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D E C I S I O N
of 6 April 2001

Case Number: T 0621/99 - 3.5.2

Application Number: 93902608.4

Publication Number: 0620956

IPC: H03H 21/00

Language of the proceedings: EN

Title of invention:
Apparatus for reducing the risk of undesirable parameterdrift of an adaptive filter used for echo cancellation

Applicant:
TELEFONAKTIEBOLAGET L M ERICSSON

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

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

Decisions cited:
-

Catchword:
-

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Case Number: T 0621/99 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 6 April 2001

Appellant: TELEFONAKTIEBOLAGET L M ERICSSON
Patent and Trademark Department
126 25 Stockholm (SE)

Representative: Wideberg, Olle Sven
Ericsson Telecom AB
IPR Management and Patent Department
126 25 Stockholm (SE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 22 January 1999 refusing European patent application No. 93 902 608.4 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: R. G. O'Connell
P. H. Mühlens

Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse application No. 93 902 608.4. The reason given for the refusal was that the subject-matter of claim 1 filed with the letter dated 13 June 1997 did not involve an inventive step, having regard to the prior art known from the following document:

D1: IEEE Transactions on Communications, vol. 37, No. 8, August 1989, Sethares et al: "Bursting in Adaptive Hybrids", pages 791 to 799.

II. With the statement of grounds of appeal, the appellant filed new Claims 1 to 3 and new pages 1 to 8 of the description to replace the claims and description previously on file.

III. Claim 1 is now worded as follows:

"Apparatus for reducing the risk of undesirable drifting of the parameters of an adaptive filter (15) which is used for echo cancellation and which is coupled between a receiving branch (17) and a transmitting branch (16) of a four-wire loop in a telephony system, and the filter being connected closer to a near-end than to a far-end of the system, the connection to the far-end being constituted by a long distance connection (20, 21), a difference signal (E) being formed in the transmitting branch by subtracting (18) a compensation signal generated in the filter from a signal which is delivered to the transmitting branch via a two/four-wire hybrid (13), at said near-end characterized in that the apparatus includes an adaptive filter (25) which is coupled between the

transmitting branch (16) and the receiving branch (17) and which is intended to generate a second compensation signal from said difference signal (E), and which is connected closer to the near-end than to the far-end and on the same side of said long distance connection as the adaptive filter (15) which is used for echo cancellation; means (26) for producing a second difference signal (X') in the receiving branch, by subtracting the second compensation signal from a signal which is received from a far-end via said long distance connection; and means (27) for updating the parameters of this latter filter (25) in a manner to minimize the correlation between the difference signal (E) in the transmitting branch and the second difference signal (X'); and in that this latter filter (25) is of an order which is sufficient to ensure that said correlation will be essentially non-existent when a signal delivered to the transmitting branch from a near-end consists at maximum of a few single sinusoidal tones."

Claims 2 and 3 are dependent on Claim 1.

IV. The appellant argued that the subject-matter of Claim 1 differed from the double adaptive hybrid shown in Figure 5 of D1 in that the second adaptive filter (25), means (26) for producing a difference signal and updating means (27) were situated at the near-end. These formed an echo canceller connected in the opposite sense to an ordinary echo canceller for the near-end and prevented possible narrow band signals from the near-end returning as echoes on the receiving branch (17). Even if the second filter (25) was of a relatively low order and not a complete echo filter it was sufficient to cancel out signals consisting of a

few sinusoidal tones. It was important to cancel out such signals since they were transmitted from certain apparatus and were correlated with themselves even after a delay. The apparatus of the present invention was included in a near-end of a telephony system, independently of how the far-end, which might belong to a different company, was equipped. It was absurd to argue, as the examining division did, that it was obvious to move the echo canceller from the far-end of the apparatus shown in Figure 5 of D1 and relocate it at the near-end; this would have the consequence that no echo cancellation could be carried out at the far-end.

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

Claims: 1 to 3 filed with the statement of grounds of appeal;

Description: pages 1 to 8, filed with the statement of grounds of appeal; and

Drawings: sheets 1/3 to 3/3 as originally filed.

Reasons for the Decision

1. The appeal is admissible.

2. The features recited in the present amended claim 1 are all disclosed in the application as originally filed, see WO 93/14566: claims 1 and 2, page 1, lines 13 to

33, page 2, line 24 to page 3, line 8, page 4, line 23 to page 6, line 12, and Figure 2.

Present claims 2 and 3 are based on originally filed claims 3 and 4.

The description has been adapted to the amended claims.

The amendments do not infringe Article 123(2) EPC.

3. The closest prior art among the documents mentioned in the search report is D1. D1 discloses with reference to its Figure 5 apparatus having all the features recited in the precharacterising portion of claim 1. This known apparatus also includes a second adaptive filter at the far-end for cancelling echoes at that end. D1 teaches that bursting is reduced when there are adaptive hybrids at both ends of the connection (see page 794, left hand column, first two paragraphs).

4. The subject-matter of claim 1 differs from the apparatus known from D1 in that the claimed apparatus includes:

- an adaptive filter (25) coupled between the transmitting branch (16) and the receiving branch (17) for generating a second compensation signal from said difference signal (E), which filter is connected closer to the near-end than to the far-end and on the same side of said long distance connection as the adaptive filter (15) which is used for echo cancellation;

- means (26) for producing a second difference signal (X') in the receiving branch, by

subtracting the second compensation signal from a signal which is received from a far-end via said long distance connection; and

- means (27) for updating the parameters of this latter filter (25) in a manner to minimize the correlation between the difference signal (E) in the transmitting branch and the second difference signal (X');

- the second filter (25) being of an order sufficient to ensure that said correlation will be essentially non-existent when a signal delivered to the transmitting branch from a near-end consists at maximum of a few single sinusoidal tones.

5. As explained in the introductory part of the present application, the present invention reduces the risk of undesirable drifting of the parameters of an adaptive filter used according to D1 for reducing bursting. A relatively small second adaptive filter is sufficient to reduce the correlation considerably when narrow band signals comprised of one or more single tones (such as are transmitted from modems, facsimile apparatus and in conjunction with DTMF-signalling) are being transmitted. This is important because such a narrow band signal is strongly correlated with itself, even after a delay.

6. There is no hint in any of the documents mentioned in the search report that a second adaptive filter at the near-end of a telephony system could be used to reduce drifting of the parameters of an adaptive filter used according to D1. The board agrees with the appellant

that it is not obvious to put both the echo cancellers shown in Figure 5 of D1 at the same end of the four-wire loop since that would leave the other end without an echo canceller and throw away the advantage mentioned in D1 of having an echo canceller at each end (cf point 3 above). Furthermore the far-end could be anywhere in the world and in general not available for modification.

7. Thus, the subject-matter of claim 1 shall be considered as involving an inventive step in accordance with Article 56 EPC.

8. The Board finds that the application meets the requirements of the EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent in the following version:

Claims: 1 to 3 filed with the statement of grounds of appeal on 21 May 1999;

Description: pages 1 to 8, filed with the statement of grounds of appeal on 21 May 1999; and

Drawings: sheets 1/3 to 3/3 as originally filed.

The Registrar: The Chairman:

M. Hörnell W. J. L. Wheeler