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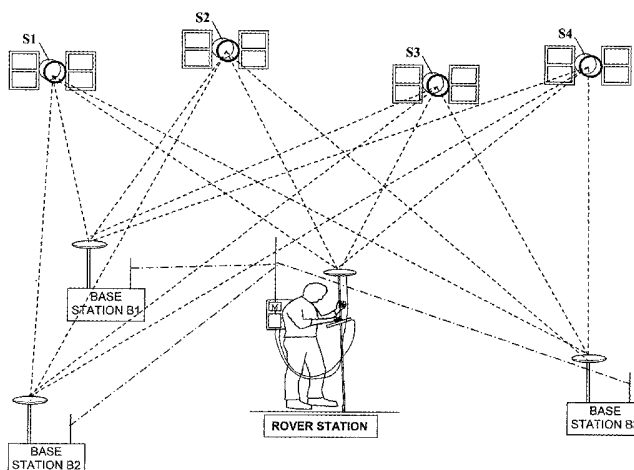
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(54) Title: POSITION ESTIMATION USING A NETWORK OF GLOBAL-POSITIONING RECEIVERS



(57) Abstract: Disclosed are methods and apparatuses for determining the position of a roving receiver in a coordinate system using at least two base-station receivers (B1, B2), which are located at fixed and known positions within the coordinate system. The knowledge of the precise locations of the base-station receivers makes it possible to better account for one or all of carrier ambiguities, receiver time offsets, and atmospheric effects encountered by the rover receiver, and to thereby increase the accuracy of the estimated receiver position of the rover. Base lines are established between the rover and each base-station, and a base line is established between the base stations. Navigation equations, which have known quantities and unknown quantities, are established for each baseline. Unknowns for the baseline between base stations are estimated, and then used to correlate and reduce the number of unknowns associated with rover baselines, thereby improving accuracy of the rover's estimated position.

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US03/29604

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : H04 B7/185  
 US CL : 342/357.12, 457

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)  
 U.S. : 342/357.01, 357.06, 357.12, 457; 701/213, 215

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

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5, 973, 643 A (Hawkes et al) 26 October 1999 (26.10.99)	1-97

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

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"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

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