

EXHIBIT 4



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

(10) **Patent No.:** US 8,661,910 B2
(45) **Date of Patent:** Mar. 4, 2014

- (54) **CAPACITIVE SENSOR**
- (75) Inventors: **Patrick L. McLaughlin**, Redmond, OR (US); **Thomas D. Decker**, Redmond, OR (US)
- (73) Assignee: **IPG, LLC**, Redmond, OR (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1105 days.
- (21) Appl. No.: **11/655,762**
- (22) Filed: **Jan. 19, 2007**
- (65) **Prior Publication Data**
US 2008/0173303 A1 Jul. 24, 2008
- (51) **Int. Cl.**
G01L 9/12 (2006.01)
- (52) **U.S. Cl.**
USPC **73/718; 73/724**
- (58) **Field of Classification Search**
None
See application file for complete search history.

- (56) **References Cited**
U.S. PATENT DOCUMENTS
- | | | | | |
|-----------|-----|---------|-----------------|--------|
| 3,678,296 | A | 7/1972 | Day | |
| 4,057,205 | A | 11/1977 | Vensel | |
| 4,120,206 | A * | 10/1978 | Rud, Jr. | 73/718 |
| 4,393,714 | A * | 7/1983 | Schmidt | 73/718 |
| 4,651,728 | A | 3/1987 | Gupta | |
| 4,686,975 | A | 8/1987 | Naimon | |
| 5,052,400 | A | 10/1991 | Dietz | |
| 5,062,302 | A * | 11/1991 | Petersen et al. | 73/754 |
| 5,134,886 | A | 8/1992 | Ball | |
| 5,195,528 | A | 3/1993 | Hok | |
| 5,492,129 | A | 2/1996 | Greenberger | |
| 5,558,086 | A | 9/1996 | Smith | |
| 5,603,315 | A | 2/1997 | Sasso | |
| 5,697,364 | A | 12/1997 | Chua | |

- | | | | | |
|--------------|------|---------|---------------|--------|
| 5,865,174 | A | 2/1999 | Kloepfel | |
| 6,213,955 | B1 | 4/2001 | Karakasoglu | |
| 6,220,244 | B1 | 4/2001 | McLaughlin | |
| 6,418,793 | B1 | 7/2002 | Pechoux | |
| 6,427,690 | B1 | 8/2002 | McCombs | |
| 6,470,885 | B1 | 10/2002 | Blue | |
| 6,532,958 | B1 | 3/2003 | Buan | |
| 6,575,163 | B1 | 6/2003 | Berthon-Jones | |
| 6,712,876 | B2 | 3/2004 | Cao | |
| 6,910,482 | B2 | 6/2005 | Bliss | |
| 6,925,884 | B2 | 8/2005 | Hegner | |
| 6,992,492 | B2 | 1/2006 | Burdick | |
| 7,013,898 | B2 | 3/2006 | Rashad | |
| 7,089,938 | B2 | 8/2006 | Gale | |
| 2002/0038657 | A1 | 4/2002 | Yagi | |
| 2003/0094047 | A1 * | 5/2003 | Torkkeli | 73/716 |
| 2004/0035422 | A1 | 2/2004 | Truitt | |
| 2006/0118115 | A1 | 6/2006 | Cannon | |
| 2006/0180149 | A1 | 8/2006 | Matarasso | |
| 2008/0000480 | A1 | 1/2008 | Cannon | |

(Continued)

OTHER PUBLICATIONS

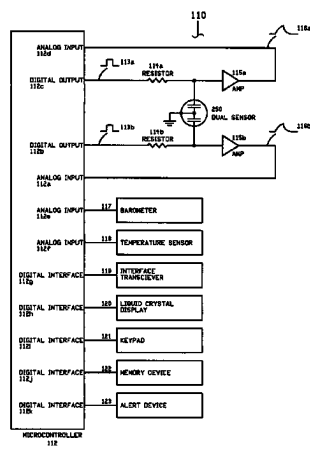
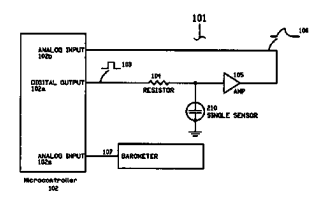
US Office Action dated Jul. 5, 2012 issued in U.S. Appl. No. 12/472,853.

(Continued)

Primary Examiner — Andre Allen
(74) *Attorney, Agent, or Firm* — Workman Nydegger

(57) **ABSTRACT**
A capacitive sensor for measuring pressure comprises a fixed charge plate integral to a printed circuit board, a flexible charge plate that is grounded, a conductive donut-shaped adhesive spacer between the charge plates, a lid, a non-conductive donut-shaped adhesive spacer between the second charge plate and the lid, means of providing a pressure, fixed or variable, to both sides of the flexible charge plate, wherein a microcontroller controls a power supply and provides a voltage to the first charge plate wherein the accumulative voltage may be measured as a means of determining differential pressure.

26 Claims, 9 Drawing Sheets



US 8,661,910 B2

Page 2

(56)

References Cited

U.S. PATENT DOCUMENTS

2008/0035150	A1	2/2008	Rittner
2008/0053541	A1	3/2008	Meckes
2008/0078392	A1	4/2008	Pelletier
2008/0282880	A1	11/2008	Bliss

2009/0056708 A1 3/2009 Stenzler

OTHER PUBLICATIONS

Notice of Allowance dated Jan. 18, 2013 issued in U.S. Appl. No. 12/472,853.

* cited by examiner

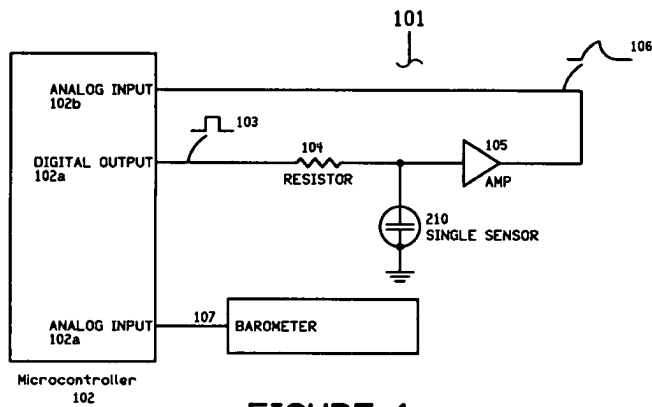


FIGURE 1a

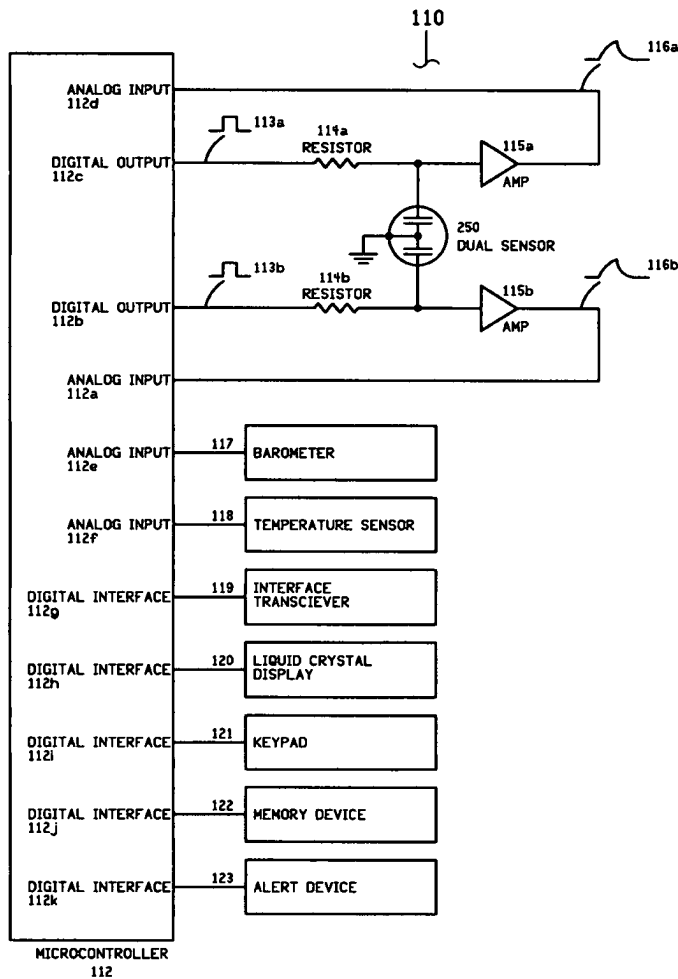
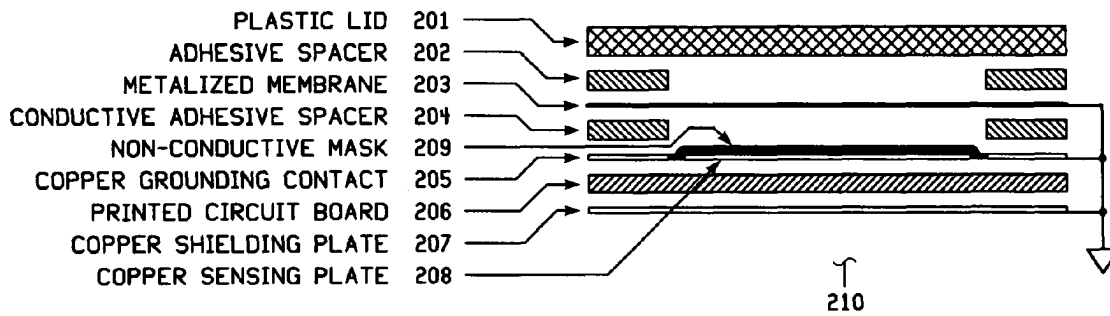
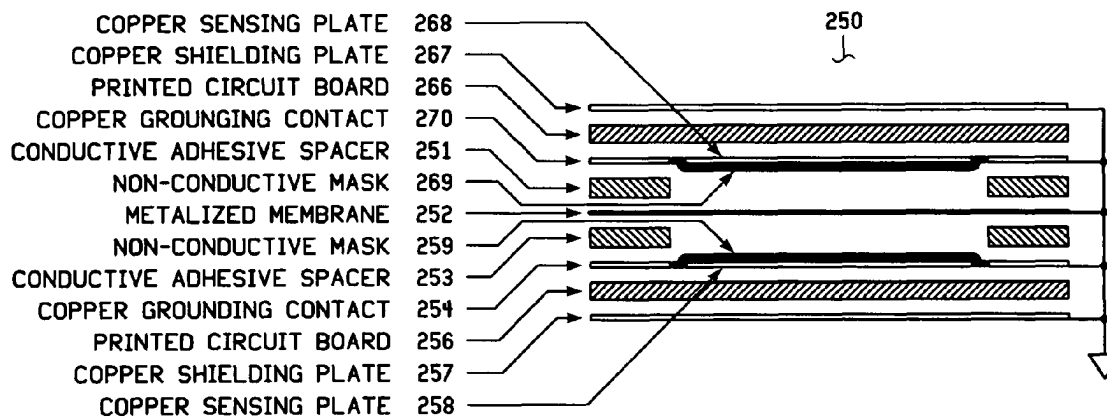


FIGURE 1b



SINGLE CAPACITOR
 FIGURE 2a



DUAL CAPACITOR
 FIGURE 2b

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.