

EXHIBIT 8



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

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(54) **METHOD AND SYSTEM FOR DOWN-CONVERTING AN ELECTROMAGNETIC SIGNAL, AND TRANSFORMS FOR SAME, AND APERTURE RELATIONSHIPS**

(58) **Field of Classification Search**
 USPC 455/413, 113, 118, 130, 131, 182.1, 455/190.1, 191.1, 313, 323, 343, 350; 327/113; 375/130, 142, 143, 150, 152, 375/316, 343
 See application file for complete search history.

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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.

This patent is subject to a terminal disclaimer.

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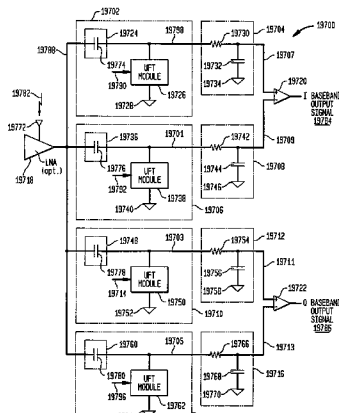
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 CPC **H04L 27/12** (2013.01); **H03C 1/62** (2013.01); **H03D 7/00** (2013.01); **H04B 1/0025** (2013.01); **H04B 1/28** (2013.01); **H04B 7/12** (2013.01); **H04L 27/00** (2013.01)

(57) **ABSTRACT**
 Methods, systems, and apparatuses, and combinations and sub-combinations thereof, for down-converting an electromagnetic (EM) signal are described herein. Briefly stated, in embodiments the invention operates by receiving an EM signal and recursively operating on approximate half cycles (1/2, 1 1/2, 2 1/2, etc) of the carrier signal. The recursive operations can be performed at a sub-harmonic rate of the carrier signal. The invention accumulates the results of the recursive operations and uses the accumulated results to form a down-converted signal. In an embodiment, the EM signal is down-converted to an intermediate frequency (IF) signal. In another embodiment, the EM signal is down-converted to a baseband information signal. In another embodiment, the EM signal is a frequency modulated (FM) signal, which is down-converted to a non-FM signal, such as a phase modulated (PM) signal or an amplitude modulated (AM) signal.

36 Claims, 284 Drawing Sheets



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Related U.S. Application Data

continuation of application No. 12/976,839, filed on Dec. 22, 2010, now Pat. No. 8,340,618, which is a continuation of application No. 12/349,802, filed on Jan. 7, 2009, now Pat. No. 7,865,177, which is a division of application No. 09/550,644, filed on Apr. 14, 2000, now Pat. No. 7,515,896, which is a continuation-in-part of application No. 09/293,342, filed on Apr. 16, 1999, now Pat. No. 6,687,493, which is a continuation-in-part of application No. 09/176,022, filed on Oct. 21, 1998, now Pat. No. 6,061,551.

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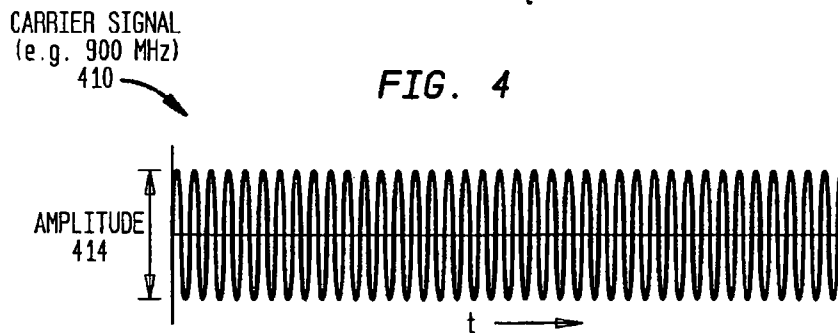
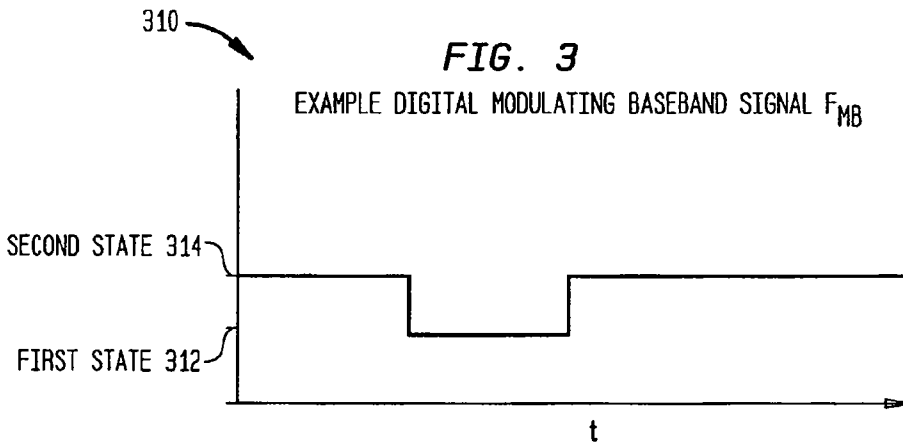
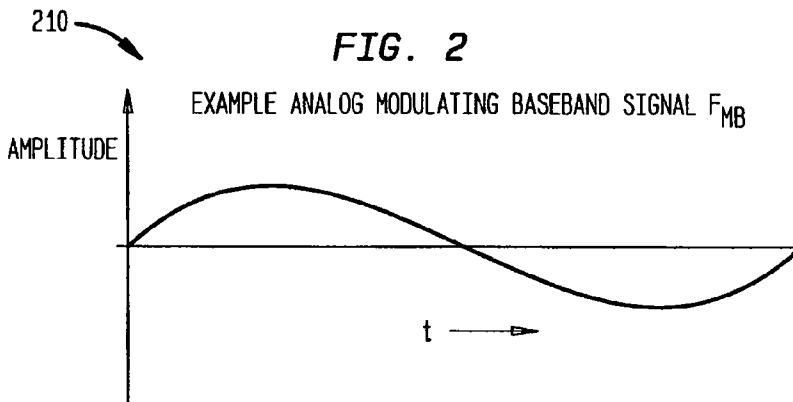
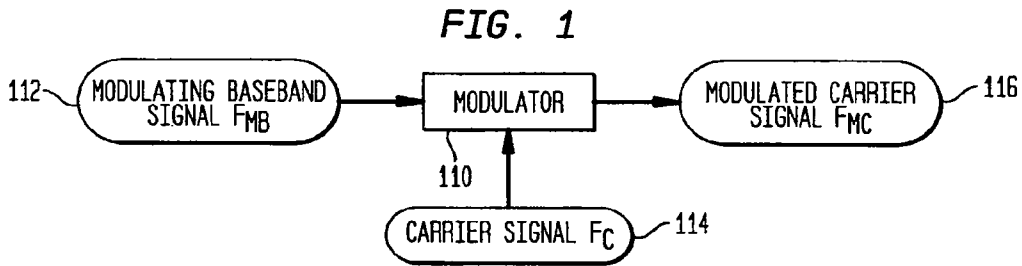
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