



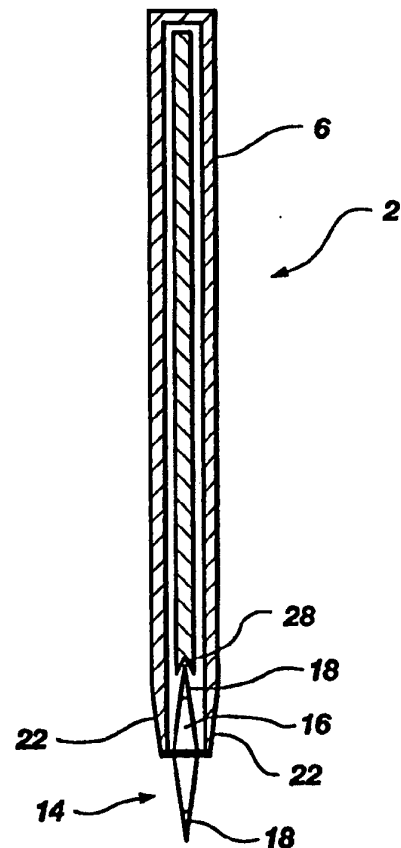
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: MARKING PEN FOR COLORING THE SKIN

(57) Abstract

An apparatus (2) and method are disclosed for marking the proper location of incisions to be made during a surgical procedure, and for coloring the skin. The apparatus (2) includes a pinwheel (16) with a plurality of marking points (18) extending therefrom for penetrating the outermost layer of the epidermis. A reservoir (6) supplies a marking agent so that as the penetrating member (18) penetrates the epidermis, a marking agent is left within the epidermis, thereby leaving a dotted line which may be followed when making incisions during surgery. The method includes penetrating the outermost layer of the epidermis, leaving a marking agent between the outermost layer of the epidermis and an innermost layer of the epidermis.



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MARKING PEN FOR COLORING THE SKINBACKGROUND OF THE INVENTION

The present invention relates to a marking pen, and in particular, to a marking pen which may be used during surgery so as to guide the surgeon in making a proper incision, and which may be used to otherwise mark the skin.

The use of marking pens during surgery is common. Often a surgeon will mark lines on a patient's body so as to know the proper place and length of the incision or incisions which will be made during the operation. Such lines can be particularly important in specialties such as plastic surgery where the operation is being conducted for cosmetic reasons. In such cases, it is extremely important that the incisions be at the proper location, and of the appropriate length. However, this is often difficult to do during surgery without the aid of markings.

Typically, a surgeon will use a felt tip pen to mark lines representing the desired incisions. Because of the patient's perspiration, natural oils and fluids that are used on the patient's body prior to surgery, such as antiseptic solutions, the lines made by the marking pens have a tendency to spread out or "bleed" after being drawn on the skin. Additionally, once an incision has been made, blood usually spills on the patient's skin, causing additional blurring of the lines. While attempts have been made to form the marking portions of the pen in a fine tip, blood and other fluids cause the ink to spread, thereby obscuring the original lines.

Another problem with the marking pens of the prior art is that they have a tendency to dry out. Some pens dry out in the package and others dry out after a single use. The felt tip of the pen can also get "gummed up" with the betadine used on the patient. Because of these problems, many surgeons have been known to break open a pen and use the ink reservoir inside the pen to draw the

lines. The reservoir, however, is fairly broad and results in a substandard marking.

Due to these problems with marking pens, some surgeons rely on primitive marking techniques. For example, some doctors will dip toothpicks or similar instruments in methylene blue. The toothpick, etc., is then dragged across the patient's skin to form a line. The toothpicks, however, will not hold a significant amount of the marking agent and must be repeatedly dipped when the surgeon is drawing a number of lines. Additionally, this method is slow and cumbersome.

In addition to the concerns with surgical marking pens, there are also many other instances in which a person may wish to place markings on the skin. For example, many women draw lines on each of their bottom eyelids with "eyeliner" so as to accentuate their eyes. While there have been proposals to permanently tattoo such marks, most consider this as generally undesirable, as the color of the eyeliner cannot be changed. Additionally, because the mark is permanent, is cannot be removed if the use of eyeliner becomes unfashionable.

To overcome these problems, there is a need for a marking pen which enables a user to make a line on the patient's skin which will not significantly broaden or smear. Additionally, the line made by the marking pen should be temporary so that it will disappear within a short period of time.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a marking pen which will produce a thin line on a patient's skin.

It is another object of the present invention to provide a marking pen which will produce lines which will not smear or blur when the skin becomes wet or oily.

It is another object of the present invention to provide such a pen which penetrates only the epidermis

and will not penetrate the dermis during recommended use.

It is another object of the invention to provide such a pen which can color a portion of skin.

5 The above and other objects of the invention are achieved in a marking pen having a handle, and a fluid reservoir in fluid communication with a penetrating member, commonly referred to as a pinwheel. The pinwheel, for example has a plurality of marking points
10 for puncturing at least one outer layer of the epidermis. As the pinwheel is rolled across a person's skin, the pinwheel leaves a temporary, tattooed line which may be used by the surgeon to make an accurate incision, or which may be used as eyeliner or some other
15 body marking.

In accordance with one aspect of the invention, the pinwheel is less than 1.5 centimeters in diameter and the marking points extend therefrom are small, i.e. 3 millimeters or less and solid. The marking agent is
20 disposed in the handle of the pen, such that a small amount of marking agent is left on the exterior of the marking point. As the pinwheel is rolled along a patient's skin, the small marking points deposit the marking agent as they penetrate the outermost layer of
25 the epidermis, so as to form a dotted line on the patient's skin.

In accordance with another aspect of the invention, the marking pen can be repeatedly run over an area of skin, repeatedly adjusting the direction of the marking
30 pen, so as to leave a plurality of colored marks in the epidermis so as to impart a color shade to the skin different from the natural color of the skin. By using different colors, the user can simulate conventional cosmetics, without fear that the coloration will leave
35 if the skin becomes wet or oily.

BRIEF DESCRIPTION OF THE DRAWINGS

The above, and other objects, features and advantages of the invention, will become apparent from a consideration of the following detailed description presented in connection with the accompanying drawings, in which:

FIG. 1 shows a perspective view of a marking pen made in accordance with the present invention;

FIG. 2 shows a cross-sectional view of a preferred embodiment of the surgical marking pen of the present invention; and

FIG. 3 shows a close-up view of the pinwheel of the present invention.

DETAILED DESCRIPTION

Reference will now be made to the drawings in which the various elements of the present invention will be given numeral designations and in which the invention will be discussed so as to enable one skilled in the art to make and use the invention. Referring to FIG. 1, there is shown a surgical marking pen, generally indicated at 2, for marking lines on a patient's body prior to, or during surgery. The marking pen 2 has a body 6 which is analogous to other marking pens in that the body contains a reservoir (not shown) for holding a supply of a marking agent, such as ink. The marking pen 2 may be disposable, or refillable through a cap, such as cap 10. Disposed in the side of the handle 6 may be a window 12 to enable a user to tell if the marking pen 2 is running out of marking agent. However, it is anticipated that a typical embodiment of the invention will use a felt reservoir mechanism to hold ink. Those familiar with such reservoirs will appreciate that it is often difficult to tell the amount of marking agent held simply by looking at the felt.

Attached to an end of the marking pen 2 is a pinwheel 14 which is formed from a central section 16

and a plurality of marking points 18 which extend from the central section. As will be explained in further detail below, the marking points 18 allow a patient to be marked with fine lines which do not blur or smudge during surgery. The marking points 18 of the pinwheel 14 can also be used to draw lines on the skin, as is commonly done when applying cosmetics, or to color the skin by repeated rolling the pinwheel over a defined area.

10 In a typical embodiment, the pinwheel 14 will be less than 1.5 centimeters in diameter, and the marking points 18 will be less than 3 millimeters in length. In a preferred embodiment of the invention, the pinwheel is less than 1 centimeter in overall diameter, and the marking points 18 extend less than 2 millimeters in length.

The small size of the pinwheel 14 offers several advantages. First, the small size limits the penetration of the marking points 18. As the pinwheel 14 is rolled across a person's skin with a moderate amount of pressure, the marking points 18 will penetrate only the epidermis. When a very small pinwheel 14 is used, only the most outer layers of the epidermis are penetrated. This allows the marking agent to be set in the skin sufficiently deep that it will not be interfered with by liquids on the skin's outer surface. However, by only penetrating the epidermis, the pinwheel will not cause bleeding caused by puncturing the dermis, and the pinwheel sets the marking agent sufficiently shallow that the marking agent will sluff off with the outer layers of the epidermis within a couple of days. Thus, it is not necessary to use a temporary dye, as the marking agent becomes inherently temporary.

The second major advantage of the small pinwheel 14 is the effect on the patient. While a large pinwheel of marking points will typically frighten a patient or other user, a pinwheel of the size described causes

little fear, as the small pinwheel appears to be harmless. Furthermore, by penetrating only the outer layer of the epidermis, the person on whom the pinwheel 14 is used will not experience any pain.

5 A third major advantage of the small size of the pinwheel 14 of the present invention is the ease with which it may be turned from one direction to another. When drawing a line on human skin, several obstacles must be overcome. Not only must the user be concerned
10 with making turns, but the same must typically be made as the pinwheel is moving up and down along the uneven skin surface. By limiting the size of the pinwheel 14 to less than 1.5 centimeters, and preferably to less than 1 centimeter, the pinwheel may be easily turned
15 around corners and other irregular surfaces of the skin.

The pinwheel 14 is attached to the pen body 6 by a pair of arms 22. Typically, the pen body 6 is formed out of plastic, and the arms 22 and pinwheel 14 are formed from a metal such as aluminum or stainless steel.
20 However, the arms 22 and even the pinwheel 14 could be formed from a durable plastic or some other similar material.

In addition to its use as a surgical marking pen, the marking pen 2 may also be useful for coloring the
25 skin, as is typically done with cosmetics. For example, instead of using eyeliner that comes off during recreational activities, or permanently tattooing a line beneath the eyes, the marking pen 2 of the present invention could be used to apply a line on the eyelid
30 below the eye. Unlike conventional cosmetics, the line will not bleed or come off when swimming or engaging in other recreational activities. However, unlike a permanent tattoo, the eyeliner will come off in a couple of days and a different color may be applied if desired.

35 In addition to using the marking pen to simulate eyeliner, the marking pen could also be used to imitate other conventional cosmetics. Instead of applying blush

which may clog pores and come off during recreational activities, a marking pen 2 having a marking agent of the desired color could simply be rolled over the area to be colored several times until the desired shading is achieved. Within a couple of days, the color will disappear as the epidermal layers of skin are sluffed off.

Referring now to FIG. 2, there is shown a side cross-sectional view of the marking pen shown in FIG. 1. The marking pen, 2, includes the pen body 6 or handle and a reservoir mechanism 24 for holding a marking agent. Typically, the reservoir mechanism 24 will be felt, such as that used in felt tipped pens.

The pinwheel 14 is disposed at a bottom of the pen body 6 so that the marking points 18 which extend from the central section 16 of the pinwheel 14 contact the bottom of the reservoir mechanism 24 with each pass. Preferentially, a groove 28 is formed in the reservoir mechanism 24. The groove 28 is disposed so that the marking points 18 of the pinwheel 14 pass therethrough to readily pass the marking agent to the marking points 18 of the pinwheel 14 without causing an excessive amount of friction.

As the marking points 18 pass next to the felt defining the sides of the groove 28, a small amount of marking agent is transferred to the end of the marking point. The marking agent is held in place by surface tension of the marking agent. As the respective marking points contact the skin, a small puncture is formed and the marking agent is deposited therein. As the pinwheel 14 is rolled along the skin, a plurality of marks are left so as to form a dotted line. If a permanent marking agent is used, the line will last as long as the layer of the epidermis in which it is deposited remains. Once the epidermal layer is sluffed off, the marking agent and the line will disappear.

If a person wished to use the marking pen for cosmetic reasons, an area of the skin could be colored by repeatedly running the pinwheel over the skin and changing the direction of the pinwheel slightly with each pass.

Referring now to FIG. 3, there is shown a close-up view of the pinwheel 14. The pinwheel 14 includes a center section 16 with a hole 30 disposed therethrough for attachment to the arms 22. The marking points 18 are disposed so that they taper from the center section 16 to a point, such as point 34. The taper has several benefits. For example, by having the entire length of the marking points 18 tapered, the marking points 18 provide resistance to the point 34 entering more than a few cellular layers into the epidermis. Thus, unless considerable pressure is placed in the pinwheel 14, the point 34 will not enter the dermis. By limiting penetration of the point 34 to the epidermis, the marking points 18 prevent pain to the person on whom the marking pen is being used, and also prevent any permanent marks which might result from a permanent marking agent being deposited in the dermis. Thus, it is ideal if the length of the marking points 18 is 2 millimeters or less.

Another advantage of the taper is that promotes the proper transfer of the marking agent from the reservoir mechanism 24 (FIG.2) into the skin of the patient. If the taper were not provided, the transfer of marking agent would be less efficient and would result in occasional splattering of the marking agent.

Typically the outer surface of the marking points will be either planar or convex. If a concave portion is provided, there is an increased chance that the marking agent will bleed as the marking points enter the skin.

Thus there is disclosed a marking pen for coloring the skin. Those skilled in the art will recognize that

numerous modifications may be made the embodiment disclosed without departing from the scope and spirit of the present invention. The appended claims are intended to cover such modifications.

CLAIMS

1. A marking pen for indicating the proper location of incisions to be made on a patient undergoing surgery, the marking pen comprising:

5 a handle configured for comfortable positioning in a hand, said handle having a support end;

10 a rotatable support member coupled to the support end of the handle and including a mounting means which enable rotation of the support member with respect to the handle;

a plurality of marking points including skin-contacting tips coupled to the rotatable support member wherein each skin-contacting tip defines a circumferential path of rotation about the support member;

15 reservoir means disposed at least partially within the handle for storing a marking agent useful for making skin;

20 dispensing means coupled to the reservoir means and having a contacting surface positioned in proximity to at least one of the circumferential paths of the marking points to enable transfer of the marking agent to at least one of the tips of the marking points.

25 2. The marking pen of claim 1, wherein the skin-contacting tips define a circumferential path around the support member which generally falls within a single plane of rotation.

30 3. The marking pen of Claim 2, wherein each of the marking points is generally solid and tapers to a point.

35 4. The marking pen of claim 1, wherein the reservoir means is disposed completely within the handle.

5 5. The marking pen of Claim 1, wherein the dispensing means comprises a groove formed in the reservoir means and disposed such that rotation of the support member causes the marking points to pass through said groove.

10 6. The marking pen of Claim 5, wherein the reservoir has a top end disposed within the handle and a bottom end disposed adjacent the support member, and wherein the groove of the dispensing means is disposed at the bottom end of the reservoir means.

15 7. The marking pen of Claim 1, wherein the reservoir means comprises a felt reservoir.

20 8. A marking pen for indicating the proper location of incisions to be made on a patient undergoing surgery, the marking pen comprising:

25 rotatable penetrating means for penetrating a portion of the epidermis of the patient, the penetrating means comprising a pinwheel having a diameter of less than 1.5 centimeters, said pinwheel including a plurality of marking points tapering as the marking points extend outward so as to form a tip for penetrating an outermost layer of a human epidermis and depositing marking agent therein, the marking points each having a lengths of less than 3 millimeters;

30 reservoir means disposed adjacent the pinwheel for storing a marking agent and for conveying the marking agent to the marking points of the penetrating means; and

35 handle means attached to the penetrating means so as to enable a user to roll the penetrating means across the epidermis of a patient, thereby leaving marking agent within the epidermis.

9. The marking pen of Claim 1, wherein the penetrating means comprises a pinwheel having a plurality of outwardly extending marking points in rotational alignment.

5

10. The marking pen of Claim 9, wherein each of the marking points is generally solid and tapers to a point.

11. The marking pen of Claim 8, wherein at least a portion of the reservoir means is disposed within the handle means.

12. The marking pen of Claim 11, wherein the reservoir means comprises a groove formed therein and disposed such that rotation of the penetrating means causes the marking points of the penetrating means to pass through said groove.

13. The marking pen of claim 12, wherein the groove is disposed in the reservoir means so as to deposit marking agent on each marking point passing therethrough.

14. A method for marking the proper place for a surgical incision to be made on a patient's body, the method comprising:

(a) making a plurality of penetrations in the patient's epidermis such that the penetration extends to a position between the innermost layer of the epidermis and the outermost surface of the epidermis; and

(b) depositing a marking agent in each penetration so as to draw a dotted line along the patient's epidermis and mark the location of an incision to be made on the patient.

15 15. The method for marking the proper place for a surgical incision to be made of Claim 14, wherein step (a) comprises, more specifically, making a plurality of perforations in the patient's epidermis such that each perforation extends slightly inward of the outermost surface of the epidermis.

10 16. The method for marking the proper place for a surgical incision to be made of Claim 15, comprising the more specific step of using a solid marking point to make the perforations and to deposit the marking agent inward of the outermost layer of the epidermis.

15 17. The method for marking the proper place for a surgical incision to be made of Claim 14, wherein step (b) comprises depositing a temporary marking agent such that the marking agent in the epidermis will disappear following surgery.

20 18. A method for selectively coloring an area of human skin, the method comprising:

(a) making a penetration into the patient's epidermis such that the penetration extends to a position between the innermost layer of the epidermis and the outermost surface of the epidermis;

(b) depositing a colored marking agent in the penetration; and

(c) repeating steps (a) and (b) a sufficient number of times to as to color the area of skin to a desired color.

35 19. The method for selectively coloring an area of human skin of claim 18, wherein steps (a) and (b) comprises, more specifically, using a pinwheel with a plurality of marking points extending radially outward therefrom, each of the marking points having colored marking disposed thereon so as to deposite a colored

marking agent into the epidermis when each marking point penetrates the outermost layer of the epidermis.

20. The method for selectively coloring an area of
5 human skin of claim 19, wherein step (c) comprises
rolling the pinwheel over the skin to form a plurality
of colored dots on the skin.

AMENDED CLAIMS

[received by the International Bureau on 4 November 1996 (04.11.96);
original claims 1,5,8,9,18 and 19 amended;
remaining claims unchanged (5 pages)]

1. A marking pen for indicating the proper
5 location of incisions to be made on a patient undergoing
surgery, the marking pen comprising:

a handle configured for comfortable positioning in
a hand, said handle having a support end;

10 a rotatable support member coupled to the support
end of the handle and including a mounting means which
enable rotation of the support member with respect to
the handle;

15 a plurality of marking points including skin-
contacting tips coupled to the rotatable support member
wherein each skin-contacting tips defines a
circumferential path of rotation about the support
member;

20 reservoir means disposed at least partially within
the handle for storing a marking agent useful for making
skin;

25 dispensing means coupled to the reservoir means and
having a contacting surface positioned in proximity to
at least one of the circumferential paths of the marking
points to enable transfer of the marking agent to at
least one of the tips of the marking points.

30 2. The marking pen of claim 1, wherein the skin-
contacting tips define a circumferential path around the
support member which generally falls within a single
plane of rotation.

35 3. The marking pen of Claim 2, wherein each of
the marking points is generally solid and tapers to a
point.

4. The marking pen of claim 1, wherein the reservoir means is disposed completely within the handle.

5 5. The marking pen of Claim 1, wherein the dispensing means comprises a groove formed in the reservoir mean and disposed such that rotation of the support member causes the marking points to pass through said groove.

10

6. The marking pen of Claim 5, wherein the reservoir has a top end disposed within the handle and a bottom end disposed adjacent the support member, and wherein the groove of the dispensing means is disposed
15 at the bottom end of the reservoir means.

7. The marking pen of Claim 1, wherein the reservoir means comprises a felt reservoir.

20 8. A marking pen for indicating the proper location of incisions to be made on a patient undergoing surgery, the marking pen comprising:

rotatable penetrating means for penetrating a portion of the epidermis of the patient, the penetrating
25 means comprising a pinwheel having a diameter of less than 1.5 centimeters, said pinwheel including a plurality of marking points tapering as the marking points extend outward so as to form a tip configured for penetrating [an outermost layer] only the outermost
30 layers of a human epidermis and depositing marking agent therein, the marking points each having a lengths of less than 3 millimeters;

reservoir means disposed adjacent the pinwheel for storing a marking agent and for conveying the marking
35 agent to the marking points of the penetrating means;
and

handle means attached to the penetrating means so as to enable a user to roll the penetrating means across the epidermis of a patient, thereby leaving marking agent within the epidermis.

5

9. The marking pen of Claim 8, wherein the rotatable penetrating means comprises a pinwheel having a plurality of outwardly extending marking points in rotational alignment.

10

10. The marking pen of Claim 9, wherein each of the marking points is generally solid and tapers to a point.

15

11. The marking pen of Claim 8, wherein at least a portion of the reservoir means is disposed within the handle means.

20

12. The marking pen of Claim 11, wherein the reservoir means comprises a groove formed therein and disposed such that rotation of the penetrating means causes the marking points of the penetrating means to pass through said groove.

25

13. The marking pen of claim 12, wherein the groove is disposed in the reservoir means so as to deposit marking agent on each marking point passing therethrough.

30

14. A method for marking the proper place for a surgical incision to be made on a patient's body, the method comprising:

35

(a) making a plurality of penetrations in the patient's epidermis such that the penetration extends to a position between the innermost layer of the epidermis and the outermost surface of the epidermis; and

(b) depositing a marking agent in each penetration so as to draw a dotted line along the patient's epidermis and mark the location of an incision to be made on the patient.

5

15. The method for marking the proper place for a surgical incision to be made of Claim 14, wherein step (a) comprises, more specifically, making a plurality of perforations in the patient's epidermis such that each perforation extends slightly inward of the outermost surface of the epidermis.

10

16. The method of marking the proper place for a surgical incision to be made of Claim 15, comprising the more specific step of using a solid marking point to make the perforations and to deposit the marking agent inward of the outermost layer of the epidermis.

15

17. The method for marking the proper place for a surgical incision to be made of Claim 14, wherein step (b) comprises depositing a temporary marking agent such that the marking agent in the epidermis will disappear following surgery.

20

18. A method for selectively coloring an area of human skin, the method comprising:

25

(a) making a penetration into the patient's epidermis such that the penetration extends to a position between the innermost layer of the epidermis and the outermost surface of the epidermis;

30

(b) depositing a colored marking agent in the penetration; and

35

(c) repeating steps (a) and (b) a sufficient number of times so as to color the area of skin to a desired color.

19. The method for selectively coloring an area of human skin of claim 18, wherein steps (a) and (b) comprises, more specifically, using a pinwheel with a plurality of marking points extending radially outward therefrom, each of the marking points having colored marking disposed thereon so as to deposit a colored marking agent into the epidermis when each marking point penetrates the outermost layer of the epidermis.

20. The method for selectively coloring an area of human skin of claim 19, wherein step (c) comprises rolling the pinwheel over the skin to form a plurality of colored dots on the skin.

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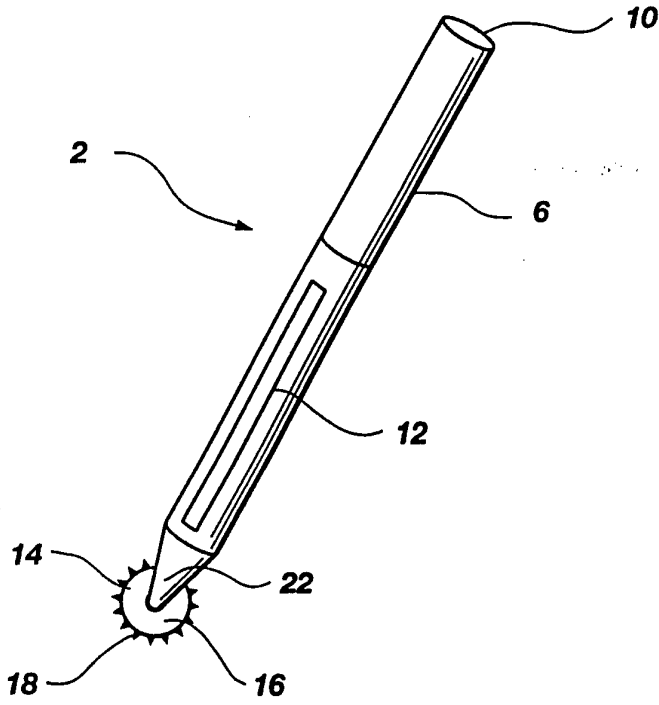


Fig. 1

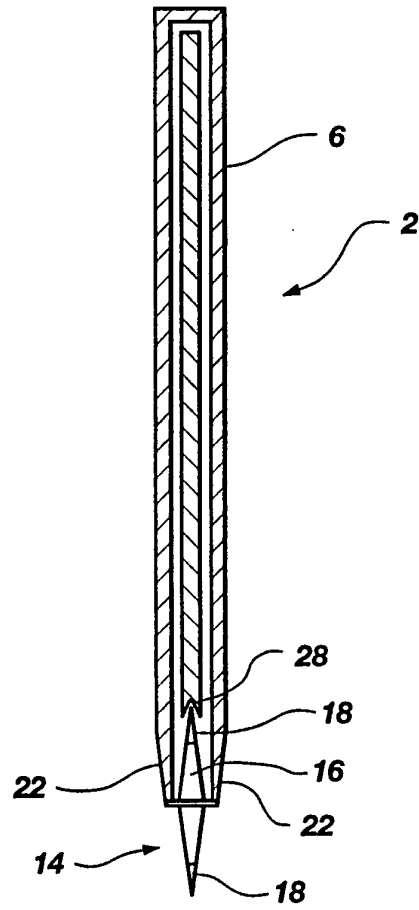


Fig. 2

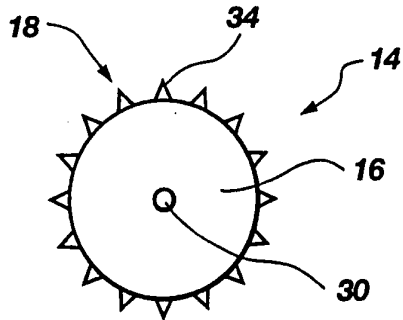
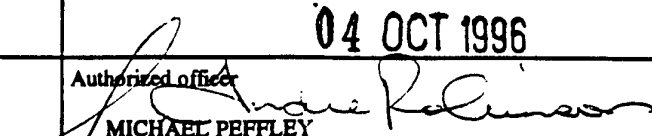


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/12023

A. CLASSIFICATION OF SUBJECT MATTER																						
IPC(6) :A61B 17/00 US CL :606/001 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) U.S. : 81/9.22; 604/46-48; 606/001,185,186																						
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched NONE																						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) NONE																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
Y	DE, A, 065858 (AUGUSTE SPIESZ) 25 July 1914, see whole document, including the figures.	8																				
Y --- A	US, A, 5,279,552 (MAGNET) 18 January 1994, see whole document.	14-18 ----- 1-20																				
Y	US, A, 5,401,242 (YACOWITZ) 28 March 1995, see whole document, especially the Abstract.	14-18																				
A	US, A, 5,139,029 (FISHMAN ET AL.) 18 August 1992, see whole document including the figures.	1-13																				
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.																						
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>*A*</td> <td>document defining the general state of the art which is not considered to be part of particular relevance</td> <td>*T*</td> <td>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</td> </tr> <tr> <td>*E*</td> <td>earlier document published on or after the international filing date</td> <td>*X*</td> <td>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</td> </tr> <tr> <td>*L*</td> <td>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)</td> <td>*Y*</td> <td>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</td> </tr> <tr> <td>*O*</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>*Z*</td> <td>document member of the same patent family</td> </tr> <tr> <td>*P*</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			*A*	document defining the general state of the art which is not considered to be part of particular relevance	*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	*E*	earlier document published on or after the international filing date	*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	*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)	*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	*O*	document referring to an oral disclosure, use, exhibition or other means	*Z*	document member of the same patent family	*P*	document published prior to the international filing date but later than the priority date claimed		
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Date of the actual completion of the international search 15 AUGUST 1996		Date of mailing of the international search report 04 OCT 1996																				
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3590		Authorized officer  MICHAEL PEFFLEY Telephone No. (703) 308-4305																				