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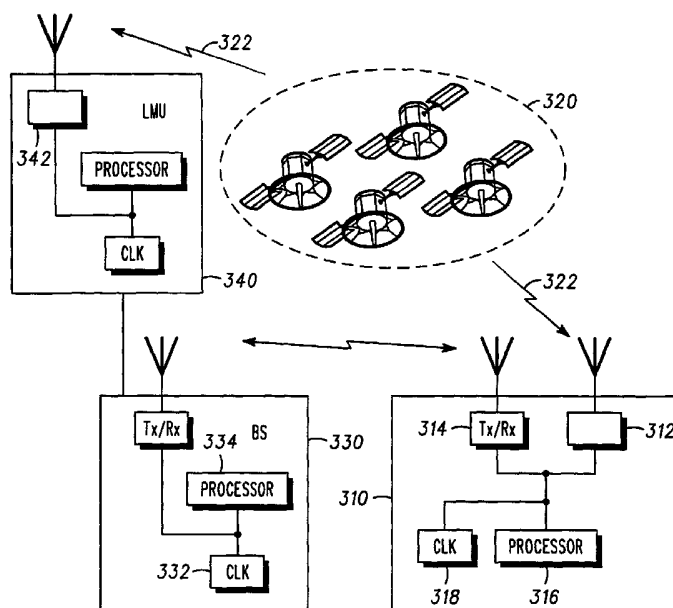
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TIME SYNCHRONIZATION OF A SATELLITE POSITIONING SYSTEM ENABLED MOBILE RECEIVER AND BASE STATION



(57) Abstract: Satellite positioning system enabled mobile receivers (310) and cellular communication network base stations (330) synchronized with satellite positioning system clocks and method therefore. In a network-assisted embodiment, a variable propagation delay for transmission of an assistance message (232) from the base station to the mobile receiver is determined for correcting the handset clock (318). In others embodiments, local clock drift of mobile receivers (310) and/or base stations (330) are determined by a ratio of local and satellite time differences, based on sequential time snapshots, for use in correcting the local clocks.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/03871

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04J 3/07; G01S 5/14

US CL : 370/519; 342/357.06

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. : 370/519, 508; 342/357.06; 375/356; 455/456

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,697,051 A (FAWCETT) 09 December 1997 (09.12.1997)	
A	US 6,166,691 A (LINDQVIST) 26 December 2000 (26.12.2000)	
A, P	US 6,313,787 A (KING et al) 06 November 2001 (06.11.2001)	
A, P	US 6,295,023 (BLOEBAUM) 25 September 2001 (25.09.2001)	

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

☐ See patent family annex.

* Special categories of cited documents:		"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier application or patent published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

02 July 2002 (02.07.2002)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/03871

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US02/03871

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-12, drawn to determining local clock drift proportional to a difference between first and second sampled satellite signals divided by a difference between first and second local clock signals.

Group II, claim(s) 13-20, drawn to synchronizing a mobile receiver clock.

This application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In order for more than one species to be examined, the appropriate additional examination fees must be paid. The species are as follows:

Species II(a) (claims 13-17) drawn to synchronizing a mobile receiver clock based on an estimated propagation delay compensating for movement substantially as defined by equation (4) on page 5.

Species II(b) (claims 18-20) drawn to setting a mobile receiver clock based on an estimated propagation delay formed by a time correction factor proportional to a product of a resolution of a bit duration and an average of plural time intervals between sequential synchronization signals, substantially as defined by equations (6) and (7) on page 6.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: see above with respect to the separate inventions claimed.

The species listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, the species lack the same or corresponding special technical features for the following reasons: see above as each relates to a different set of equations for defining the correction.