

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
05 March 2020 (05.03.2020)



(10) International Publication Number
WO 2020/046860 A8

(51) International Patent Classification:

G01R 33/60 (2006.01) G01N 24/08 (2006.01)
G01N 24/00 (2006.01) G01R 33/62 (2006.01)

(21) International Application Number:

PCT/US2019/048238

(22) International Filing Date:

27 August 2019 (27.08.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/723,113 27 August 2018 (27.08.2018) US

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(54) Title: MICROWAVE RESONATOR READOUT OF AN ENSEMBLE SOLID STATE SPIN SENSOR

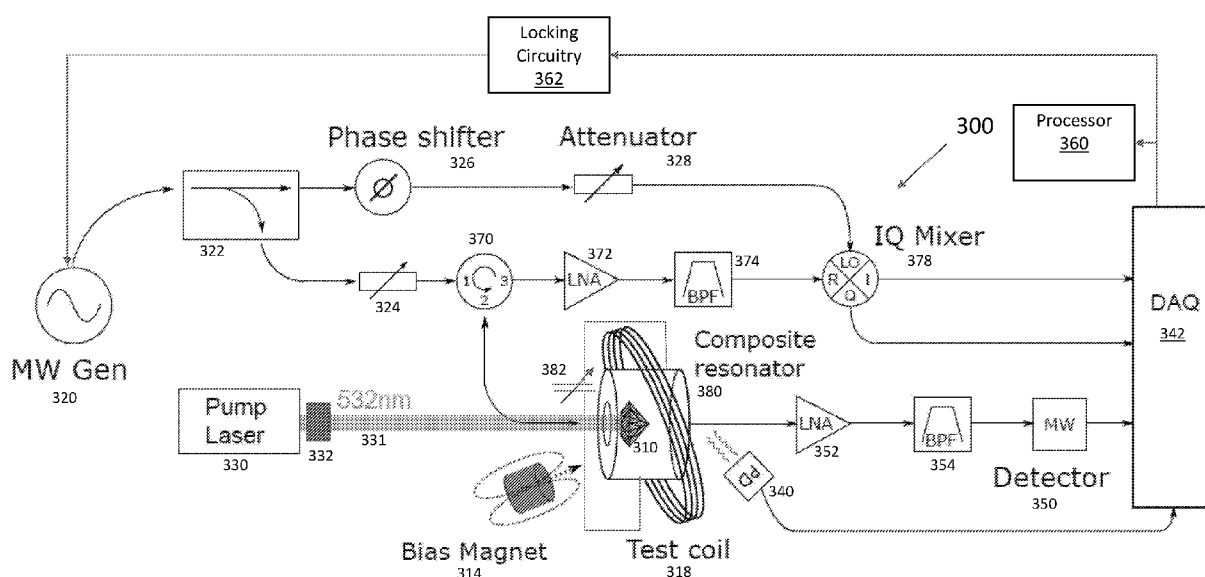


FIG. 3A

(57) **Abstract:** Microwave resonator readout of the cavity-spin interaction between a spin defect center ensemble and a microwave resonator yields fidelities that are orders of magnitude higher than is possible with optical readouts. In microwave resonator readout, microwave photons probe a microwave resonator coupled to a spin defect center ensemble subjected to a physical parameter to be measured. The physical parameter shifts the spin defect centers' resonances, which in turn change the dispersion and/or absorption of the microwave resonator. The microwave photons probe these dispersion and/or absorption changes, yielding a measurement with higher visibility, lower shot noise, better sensitivity, and higher signal-to-noise ratio than a comparable fluorescence measurement. In addition, microwave resonator readout enables coherent averaging of spin defect center ensembles and is compatible with spin systems other than nitrogen vacancies in diamond.

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(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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

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

(48) **Date of publication of this corrected version:**

04 March 2021 (04.03.2021)

(15) **Information about Correction:**

see Notice of 04 March 2021 (04.03.2021)