



- (51) **International Patent Classification:**
C12P 7/26 (2006.01) *C12N 1/20* (2006.01)
- (21) **International Application Number:**
PCT/US2010/052570
- (22) **International Filing Date:**
13 October 2010 (13.10.2010)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/251,287 13 October 2009 (13.10.2009) US
- (71) **Applicant (for all designated States except US):** GENOMATICA, INC. [US/US]; 10520 Wateridge Circle, San Diego, CA 92121 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** HASELBECK, Robert [US/US]; 10520 Wateridge Circle, San Diego, CA 92121 (US). TRAWICK, John, D. [US/US]; 10520 Wateridge Circle, San Diego, CA 92121 (US). NIU, Wei [CN/US]; 6100 Loma Circle, Lincoln, Nebraska 68516 (US). BURGARD, Anthony, P. [US/US]; 10520 Wateridge Circle, San Diego, CA 92121 (US).
- (74) **Agents:** CADENA, Deborah, L. et al.; McDermott Will & Emery LLP, 11682 El Camino Real, Suite 400, San Diego, CA 92130-2047 (US).
- (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, 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, KM, 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, PE, PG, PH, PL, PT, RO, RS, RU, 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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, 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, ML, MR, NE, SN, TD, TG).

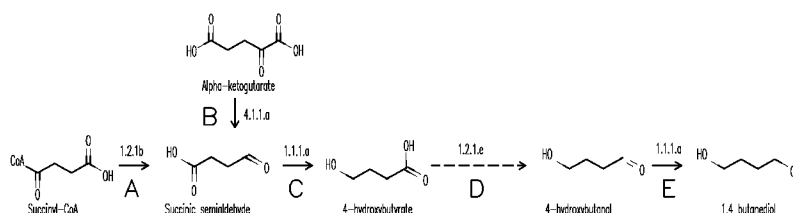
Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) **Title:** MICROORGANISMS FOR THE PRODUCTION OF 1,4-BUTANEDIOL, 4-HYDROXYBUTANAL, 4-HYDROXYBUTYRYL-COA, PUTRESCINE AND RELATED COMPOUNDS, AND METHODS RELATED THERETO

**FIG. 58**

(57) **Abstract:** The invention provides non-naturally occurring microbial organisms comprising a 1,4- butanediol (BDO), 4-hydroxybutyryl-CoA, 4-hydroxybutanal or putrescine pathway comprising at least one exogenous nucleic acid encoding a BDO, 4-hydroxybutyryl-CoA, 4-hydroxybutanal or putrescine pathway enzyme expressed in a sufficient amount to produce BDO, A- hydroxybutyryl-CoA, 4-hydroxybutanal or putrescine and further optimized for expression of BDO. The invention additionally provides methods of using such microbial organisms to produce BDO, 4-hydroxybutyryl-CoA, 4-hydroxybutanal or putrescine.