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Billhartz et al.

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(54) **WIRELESS COMMUNICATIONS SYSTEM INCLUDING A WIRELESS DEVICE LOCATOR AND RELATED METHODS**

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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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(51) **Int. Cl.**
H04Q 7/20 (2006.01)

(52) **U.S. Cl.** **455/456.2**; 455/456.1; 455/456.5; 455/456.6; 342/457; 370/328

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,526,357 A	6/1996	Jandrell	370/95.2
5,550,549 A	8/1996	Procter, Jr. et al.	342/47
5,687,196 A	11/1997	Procter, Jr. et al.	375/347
5,706,010 A	1/1998	Franke	342/47
6,292,665 B1	9/2001	Hildebrand et al.	455/456
6,680,923 B1	1/2004	Leon	370/328
6,865,394 B2	3/2005	Ogino et al.	455/456.1

(Continued)

OTHER PUBLICATIONS

Yellowjacket-A, 802.11a Wi-Fi Analysis System, Berkeley Varitronics Systems.

Primary Examiner—George Eng

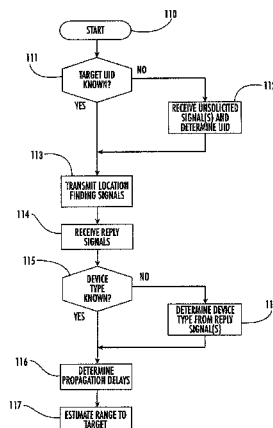
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(57) **ABSTRACT**

A wireless communications system may include a plurality of wireless communications devices and a wireless device locator. More particularly, the wireless device locator may include at least one antenna and a transceiver connected thereto, and a controller for cooperating with the transceiver for transmitting a plurality of location finding signals to a target wireless communications device from among the plurality thereof. The target device may transmit a respective reply signal for each of the location finding signals. Additionally, the controller may also cooperate with the transceiver for receiving the reply signals, and it may determine a propagation delay associated with the transmission of each location finding signal and the respective reply signal therefor based upon a known device latency of the target device. As such, the controller may estimate a range to the target device based upon a plurality of determined propagation delays.

25 Claims, 9 Drawing Sheets



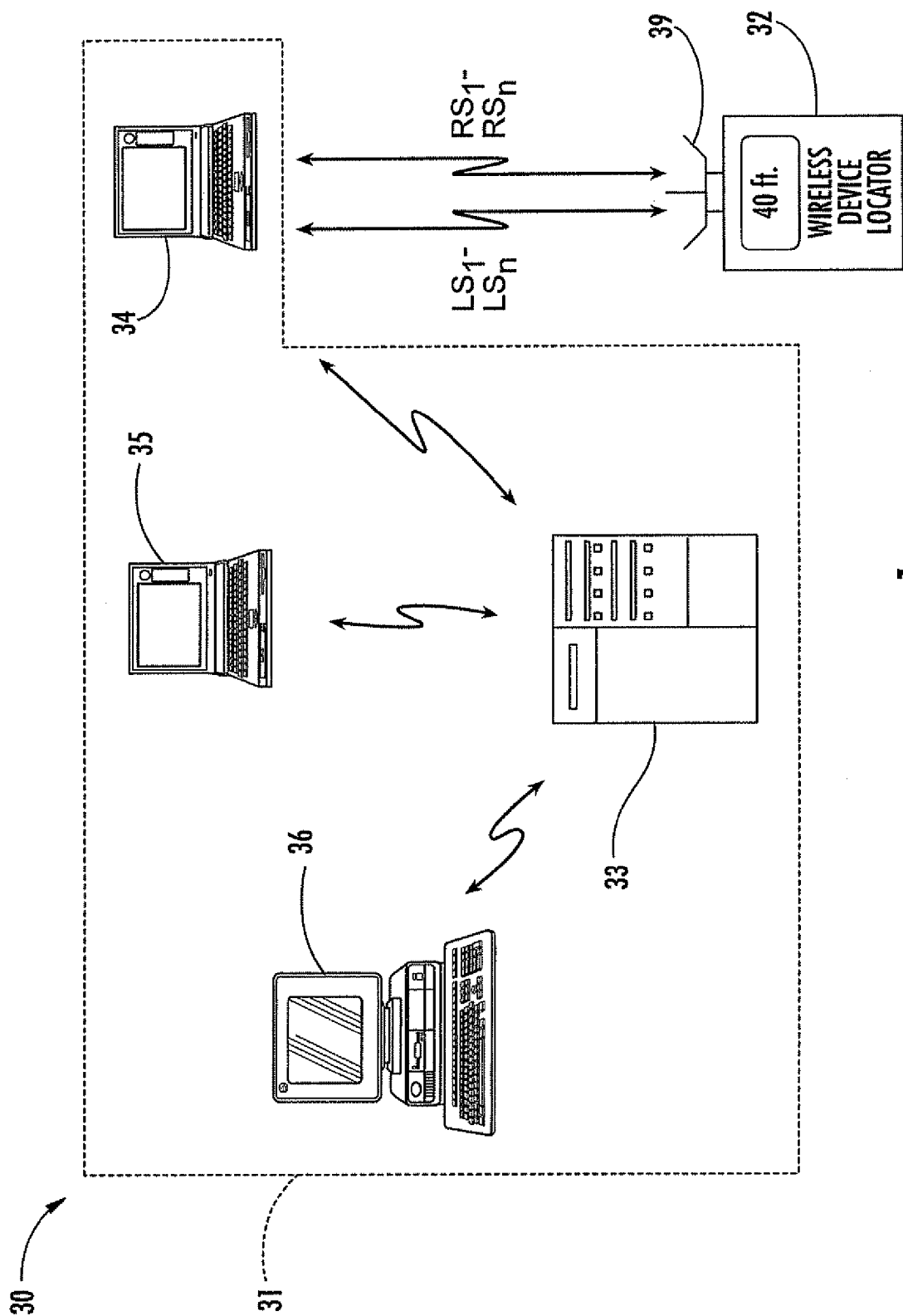
US 7,321,777 B2

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U.S. PATENT DOCUMENTS

6,990,428 B1 *	1/2006	Kaiser et al.	455/456.1	2003/0162550 A1	8/2003	Kuwahara et al.	455/456
7,042,868 B2 *	5/2006	Runkle et al.	370/347	2003/0182062 A1	9/2003	DeLorne et al.	701/201
7,046,987 B2 *	5/2006	Siegel et al.	455/404.2	2003/0191604 A1	10/2003	Kuwahara et al.	702/150
7,110,779 B2 *	9/2006	Billhartz et al.	455/456.2	2004/0072566 A1 *	4/2004	Kuwahara et al.	455/440
2002/0080759 A1	6/2002	Harrington et al.	370/338	2004/0081139 A1	4/2004	Beckmann et al.	370/352
2002/0118655 A1	8/2002	Harrington et al.	370/328	2004/0110514 A1	6/2004	Kim et al.	455/456.1
2002/0171586 A1	11/2002	Martorana et al.	342/458	2004/0203889 A1	10/2004	Karaoguz	455/456.1
2003/0025602 A1	2/2003	Medema et al.	340/568.1	2004/0266348 A1	12/2004	Deshpande et al.	455/41.2
2003/0034887 A1	2/2003	Crabtree et al.	340/539	2005/0037775 A1	2/2005	Moeglein et al.	455/456.1
2003/0043073 A1	3/2003	Gray et al.	342/465	2005/0059411 A1	3/2005	Zhengdi	455/456.1
2003/0117320 A1 *	6/2003	Kim et al.	342/457	2006/0183488 A1 *	8/2006	Billhartz	455/456.5
2003/0128163 A1 *	7/2003	Mizugaki et al.	342/464				

* cited by examiner



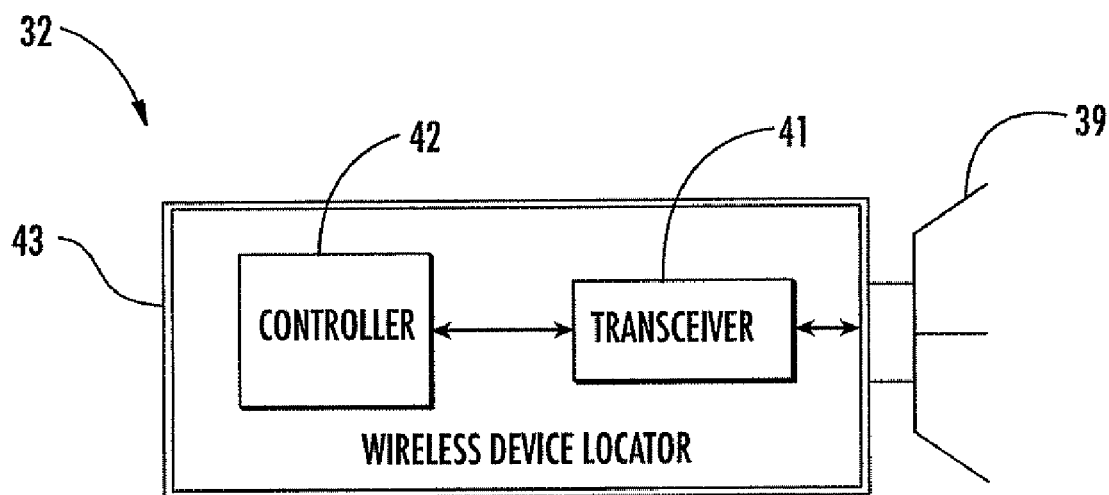


FIG. 2

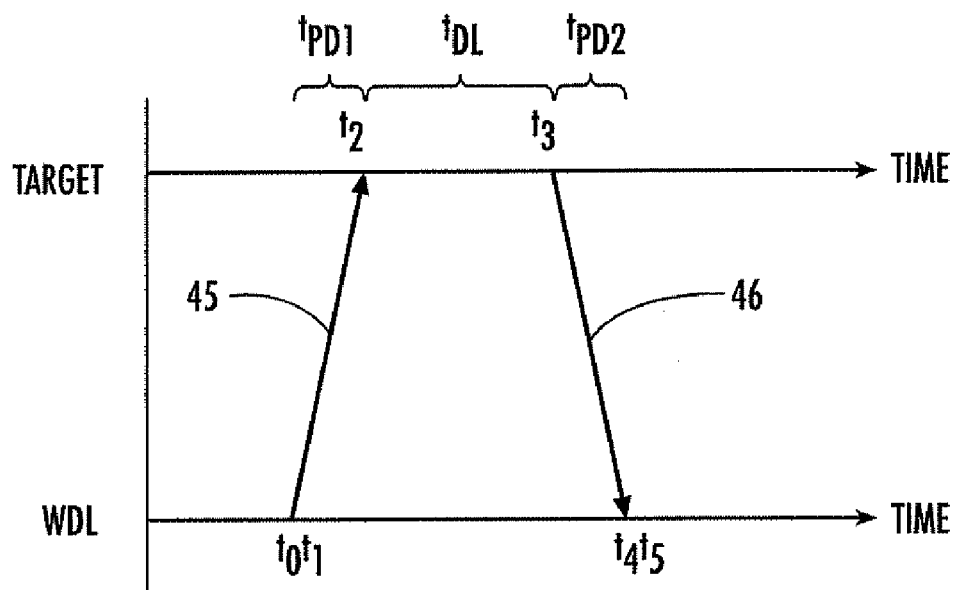


FIG. 3

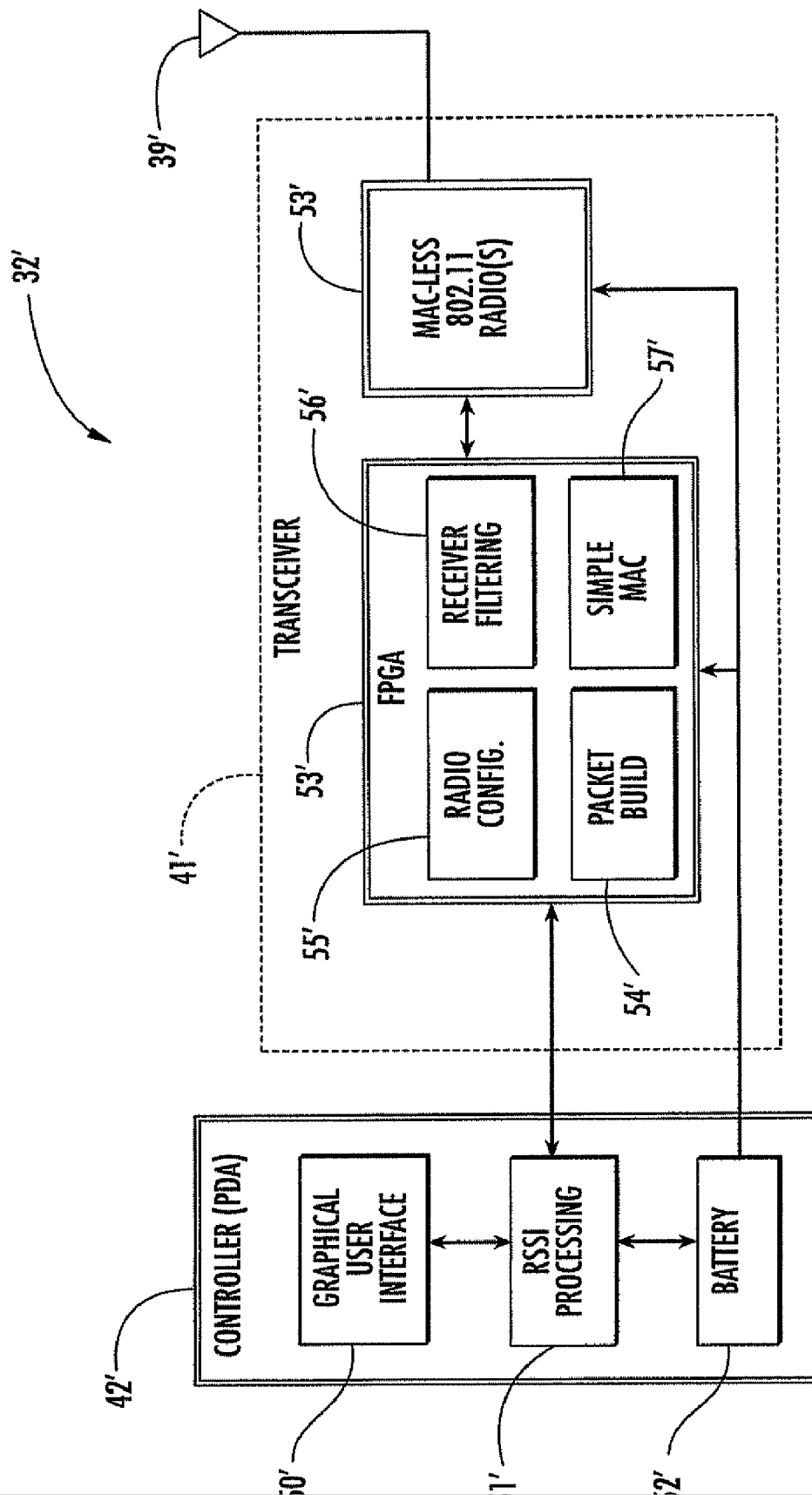


FIG. 4

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