



US005724265A

United States Patent [19]
Hutchings

[11] Patent Number: 5,724,265
[45] Date of Patent: Mar. 3, 1998

- [54] SYSTEM AND METHOD FOR MEASURING MOVEMENT OF OBJECTS
- [76] Inventor: Lawrence J. Hutchings, 18729 Brickell Way, Castro Valley, Calif. 94546
- [21] Appl. No.: 570,759
- [22] Filed: Dec. 12, 1995
- [51] Int. Cl.⁶ G01C 22/00
- [52] U.S. Cl. 364/565; 364/410; 364/561; 340/323 R; 235/105
- [58] Field of Search 364/410, 449, 364/450, 561, 565, 569, 556, 559, 143, 443, 460; 128/670, 779; 482/8, 3, 74, 902; 342/52; 324/171; 340/384.71, 323 R; 377/24, 24.2; 73/490; 235/105

5,033,013	7/1991	Kato et al.	364/561
5,117,444	5/1992	Sutton et al.	377/24.2
5,206,652	4/1993	Hoyt et al.	342/52
5,245,537	9/1993	Barber	364/410
5,396,510	3/1995	Wilson	372/38
5,452,216	9/1995	Mounce	364/449
5,471,405	11/1995	Marsh	364/556
5,516,334	5/1996	Easton	482/8
5,524,637	6/1996	Erickson	128/779
5,574,669	11/1996	Marshall	364/569
5,583,776	12/1996	Levi et al.	364/450

FOREIGN PATENT DOCUMENTS

58-189509	11/1983	Japan	G01C 22/00
59-202016	11/1984	Japan	G01C 22/00
60-200119	10/1985	Japan	G01C 22/00
02121219	12/1983	United Kingdom	G01C 22/00

OTHER PUBLICATIONS

Britting, Kenneth R., Inertial Navigation Systems Analysis, Wiley-Interscience, A of John Wiley & Sons, Inc., pp. 1-10, 156-163 (1971, Library of Congress, No. 70-168635).

(List continued on next page.)

Primary Examiner—James P. Trammell
Assistant Examiner—Cuong H. Nguyen
Attorney, Agent, or Firm—Sofer & Haroun, LLP

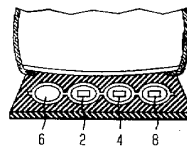
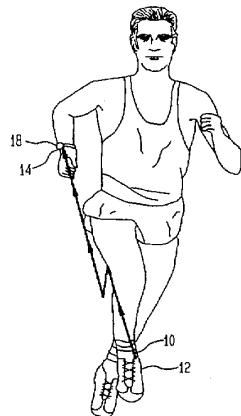
[56] References Cited
U.S. PATENT DOCUMENTS

3,789,402	1/1974	Heywood et al.	340/384.71
3,797,010	3/1974	Adler et al.	340/323 R
3,865,305	2/1975	Sampey	377/24
4,053,755	10/1977	Sherrill	364/561
4,094,199	6/1978	Holdren et al.	73/517 B
4,180,726	12/1979	DeCrescent	250/222 R
4,220,996	9/1980	Searcy	364/561
4,312,358	1/1982	Barney	128/670
4,334,190	6/1982	Sochaczewski	324/171
4,371,945	2/1983	Karr et al.	364/561
4,387,437	6/1983	Lowrey et al.	364/561
4,449,191	5/1984	Mehnert	364/559
4,460,823	7/1984	Ruehlmann	235/105
4,560,861	12/1985	Kato et al.	235/105
4,571,680	2/1986	Wu	364/410
4,578,769	3/1986	Frederick	364/565
4,627,011	12/1986	Spencer et al.	364/566
4,630,226	12/1986	Tanaka	364/561
4,703,445	10/1987	Dassler	364/561
4,736,312	4/1988	Dassler et al.	364/561
4,741,001	4/1988	Ma	377/24.2
4,763,287	8/1988	Gerhaeuser et al.	364/561
4,821,218	4/1989	Potsch	364/566
4,855,942	8/1989	Bianco	364/561
4,885,710	12/1989	Hersberger et al.	364/565

[57] ABSTRACT

A device that measures the distance traveled, speed, and height jumped of a person while running or walking. Accelerometers and rotational sensors are placed in the sole of one shoe along with an electronic circuit that performs mathematical calculations to determine the distance and height of each step. A radio frequency transmitter sends the distance and height information to a wristwatch or other central receiving unit. A radio frequency receiver in the wristwatch or other unit is coupled to a microprocessor that calculates an output speed based upon step-distance and elapsed time, and the distance traveled of the runner from the sum of all previous step distances. The output of the microprocessor is coupled to a display that shows the distance traveled, speed, or height jumped of the runner or walker.

22 Claims, 5 Drawing Sheets



OTHER PUBLICATIONS

Goldstein, Herbert, *Classical Mechanics*, Ch. 4, pp. 124–132, Addison Wesley Publishing, Reading, MA 1956.

Van Bronkhorst, A., Euler Angle Strapped–Down Computer, Advisory Group for Aerospace Research and Development (AGARD), Inertial Navigation Systems and Components, pp. 253–257 North Atlantic Treaty Organization, May 1968.

Casio product, “JC–10–1BV Jog & Walk Calorie”, Web site, <http://www.starnetinc.com/globalproducts/casio/jc101bv.html>, 1997.

Airline International Home Page, “Electronic Pedometer”, <http://www.ishops.com/airline/el-ped.html>, 1997.

Meijer, et al. “Methods to Assess Physical activity with Special Reference to Motion Sensors and Accelerometers”, *IEEE Trans. on Biomedical Engineering*, vol.38, No.3, Mar. 1991.

FIG. 1

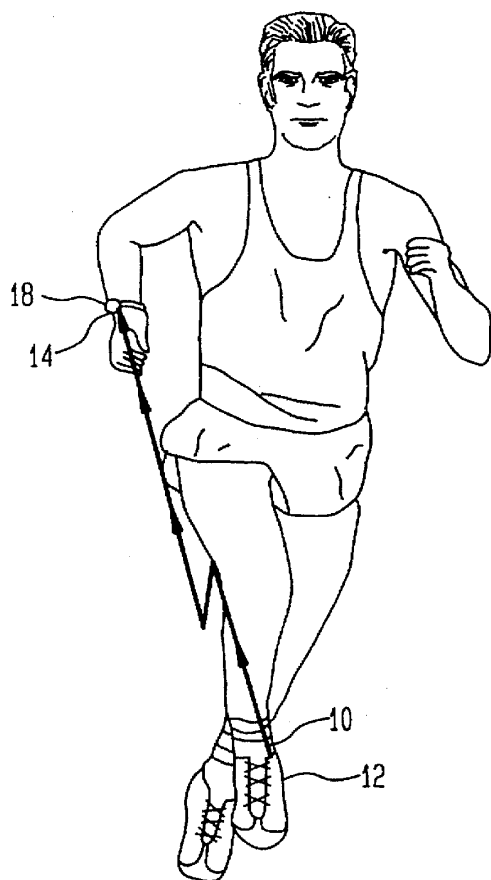


FIG. 2

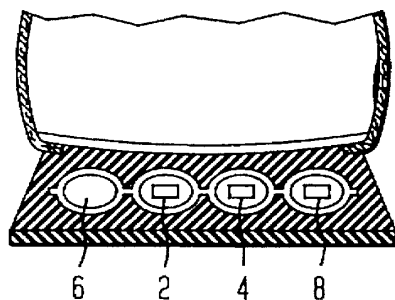


FIG. 3

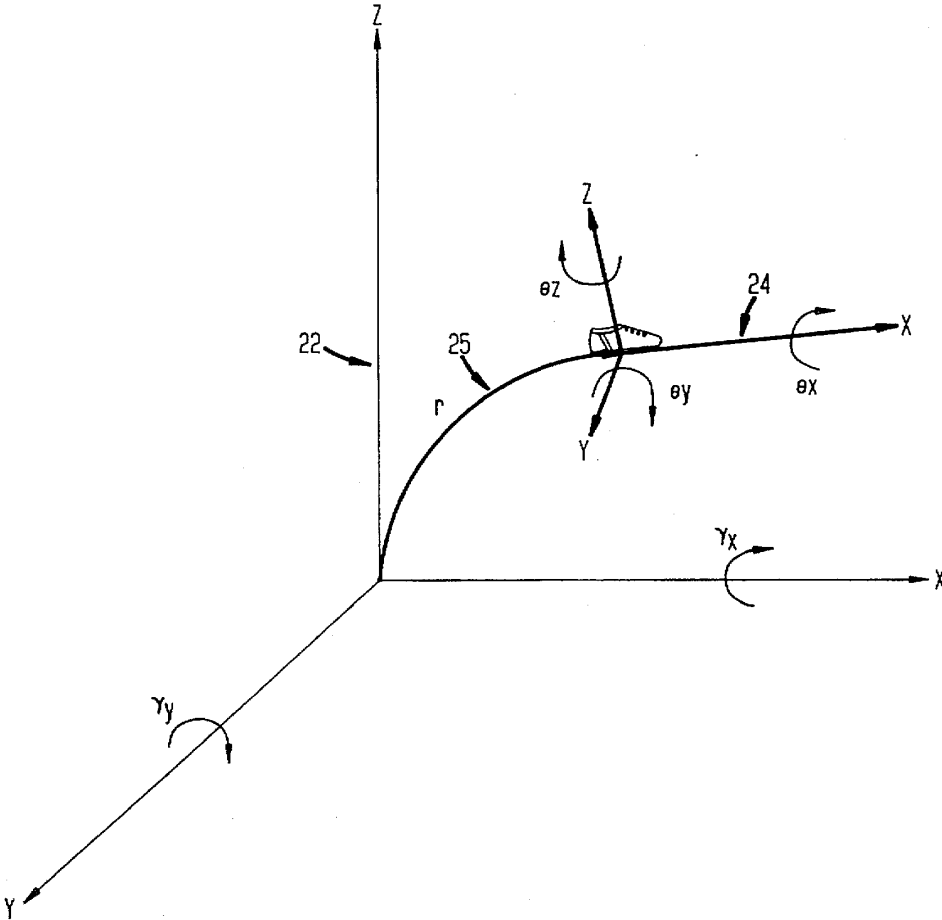
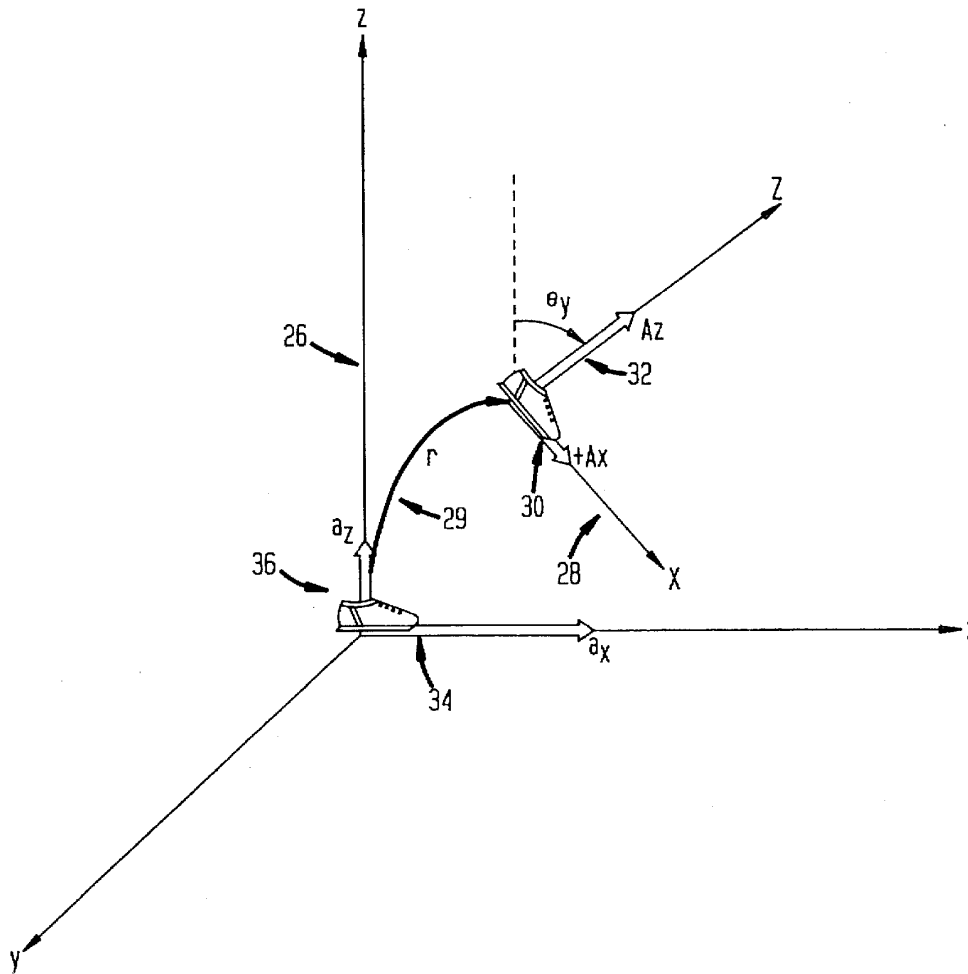


FIG. 4



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.