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(54) **MEDICAL DEVICE WITH ADHERENT COATING AND METHOD FOR PREPARING SAME**

MEDIZINPRODUKT MIT HAFTÜBERZUG UND VERFAHREN ZU SEINER HERSTELLUNG

DISPOSITIF MEDICAL A REVETEMENT ADHESIF ET PROCEDE DE FABRICATION ASSOCIE

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(73) Proprietor: **Cook Medical Technologies LLC**
Bloomington, IN 47402 (US)

(72) Inventors:
- **CLARK, Tamisha**
  Lexington
  NC 27195 (US)
- **CHILTON, Barry, H.**
  Mount Airy
  NC 27030 (US)

(74) Representative: **Atkinson, Peter Birch et al**
Marks & Clerk LLP
1 New York Street
Manchester, M1 4HD (GB)

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Description

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to medical devices, and more particularly to elongate medical devices useful in minimally invasive procedures, such as wire guides and related devices.

[0002] Medical devices such as wire guides are often coated with another material, for example to increase the lubricity of a surface or to serve as a carrier for release of a therapeutic substance. A number of different coating strategies have been suggested and employed, including strategies that involve covalent, ionic, or hydrogen bonding of the material to the device surface.

[0003] US 6,432,510 B1 describes a biocompatible coated article, comprising a fluorinated resin having enhanced wettability to water. This enhanced wettability is obtained by roughening the surface and then depositing thereon a thin hydrophilic film. Roughening is done by plasma etching or ion beam etching. The hydrophilic film is made from hydrophilic polymers. The roughening plays an important role in improving the adhesive property of fluorinated resins and hydrophilic thin films formed on the surface thereon.

[0004] US 4,842,889 A describes a coating to be applied on biomedical devices such as needles, syringes, catheters. The substrate is a fluoropolymer, which is plasma treated (Ar plasma) and then a thin film of polysiloxane lubricant is applied thereon.

[0005] WO 92/07464 A describes fluoropolymer films immersed in aqueous N-vinylpyrrolidone monomer and irradiated with gamma radiations, which allows grafting of hydrophilic PVP on the surface. These films are intended for biomedical use, in catheter, prosthetic implant or surgical instrument.

[0006] EP 0405823 A describes a hydrophilically coated flexible wire guide. This coating is applied to reduce friction between the outer surface of the wire guide and the inner surface of the organ, it is a lubricious coating. The wire guide comprises an elongate central core, a coil concentrically positioned on the core and a polymer sleeve enclosing the core. The hydrophilic coating is applied on the polymer sleeve.

[0007] Difficulties arise in that the coating material and the device surface sometimes do not adhere to one another to provide sufficient integrity to the coating. This is particularly a problem when non-covalent bonding of the coating material is involved. This is also a particular problem when the device surface is formed with a material, such as a fluoropolymer, that is chosen for its inert, non-reactive, non-adherent qualities.

[0008] The present invention is addressed to these problems.

SUMMARY OF THE INVENTION

[0009] The present invention provides a medical device, comprising a member for traversing or implantation within a bodily passage, the member having an etched polymer portion having a carbonaceous surface. The device also has a lubricious and/or therapeutic coating adhered to the carbonaceous surface.

[0010] The device may be an elongate medical device, such as a wire guide, having a fluoropolymer surface, and a lubricious and/or therapeutic coating stably adhered to the fluoropolymer surface. In preferred devices the coating is a lubricious coating and the fluoropolymer surface has been modified to form a carbonaceous film using a strong chemical etchant such as metallic sodium.

[0011] Preferred medical devices include wire guides, catheters, and stents.

[0012] The present invention also provides a method for applying a lubricious and/or therapeutic coating to a medical device, comprising applying a lubricious and/or therapeutic coating to an etched carbonaceous surface of a polymeric portion of the device.

[0013] The etched carbonaceous surface may have been chemically etched, eg sodium etched.

[0014] Another embodiment of the invention provides a method for manufacturing a medical wire guide, comprising the steps of (a) providing an elongate wire; (b) applying a fluoropolymer coating on the elongate wire; (c) etching the fluoropolymer coating with sodium metal to form an etched carbonaceous surface; and (d) applying a lubricious and/or therapeutic coating on the etched polymer surface.

[0015] Additional embodiments as well as features and advantages of the invention will be apparent from the descriptions herein.

Brief Description of the Drawing

[0016]

FIG. 1 depicts a side view of an illustrative wire guide embodiment of the present invention.

FIG. 2 depicts a cross-sectional view of the wire guide of FIG. 1 taken along line 2-2 and viewed in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] For the purpose of promoting an understanding of the principles of the present invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same.

[0018] With reference to Figure 1, a medical wire guide 10 or similar elongate device for traversing bodily passages is provided. The illustrative device 10 preferably comprises a standard exchange wire guide, e. g., 480 cm or 260 cm in length, with a solid core wire 11, formed from a metal such as nitinol, and a coating 12 on the wire 11, comprising a polymer such as a fluoropolymer, e.g. polytetrafluoroethylene (PTFE), that is shrink-wrapped

over the wire. It will be understood that the present invention also applies to wire guide devices having outer surface coatings applied in other manners such as dipping, extruding over or otherwise coating the internal core wire 11.

[0019] The preferred device 10 also includes a distal portion having a radioactive marker material 13, either as a single marker, a plurality of markers, or an extended radiopaque region that is several centimeters long (e.g., the distal 5 cm). Methods of providing radiopacity include standard techniques such as the addition of a distal platinum coil, adding gold or other radiopaque material markers, using radiopaque inks, or the use of radiopaque shrink wrap or tubing over the core wire, e. g., radiopaque urethane, or dipping the wire in a radiopaque polymer, or affixing a polymer tip, such as PEBAX, that has been loaded with radiopaque powder, such as tungsten.

[0020] The device 10 may also have a lubricious coating 14 applied upon a distal tip portion. The lubricious coating 14 provides lubricity while the device 10 traverses a body passageway to ease the use of the device and prevent damage to tissues lining the passageway. The lubricious coating 14 is applied overtop a portion of the polymer coating 12 that has been modified to improve the adherence of the lubricious coating 14. In accordance with the invention, such modifications will typically involve the abstraction and replacement of atoms or chemical groups presented at the surface of the polymer coating 12 in a manner that increases the level of adherence of the lubricious coating 14. These modifications may, for example, also be evidenced by an increase in the wettability and/or hydrophilic character of the surface of the polymer coating 12. Illustratively, the surface modification may involve the removal of atoms or chemical groups from the polymer coating material and the formation of a carbonaceous film or surface that is more adherent to the polymer(s) used in the lubricious coating than the corresponding unmodified polymer surface. For instance, where a fluoropolymer coating 12 is present, the surface modification may involve the removal of fluorine atoms and the formation of a carbonaceous surface. Removal of atoms such as fluorine atoms may be accomplished utilizing strong chemical etchants such as metallic sodium, as occurs for example in products comprising sodium-naphthalene complexes (e.g. FluroEtch® Safety Solvent, Acton Technologies, Inc., Pittston, Pennsylvania, USA). The resulting carbonaceous film presents a surface-exposed carbonaceous backbone that typically includes relatively polar organic groups, including oxygen-containing organic groups such as hydroxyl groups and carbonyl-containing groups. In such etching processes, the etchant can be contacted one or more times with the polymer coating 12 in any suitable manner, including dipping, spraying, and the like. In a dipping process, a fluoropolymer coating 12 can be suitably contacted with a sodium metal etchant for a period sufficient to form the carbonaceous film, for example up to 5 minutes or more, and typically 30 seconds to 5 minutes. Thereafter, the etched surface is desirably rinsed thoroughly, for example with an alcohol and/or warm water, prior to the application of coating(s) thereon.

[0021] A wide variety of lubricious coating materials may be used for purposes of coating the etched surface. Preferred materials are disclosed in U.S. Patent Nos. 5,001,009 and 5,331,027 to Whitbourne et al., and commercially available from STS Biopolymers, Inc. of Henrietta, New York, USA, under the tradename SLIP-COAT®. More preferred are coatings including an overlying layer containing a relatively hydrophilic lubricious polymer and an underlying layer containing a relatively less hydrophilic and less lubricious coating material. The hydrophilic polymer is a polyolefin such as a vinyl polymer having polar pendant groups, a polyacrylate or methacrylate having hydrophilic esterifying groups, a polyether, a polyethylene glycol, or other polyolefin with hydrophilic characteristics. The hydrophilic polymer is preferably polyvinylpyrrolidone or polyvinylpyrrolidone vinyl acetate. The underlying or "basecoat" polymer is advantageously a water-insoluble polymer that does not significantly react with the hydrophilic polymer in solution, and is preferably cellulose ester, a copolymer of polymethyl vinyl ether and maleic anhydride, or nylon. Cellulose esters are most preferred, including for example ethyl cellulose, hydroxyethyl cellulose, cellulose nitrate, cellulose acetate, cellulose acetate butyrate, and cellulose acetate proprionate. Preferably, the basecoat polymer and hydrophilic top coat polymer are applied in separate steps, with drying after each step at a suitable temperature usually ranging from 10°C to 65.6°C (about 50°F to about 150°F), although higher or lower temperatures may also be used.

[0022] The coating 14 may also serve one or more therapeutic purposes, by incorporating one or more therapeutic agents, for example antibiotic(s) and/or antithrombogenic agent(s), for release during the residence of device 10 within the body. In this regard, coating 14 may possess either or both of lubricious and therapeutic properties, and given the teachings herein it is within the purview of those skilled in the art to select appropriate coating materials for these purposes.

[0023] Device 10 may also include a pigmented portion 15 along the distal-most portion of the wire. The pigmented portion 15 of the distal tip may, for example, be a solidly pigmented portion that coincides with the span of the underlying coil or other radiopaque material, and provides both a reference nearing the end of the wire, and an endoscopically visible reference that can be positionally compared to a radiographic image of the coil or other radiopaque material. Any suitable pigment may be used for pigmented portion 15, either applied overtop the polymer coating 12 or incorporated therein, or both. In addition, polymer coating 12 in areas at the distal tip of device 10 may be formed from the same polymer as, or a different polymer from, the polymer coating on the remainder of the device 10. Where a PTFE polymer coating 12 is used, a compatible PTFE (e.g. Teflon®) pigment may be used. Any suitable pigment may be used, includ-

ing both colors and hues such as black, gray or white pigments. A variety of suitable PTFE pigments are commercially available, including for example Black Striping Ink sold by GEM Gravure Company, Inc., West Hanover, Massachusetts, USA. Where a polymer-based ink such as a fluoropolymer (e.g. PTFE) ink is used, the ink coating may serve as the polymer surface or coating to be etched in accordance with the present invention.

[0024] Excellent adherence of and cohesiveness of the lubricious and/or therapeutic coating 13 can be achieved using non-covalent interactions such as ionic and/or hydrogen bonding and potentially also molecular intermixing of the polymers. Thus, lubricious and/or therapeutic coatings 14 of the invention may lack covalent bonding to the polymer coating 12 or between multiple layers (if present) of the coating 14, for example incorporating film-forming polymers. If desired, however, reactive monomers or other reactive functional groups could be introduced to induce covalent bonding to the polymer coating 12 and/or between layers of the lubricious and/or therapeutic coating 14.

[0025] In a preferred wire guide manufacturing process, a platinum coilspring is welded onto the distal, tapered tip of a nitinol core wire. The nitinol core wire is inserted into a PTFE sheath bearing spiral indicia, distal end first, and the sheath is heat shrunk to the wire using conventional techniques. After trimming any excess sheath material, a PTFE black striping ink (Gem Gravure) is applied to the distal tip by dipping into the ink and drying at an elevated temperature of about 538 °C (about 1000°F). The ends of the wire are conventionally closed, and the wires are grit-blast roughened over approximately 5 cm of the distal tip. The roughened 5 cm of the distal tip are dipped into the sodium etchant, and rinsed well, for example with warm water and/or a polar organic solvent such as an alcohol (e.g. isopropanol) and/or acetone. After drying, a film-forming, two-coat SLIP-COAT® system is then used to form a lubricious coating on the distal 5 cm of the wire by first applying a cellulose ester basecoat (e.g. ethyl cellulose, hydroxyethyl cellulose, cellulose nitrate, cellulose acetate, cellulose acetate butyrate, or cellulose acetate proprionate, and potentially also containing the ink) and drying at a temperature of about 43.3° C (about 110°F) for about 5 minutes, and then applying the hydrophilic polyvinylpyrrolidone top coat overtop the basecoat and again drying at a temperature of about 37.8°C (about 100°F) for about an hour. The resulting coating is highly coherent and stably adhered to the wire.

[0026] Medical devices such as wire guides of the invention can also have the features disclosed in International Application Serial No. PCT/US00/15532 filed June 5, 2000 and published as WO 00/74565 on December 14, 2000. Thus, wire guide 10 may be an exchange wire guide adapted for use with an endoscope, having multiple types of indicia for indicating position and/or movement within a body of a patient. For example, as illustrated in FIG. 1, the wire guide can include an indicia pattern that is at least partially visible by direct or endoscopic observation. The indicia pattern comprises a first system of indicia 16 and a second system of indicia 17. The first system of indicia includes series of scale reference markings that uniquely identify the particular distance to a fixed reference point on the elongate member, such as the distal tip. These scale references markings can include numerals (as shown in FIG. 1), differently numbered bands, dots, etc., or some other form of unique indicia. The second system of indicia 17 is imprinted on, or incorporated into the elongate member to allow the endoscopist or operator to readily determine whether the elongate member is moving relative to the endoscope into which it situated. The second system of indicia can comprise helical strips 18 and 19 (FIG. 1) containing two different colors or alternatively oblique lines, helical stripes, closely placed marking, or another pattern of indicia that allow one to detect longitudinal shifts in position by viewing the device through an endoscope or monitoring the external portion of the elongate member that extends proximally from the endoscope. Various embodiments of use of the second system of indicia 17 include placement of oblique or closely spaced markings on the distal portion to be viewed by the endoscope, placement of the markings at the proximal portion of the elongate member such that they can be directly viewed externally of the patient to determine relative movement, or to incorporate the helical pattern into the device, e.g., providing a striped wire guide coating or co-extrusion of a bicolor catheter. In the case of the latter, the printed scale reference marker, bands, oblique lines, etc. can be printed over the surface of the device having the helical pattern.

[0027] Coated medical devices of the invention may include, for example, exchange wire guides as disclosed above for use in the gastrointestinal tract, vascular wire guides, catheters, stents such as plastic drainage stents for the gastrointestinal system (e.g. fabricated from PTFE, polyurethane or polyethylene), or other medical devices potentially benefiting from lubricious and/or therapeutic coatings, particularly medical devices for traversal of or implantation within bodily passages. Such devices present polymeric surfaces that can be modified and coated with lubricious and/or therapeutic coatings as disclosed above.

Claims

1. A medical device (10), comprising:

a member (11) for traversing or implantation within a bodily passage;
the member (11) having an etched polymer portion having a carbonaceous surface; and
a lubricious and/or therapeutic coating (14) adhered to said carbonaceous surface.

2. The medical device (10) of claim 1, wherein the pol-

ymer is a fluoropolymer.

3. The medical device (10) of claim 1 or 2, which is a wire guide, catheter, or stent.

4. The medical device (10) of any of claims 1 to 3, wherein a lubricious coating is adhered to said carbonaceous surface.

5. The medical device (10) of claim 1, wherein a therapeutic coating is adhered to said carbonaceous surface, the therapeutic coating containing an antibiotic or anti-thrombogenic agent.

6. A medical device (10) of claim 2, which is a wire guide.

7. The medical device (10) of claim 6, wherein the fluoropolymer, is polytetrafluoroethylene.

8. The medical device (10) of claim 7, which is an exchange wire guide.

9. The medical device (10) of any of claims 6 to 8, including at least one system of indicia thereon.

10. The medical device (10) of any of claims 6 to 9, having a lubricious coating (14) adhered to said etched carbonaceous surface.

11. The medical device (10) of claim 10, wherein said lubricious coating (14) comprises one or more polymers non-covalently adhered to the carbonaceous surface.

12. The medical device (10) of claim 10, wherein said lubricous coating (14) comprises polyvinylpyrrolidone or a copolymer thereof.

13. The medical device (10) of claim 1, comprising an elongate member (11) for traversing a bodily passage, the elongate member (11) having said carbonaceous surface and said lubricous and/or therapeutic coating adhered to said surface.

14. The medical device (10) of claim 13, wherein said polymer portion is a fluoropolymer portion.

15. The medical device (10) of claim 14, wherein the fluoropolymer is polytetrafluoroethylene.

16. The medical device (10) of any of claims 13 to 15, which is a catheter or wire guide.

17. A method for applying a lubricious and/or therapeutic coating to a medical device, comprising applying a lubricous and/or therapeutic coating to an etched carbonaceous surface of a polymeric portion of the device.

18. The method of claim 17, wherein said etched carbonaceous surface has been chemically etched.

19. The method of claim 18, wherein said etched carbonaceous surface has been sodium etched.

20. The method of claim 19, which is a method for applying a lubricious coating to a medical device.

21. The method of claim 20, wherein the polymer is a fluoropolymer.

22. The method of claim 21, wherein the fluoropolymer is polytetrafluoroethylene.

23. The method of any of claims 20 to 22, wherein the medical device is a wire guide, catheter, or stent.

24. The method of claim 23, wherein the medical device is a wire guide.

25. The method of claim 17, wherein the device is a wire guide, and also comprising:

providing an elongate wire;
applying a fluoropolymer coating on the elongate wire to provide said polymeric portion;
etching the fluoropolymer coating with sodium metal to form said etched carbonaceous surface; and
applying a lubricious coating to the etched carbonaceous surface.

26. The method of claim 21, wherein the lubricious coating also includes a therapeutic agent

Patentansprüche

1. Medizinprodukt (10), das aufweist:

ein Element (11) für ein Durchqueren eines oder eine Implantation innerhalb eines Körperdurchganges,
wobei das Element (11) einen geätzten Polymerabschnitt mit einer kohlenstoffhaltigen Oberfläche aufweist; und
einen gleitfähigen und/oder therapeutischen Überzug (14), der an der kohlenstoffhaltigen Oberfläche haftet.

2. Medizinprodukt (10) nach Anspruch 1, bei dem das Polymer ein Fluorpolymer ist.

3. Medizinprodukt (10) nach Anspruch 1 oder 2, das eine Drahtführung, ein Katheter oder ein Stent ist.

4. Medizinprodukt (10) nach einem der Ansprüche 1 bis 3, bei dem ein gleitfähiger Überzug an der kohlenstoffhaltigen Oberfläche haftet.

5. Medizinprodukt (10) nach Anspruch 1, bei dem ein therapeutischer Überzug an der kohlenstoffhaltigen Oberfläche haftet, wobei der therapeutische Überzug ein antibiotisches oder antithrombogenisches Mittel enthält.

6. Medizinprodukt (10) nach Anspruch 2, das eine Drahtführung ist.

7. Medizinprodukt (10) nach Anspruch 6, bei dem das Fluorpolymer Polytetrafluorethylen ist.

8. Medizinprodukt (10) nach Anspruch 7, das eine Austauschdrahtftihrung ist.

9. Medizinprodukt (10) nach einem der Ansprüche 6 bis 8, das mindestens ein System von Kennzeichnungen daraufumfasst.

10. Medizinprodukt (10) nach einem der Ansprüche 6 bis 9, das einen gleitfähigen Überzug (14) aufweist, der an der geätzten kohlenstoffhaltigen Oberfläche haftet.

11. Medizinprodukt (10) nach Anspruch 10, bei dem der gleitfähige Überzug (14) ein oder mehr Polymere aufweist, die nichtkovalent an der kohlenstoffhaltigen Oberfläche haften.

12. Medizinprodukt (10) nach Anspruch 10, bei dem der gleitfähige Überzug (14) Polyvinylpyrrolidon oder ein Copolymer davon aufweist.

13. Medizinprodukt (10) nach Anspruch 1, das ein längliches Element (11) für ein Durchqueren eines Körperdurchganges aufweist, wobei das längliche Element (11) die kohlenstoffhaltige Oberfläche aufweist, und wobei der gleitfähige und/oder therapeutische Überzug an der Oberfläche haftet.

14. Medizinprodukt (10) nach Anspruch 13, bei dem der Polymerabschnitt ein Fluorpolymerabschnitt ist.

15. Medizinprodukt (10) nach Anspruch 14, bei dem das Fluorpolymer Polytetrafluorethylen ist.

16. Medizinprodukt (10) nach einem der Ansprüche 13 bis 15, das ein Katheter oder eine Drahtführung ist.

17. Verfahren zur Aufbringung eines gleitfähigen und/oder therapeutischen Überzuges auf ein Medizinprodukt, das den Schritt des Aufbringens eines gleitfähigen und/oder therapeutischen Überzuges auf eine geätzte kohlenstoffhaltige Oberfläche eines Polymerabschnittes des Produktes aufweist.

18. Verfahren nach Anspruch 17, bei dem die geätzte kohlenstoffhaltige Oberfläche chemisch geätzt wurde.

19. Verfahren nach Anspruch 18, bei dem die geätzte kohlenstoffhaltige Oberfläche natriumgeätzt wurde.

20. Verfahren nach Anspruch 19, das ein Verfahren zum Aufbringen eines gleitfähigen Überzuges auf ein Medizinprodukt ist.

21. Verfahren nach Anspruch 20, bei dem das Polymer ein Fluorpolymer ist.

22. Verfahren nach Anspruch 21, bei dem das Fluorpolymer Polytetrafluorethylen ist.

23. Verfahren nach einem der Ansprüche 20 bis 22, bei dem das Medizinprodukt eine Drahtführung, ein Katheter oder ein Stent ist.

24. Verfahren nach Anspruch 23, bei dem das Medizinprodukt eine Drahtführung ist.

25. Verfahren nach Anspruch 17, bei dem das Produkt eine Drahtführung ist, und das ebenfalls die folgenden Schritte aufweist:

    Bereitstellen eines länglichen Drahtes;
    Aufbringen eines Fluorpolymerüberzuges auf den länglichen Draht, um den Polymerabschnitt zu liefern;
    Ätzen des Fluorpolymerüberzuges mit Natriummetall, um die geätzte kohlenstoffhaltige Oberfläche zu bilden; und
    Aufbringen eines gleitfähigen Überzuges auf die geätzte kohlenstoffhaltige Oberfläche.

26. Verfahren nach Anspruch 21, bei dem der gleitfähige Überzug ebenfalls ein therapeutisches Mittel umfasst.

Revendications

1. Dispositif médical (11), comprenant:

    un élément (11) destiné à traverser un passage corporel ou à être implanté dans celui-ci;
    l'élément (11) comportant une partie en polymère gravée comportant une surface carbonée; et un revêtement lubrifiant et/ou thérapeutique (14) adhérant à ladite surface carbonée.

2. Dispositif médical (10) selon la revendication 1, dans lequel le polymère est un polymère fluoré.

3. Dispositif médical (10) selon les revendications 1 ou 2, constitué par un guide-fil, un cathéter ou un stent.

4. Dispositif médical (10) selon l'une quelconque des revendications 1 à 3, dans lequel un revêtement lubrifiant adhère à ladite surface carbonée.

5. Dispositif médical (10) selon la revendication 1, dans lequel un revêtement thérapeutique adhère à ladite surface carbonée, le revêtement thérapeutique contenant un antibiotique ou un agent anti-thrombogène.

6. Dispositif médical (10) selon la revendication 2, constitué par un guide-fil.

7. Dispositif médical (10) selon la revendication 6, dans lequel le polymère fluoré est un polytétrafluoréthylène.

8. Dispositif médical (10) selon la revendication 7, constitué par un guide-fil de rechange.

9. Dispositifmédical (10) selon l'une quelconque des revendications 6 à 8, englobant au moins un système de repères qui y sont appliqués.

10. Dispositif médical (10) selon l'une quelconque des revendications 6 à 9, comportant un revêtement lubrifiant (14) adhérant à ladite surface carbonée gravée.

11. Dispositif médical (10) selon la revendication 10, dans lequel ledit revêtement lubrifiant (14) comprend un ou plusieurs polymères adhérant de manière non covalente à la surface carbonée.

12. Dispositif médical (10) selon la revendication 10, dans lequel ledit revêtement lubrifiant (14) comprend une polyvinylpyrrolidone ou un copolymère de celle-ci.

13. Dispositif médical (10) selon la revendication 1, comprenant un élément allongé (11) destiné à traverser un passage corporel, l'élément allongé (11) comportant ladite surface carbonée et ledit revêtement lubrifiant et/ou thérapeutique adhérant à ladite surface.

14. Dispositif médical (10) selon la revendication 13, dans lequel ladite partie de polymère est une partie de polymère fluoré.

15. Dispositif médical (10) selon la revendication 14, dans lequel le polymère fluoré est du polytétrafluoréthylène.

16. Dispositif médical (10) selon l'une quelconque des revendications 13 à 15, constitué par un cathéter ou un guide-fil.

17. Procédé d'application d'un revêtement lubrifiant et/ou thérapeutique sur un dispositif médical, comprenant l'étape d'application d'un revêtement lubrifiant et/ou thérapeutique sur une surface carbonée gravée d'une partie polymère du dispositif.

18. Procédé selon la revendication 17, dans lequel ladite surface carbonée gravée a été soumise à une gravure chimique.

19. Procédé selon la revendication 18, dans lequel ladite surface carbonée gravée a été soumise à une gravure au sodium.

20. Procédé selon la revendication 19, constitué par un procédé pour appliquer un revêtement lubrifiant sur un dispositif médical.

21. Procédé selon la revendication 20, dans lequel le polymère est un polymère fluoré.

22. Procédé selon la revendication 21, dans lequel le polymère fluoré est un polytétrafluoréthylène.

23. Procédé selon l'une quelconque des revendications 20 à 22, dans lequel le dispositif médical est un guide-fil, un cathéter ou un stent.

24. Procédé selon la revendication 23, dans lequel le dispositif médical est un guide-fil.

25. Procédé selon la revendication 17, dans lequel le dispositif est un guide-fil, et comprenant en outre les étapes ci-dessous:

    fourniture d'un fil allongé;
    application d'un revêtement d'un polymère fluoré sur le fil allongé pour former ladite partie polymère ;
    gravure du revêtement de polymère fluoré avec du sodium métal pour former ladite surface carbonée gravée ; et
    application d'un revêtement lubrifiant sur la surface carbonée gravée.

26. Procédé selon la revendication 21, dans lequel le revêtement lubrifiant englobe en outre un agent thérapeutique.

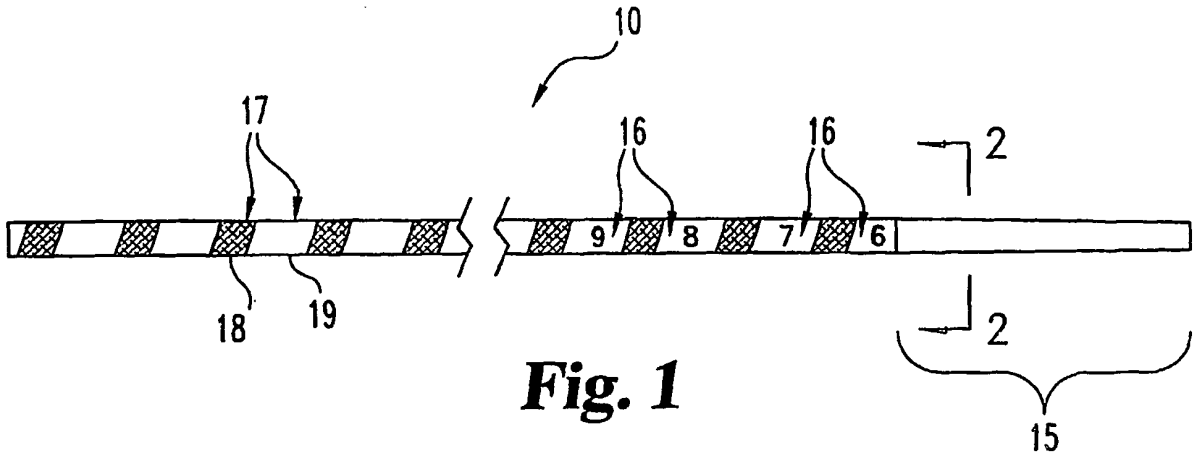

Fig. 1

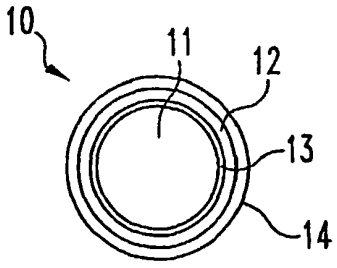

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	具有粘附涂层的医疗装置及其制备方法		
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[标]申请(专利权)人(译)	WILSONCOOK医疗		
申请(专利权)人(译)	WILSON-COOK MEDICAL INC.		
当前申请(专利权)人(译)	WILSON-COOK MEDICAL INC.		
[标]发明人	CLARK TAMISHA CHILTON BARRY H		
发明人	CLARK, TAMISHA CHILTON, BARRY, H.		
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其他公开文献	EP1594397B1 EP1594397A2		
外部链接	Espacenet		

摘要(译)

诸如线引导器的医疗装置具有粘附到蚀刻的碳质聚合物表面的润滑和/或治疗涂层，例如钠蚀刻的聚合物表面。一种用于在医疗装置上制备润滑和/或治疗涂层的方法，包括蚀刻装置的聚合物部分以产生碳质表面并在蚀刻表面上施加润滑和/或治疗涂层。