



(51) International Patent Classification:

D01D 5/00 (2006.01) *H01B 1/20* (2006.01)
B29C 51/00 (2006.01) *B29C 70/88* (2006.01)
H01B 1/14 (2006.01) *H01B 13/14* (2006.01)

(21) International Application Number:

PCT/US2021/028347

(22) International Filing Date:

21 April 2021 (21.04.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/015,109 24 April 2020 (24.04.2020) US

(71) Applicants: **ADVANCED FUNCTIONAL FABRICS OF AMERICA, INC.** [US/US]; 12 Emily Street, Suite 2, Cambridge, Massachusetts 02139 (US). **MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

[US/US]; 77 Massachusetts Avenue, Cambridge, Massachusetts 02139 (US).

(72) Inventors: **CHUNG, Chia-Chun**; 1 Dexter Street, Unit 3, Malden, Massachusetts 02148 (US). **COX, Jason**; 9 Edgewood Drive, Ashland, Massachusetts 01721 (US). **DEISENHAUS, Joshua**; 4711 Trent Court, Chevy Chase, Maryland 20815 (US). **MCCARTHY, Kristina**; 18 Larned Road, Oxford, Massachusetts 01540 (US). **MULHERIN, Kristen**; 74 Dalby Street, Newton, Massachusetts 02458 (US). **NGUYEN, Jimmy**; 212 Campbell Drive, Lowell, Massachusetts 01851 (US). **REIN, Michael**; 5 Hampstead Road, Boston, Massachusetts 02130 (US). **BERNASCONI, Matthew**; 18 Nathan Pratt Drive, Unit 204, Concord, Massachusetts 01742 (US). **CANTLEY, Lauren**; 29B Lawrence Street, Cambridge, Massachusetts 02139 (US). **PARAMESWARAN, Lalitha**; 46 Ridgeway Avenue, Billerica, Massachusetts 01821 (US). **RICKLEY, Michael**; 25 Sunset Rock Lane, Reading, Massachusetts

(54) Title: MULTI-MATERIAL FIBERS AND METHODS OF MANUFACTURING THE SAME

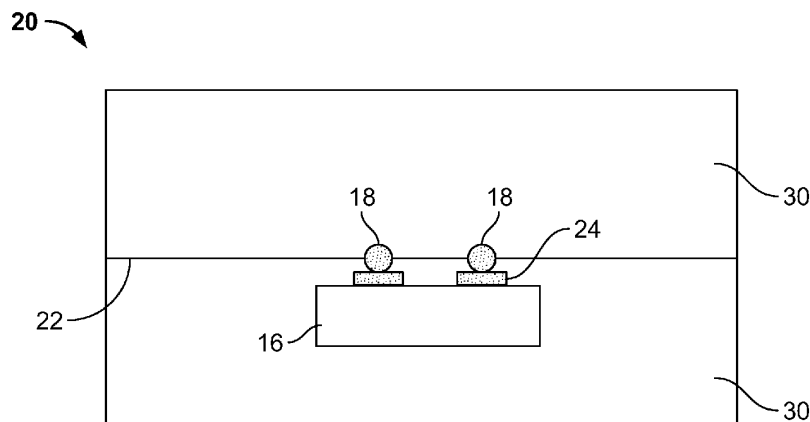


FIG. 4

(57) Abstract: Methods of manufacturing multi-material fibers having one or more electrically-connectable devices disposed therein are described. In certain instances, the methods include the steps of: positioning the electrically-connectable device(s) within a corresponding pocket provided in a preform material; positioning a first electrical conductor longitudinally within a first conduit provided in the preform material; and drawing the multi-material fiber by causing the preform material to flow, such that the first electrical conductor extends within the multi-material fiber along a longitudinal axis thereof and makes an electrical contact with a first electrode located on each electrically-connectable device. A metallurgical bond may be formed between the first electrical conductor and the first electrode while drawing the multi-material fiber and/or, after drawing the multi-material fiber, the first electrical conductor may be located substantially along a neutral axis of the multi-material fiber.

[Continued on next page]

01867 (US). **STOLYAROV, Alexander**; 60 Channing Street, Belmont, Massachusetts 02478 (US).

(74) **Agent: HARTNELL, George**; Goodwin Procter LLP, 100 Northern Avenue, IP DOCKETING DEPT./7TH FL, Boston, Massachusetts 02210 (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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, 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, ST, 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))