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Beasley et al.

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[54] **SYSTEM AND METHOD FOR REMOTE PATCHING OF OPERATING CODE LOCATED IN A MOBILE UNIT**

[75] Inventors: **Dale E. Beasley**, Flower Mound; **William C. Kennedy, III**, Dallas; **Kenneth R. Westerlage**, Fort Worth, all of Tex.

[73] Assignee: **Highwaymaster Communications, Inc.**, Dallas, Tex.

[21] Appl. No.: **422,075**

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[51] **Int. Cl.**[6] **G06F 13/00**

[52] **U.S. Cl.** ..... **364/514 R**

[58] **Field of Search** ..... 364/514 R; 395/600, 395/700, 200.09; 379/56, 58, 59, 95; 455/31.1, 33.1, 54.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

Re. 34,034	8/1992	O'Sullivan	379/59
3,518,674	6/1970	Moorehead et al.	343/112
3,680,121	7/1972	Anderson et al.	343/112 TC
3,714,650	1/1973	Fuller et al.	343/6.5 LC
3,757,290	9/1973	Ross et al.	340/23

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

3767589	2/1993	Australia	G01S 5/02
0242099	10/1987	European Pat. Off.	G01S 5/14
0290725	11/1988	European Pat. Off.	H04Q 7/04
0367935	5/1990	European Pat. Off.	H04Q 7/04
3516357	11/1986	Germany	H04B 7/26
0161941	9/1984	Japan	H04B 7/26
0175537	7/1988	Japan	H04B 7/26
0219238	9/1988	Japan	H04B 7/26
0226226	9/1989	Japan	H04B 7/26
2193861	2/1988	United Kingdom	H04Q 7/04
2221113	1/1993	United Kingdom	G01S 5/00
WO8904035	5/1989	WIPO	G10L 5/06
WO8912835	12/1989	WIPO	G01S 5/02

OTHER PUBLICATIONS

"TRIMPACK" Brochure, TrimbleNavigation, date unknown, 1 page.

Gary D. Ott, "Vehicle Location in Cellular Mobile Radio Systems," *IEEE*, vol. VT-26, No. 1, Feb., 1977, pp. 43–46.

James C. Reynolds, et al., "GPS–Based Vessel Position Monitoring and Display System," IEEE, 1990, pp. 601–607.

R. DeSadaba, "Personal Communications in the Intelligent Network," *British Telecommunications Engineering*, vol. 9, Aug., 1990, pp. 80–83.

"GPS NAVSTAR Global Positioning System User's Overview—YEE–82–009D," *Navstar Global Positioning System Joint Program Office*, Mar., 1991, pp. 1–164.

"U.S. Coast Guard Differential GPS" Brochure, *U.S. Department of Transportation, United States Coast Guard*, May, 1993.

"GPS Facts & Figures" Brochure, *U.S. Department of Transportation, United States Coast Guard*, May, 1993.

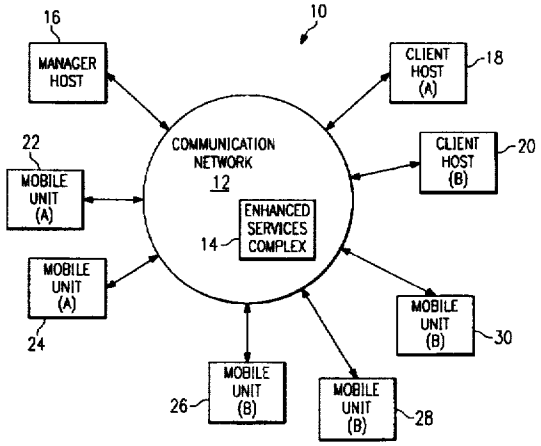
(List continued on next page.)

Primary Examiner—Hassan Kizou
Assistant Examiner—Kwang Bin Yao
Attorney, Agent, or Firm—Baker & Botts, L.L.P.

[57] **ABSTRACT**

A system (**10**) for remote patching or updating of operating code located in a mobile unit (**22**, **24**, **26**, **28**, or **30**) is provided. The system (**10**) includes a manager host (**16**) and a mobile unit (**22**, **24**, **26**, **28**, or **30**). The manager host (**16**) is operable to initiate transmission through a communication network (**12**) of at least one discrete patch message defining at least one patch. The mobile unit (**22**, **24**, **26**, **28**, or **30**) is operable to receive the at least one patch message. The mobile unit (**22**, **24**, **26**, **28**, or **30**) is also operable to create patched operating code by merging the patch with current operating code located in the mobile unit (**22**, **24**, **26**, **28**, or **30**) and to switch execution to the patched operating code. The mobile unit (**22**, **24**, **26**, **28**, or **30**) can also receive at least one download message defining new operating code to replace the current operating code.

42 Claims, 5 Drawing Sheets



U.S. PATENT DOCUMENTS

3,789,409	1/1974	Easton	343/112 R
3,848,254	11/1974	Drebinger et al.	343/112 R
3,906,166	9/1975	Cooper et al.	179/41 A
4,053,893	10/1977	Boyer	343/112 PT
4,083,003	4/1978	Haemming	325/6
4,107,689	8/1978	Jellinek	343/23
4,152,693	5/1979	Ashworth, Jr.	340/24
4,177,466	12/1979	Reagan	343/112 TC
4,222,052	9/1980	Dunn	343/112 R
4,428,052	1/1984	Robinson et al.	364/436
4,428,057	1/1984	Setliff et al.	364/521
4,435,711	3/1984	Ho et al.	343/389
4,445,118	4/1984	Taylor et al.	343/357
4,547,778	10/1985	Hinkle et al.	343/456
4,590,569	5/1986	Rogoff et al.	364/452
4,644,351	2/1987	Zabarsky et al.	340/825.44
4,651,157	3/1987	Gray et al.	342/457
4,654,879	3/1987	Goldman et al.	455/33
4,660,037	4/1987	Nakamura	340/990
4,670,905	6/1987	Sandvos et al.	455/33
4,688,244	8/1987	Hannon et al.	379/58
4,700,374	10/1987	Bini	379/60
4,734,928	3/1988	Weiner et al.	379/59
4,737,978	4/1988	Burke et al.	379/60
4,740,792	4/1988	Sagey et al.	342/457
4,742,357	5/1988	Rackley	342/457
4,750,197	6/1988	Denekamp et al.	379/58
4,754,465	6/1988	Trimble	375/1
4,774,670	9/1988	Palmieri	364/446
4,775,999	10/1988	Williams	379/59
4,776,003	10/1988	Harris	379/91
4,788,637	11/1988	Tamaru	364/200
4,791,571	12/1988	Takahashi et al.	364/436
4,791,572	12/1988	Green, III et al.	364/449
4,796,189	1/1989	Nakayama et al.	364/449
4,797,948	1/1989	Milliorn et al.	455/54
4,799,162	1/1989	Shinkawa et al.	364/436
4,804,937	2/1989	Barbiaux et al.	340/52 F
4,809,005	2/1989	Counselman, III	342/352
4,819,174	4/1989	Furuno et al.	364/444
4,833,477	5/1989	Tendler	342/389
4,833,701	5/1989	Comroe et al.	379/60
4,833,702	5/1989	Shitara et al.	379/60
4,843,575	6/1989	Crane	364/550
4,860,341	8/1989	D'Avello et al.	379/91
4,866,762	9/1989	Pintar	379/200
4,876,738	10/1989	Selby	455/33
4,884,208	11/1989	Marinelli et al.	364/460
4,891,650	1/1990	Sheffer	342/457
4,891,761	1/1990	Gray et al.	364/452
4,897,642	1/1990	DiLullo et al.	340/825.06
4,901,340	2/1990	Parker et al.	379/60
4,905,270	2/1990	Ono	379/58
4,907,290	3/1990	Crompton	455/56
4,908,629	3/1990	Apsell et al.	342/457
4,912,756	3/1990	Hop	379/60
4,914,686	4/1990	Hager, III et al.	379/61
4,945,570	7/1990	Gerson et al.	381/110
4,953,198	8/1990	Daly et al.	379/61
4,963,865	10/1990	Ichikawa et al.	340/995
4,993,062	2/1991	Dula et al.	379/88
4,998,291	3/1991	Marui et al.	455/89
5,003,317	3/1991	Gray et al.	342/457
5,008,814	4/1991	Mathur	364/200
5,014,206	5/1991	Scribner et al.	364/449
5,019,963	5/1991	Alderson et al.	364/200
5,025,253	6/1991	DiLullo et al.	340/825.06
5,032,845	7/1991	Velasco	342/457
5,043,736	8/1991	Darnell et al.	342/357
5,045,861	9/1991	Duffett-Smith	342/457
5,046,082	9/1991	Zicker et al.	379/59
5,055,851	10/1991	Sheffer	342/457
5,058,201	10/1991	Ishii et al.	455/33
5,068,656	11/1991	Sutherland	340/989
5,090,050	2/1992	Heffernan	379/60
5,101,500	3/1992	Marui	455/33
5,119,102	6/1992	Barnard	342/357
5,121,126	6/1992	Clagett	342/419
5,121,325	6/1992	DeJonge	364/442
5,131,019	7/1992	Sheffer et al.	379/39
5,131,020	7/1992	Liebesny et al.	379/59
5,142,281	8/1992	Park	340/991
5,142,654	8/1992	Sonberg et al.	379/59
5,155,490	10/1992	Spradley, Jr. et al.	342/357
5,155,847	10/1992	Kirouac et al.	395/600
5,159,625	10/1992	Zicker	379/59
5,166,694	11/1992	Russell et al.	342/457
5,172,321	12/1992	Ghaem et al.	364/444
5,208,756	5/1993	Song	364/449
5,223,844	6/1993	Mansell et al.	342/357
5,225,842	7/1993	Brown et al.	342/357
5,235,633	8/1993	Dennison et al.	379/60
5,237,612	8/1993	Raith	380/23
5,243,529	9/1993	Kashiwazaki	364/449
5,247,564	9/1993	Zicker	379/40
5,252,982	10/1993	Frei	342/357
5,261,118	11/1993	Vanderspool, II et al.	455/51.2
5,270,936	12/1993	Fukushima et al.	364/444
5,276,729	1/1994	Higuchi et al.	379/58
5,293,163	3/1994	Kakihara et al.	340/995
5,297,191	3/1994	Gerszberg	379/59
5,297,192	3/1994	Gerszberg	379/59
5,299,132	3/1994	Wortham	364/460
5,311,194	5/1994	Brown	342/357
5,323,322	6/1994	Mueller et al.	364/449
5,365,516	11/1994	Jandrell	370/18
5,371,692	12/1994	Draeger et al.	364/580
5,392,458	2/1995	Sasuta et al.	455/54.1
5,396,540	3/1995	Gooch	379/59
5,430,877	7/1995	Naylor	395/700
5,495,610	2/1996	Shing et al.	395/600

OTHER PUBLICATIONS

D. H. Alsip, J. M. Butler, and J. T. Radice, "Implementation of the U.S. Coast Guard's Differential GPS Navigation Service," *U.S. Coast Guard Headquarters, Office of Navigation Safety and Waterway Services, Radionavigation Division*, Jun. 28, 1993, pp. 1–10.

"Motorola GPS Technical Reference Manual," *Motorola*, Oct., 1993, Manual Cover, Title Page, and pp. 4–109.

Don Burtis, "CDPD—A Bandwidth Optimization Technique for Cellular Telephones," *Computer Design's OEM Integration*, May, 1994, pp. 19–20.

"U.S. Coast Guard Bulletin Board System File 'FRP–DGPS,'" *U.S. Coast Guard*, Date Unknown, pp. 1–6.

Gene L. Schlechte, LCDR, "U.S. Coast Guard Bulletin Board System Document 'DESIGN.TXT'—Design Process for the United States Coast Guard's Differential GPS Navigation Service," *U.S. Coast Guard, U.S. Coast Guard Omega Navigation System Center*, Date Unknown, pp. 1–21.

"Appendix B, The 1991 Radionavigation User Conference," *Department of Transportation*, Date Unknown, pp. 1–2.

Kirk Ladendorf, "First in Flight—Using State–Of–The–Art Technology, Austin–Based Arrowsmith Technologies Establishes Itself As A Major Player in Nascent Technology–Supplier Market", *Austin America–Statesman*, Jan. 30, 1995, 3 pages.

FIG. 1

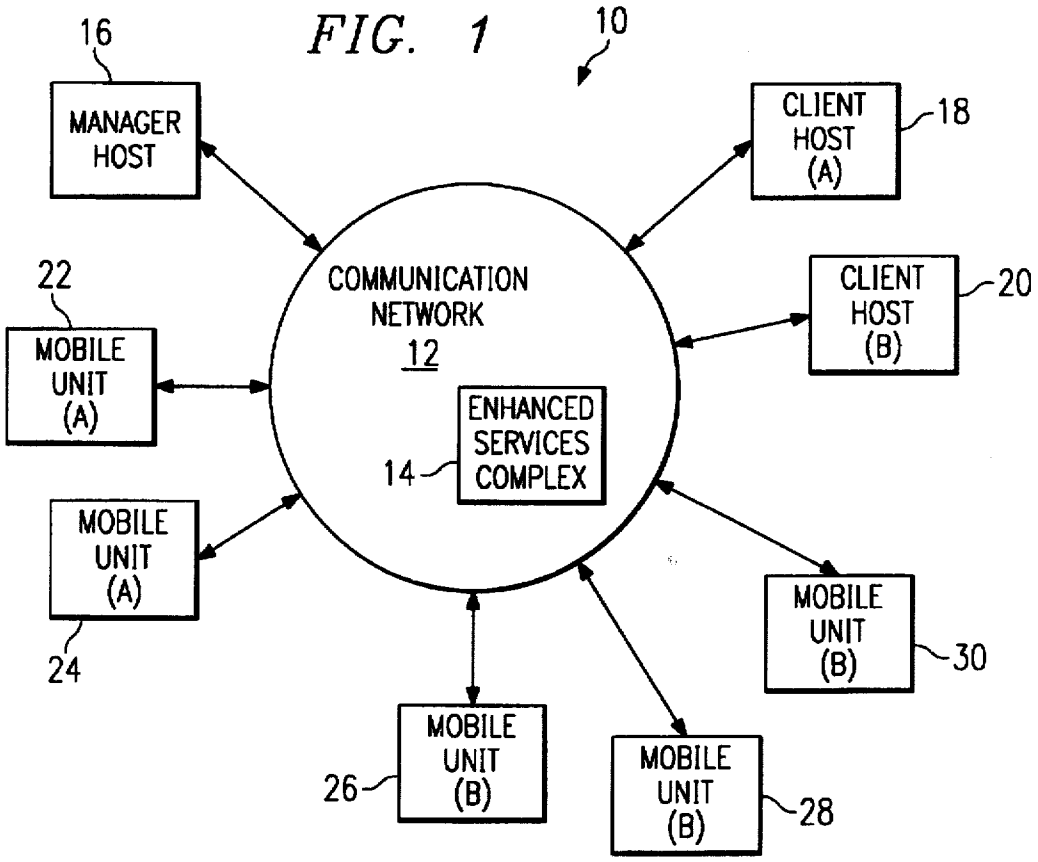


FIG. 2

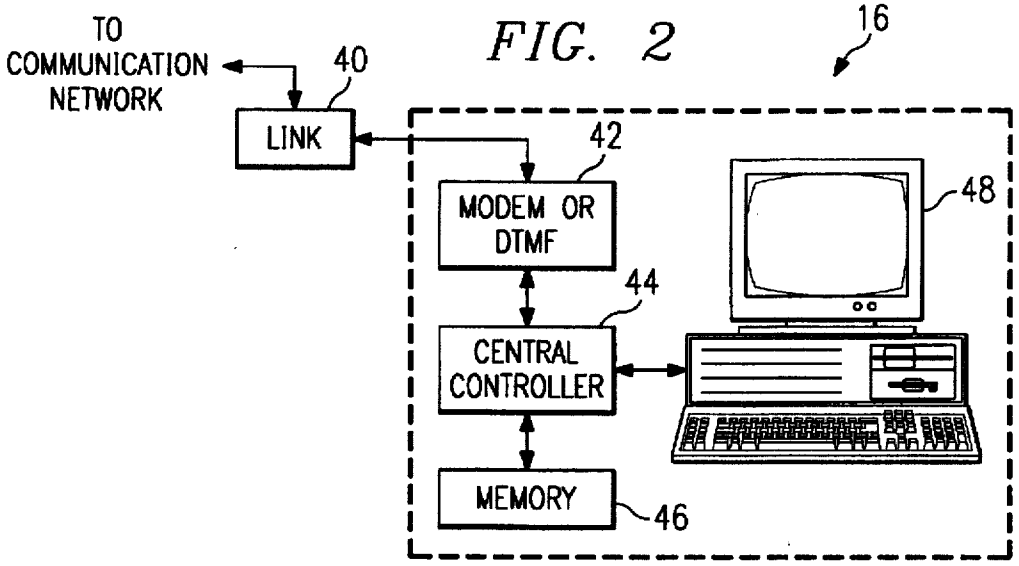


FIG. 3

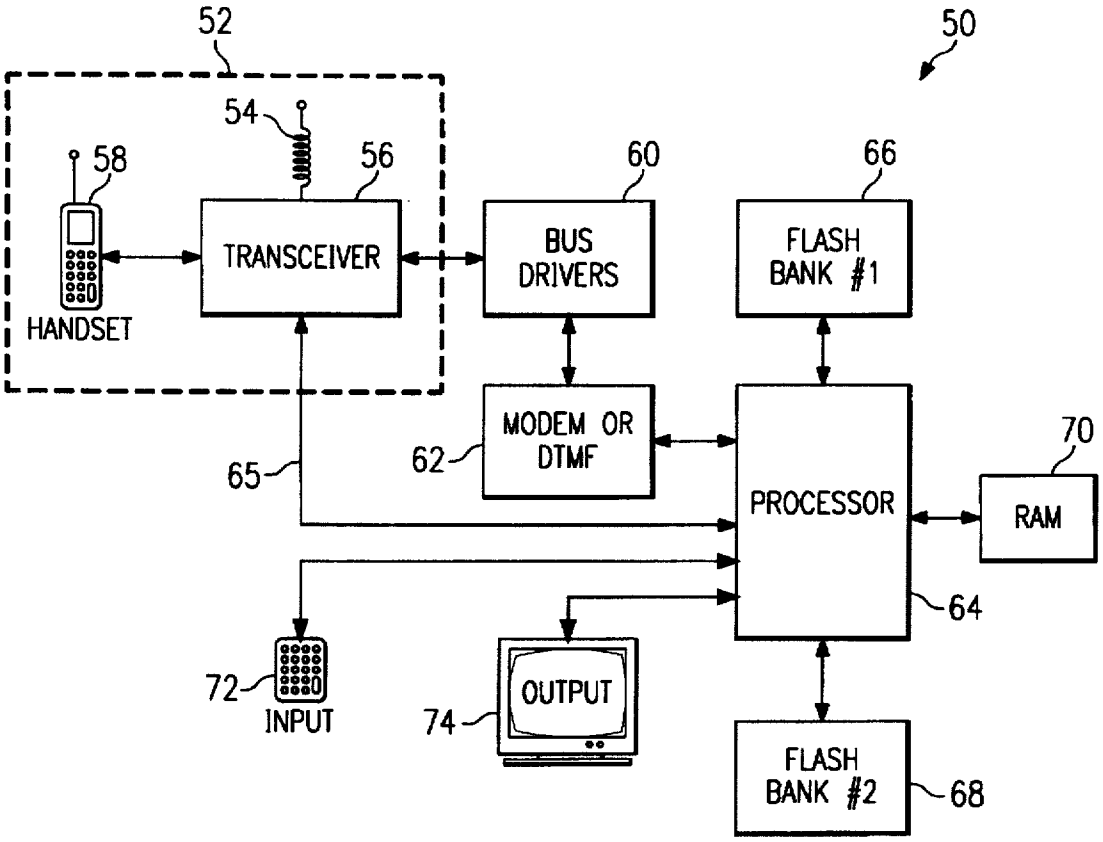


FIG. 4

MESSAGE	TYPE	MESSAGE FORMAT							
NEW PATCH FILE MESSAGE	0	MESSAGE TYPE (1 BYTE)	PATCH FILE ID (1 BYTE)	SOFTWARE VERSION (8 BYTES)	NUMBER OF PATCHES (1 BYTE)	MEMORY ADDRESS TO BE MODIFIED BY PATCH (4 BYTES)	STARTING ADDRESS IN PATCH MEMORY SPACE (4 BYTES)	NUMBER OF BYTES OF DATA (1 BYTE)	PATCH DATA (1-232 BYTES)
APPEND PATCH MESSAGE	1	MESSAGE TYPE (1 BYTE)	PATCH FILE ID (1 BYTES)	MEMORY ADDRESS TO BE MODIFIED BY PATCH (4 BYTES)		STARTING ADDRESS IN PATCH MEMORY SPACE (4 BYTES)	NUMBER OF BYTES OF DATA (1 BYTE)	PATCH DATA (1-241 BYTES)	
APPEND DATA MESSAGE	2	MESSAGE TYPE (1 BYTE)	PATCH FILE ID (1 BYTE)	PATCH EXTENSION DATA (1-250 BYTES)					
DELETE UNINCORPORATED PATCHES MESSAGE	3	MESSAGE TYPE (1 BYTE)							
PREPARE FOR DOWNLOAD MESSAGE	4	MESSAGE TYPE (1 BYTE)							
DOWNLOAD MESSAGE	5	MESSAGE TYPE (1 BYTE)	RECORD TYPE (2 BYTES)	RECORD LENGTH (1 BYTE)	STARTING ADDRESS (2-4 BYTES)	PROGRAM DATA (1-100 BYTES)			RECORD CHECKSUM (1 BYTE)
PROGRAM CHECKSUM MESSAGE	6	MESSAGE TYPE (1 BYTE)	PROGRAM CHECKSUM (2 BYTES)						

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