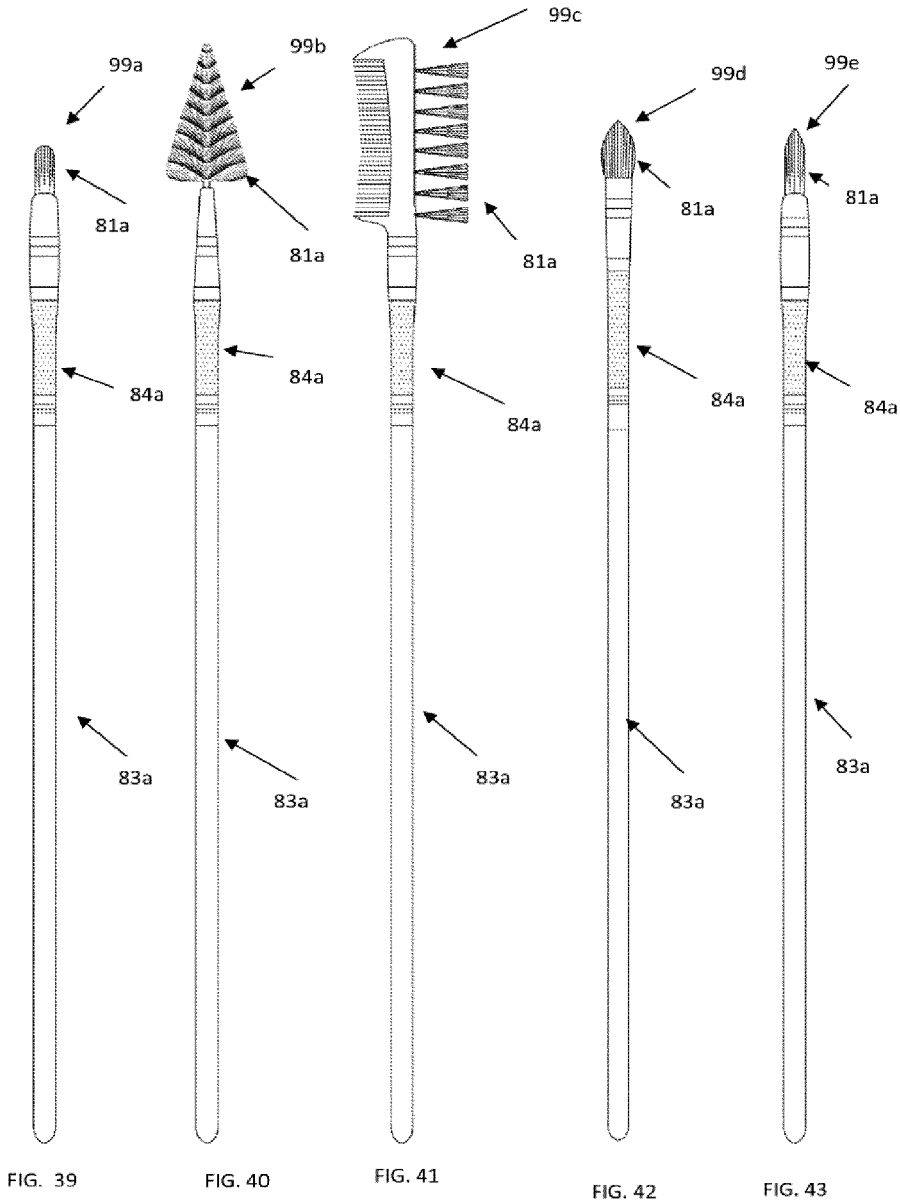


FIG. 34

FIG. 35





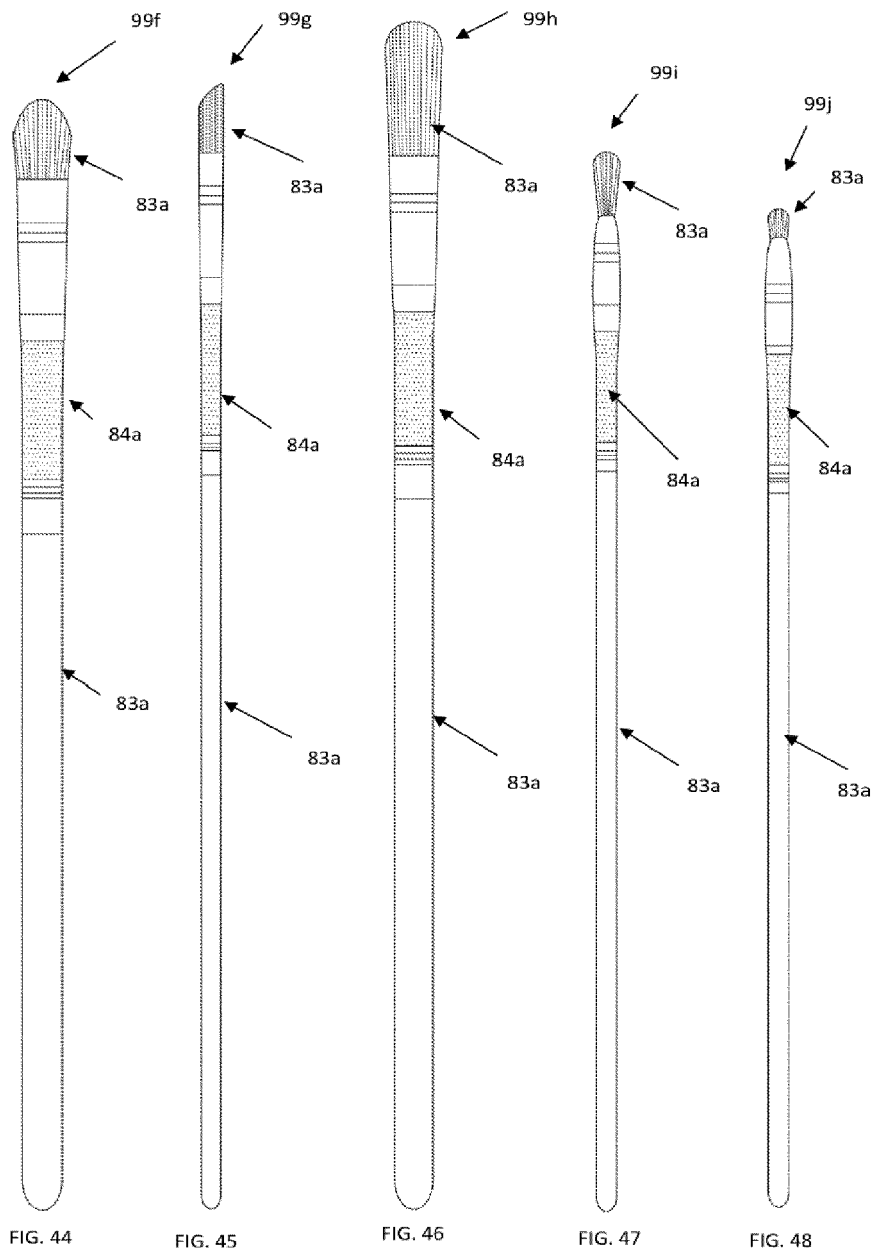


FIG. 44

FIG. 45

FIG. 46

FIG. 47

FIG. 48

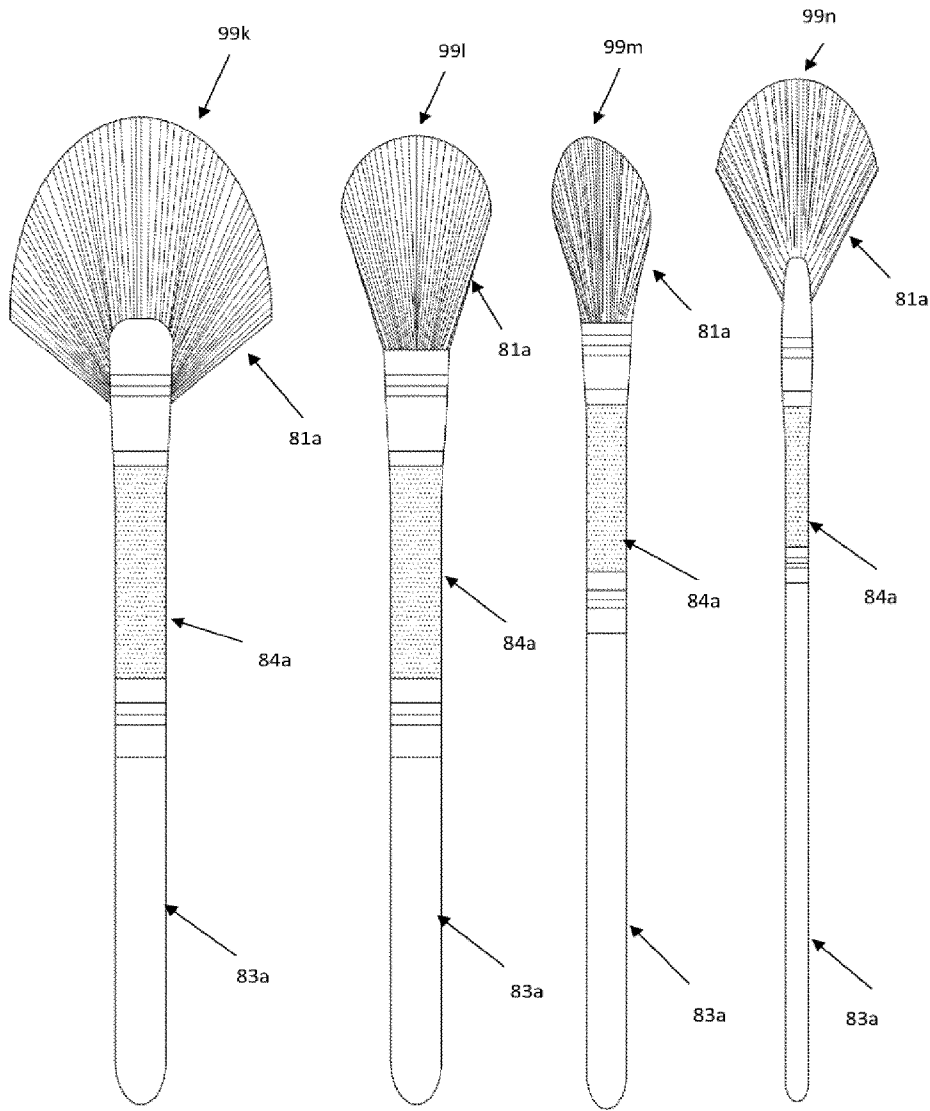
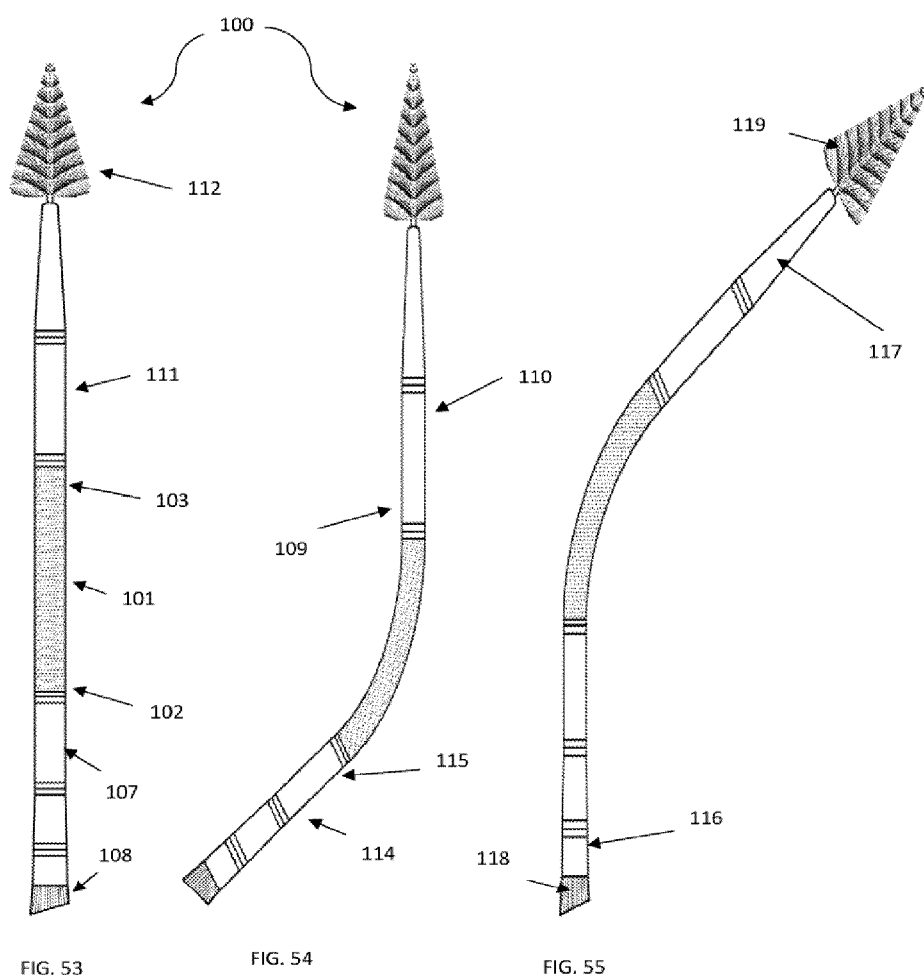


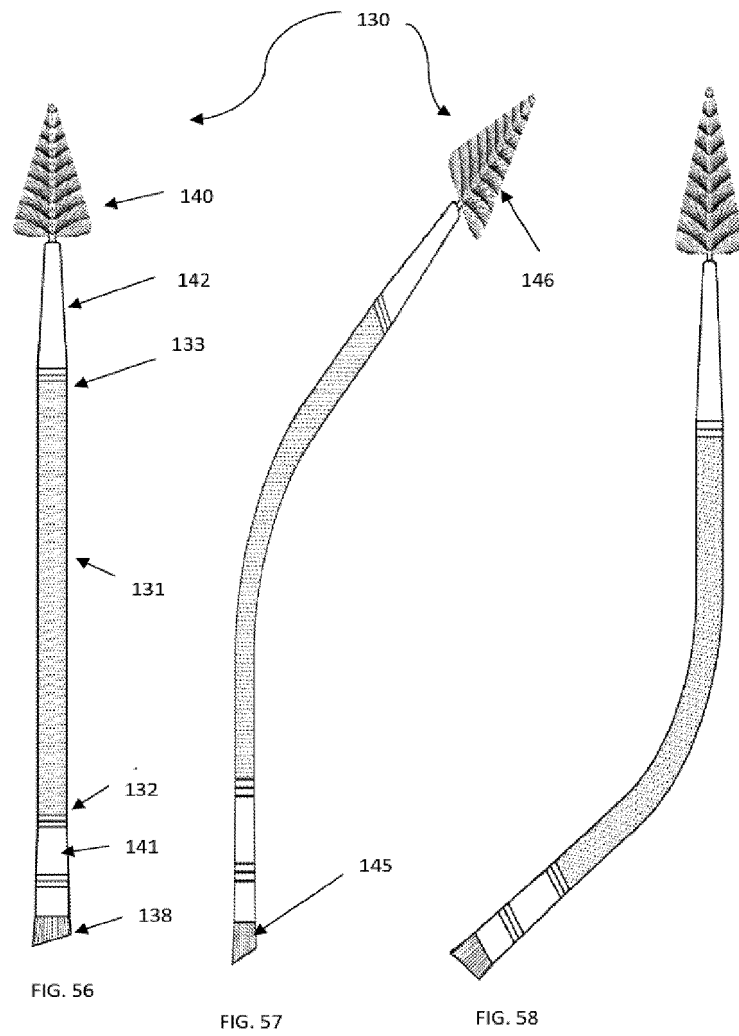
FIG. 49

FIG. 50

FIG. 51

FIG. 52





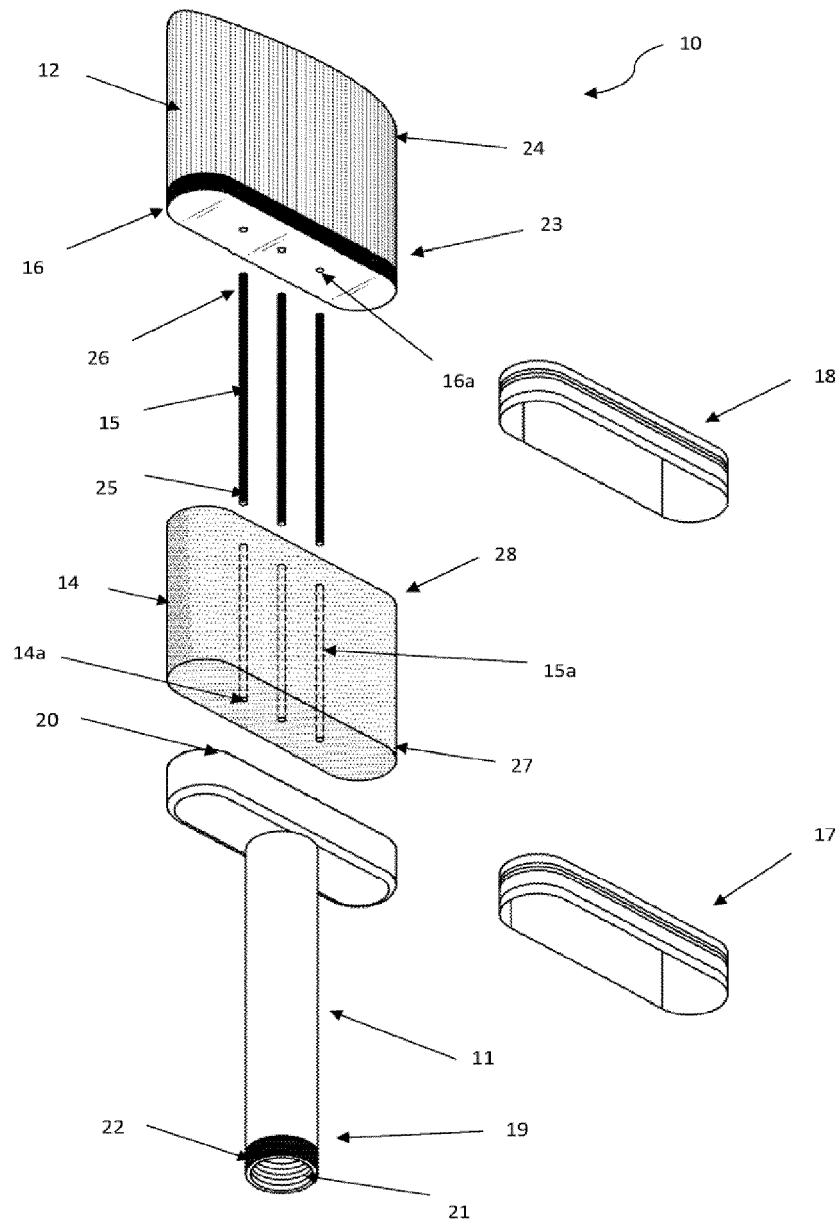


FIG. 59

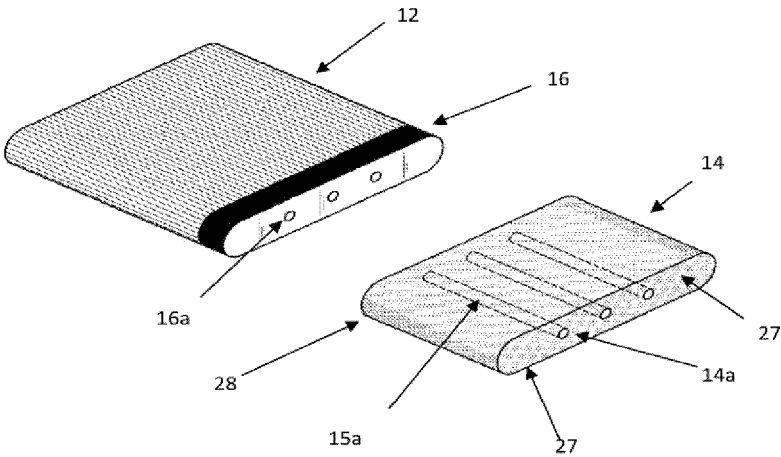


FIG. 60A

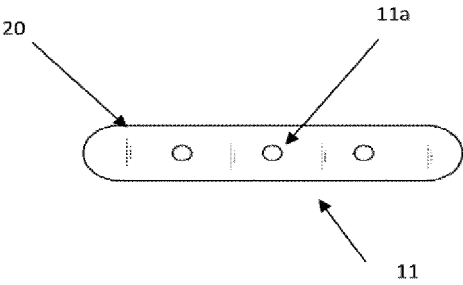


FIG. 60B

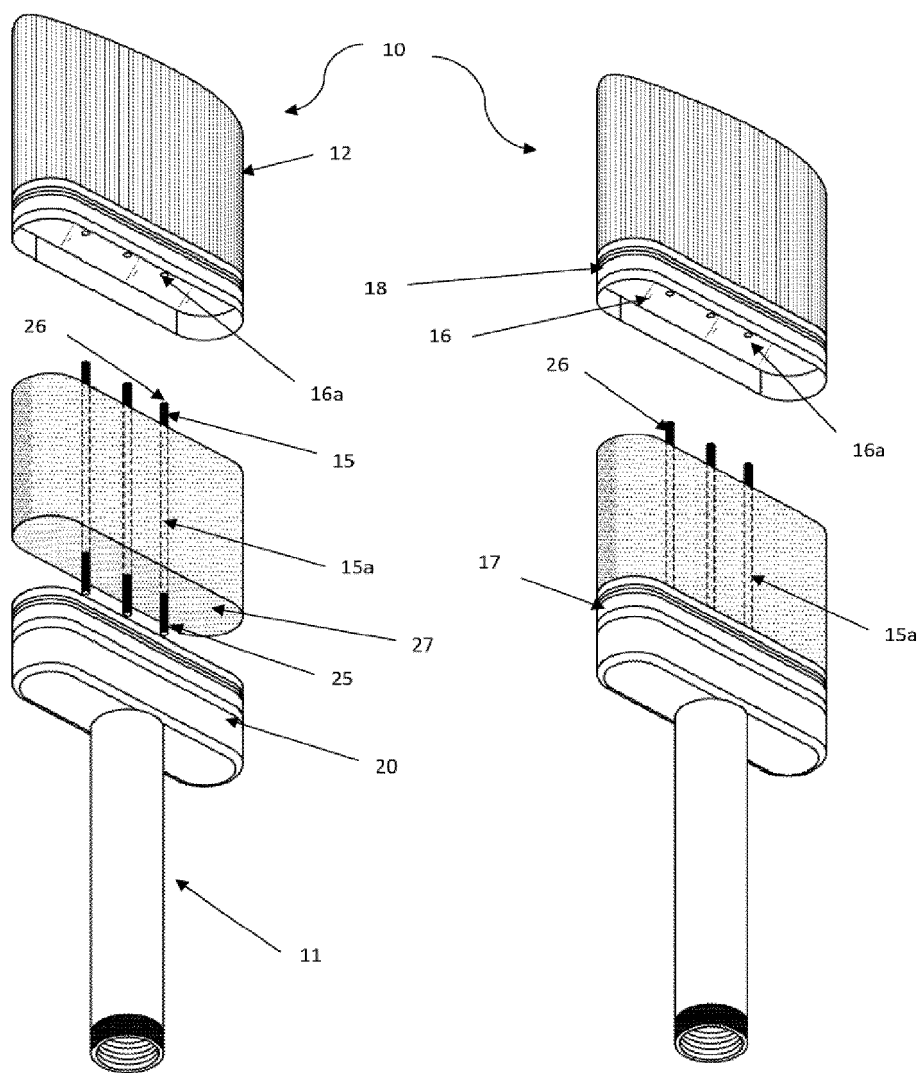


FIG. 61

FIG. 62

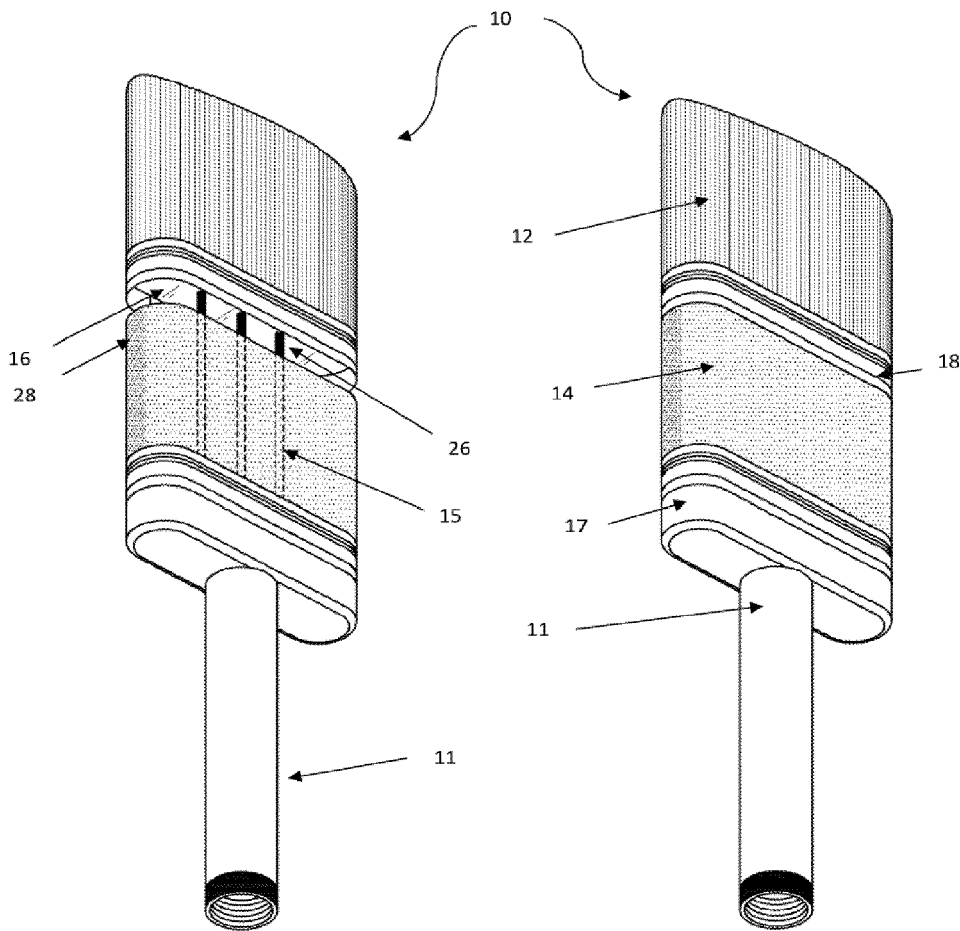
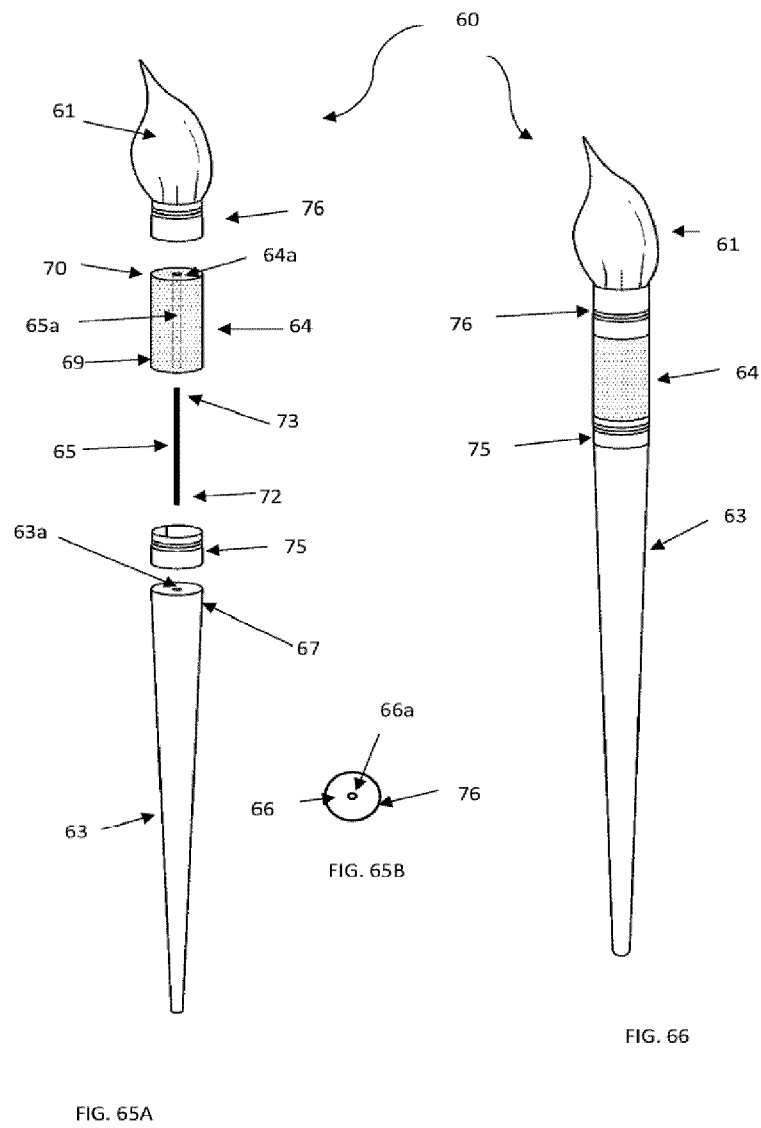
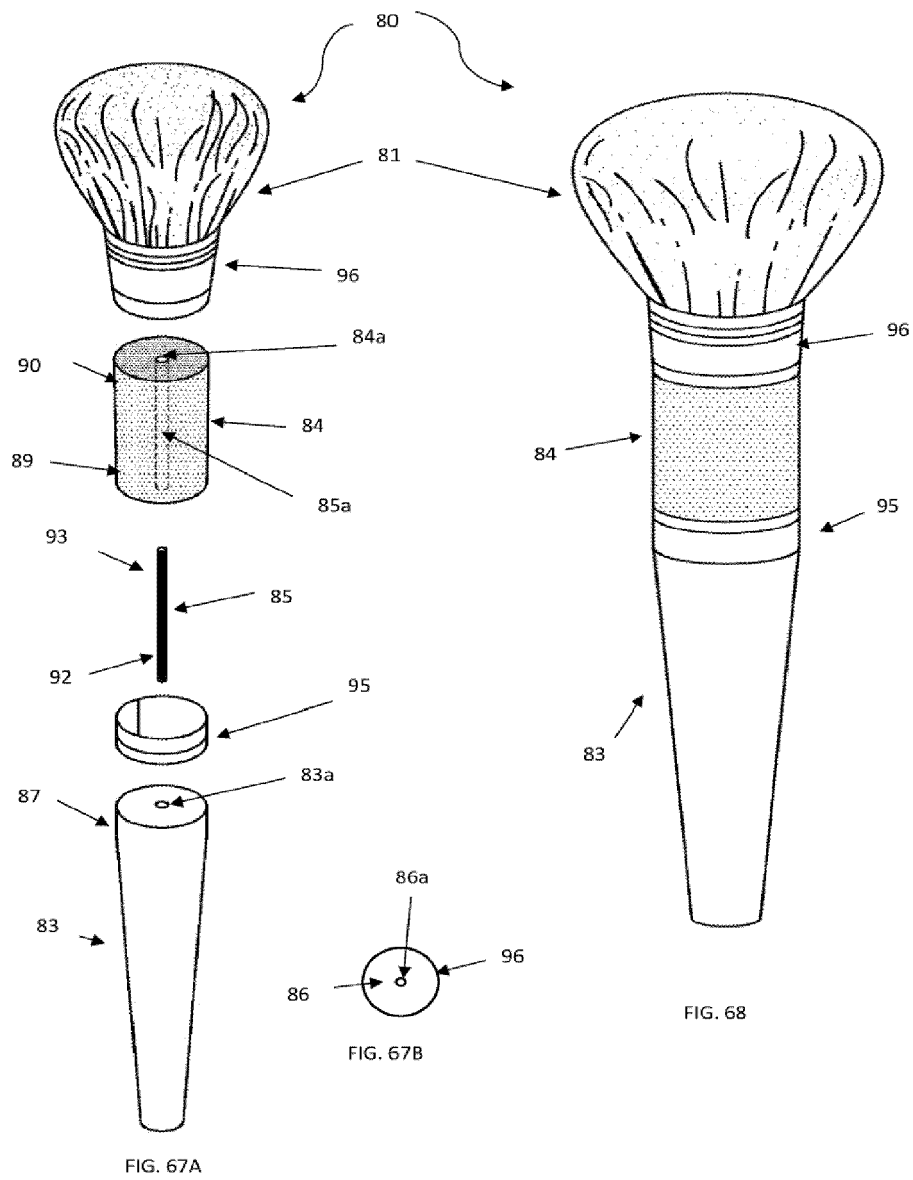


FIG. 63

FIG. 64





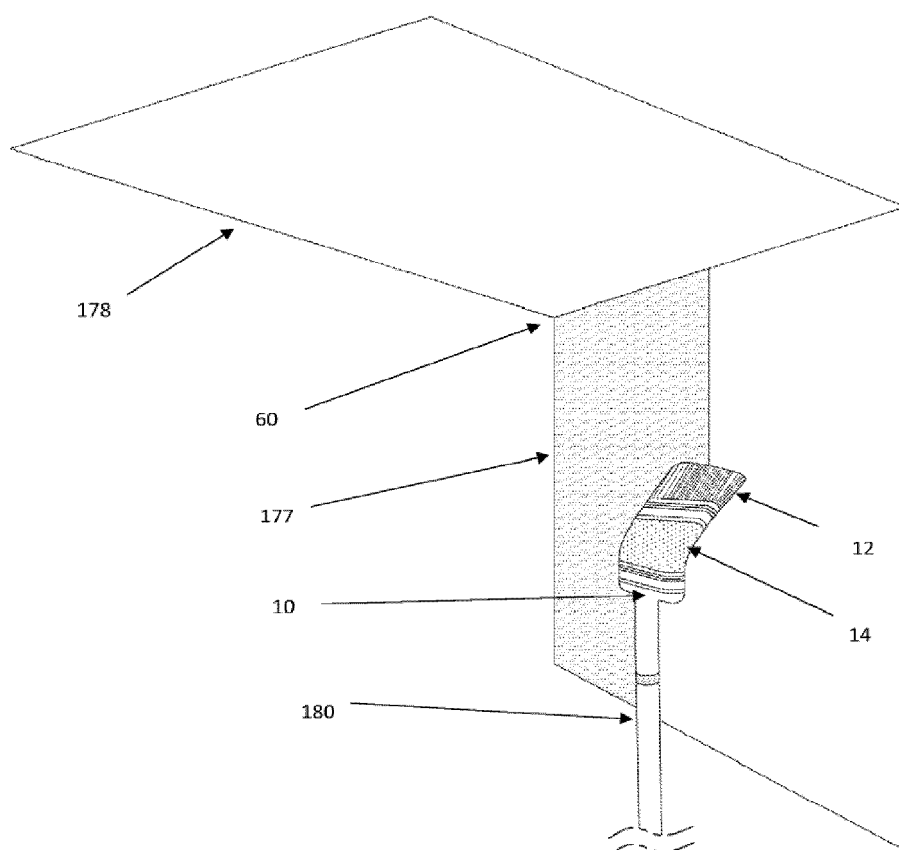


FIG. 69

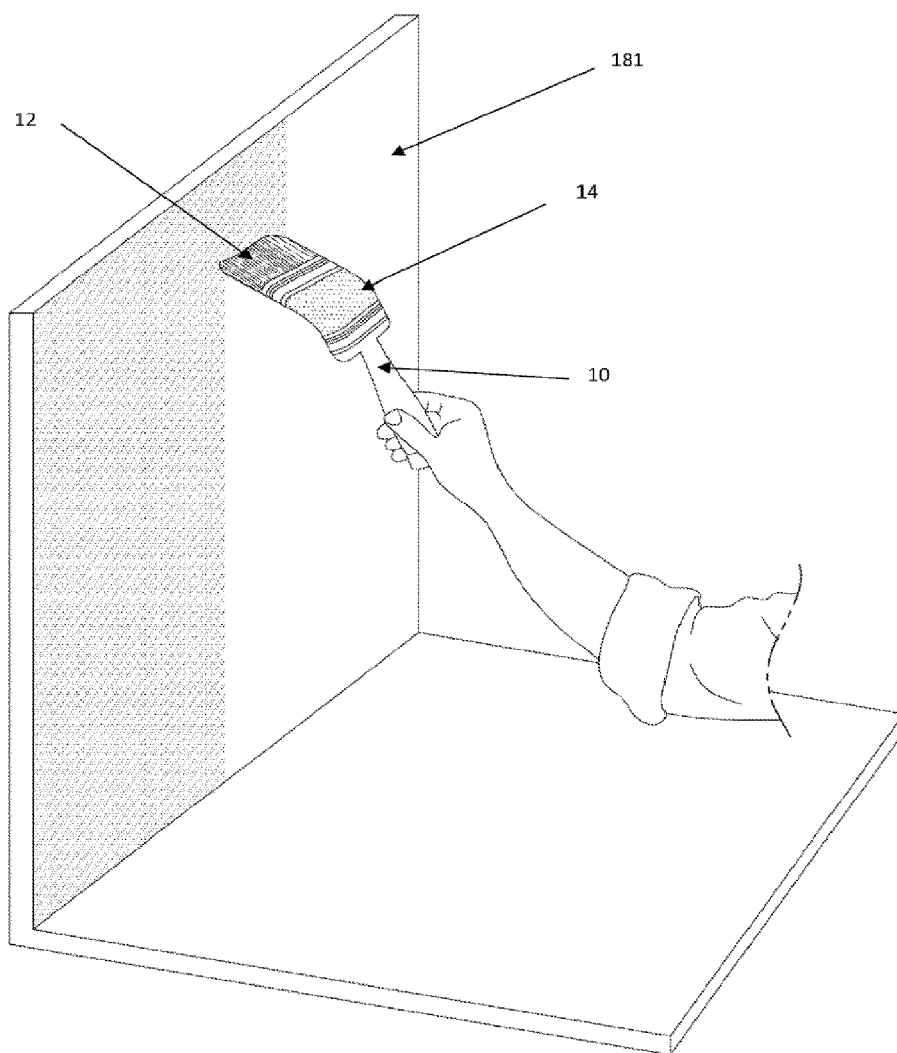


FIG. 70

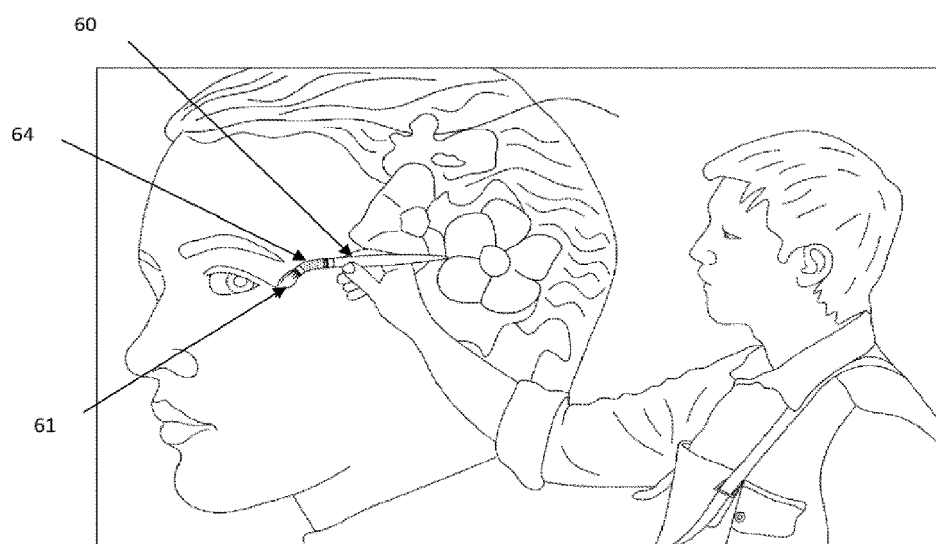


FIG. 71

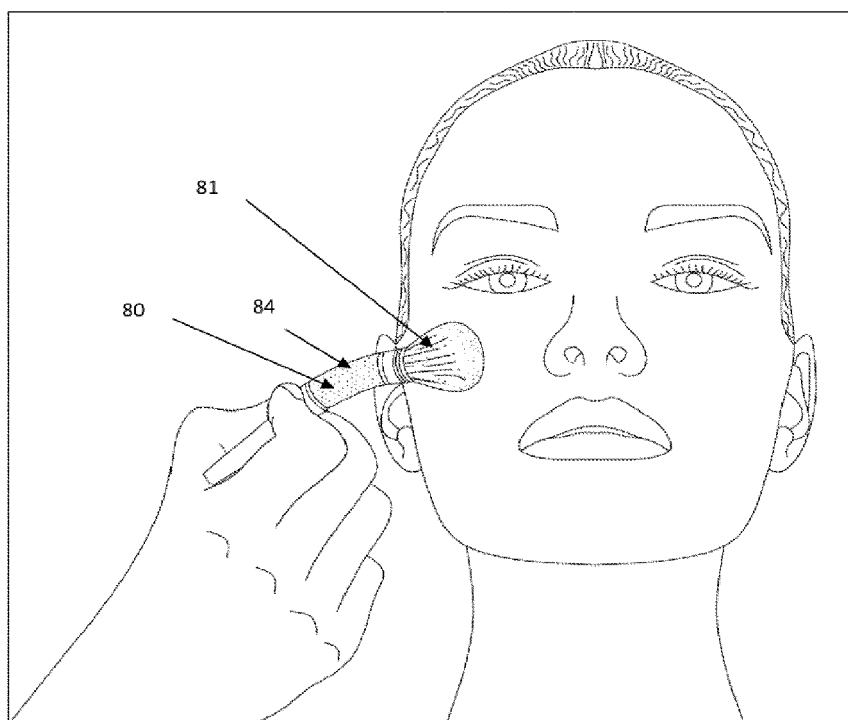


FIG. 72



EUROPEAN SEARCH REPORT

Application Number

EP 24 18 9941

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2008/209687 A1 (MCCAULEY PATRICK [US]) 4 September 2008 (2008-09-04)	1-4, 6-22	INV. A46B5/00
A	* paragraphs [0024], [0025], [0034] - [0036], [0038]; claims 1-5; figures 1,14 *	5	
X	EP 1 862 090 A1 (TEPE MUNHYGIENPRODUKTER AB [SE]) 5 December 2007 (2007-12-05) * paragraphs [0023] - [0034]; figure 4 *	1-4	
X	JP H02 257904 A (BLENDAX WERKE SCHNEIDER CO) 18 October 1990 (1990-10-18) * claims 1-8; figures 1-3 *	1-5	
			TECHNICAL FIELDS SEARCHED (IPC)
			A46B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		2 January 2025	Rossini, Marco
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 24 18 9941

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02 - 01 - 2025

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008209687 A1	04-09-2008	NONE	

EP 1862090 A1	05-12-2007	AT E422311 T1	15-02-2009
		AU 2007267167 A1	06-12-2007
		DK 1862090 T3	20-04-2009
		EP 1862090 A1	05-12-2007
		ES 2320817 T3	28-05-2009
		JP 5475172 B2	16-04-2014
		JP 2009538653 A	12-11-2009
		JP 2013223787 A	31-10-2013
		KR 20090023362 A	04-03-2009
		US 2009235477 A1	24-09-2009
		WO 2007138030 A1	06-12-2007

JP H02257904 A	18-10-1990	AT E133541 T1	15-02-1996
		CA 2004029 A1	29-05-1990
		DE 3840136 C1	17-05-1990
		DE 68925567 T2	14-08-1996
		DK 590189 A	30-05-1990
		EP 0371293 A2	06-06-1990
		ES 2081827 T3	16-03-1996
		GR 3018854 T3	31-05-1996
		IE 75897 B1	24-09-1997
		JP 2831401 B2	02-12-1998
		JP H02257904 A	18-10-1990
		KR 900007366 A	01-06-1990

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2346570 A [0006]
- US 2469050 A [0006]
- US 2792581 A [0006]
- US 3413034 A [0006]
- US 3357035 A [0006]
- US 3994037 A [0006]
- US 4127296 A [0006]
- US 4525889 A [0006]
- US 4854625 A [0006]
- US 5056952 A [0006]
- US 5329663 A [0006]
- US 8566999 B [0006]
- US 8839480 B [0006]
- US 3928886 A [0007]
- US 7472447 B [0007]
- US 7770252 B [0007]
- US 8595883 B [0007]
- US 20050039281 A [0007]
- US 20070204418 A [0007]
- US 20170188692 A [0007]
- US 20190281966 A [0007]
- US 10791824 B [0008]
- US 10888151 B [0008]
- US 20060248669 [0009]
- US 20120054986 [0009]
- US 2395245 A [0010]
- US 4528714 A [0010]
- US 5207755 A [0010]
- US 8132978 B [0010]
- US 9486060 B [0010]