



US007548037B2

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

(10) **Patent No.:** **US 7,548,037 B2**
(45) **Date of Patent:** **Jun. 16, 2009**

(54) **COLLISION MONITORING SYSTEM**

(75) Inventors: **Mario Boisvert**, Reed City, MI (US);
Randall Perrin, Grawn, MI (US); **John Washeleski**, Cadillac, MI (US)

(73) Assignee: **Nartron Corporation**, Reed City, MI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 351 days.

(21) Appl. No.: **10/100,892**

(22) Filed: **Mar. 18, 2002**

(65) **Prior Publication Data**

US 2002/0101210 A1 Aug. 1, 2002

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/562,986, filed on May 1, 2000, now Pat. No. 6,404,158, which is a continuation-in-part of application No. 08/736,786, filed on Oct. 25, 1996, now Pat. No. 6,064,165, which is a continuation of application No. 08/275,107, filed on Jul. 14, 1994, now abandoned, which is a continuation-in-part of application No. 07/872,190, filed on Apr. 22, 1992, now Pat. No. 5,334,876.

(60) Provisional application No. 60/169,061, filed on Dec. 6, 1999.

(51) **Int. Cl.**
G05D 3/00 (2006.01)

(52) **U.S. Cl.** **318/466**; 318/461; 318/465;
318/467; 318/468; 318/469

(58) **Field of Classification Search** 318/264-266,
318/280-286, 460-470, 565, 626, 434, 139,
318/474-477, 815, 833, 903; 701/36, 49

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,383,206 A * 5/1983 Matsuoka et al. 318/445
4,514,670 A 4/1985 Fassel et al.
4,608,637 A 8/1986 Okuyama et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 581509 A1 2/1994

(Continued)

OTHER PUBLICATIONS

Federal Register, vol. 56, No. 73/Tuesday, Apr. 16, 1991, Rules and Regulations, Department of Transportation, National Highway Traffic Safety Administration, 49 CFR Part 571, pp. 15290-15299.

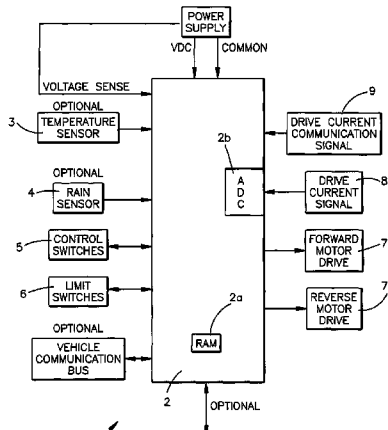
Primary Examiner—Marlon T Fletcher

(74) *Attorney, Agent, or Firm*—Tarolli, Sundheim, Covell & Tummino LLP

(57) **ABSTRACT**

Disclosed is an improved system and method for sensing both hard and soft obstructions for a movable panel such as a sunroof. A dual detection scheme is employing that includes an optical sensing as the primary means and electronic sensing of motor current as a secondary means. The secondary means utilizes system empirical precharacterization, fast processing algorithms, motor parameter monitoring including both current sensing and sensorless electronic motor current commutation pulse sensing, and controller memory, to adaptively modify electronic obstacle detection thresholds in real time without the use of templates and cycle averaging techniques.

24 Claims, 9 Drawing Sheets



U.S. PATENT DOCUMENTS

4,641,067 A 2/1987 Iizawa et al.
 4,673,848 A 6/1987 Hagiwara et al.
 4,686,598 A 8/1987 Herr
 4,730,152 A 3/1988 Foust et al.
 4,746,845 A 5/1988 Mizuta et al.
 4,823,059 A 4/1989 Compeau et al.
 4,831,509 A * 5/1989 Jones et al. 318/466
 4,855,653 A * 8/1989 Lemirande 318/282
 4,870,333 A 9/1989 Itoh et al.
 4,980,618 A 12/1990 Milnes et al.
 5,038,087 A 8/1991 Archer et al.
 5,039,925 A * 8/1991 Schap 318/282
 5,069,000 A 12/1991 Zuckerman
 5,081,586 A 1/1992 Barthel et al.
 5,131,506 A 7/1992 Mizuno et al.
 5,140,316 A 8/1992 DeLand et al.
 5,162,711 A 11/1992 Heckler
 5,204,592 A 4/1993 Huyer
 5,218,282 A * 6/1993 Duhame 318/603
 5,278,480 A 1/1994 Murray
 5,334,876 A 8/1994 Washeleski et al.
 5,399,950 A 3/1995 Lu et al.
 5,432,413 A 7/1995 Duke et al.

5,436,539 A 7/1995 Wrenbeck et al.
 5,497,326 A 3/1996 Berland et al.
 5,525,876 A 6/1996 Filippi
 5,530,329 A 6/1996 Shigematsu et al.
 5,537,013 A 7/1996 Toyozumi et al.
 5,539,290 A 7/1996 Lu et al.
 5,701,063 A 12/1997 Cook et al.
 5,723,960 A 3/1998 Harada
 5,729,104 A 3/1998 Kamishima et al.
 5,734,245 A 3/1998 Terashima et al.
 5,832,664 A 11/1998 Tajima et al.
 5,952,801 A 9/1999 Boisvert et al.
 5,955,854 A 9/1999 Zhang et al.
 5,969,637 A 10/1999 Doppelt et al.
 5,982,124 A 11/1999 Wang
 6,064,165 A 5/2000 Boisvert et al.
 6,243,635 B1 6/2001 Swan et al.
 6,377,009 B1 4/2002 Philipp

FOREIGN PATENT DOCUMENTS

FR 2502679 3/1982
 GB 2189906 11/1987
 WO WO 92/20891 11/1992

* cited by examiner

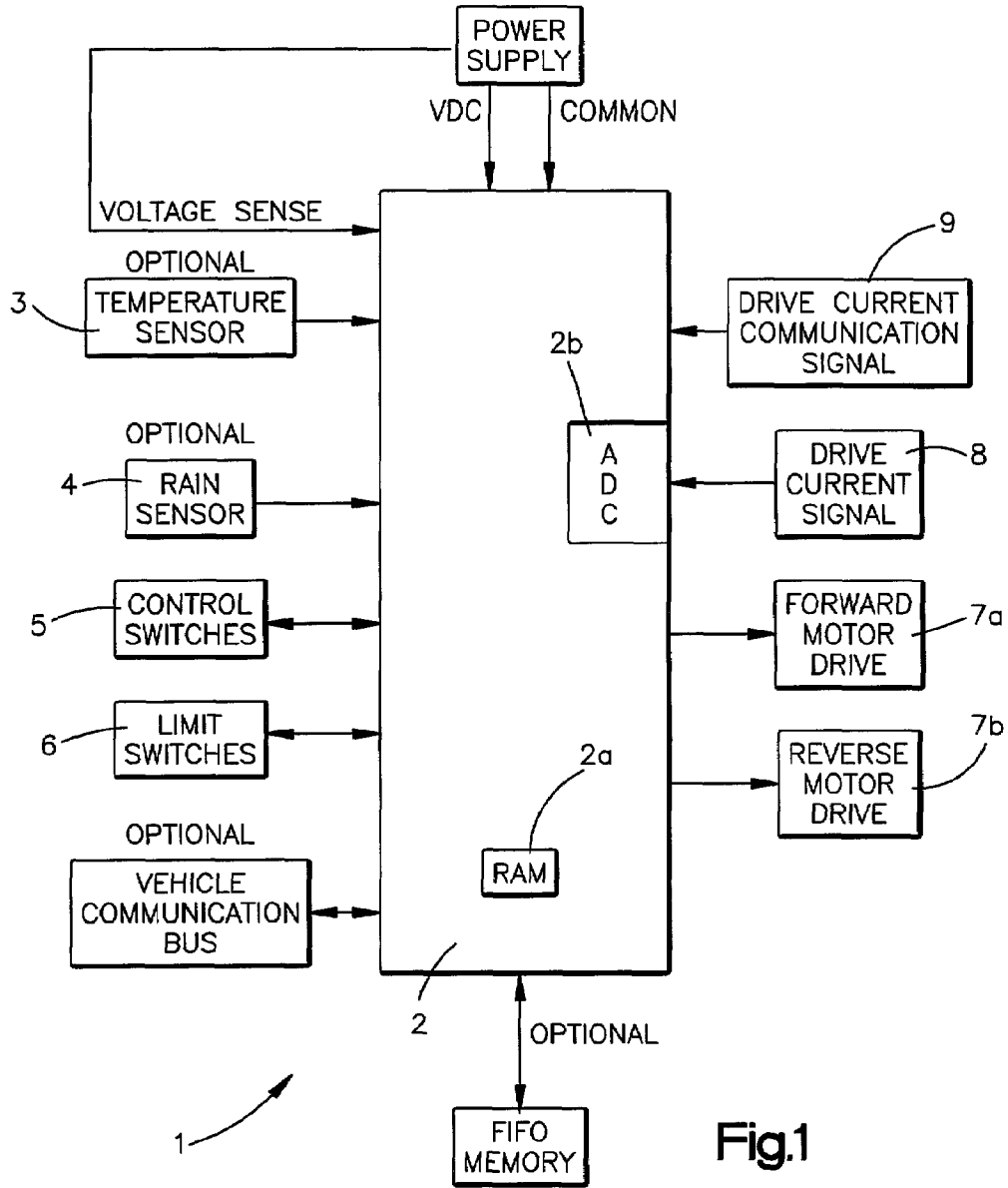


Fig.1

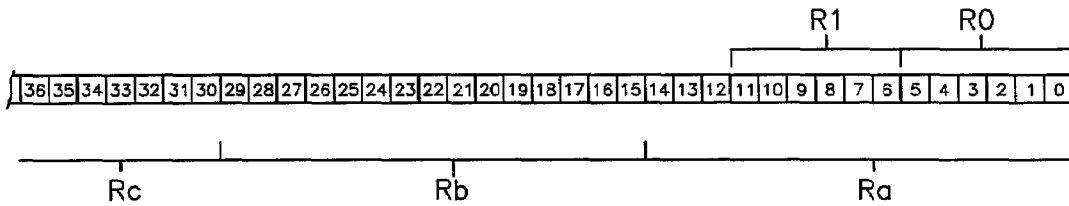


Fig.8

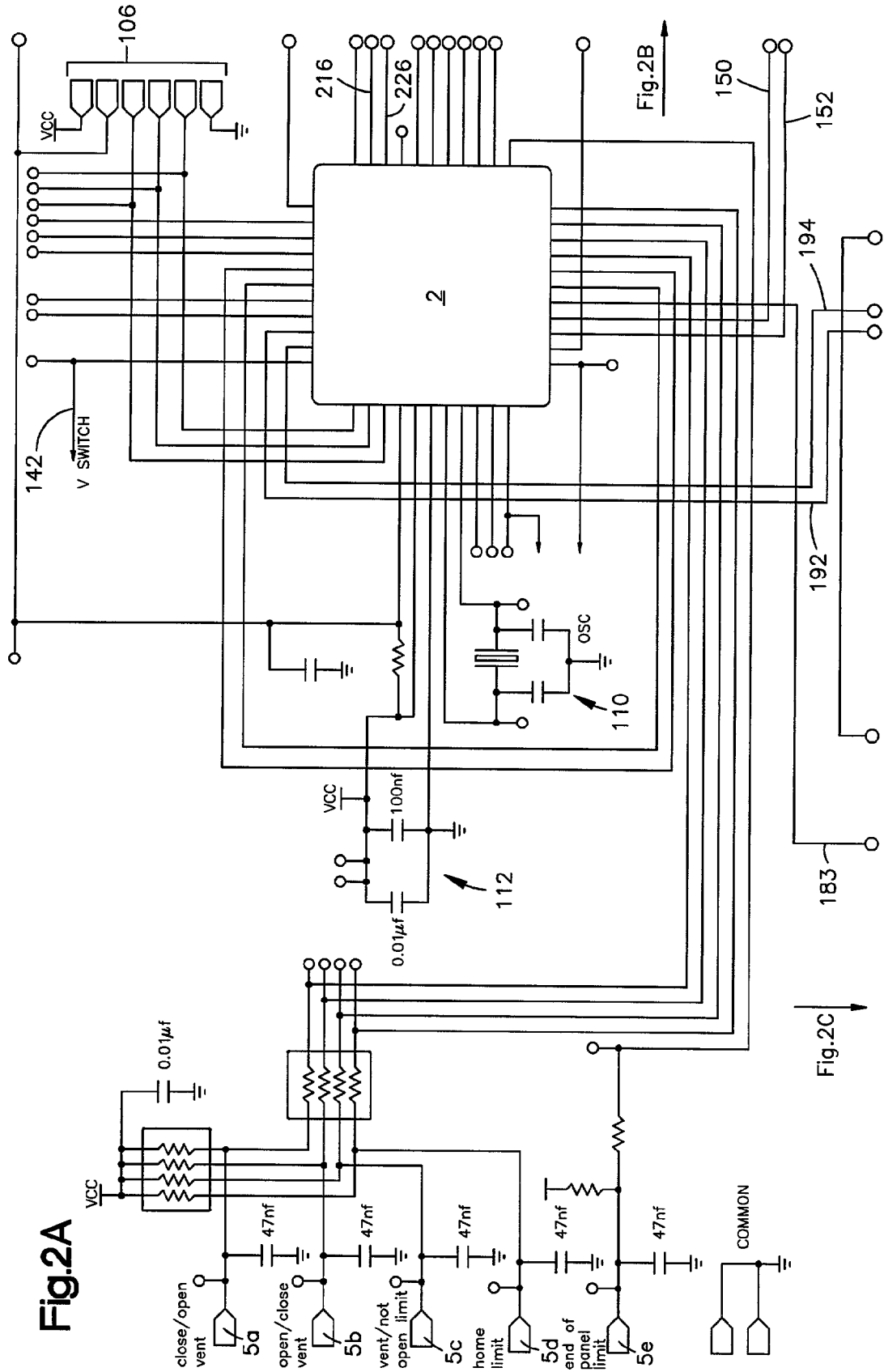
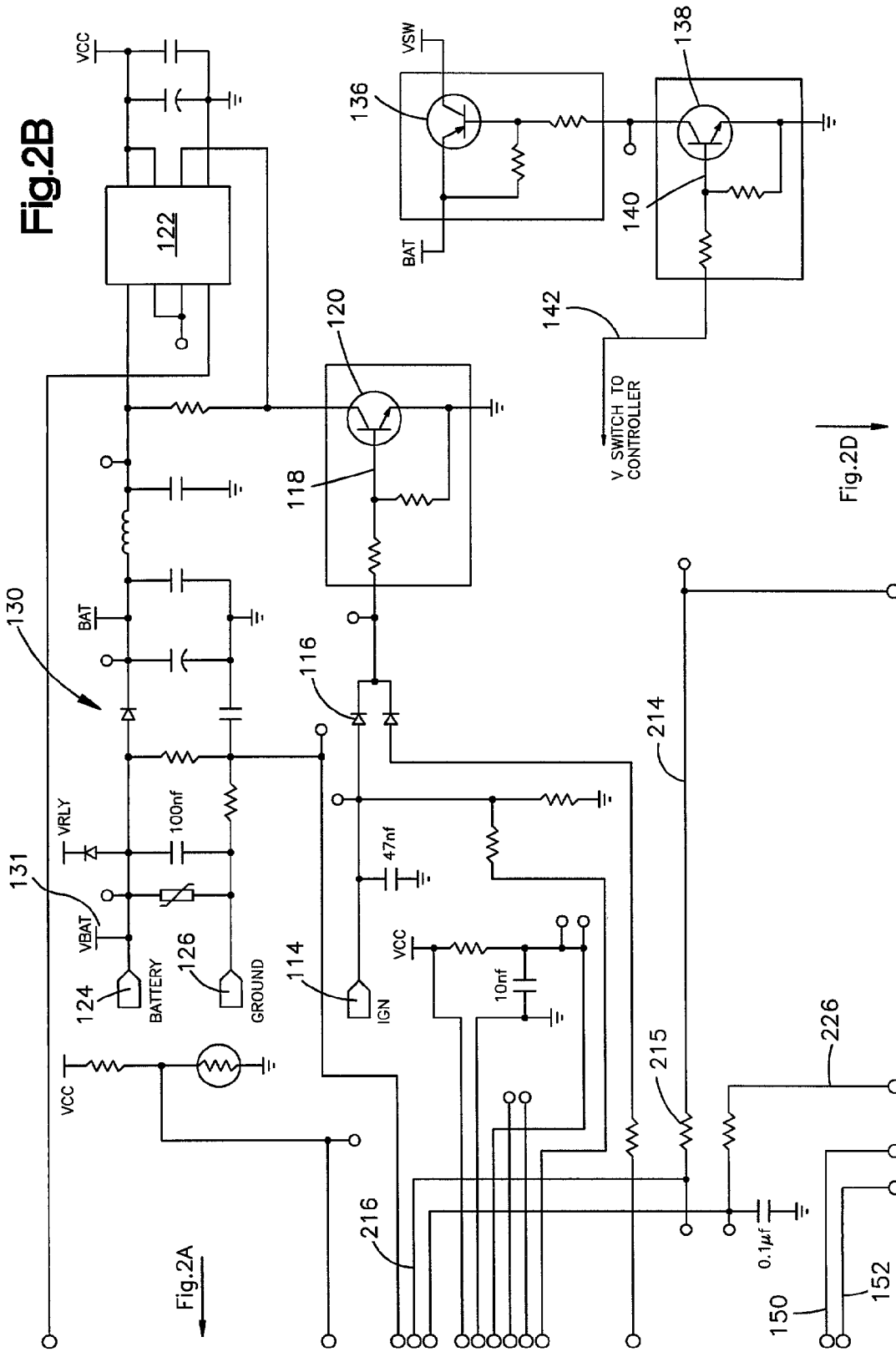


Fig.2A

Fig.2C



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.