



US009443648B2

(12) **United States Patent**
Sawa et al.

(10) **Patent No.:** **US 9,443,648 B2**
(45) **Date of Patent:** **Sep. 13, 2016**

(54) **MAGNETIC SHEET FOR NON-CONTACT POWER RECEIVING DEVICE, NON-CONTACT POWER RECEIVING DEVICE, ELECTRONIC APPARATUS, AND NON-CONTACT CHARGER**

(71) Applicants: **KABUSHIKI KAISHA TOSHIBA**, Tokyo (JP); **TOSHIBA MATERIALS CO., LTD.**, Yokohama-shi, Kanagawa (JP)

(72) Inventors: **Takao Sawa**, Yokohama (JP); **Katsuhiko Yamada**, Yokohama (JP); **Tadao Saito**, Yokohama (JP); **Kiyoshi Nagasaki**, Yokohama (JP)

(73) Assignees: **KABUSHIKI KAISHA TOSHIBA**, Minato-Ku (JP); **TOSHIBA MATERIALS CO., LTD.**, Yokohama-Shi (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 198 days.

(21) Appl. No.: **14/271,780**

(22) Filed: **May 7, 2014**

(65) **Prior Publication Data**
US 2014/0239892 A1 Aug. 28, 2014

Related U.S. Application Data
(63) Continuation of application No. PCT/JP2012/007133, filed on Nov. 7, 2012.

(30) **Foreign Application Priority Data**
Nov. 8, 2011 (JP) 2011-244955

(51) **Int. Cl.**
H02J 7/00 (2006.01)
H01F 7/02 (2006.01)
H01F 38/14 (2006.01)
H01F 3/02 (2006.01)
H01F 27/245 (2006.01)
H02J 7/02 (2016.01)
H01F 3/10 (2006.01)
H01F 27/36 (2006.01)
H01F 17/00 (2006.01)

(52) **U.S. Cl.**
CPC **H01F 7/0247** (2013.01); **H01F 3/02** (2013.01); **H01F 3/10** (2013.01); **H01F 27/245** (2013.01); **H01F 27/365** (2013.01); **H01F 38/14** (2013.01); **H02J 7/0042** (2013.01); **H02J 7/025** (2013.01); **H01F 2017/0066** (2013.01); **Y10T 428/24314** (2015.01); **Y10T 428/24942** (2015.01); **Y10T 428/24967** (2015.01); **Y10T 428/31678** (2015.04)

(58) **Field of Classification Search**
CPC H02J 7/025; H01F 38/14; Y02T 90/122; B60L 11/182; Y02E 60/12

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,368,496 A * 1/1983 Kato G11B 5/105
360/110
5,821,731 A * 10/1998 Kuki B60L 11/1805
320/108
8,193,767 B2 6/2012 Inoue et al.
8,232,764 B2 7/2012 Inoue et al.
2009/0058358 A1 3/2009 Inoue et al.
2009/0121677 A1 5/2009 Inoue et al.
2009/0206791 A1* 8/2009 Jung H02J 7/025
320/108
2009/0284341 A1 11/2009 Okada et al.
2010/0156344 A1 6/2010 Inoue et al.
2010/0181842 A1 7/2010 Suzuki et al.
2013/0293191 A1 11/2013 Hidaka et al.

FOREIGN PATENT DOCUMENTS

JP 09-190938 A 7/1997
JP 11-265814 A 9/1999
JP 2000-023393 A 1/2000
JP 2009-005475 A 1/2009
JP 2009-277820 A 11/2009
JP 2010-283263 A 12/2010
JP 2012-156280 A 8/2012
WO WO 2007/080820 A1 7/2007
WO WO 2007/111019 A1 10/2007
WO WO 2007/122788 A1 11/2007

OTHER PUBLICATIONS

System Description Wireless Power Transfer, Volume I: Low Power, Part 1: Interface Definition, Version 1.0.1., Oct. 2010, pp. 1-76.

* cited by examiner

Primary Examiner — Arun Williams
(74) *Attorney, Agent, or Firm* — Foley & Lardner LLP

(57) **ABSTRACT**

A magnetic sheet of an embodiment includes a laminate of a plurality of magnetic thin plates. The laminate constituting the magnetic sheet includes a first magnetic thin plate and a second magnetic thin plate different in kind from the first magnetic thin plate. The first magnetic thin plate has a magnetostriction constant exceeding 5 ppm in an absolute value, and the second magnetic thin plate has a magnetostriction constant of 5 ppm or less in an absolute value. Alternatively, the first magnetic thin plate has a thickness of from 50 to 300 μm, and the second magnetic thin plate has a thickness of from 10 to 30 μm.

FIG. 1

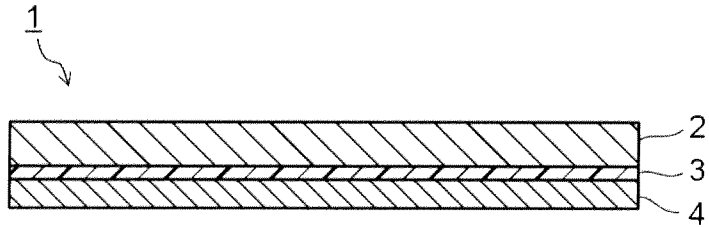


FIG. 2

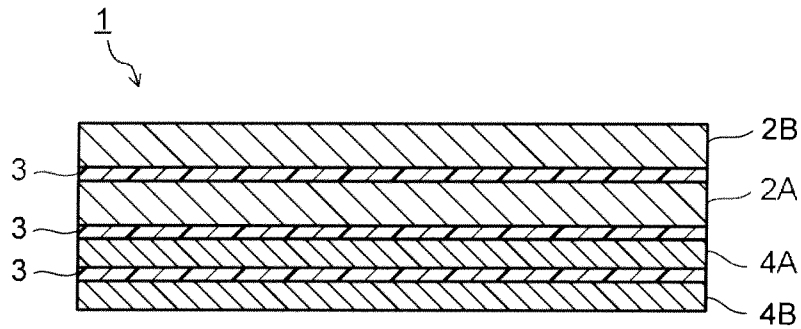


FIG. 3

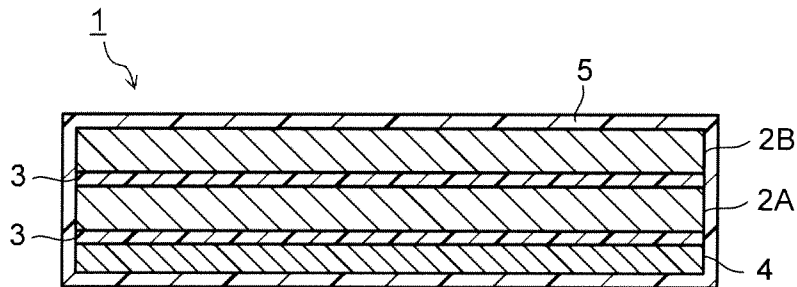


FIG. 4

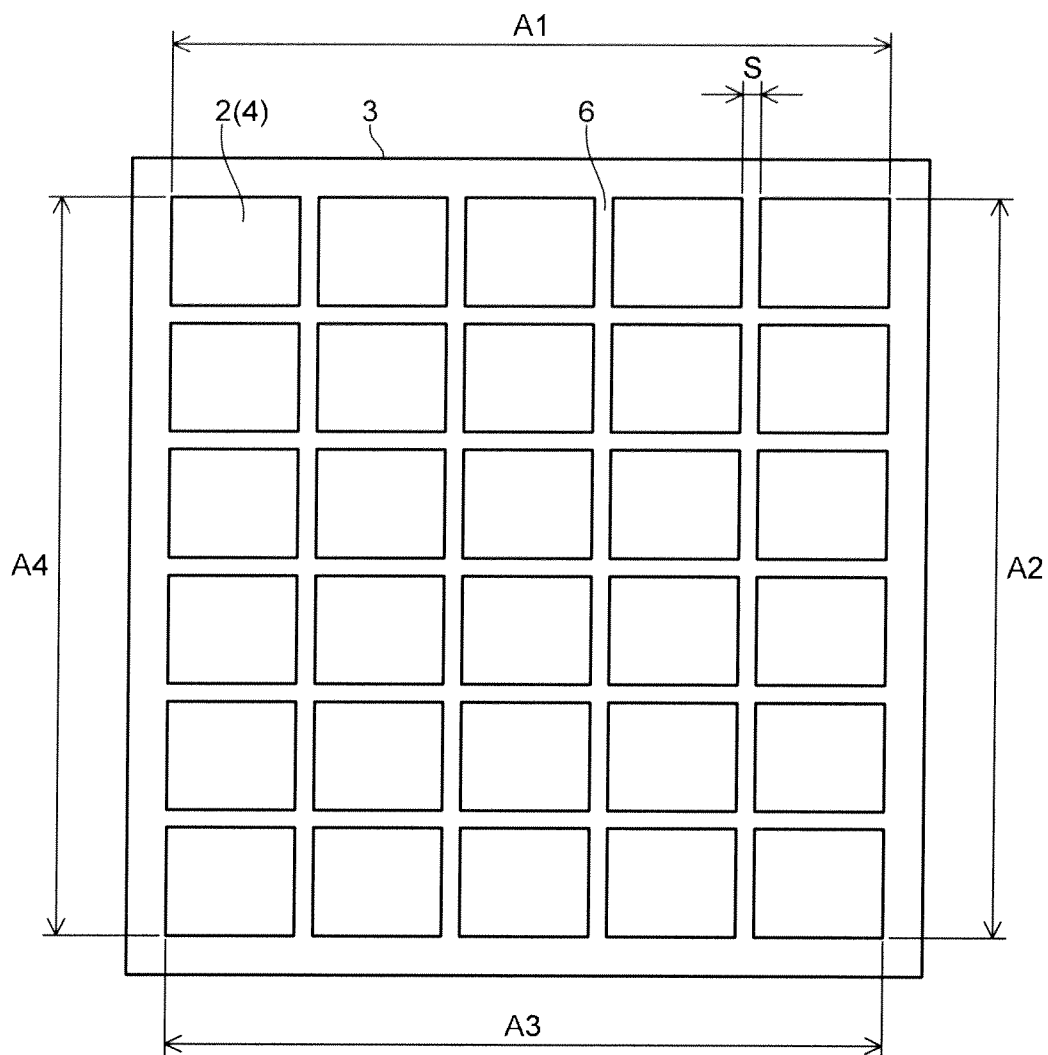


FIG. 5

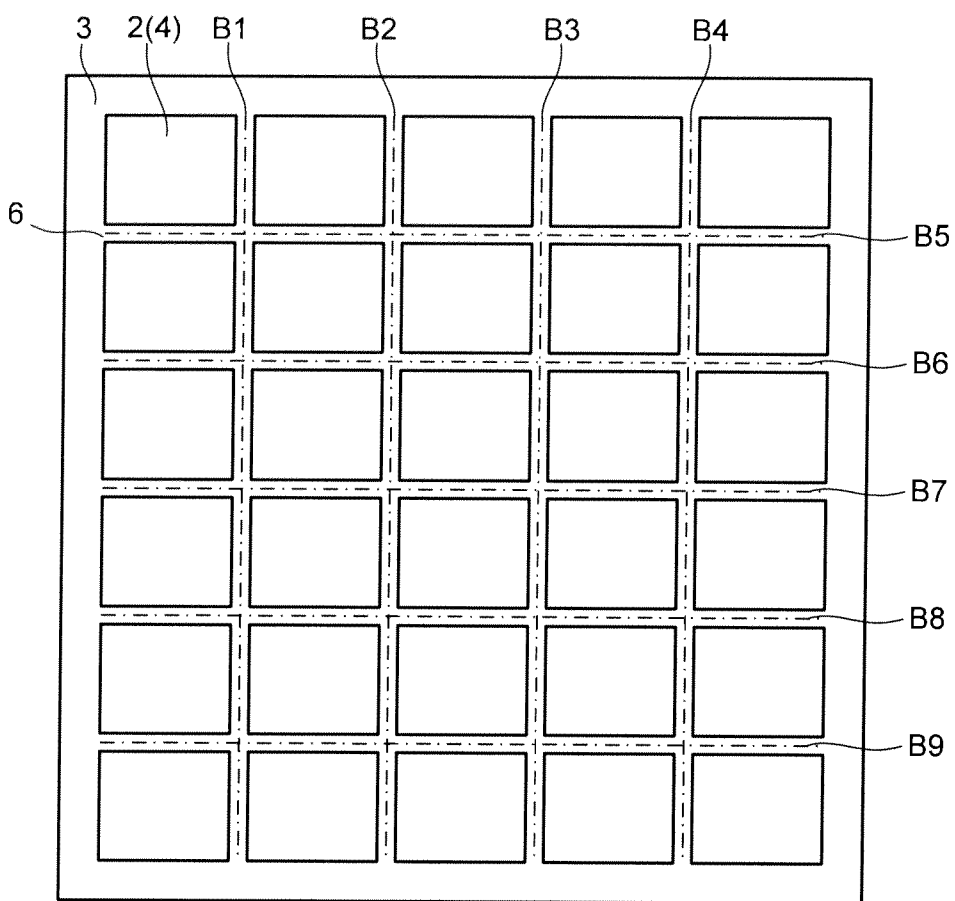
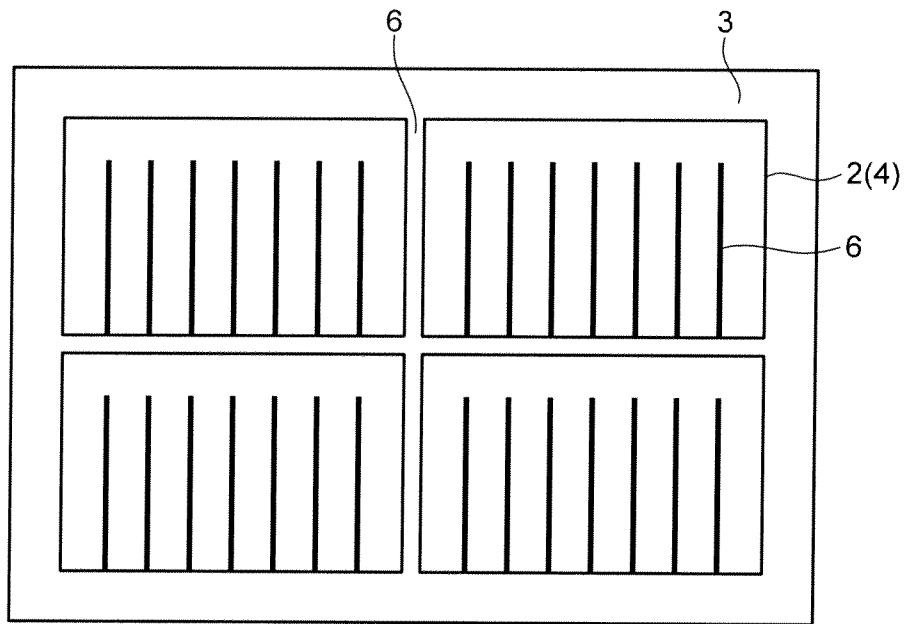


FIG. 6



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.