

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
2 April 2009 (02.04.2009)

(10) International Publication Number  
**WO 2009/042644 A3**

(51) International Patent Classification:  
A61B 1/04 (2006.01)

ADLER, Ronald, S. [US/US]; 10 Howell Avenue, Larchmont, NY 10538 (US).

(21) International Application Number:  
PCT/US2008/077454

(74) Agents: ELLIS, Edward, J. et al.; Leason Ellis LLP, 81 Main Street, Suite 100, White Plains, NY 10601 (US).

(22) International Filing Date:  
24 September 2008 (24.09.2008)

(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, BR, BW, BY, BZ, CA, CH, 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, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/974,963 25 September 2007 (25.09.2007) US

(71) Applicants (for all designated States except US): PERCEPTION RAISONNEMENT ACTION EN MEDECINE [FR/FR]; 4, Avenue De L'Obiou, F-38700 La Tronche (FR). UNIVERSITE JOSEPH FOURIER [FR/FR]; 621 Avenue Centrale, B.P. 53, F-38041 Grenoble Cedex 9 (FR).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, 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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicants and

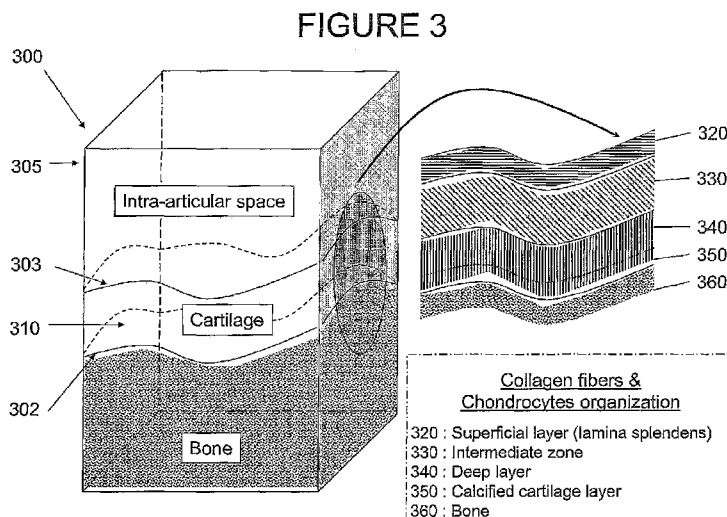
(72) Inventors: MOREAU-GAUDRY, Alexandre, Marie [FR/FR]; 12 Rue Ernest Calvat, F-38000 Grenoble (FR). CINQUIN, Philippe [FR/FR]; 266, Chemin De La Touviere, F-38330 St. Nazaire Les Eymes (FR). PLASKOS, Christopher [CA/US]; 183 Sullivan St., Apt. E5, New York, NY 10012 (US). GRANCHI, Carinne [FR/US]; 1520 York Avenue, Apt. 29j, New York, NY 10028 (US).

Published:

— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR ASSISTING CARTILAGE DIAGNOSTIC AND THERAPEUTIC PROCEDURES



(57) Abstract: In one embodiment of the present invention, a method is provided for assisting cartilage diagnostic and therapeutic procedures and includes the steps of acquiring 3D osteocartilaginous parameters by using multimodal 3D tracked devices; incorporating these parameters into a volumic anatomic osteocartilaginous model from which a bone tracking virtual real-time environment is built; three-dimensionally computing an osteocartilaginous quality score from this multiparametric 3D osteocartilaginous model; providing real-time navigation in this 3D virtual environment in order to make ongoing therapeutic assessments and adjustments; and updating steps 1 to 3 according to the performed therapy. It will be appreciated that the above steps are compatible with arthroscopic procedures involving cartilage.



WO 2009/042644 A3

**(88) Date of publication of the international search report:**  
28 January 2010

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 08/77454

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B 1/04 (2009.01)

USPC - 600/117

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)

USPC: 600/117

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
USPC: 600/407,416,424,476,562; 606/102,300,53; 623/908 (text searched-see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWest (PGPB, USPT, USOC, EPAB, and JPAB); Google Scholar

Search terms: \$cartilag\$, morphology, data, condition, parameter, health, contour, model, image, register\$, updat\$, combin\$, superimpos\$, optical coherence tomography, infrared, fluoresce\$, and cytokine\$

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|-----------|---|-----------------------|
| Y         | US 2006/0142657 A1 (QUAID et al.) 29 June 2006 (26.06.2006), Fig 1, para[0013], [0093], [0096], [0097], [0100], [0107], [0108], [0118], [0126], [0127], [0130], [0155], [0188], [0189], [0194], [0203], [0205]-[0209], and [0214] | 1-21 and 25-28        |
| Y         | US 2004/0193048 A1 (TSOREF) 30 September 2004 (30.09.2004), Fig 4, 5A, and 9, abstract, para[0017], [0090], [0101], [0102], [0105], [0119]-[0127], [0131], [0133]-[0144], and [0190]  | 1-21 and 25-28        |
| Y         | US 2005/0267584 A1 (BURDULIS, JR et al.) 01 December 2005 (01.12.2005), Fig 1A, para[0036]-[0039]   | 14                    |
| Y         | US 2004/0153079 A1 (TSOUGARAKIS et al.) 05 August 2004 (05.08.2004), para[0040] and [0044]-[0046]   | 17                    |
| Y         | US 2005/0119587 A1 (ROESSLER et al.) 02 June 2005 (02.06.2005), Fig 1-3, para[0028], and [0046]-[0049]  | 18                    |
| Y         | US 2002/0164651 A1 (STEINBECK) 07 November 2002 (07.11.2002), para[0009]-[0011]   | 19                    |

 Further documents are listed in the continuation of Box C.

## \* 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)

"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

13 August 2009 (13.08.2009)

Date of mailing of the international search report

**27 AUG 2009**

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 08/77454

**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:

\*\*\*\*\*PLEASE SEE SUPPLEMENTAL 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 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.:  
1-21 and 25-28

- 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.

**Box III: Observations where unity of invention is lacking**

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-21 and 25-28, drawn to a method and system of diagnosing and treating articular cartilage diseases by means of a surgical procedure comprising updating a three-dimensional osteo-cartilaginous model during the surgical procedure.

Group II, claims 22-24, drawn to a method of diagnosing and treating articular cartilage diseases comprising radiating a surface of cartilage tissue before and after applying stress to cartilage tissue analyzing the different recorded reflected light patterns to assist diagnosing and treating the articular cartilage disease.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of Group I is a method and system of updating a three dimensional osteo-cartilaginous model using acquired cartilage data from at least one tool. The special technical feature of Group I is not present in Group II.

The special technical feature of Group II is a method of radiating, receiving, and analysing laser imaging data of cartilage tissue that has been stressed. The special technical feature of Group II is not present in Group I.

Accordingly, the inventions listed as Groups I and II lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.