

(12) **United States Patent**
Kobori

(10) **Patent No.:** **US 9,410,824 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **ELECTROMAGNETIC INDUCTION POSITION DETECTION SENSOR**

(71) Applicant: **Wacom Co., Ltd.**, Saitama (JP)
(72) Inventor: **Takeshi Kobori**, Ibaraki (JP)
(73) Assignee: **Wacom Co., Ltd.**, Saitama (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 105 days.

(21) Appl. No.: **13/973,763**

(22) Filed: **Aug. 22, 2013**

(65) **Prior Publication Data**
US 2014/0084907 A1 Mar. 27, 2014

(30) **Foreign Application Priority Data**
Sep. 27, 2012 (JP) 2012-214345

(51) **Int. Cl.**
G01B 7/14 (2006.01)
G01D 5/20 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **G01D 5/2073** (2013.01); **G06F 3/046** (2013.01); **H01Q 7/00** (2013.01)

(58) **Field of Classification Search**
CPC G01B 7/143; G01B 7/004; G01D 5/2073; G06F 3/046; G08C 21/00; H01Q 7/00; H01Q 21/00
USPC 324/207.11–207.17, 207.24, 654, 324/207.26, 228–243, 207.18, 207.22, 324/207.25, 247, 260, 262, 655; 343/173, 343/741, 742, 867, 876, 732, 866, 895; 345/157, 173, 179, 180, 174; 702/95, 702/150; 178/18.01, 18.03, 18.07, 18.08, 178/19.01, 19.03, 19.06

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,045,645 A * 9/1991 Hoendervoogt G06F 3/046 178/19.07
5,548,306 A * 8/1996 Yates, IV G06F 3/044 345/174

(Continued)

FOREIGN PATENT DOCUMENTS

EP 2 031 543 A1 9/2008
JP 3-201018 A 9/1991

(Continued)

OTHER PUBLICATIONS

Extended European Search Report dated Feb. 13, 2014, for corresponding European Application No. 13186271.6-1904, 5 pages.

(Continued)

Primary Examiner — Arleen M Vazquez
Assistant Examiner — Steven Yeninas
(74) *Attorney, Agent, or Firm* — Seed Intellectual Property Law Group PLLC

(57) **ABSTRACT**

An electromagnetic induction position detection sensor includes a plurality of loop coils, each being an N-turn loop coil formed by winding a conductor N times (N is an integer equal to or greater than 2), and each coil turn having long side portions that are separated by a predetermined width and that are parallel to each other. The loop coils are arranged at predetermined intervals in a predetermined direction intersecting the long side portions of the loop coils. The width of at least one of the N turns of the Mth loop coil from the edge portion of the sensor in the predetermined direction (M is an integer equal to or greater than 2) is larger than the predetermined width, with the long side portion of this turn of the Mth loop coil arranged more outward than the long side portions of the other turns of the Mth loop coil.

20 Claims, 8 Drawing Sheets

