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(71) Applicant (for all designated States except US): **THE REGENTS OF THE UNIVERSITY OF COLORADO** [US/US]; Suite 100, 4740 Walnut Street, Boulder, Colorado 80309 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SHANDAS, Robin** [US/US]; 1408 Kingwood Place, Boulder, CO 80304 (US). **YAKACKI, Christopher M.** [US/US]; Apt. 303, 4870 Meredith Way, Boulder, CO 80303 (US). **GALL, Kenneth** [US/US]; 768 Springlake Lane N.W., Atlanta, GA 30318 (US). **ECKSTEIN, Alex E.** [US/US]; 8688 East Kettle Avenue, Centennial, CO 80112 (US). **LYONS, Michael** [US/US]; Apt. 15, 1320 Folsom Street, Boulder, CO 80302 (US). **NAIR, Devatha P.** [US/US]; 283 Van Gordon Street, Lakewood, CO 80228 (US).

(74) Agent: **LARSON, Heather C**; Suite 3050, 1660 Lincoln Street, Denver, CO 80264 (US).

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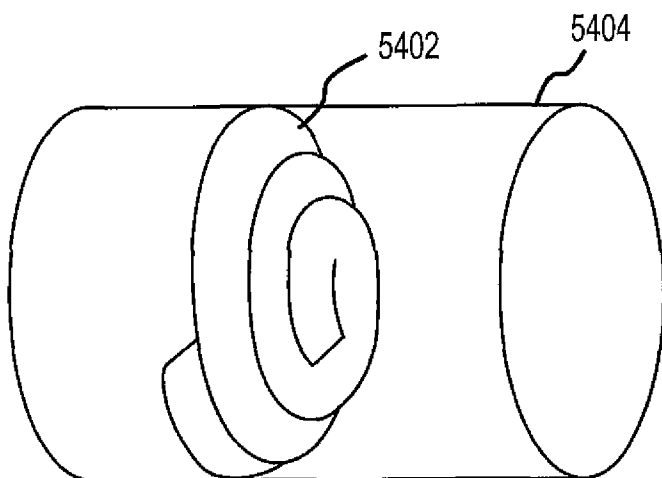
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(54) Title: SHAPE MEMORY POLYMER MEDICAL DEVICES



(57) Abstract: Medical devices for *in vivo* medical applications are disclosed. The medical devices are constructed of shape memory polymer (SMP) materials capable of assuming a memory shape at physiological temperatures. These medical devices may be used in surgical procedures and in both vascular and non-vascular applications. These SMP medical devices have a post-implantation memory shape that is substantially identical to or slightly larger than the insertion site to adapt to vessel growth or size changes. SMP medical devices may be formed as stents or occlusion devices (i.e., plugs) having a number of different structural features. The SMP medical devices may be formed from a first monomer and a second cross-linking monomer, wherein the weight percentages of the first and second monomers are selected by performing an iterative function to reach a predetermined glass transition temperature

(T_g) and a predetermined rubbery modulus to optimize post-implantation memory shape properties of the devices.

A. CLASSIFICATION OF SUBJECT MATTER*A61B 17/00(2006.01)i, A61M 29/00(2006.01)i*

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 17/00, A61M 29/00

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)
eKIPASS (KIPO Internal), Delphion, USPTO, Google Scholar("shpae memory polymer, crooshnk, medical device etc)**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No |
|-----------|--|----------------------|
| A | US 2003-0083735 AI(A J DENARDO et al) 01 05 2003 See the whole document | 1-63 |
| A | US 2004-0122174 AI(P T MATHER et al) 24 06 2004 See the whole documnet | 1-63 |

☐ Further documents are listed in the continuation of Box C☒ See patent family annex

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Name and mailing address of the ISA/KR

Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
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Authorized officer

JO Soo Ik

Telephone No 82-42-48 1-8196



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Information on patent family members

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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 20030083735A1 | 01.05.2003 | WO 0193780A3 | 20.06.2002 |
| | | US 20040098 109A1 | 20.05.2004 |
| | | US 6855 155B | 15.02.2005 |
| | | JP 20045096662T2 | 02.04.2004 |
| | | EP1286629A2 | 05.03.2003 |
| US 20040122174A1 | 24.06.2004 | US 07208550 | 24.04.2007 |
| | | US 2007135578AA | 14.06.2007 |
| | | WO 04033553A1 | 22.04.2004 |
| | | WO 04032799A3 | 29.07.2004 |
| | | JP 2006503 172T2 | 26.01.2006 |
| | | EP 1560612A2 | 10.08.2005 |