



(51) International Patent Classification:

B01F 3/04 (2006.01) **B03D 1/24** (2006.01)
B01F 5/16 (2006.01) **F04D 7/02** (2006.01)

(21) International Application Number:

PCT/US2020/025515

(22) International Filing Date:

27 March 2020 (27.03.2020)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/825,491 28 March 2019 (28.03.2019) US
62/969,729 04 February 2020 (04.02.2020) US

(71) Applicant: **NANOPURE, LLC** [US/US]; 875 Walt Miller Street, Suite A-1, Mount Pleasant, South Carolina 29464 (US).

(72) Inventors: **DOMRESE, Brian C.**; 828 Harbor Place Drive, Charleston, South Carolina 29412 (US). **GARELECK,**

Steve; 4848 Rivercliff Drive SE, Marietta, Georgia 30067 (US).

(74) Agent: **ANDERSON, James Scott**; CULHANE MEADOWS PLLC, 534 Medlock Road, Suite 103, Decatur, Georgia 30030 (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, 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,

(54) Title: GAS INJECTION SYSTEMS FOR OPTIMIZING NANOBUBBLE FORMATION IN A DISINFECTING SOLUTION

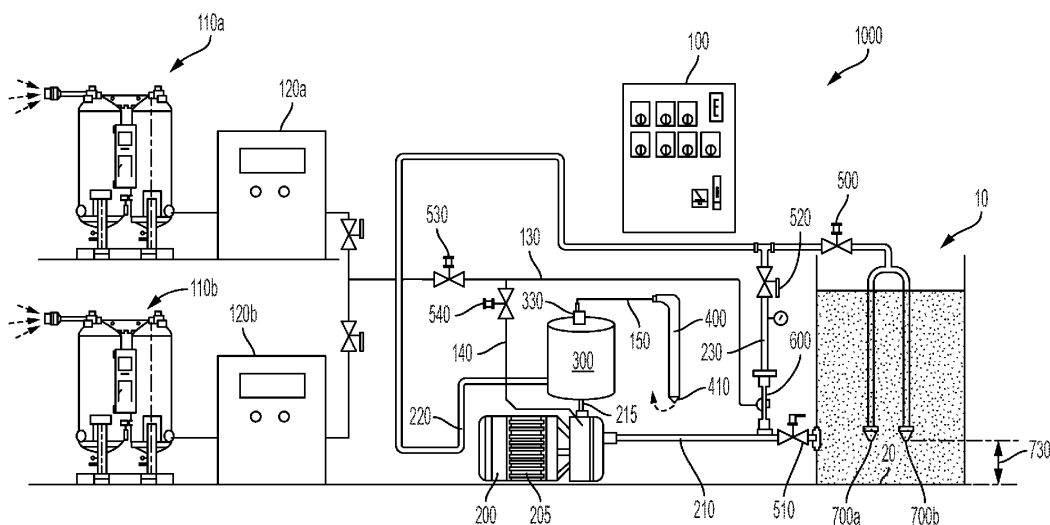


FIG. 1

(57) Abstract: Systems, devices, and methods are presented for optimizing the formation of gas nanobubbles in a disinfecting solution. In an example system for treating contaminated water, a centrifugal pump draws the water from a reservoir and circulates the water in and through a circuit of elements including a mixing chamber in the pump, a pressure vessel, a backflow valve, a Venturi injector, and a pair of nozzles immersed in the reservoir. The system injects ozone-rich gas into the fluid to produce an aqueous solution containing a volume of gas nanobubbles. The nozzles release the gas nanobubbles into the reservoir, creating highly reactive compounds that destroy organic compounds and other contaminants in the water.

[Continued on next page]

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).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

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