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Boisvert et al.

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- (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 0 days.

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(21) Appl. No.: **10/071,759**

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(65) **Prior Publication Data**

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EP	581509 A1	2/1994
FR	2502679	3/1982
GB	2189906	11/1987
WO	WO 92/20891	11/1992

Related U.S. Application Data

OTHER PUBLICATIONS

- (63) Continuation of application No. 09/562,986, filed on May 1, 2000, 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. 60/169,016, filed on Dec. 6, 1999.

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.

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(74) *Attorney, Agent, or Firm*—Watts, Hoffmann, Fisher & Heinke

- (51) **Int. Cl.**⁷ **G05D 3/00; H02P 1/04; H02P 3/00**
- (52) **U.S. Cl.** **318/469; 318/280; 318/434**
- (58) **Field of Search** **318/434, 466-470, 318/565, 626, 280, 282, 283, 286**

(57) **ABSTRACT**

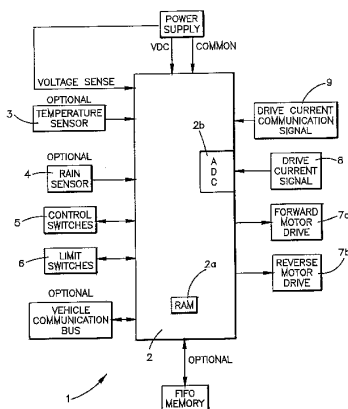
Disclosed is an improved system and method for sensing both hard and soft obstructions for a movable panel such as a sunroof. A dual detection scheme is employing that includes an optical sensing as the primary means and electronic sensing of motor current as a secondary means. The secondary means utilizes 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.

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26 Claims, 9 Drawing Sheets



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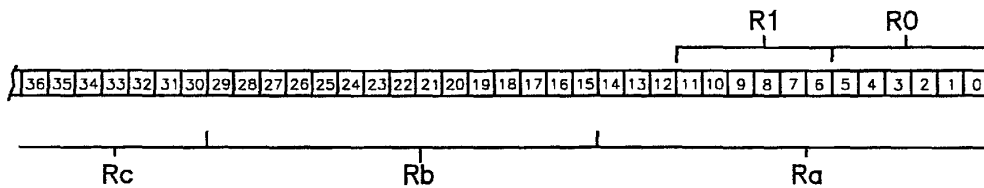
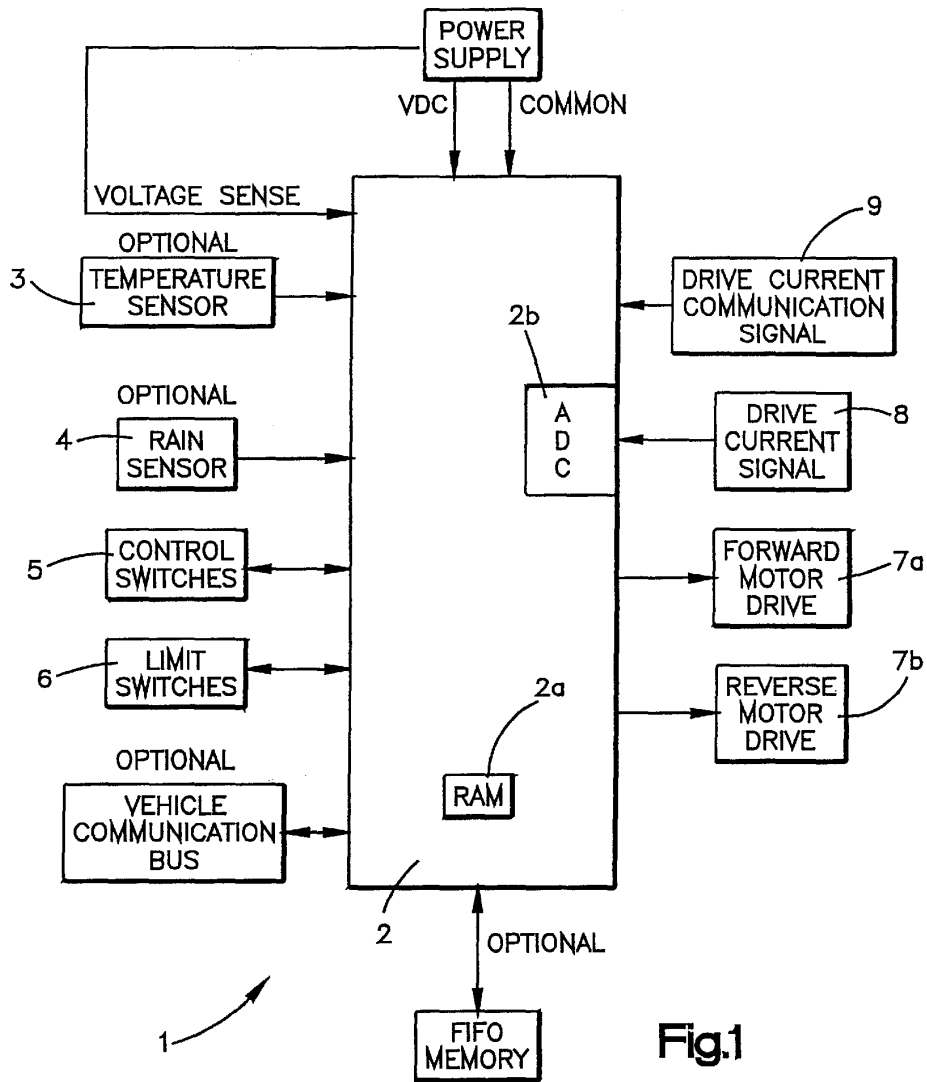


Fig.2A

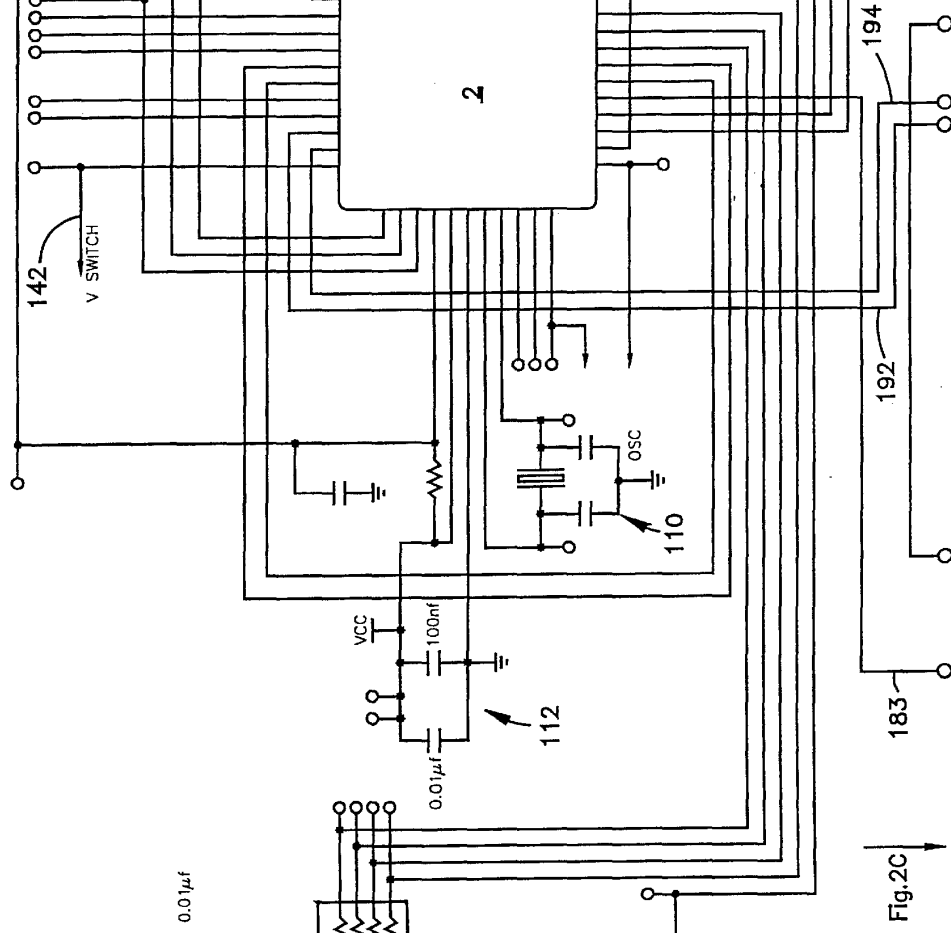
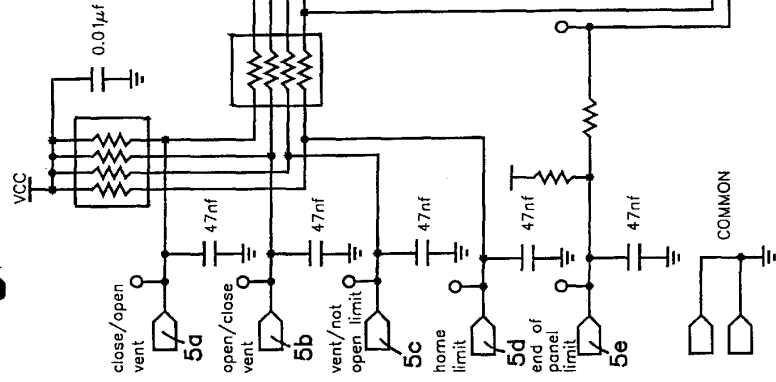


Fig.2C

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