



(51) International Patent Classification:

A61B 17/29 (2006.01) A61B 17/00 (2006.01)
A61B 17/32 (2006.01) A61B 17/22 (2006.01)

(21) International Application Number:

PCT/US2013/045823

(22) International Filing Date:

14 June 2013 (14.06.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/538,700 29 June 2012 (29.06.2012) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

15 May 2014

(54) Title: SURGICAL INSTRUMENTS WITH ARTICULATING SHAFTS

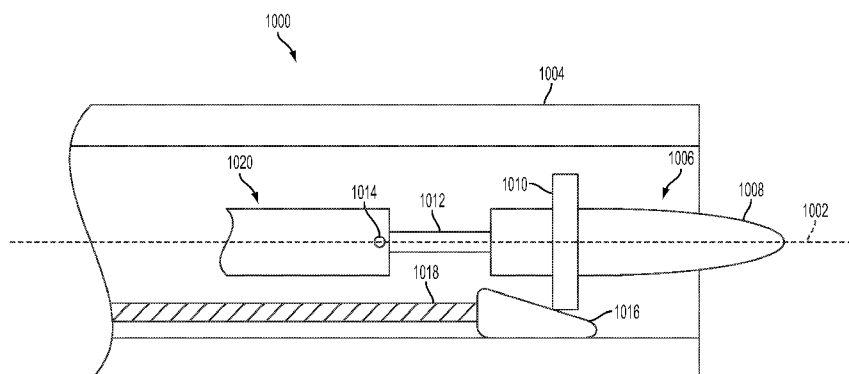


FIG. 52

(57) Abstract: Various embodiments are directed to articulatable surgical instruments. Some embodiments comprise an end effector to treat tissue, where the end effector comprises an ultrasonic blade. A hollow shaft may extend proximally from the end effector along a longitudinal axis. A waveguide may extend through the shaft and may be acoustically coupled to the ultrasonic blade. The waveguide may comprise a distally positioned flange positioned within the hollow shaft proximally from the blade and may be held stationary at a first pivot point positioned within the hollow shaft proximally from the flange. A reciprocating wedge may be positioned within the hollow shaft such that distal motion of the wedge pushes the wedge between the flange and the hollow shaft, causing the ultrasonic blade to pivot about the first pivot point in a first direction.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/045823

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B17/29 A61B17/32
ADD. A61B17/00 A61B17/22

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)
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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/173871 A1 (HOUSER KEVIN L [US] ET AL HOUSER KEVIN [US] ET AL HOUSER KEVIN L [US]) 26 July 2007 (2007-07-26)	25-32
A	paragraph [0016] - paragraph [0027]; figures 1-5	1-24, 33-41
X	US 2003/083683 A1 (SCHWEMBERGER RICHARD F [US] ET AL) 1 May 2003 (2003-05-01)	16-20
A	paragraph [0023] - paragraph [0040]; figures 1-10	1-15,21, 24,25, 36-41
A	US 5 897 523 A (WRIGHT JOHN C [US] ET AL) 27 April 1999 (1999-04-27) column 3, line 6 - column 6, line 39; figures 1-9	1-25, 36-41
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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

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

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

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"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

17 March 2014

Date of mailing of the international search report

24/03/2014

Name and mailing address of the ISA/

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Neef, Tatjana

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/045823

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 229 515 A2 (ETHICON ENDO SURGERY INC [US]) 7 August 2002 (2002-08-07) paragraph [0017] - paragraph [0026]; claims 1-10; figures 1-9 -----	1-24, 36-41
A	WO 93/16646 A1 (ANGIOSONICS INC [US]) 2 September 1993 (1993-09-02) page 9, line 5 - page 27, line 28; figures 1-7 -----	1-25, 36-41
A	WO 99/52489 A1 (ETHICON ENDO SURGERY INC [US]) 21 October 1999 (1999-10-21) page 6, line 6 - page 29, line 5; figures 1-14 -----	1-41
A	EP 0 677 275 A2 (TERUMO CORP [JP]; HASHIMOTO DAIJO [JP] TERUMO CORP; HASHIMOTO DAIJO) 18 October 1995 (1995-10-18) column 4, line 34 - column 29, line 46; figures 1-19 -----	26-28,32
A	US 5 704 534 A (HUITEMA THOMAS W [US] ET AL) 6 January 1998 (1998-01-06) column 6, line 60 - column 12, line 64; figures 1-3,15-28 -----	27-29
A	US 2010/042140 A1 (CUNNINGHAM JAMES S [US]) 18 February 2010 (2010-02-18) paragraph [0030] - paragraph [0045]; figures 1-7 -----	26,30-32
A	EP 1 510 178 A1 (OLYMPUS CORP [JP]) 2 March 2005 (2005-03-02) paragraph [0073] - paragraph [0094]; figures 1,2,18-22 -----	25,26
A	US 2009/023985 A1 (EWERS RICHARD C [US]) 22 January 2009 (2009-01-22) paragraph [0045] - paragraph [0067]; figures 1-3 -----	26,30
A	EP 1 749 479 A1 (GANDINI MARCO [IT]) 7 February 2007 (2007-02-07) paragraph [0021] - paragraph [0068]; figures 1-10 -----	33-35
A	US 2005/177138 A1 (DUBROVSKY ARKADY V [RU] DUBROVSKY ARKADY VENIAMINOVICH [RU]) 11 August 2005 (2005-08-11) paragraph [0041] - paragraph [0054]; figures 1-15 -----	33-35
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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/045823

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/006430 A1 (WALES KENNETH S [US]) 13 January 2005 (2005-01-13) paragraph [0062] - paragraph [0067]; figures 1,2,10,11 -----	33-35

INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 fees, this Authority did not invite payment of additional fees.
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 and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-24, 36-41

articulatable surgical instrument with an end effector comprising an ultrasonic blade, an hollow shaft, a waveguide extending through the shaft and acoustically coupled to the end effector and having a distal flange positioned proximal from the end effector, with means to provide a force to the flange such as to bend/bend/articulate the waveguide and blade away from the longitudinal axis of the shaft.

2. claims: 25-32

articulatable surgical instrument with an end effector comprising an ultrasonic blade, a hollow shaft having a rigid portion and a flexible portion at a first position on the longitudinal axis and a waveguide extending through the shaft and acoustically coupled to the end effector, the waveguide comprising a flexible portion at the first position, such that the end effector is pivotable away from the longitudinal axis and with a clamp arm pivotably coupled to a distal member and pivotable relative to the blade, wherein translation of a flexible control wire that is attached offset from the pivot point of the arm causes the clamp to pivot.

3. claims: 33-35

articulatable surgical instrument with an end effector and a shaft extending proximal of the end effector, the shaft having a proximal tube and a distal tube pivotably attached to the proximal tube at a hinge interface, wherein the distal tube has an axially directed peg member the shaft further having an inner rotatable member with a slanted slot in which the peg member rides at least partially such that rotation of the rotatable member in first direction pushes the peg and distal tube distally, and rotation in second direction pushes proximally, which results in articulation of the distal tube about the hinge

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/045823

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007173871	A1	26-07-2007	AU 2007207435 A1 26-07-2007
		CA 2637916 A1 26-07-2007	
		CN 101394799 A 25-03-2009	
		EP 1993453 A2 26-11-2008	
		JP 5259420 B2 07-08-2013	
		JP 2009523559 A 25-06-2009	
		US 2007173871 A1 26-07-2007	
		US 2010042126 A1 18-02-2010	
		US 2013231691 A1 05-09-2013	
		WO 2007084731 A2 26-07-2007	
US 2003083683	A1	01-05-2003	US 6589200 B1 08-07-2003
			US 2003083683 A1 01-05-2003
US 5897523	A	27-04-1999	US 5897523 A 27-04-1999
			US 6090120 A 18-07-2000
EP 1229515	A2	07-08-2002	AU 785217 B2 09-11-2006
			AU 1362602 A 01-08-2002
			CA 2369452 A1 31-07-2002
			EP 1229515 A2 07-08-2002
			JP 4141695 B2 27-08-2008
			JP 2002253567 A 10-09-2002
			US 2002128674 A1 12-09-2002
WO 9316646	A1	02-09-1993	CA 2128006 A1 02-09-1993
			EP 0627897 A1 14-12-1994
			EP 0891744 A1 20-01-1999
			IL 104860 A 31-10-1996
			JP 2670715 B2 29-10-1997
			JP H07509146 A 12-10-1995
			US 5269297 A 14-12-1993
			WO 9316646 A1 02-09-1993
WO 9952489	A1	21-10-1999	AU 2988599 A 01-11-1999
			US 6063098 A 16-05-2000
			WO 9952489 A1 21-10-1999
EP 0677275	A2	18-10-1995	DE 69532486 D1 04-03-2004
			DE 69532486 T2 23-12-2004
			EP 0677275 A2 18-10-1995
			US 5649955 A 22-07-1997
US 5704534	A	06-01-1998	AU 712961 B2 18-11-1999
			AU 3917397 A 02-04-1998
			CA 2217079 A1 30-03-1998
			DE 69702289 D1 20-07-2000
			DE 69702289 T2 30-11-2000
			EP 0832605 A1 01-04-1998
			ES 2147423 T3 01-09-2000
			JP 3989601 B2 10-10-2007
			JP H10113352 A 06-05-1998
			US 5704534 A 06-01-1998
US 2010042140	A1	18-02-2010	NONE
EP 1510178	A1	02-03-2005	AT 511802 T 15-06-2011
			EP 1510178 A1 02-03-2005

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/045823

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 3999715 B2	31-10-2007
		JP 2005073746 A	24-03-2005
		US 2005049525 A1	03-03-2005

US 2009023985	A1	22-01-2009	NONE

EP 1749479	A1	07-02-2007	EP 1749479 A1
		US 2007032704	A1 08-02-2007

US 2005177138	A1	11-08-2005	AU 2003235552 A1
		DE 10392849	T5 14-07-2005
		RU 2284160	C2 27-09-2006
		US 2005177138	A1 11-08-2005
		WO 2004000128	A1 31-12-2003

US 2005006430	A1	13-01-2005	AU 2004203122 A1
		AU 2010257302	A1 13-01-2011
		BR PI0402681	A 29-03-2005
		CA 2473482	A1 09-01-2005
		CN 1596833	A 23-03-2005
		EP 1522263	A1 13-04-2005
		JP 4667774	B2 13-04-2011
		JP 2005028148	A 03-02-2005
		MX PA04006764	A 19-04-2005
		US 2005006430	A1 13-01-2005
