



(51) International Patent Classification:
A61M 5/19 (2006.01) *A61M 5/31* (2006.01)
A61M 5/28 (2006.01)

(21) International Application Number:
PCT/US2023/028371

(22) International Filing Date:
21 July 2023 (21.07.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/391,409 22 July 2022 (22.07.2022) US

(71) Applicant: **WEST PHARMACEUTICAL SERVICES, INC.** [US/US]; 530 Herman O. West Drive, Exton, Pennsylvania 19341 (US).

(72) Inventors: **GUTHLEIN, James G.**; 530 Herman O. West Drive, Exton, Pennsylvania 19341 (US). **SULLIVAN, Michael**; 530 Herman O. West Drive, Exton, Pennsylvania 19341 (US). **KUMAR, Rajiv**; 530 Herman O. West Drive, Exton, Pennsylvania 19341 (US).

(74) Agent: **AKHAVANNIK, Hussein**; BLANK ROME LLP, 1825 Eye Street NW, Washington, District of Columbia 20006 (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, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, 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, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, 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, ME, 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).

(54) Title: SYRINGE FOR GENERATING PARTICLE BASED FORMULATIONS

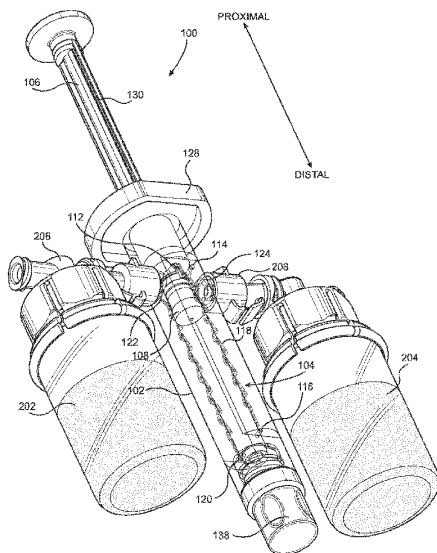


FIG. 2

(57) Abstract: A syringe and associated methods for generating a particle-based formulation is described. The syringe includes a barrel with a microfluidic mixer, a seal, and piston. A displacement of the piston in a distal direction is configured to draw a first fluid from a first fluid source into a first chamber of the barrel and to draw a second fluid from a second fluid source into a second chamber of the barrel. A displacement of the piston in a proximal direction is configured to expel the first fluid and the second fluid respectively out of the first chamber and the second chamber and into the microfluidic mixer to mix the first and second fluid into the particle-based formulation.

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

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