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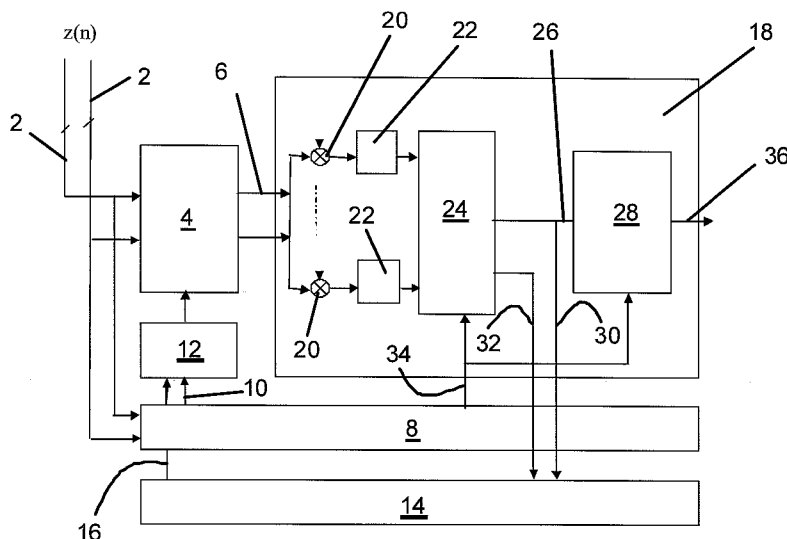
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[Continued on next page]

(54) Title: CPFSK RECEIVER WITH FREQUENCY OFFSET CORRECTION AND MATCHED FILTER BANK DECODING



(57) Abstract: A digital radio receiver adapted to receive radio signals modulated using continuous phase frequency shift keying, CPFSK. The receiver comprises means for receiving a radio signal (2), a correlator (8) arranged to estimate a frequency offset between the carrier frequency of the received radio signal and a nominal carrier frequency, means for correcting said frequency offset (4) and outputting a frequency-corrected radio signal (6), and a matched filter bank, MFB, which comprises a plurality of filters (20,22), each of which corresponds to a different bit pattern, for determining a bit sequence (36) from the frequency-corrected radio signal (6).

FIG. 1

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

**(88) Date of publication of the international search report:**  
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INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2014/051098

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04L27/233  
ADD. H04L27/00

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)  
H04L

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)  
EPO-Internal, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	TIBENDERANA C ET AL: "A low-cost scalable matched filter bank receiver for GFSK signals with carrier frequency and modulation index offset compensation", CONFERENCE RECORD OF THE 38TH ASILOMAR CONFERENCE ON SIGNALS, SYSTEMS AND COMPUTERS, 2004, HELD IN PACIFIC GROVE, CA, USA, vol. 1, 7 November 2004 (2004-11-07), pages 682-686, XP010779661, PISCATAWAY, NJ, USA DOI: 10.1109/ACSSC.2004.1399221 ISBN: 978-0-7803-8622-8	1,3, 8-11,22, 24,29-32
Y A	sections 2, 3, 4.1; figure 3  ----- -/--	2,23 4-7, 12-19, 25-28, 33-39

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "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)
- "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

- "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
- "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
- "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
- "&" document member of the same patent family

Date of the actual completion of the international search  5 June 2014	Date of mailing of the international search report  09/10/2014
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Marselli, Marco
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/GB2014/051098

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Heinrich Meyr ET AL: "Digital Communication Receivers: Synchronization, Channel Estimation, and Signal Processing - Chapter 8: Frequency Estimation" In: 1998, Wiley-Interscience Publication, XP055121272, ISBN: 978-0-47-120057-4 pages 445-504, cited in the application	2,23
A	sections 8.4.3 and 8.4.4; figure 8-24  -----	1,3-19, 22,24-39

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2014/051098

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims 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.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional 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 fees, this Authority did not invite payment of additional fees.
  
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.:  
  
1-19, 22-39

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-19, 22-39

Estimation of frequency drift in a CPFSK receiver

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2. claims: 20, 21, 40

Determination of an output bit value according to a majority-vote

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