(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 August 2004 (12.08.2004)

PCT

(10) International Publication Number
WO 2004/066847 A1

(51) International Patent Classification[7]: A61B 17/06, A61L 17/06, D02G 3/32

(21) International Application Number: PCT/EP2004/000623

(22) International Filing Date: 26 January 2004 (26.01.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
GE2003A000007 27 January 2003 (27.01.2003) IT

(71) Applicant and
(72) Inventor: **CAPURRO, Sergio** [IT/IT]; Via Argonauti, 18, I-16147 Genoa (IT).

(74) Agent: **MARITANO MAELLO, Giovanna**; Via Granello, 5-10, I-16121 Genoa (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

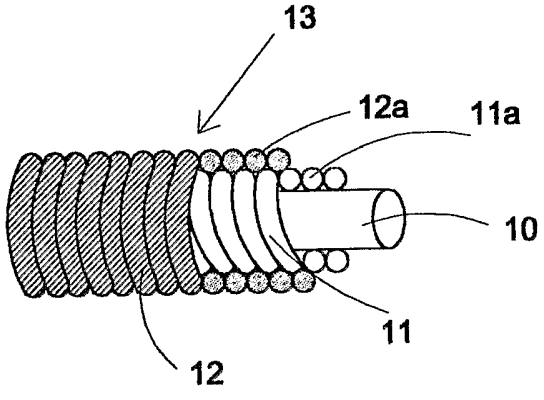
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SHEATHED ELASTIC SURGIGAL THREAD



(57) Abstract: Surgical thread (13), that has an elastic core (10) and a non-elastic sheathing, in which the elastic core (10) consists of one or more bio-compatible elastic threads, and the sheathing consists of one or more non-stretch threads (11, 12) made of bio-compatible material. The non-stretch treads of the sheathing may be absorbable or non-absorbable. Chemical substances and/or medications can be incorporated into the sheath. Different attachments between suture and needle are also covered.

WO 2004/066847 A1

"SHEATHED ELASTIC SURGICAL THREAD"

DESCRIPTION

The present invention concerns a sheathed elastic thread for use in surgery,

In accordance with the usual techniques, non-stretch threads are normally used in surgery, and threads that stretch by only a few millimetres when subjected to traction are considered to be elastic. Such threads are supplied in bobbins, and are subsequently cut, sterilised and mounted manually on surgical needles equipped, at the non-pointed end, with an open eye, to which the thread is secured, or are utilised in various ways for different surgical purposes.

In the most commonly used technique, the thread is fixed industrially to an atraumatic surgical needle. The atraumatic surgical needle is a needle without an eye, which, when fixed to a thread, forms a single unit with no appreciable variation in diameter. The fact that the needle has no eye means that the needle and thread cause only minimal damage on passing through the tissues. In traditional atraumatic surgical needles, the thread is fixed into a hole or groove situated at the non-pointed end of the needle. In the two-tipped atraumatic needle described in patent application N. GE 2002 A 00056 in the name of the same inventor, the thread is inserted into the needle and fixed inside it.

There exists a type of elastic thread for surgical suturing that is able to stretch by 50% to 100% or more of its original length and then to return immediately to its original length once traction ceases.

Described in patent N. EP0792622, this suturing thread is made of silicone elastomer. It is used for cutaneous expansion, before or after large excisions, and for suturing wounds prone to diastasis. The silicone elastomer thread described in patent N. EP0792622 has the following disadvantages.

One disadvantage of the silicone elastomer thread is that sometimes a fine elastic thread of 0.01- 1 mm in diameter is required, for instance to lift facial tissues or to suture the skin. However, such fine threads can easily be cut

during handling with surgical instruments and may snap when pulled through the tissues by the surgeon. Indeed, if a fine silicone elastomer thread is attached by the usual technique to a surgical needle with an open eye, it is very likely to be severed.

Another disadvantage of the silicone elastomer thread, even if its diameter is greater than 1 mm, is that the silicone surface is very slippery, which makes it difficult to exert proper traction during handling with surgical gloves.

The slippery surface of the silicone elastomer thread gives rise to a further disadvantage. If used as a permanent implant for tissue lifting, according to the usual technique, when placed under elastic tension it exerts pressure exclusively on the loops at the two extremities, as the rest of the thread offers no resistance to traction. This feature of the silicone elastomer thread leads to an uneven distribution of the thread's resistance in the tissues and consequently to the risk of cutting through the tissues (cheese-wire effect). If the silicone elastomer thread were to be woven, for instance in order to repair a breach in the abdominal wall, the above disadvantage would remain. Moreover, since silicone rubber cannot be colonised by the tissues, but only encapsulated, the thread would not provide the adhesion necessary for a secure plastic repair.

In accordance with the most commonly adopted technique, normal surgical threads inserted into a hole or groove in the rear end of the traditional single-tipped atraumatic needle are held in place by pinching. However, an elastomer thread, on account of its intrinsic elasticity and its poor resistance to compression, cannot guarantee sufficient resistance to traction when secured by pinching. Moreover, even when glued to the needle, the elastomer thread cannot guarantee resistance to traction on account of the characteristics of this material.

Patent EP0960600 describes a particular patented method of fixing a silicone elastomer thread to a surgical needle. This method, however, presents the following disadvantages.

The method exploits the capacity of the extremity of the silicone elastomer thread, following polymerisation, to adhere around a length of traditional non-stretch suturing thread. In the said patent, the traditional suturing thread is fixed to the atraumatic surgical needle according to the usual techniques.

In order to form a secure bond between the two merged threads, the patented method involves marked polymerisation of the silicone rubber. This has the disadvantage of stiffening the initial length of thread, precisely in its most critical zone, where the thread needs to be flexible when drawn through the tissues. Furthermore, this joint is not as secure as a normal industrial attachment of a thread to an atraumatic surgical needle.

Another disadvantage of this method of attachment is that the silicone elastomer thread, at the point where it is fixed to the non-stretch thread connected to the needle, has a larger diameter than the needle itself. This makes it difficult for the needle/thread junction to pass through the tissues and may cause the thread to detach from the needle; alternatively, the two-tipped atraumatic needle may jerk completely out through the skin, owing to the force that the surgeon has to exert in order to overcome the resistance of the needle/thread junction.

Similar problems of inconsistency in size and poor flexibility are encountered in the other solutions proposed in the same patent EP0960600.

The aim of the present invention is to create an elastic thread that is flexible, resistant to traction and non-slippery. This thread must display good adhesion to the tissues when used as an implant and be able to be attached to open-eye surgical needles without the risk of snapping. In addition, it must be directly attachable to traditional atraumatic surgical needles, without requiring further polymerisation or causing noticeable variations in diameter. The said thread must be able to be woven easily in order to create the implants necessary in various surgical applications. To be used in surgery, the thread described in the present patent must be bio-compatible and cause as little inflammatory reaction as possible if left permanently in the tissues. To this

end, a thread has been created that consists of an elastic core and a non-elastic sheath. The core consists of one or more bio-compatible elastic threads, and the sheath of one or more bio-compatible non-stretch threads.

The non-stretch sheathing threads may or may not be absorbable by the organism.

Preferably, the non-stretch sheathing threads are wound in a spiral fashion, with the windings and/or other modalities set in such a way as to limit the maximum extension of the elastic thread to a precise value suited to the specific application.

The sheathed elastic thread is capable of stretching by up to 100% of its length or more and returning immediately to its original length; once the maximum extension of the sheath has been reached, the thread can be stretched no further. This thread withstands far greater traction than the same elastic thread without a sheath.

Several advantages are gained by sheathing a bio-compatible elastic thread with one or more non-stretch threads.

Firstly, the elastic thread cannot be stretched beyond its breaking point.

Secondly, the elastic thread is protected against cutting by the sharp edges of the surgical instruments with which it is handled.

Thirdly, the outer sheathing enables the thread to be gripped more easily in the hand.

Fourthly, the sheathing allows the thread to be knotted more securely.

A further advantage of the sheathed elastic thread is that it can be woven more easily than a silicone elastomer thread with a slippery surface.

Yet another advantage of the present invention is that, when a permanent implant is inserted into the tissues, the outer sheathing of the elastic thread, as created in the present invention, is colonised by the histiocytic-fibroblastic cells, which bind the thread to the tissues through which it passes; this enables the tension of the sheathed elastic thread to be distributed along its entire surface. If colonisation of the sheathing is not required, such as, for

example, in the case of skin sutures that are to be removed within a few days, the surface of the sheathed elastic thread will have to be treated with special non-stick substances in accordance with standard techniques.

A further advantage of the present invention is that the sheathing of the elastic thread enables the thread to be mounted on an open-eye surgical needle without the risk of cutting the elastic core.

Moreover, the thread described in the present invention can be attached directly to a single-tipped atraumatic surgical needle. Indeed, the sheathing thread or threads can be pinched in the hole or groove at the rear end of the needle, thereby providing an adequate bond that will withstand traction. Even if the end of the thread is glued to the needle, the sheathing provides secure adhesion. When the sheathed thread is inserted into a two-tipped atraumatic needle, the risk of the thread being cut by the edges of the hole during surgical manoeuvres is considerably reduced.

The elastic core and the sheathing thread or threads can be made of natural and/or synthetic fibres. For example, the said elastic thread may be made of methylvinyl-polysiloxane silicone rubber or other bio-compatible elastic materials, such as purified natural rubber, 1,4 cis-polyisoprene, acrylonitrile butadiene copolymer, isoprene cisobutylene, conjugated ethylene-propylene/diene terpolymer or derivatives.

The non-stretch absorbable sheathing threads may, for example, be made of collagen, polyglactin 910, polydioxanone, polyglycolic acid, polyglecaprone, polyglyconate or derivatives.

Among the materials used for the non-stretch non-absorbable sheathing threads, we may quote, by way of example, PTFE, polypropylene, polyurethane, polyether, polyurethane-polyether, PVDF (polyvinylidine fluoride), polyamide and derivatives, or silk and other natural fibres.

The type and windings of the non-stretch sheathing threads vary according to whether the thread is destined for use as an implant or as an elastic suture.

Chemical substances and/or medications can also be incorporated into the

sheathing.

The sheathing of the thread described in the present invention can be produced according to the techniques used in the textile industry in accordance with specifications and utilising materials suited to surgical applications.

The applications of the sheathed elastic thread, as described in the present invention, can be extended to permanent implants to lift the tissues and to the permanent suturing of cutaneous and subcutaneous tissues. If the sheathed elastic thread is woven, it can be used in the plastic repair of hernias, breaches in the abdominal wall, etc.

The sheathed elastic thread, as described in the present invention, can usefully substitute traditional non-stretch stitching materials in surgical operations. The advantage that the sheathed elastic thread described in the present invention has over traditional non-stretch threads, when used for suturing, is that it adapts to the swelling of the tissues, thereby maintaining firm adhesion of the tissues, and is easier to remove. When used as a permanent implant in the tissues, the sheathed elastic thread proves useful for suturing the derma or the subcutaneous or vascular tissue and for lifting facial tissues, as it counteracts drooping. In this application, it is superior to non-stretch threads in that it does not hinder the movements of the facial muscles; it neither cuts into the tissues nor forces the features to remain unnaturally static. When woven, for example into a web, the sheathed elastic thread has the advantage of creating a bio-compatible elastic surface that can be colonised by the tissues; it is therefore stable, well integrated and spreads tension over its entire surface. A web of sheathed elastic thread offers a more physiological plastic repair of hernias, for instance. Indeed, owing to its elastic and adhesive properties, it is better than webs woven from non-stretch threads at adapting to sudden increases in endoabdominal pressure, which may cause a recurrence of the hernia.

All of the above-mentioned advantages, and many others, will be seen from

the description of the following figures, which are attached by way of illustration and are not regarded as limiting.

Fig. 1 depicts a sheathed elastic thread as described in the present invention;

Fig. 2 depicts a sheathed elastic thread with a reduced diameter at one end;

Fig. 3 shows a sheathed elastic thread inserted into the hole or groove of a single-tipped atraumatic needle;

Fig. 4 shows a sheathed elastic thread inserted into a two-tipped atraumatic needle;

Fig. 5 shows a sheathed elastic thread woven into a web;

In the various figures, the same elements are indicated by the same numbers.

In Figure 1, a sheathed elastic thread (13) as described in the present invention is illustrated by way of example.

The core (10) of the thread is made of bio-compatible elastic material capable of stretching by up to 100% of its length or more and of returning immediately to its original length.

The elastic core (10) is sheathed by a non-stretch thread (11) wound in a spiral fashion, for example anti-clockwise, the windings of which, seen in section, are indicated (11a).

The spiral of the non-stretch thread (11) is covered by a second outer thread (12) wound in a spiral in the opposite direction, for example clockwise, the windings of which, seen in section, are indicated (12a).

In order to facilitate insertion of the thread (13) into a needle (14), the diameter of one end of the thread (13) is reduced by stretching this portion of the thread to its maximum. The thinned end (13') is then fixed by means of a bio-compatible glue, as illustrated in Figure 2. Alternatively, a low-temperature treatment can be used to maintain the thinning of the end (13') of the thread.

In Figure 2, a normal atraumatic suturing needle (14) with an axial hole (16) at the non-pointed end is seen in front of the thread (13).

In Figure 3, the sheathed elastic thread (13) is shown with the thinned end (13') inserted into the hole (16) of the needle (14). The thread (13) can be

attached to the needle (14) in the usual ways, by compressing the non-stretch threads (11 and 12) of the sheathing, comprising or not comprising the elastic core (10).

Another recommended method of attaching the thread (13) to the needle (14) is to use bio-compatible glue.

The end of the thread (13) that is not attached to the needle (14) can also be treated with a glue that has suitable characteristics of bio-compatibility and resistance to sterilisation, in order to prevent the sheathing from fraying.

Obviously, production of the materials used in the sheathed elastic thread (13) and attachment of the thread to the needle (14) must take place in a controlled environment and in conformity with current regulations.

Figure 4 shows the sheathed elastic thread (13) with its thinned end (13') inserted into the hole (17) of a two-tipped atraumatic needle (15) by means of the modalities described in the above-mentioned patent application N. GE 2002 A 00056.

Figure 5 depicts a sheathed elastic thread woven into a web.

Traction with forceps (19) illustrates the elasticity and pliability of the web (18), owing to the elastic features of the sheathed thread as described in the present invention.

The present invention comprises all those variations in detail and all modifications that may prove obvious to a technician in this field, and which do not lie outside the ambit of the present invention, but which are understood to be included within the area of the following claims.

CLAIMS

1. Surgical thread (13), characterised by the fact that it has an elastic core (10) and a non-elastic sheathing, in which the elastic core (10) consists of one or more bio-compatible elastic threads, and the sheathing consists of one or more non-stretch threads (11, 12) made of bio-compatible material.

2. Surgical thread (13), according to claim 1, in which the non-stretch sheathing thread (11) is wound in a spiral fashion, with the windings and/or other modalities set in such a way as to limit the maximum extension of the elastic thread to a precise value suited to the specific application.

3. Surgical thread (13), according to claim 1, characterised by the fact that the non-stretch sheathing threads (11, 12) are wound in overlying spirals in opposite directions.

4. Surgical thread (13), according to claim 1, in which the elastic core (10) and the sheathing thread or threads are made of natural and/or synthetic materials.

5. Surgical thread (13), according to claim 1, characterised by the fact that it has an elastic core (10) made of methylvinyl-polysiloxane silicone rubber or other bio-compatible elastic materials, such as purified natural rubber, 1,4 cis-polyisoprene, acrylonitrile butadiene copolymer, isoprene cisobutylene, conjugated ethylene-propylene/diene terpolymer.

6. Surgical thread (13), according to claim 1, characterised by the fact that the non-stretch sheathing thread or threads (11, 12) are made of absorbable material.

7. Surgical thread (13), according to claim 1, characterised by the fact that the non-stretch sheathing thread or threads (11, 12) are made of non-absorbable material.

8. Surgical thread (13), according to claims 1 and 4, characterised by the fact that the absorbable material used in the non-stretch sheathing thread or threads (11, 12) is constituted by collagen or polyglactin 910, polydioxanone, polyglycolic acid, polyglecaprone, polyglyconate or derivatives.

9. Surgical thread (13), according to claims 1 and 5, characterised by the fact that the non-absorbable material used in the non-stretch sheathing thread or threads (11, 12) is constituted by PTFE or polypropylene, polyurethane, polyether, polyurethane-polyether, PVDF (polyvinylidine fluoride), polyamide or derivatives of these, or by silk or other natural fibres.

10. Surgical thread (13), according to claim 1, characterised by the fact that chemical substances and/or medications can be incorporated into the non-stretch sheathing threads (11, 12).

11. Surgical thread (13), according to claim 1, in which the sheathing can be colonised by living tissues.

12. Surgical thread (13), according to claim 1, in which the sheathing can be rendered impervious to colonisation by living tissues by treating with special non-stick substances.

13. Surgical thread (13), according to claim 1, characterised by the fact that sheathing (11, 12) of the elastic core (10) is performed according to standard techniques used in the textile industry with specifications and materials that are suited to surgical applications.

14. Surgical thread (13), according to claim 1, characterised by the fact that the extremity of the thread (13) to be attached to the needle (14, 15) is thinned (13') by applying maximum tension, and that this thinned end (13') is fixed in place by means of bio-compatible glue.

15. Surgical thread (13), according to claim 1, characterised by the fact that the extremity of the thread (13) to be attached to the needle (14, 15) is thinned by applying maximum tension, and that the thinning of the end (13') is maintained by means of low-temperature treatment.

16. Surgical thread (13), according to claims 1 and 12 or 13, characterised by the fact that the thinned end (13') is inserted into the hole (16) of an atraumatic surgical needle (14).

17. Surgical thread (13), according to claim 1, characterised by the fact that the thread (13) is fixed to the needle (14, 15) by means of bio-compatible

glues.

18. Surgical thread (13), according to claim 1, characterised by the fact that the thread (13) is attached to the needle (14) by compressing the non-stretch sheathing thread or threads (11, 12), comprising or not comprising the elastic core (10).

19. Surgical thread (13), according to claim 1, characterised by the fact that the extremity of the thread (13) that is not attached to the needle (14, 15) is treated with a glue that has suitable characteristics of bio-compatibility and resistance to sterilisation.

20. Surgical thread (13), according to claim 1, characterised by the fact that the thread (13) is thinned at one end (13') for insertion into the hole (17) of a two-tipped atraumatic needle (15).

21. Surgical thread (13), according to claim 1, which is woven in order to create an elastic surface for implantation.

1/1

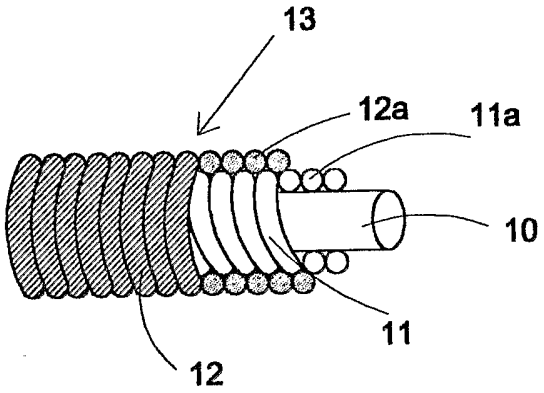


FIG. 1

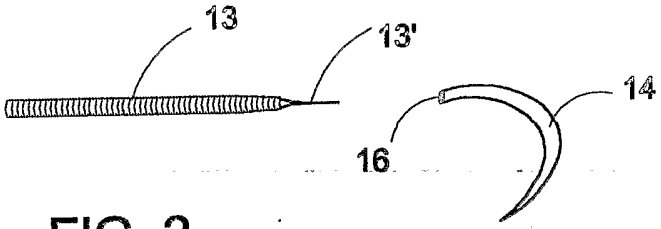


FIG. 2

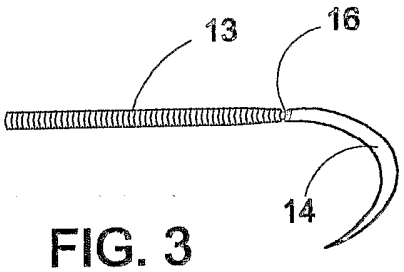


FIG. 3

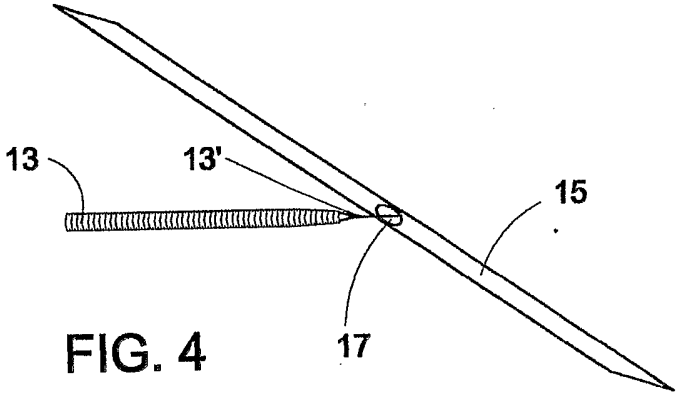


FIG. 4

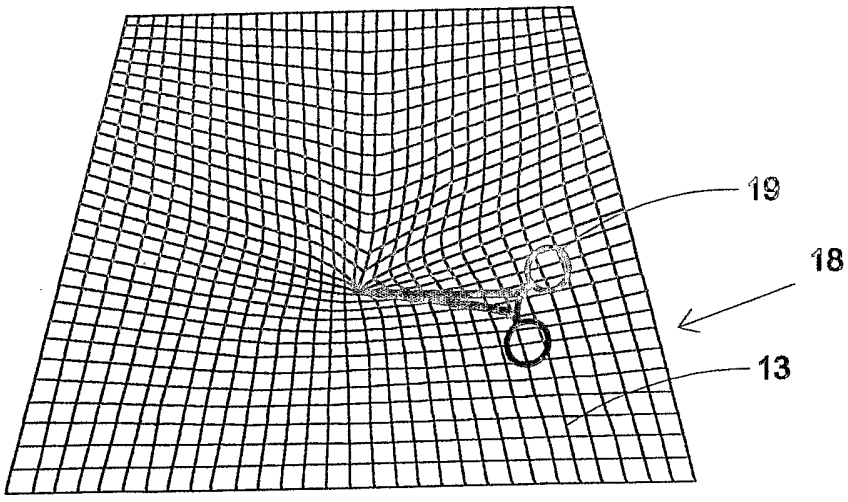


FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/000623

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61B17/06 A61L17/06 D02G3/32

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 7 A61B A61L D02G

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 practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 0 397 500 A (UNITED STATES SURGICAL CORP) 14 November 1990 (1990-11-14) column 3, line 5 -column 5, line 20 column 5, line 49 -column 8, line 18; figures 1-3	1-6,8, 10-13,21 14-20
X	US 6 240 716 B1 (HAYASHI SHOICHI ET AL) 5 June 2001 (2001-06-05) column 1, line 48 - line 58 column 2, line 24 - line 32	1,7,9
X	EP 0 485 986 A (UNITED STATES SURGICAL CORP) 20 May 1992 (1992-05-20) the whole document	1-6,8,10

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in 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 document 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
17 May 2004	26/05/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Herberhold, C

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/000623

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 926 194 A (GREENBERG JONATHAN FRED ET AL) 16 December 1975 (1975-12-16) column 1, line 25 -column 3, line 63; figure 2 ---	14-20
Y	US 5 080 667 A (CHEN CHAO ET AL) 14 January 1992 (1992-01-14) column 2, line 29 - line 44; figures 1,2 column 3, line 24 - line 38 ---	16-18,20
A	US 3 890 975 A (MCGREGOR WALTER) 24 June 1975 (1975-06-24) the whole document -----	14-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP2004/000623

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0397500 A	14-11-1990	US 4990158 A	05-02-1991
		CA 2016493 A1	10-11-1990
		DE 69021261 D1	07-09-1995
		DE 69021261 T2	01-02-1996
		EP 0397500 A2	14-11-1990
		US 5376118 A	27-12-1994
		US 5147400 A	15-09-1992
		US 5217495 A	08-06-1993
US 6240716 B1	05-06-2001	CN 1109784 B	28-05-2003
		DE 69802499 D1	20-12-2001
		DE 69802499 T2	27-06-2002
		EP 0956382 A1	17-11-1999
		JP 10273837 A	13-10-1998
		WO 9832904 A1	30-07-1998
EP 0485986 A	20-05-1992	US 5217495 A	08-06-1993
		EP 0485986 A1	20-05-1992
		US 5376118 A	27-12-1994
US 3926194 A	16-12-1975	CA 1080073 A1	24-06-1980
		DE 2552098 A1	26-05-1976
		GB 1521999 A	23-08-1978
		IT 1052313 B	20-06-1981
US 5080667 A	14-01-1992	US 5007922 A	16-04-1991
		AU 646362 B2	17-02-1994
		AU 3280093 A	25-03-1993
		AU 635980 B2	08-04-1993
		AU 6587890 A	16-05-1991
		BR 9005726 A	17-09-1991
		CA 2029668 A1	14-05-1991
		DE 69010840 D1	25-08-1994
		DE 69010840 T2	23-03-1995
		DK 428110 T3	29-08-1994
		EP 0428110 A1	22-05-1991
		ES 2056338 T3	01-10-1994
		GR 90100805 A ,B	17-04-1992
		IE 904073 A1	22-05-1991
		JP 2965667 B2	18-10-1999
		JP 3210251 A	13-09-1991
		PT 95873 A ,B	13-09-1991
US 3890975 A	24-06-1975	AR 206516 A1	30-07-1976
		AU 7382474 A	01-04-1976
		BE 821309 A4	21-04-1975
		CA 1026183 A1	14-02-1978
		CA 1059857 A1	07-08-1979
		CH 588275 A5	31-05-1977
		CH 586035 A5	31-03-1977
		DE 2420512 A1	30-04-1975
		DK 562074 A	16-06-1975
		ES 431206 A2	16-02-1977
		ES 450065 A2	01-09-1977
		FI 312574 A	27-04-1975
		FR 2248817 A2	23-05-1975
		GB 1448543 A	08-09-1976
		GB 1448544 A	08-09-1976

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP2004/000623

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3890975 A		IE 40444 B1	06-06-1979
		IE 40443 B1	06-06-1979
		IT 1059694 B	21-06-1982
		JP 50073480 A	17-06-1975
		NL 7413879 A	29-04-1975
		NO 743709 A	26-05-1975
		PH 13499 A	23-05-1980
		PL 98127 B3	29-04-1978
		SE 7413464 A	28-04-1975
		SU 566506 A3	25-07-1977
		TR 17343 A	24-03-1975
		US 3980177 A	14-09-1976
		ZA 7406792 A	26-05-1976
		AR 196933 A1	28-02-1974
		AT 333438 B	25-11-1976
		AT 468373 A	15-03-1976
		AU 473919 B2	08-07-1976
		AU 5586473 A	21-11-1974
		BE 800148 A1	28-11-1973
		CH 563766 A5	15-07-1975
		DE 2327281 A1	13-12-1973
		ES 415295 A1	01-05-1976
		FR 2186214 A1	11-01-1974
		GB 1428559 A	17-03-1976
		IE 37724 B1	28-09-1977
		IT 985255 B	30-11-1974
		JP 49056487 A	31-05-1974
		JP 58039544 B	30-08-1983
		NL 7307477 A	04-12-1973
		NO 136562 B	20-06-1977
		PH 9576 A	16-01-1976
		PH 11141 A	27-10-1977
		PL 89136 B1	30-10-1976