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Datasheet for the decision of 2 December 2024

Case Number: T 1569/23 - 3.5.05

Application Number: 15807822.0

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Language of the proceedings: EN

Title of invention:
Signal processing systems and signal processing methods

Applicant:
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
Technische Universität Berlin

Headword:
DAC-based signal processing/FRAUNHOFER

Relevant legal provisions:
EPC Art. 54, 111(1)

Keyword:
Novelty - first auxiliary request (yes)
Remittal to the examining division on the basis of the first auxiliary request (yes): different claim construction by the board

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Case Number: T 1569/23 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 2 December 2024

Appellant 1: (Applicant 1)	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. Hansastr. 27c 80686 München (DE)
Appellant 2: (Applicant 2)	Technische Universität Berlin Strasse des 17. Juni 135 10623 Berlin (DE)
Representative:	Maikowski & Ninnemann Patentanwälte Partnerschaft mbB Postfach 15 09 20 10671 Berlin (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 22 February 2023 refusing European patent application No. 15807822.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	K. Bengi-Akyürek
Members:	K. Schenkel
	R. Romandini

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the present European patent application. The refusal was based on the grounds that claims 1 and 5 of the main request and auxiliary requests 1 and 2 did not not comply with Article 54 EPC and that claim 13 of these requests did not comply with Article 84 EPC.

II. In this decision, reference is made to the following prior-art documents:

D1: US 2009/0052556 A1;
D2: US 2011/0140942 A1;
D3: US 2007/0092018 A1;
D4: US 4,835,791;
D5: US 4,586,174;
D6: US 5,559,834;
D7: US 7,822,147 B2;
D8: Sun Hongtao et al.: "Crosstalk Simulation based on Full Wave S-Parameter Extraction Method between High-Speed Signals", Advanced Materials Research, vols. 433-440, January 2012.

III. With its statement setting out the grounds of appeal, the appellants requested that the appealed decision be set aside and that a patent be granted on the basis of a **main request** or one of four auxiliary requests, i.e. **auxiliary requests 1 to 4**.

The main request and auxiliary requests 2 and 3 correspond to the main request and auxiliary requests 1 and 2 underlying the appealed decision. Auxiliary

requests 1 and 4 were filed for the first time with the statement of grounds of appeal.

IV. In a communication under Article 15(1) RPBA, the board expressed its preliminary view that claim 13 of the main request did not comply with Article 84 EPC, but that claim 13 of auxiliary request 1 overcame the underlying objections. As to the question of novelty, the board, adopting a different claim construction, concluded that claim 1 of the main request, being identical to claim 1 of auxiliary request 1, complied with Article 54 EPC. The board further indicated that, if the main request was withdrawn, it would remit the case to the examining division on the basis of auxiliary request 1.

V. In reaction to the preliminary opinion, the appellants withdrew their main request and requested that the case be remitted to the examining division. Auxiliary request 1 thus became the highest-ranking claim request.

VI. Oral proceedings were then cancelled.

VII. Claim 1 of **auxiliary request 1** reads as follows (board's labelling):

"A signal processing system, comprising
(a) at least a first, a second and a third digital-to-analog converter, DAC, (31-33);
(b) a processing unit (21) configured to split a sampled signal into at least a first and a second signal corresponding to different frequency portions of the sampled signal, wherein the first signal is a real valued signal, to transmit the first signal to the first DAC (31), split the

second signal into a first and a second subsignal and transmit the first subsignal to the second DAC (32) and the second subsignal to the third DAC (33), the first subsignal corresponding to the real part of the second signal and the second subsignal corresponding to the imaginary part of the second signal;

(c) an IQ mixer (600) configured to mix an analog output signal of the second DAC (32) and an analog output signal of the third DAC (33);

(d) a combiner (4) configured to combine an analog output signal of the first DAC (31) and an output signal of the IQ mixer (600)."

VIII. Claim 5 of **auxiliary request 1** reads as follows:

"A signal processing method, using the system of any of the preceding claims, comprising the steps of:

- pre-equalizing the first and the second signal,
- wherein the processing unit (21), the first DAC (31) and the combiner (4) define a first processing channel (101),
- wherein the processing unit (21), the second DAC (32) and the combiner (4) define a second processing channel (102), and
- wherein the pre-equalized first signal is generated by processing the first signal in such a way that the pre-equalized first signal compensates cross talk between the first and the second processing channel (101, 102), and/or the pre-equalized second signal is generated by processing the second signal in such a way that the pre-equalized second signal compensates cross talk between the first and the second processing channel (101, 102)."

IX. Claim 13 of the **auxiliary request 1** reads as follows:

"The method as claimed in any of claims 5 to 12, wherein the pre-equalized first and second signal are generated adaptively by means of the results of re-calibration measurements carried out using a portion of an analog signal produced by the combiner (4), the portion of the analog signal being branched-off from the analog signal produced by the combiner (4) using a splitter (81) or a switch and supplied to a channel identification unit (80)."

Reasons for the Decision

1. Auxiliary request 1

1.1 Novelty - claims 1 and 5 (Article 54 EPC)

1.1.1 The examining division interpreted the term "combine" as "any mathematical/electric operation or set of operations between two or more operands/signals" (see Reasons 1.2.2). Adopting this understanding, the examining division concluded that **feature (d)** was anticipated by Figure 7 of D1, where combiner 73 receives, at one input, the output of "DAC 11A" (via "mixer 15A") and, at the other input, the output of "(IQ-)mixer 15B" (see Reasons 1.2.3.1).

1.1.2 The board does not agree with this claim construction for the following reasons:

1.1.3 In the technical field of RF-signal processing, a (power) "splitter" or "combiner" is typically a device which receives/delivers at *one* port a signal and delivers/receives at the *other* ports multiple copies of

the signal with specific phase and amplitude characteristics. A "splitter" or "combiner" may change the amplitude and the phase but does not change the frequency or applies a modulation. A "combination" of multiple signals contains each combined signal essentially unaltered except for the amplitude and/or phase.

1.1.4 Hence, **feature (d)** of claim 1 is to be understood as meaning that the two signals, namely the "output signal of the first DAC" and the "output signal of the IQ mixer", are combined without applying to them any (in the case of the output signal of the IQ mixer a further) multiplication or frequency shift.

1.1.5 In consequence, contrary to the appealed decision, in Figure 7 of D1, the output of the "combiner 73" does not represent a combination of the output signal of the IQ-mixer 15B and the analog output signal of the (first) DAC 11A (see Reasons 1.2.3.1).

The output of the combiner 73 is rather a combination of the output signal of the two IQ-mixers 15A and 15B, the output of the IQ-mixer 15A being the result of a mixing operation applied to the output of the first DAC 11A. Document D1 therefore fails to disclose **feature (d)**.

1.1.6 Neither does any one of the other prior-art documents **D2 to D8** disclose a "combiner" combining the outputs of an "IQ-mixer" and of a "DAC" according to feature (d).

1.1.7 Thus, in view of the above claim construction, the subject-matter of claim 1 is new (Article 54 EPC). The same applies to the method according to claim 5.

1.2 Clarity - claim 13 (Article 84 EPC)

1.2.1 As to claim 13 of the withdrawn main request, the examining division had objected that the wording "using a portion of an analog signal produced by the combiner" was unclear. The board agrees since "a portion" of a signal can have many and totally different meanings.

1.2.2 However, in claim 13 of auxiliary request 1, the "portion" has been further characterised in that now it is supposed to be branched-off from the "analog signal" produced by the "combiner" using a "splitter" or a "switch" and supplied to a "channel identification unit".

1.2.3 Hence, a "splitter" divides the power of the signal and provides copies of the original signal with a reduced amplitude or a "switch" routes the whole signal, ideally without loss, according to the position of the switch. In both cases, it is clear now that the "branched-off portion" is an identical equivalent of the original signal possibly with reduced power.

1.2.4 Claim 13 of auxiliary request 1 is therefore allowable under Article 84 EPC.

2. Remittal (Article 111(1) EPC; Article 11 RPBA)

2.1 The board's different interpretation of the term "combine" in claim 1 of all claim requests renders the findings of the examining division moot. Furthermore, this construction could also affect the assessment of inventive step (Article 56 EPC) which has not been examined yet.

2.2 Consequently, "special reasons" within the meaning of Article 11 RPBA are present in this case, justifying further consideration.

2.3 In view of the above, the board has decided to remit the case to the examining division for further prosecution under Article 111(1) EPC, on the basis of the claims of **auxiliary request 1** on file.

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.

The Registrar: The Chair:

B. Brückner K. Bengi-Akyürek

Decision electronically authenticated