

EXHIBIT 6



US008588725B2

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

(10) **Patent No.:** **US 8,588,725 B2**
(45) **Date of Patent:** ***Nov. 19, 2013**

(54) **APPARATUS, SYSTEM, AND METHOD FOR DOWN CONVERTING AND UP-CONVERTING ELECTROMAGNETIC SIGNALS**

(75) Inventors: **David F. Sorrells**, Middleburg, FL (US); **Michael J. Bultman**, Jacksonville, FL (US); **Robert W. Cook**, Switzerland, FL (US); **Richard C. Looke**, Jacksonville, FL (US); **Charley D. Moses, Jr.**, Jacksonville, FL (US); **Gregory S. Rawlins**, Heathrow, FL (US); **Michael W. Rawlins**, Lake Mary, FL (US)

(73) Assignee: **ParkerVision, Inc.**, Jacksonville, FL (US)

(*) 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.

(21) Appl. No.: **13/618,621**

(22) Filed: **Sep. 14, 2012**

(65) **Prior Publication Data**

US 2013/0109338 A1 May 2, 2013

Related U.S. Application Data

(60) Continuation of application No. 12/876,356, filed on Sep. 7, 2010, now Pat. No. 8,295,800, which is a continuation of application No. 10/961,342, filed on Oct. 12, 2004, now Pat. No. 7,822,401, which is a division of application No. 09/855,851, filed on May 16, 2001, now Pat. No. 7,010,286, which is a continuation-in-part of application No. 09/550,644, filed on Apr. 14, 2000, now Pat. No. 7,515,896.

(60) Provisional application No. 60/204,796, filed on May 16, 2000, provisional application No. 60/213,363, filed on Jun. 21, 2000, provisional application No. 60/272,043, filed on Mar. 1, 2001.

(51) **Int. Cl.**
H04B 1/26 (2006.01)
H04B 15/00 (2006.01)

(52) **U.S. Cl.**
USPC **455/313**; 455/323; 455/334; 455/318

(58) **Field of Classification Search**
USPC 455/313, 323, 334, 318, 316, 319, 325, 455/333, 339, 340-341, 130, 197.2, 203, 455/262, 265, 284, 287, 326; 327/356-360
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

5,822,373 A 10/1998 Addy
5,949,471 A 9/1999 Yuen et al.

(Continued)
OTHER PUBLICATIONS

Notice of Allowance dated Oct. 22, 2012 cited in U.S. Appl. No. 12/976,839, filed Dec. 22, 2010.

(Continued)

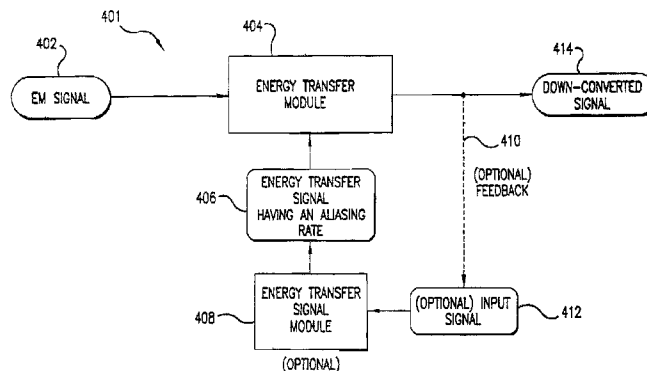
Primary Examiner — Pablo Tran

(74) *Attorney, Agent, or Firm* — Workman Nydegger

(57) **ABSTRACT**

Methods, systems, and apparatuses for down-converting and up-converting an electromagnetic signal. In embodiments, the invention operates by receiving an electromagnetic signal and recursively operating on approximate half cycles of a 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 embodiments, up-conversion is accomplished by controlling a switch with an oscillating signal, the frequency of the oscillating signal being selected as a sub-harmonic of the desired output frequency. When the invention is being used in the frequency modulation or phase modulation implementations, the oscillating signal is modulated by an information signal before it causes the switch to gate a bias signal. The output of the switch is filtered, and the desired harmonic is output.

41 Claims, 94 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

6,240,100	B1	5/2001	Riordan et al.	
6,459,889	B1	10/2002	Ruelke	
7,321,640	B2*	1/2008	Milne et al.	375/330
7,522,900	B2	4/2009	Allott et al.	
7,536,331	B1	5/2009	Pellegrino et al.	
7,630,700	B2*	12/2009	Vaisanen	455/313
7,668,527	B2*	2/2010	Vaisanen	455/323
7,844,233	B2*	11/2010	Vaisanen	455/127.1
8,223,898	B2	7/2012	Sorrells et al.	
8,224,281	B2	7/2012	Sorrells et al.	
8,229,023	B2	7/2012	Sorrells et al.	
8,233,855	B2	7/2012	Sorrells et al.	
8,295,406	B1	10/2012	Sorrells et al.	
8,295,800	B2	10/2012	Sorrells et al.	
8,340,618	B2	12/2012	Sorrells et al.	
8,406,724	B2	3/2013	Sorrells et al.	
8,407,061	B2*	3/2013	Sorrells	705/1.1
8,446,994	B2	5/2013	Rawlins et al.	
2012/0114078	A1	5/2012	Sorrells et al.	
2012/0178398	A1	7/2012	Sorrells et al.	
2012/0220254	A1*	8/2012	Sorrells et al.	455/319
2012/0243643	A1*	9/2012	Sorrells et al.	375/340

OTHER PUBLICATIONS

Notice of Allowanced dated Jul. 26, 2012 cited in U.S. Appl. No. 12/876,356, filed Sep. 7, 2010.

Office Action dated Jun. 11, 2012 cited in U.S. Appl. No. 13/421,635, filed Mar. 15, 2012.

Office Action dated Aug. 8, 2012 cited in U.S. Appl. No. 12/634,233, filed Dec. 9, 2009.

Office Action dated Aug. 15, 2012 cited in U.S. Appl. No. 12/118,111, filed May 9, 2008.

U.S. Appl. No. 13/428,816, date filed, Dec. 17, 2012, Office Action.

U.S. Appl. No. 13/323,550, date filed, Dec. 21, 2012, Office Action.

U.S. Appl. No. 13/421,635, date filed, Jan. 4, 2013, Notice of Allowance.

U.S. Appl. No. 12/118,111, date filed, Jan. 7, 2013, Notice of Allowance.

Notice of Allowance dated Feb. 22, 2013 cited in U.S. Appl. No. 12/634,233, filed Dec. 9, 2009.

Office Action dated May 29, 2013 in U.S. Appl. No. 13/550,492, filed Mar. 14, 2013.

Final Office Action dated Jun. 28, 2013 in U.S. Appl. No. 13/323,550, filed Dec. 12, 2011.

Notice of Allowance dated Aug. 2, 2013 in U.S. Appl. No. 13/618,621, filed Sep. 14, 2012.

Office Action dated Aug. 5, 2013 in U.S. Appl. No. 13/549,213, filed Mar. 23, 2012.

Notice of Allowance dated Aug. 14, 2013 in U.S. Appl. No. 13/323,550, filed Dec. 12, 2011.

Office Action dated Aug. 14, 2013 in U.S. Appl. No. 13/550,501, filed Jul. 16, 2012.

* cited by examiner

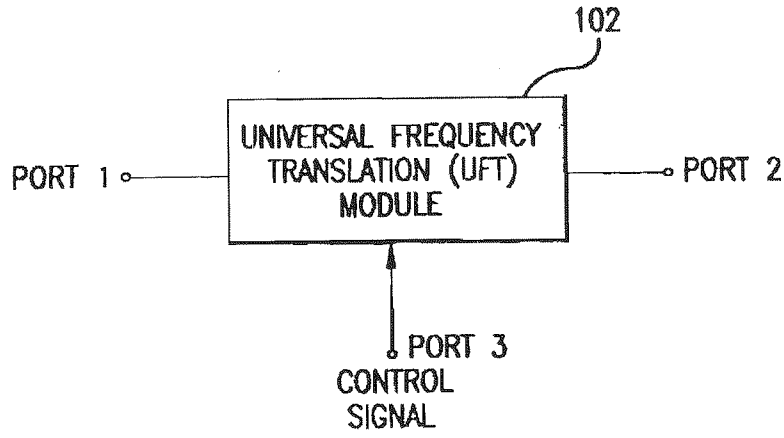


FIG. 1A

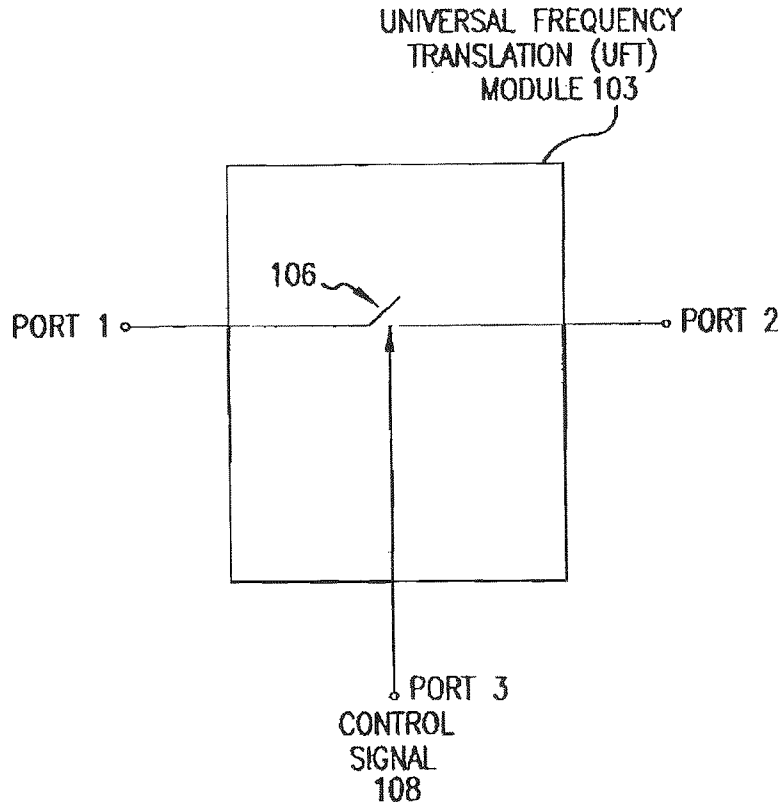


FIG. 1B

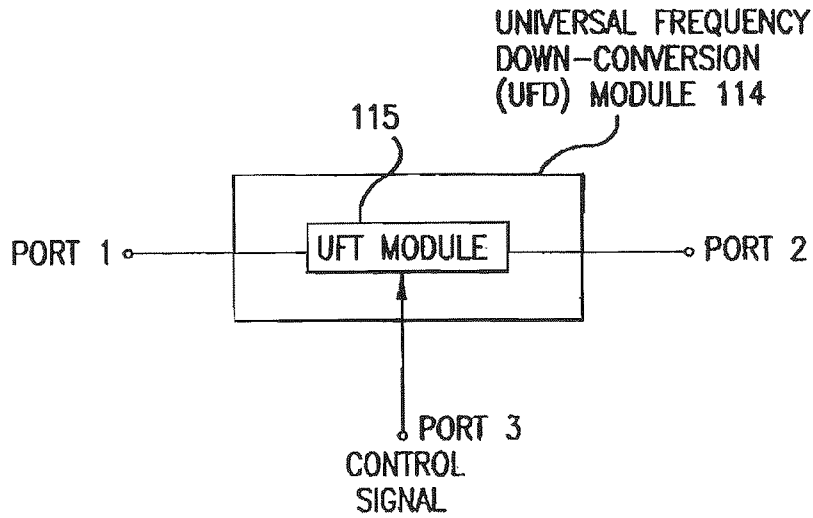


FIG. 1C

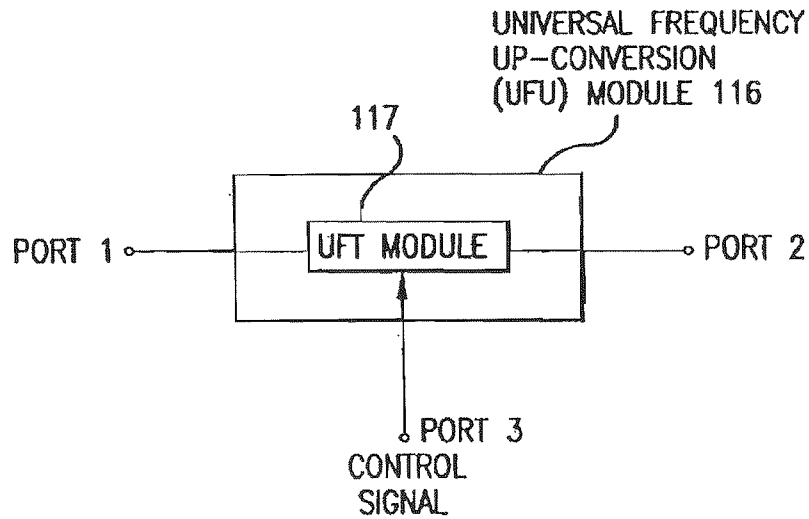


FIG. 1D

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.