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Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.

Leea Staret Kea

Acting Director of the United States Patent and Trademark Office



US008452544B2

(12) **United States Patent**
Hymel

(10) **Patent No.:** **US 8,452,544 B2**
(45) **Date of Patent:** **May 28, 2013**

(54) **UTILITY AND METHOD FOR THE APPLICATION OF SIGNAL ADVANCE AMPLIFICATION TO ANALOG WAVEFORM OR SIGNAL DETECTION, ACQUISITION AND PROCESSING**

(58) **Field of Classification Search**
USPC 702/19, 32, 38, 66, 70, 76, 78, 79, 702/109; 333/20, 156, 251
See application file for complete search history.

(76) Inventor: **Chris M. Hymel**, Rosharon, TX (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.

(56) **References Cited**
U.S. PATENT DOCUMENTS
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2003/0073917 A1 * 4/2003 Echauz et al. 600/510
OTHER PUBLICATIONS

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(22) Filed: **Mar. 9, 2008**
(65) **Prior Publication Data**
US 2011/0184650 A1 Jul. 28, 2011

M. Kitano, T Nakanishi, K. Sugiyama; Negative Group Delay and Superluminal Propagation: An Electric Circuit Approach; Feb. 21, 2003; all pages.*
Morgan W. Mitchell, Raymond Y. Chiao; Causality and Negative group delays in a simple bandpass amplifier; Mar. 6, 1999, all pages.*

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Primary Examiner — Michael Nghiem
Assistant Examiner — Manuel Rivera Vargas

Related U.S. Application Data

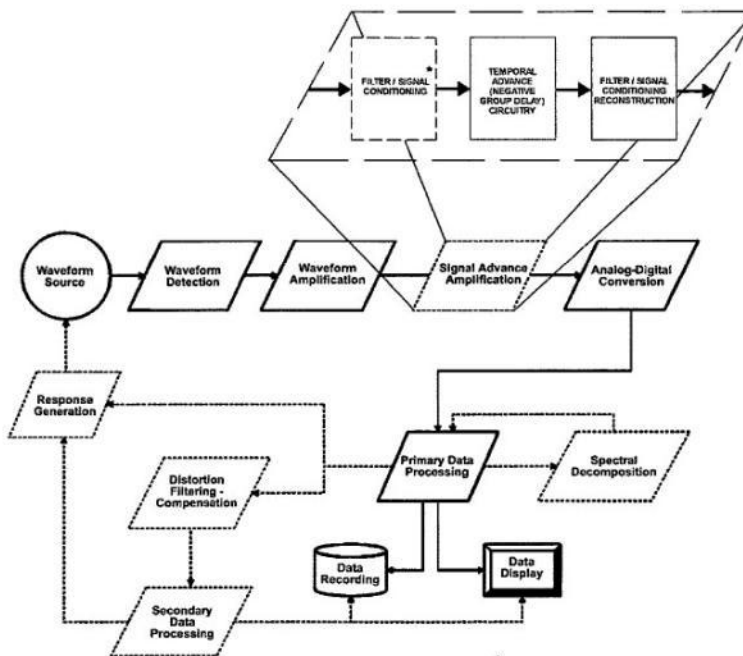
(60) Provisional application No. 60/893,983, filed on Mar. 9, 2007.

(57) **ABSTRACT**

(51) **Int. Cl.**
G01R 23/16 (2006.01)
G01R 25/00 (2006.01)
G01R 29/02 (2006.01)
(52) **U.S. Cl.**
USPC **702/19; 702/79; 702/76**

An analog waveform signal detection/data acquisition system that is based on negative group delay for reducing inherent delay in analog waveform or signal detection and acquisition and facilitating earlier than otherwise possible responsive actions to analog waveform data. Signal advance amplification and data conditioning reduces distortion and permits greater temporal advance than previously possible.

18 Claims, 8 Drawing Sheets



* optional, single or first stage only

Data Acquisition System with Signal Advance