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**Boisvert et al.**

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(54) **COLLISION MONITORING SYSTEM**

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This patent is subject to a terminal disclaimer.

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**Related U.S. Application Data**

(63) Continuation of application No. 10/100,892, filed on Mar. 18, 2002, now Pat. No. 7,548,037, 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.

(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**; 318/264; 318/265; 318/266; 318/280; 318/282; 318/286; 318/461; 318/468; 318/469

(58) **Field of Classification Search** ..... None  
See application file for complete search history.

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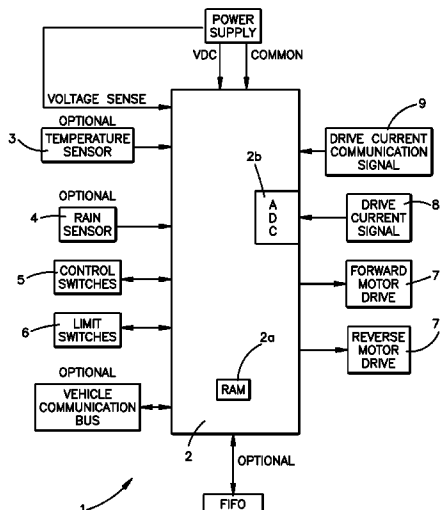
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(57) **ABSTRACT**

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.

**10 Claims, 9 Drawing Sheets**



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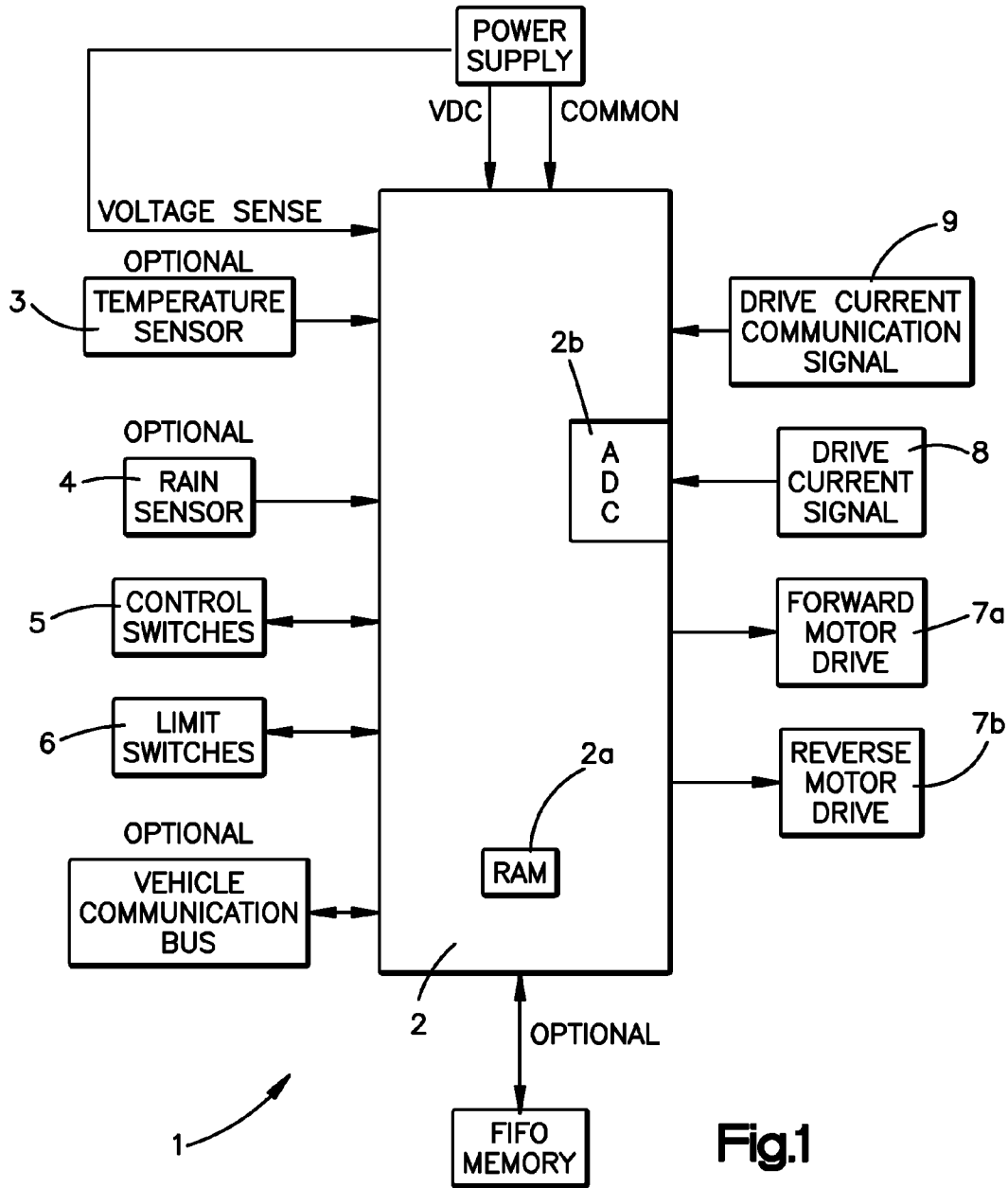


Fig.1

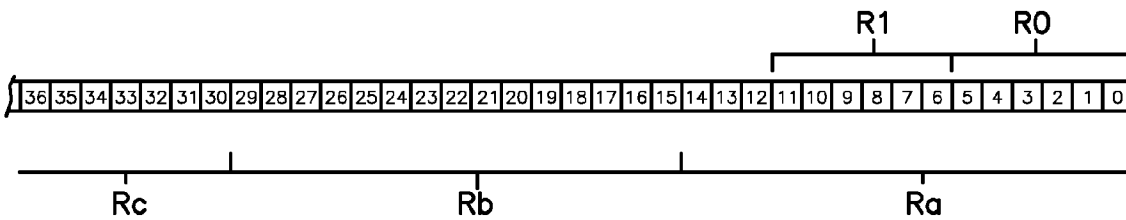
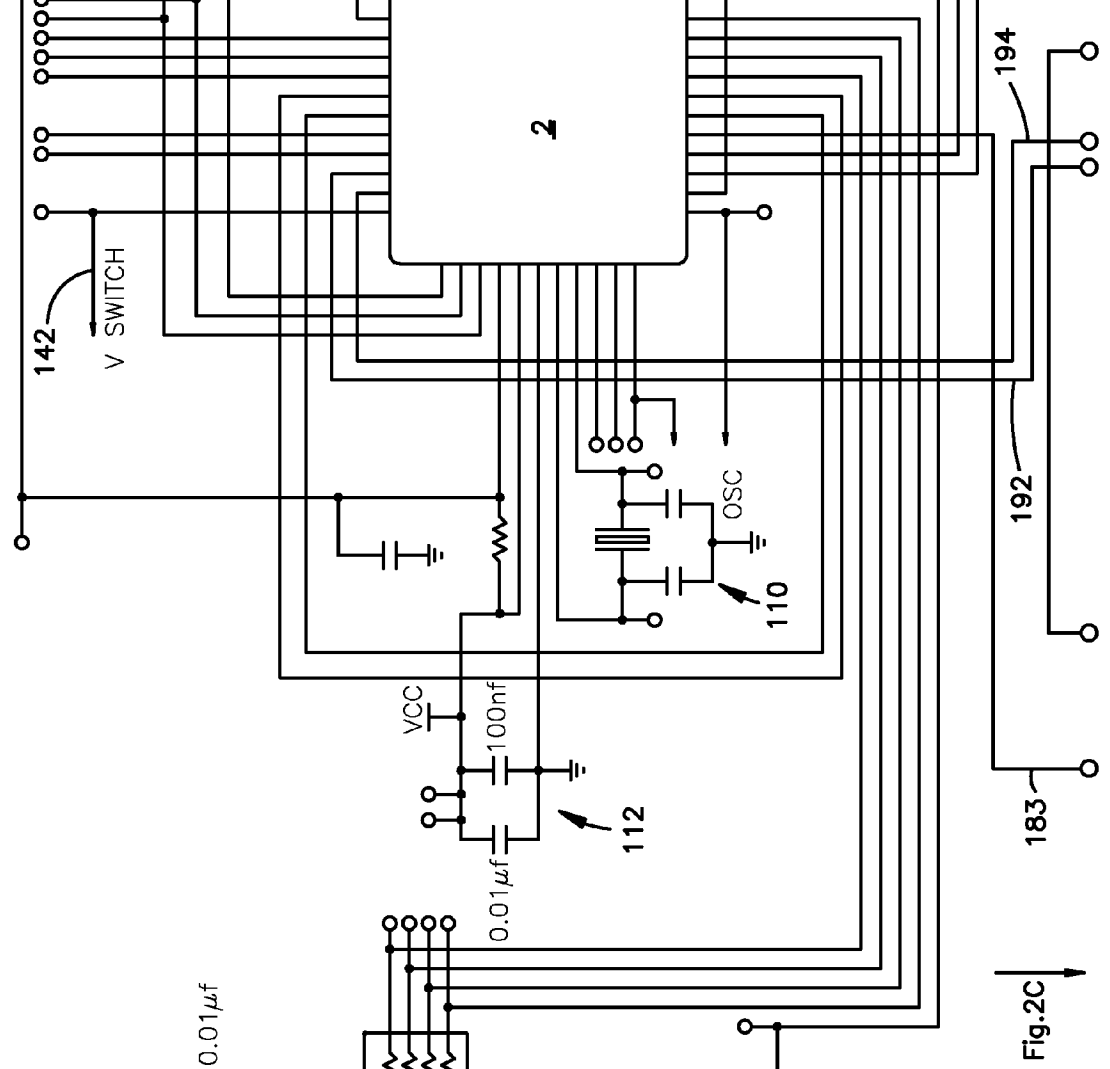
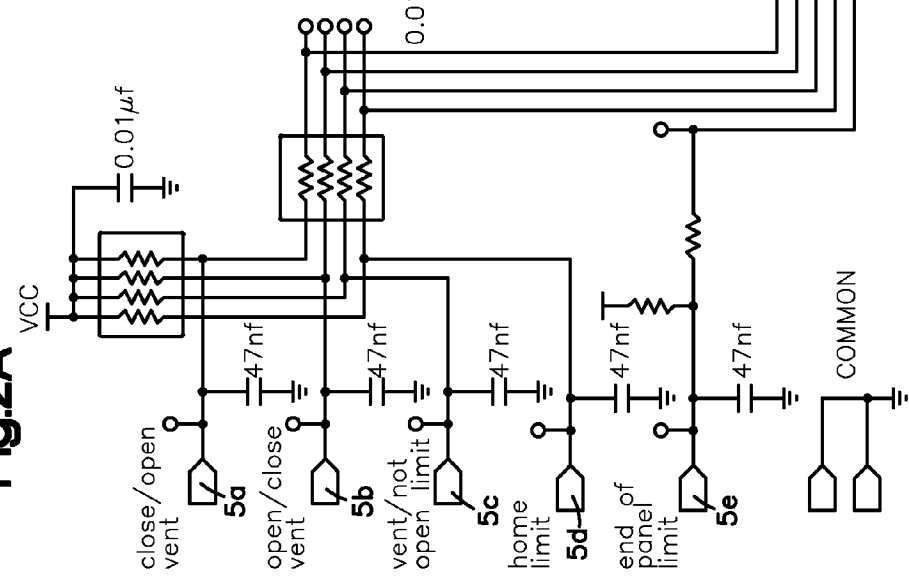


Fig.8

**Fig.2A**



**Fig.2C**



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