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**Datasheet for the decision
of 9 December 2013**

Case Number: T 2150/09 - 3.5.05

Application Number: 00969617.0

Publication Number: 1336268

IPC: H04L1/06

Language of the proceedings: EN

Title of invention:
METHOD AND ARRANGEMENT FOR DIGITAL SIGNAL TRANSMISSION

Applicant:
Amosmet Investments LLC

Headword:
Space-Time Block coding/AMOSMET

Relevant legal provisions:
EPC Art. 83, 84, 123(2)

Keyword:
Sufficiency of disclosure - (yes)
Claims - clarity (yes)
Amendments - added subject-matter (no)
Remittal to the department of first instance - (yes)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 2150/09 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 9 December 2013

Appellant: Amosmet Investments LLC
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 2 June 2009
refusing European patent application No.
00969617.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair: A. Ritzka
Members: P. Cretaine
D. Prietzel-Funk

Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division, posted on 2 June 2009, to refuse European patent application No. 00 969 617.0, taken at the request of the applicant (appellant) as a "decision according to the state of the file" without oral proceedings having been held. As to the grounds for the refusal, the decision referred to the communication of the examining division dated 9 February 2009, which raised objections under Articles 83, 84 and 123(2) EPC.

- II. Notice of appeal was received on 23 July 2009, and the appeal fee was paid on the same day. With the statement setting out the grounds of appeal, received on 1 October 2009, the appellant filed a set of amended claims 1 to 15, amended description pages 3 to 17 and an amended drawing page 4/4. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 15. In addition, oral proceedings were requested as an auxiliary measure.

- III. A summons to oral proceedings scheduled for 18 November 2013 was issued on 24 July 2013. In an annex to this summons, the board expressed its preliminary opinion on the appeal pursuant to Article 15(1) RPBA. In particular, an objection under Article 84 EPC was raised against independent claims 1 and 11. Furthermore, the board expressed the opinion that all other objections under Articles 83, 84 and 123(2) EPC raised in the communication of the examining division of 9 February 2009 had been overcome by the amendments to the claims. The board subsequently announced that it would remit the case to the

department of first instance for further prosecution, should the only outstanding objection under Article 84 EPC be overcome.

- IV. By letter of reply dated 19 September 2013, the appellant filed amended claims 1 to 15 and requested that the case be remitted to the department of first instance for further prosecution. The auxiliary request for oral proceedings was maintained.
- V. By communication dated 30 September 2009, the appellant was informed that the oral proceedings scheduled for 18 November 2013 had been cancelled.
- VI. Claim 1 of the sole request reads as follows:

"A method of transmitting a digital signal consisting of symbols, the method comprising the steps of coding complex symbols to channel symbols (410) in blocks of given length utilizing space-time coding and transmitting the channel symbols (410) via several different channels and two or more antennas, in which method the coding is defined by a code matrix comprising an orthogonal block code with code rate lower than one, and using as many channels as transmitting antennas for transmitting each of the complex symbols, characterized by coding information in the matrix elements of the code matrix that correspond to zeros of the orthogonal block code, in such a manner that the resulting code matrix still has zeros, repeating at least once the step of coding information in the matrix elements of the code matrix that corresponds *[sic]* to zeros of the orthogonal block code, and including the coded information in the transmission."

Claim 9 of the sole request reads as follows:

"9. A method of receiving a signal transmitted according to claim 1, characterized by decoding and removing from the received signals symbols transmitted in the matrix elements of the code matrix that correspond to zeros of the orthogonal block code prior to decoding the symbols transmitted using the code matrix."

Independent claim 11 and claim 15 are directed towards an apparatus, claim 15 corresponding to method claim 9.

Reasons for the Decision

1. Admissibility of the appeal

The appeal complies with the provisions of Articles 106 to 108 EPC (cf. point II above) and is therefore admissible.

2. Article 83 EPC

2.1 The examining division considered that the construction of the upper-level code, as defined on page 10, lines 7 to 10, and in equation (7) of the description, was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art because neither the elements of matrix $C^{(2)}$ (z_{13} , z_{14} , ...etc.) nor the notation used for the subscript of these elements was defined in the application as filed.

The board however notes that the embodiment making use of upper-level matrix $C^{(2)}$ is described from page 9, line 14, to page 10, line 30, in combination with Figure 3. It is stated on page 9, lines 16 to 18, that the space-time block code of the lower layer (layer 1 in Figure 3) and that of the upper layer (layer 2 in Figure 3) are similar and use the same code matrix (1) defined on page 3. This code matrix (1) transmits one basic block with three symbols designated as z_1, z_2, z_3 . Since layer 1 comprises four basic blocks (see page 9, line 21), it transmits 4×3 symbols designated as z_1 to z_{12} (see the layer 1 matrices in Figure 3). The layer 2 coding is defined as specified on page 10, lines 12 to 17, by adding a matrix to each block of the layer 1 code, this matrix being constructed from the product of matrix β_0 (see page 9, equation (4)) and of a matrix that has one row of matrix $C^{(2)}$ in its diagonal.

Matrix $C^{(2)}$ being identical to matrix (1) in respect of the arrangement of the terms, it is obvious for the skilled person that terms z_{13}, z_{14} and z_{15} represent the three symbols to be transmitted by the layer 2 block code.

Moreover the skilled person, by applying the definition of the layer 2 block code, as defined on page 10, lines 7 to 15, would perform the following matrix calculations:

$$C^{(2)} = \begin{pmatrix} z_{13} & z_{14} & z_{15} & 0 \\ -z_{14}^* z_{13}^* & 0 & -z_{15} & \\ -z_{15}^* & 0 & z_{13}^* & z_{14} \\ 0 & z_{15}^* & -z_{14}^* & z_{13} \end{pmatrix} \quad \beta_0 = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{pmatrix}$$

The product of matrix β_0 by a matrix which has the first row of matrix $C^{(2)}$ on its diagonal gives:

$$\begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & 0 \\ -1 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & z_{15} & 0 \\ 0 & z_{14} & 0 & 0 \\ z_{13} & 0 & 0 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & z_{15} & 0 \\ 0 & -z_{14} & 0 & 0 \\ -z_{13} & 0 & 0 & 0 \end{pmatrix}$$

This corresponds to the first sub-block code of layer 2 (see Figure 3).

Similar matrix products using the second, third and fourth rows of matrix $C^{(2)}$ lead respectively to the second, third and fourth layer 2 sub-blocks building the complete layer 2 block code of Figure 3.

The board therefore judges that the application complies with the requirement of Article 83 EPC in respect of the construction of the upper-level code as described on page 10, lines 7 to 10.

2.2 The examining division considered that the construction of the other upper-level codes was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. Since the appellant has deleted from the description the passages dealing with the other upper-level code, namely the code rate 1 example, the objection of the examining division has become irrelevant.

2.3 For these reasons the board judges that the application meets the requirements of Article 83 EPC.

3. Article 84 EPC

3.1 The examining division objected that the independent claims did not refer to space-time coding, and as such were neither clear nor supported by the description. Since the amended claims on file refer to coding utilising space-time coding, the objection of the examining division is void.

3.2 The examining division further objected that the wording "blocks of given length" in the independent claims was unclear. The board however agrees with the appellant that the use of a block coding, as defined in the claims, implies that a fixed number of symbols are coded in a block, this number being the block length. The claims therefore are clear in that respect.

3.3 The examining division also objected that independent claims 1 and 11 did not contain all the technical features essential to the performance of the invention. The missing features were, according to the examining division, the steps of constructing the lower-layer and upper-layer block codes based on corresponding squared matrices having zeros in their diagonals and the step

of constructing the upper-layer code by filling zeros in the lower-layer code with block code rows of the upper-layer code, where the upper-layer matrix is formed of a code matrix and a tuning matrix.

The examining division cited pages 9 and 10 of the description in support of its objection. These pages relate however to the description of a preferred embodiment using a specific code matrix (see matrix (1) on page 3) and a specific tuning matrix (see matrix β_0 on page 9). The features which the examining division considered essential are related to the construction of the codes and are recited only with respect to the preferred embodiment and do not appear in the passage "Brief description of the invention" from page 3, line 23, to page 6, line 26. The board concurs with the appellant in considering that the features essential to the definition of the invention, as described in the passage "Brief description of the invention", are all present in the independent claims.

These features are related to the space-time coding of a signal using a code matrix comprising an orthogonal block code, to the use of the matrix elements having a zero value for transmitting additional coded data, and to the repeating of the addition of coded data in the remaining zeros of the code matrix. The details of constructing the code of the additional data are not essential to the definition of the invention, and the appellant is entitled to claim the invention in more general terms than the preferred embodiment without contravening the requirements of Article 84 EPC in respect of clarity of the claims.

The board notes that it would be a novelty and inventive step issue if some other features enabling the subject-matter of claims 1 and 11 to be

distinguished from the prior art were missing from these claims.

The same considerations apply to claims 9 and 15 relating to a corresponding receiving method and apparatus respectively. In the board's view, all the features essential to the definition of the receiving method or apparatus, as described on page 5, lines 28 to 34, of the description, are present in claims 9 and 15.

- 3.4 The board is further satisfied that the clarity objection raised by the examining division and based on the discrepancy between independent claims 1 and 11 claiming a block code with a rate lower than one and the "rate 1 codes" example of the description has been overcome by the removal of said example from the description.
- 3.5 The appellant has amended claims 1 and 11 to define the repeating step as a step of coding information in the matrix elements of the code matrix that corresponds to zeros of the orthogonal block code. The clarity objection raised by the examining division in respect of this step has thus been overcome.
- 3.6 The examining division further objected that independent claims 1 and 11 were not consistent with the description in respect of the number of transmit antennas. The appellant has amended the claims to specify that the signal is transmitted via two or more antennas. The board is satisfied that this feature is supported by the description (see page 1, lines 32 to 33; page 3, lines 23 to 28; page 4, lines 2 to 7; page 9, line 1) and is not in contradiction with other passages of the description specifying examples using

three or more antennas (see for instance page 7, lines 4 to 6; page 9, line 23; page 10, lines 18 to 27; page 17, lines 22 to 25).

3.7 For these reasons the board judges that the claims meet the requirements of Article 84 EPC.

4. Article 123(2) EPC.

4.1 The examining division objected that the characterising parts of claims 9 and 11 contained subject-matter extending beyond the content of the application as originally filed. The board however concurs with the appellant in considering that these features are supported by the description as originally filed. In particular, the passages on page 5, lines 28 to 34, and page 11, lines 5 to 14, clearly describe that the symbols coded in the redundant directions, i.e. the zeros, of the code matrix are first decoded and then subtracted from the code matrix, i.e. removed from the symbols transmitted in the matrix elements, and that the signal then remaining, i.e. the symbols transmitted using the code matrix, are decoded.

4.2 The board therefore judges that claims 9 and 11 do not contravene the requirements of Article 123(2) EPC.

5. In conclusion the board judges that the sole request meets the requirements of Articles 83, 84 and 123(2) EPC.

The issues of novelty (Article 54 EPC) and inventive step (Article 56 EPC) have not been addressed in substance so far by the examining division and are not dealt with in the official communication of 9 February 2009 on which the impugned decision was

based. For these reasons the board decides to allow the appellant's request to remit the case to the department of first instance for further prosecution.

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 for further prosecution on the basis of claims 1 to 15, filed as sole request with the letter dated 19 September 2013.

The Registrar:

The Chair:



K. Götz

A. Ritzka

Decision electronically authenticated