

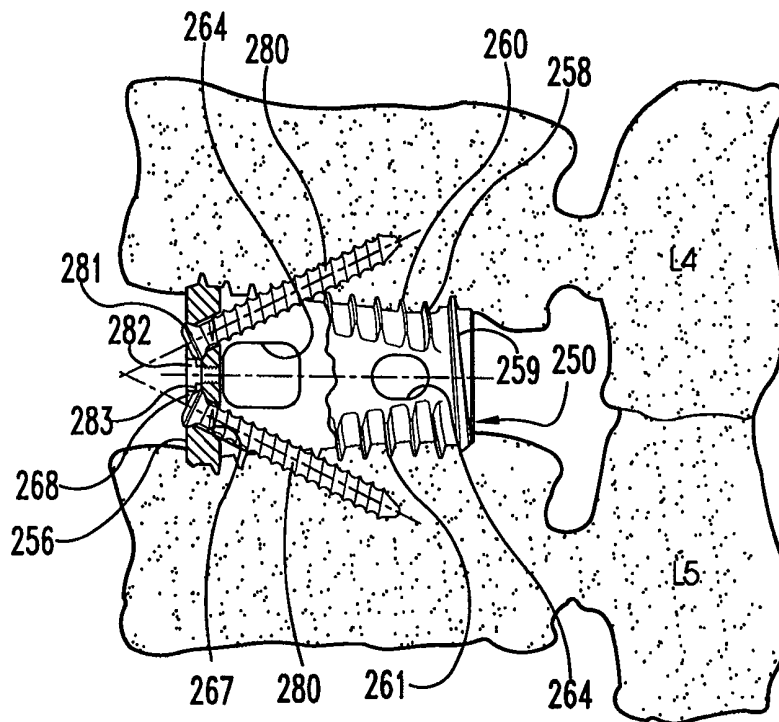


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61F 2/44, 2/46, A61B 17/02, 1/313, 17/16, 17/17, 17/28	A3	(11) International Publication Number: WO 99/38463 (43) International Publication Date: 5 August 1999 (05.08.99)
(21) International Application Number: PCT/US99/01593 (22) International Filing Date: 26 January 1999 (26.01.99) (30) Priority Data: 09/014,901 28 January 1998 (28.01.98) US (71) Applicant (for all designated States except US): SDGI HOLDINGS, INC. [US/US]; Suite 508, 300 Delaware Avenue, Wilmington, DE 19801 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): ZDEBLICK, Thomas, A. [US/US]; 4517 Fox Bluff Lane, Middleton, WI 53562 (US). MCGAHAN, Thomas [US/US]; 4904 Harvest Fields Circle, Memphis, TN 38125 (US). (74) Agents: LOWES, J., Andrew et al.; Woodard, Emhardt, Naughton, Moriarty & McNett, Bank One Center/Tower, Suite 3700, 111 Monument Circle, Indianapolis, IN 46204 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, 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, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 4 November 1999 (04.11.99)

(54) Title: METHODS AND INSTRUMENTS FOR INTERBODY FUSION**(57) Abstract**

A laparoscopic surgical technique is provided for preparing a site for implantation of a novel fusion device or implant. In accordance with one embodiment of the technique, laparoscope (170) is provided having an outer sleeve (171) with distraction fingers (173) at one end to distract the disc space. The laparoscope (170) provides a sealed working channel to the disc space, through which the disc space is distracted, the vertebral endplates and surrounding disc is reamed, and the fusion device (250) inserted. A distraction plug (290) is provided for centering the outer sleeve (171) and for providing midline distraction of the disc space. In one embodiment, a fusion device (250) includes diverging bone screws (280) passing through an end wall (256) and upper and lower walls (260, 261) of the device to engage the adjacent vertebrae. In another embodiment, a connector plate (365, 375) is engaged to bilaterally position fusion devices (350) to prevent rotation and resist expulsion of the devices from the disc space.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon		Republic of Korea	PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/01593

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61F2/44 A61F2/46 A61B17/02 A61B1/313 A61B17/16
A61B17/17 A61B17/28

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 6 A61F A61B

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 97 30666 A (DANEK MEDICAL) 28 August 1997 (1997-08-28) cited in the application	1-4, 7-11
A	the whole document	14, 24, 29, 31
Y	FR 2 727 003 A (EUROS) 24 May 1996 (1996-05-24)	1-4, 7-11
A	the whole document	6
A	US 5 514 180 A (HEGGENESS) 7 May 1996 (1996-05-07) column 11, line 61 - column 12, line 8; figure 27	1, 3
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ 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

31 August 1999

Date of mailing of the international search report

13. 09. 1999

Name and mailing address of the ISA

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

Authorized officer

Klein, C

INTERNATIONAL SEARCH REPORT

In. ational Application No
PCT/US 99/01593

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 20526 A (BRAY) 12 June 1997 (1997-06-12) page 7, line 29 - page 8, line 4; figures 3,14-16 ---	5
A	EP 0 716 840 A (SURGICAL DYNAMICS) 19 June 1996 (1996-06-19) column 5, line 54 - line 59 column 7, line 18 - line 32; figures 3,5,19,27,30 ---	12,13
A	US 4 501 269 A (BAGBY) 26 February 1985 (1985-02-26) cited in the application column 4, line 29 - line 31; figures 1,3,6 ---	12,13
Y	WO 96 27345 A (MICHELSON) 12 September 1996 (1996-09-12) cited in the application page 79, line 12 - page 84, line 19; figures 19,20,23-32 ---	14,18, 19,24,27
A	the whole document	31
Y	US 5 431 658 A (MOSKOVICH) 11 July 1995 (1995-07-11) the whole document ---	14,18, 19,24,27 22,23,26
A	EP 0 796 593 A (SURGICAL DYNAMICS) 24 September 1997 (1997-09-24) the whole document ---	14,24,31
A	WO 96 27321 A (MICHELSON) 12 September 1996 (1996-09-12) the whole document ---	14,24,31
A	US 5 697 889 A (SLOTMAN) 16 December 1997 (1997-12-16) column 4, line 61 - line 65; claim 1; figures 1,1A,3,5,6 ---	18,19,27
A	US 5 020 519 A (HAYES) 4 June 1991 (1991-06-04) column 3, line 24 - line 26 column 3, line 41 - line 43; figures 1,2,4,6,9 ---	23,28
A	WO 96 40016 A (PISHARODI) 19 December 1996 (1996-12-19) figure 13 ---	29
A	EP 0 450 886 A (VANCE PRODUCTS) 9 October 1991 (1991-10-09) abstract ---	29
	-/--	

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/01593

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 724 312 A (ALBY) 15 March 1996 (1996-03-15) page 6, line 23 - line 26; claims 1-3; figure 1 ----	35
Y	FR 2 727 005 A (EUROS) 24 May 1996 (1996-05-24) the whole document ----	35
A	US 5 055 104 A (RAY) 8 October 1991 (1991-10-08) cited in the application column 4, line 47 - line 53; figure 2 ----	36
A	US 5 092 893 A (SMITH) 3 March 1992 (1992-03-03) abstract; figures 1,5,6 ----	35
A	US 5 397 364 A (KOZAK) 14 March 1995 (1995-03-14) figures 1,5-13,22,25 ----	36
A	FR 2 631 539 A (HENRY) 24 November 1989 (1989-11-24) figure 2 ----	37
A	DE 43 02 397 A (ASAHI KOGAKU KOGYO) 29 July 1993 (1993-07-29) ----	
A	WO 97 31517 A (DANEK MEDICAL) 28 August 1997 (1997-08-28) cited in the application ----	
A	EP 0 307 241 A (BRANTIGAN) 15 March 1989 (1989-03-15) cited in the application ----	
A	US 4 349 921 A (KUNTZ) 21 September 1982 (1982-09-21) cited in the application -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 99/01593

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 99/01593

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-13

An intervertebral fusion apparatus comprising a hollow body, at least a screw bore and a bone screw, and a driving tool assembly for use therewith.

2. Claims: 14-28

A distraction device comprising an elongated stem having a second end and a first end with a flange.

3. Claims: 29-34

Laparoscopic instrumentation comprising a tubular sleeve and a centering device.

4. Claims: 35-37

An apparatus for implantation in the intervertebral space comprising at least two elongated bodies, an elongated connecting plate and at least two connecting screws.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Application No

PCT/US 99/01593

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9730666	A	28-08-1997	AU 2271497 A EP 0904037 A TR 9700150 A	10-09-1997 31-03-1999 21-09-1997
FR 2727003	A	24-05-1996	NONE	
US 5514180	A	07-05-1996	NONE	
WO 9720526	A	12-06-1997	AU 705598 B AU 1330197 A CA 2242645 A EP 0915687 A US 5888223 A	27-05-1999 27-06-1997 12-06-1997 19-05-1999 30-03-1999
EP 716840	A	19-06-1996	AU 3505395 A AU 4035395 A CA 2164922 A CA 2199637 A EP 0781113 A JP 8215225 A WO 9608205 A US 5885299 A US 5906616 A AU 696997 B JP 10508766 T	29-03-1996 20-06-1996 12-06-1997 21-03-1996 02-07-1997 27-08-1996 21-03-1996 23-03-1999 25-05-1999 24-09-1998 02-09-1998
US 4501269	A	26-02-1985	CA 1221801 A	19-05-1987
WO 9627345	A	12-09-1996	US 5484437 A AU 701744 B AU 5025896 A AU 7139994 A AU 7741598 A CA 2213819 A CN 1128944 A DE 29623246 U EP 0703757 A EP 0812167 A JP 7008514 A JP 11500947 T WO 9428824 A US 5772661 A US 5505732 A US 5797909 A CA 2164859 A	16-01-1996 04-02-1999 23-09-1996 03-01-1995 01-10-1998 12-09-1996 14-08-1996 02-01-1998 03-04-1996 17-12-1997 13-01-1995 26-01-1996 22-12-1994 30-06-1998 09-04-1996 25-08-1998 22-12-1994
US 5431658	A	11-07-1995	NONE	
EP 796593	A	24-09-1997	AU 1629597 A CA 2199462 A JP 10000200 A	18-09-1997 14-09-1997 06-01-1998
WO 9627321	A	12-09-1996	US 5772661 A AU 707418 B AU 5025996 A CA 2213827 A DE 29623247 U EP 0814718 A	30-06-1998 08-07-1999 23-09-1996 12-09-1996 19-02-1998 07-01-1998

INTERNATIONAL SEARCH REPORT

Information on patent family members

In. ational Application No
PCT/US 99/01593

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W0 9627321 A		JP 11503339 T US 5860973 A	26-03-1999 19-01-1999
US 5697889 A	16-12-1997	CA 2144211 A EP 0676176 A US 5599279 A	17-09-1995 11-10-1995 04-02-1997
US 5020519 A	04-06-1991	CA 2051768 A	08-06-1992
W0 9640016 A	19-12-1996	US 5658336 A US 5697977 A AU 2186795 A CA 2185460 A EP 0750482 A W0 9525487 A US 5653761 A US 5653762 A US 5601556 A US 5893890 A AU 6090096 A CA 2222025 A CN 1192669 A EP 0830116 A	19-08-1997 16-12-1997 09-10-1995 28-09-1995 02-01-1997 28-09-1995 05-08-1997 05-08-1997 11-02-1997 13-04-1999 30-12-1996 19-12-1996 09-09-1998 25-03-1998
EP 450886 A	09-10-1991	US 4958621 A AU 648783 B AU 7406491 A CA 2037268 A DE 69111114 D JP 4224740 A	25-09-1990 05-05-1994 10-10-1991 05-10-1991 17-08-1995 14-08-1992
FR 2724312 A	15-03-1996	NONE	
FR 2727005 A	24-05-1996	NONE	
US 5055104 A	08-10-1991	AU 6436090 A W0 9106266 A	31-05-1991 16-05-1991
US 5092893 A	03-03-1992	NONE	
US 5397364 A	14-03-1995	AU 680309 B AU 7921794 A CA 2172638 A CN 1137232 A EP 0725607 A JP 9503416 T W0 9510248 A ZA 9407959 A	24-07-1997 04-05-1995 20-04-1995 04-12-1996 14-08-1996 08-04-1997 20-04-1995 22-05-1995
FR 2631539 A	24-11-1989	NONE	
DE 4302397 A	29-07-1993	JP 5269160 A US 5534031 A US 5776196 A	19-10-1993 09-07-1996 07-07-1998
W0 9731517 A	28-08-1997	US 5782919 A AU 2132897 A AU 4829296 A	21-07-1998 10-09-1997 10-10-1996

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/01593

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9731517 A		AU 4829496 A	10-10-1996
		CA 2171907 A	28-09-1996
		CA 2171921 A	28-09-1996
		CN 1143488 A	26-02-1997
		CN 1143489 A	26-02-1997
		EP 0734703 A	02-10-1996
		EP 0888099 A	07-01-1999
		JP 8266565 A	15-10-1996
		JP 8294495 A	12-11-1996
		NO 961213 A	30-09-1996
		NO 961214 A	30-09-1998
		US 5669909 A	23-09-1997
		AU 705991 B	03-06-1999
		AU 705930 B	03-06-1999
		TR 960950 A	21-11-1996
		TR 960951 A	21-11-1996
		ZA 9602368 A	01-10-1996
EP 307241 A	15-03-1989	US 4834757 A	30-05-1989
		AT 83639 T	15-01-1993
		CA 1292596 A	03-12-1991
		DE 3876909 A	04-02-1993
		US 4878915 A	07-11-1989
		AU 614609 B	05-09-1991
		AU 3436389 A	16-10-1989
		JP 3503133 T	18-07-1991
		JP 5051304 B	02-08-1993
		WO 8909035 A	05-10-1989
US 4349921 A	21-09-1982	CA 1146301 A	17-05-1983
		AU 7169081 A	17-12-1981
		BR 8103700 A	02-03-1983
		EP 0042271 A	23-12-1981
		JP 57029348 A	17-02-1982
		SU 1127522 A	30-11-1984