



- (51) **International Patent Classification:**
H01L 39/16 (2006.01)
- (21) **International Application Number:**
PCT/EP2021/056076
- (22) **International Filing Date:**
10 March 2021 (10.03.2021)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
16/831,241 26 March 2020 (26.03.2020) US
- (71) **Applicant:** **INTERNATIONAL BUSINESS MACHINES CORPORATION** [US/US]; New Orchard Road, Armonk, New York 10504 (US).
- (71) **Applicant (for MG only):** **IBM DEUTSCHLAND GMBH** [DE/DE]; IBM-Allee 1, 71139 Ehningen (DE).
- (72) **Inventors:** **FUHRER JANETT, Andreas**; c/o IBM Research GmbH - Zurich, Säumerstrasse 4, 8803 Rüschlikon (CH). **NICHELE, Fabrizio**; c/o IBM Research GmbH - Zurich, Säumerstrasse 4, 8803 Rüschlikon (CH). **RITTER, Markus**; c/o IBM Research GmbH - Zurich, Säumerstrasse 4, 8803 Rüschlikon (CH). **RIEL, Heike**; c/o IBM Research GmbH - Zurich, Säumerstrasse 4, 8803 Rüschlikon (CH).
- (74) **Agent:** **LAUX, Felix**; c/o IBM Deutschland GmbH, Patentwesen und Urheberrecht, IBM-Allee 1, 71139 Ehningen (DE).
- (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,

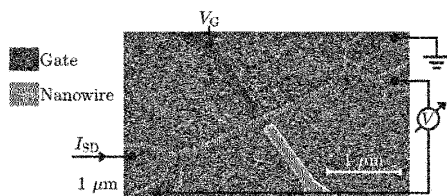
(54) **Title:** OPERATING A SUPERCONDUCTING CHANNEL BY ELECTRON INJECTION

FIG. 1A

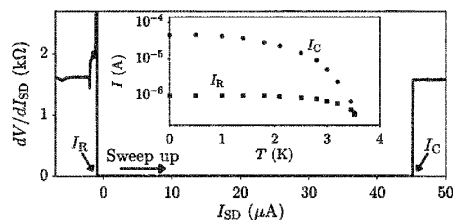


FIG. 1B

(57) **Abstract:** The invention is notably directed to a method of operating a superconducting channel. The method relies on a device including: a potentially superconducting material; a gate electrode; and an electrically insulating medium. A channel is defined by the potentially superconducting material. The gate electrode positioned adjacent to the channel, such that an end surface of the gate electrode faces a portion of the channel. The electrically insulating medium is arranged in such a manner that it electrically insulates the gate electrode from the channel. Rendering the channel superconducting by cooling down the device. Next, a voltage difference is applied between the gate electrode and the channel to inject electrons in the channel through the electrically insulating medium and thereby generate a gate current between the gate electrode and the channel. The electrons are injected with an average energy sufficient to modify a critical current I_C of the channel.

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))*