

(19) World Intellectual Property
Organization
International Bureau



WIPO | PCT



(10) International Publication Number
WO 2017/158595 A9

(43) International Publication Date
21 September 2017 (21.09.2017)

(51) International Patent Classification:
H02K 41/02 (2006.01) *H02K 11/21* (2016.01)

(21) International Application Number:
PCT/IL2017/050318

(22) International Filing Date:
13 March 2017 (13.03.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/307,516 13 March 2016 (13.03.2016) US

(71) Applicant: **SERVOSENSE (SMC) LTD.** [IL/IL]; 21c
Yagea Kapayim Street, 4913020 Petach-Tikva (IL).

(72) Inventors: **ERLICH, Markus**; 1 Isaak Stern Street,
6323702 Tel-Aviv (IL). **VILLARET, Yves**; 7d HaKinor
Street, 3853041 Hadera (IL).

(74) Agent: **EHRlich, Gal** et al.; G. E. EHRlich (1995)
LTD., 11 Menachem Begin Road, 5268104 Ramat Gan (IL).

(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, 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.

(54) Title: POSITION ENCODER

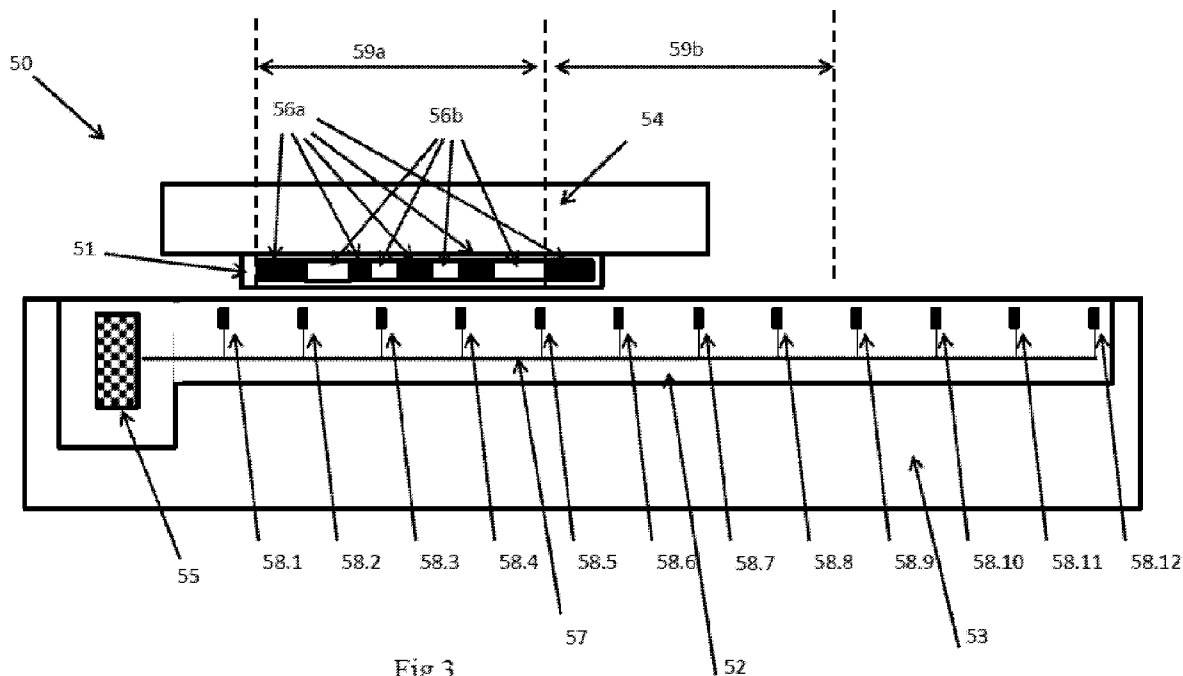


Fig 3

(57) Abstract: A linear encoder has a stationary part and a moving part, and measures and encodes a relative displacement between the stationary part and the moving part along a linear extent of displacement. The encoder comprises multiple machine sensible elements arranged on one of the parts in a predetermined, pattern; and multiple evenly placed sensors arranged along the other part along the entire linear extent, thereby to measure and encode the displacement. The encoder may be an absolute encoder and may be based on magnetic or optical or any other kind of sensing.

(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:

— *of inventorship (Rule 4.17(iv))*

Published:

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

(88) Date of publication of the revised international search report:

14 June 2018 (14.06.2018)

(15) Information about Correction:

see Notice of 14 June 2018 (14.06.2018)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL2017/050318

A. CLASSIFICATION OF SUBJECT MATTER IPC (2017.01) H02K 41/02, H02K 11/21 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC (2017.01) H02K Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Databases consulted: THOMSON INNOVATION, FamPat database Search terms used: displacement, sensor, mov*, mobil*, slid*, rotor, magnet, stator, stationary, fixed, static, coil, sensor, sensing, detect*, linear, motor		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011062901 A1 Sven Busch 17 Mar 2011 (2011/03/17) Entire Document	1-10,13-15,17-19,21,24,25
X	US 2015028699 A1 Bonaduz AG 29 Jan 2015 (2015/01/29) Entire Document	1,12
A	US 2001054851 A1 NIPPON THOMPSON CO LTD 27 Dec 2001 (2001/12/27) Entire Document	1-25
A	US 2006091304 A1 THE BOEING COMPANY 04 May 2006 (2006/05/04) Entire Document	1-25
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search 22 Jun 2017		Date of mailing of the international search report 14 Jan 2018
Name and mailing address of the ISA: Israel Patent Office Technology Park, Bldg.5, Malcha, Jerusalem, 9695101, Israel Facsimile No. 972-2-5651616		Authorized officer COHAY Mattan Telephone No. 972-2-5651611

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IL2017/050318

Patent document cited search report			Publication date	Patent family member(s)			Publication Date
US	2011062901	A1	17 Mar 2011	US	2011062901	A1	17 Mar 2011
				CN	101779370	A	14 Jul 2010
				CN	101779370	B	18 Sep 2013
				DE	102007038845	A1	19 Mar 2009
				EP	2181496	A2	05 May 2010
				EP	2181496	B1	15 Jun 2016
				JP	2010537611	A	02 Dec 2010
				WO	2009021629	A2	19 Feb 2009
				WO	2009021629	A3	09 Apr 2009
				WO	2009021629	A4	11 Jun 2009
US	2015028699	A1	29 Jan 2015	US	2015028699	A1	29 Jan 2015
				CN	104094507	A	08 Oct 2014
				CN	104094507	B	07 Dec 2016
				DE	102011085636	A1	02 May 2013
				EP	2774252	A2	10 Sep 2014
				EP	2774252	B1	11 May 2016
				WO	2013064614	A2	10 May 2013
				WO	2013064614	A3	22 May 2014
US	2001054851	A1	27 Dec 2001	US	2001054851	A1	27 Dec 2001
				US	6573623	B2	03 Jun 2003
				DE	60131808	D1	24 Jan 2008
				DE	60131808	T2	27 Nov 2008
				EP	1168585	A2	02 Jan 2002
				EP	1168585	A3	24 Nov 2004
				EP	1168585	B1	12 Dec 2007
				JP	2002010617	A	11 Jan 2002
				JP	4094799	B2	04 Jun 2008
US	2006091304	A1	04 May 2006	US	2006091304	A1	04 May 2006

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/IL2017/050318

Patent document cited search report	Publication date	Patent family member(s)	Publication Date
		US 7135673 B2	14 Nov 2006