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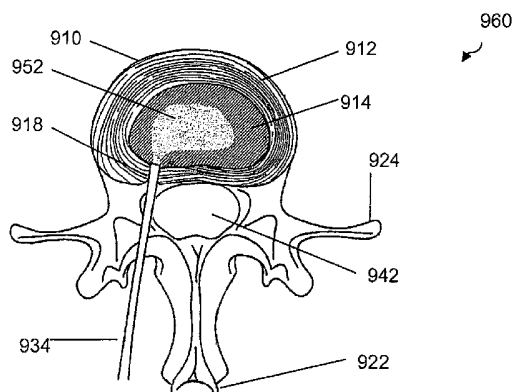
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| <p>(51) International Patent Classification⁷: C08J 3/075,
A61L 27/16, C08F 283/01, A61L 15/60, 27/52</p> <p>(21) International Application Number:
PCT/US2005/004773</p> <p>(22) International Filing Date: 4 February 2005 (04.02.2005)</p> <p>(25) Filing Language: English</p> <p>(26) Publication Language: English</p> <p>(30) Priority Data:</p> <table border="0"> <tr> <td>PCT/US04/03135</td> <td>4 February 2004 (04.02.2004)</td> <td>US</td> </tr> <tr> <td>10/771,852</td> <td>4 February 2004 (04.02.2004)</td> <td>US</td> </tr> </table> <p>(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:</p> <table border="0"> <tr> <td>US</td> <td>PCT/US04/03135 (CIP)</td> </tr> <tr> <td>Filed on</td> <td>4 February 2004 (04.02.2004)</td> </tr> <tr> <td>US</td> <td>10/771,852 (CIP)</td> </tr> <tr> <td>Filed on</td> <td>4 February 2004 (04.02.2004)</td> </tr> </table> <p>(71) Applicant (for all designated States except US): CAM-BRIDGE POLYMER GROUP, INC. [US/US]; 52-R Roland Street, Boston, MA 02129-1234 (US).</p> | PCT/US04/03135 | 4 February 2004 (04.02.2004) | US | 10/771,852 | 4 February 2004 (04.02.2004) | US | US | PCT/US04/03135 (CIP) | Filed on | 4 February 2004 (04.02.2004) | US | 10/771,852 (CIP) | Filed on | 4 February 2004 (04.02.2004) | <p>(72) Inventors; and
(75) Inventors/Applicants (for US only): RUBERTI, Jeffrey, W. [US/US]; 47 School Street, Lexington, MA 02421 (US). BRAITHWAITE, Gavin J.C. [GB/US]; 860 Massachusetts Avenue, Unit 850-10, Cambridge, MA 02139-3026 (US).</p> <p>(74) Agents: ISACSON, John, P. et al.; Heller Ehrman LLP, 1717 Rhode Island Avenue, N.W., Washington, DC 20036-3001 (US).</p> <p>(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, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US (patent), UZ, VC, VN, YU, ZA, ZM, ZW.</p> <p>(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,</p> |
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[Continued on next page]

- (54) Title:** SYSTEMS AND METHODS FOR CONTROLLING AND FORMING POLYMER GELS



(57) Abstract: In preferred embodiments, the present invention provides methods of controllably making a vinyl polymer hydrogel having desired physical properties without chemical cross links or radiation. The gelation process is modulated by controlling, for example, the temperature of a resultant vinyl polymer mixture having a gellant or using active ingredients provided in an inactive gellant complex. In accordance with a preferred embodiment, the method of manufacturing a vinyl polymer hydrogel includes the steps of providing a vinyl polymer solution comprising a vinyl polymer dissolved in a first solvent; heating the vinyl polymer solution to a temperature elevated above the melting point of the physical associations of the vinyl polymer, mixing the vinyl polymer solution with a gellant, wherein the resulting mixture has a higher Flory interaction parameter than the vinyl polymer solution; inducing gelation of the mixture of vinyl polymer solution and gellant; and controlling the gelation rate to form a viscoelastic solution, wherein workability is maintained for a predetermined period, thereby making a vinyl polymer hydrogel having the desired physical property. In further preferred embodiments, the present invention provides physically crosslinked hydrogels produced by controlled gelation of viscoelastic solution wherein workability is maintained for a predetermined period. In another aspect, the present invention provides kits for use in repairing intervertebral disks or articulated joints including a dispenser and single use containers housing components that form the vinyl polymer hydrogel.



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, IS, IT, LT, LU, MC, NL, PL, PT, RO,
SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, ML, MR, NE, SN, TD, TG).

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.

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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C08J3/075 A61L27/16 C08F283/01 A61L15/60 A61L27/52

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 C08J A61L C08F

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, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	US 2004/171740 A1 (RUBERTI JEFFREY W ET AL) 2 September 2004 (2004-09-02) claims 1,122-131; examples	1-52
P,X	US 2004/092653 A1 (BRAITHWAITE GAVIN J C ET AL) 13 May 2004 (2004-05-13) claims	1-52
X	US 6 231 605 B1 (KU DAVID N) 15 May 2001 (2001-05-15) claims; example 4	1-52

☐ 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

9 August 2005

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2005/004773

Box 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.: 35, 38-42
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
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 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:

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

Information on patent family members

International Application No

PCT/US2005/004773

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