

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
06 April 2023 (06.04.2023)



(10) International Publication Number
WO 2023/055357 A1

- (51) **International Patent Classification:**
E21B 33/124 (2006.01) *E21B 33/129* (2006.01)
- (21) **International Application Number:**
PCT/US2021/052631
- (22) **International Filing Date:**
29 September 2021 (29.09.2021)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
17/487,970 28 September 2021 (28.09.2021) US
- (71) **Applicant: HALLIBURTON ENERGY SERVICES, INC.** [US/US]; 3000 N. Sam Houston Parkway E., Houston, Texas 77032 (US).
- (72) **Inventors: SONAT, Cem;** 3000 N. Sam Houston Parkway E., Houston, Texas 77032-3219 (US). **FRIPP, Michael Linley;** 3000 N. Sam Houston Parkway E., Houston, Texas 77032-3219 (US). **SHUKLA, Shashwat;** 3000 N. Sam Houston Parkway E., Houston, Texas 77032-3219 (US).
- (74) **Agent: GARDNER, Jason D.** et al.; Kilpatrick Townsend & Stockton LLP, IP Docketing - 22nd Floor, 1100 Peachtree Street NE, Suite 2800, Atlanta, Georgia 30309 (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))

(54) **Title:** SWELLABLE METAL MATERIAL WITH SILICA

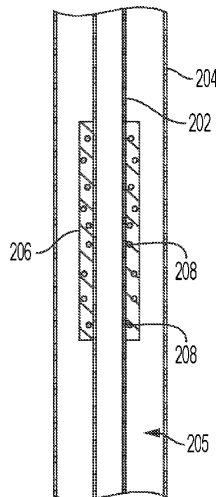


FIG. 2A

(57) **Abstract:** A tubing string may include a swellable metal material for providing a seal downhole. The swellable metal material may react with a silica material and a water-based fluid to cause the swellable metal material to swell and form a seal within a flow path defined in part by the tubing string.

WO 2023/055357 A1