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

(10) **Patent No.:** US 7,579,802 B2
(45) **Date of Patent:** Aug. 25, 2009

(54) **COLLISION MONITORING SYSTEM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 550 days.

(21) Appl. No.: **10/765,487**

(22) Filed: **Jan. 27, 2004**

(65) **Prior Publication Data**

US 2004/0183493 A1   Sep. 23, 2004

Related U.S. Application Data

(60) Division of application No. 10/100,892, filed on Mar. 18, 2002, which is a 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.

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

(52) **U.S. Cl.** **318/466**; 318/467; 318/468; 318/469; 318/476

(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.

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(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.

22 Claims, 9 Drawing Sheets
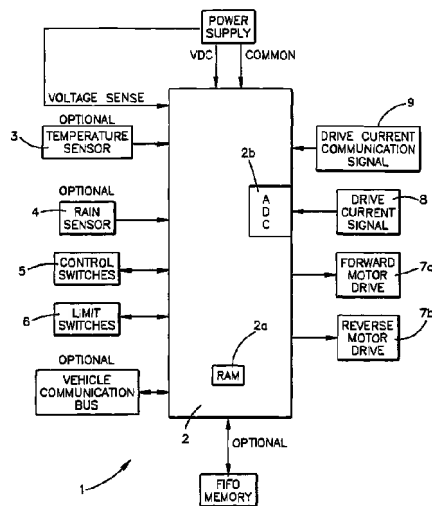
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Fig.1

Fig.8

Fig.2A

Fig.2B
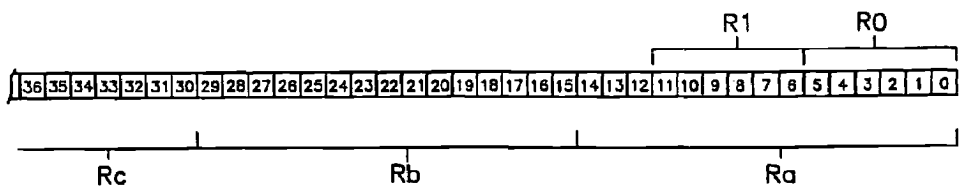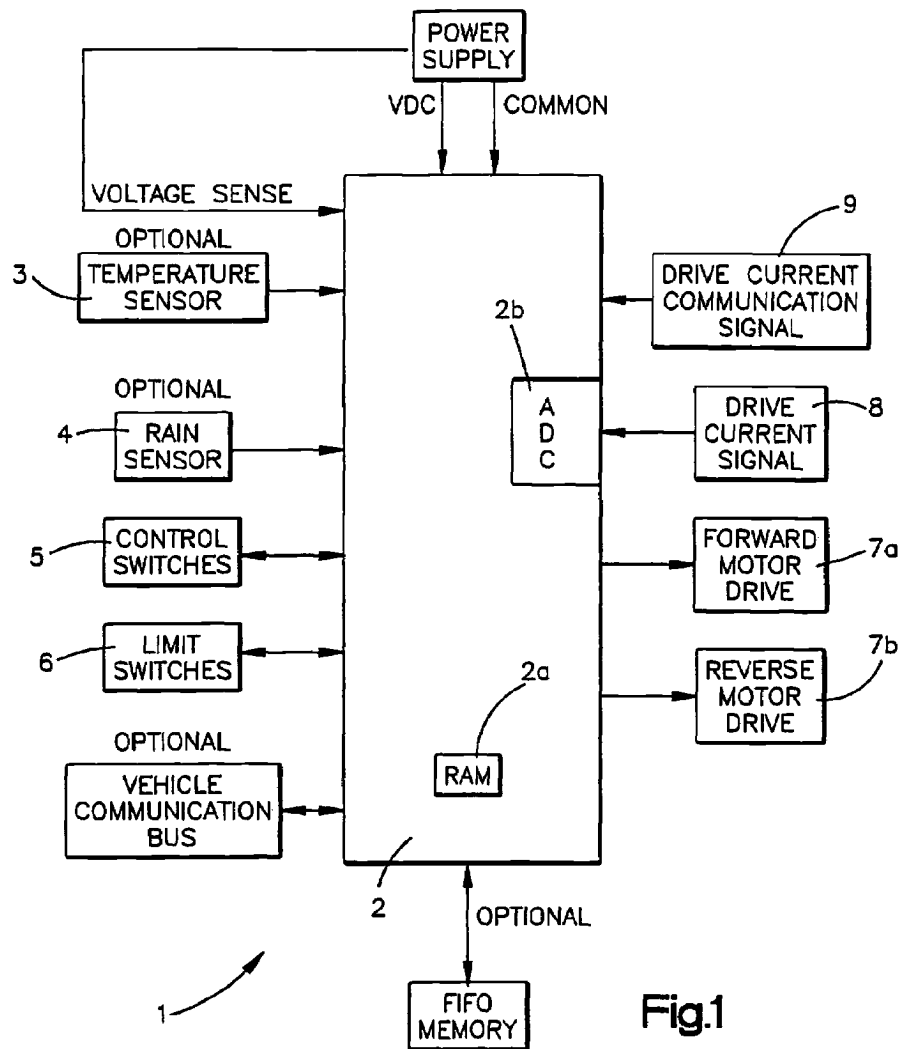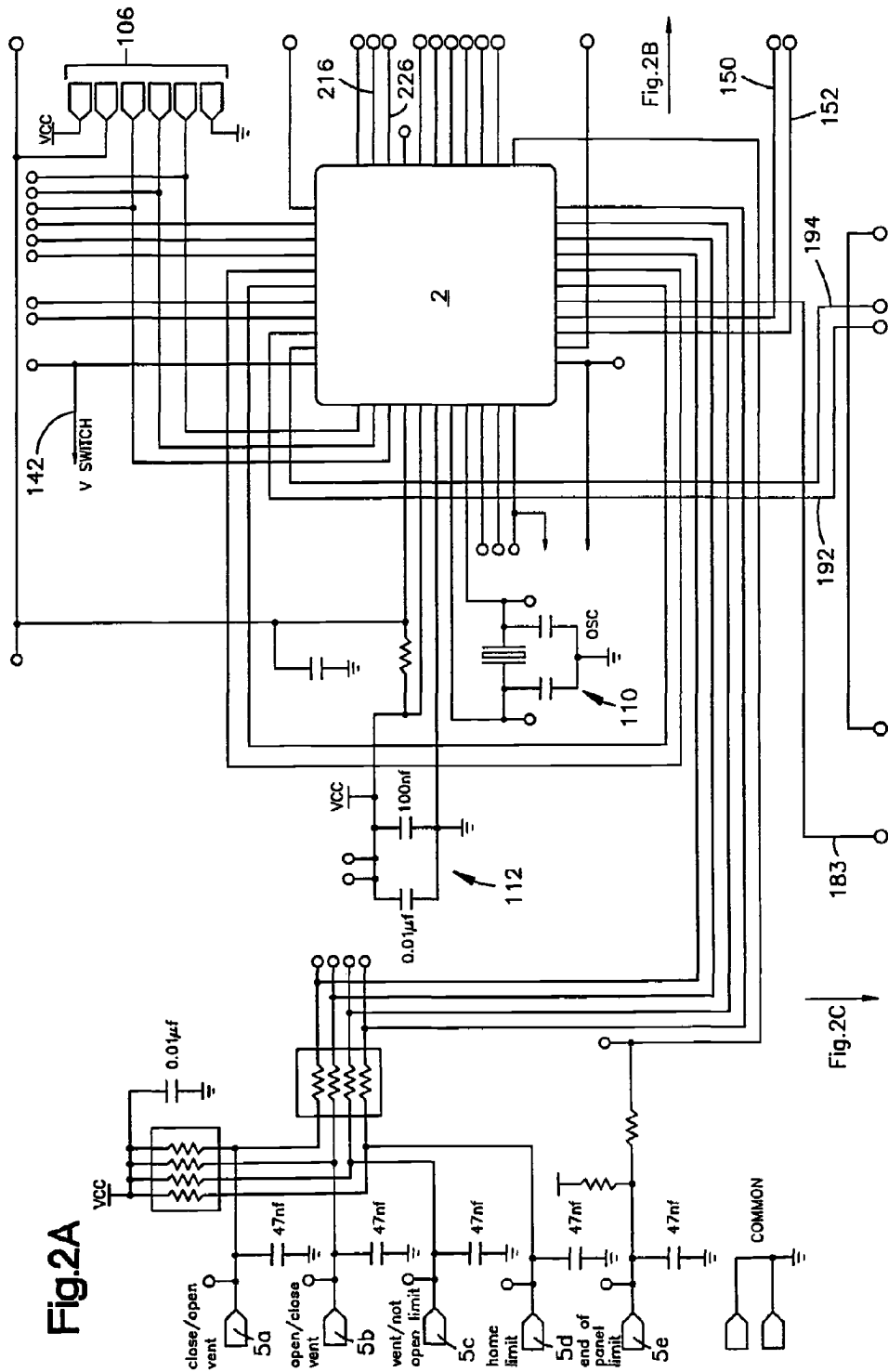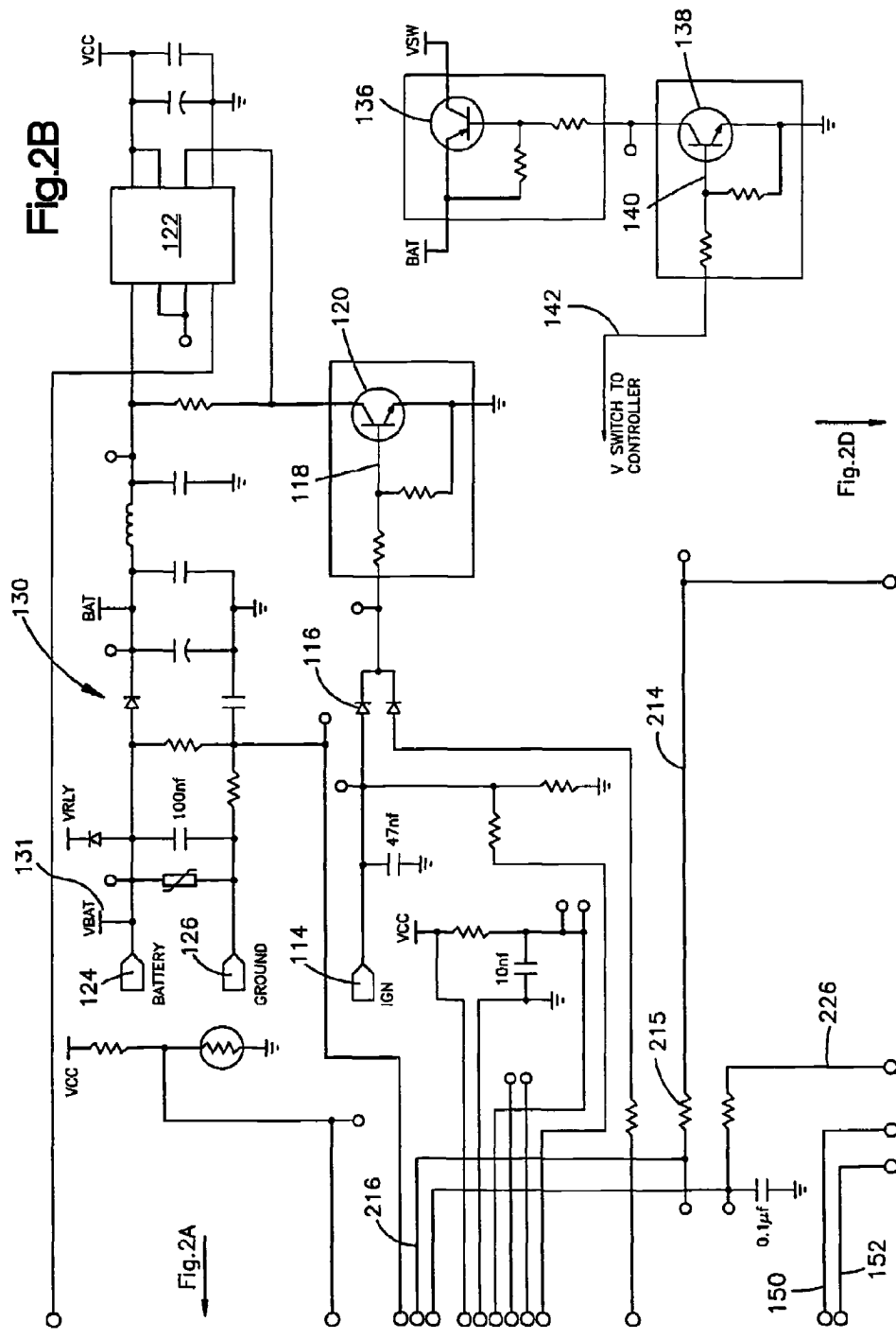
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