EXHIBIT 10

US009444673B2

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

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(54) **METHODS AND SYSTEMS FOR DOWN-CONVERTING A SIGNAL USING A COMPLEMENTARY TRANSISTOR STRUCTURE**

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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 30 days.

This patent is subject to a terminal disclaimer.

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  See application file for complete search history.

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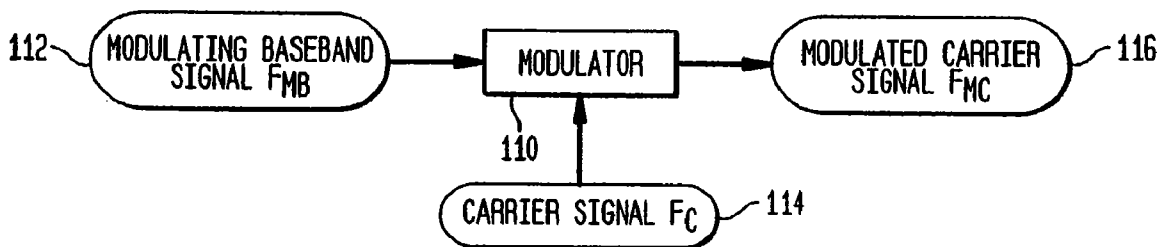
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(57)   **ABSTRACT**

Methods, systems, and apparatuses for down-converting a modulate carrier signal to a demodulated baseband signal by sampling the energy of the carrier signal are described herein. Briefly stated, such methods systems, and apparatuses operate by receiving a modulated carrier signal and using pulses with apertures to control a switch so as to (a) transfer energy from the modulated carrier signal and accumulate the transferred energy in a capacitor when the switch is closed during the apertures of the pulses and (b) discharge some of the previously accumulated energy from the capacitor into load circuitry at least when the switch is open. The demodulated baseband signal is generated from (i) accumulating energy transferred to the capacitor each time the switch is closed during the apertures of the pulses, and (ii) discharging some of the previously accumulated energy into the load circuitry each time the switch is opened.

28 Claims, 178 Drawing Sheets

Related U.S. Application Data

continuation of application No. 13/428,816, filed on Mar. 23, 2012, now Pat. No. 8,594,607, which is a continuation of application No. 13/040,570, filed on Mar. 4, 2011, now Pat. No. 8,190,116, which is a continuation of application No. 12/059,333, filed on Mar. 31, 2008, now Pat. No. 7,937,059, which is a continuation of application No. 11/355,167, filed on Feb. 16, 2006, now Pat. No. 7,376,410, which is a division of application No. 11/020,547, filed on Dec. 27, 2004, now Pat. No. 7,194,246, which is a continuation of application No. 10/330,219, filed on Dec. 30, 2002, now Pat. No. 6,836,650, which is a continuation of application No. 09/293,095, filed on Apr. 16, 1999, now Pat. No. 6,580,902, 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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H04B 1/28	(2006.01)
H04B 7/12	(2006.01)
H04L 27/00	(2006.01)
H04L 27/12	(2006.01)
H04L 27/14	(2006.01)
H04L 27/148	(2006.01)
H04L 27/156	(2006.01)
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H04L 25/08	(2006.01)
H04L 27/06	(2006.01)
H04L 27/26	(2006.01)

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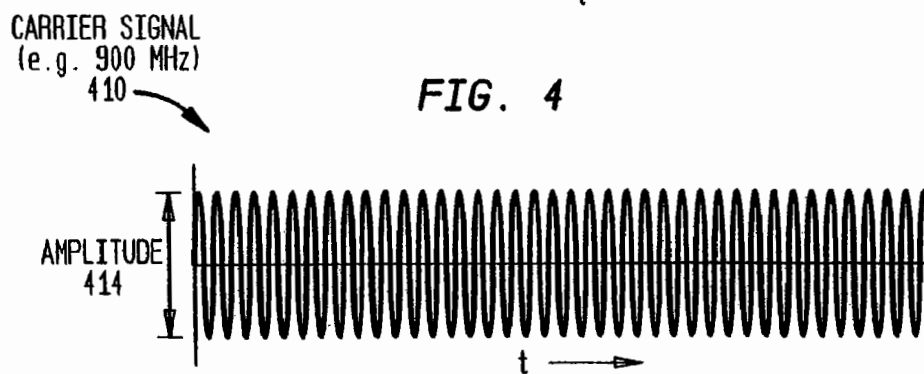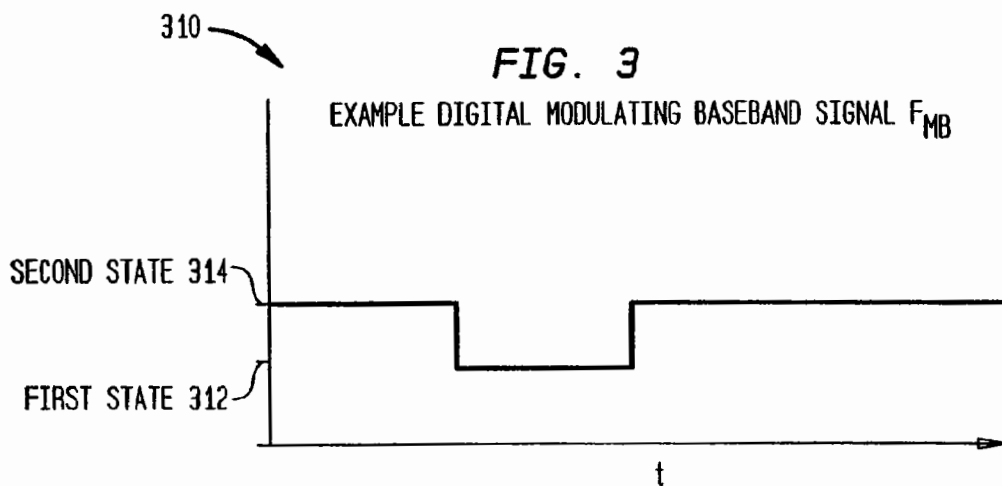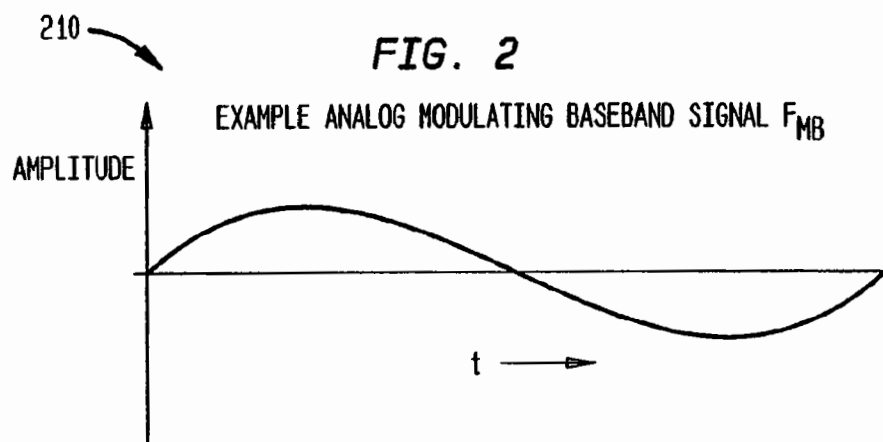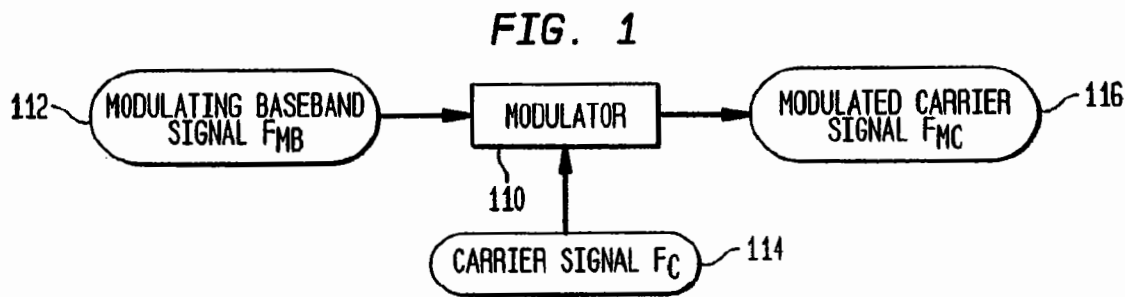Tanenbaum, "Computer Networks", Prentice Hall, Mar. 1996, 35 pages.
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FIG. 1

112 — (MODULATING BASEBAND SIGNAL F_{MB}) → [MODULATOR] → (MODULATED CARRIER SIGNAL F_{MC}) — 116

110

(CARRIER SIGNAL F_C) — 114

210 —

FIG. 2

EXAMPLE ANALOG MODULATING BASEBAND SIGNAL F_{MB}

AMPLITUDE

t —→

310 —

FIG. 3

EXAMPLE DIGITAL MODULATING BASEBAND SIGNAL F_{MB}

SECOND STATE 314

FIRST STATE 312

t

FIG. 4

CARRIER SIGNAL (e.g. 900 MHz)
410 —

AMPLITUDE 414

t —→

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