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Boisvert et al.

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(54) COLLISION MONITORING SYSTEM

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G05D 3/00 (2006.01)

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

(56) References Cited

U.S. PATENT DOCUMENTS

4,328,540	A *	5/1982	Matsuoka et al.	700/56
4,344,252	A *	8/1982	Suzuki et al.	49/199
4,347,465	A *	8/1982	Goertler et al.	318/266
4,365,250	A *	12/1982	Matsuoka et al.	340/5.71
4,383,206	A *	5/1983	Matsuoka et al.	318/445
4,386,398	A *	5/1983	Matsuoka et al.	700/90
4,514,670	A	4/1985	Fassel et al.	
4,608,637	A	8/1986	Okuyama et al.	
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.	
4,855,653	A	8/1989	Lemirande	
4,870,333	A	9/1989	Itoh et al.	

(Continued)

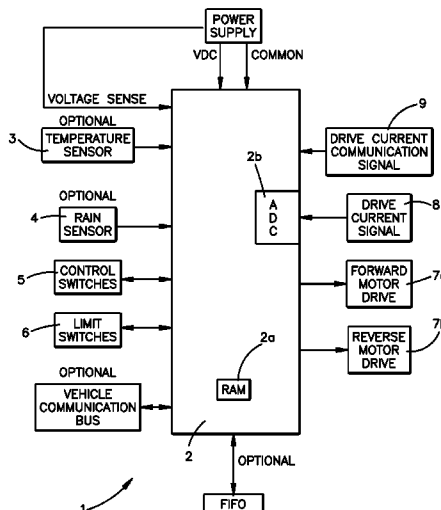
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(57) ABSTRACT

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.

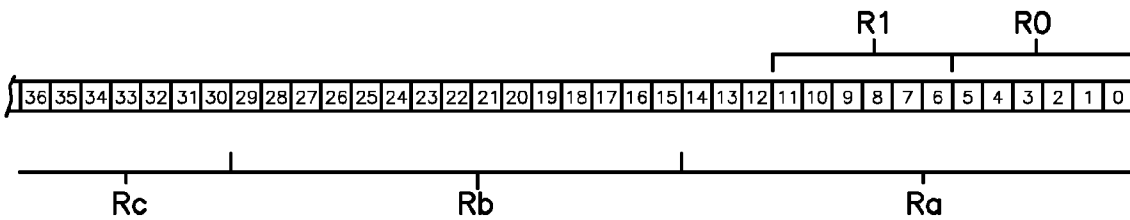
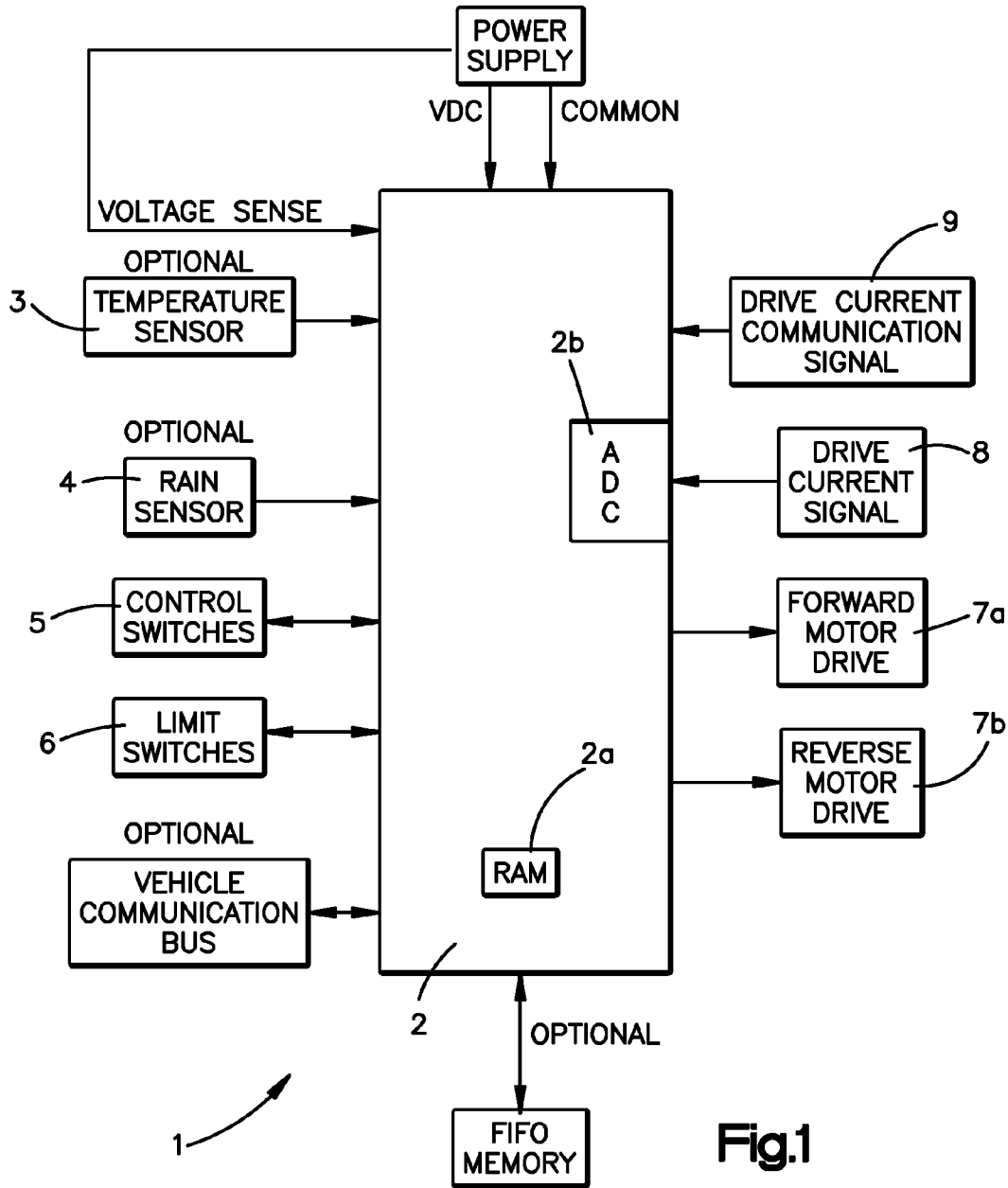
10 Claims, 9 Drawing Sheets

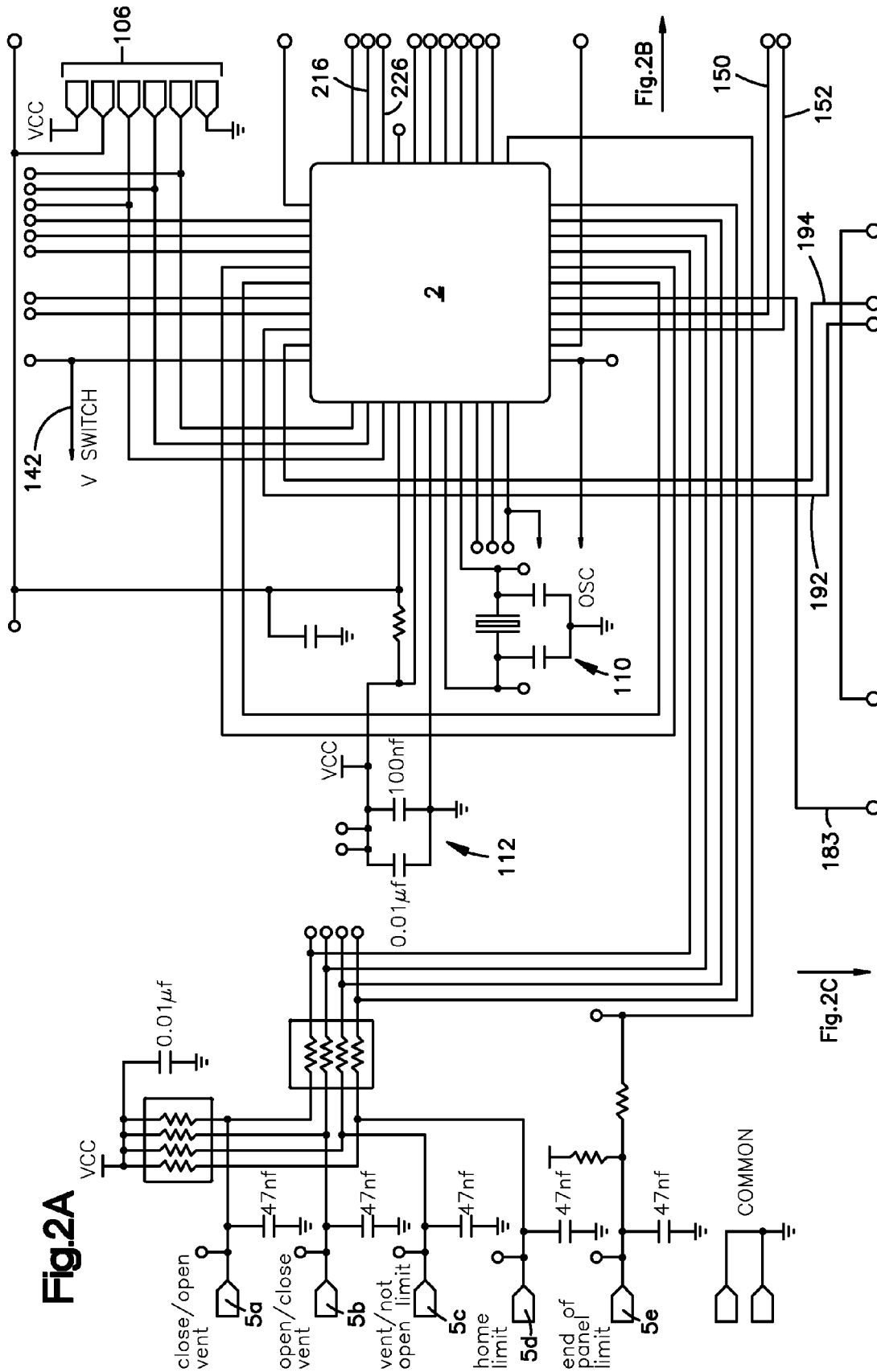


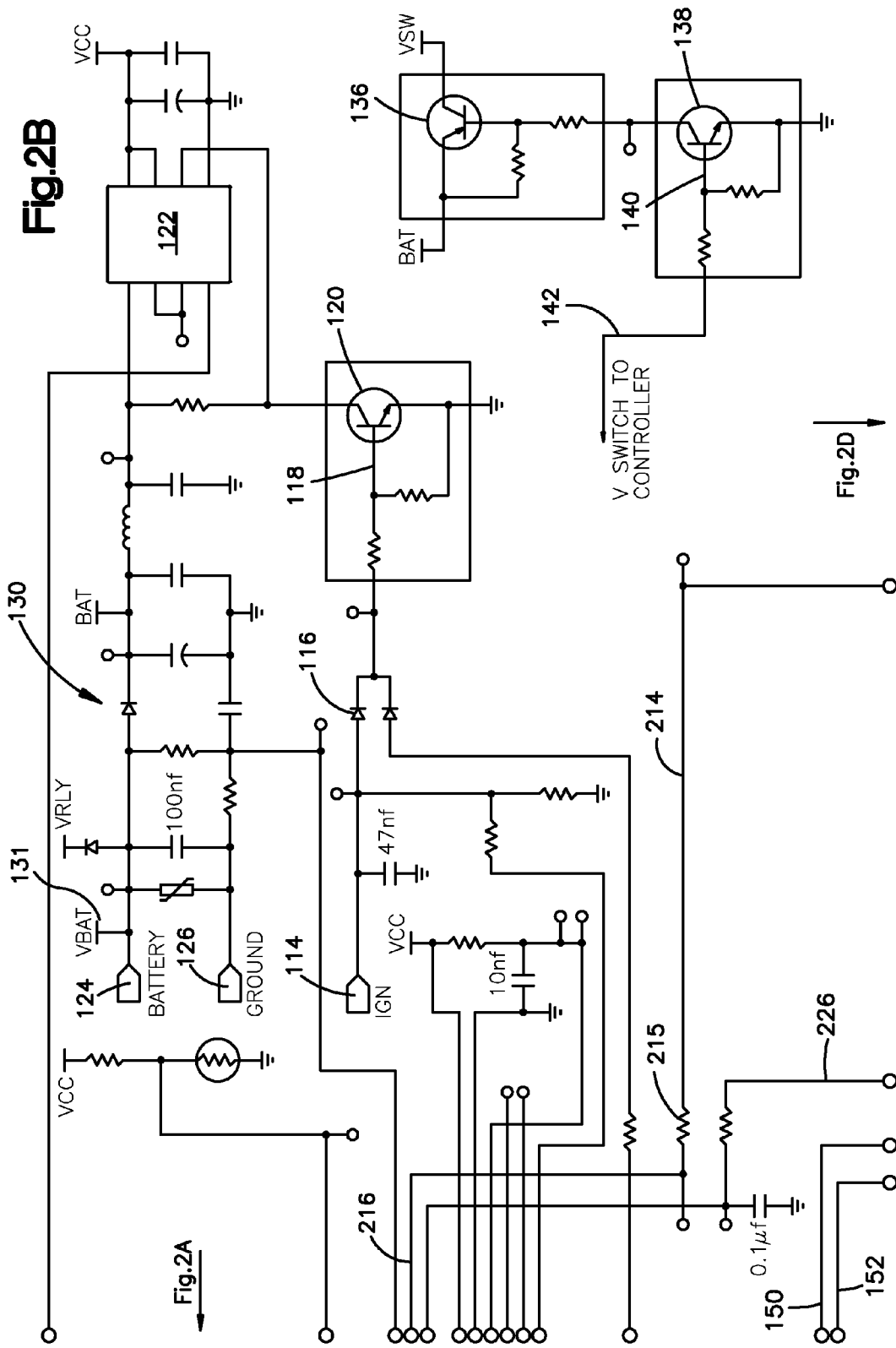
U.S. PATENT DOCUMENTS

4,980,618	A	12/1990	Milnes et al.		6,111,374	A *	8/2000	Fitzgibbon et al.	318/282
5,038,087	A	8/1991	Archer et al.		6,133,703	A *	10/2000	Fitzgibbon et al.	318/445
5,039,925	A	8/1991	Schap		6,169,379	B1 *	1/2001	Zhang et al.	318/280
5,069,000	A	12/1991	Zuckerman		6,172,475	B1 *	1/2001	Fitzgibbon et al.	318/266
5,081,586	A	1/1992	Barthel et al.		6,208,102	B1 *	3/2001	Kikuchi et al.	318/466
5,131,506	A	7/1992	Mizuno et al.		6,243,635	B1	6/2001	Swan et al.	
5,140,316	A	8/1992	DeLand et al.		6,246,196	B1 *	6/2001	Fitzgibbon et al.	318/430
5,162,711	A	11/1992	Heckler		6,274,947	B1 *	8/2001	Terashima	307/10.1
5,204,592	A	4/1993	Huyer		6,278,249	B1 *	8/2001	Fitzgibbon et al.	318/268
5,218,282	A	6/1993	Duhame		6,310,451	B1 *	10/2001	Fitzgibbon et al.	318/266
5,278,480	A	1/1994	Murray		6,377,009	B1	4/2002	Philipp	
5,334,876	A *	8/1994	Washeski et al.	307/10.1	6,400,112	B1 *	6/2002	Fitzgibbon et al.	318/445
5,399,950	A	3/1995	Lu et al.		6,404,158	B1 *	6/2002	Boisvert et al.	318/469
5,404,673	A *	4/1995	Takeda et al.	49/28	RE37,784	E *	7/2002	Fitzgibbon et al.	318/466
5,432,413	A	7/1995	Duke et al.		6,456,022	B1 *	9/2002	Fitzgibbon et al.	318/162
5,436,539	A	7/1995	Wrenbeck et al.		6,528,961	B1 *	3/2003	Fitzgibbon et al.	318/283
5,497,326	A	3/1996	Berland et al.		6,548,979	B2 *	4/2003	Boisvert et al.	318/469
5,525,876	A	6/1996	Filippi		6,566,828	B2 *	5/2003	Fitzgibbon et al.	318/283
5,530,329	A	6/1996	Shigemaatsu et al.		6,683,431	B2 *	1/2004	Fitzgibbon et al.	318/468
5,537,013	A	7/1996	Toyozumi et al.		6,806,665	B2 *	10/2004	Fitzgibbon et al.	318/282
5,539,290	A	7/1996	Lu et al.		7,164,246	B2 *	1/2007	Fitzgibbon et al.	318/264
5,585,702	A *	12/1996	Jackson et al.	318/266	7,548,037	B2 *	6/2009	Boisvert et al.	318/466
5,616,997	A *	4/1997	Jackson et al.	318/467	7,579,802	B2 *	8/2009	Boisvert et al.	318/466
5,701,063	A	12/1997	Cook et al.		2001/0024094	A1 *	9/2001	Fitzgibbon et al.	318/445
5,708,338	A *	1/1998	Cook et al.	318/466	2001/0024095	A1 *	9/2001	Fitzgibbon et al.	318/480
5,723,960	A	3/1998	Harada		2001/0038272	A1 *	11/2001	Fitzgibbon et al.	318/565
5,729,104	A	3/1998	Kamishima et al.		2002/0084759	A1 *	7/2002	Fitzgibbon et al.	318/283
5,734,245	A *	3/1998	Terashima et al.	318/453	2002/0093301	A1 *	7/2002	Itami et al.	318/452
5,832,664	A	11/1998	Tajima et al.		2002/0101210	A1 *	8/2002	Boisvert et al.	318/469
5,932,931	A *	8/1999	Tanaka et al.	307/10.1	2003/0025470	A1 *	2/2003	Fitzgibbon et al.	318/66
5,952,801	A *	9/1999	Boisvert et al.	318/468	2004/0056621	A1 *	3/2004	Fitzgibbon et al.	318/445
5,955,854	A	9/1999	Zhang et al.		2004/0183493	A1 *	9/2004	Boisvert et al.	318/469
5,969,637	A	10/1999	Doppelt et al.		2004/0195986	A1 *	10/2004	Fitzgibbon et al.	318/280
5,982,124	A	11/1999	Wang		2005/0140323	A1 *	6/2005	Fitzgibbon et al.	318/468
6,064,165	A *	5/2000	Boisvert et al.	318/465	2006/0186844	A1 *	8/2006	Fitzgibbon et al.	318/280
6,097,166	A *	8/2000	Fitzgibbon et al.	318/471	2009/0272035	A1 *	11/2009	Boisvert et al.	49/28
6,107,765	A *	8/2000	Fitzgibbon et al.	318/266					

* cited by examiner







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