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Datasheet for the decision of 10 October 2006

Case Number: T 0626/04 - 3.4.01

Application Number: 96939443.6

Publication Number: 0855039

IPC: G01S 1/04

Language of the proceedings: EN

Title of invention:
GPS receiver and method for processing GPS signals

Applicant:
Snaptrack, Inc.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes (after amendment)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0626/04 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 10 October 2006

Appellant: Snaptrack, Inc.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 24 November 2003 refusing European application No. 96939443.6 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: B. Schachenmann
Members: R. Bekkering
G. Assi

Summary of Facts and Submissions

I. European patent application 96 939 443.6 (publication nos. WO-A-97 14049 and EP-A-0 855 039) was refused pursuant to Article 97(1) EPC by a decision of the examining division dispatched on 24 November 2003, on the grounds of Articles 52(1) and 56 EPC and Article 123(2) EPC.

II. The applicant (appellant) lodged an appeal against the decision on 12 January 2004 and paid the appeal fee on the same day. The statement setting out the grounds of appeal was received on 1 April 2004.

III. Reference was made to the following documents:

D1: US-A-4 445 118

D2: EP-A-0 386 874

D3: WO-A-94 28434

D4: US-A-5 365 450

IV. Oral proceedings, requested as an auxiliary measure by the appellant, were held on 10 October 2006.

V. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

Claims: No. 1 to 15 filed in the oral proceedings on 10 October 2006;

Description: Pages 1 to 42 filed in the oral proceedings on 10 October 2006;

Drawings: Sheets 1/11 to 9/11 and 11/11 as originally filed;
Sheet 10/11 filed in the oral proceedings on 10 October 2006.

VI. Independent claims 1 and 9 read as follows:

"*1. A method of calibrating a local oscillator (606) in a mobile GPS receiver, said method comprising:*

receiving a signal modulated onto a precision carrier frequency from a source providing said modulated signal, said source being a basestation or a satellite emulating a basestation,

automatically locking to said modulated signal and providing a reference signal (604) locked in frequency to the precision carrier frequency,

computing the local oscillator drift by comparing the reference signal to a signal generated by said local oscillator and generating an error correction signal

calibrating the signal generated by said local oscillator with said error correction signal,

using said calibrated signal to acquire GPS signals."

"*9. A mobile GPS receiver comprising:*

a first antenna (613) for receiving GPS signals;

a downconverter (614) coupled to said first antenna, said first antenna providing said GPS signals to said downconverter;

a local oscillator (606) coupled to said downconverter, said local oscillator

generating a first reference signal for said downconverter to convert said GPS signals from a first frequency to a second frequency;

a second antenna (601) for receiving a signal modulated onto a precision carrier frequency from a source providing said modulated signal, said source being a basestation or a satellite emulating a basestation;

an automatic frequency control (AFC) (603) circuit coupled to said second antenna, said AFC circuit providing a second reference signal (604) which is locked in frequency to said precision carrier frequency;

a comparator (605) for computing the drift of said local oscillator by comparing the first reference signal to the second reference signal and by generating an error correction signal (610) in order to calibrate the first reference signal generated by said local oscillator."

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. *Amendments*

Claim 1 is based on originally filed claims 178 and 185, with the additional features which relate to the signal modulation, the base station, the frequency locking and the calibration being derivable from the original description as published, pages 18 and 25 to 27.

Dependent claims 2 to 8 are based on originally filed claims 179 to 184 and the original description, page 27.

Independent claim 9 is based on originally filed claims 186 and 187, and the original description, page 27.

Dependent claims 10 to 15 are based on originally filed claims 188 to 192 and the original description, page 27.

The Board is thus satisfied that the amendments to these claims comply with the requirements of Article 123(2) EPC.

3. *Novelty*

Document D1 discloses a mobile GPS receiver which, in addition to the GPS satellite signals, receives an additional signal through a reference channel from a remote ground based control station. The additional signal contains, in real time, GPS satellite position, data as to which GPS satellites are in best view, Doppler prediction information in terms of Doppler offset, and, optionally, a PRN code generator signal. The GPS and reference channel signals are downconverted to an intermediate frequency using a common local oscillator 52 in the receiver. This local oscillator may have a relatively low stability because frequency drift of the local oscillator is common to both the GPS and reference channels and, therefore, does not affect the code correlation (see column 8, lines 15 to 26).

The data obtained through the reference channel supplied to the receiver's microprocessor includes Doppler coefficient data which is determined from the

appropriate receiver position known within ±150 km. This data is used to obtain Doppler offset values for each of the four GPS signals to be acquired. The Doppler terms, computed in the microprocessor, are applied as a control signal to vary the frequency of a voltage controlled oscillator (VCXO) 70. The output of VCXO 70 is mixed in mixer 74 with the appropriate 1,023 Mbps C/A code corresponding to a particular GPS satellite generated by a reference code generator 72. The 30 MHz reference carrier generated by FSK demodulator 62 is mixed in a mixer 68 with the C/A code modified VCXO signal for up-conversion to the GPS IF carrier frequency of 50 MHz and fed to the correlator 81 (see column 8, line 42 to column 9, line 25 and figure 4).

In document D1 there is no automatic locking to the reference channel signal in order to provide a reference signal locked in frequency to the carrier frequency as defined in claim 1. Furthermore, neither for local oscillator 70, nor for local oscillator 52, there is any computing of the local oscillator drift by comparing a reference signal locked in frequency to the carrier frequency to a signal generated by the local oscillator and generating an error correction signal, or any calibration of the signal generated by the local oscillator with this error correction signal.

In view of the above, the subject-matter of claim 1 is novel with respect to document D1.

Novelty is also provided with respect to the remaining available, more remote prior art.

4. *Inventive step*

4.1 Calibrating the signal generated by the local oscillator used for GPS signal acquisition results in a faster determination of the pseudorange from the first acquired satellite (see description as published, page 17, line 1 to page 18, line 9 and appellant's letter dated 22 September 2006, point 3).

Accordingly, having regard to the disclosure of document D1 providing the closest prior art, the objective problem-to-be-solved in the present case may be seen as further improving the acquisition time of the mobile GPS receiver.

4.2 Document D2 concerns the synchronisation of radio network stations. The narrow band modulation UHF/Microwave communication system comprises a transmit/receive base station having a plurality of transmitter for transmitting information at respective UHF/Microwave channel frequencies to a plurality of remote transmit/receive stations. The transmitters at the base station are served in common by a single master oscillator. A single reference frequency signal is derived from the master oscillator at the base station and transmitted to all of said remote stations where it serves to provide for frequency locking of the oscillators at the stations to produce synchronisation between the frequencies at the base station and the remote stations.

In document D1, however, no calibration of the local oscillator is envisaged, the document in fact centres on a high oscillator precision, or indeed any

calibration, being unnecessary, so that in the board's opinion there would not be any reason for the skilled person to adopt the synchronisation suggested by document D2.

4.3 Document D3 concerns a mobile GPS receiver which receives data related to visible satellites, the Doppler shifts etc. from a base station in order to provide a faster acquisition. The local oscillator of the mobile GPS receiver, however, is only calibrated once a satellite is tracked and its signal is acquired and locked onto. The error of the receiver frequency source relative to the more accurate satellite time base is estimated and a corresponding adjustment to the receiver's time base is made for the subsequent acquisition of GPS signals from further satellites (see page 7, line 24 to page 8, line 26).

Similarly, document D4 concerns a mobile GPS receiver which receives satellite data from a base station in order to provide a faster acquisition. The local oscillator of the GPS receiver is calibrated by locking onto the GPS signal of a satellite and adjusting the oscillator's frequency (see column 4, line 8 to column 5, line 57).

There is nothing in documents D3 or D4 to suggest using the frequency of the carrier of the data link to calibrate the local oscillator as per claim 1 allowing for a faster acquisition with respect to the first satellite.

Accordingly, the subject-matter of claim 1 is also not considered to be rendered obvious by either document D3 or D4.

5. For the reasons above, the subject-matter of claim 1 is considered to be novel and to involve an inventive step with respect to the available prior art (Articles 52(1), 54 and 56 EPC).

Independent claim 9 is directed to a corresponding mobile GPS receiver. The subject-matter of this claim is considered to be novel and to involve an inventive step (Articles 52(1), 54 and 56 EPC) for in substance the same reasons given with respect to claim 1.

The dependent claims 2 to 8 and 10 to 15 contain further features of the method and the mobile GPS receiver, respectively, and, thus, involve an inventive step as well.

The description and drawings have been adapted to the amended claims as appropriate.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of the following documents:

   Claims: No. 1 to 15 filed in the oral proceedings on 10 October 2006;

   Description: Pages 1 to 42 filed in the oral proceedings on 10 October 2006;

   Drawings: Sheets 1/11 to 9/11 and 11/11 as originally filed;
   Sheet 10/11 filed in the oral proceedings on 10 October 2006.

The Registrar: The Chairman:

R. Schumacher B. Schachenmann