



- (51) **International Patent Classification:**
B32B 37/12 (2006.01)
- (21) **International Application Number:**
PCT/US2013/051210
- (22) **International Filing Date:**
19 July 2013 (19.07.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
61/698,210 7 September 2012 (07.09.2012) US
- (71) **Applicant:** GENERAL ELECTRIC COMPANY
[US/US]; 1 River Road, Schenectady, New York 12345 (US).
- (72) **Inventor:** RAMANAN, Harikrishnan; WS2-First Floor, 1 Engineering Drive 3, Singapore 117576 (SG).
- (74) **Agent:** PUNDSACK, Scott R.; Borden Ladner Gervais LLP, World Exchange Plaza, 100 Queen Street, Suite 1100, Ottawa, Ontario K1P 1J9 (CA).
- (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, 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:

- without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) **Title:** METHODS FOR MANUFACTURING ION EXCHANGE MEMBRANES

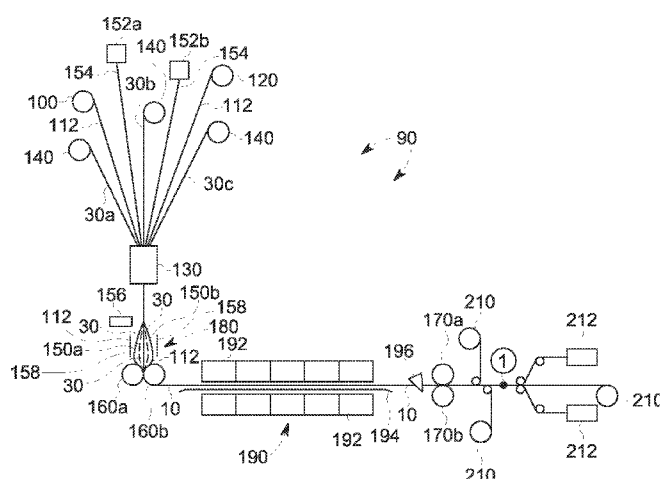


FIG. 2

(57) **Abstract:** To make membranes, a plurality of membrane substrates are each wetted with a curable liquid mixture, arranged in a stack such that every pair of substrates are separated by at least one film, and moved simultaneously through a common curing region. Each wetted substrate sheet may be sandwiched between two films. After curing, the stack comprises two or more membranes with each pair of membranes separated by a film. An apparatus for making membranes comprises at least two substrate feeding devices, at least one film feeding device, one or more chemical wetting devices, a curing region, optionally, a stack separating region, and, optionally, a membrane binding or fusing region. Membrane production rate may be increased while the curing energy required per unit area of membrane is decreased. The method can make, for example, ion exchange membranes.