(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

G00002

(43) International Publication Date
11 July 2002 (11.07.2002)

PCT

(10) International Publication Number
WO 02/053193 A3

(51) International Patent Classification[7]: A61F 2/00, C12N 5/06, 5/08, 11/08, 11/04

(21) International Application Number: PCT/US02/00012

(22) International Filing Date: 2 January 2002 (02.01.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/259,283 2 January 2001 (02.01.2001) US

(71) Applicants *(for all designated States except US)*: **THE CHARLES STARK DRAPER LABORATORY, INC.** [US/US]; 555 Technology Square, Cambridge, MA 02139 (US). **THE GENERAL HOSPITAL CORPORATION** [—/—]; 55 Fruit Street, Boston, MA 02114 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **BORENSTEIN, Jeffrey** [—/—]; 936 Highland Street, Holliston, MA 01746 (US). **KING, Kevin** [—/—]; 5238 Harvey Avenue, Western Springs, IL 60558 (US). **VACANTI, Jay** [—/—]; 55 Fruit Street, Warren Building 1157, Boston, MA 02114 (US). **TERAI, Hidetomi** [—/—]; 1-4-3, Ashaimachi-Abenoku, Osaka 545-8585 (JP).

(74) Agent: **KOWALSKI, Thomas, J.**; Frommer Lawrence & Haug LLP, 745 Fifth Avenue, New YOrk, NY 10151 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, 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, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
26 September 2002

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.

162162

WO 02/053193 A3

(54) Title: TISSUE ENGINEERING OF THREE-DIMENSIONAL VASCULARIZED USING MICROFABRICATED POLYMER ASSEMBLY TECHNOLOGY

(57) Abstract: The invention provides for the translating two-dimensional microfabrication technology into the third dimension. Two-dimensional tamplates are fabricated using high-resolution molding processes. These templates are then bonded to form three-dimensional scaffold structures with closed lumens. These scaffolds can be formed by layering techniques, to interconnect flat template sheets to build up a full, vascularized organ. Alternatively, such scaffolds can be formed by rolling or folding the templates to form thick three-dimensional constructs. The scaffolds can server as the template for cell adhesion and growth by cells that are added to the scaffolds through the vessels, holes or pores. A second set of cells, such as endothelial cells, can also be added to or seeded onto the scaffold. The second set of seeded cells form small-dimensional blood vessels between and through the first set of seeded cells. Once the sets of cells have been added to or seeded onto the three-dimensional scaffold, this tissue-engineered organ is implanted into a recipient.