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[Continued on next page]

(54) **Title:** TIME OF FLIGHT RANGE FINDING WITH AN ADAPTIVE TRANSMIT PULSE AND ADAPTIVE RECEIVER PROCESSING

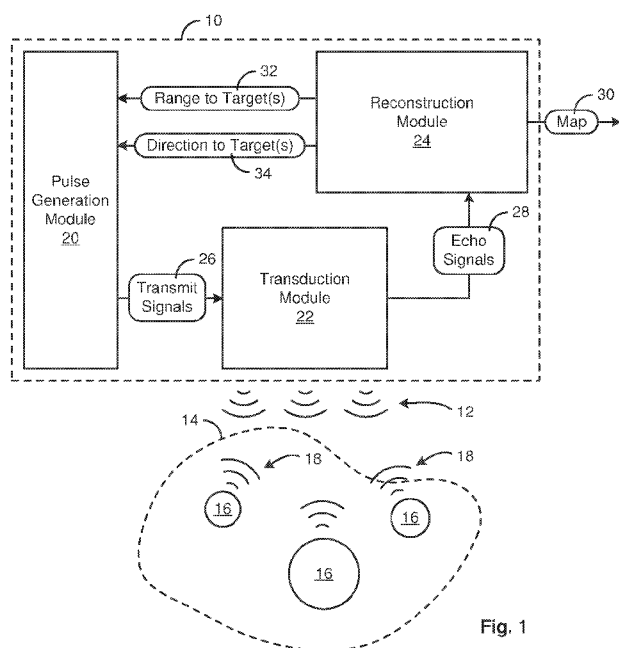


Fig. 1

(57) **Abstract:** A rangefinding apparatus and method are disclosed. The apparatus may include at least one processor and memory operably connected to the at least one processor. The memory may store instructions that, when executed, cause the apparatus to iterate a target-acquisition process until a target is identified and then iterate a target-tracking process after the target has been identified. The target-acquisition process may include transmitting a short ultrasonic pulse, transmitting a long ultrasonic pulse, and listening for one or more echoes corresponding to the short or long ultrasonic pulses. The target-tracking process may include steering an optimized ultrasonic pulse toward the target, listening for an echo corresponding to the optimized ultrasonic pulse, and calculating, based on the echo, an updated location for the target.



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# INTERNATIONAL SEARCH REPORT

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## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G01S 15/00 (2015.01)

CPC - G10K 11/346

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC (8) - G01S 15/00 (2015.01)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CPC - G01S 15/42; G01S 7/52003 (See keywords below)

USPC - 367/103; 367/99

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Thomsoninnovation.com; Patbase; Google Scholar; Google Patents; Gogole.com; Freepatentsonline; ProQuest Dialog

Search Terms: Time of flight, range finding, pulse, ultrasonic, acquire, locate, track, trace, path, movement, range, depth, distance, time to target, target, object, adapt, dynamic, period, duration, window, steer, optimize, power, etc..

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0081502 A1 (WELKE), 01 May 2003 (01.05.2003), entire document, especially Abstract; Para [0008], [0027], [0032], [0036]-[0038]	1-24
Y	US 2010/0128568 A1 (HAN et al.), 27 May 2010 (27.05.2010), entire document, especially Abstract; Para [0011], [0031]-[0032], [0044], [0074]-[0077]	1-24
Y	US 2009/0262604 A1 (FUNADA), 22 October 2009 (22.10.2009), entire document, especially Abstract; Para [0026]-[0028], [0044]	5
A	US 2008/0279044 A1 (HAFFER et al.), 13 November 2008 (13.11.2008), entire document	1-24
A	US 2010/0278012 A1 (TREMPE), 04 November 2010 (04.11.2010), entire document	1-24

☐ Further documents are listed in the continuation of Box C.

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