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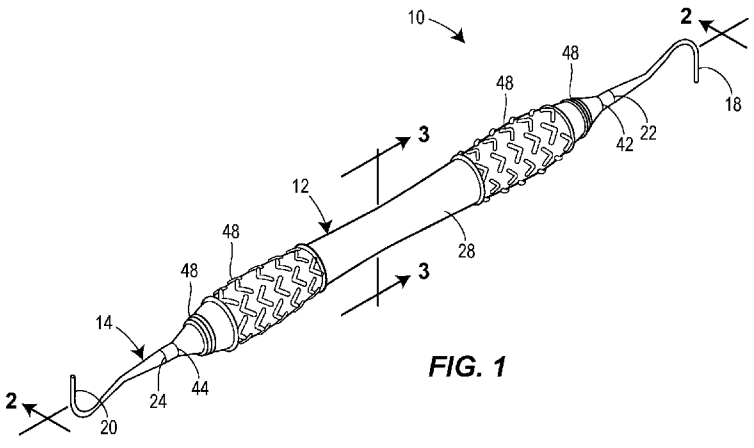

FIG. 1

(57) Abstract: A dental instrument includes a handle and a tool that extends completely through the handle. The handle includes a handle body made of rigid material and a gripping sheath formed of resilient pliable material surrounding the handle body. The handle body and the gripping sheath may terminate at the same location on at least one end of the handle, preferably with an intersection with a bore through the handle body and/or an outer surface of a shaft of the tool.

DENTAL OR SURGICAL INSTRUMENT AND HANDLE AND METHOD FOR MANUFACTURING

FIELD OF THE INVENTION

[0001] The application relates to a dental or surgical instrument and a handle suitable for a tool, such as a dental or surgical instrument, and a method for manufacturing.

BACKGROUND

[0002] Dental instruments often have the form generally of an elongate handle portion with a working tool or tip disposed at either or both opposite ends of the handle portion. Some surgical instruments also may have a similar form. For example, a typical scaler may have a cylindrical handle, a first scaler tip projecting from one end of the handle and a second scaler tip projecting from the opposite end of the handle. The scaler is typically used over and over again. Further, an operator, such as a dentist or a dental hygienist, frequently spends significant time using such dental instruments.

[0003] Due to the nature of the usage of such dental instruments, there are several different design parameters to consider. For example, because the dental instrument is to be reused, it typically needs to be made of a material that can withstand sterilization, such as in an autoclave. Further, the large number of stress cycles through use and reuse of the dental instrument, such as by scraping a patients teeth to remove scale, can cause unwanted and/or premature structural failure of various parts of the instruments. In addition, it can be important to make the instrument ergonomically comfortable for the user because the user can spend large amounts of time manipulating the instrument.

[0004] Some typical dental instruments are formed of an elongate handle body, which may be formed of metal or plastic, and have a shank of a tool tip inserted axially into a blind bore extending into either or both of the opposite ends of the handle. This structure, however, can be prone to undesirable pullout of the tool tip and/or can require a complicated connection to the handle to prevent pullout of the tool tip.

[0005] Other known dental instruments avoid problems with pullout of the tool tip from the handle by forming the handle and the tool tips of a single piece of material, typically surgical grade steel such as stainless steel. Although this design overcomes the problem with tool tip pullout, such an instrument may not be ergonomically desirable to the user and may be difficult to maintain a tight grip on while working on a patient due to saliva or other liquids on the surface of the metal handle.

[0006] To overcome the problems with a unitary metal handle and working tips, it is known in some instances to provide a removable sleeve made of elastomeric material that can be slipped onto and/or removed from the handle. This sleeve has a contoured outer surface to provide a more ergonomic gripping surface for the user and provides a soft or resilient surface for the user to grip. Unfortunately, such a removable sleeve may slip along the shaft of the handle while being used on a patient. The sleeve may also deform excessively along regions where the sleeve is thicker due to the contouring of the outer surface. Further, it may be cumbersome to remove and/or reapply the sleeve periodically for cleaning and/or disinfection of the instrument.

[0007] Another known dental instrument overcomes the problems of a removable sleeve by molding a cylindrical plastic handle about the metal cylindrical shaft of a dental instrument. The molded plastic handle extends along the shaft between working tips disposed at opposite ends of the shaft. However, the plastic molded handle may still be subject to becoming slippery and difficult to grip if it becomes wet.

SUMMARY

[0008] According to some aspects of the present disclosure, a dental or surgical instrument includes a handle body and a gripping sheath. The handle body is formed of a monolithic mass of rigid material, such as a polymer resin, and has a first end, a second end, and a bore extending from the first end to the second end. The gripping sheath surrounds the handle body. The gripping sheath is formed of a resilient, pliable material, such as silicone rubber, to provide a comfortable and preferably slip resistant outer or gripping surface for a user. A tool may include an elongate shaft extending from a first end to a second end and have a first working tip

disposed at least at the first end, and preferably a second working tip disposed at the second end. The tool, and preferably the shaft, extends completely through the bore from the first end of the handle body to the second end of the handle body. The tool and the handle in some aspects form a scaler.

[0009] According to another aspect, a dental instrument of the present disclosure may be manufactured by first overmolding a resin onto the shaft of the tool to form the handle body, and subsequently overmolding the resilient material onto the handle body to form the gripping sheath surrounding the handle body.

[0010] According to yet another aspect of the present disclosure, a handle, for example for a surgical or dental instrument, includes the handle body and the gripping sheath surrounding the handle body. The gripping sheath includes a first end and a second end. The first end of the gripping sheath is coterminous with the first end of the handle body at either the bore through the handle body and/or the outer surface of a shaft extending through the bore.

[0011] In further accordance with any one or more of the foregoing exemplary aspects and new arrangements, a dental instrument and/or a handle according to the teachings of the present disclosure optionally may include any one or more of the following optional forms.

[0012] In some optional forms, the handle body has a contoured outer surface defining a first tapered portion at the first end of the handle, wherein the first tapered portion terminates at the outer surface of the shaft and/or at the bore. Also optionally, the contoured outer surface of the handle body may define a second tapered portion at the second end of the handle body, wherein the second tapered portion also terminates at the outer surface of the shaft and/or at the bore. Either or both of the first and second tapered portions of the body may be angled at an oblique angle with respect to the outer surface of the shaft and/or an axis of the bore. Preferably, the oblique angle is an obtuse angle between approximately 90° and 180°, and more preferably between approximately 95° and 135°, from the outer surface and/or the axis projecting outwardly from the respective end of the bore.

[0013] In some optional forms, the handle body is formed of a single monolithic mass, preferably without having any seams. The bore of the handle body may be bonded directly to

the outer surface of the shaft. The handle body may be formed of a hardened polymer resin. Preferably, the handle body is overmolded directly onto the shaft, such as between the first and second opposite ends of the shaft of the tool.

[0014] In some optional forms, the tool is made of a surgical grade steel, such as stainless steel. Either or both of the working tips may be formed integrally with the shaft, whereby the working tips are not removable from the ends of the shaft. The shaft may have uniform cross-sectional shape extending completely from the first end to the second end of the shaft. In some arrangements, the shaft is cylindrical.

[0015] In some optional forms, the gripping sheath has a contoured outer surface defining a tapered portion at either or each of the first and second ends. The tapered portion preferably forms an oblique angle with the shaft and/or the axis of the bore. The tapered portion of the gripping sheath preferably terminates at the outer surface of the shaft and/or the bore, preferably coterminous with the respective first and/or second end of the handle body. Preferably, the gripping sheath is formed of the silicone rubber or a similar flexible, resilient, and/or slip resistant material. The gripping sheath may further include one or more traction surfaces along an outer surface thereof. The traction surface or surfaces may be disposed adjacent or near either or both of the first and second ends of the gripping sheath. The tractions surfaces may have various aesthetically pleasing designs, the ornamental appearance of which is not dictated by their function.

[0016] In some optional forms, raw plastic resin is dried and the tool is pre-heated before injection molding the raw plastic resin onto the tool to form the handle body. The freshly molded handle body may be cured. A primer may be applied to the exterior surface of the handle body. The gripping sheath may be injection molded onto the primed exterior surface of the handle body. The gripping sheath may be cured.

[0017] Other viable aspects and optional forms of the handle and the dental instrument disclosed herein will be apparent upon consideration of the following detailed description and the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is an isometric view of an exemplary dental instrument including a handle according to the teachings of the present disclosure;

[0019] FIG. 2 is an longitudinal cross-sectional view of the dental instrument along the lines 2-2 in FIG. 1;

[0020] FIG. 3 is an axial cross-sectional view of the dental instrument along the lines 3-3 in FIG. 1; and

[0021] FIG. 4 is an enlarged detail view of the circled portion in FIG. 2.

DETAILED DESCRIPTION

[0022] Turning now to the drawings, FIG. 1 illustrates a dental instrument 10, including a handle 12 secured to a tool 14, exemplary of the teachings of the present disclosure. The tool 14 extends completely through the handle 12, thereby minimizing or completely preventing the possibility of pullout of the tool 14 from the handle 12.

[0023] As best seen in FIG. 2, the tool 14 includes an elongate shaft 16 and at least one, and preferably two working tips 18, 20 disposed on opposite ends 22, 24 of the shaft 16. The handle 12 includes a handle body 26 surrounding the shaft 16 and a gripping sheath 28 surrounding the handle body 26. The tool 14 is a dental tool in the form of a scaler, but in other arrangements, the tool 14 may be another type of dental tool and/or surgical tool.

[0024] The handle body 26 has an elongate, preferably axial form that extends from a first end 30 to a second end 32 and has a bore 34 extending through the first and second ends 30, 32. The tool 14 extends completely through the bore 34, preferably with the first end 22 of the shaft 16 extending and space distally outwardly from the first end 30 of the handle body 26 and/or the second end 24 of the shaft 16 extending and spaced distally outwardly from the second end 32 of the handle body 26. The handle body 26 is formed of a rigid material to form a rigid support surface for the gripping sheath 28. The handle body 26 has a contoured outer surface 36 defining a first tapered surface 38 at the first end 30. The outer surface 36 also defines a second tapered surface 40 at the second end 32. Each of the tapered surfaces 38, 40 intersects with the bore 34 at the respective first or second end 30, 32, thereby terminating at

the bore 34 and/or the outer surface of the tool 14, preferably along the outer surface of the shaft 16. Each tapered surface 38, 40 of the handle body 26 forms an oblique angle α with the outer surface of the shaft 16 and/or the axis of the bore 34. Preferably, for each tapered surface 38, 40, the angle α is an obtuse angle between 180° and 90°, and more preferably between about 95° and 135°, with the axis of the bore 34 and/or outer surface of the shaft 16 extending outwardly from the respective end 22, 24 of the handle body 26. The angle α is preferably selected to provide an ergonomically comfortable gripping surface for a user and to form a gentle angular transition between the outer surface of the handle 12 and the portion of the tool 14 extending outwardly from the handle 12.

[0025] The handle body 26 is preferably formed of a hardened polymer resin, preferably an amorphous thermoplastic polyetherimide (PEI) resin suitable for use in medical and dental applications, such as Ultem™ HU1004 polyetherimide resin, from SABIC Innovative Plastics IP BV. The handle body 26 is a monolithic or unitary mass of material, having no seams, which can improve the structural strength of the handle body over a glued-together multi-piece handle body and can minimize potential cracks and/or crevices for the accumulation of germs, pathogens, plaque, tartar, calculus, blood, saliva, food, dirt or other debris. The handle body 26 is preferably formed by being overmolded onto the shaft 16, thereby bonding the handle body 26 directly to the shaft 16. In some optional arrangements, chemical and/or mechanical bonding agents (not shown), such as adhesives, a roughened or scored outer surface of the shaft 16, and or projections and/or recesses in the outer surface of the shaft 16 may also or alternatively be provided to help permanently bond the handle body 26 to the shaft 16. However, the inventor has found that using amorphous thermoplastic PEI resin in some instances bonds with sufficient strength and affinity directly to the outer surface of the shaft 16 without requiring additional bonding agents.

[0026] The gripping sheath 28 is generally in the form of an elongate axial tube of that extends from a first end 42 to a second end 44. The first end 42 of the gripping sheath 28 is adjacent and preferably coterminous with the first end 30 of the handle body 26. Similarly, the second end 44 of the gripping sheath 28 preferably is adjacent and coterminous with the second end 32 of the handle body 26. The gripping sheath 28 is formed of a resilient,

preferably flexible and/or pliable, material, such as silicone rubber, to provide a soft, resilient, slip-resistant surface to be gripped by the user to improve ergonomic aspects of the handle 12. Preferably, the gripping sheath is formed of a high consistency silicone rubber elastomer suitable for use in the medical or dental industry, such as a Dow Corning Class VI elastomer C6-160, available from Dow Corning Corporation, or a similar material. The gripping sheath 28 is preferably overmolded onto the handle body 26. Overmolding the gripping sheath 28 onto the handle body 26 rather than directly onto the shaft 16 of the tool 14 provides more secure base and bond for the gripping sheath 28. To prepare the handle body 26 to receive the gripping sheath 28, the outer surface 36 of the handle body 26 is preferably scored or roughened prior to overmolding the gripping sheath 28 onto the handle body 26.

[0027] The gripping sheath 28 preferably has a relatively thin thickness as compared with the handle body 26 and generally follows the contoured shape of the outer surface 36 of the handle body 26. In this arrangement, the gripping sheath 28 provides a soft resilient surface to grip, while the harder handle body 26 provides a firm base. The relatively thin thickness of the gripping sheath also prevents the handle 12 from being overly flexible and thereby difficult to control during use, as may happen if the entire handle were to be made of only silicone rubber, such as by deforming to a degree that alters the positioning of the user's fingers relative to the working tips 18, 20 during use. However, as best seen in the enlarged detail of FIG. 4, one or both of the first and second ends 42, 44 of the gripping sheath 28 and the respective first and second ends 30, 32 of the handle body 26 preferably terminate at substantially the same location at the outer surface of the shaft 16 and/or the intersection with the bore 34. This eliminates any overhanging portion of the gripping sheath 28 beyond the ends 30, 32 of the handle body 26, which can move excessively under pressure during use, while still providing a soft gripping surface up to the end of the handle body 26. This also maintains a minimum number of edges and/or seams along which pathogens, plaque, tart, calculus, blood, saliva, food, dirt, or other debris may accumulate, thereby maintaining good sterilization performance. Thus, the thickness of the gripping sheath 28 decreases along each tapered surface 38, 40 of the handle body 26 to essentially zero at the ends 42, 44 of the gripping sheath 28. To achieve this, the gripping sheath 28 also forms an oblique angle β, preferably an obtuse angle, with the

axis of the bore 34 and/or the outer surface of the shaft 16 at each end 42 and 44. The angle α of the handle body 26 is larger than the angle β of the gripping sheath 28.

[0028] The tool 14 may take many different forms and preferably is a dental or other type of medical instrument. The tool 14 is preferably formed, such as by casting and/or machining, of a single piece of metal, such as surgical grade stainless steel, thereby preventing rotational misalignment of the working tips 18, 20 relative to each other and providing better structural integrity with respect to repetitive stress loadings over a dental instrument in which the working tips are formed separately and inserted into the opposite ends of a handle. However, in other arrangements, either or both of the working tips 18, 20 may be releasably secured to the shaft 16, such as with a threaded pin and socket connection or other locking connection. The shaft 16 preferably has a straight axis extending through the first and second end 22, 24. The shaft 16 preferably has a uniform cross-sectional shape, such as circular, oval, or rectangular, extending completely between the first and second ends 22, 24, for example, forming a cylindrical or tubular shaft.

[0029] The outer surface 36 of the handle body 26 is contoured to form an hourglass contour extending between the first and second ends 30, 32 and defining a concave central portion connecting a first convex bulbous portion and a second convex bulbous portion , wherein the first convex bulbous portion connects to the first tapered surface 38, and the second convex bulbous portion connects to the second tapered surface 40. However, the exact contour shape of the outer surface 36 may have alternative or additional aspects and/or forms to provide other aesthetically pleasing forms. The outer diameter of the handle body 26 varies along its length, such as by continuously varying from the first end 30 to the second end 32 to form a smoothly curving contoured outer surface 36.

[0030] As best seen in FIG. 3, each of the shaft, 16, the handle body 26, and the gripping sheath 28 has a substantially circular cross-sectional shape. The shaft 16 is coaxial with the bore 34. Along a majority, and preferably the entire of the length of the bore 34, the inner surface of the bore 34 is coextensive with and bonded directly to the outer surface of the shaft 16. For example, when the handle body 26 is overmolded onto the shaft 16, the outer

circumferential surface of the shaft 16 defines and is coextensive with the inner circumferential surface of the bore 34. The shaft 16 and the handle 12 are not limited to having circular cross-sections.

[0031] One or more rough or undulating traction surfaces 48, such as raised ribs or knobs and/or recessed grooves or dimples, are disposed on an outer surface of the gripping sheath 28. The traction surfaces 48 are to reduce slipping or increase gripping traction when held by the user during use. The traction surfaces 48 are not limited to a specific shape, and may be in any of many aesthetically pleasing forms, the ornamental appearance of which is not dictated by their function.

[0032] The working tips 18 and 20 may take on any of many forms and/or shapes appropriate for any various dental or other medical procedures. In the present example, the working tips 18 and 20 are specifically designed for use as scalers, which may be a variety of scaler types and sizes, such as Gracey, Universal, or curette, and are oriented rotationally offset 180° from each other. However, other working tips may be used, and other spatial orientations may also be used within the scope of the disclosure.

[0033] To manufacture the dental instrument 10, the handle body 26 is overmolded over the shaft 16. Preferably, the handle is overmolded directly onto the outer surface of the shaft. Thereafter, the gripping sheath 28 is overmolded over the handle body 26 and preferably directly onto the outer surface 36 of the handle body 26 or onto a primer that is applied to the exterior surface of the handle body 26. This allows each of the handle body 26 and the gripping sheath 28 to be seamless. It also allows the formation of the monolithic, seamless handle body 26 on the shaft 16 between the two working tips 18 and 20. It can also make it easier to form either or both of the ends 42,44 of the gripping sheath 28 to be coterminous with the respective ends 30, 32 of the handle body 26 through the use of pre-sized and exactly arranged molds. Optionally, the outer surface of the shaft 16 is scored prior to overmolding the handle body 26 thereover to improve the mechanical bond therebetween, and/or the outer surface 36 of the handle body 26 is scored prior to overmolding the gripping sheath 28 thereover to improve the mechanical bond therebetween.

[0034] In one preferred method of manufacturing, raw plastic resin is dried before molding the handle body 26 to the tool 14. For example, the amorphous thermoplastic PEI resin in the form of powder or beads, is dried in an oven at approximately 150 °C for approximately 5 hours. The tool 14 is pre-heated, preferably to a temperature of between approximately 120 °C and 150 °C, before overmolding the handle body 26. The pre-heated tool 14 is disposed in a mold arranged to mold the handle body 26 onto the shaft 16. The dried raw plastic resin is overmolded onto the pre-heated tool 14, for example, by injection molding the dried amorphous thermoplastic PEI into the mold surrounding the shaft 16 to form the handle body 26. The freshly molded handle body 26 is cured before adding additional components of the handle 12, preferably by thermal curing, for example, by placing the tool 14 and handle body 26 into an oven at approximately 120 °C for approximately 10 hours. One or more quality control checks, including dimensional and visual inspection of the freshly molded handle body 26, may optionally be performed before and/or after the handle body 26 is cured. After curing, a primer for receiving and bonding to the gripping sheath 28 is applied to the exterior surface of the cured handle body 26, for example, with a brush or with a sprayer. In a preferred arrangement, the primer is specifically adapted for bonding to silicon rubber, for example, a solution of reactive siloxanes and silicone resins in a mixture of isoalkanes, such as Wacker® primer G 790 available from Wacker Chemie AG, or a similar primer for bonding with silicon rubber. The gripping sheath 28 is overmolded onto the primed handle body 26, preferably by injection molding of raw silicon rubber onto and around the handle body 26 with a second mold. The freshly molded gripping sheath 28 is preferably post-cured to increase bonding strength to the primed handle body 26, for example, by thermal curing the dental instrument 10 with the freshly molded gripping sheath 28 in an oven at approximately 150 °C for approximately 2 hours. Thereafter, the dental instrument 10 is allowed to cool and is ready for further processing, packaging, and/or shipping as desired. Other methods of making the dental instrument 10 and the handle 12 may be used, including, for example, including fewer than all of these steps, performing any one or more of these steps in different orders, machining the handle body 26, and/or sliding the gripping sheath 28 over the handle body.

INDUSTRIAL APPLICABILITY

[0035] A handle according the teachings of the present disclosure is useful for a dental instrument as described in the technical example provided herein. However, the handle may be used with other types of surgical instruments and/or other non-medical instruments.

WHAT IS CLAIMED:

1. A dental or surgical instrument comprising:

a tool including an elongate shaft extending from a first end to a second end and a first working tip disposed at the first end;

a handle body secured to the shaft, the handle body comprising a monolithic mass of rigid material surrounding the shaft and having a first end, a second end, and a bore extending from the first end to the second end;

wherein the tool extends completely through the bore from the first end of the handle body to the second end of the handle body; and

a gripping sheath surrounding the handle body, the gripping sheath formed of resilient material and extending between a first end and a second end,

wherein the first end of the gripping sheath is coterminous with the first end of the handle body at an outer surface of the shaft.

2. The dental or surgical instrument of claim 1, wherein the handle body comprises a contoured outer surface defining a first tapered portion at the first end of the handle body, wherein the first tapered portion terminates at the outer surface of the shaft.

3. The dental or surgical instrument of claim 2, wherein the gripping sheath comprises a contoured outer surface defining a tapered portion at the first end of the gripping sheath, the tapered portion forming an oblique angle with the shaft and terminating at the outer surface of the shaft.

4. The dental or surgical instrument of claim 2, wherein the first tapered portion of the handle body is angled at an oblique angle with respect to the outer surface of the shaft at the first end of the handle.

5. The dental or surgical instrument of claim 2, wherein the tool further includes a second working tip disposed at the second end of the shaft, wherein the contoured outer

surface of the handle body further defines a second tapered portion at the second end of the handle body, and wherein the second tapered portion terminates at the outer surface of the shaft.

6. The dental or surgical instrument of claim 1, wherein the bore of the handle body is bonded directly to an outer surface of the shaft

7. The dental or surgical instrument of claim 1, wherein the handle body consists of a continuous mass of hardened polymer resin without any seams.

8. The dental or surgical instrument of claim 7, wherein the handle body is overmolded directly onto the shaft.

9. The dental or surgical instrument of claim 1, wherein the shaft has a uniform cross-sectional shape from the first end of the shaft to the second end of the shaft.

10. The dental or surgical instrument of claim 9, wherein the shaft is cylindrical.

11. The dental or surgical instrument of claim 1, wherein the tool is formed of surgical grade steel, and/or wherein the gripping sheath is formed of silicone rubber.

12. A dental instrument comprising:

a tool including an elongate metal shaft extending from a first end to a second end and a first working tip extending from the first end;

a handle body overmolded onto the shaft, the handle body surrounding the shaft and having a first end, a second end, and a bore extending from the first end to the second end, the handle body formed of a continuous seamless mass of rigid resin material bonded to the shaft, wherein the shaft extends completely through the bore from the first end of the handle body to the second end of the handle body; and

a gripping sheath overmolded onto and surrounding the handle body, the gripping sheath formed of resilient material.

13. The dental instrument of claim 12, wherein the handle body comprises a contoured outer surface defining a first tapered portion at the first end of the handle body, and the first tapered portion terminates at an outer surface of the shaft and forms an oblique angle with respect to the outer surface of the shaft, and

a first end of the gripping sheath is coterminous with the first end of the handle body at the outer surface of the shaft.

14. The dental instrument of claim 13, wherein the tool is formed of surgical grade steel, the handle body is formed of a polymer resin, and the gripping sheath is formed of silicone rubber.

15. The dental instrument of claim 13, wherein the handle body further comprises a second tapered portion at the second end of the handle, and the second tapered portion terminates at the outer surface of the shaft and forms an oblique angle with respect to the outer surface of the shaft, and wherein a second end of the gripping sheath is coterminous with the second end of the handle body at the outer surface of the shaft.

16. The dental instrument of claim 13, wherein the shaft has a uniform cross-section extending from the first end of the shaft to the second end of the shaft.

17. A handle for a tool with an elongate shaft, the handle comprising:

a handle body formed of a continuous seamless mass of rigid material surrounding the shaft, the handle body including a first end, a second end, a bore extending from the first end to the second end, and a contoured outer surface defining a first tapered portion at the first end of the handle body, wherein the first tapered portion terminates at the bore and forms an oblique angle with respect to an axis of the bore; and

a gripping sheath surrounding the handle body, the gripping sheath formed of resilient material and extending between a first end and a second end, wherein the first end of the gripping sheath is coterminous with the first end of the handle body at the bore.

18. The handle of claim 17, wherein the tool comprises a dental or surgical tool, the contoured outer surface defines a second tapered portion at the second end of the handle body, and the second end of the gripping sheath is coterminous with the second end of the handle body at the bore.

19. A method of manufacturing a dental or surgical instrument, comprising:

providing a tool including an elongate shaft extending from a first end to a second end, a first working tip extending from the first end of the shaft;

overmolding a handle body over the shaft, the handle body formed of rigid material and having a first end a second end, such that the tool extends completely through a bore through the handle body from the first end of the handle body to the second end of the handle body; and

overmolding a gripping sheath over the handle body, the gripping sheath formed of a resilient material surrounding the handle body and having a first end and a second end.

20. The method of claim 19, wherein overmolding the gripping sheath comprises:

molding the first end of the gripping sheath coterminous with the first end of the handle body at the shaft; and

molding the second end of the gripping sheath coterminous with the second end of the handle body at the shaft.

21. The method of claim 20, wherein the elongate shaft comprises metal, the rigid material of the handle body comprises a polymer resin, and/or the resilient material of the gripping sheath comprises a silicone rubber.

22. The method of claim 19, further comprising:

scoring an outer surface of the shaft prior to overmolding the handle body over the shaft.

23. The method of claim 19, further comprising:

scoring an outer surface of the handle body prior to overmolding the gripping sheath over the handle body.

24. The method of claim 19, further comprising:

drying raw plastic resin;

pre-heating the elongate shaft;

wherein overmolding the handle body includes molding the dried raw plastic resin onto the pre-heated elongate shaft.

25. The method of claim 24, wherein drying the plastic resin includes heating the plastic resin to a temperature of approximately 150 °C for approximately 5 hours.

26. The method of claim 24, wherein pre-heating the elongate shaft includes heating the elongate shaft to a temperature between approximately 120 °C and 150 °C.

27. The method of claim 19, further comprising:

thermally curing the handle body prior to overmolding the gripping sheath over the handle body .

28. The method of claim 27, wherein the thermally curing the handle body includes heating the tool and the handle body to a temperature of approximately 120 °C for a period of approximately 10 hours.

29. The method of claim 19, further comprising:

applying a primer to an exterior surface of the cured handle body prior to overmolding the gripping sheath over the handle body;

wherein overmolding the gripping sheath includes injection molding silicon rubber onto the primed handle body .

30. The method of claim 19, further comprising:

thermally curing the gripping sheath after overmolding the gripping sheath over the handle body .

31. The method of claim 30, wherein the thermally curing the gripping sheath includes heating the gripping sheath at a temperature of approximately 150 °C for approximately 2 hours.

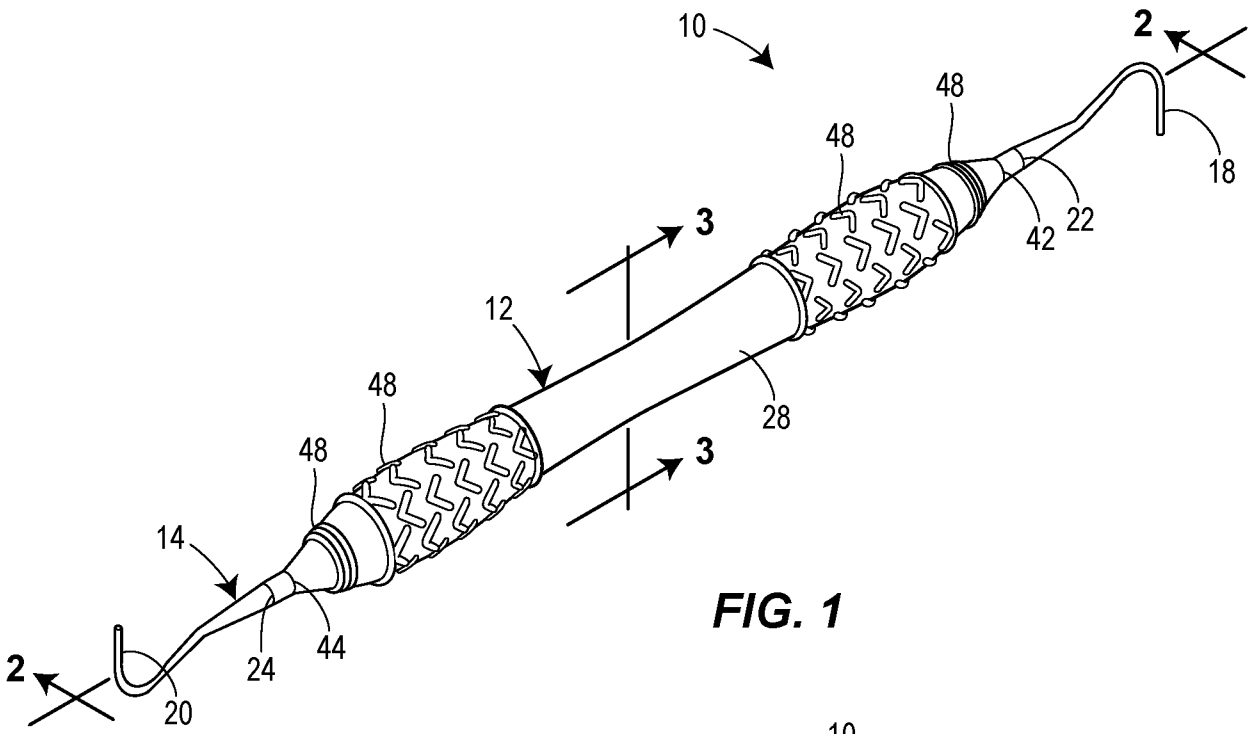

FIG. 1

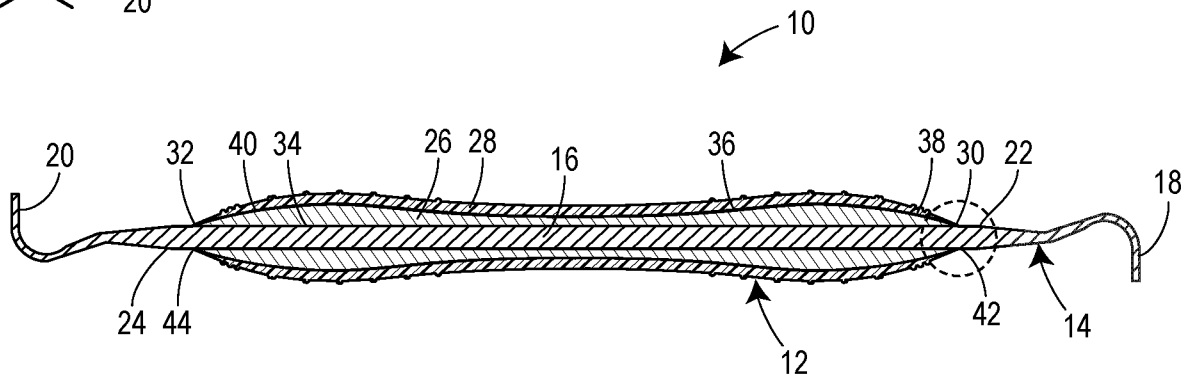

FIG. 2

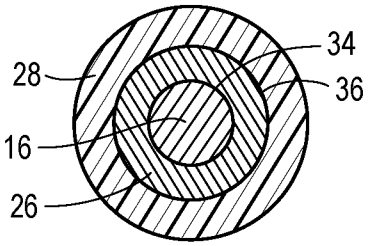

FIG. 3

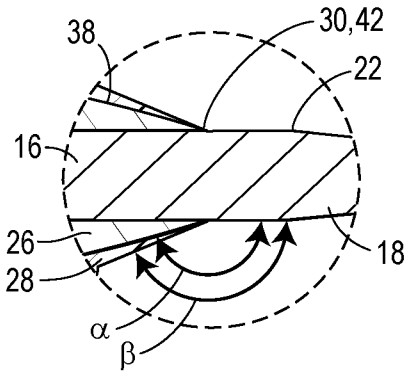

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/072761

A. CLASSIFICATION OF SUBJECT MATTER

A61C 3/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61C 3/-; A61C 5/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, WPI, EPODOC, CNKI: handle, shaft, sheath, mold, inject+, monolithic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4759713 (BAXTER TRAVENOL LABORATORIES, INC.) 26 July 1988 (26.07.1988) description, column 3 lines 9-22, column 4 line 50 to column 5 line 9, and figures 1-11	1-31
Y	US 2006/0084032 A1 (TIPTON, David W. et al.) 20 April 2006 (20.04.2006) description, paragraphs [0034] to [0086], and figures 1-6	1-18, 20-21, 24-28, 30-31
Y	US 2006/0110703 A1 (BILLS, Dan J.) 25 May 2006 (25.05.2006) description, paragraphs [0024] to [0034], and figures 1-3	11, 14, 19-31
A	US 5501597 A (MINNESOTA PROPHY POWER, INC.) 26 March 1996 (26.03.1996) description, column 2 lines 54-59, and figure 7	1-31

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 November 2013 (26.11.2013)	**19 Dec. 2013 (19.12.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer MA,Wei Telephone No. (86-10)62413516

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/072761

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4882867 (LINDÉN, Sigurd R.) 28 November 1989 (28.11.1989) the whole document	1-31
A	US 6361317 B1 (HU-FRIEDY MFG. CO., INC.) 26 March 2002 (26.03.2002) the whole document	1-31
A	US 5816806 A (HU-FRIEDY MFG. CO., INC.) 06 October 1998 (06.10.1998) the whole document	1-31

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/072761

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
US 4759713	26.07.1988	None	
US 2006/0084032 A1	20.04.2006	EP 1647238 A1	19.04.2006
US 2006/0110703 A1	25.05.2006	US 7226289 B2	05.06.2007
		US 2006/0110704 A1	25.05.2006
		US 7234939 B2	26.06.2007
		WO 2006/057919 A2	01.06.2006
		EP 1814486 A2	08.08.2007
US 5501597 A	26.03.1996	None	
US 4882867	28.11.1989	SE 448272 B	09.02.1987
		WO 87/05487 A1	24.09.1987
		EP 0302860 A1	15.02.1989
		DK 8705948 A	27.02.1989
		JP H01501757 A	22.06.1989
		EP 0302860 B1	22.05.1991
		DE 3770269 G	27.06.1991
US 6361317 B1	26.03.2002	None	
US 5816806 A	06.10.1998	None	