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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 April 2014 (03.04.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/048637 A1

(51) **International Patent Classification**:
***C12M 3/00*** (2006.01) ***C12M 1/00*** (2006.01)
***C12M 3/06*** (2006.01) ***C12M 1/34*** (2006.01)
***C12M 1/04*** (2006.01)

(21) **International Application Number**:
PCT/EP2013/067073

(22) **International Filing Date**:
15 August 2013 (15.08.2013)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
12186550.5 28 September 2012 (28.09.2012) EP
61/706,928 28 September 2012 (28.09.2012) US

(71) **Applicant**: **TISSUSE GMBH** [DE/DE]; Markgrafenstr. 18, 15528 Spreenhagen (DE).

(72) **Inventor**: **MARX, Uwe**; Markgrafenstr. 18, 15528 Spreenhagen (DE).

(74) **Agent**: **GULDE HENGELHAUPT ZIEBIG & SCHNEIDER PATENTANWÄLTE - RECHTSANWÄLTE**; Wallstraße 58/59, 10179 Berlin (DE).

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

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published**:

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

WO 2014/048637 A1

(54) **Title**: MULTI-ORGAN-CHIP WITH IMPROVED LIFE TIME AND HOMOEOSTASIS

(57) **Abstract**: The present invention is directed to a multi-organ-chip device comprising a base layer; an organ layer arranged on the base layer; an antra layer arranged on the organ layer; and an actuator layer; wherein the base layer is configured to provide a solid support for the further layers; the organ layer is configured to comprise a multiplicity of individual organ equivalents, each organ equivalent comprising one or more organ growth sections, each of the organ growth sections being configured to comprise an organoid cavity for housing at least one organoid of an organ and to comprise a micro- inlet and a micro-outlet for fluid communication between the organoid cavity of the organ growth section and a self-contained circulation system, wherein the organ layer comprises at least one organ equivalent configured to represent the organs lung, small intestine, spleen, pancreas, liver, kidney and bone marrow, respectively, and a self-contained circulation system configured to be in direct fluid communication with the organ growth sections of the organ layer via the micro inlets and outlets of the organ growth sections; the antra layer is configured to comprise a multiplicity of cavities and tubes arranged to be in fluid communication with selected organ equivalents or organ growth sections in order to allow for exchange of fluids between cavities and organ growth sections; and the actuator layer is configured to comprise a multiplicity of actuators arranged and configured to regulate a pressure force applied on a selected organ equivalent, the self-contained circulation system and/or part thereof.