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(54) Title: METHODS, DEVICES AND COMPOSITIONS FOR ADHERING HYDRATED POLYMER IMPLANTS TO BONE

(57) Abstract: A method of attaching an implant to a bone, the implant comprising a hydrated polymer comprising a lubricious hydrated surface and an attachment surface comprising accessible chemical functional groups. The method includes the steps of treating the implant or the bone with an isocyanate-containing compound; placing the attachment surface in apposition to the bone; and allowing the isocyanate-containing compound to cure to bond the implant to the bone. The invention also includes a medical implant having a hydrated polymer comprising an attachment surface comprising a thermoplastic material, the hydrated polymer having an interpenetrating polymer network with at least two polymers, the hydrated polymer having a low coefficient of friction on at least one surface.



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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. A61L27/50 A61L27/52 A61L27/18 A61L27/34
ADD.

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)

A61L

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, BIOSIS, EMBASE, INSPEC, 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	WO 00/43050 A1 (ST JUDE MEDICAL [US]) 27 July 2000 (2000-07-27) page 1, lines 3-6 page 8, line 30 - page 9, line 32 page 13, line 4 - page 14, line 14 page 29, line 7 - page 30, line 34 claims 1,5,7,28	1-41
X	WO 2007/067697 A2 (ZIMMER INC [US]; THOMAS BRIAN [US]; ZHANG KAI [US]; HUDGINS GARRYL [US]) 14 June 2007 (2007-06-14)	42-44, 46
A	paragraph [0010] paragraph [0075] claims 1,2,14	1-41
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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 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

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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

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 795 353 A (FELT JEFFREY C [US]) 18 August 1998 (1998-08-18) column 4, lines 30-35 column 5, lines 4-20 claims 1-8 figures 1,2	47-62
A	----- EP 1 779 875 A1 (HOKKAIDO TECH LICENSING OFFICE [JP]) 2 May 2007 (2007-05-02) claims 1-14	42-62
A	----- MYUNG ET AL: "Biomimetic strain hardening in interpenetrating polymer network hydrogels" POLYMER, ELSEVIER SCIENCE PUBLISHERS B.V, GB LNKD- DOI:10.1016/J.POLYMER.2007.06.070, vol. 48, no. 18, 16 August 2007 (2007-08-16), pages 5376-5387, XP022201302 ISSN: 0032-3861 * abstract	42-62
A	----- LEE S J ET AL: "Interpenetrating polymer network hydrogels based on poly(ethylene glycol) macromer and chitosan" CARBOHYDRATE POLYMERS, APPLIED SCIENCE PUBLISHERS, LTD. BARKING, GB LNKD- DOI:10.1016/S0144-8617(99)00088-0, vol. 41, no. 2, 1 February 2000 (2000-02-01), pages 197-205, XP004244348 ISSN: 0144-8617 * abstract	42-62
A	----- WO 02/26848 A2 (PRAXIS LLC [US]) 4 April 2002 (2002-04-04) page 1, paragraph 1-2 claims 1-17	1-41
A	----- US 2007/225823 A1 (HAWKINS MICHAEL E [US] ET AL) 27 September 2007 (2007-09-27) paragraph [0002] claims 1,2,9,18,21-26	1-41
A	----- US 6 376 742 B1 (ZDRAHALA RICHARD J [US] ET AL) 23 April 2002 (2002-04-23) column 1, lines 8-15 claims 1-16 -----	1-42

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/037979

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: 1-41

A method of attaching an implant to a bone, the implant comprising a hydrated polymer comprising a lubricious hydrated surface and an attachment surface comprising accessible chemical functional groups, the method comprising: i) treating the implant or the bone with an isocyanate-containing compound; ii) placing the attachment surface in apposition to the bone; and iii) allowing the isocyanate-containing compound to cure to bond the implant to the bone.

The reaction product of the isocyanate material is a is a thermoplastic polyurethane.

The method comprising applying a solvent to the attachment surface to at least partially dissolve the attachment surface and cause a dissolved portion of the attachment surface to flow into the bone.

2. claims: 42-62

- A method of attaching an implant to a bone, the implant comprising a hydrated polymer comprising a lubricious hydrated surface and an attachment surface comprising a thermoplastic material, the method comprising: i) placing the attachment surface in apposition to the bone; and ii) applying an infrared-radiation to cause the thermoplastic material to flow into and bond to the bone.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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