

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
23 January 2020 (23.01.2020)



(10) International Publication Number
WO 2020/018147 A1

(51) International Patent Classification:	US	16/048,052 (CIP)
<i>G05B 15/02</i> (2006.01)	Filed on	27 July 2018 (27.07.2018)
(21) International Application Number:	US	16/036,685 (CIP)
PCT/US2019/015481	Filed on	16 July 2018 (16.07.2018)
(22) International Filing Date:	US	16/142,578 (CIP)
28 January 2019 (28.01.2019)	Filed on	26 September 2018 (26.09.2018)
(25) Filing Language:	English	US
(26) Publication Language:	English	16/142,758 (CIP)
(30) Priority Data:	Filed on	26 September 2018 (26.09.2018)
16/036,685	16 July 2018 (16.07.2018)	US
16/048,052	27 July 2018 (27.07.2018)	US
16/142,578	26 September 2018 (26.09.2018)	US
16/142,758	26 September 2018 (26.09.2018)	US
(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:	(71) Applicant: JOHNSON CONTROLS TECHNOLOGY COMPANY [US/US]; 2875 High Meadow Circle, Auburn Hills, Michigan 48326 (US).	
	(72) Inventors: PARK, Youngchoon ; 2715 Chadwick Ct., Brookfield, Wisconsin 53045 (US). SINHA, Sudhi R. ; 1918 E. Lafayette Place, Apt. 1601, Milwaukee, Wisconsin 53202 (US).	

(54) Title: BUILDING MANAGEMENT SYSTEM WITH SPACE GRAPHS

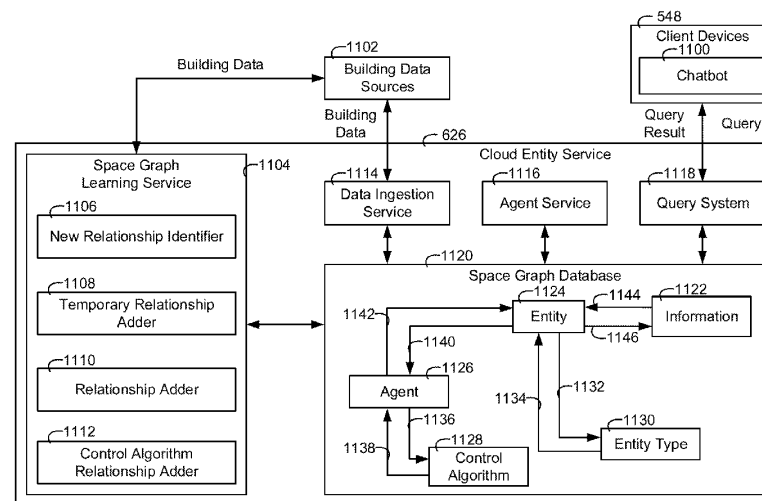


FIG. 11

(57) Abstract: A building system for operating a building and managing building information causes one or more processors to receive building data from one or more building data sources, generate relationships between entities based on the building data, wherein the relationships comprises a pair of relationships between a first entity and a second entity of the entities representing two different types of relationships, wherein the pair of relationships comprises a first relationship between the first entity and the second entity and a second relationship between the second entity and the first entity, and update a space graph by causing the space graph to store nodes representing the entities and edges between the nodes representing the relationships, wherein the space graph is a graph data structure.

[Continued on next page]

(74) **Agent: BELDEN, Brett P.** et al.; Foley & Lardner LLP,
3000 K Street NW, Suite 600, Washington, District of Co-
lumbia 20007 (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, 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).

Published:

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