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Bezeichnung der Erfindung:
Title of invention: Digital dynamic range converter
Titre de l'invention :

Klassifikation / Classification / Classement : H03G 7/00

ENTSCHEIDUNG / DECISION

vom / of / du 14 August 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : N.V. Philips' Gloeilampenfabrieken

Einsprechender / Opponent / Opposant : ANT Nachrichtentechnik GmbH

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 56, 100(a), 123(2), (3).

Schlagwort / Keyword / Mot clé : "Amendments admissible" - "Inventive step (confirmed) - unobvious modification"

Leitsatz / Headnote / Sommaire

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Case Number : T 477 89 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 14 August 1990

Appellant : (Opponent)
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Decision under appeal :
Interlocutory decision of the Opposition Division of the European Patent Office dated 11 July 1989 concerning maintenance of European Patent No. 0 118 144 in amended form.

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W.B. Oettinger
C. Holtz

Summary of Facts and Submissions

I. European patent No. 118 144 was granted on patent application No. 84 200 140.6 claiming a priority of 8 February 1983 and filed on 3 February 1984.

The mention of the grant was published on 6 May 1987.

II. An admissible notice of opposition, referring to Article 100(a), viz. Articles 52(1), 54 and 56 EPC, was filed on 7 January 1988, citing, apart from the citation

D0: DE-A-2 414 624

mentioned in the patent, inter alia the following prior art document against the granted claims:

D1: G.W. McNally and T.A. Moore: A Modular Signal Processor For Digital Filtering And Dynamic Range Control Of High Quality Audio Signals, IEEE Tagung March 1981, Vol. 2, pages 590-594.

III. With his counterstatement, the Patentee filed, on 7 July 1988, amended claims.

IV. In response, the Opponent made reservations against the amended Claim 1 based, in effect, on Article 123(3) EPC, on Article 57 EPC and on Article 84 EPC.

Furthermore, he cited, inter alia, the following prior art document:

D2: Programmierung und Nutzung von Rechenanlagen, Teil 3, Fortran, Berlin 1975, page 47

and maintained his contention of lack of inventive step.

V. On 10 March 1989, the Opposition Division issued a communication pursuant to Rule 58(4) EPC informing the parties of its intention to maintain the patent as amended, with further minor amendments made by the Opposition Division.

Claim 1 in this version reads as follows:

"A digital dynamic range converter of the forward control type for varying the dynamic range of an audio signal which is available in digital form and is constituted by a sequence of audio signal samples x(n), and comprising:

(i) means (5) for multiplying each audio signal sample x(n) by an associated one of a sequence of control signal samples s(n) for producing a sequence of output samples y(n) which represents a version of the sequence of audio signal samples x(n) varied in dynamic range

(ii) first means (7,10) for converting the sequence of audio signal samples x(n) into said sequence of control signal samples s(n), including:
(iia) second means (10,11) for converting the sequence of audio signal samples x(n) into a sequence of peak value samples $\hat{x}(n)$;
(iib) non-linear amplitude transformation means (12) for converting the sequence of peak value samples $\hat{x}(n)$ into a sequence of transformation samples $\breve{s}(n)$, the relationship between the magnitude of the transformation samples s(n) and the peak samples $\hat{x}(n)$ being given by an amplitude transfer characteristic whose shape is determined by a plurality of adjustment quantities (R,a) received;
(iic) digital low pass filter means (13) receiving the transformation samples s(n) and producing the control signal samples s(n);

characterised in that the second converting means comprises

- means (10) for converting the sequence of audio signal samples x(n) into a sequence of unipolar signal samples x(n), and
- means (11) for converting the sequence of unipolar signal samples x(n) into a sequence of peak value samples x(n) by comparing each unipolar signal sample with an auxiliary sample Q(n), and selecting as a peak value sample the unipolar signal sample x(n) if this is larger than or equal to the auxiliary sample Q(n), or the auxiliary sample Q(n) if the unipolar signal sample is smaller than the auxiliary sample Q(n)."

Dependent Claim 2 defines particular means for generating the auxiliary sample.

Claims 3 and 4 are also dependent claims.

VI. In a letter expressing his disapproval, the Opponent cited further prior art documents.

VII. By an interlocutory decision dated 11 July 1989, the Opposition Division decided that, taken into consideration the amendments made as specified in the aforementioned communication, the patent and the invention to which it relates would meet the requirements of the Convention.

VIII. That decision was appealed by the Opponent/Appellant on 28 July 1989.

On 1 August 1989, the Appellant paid the appeal fee and on 7 November 1989 he filed a statement of grounds, in which he requested that the decision under appeal be set aside in its entirety, citing the following further prior art document against Claims 1 and 2:

D3: GB-A-1 445 837.

IX. In oral proceedings held, on the request of both parties, on 14 August 1990, the Appellant maintained the aforementioned request (cf. VIII).

The Respondent requested that the appeal be dismissed and the patent maintained as amended in accordance with the decision under appeal.

X. In support of his request that the patent be revoked for the reason of lack of inventive step of the subject-matter claimed, the Appellant argued essentially as follows:

D1 discloses all the features recited in the preamble of Claim 1 (cf. V) including feature (iia) relating to a peak detector as one of the alternatives mentioned on page 592, right-hand column, first line and indicated in Figure 3.

In addition, a comparer and outputting means, such as a switch, are clearly necessary in a peak detector; cf. D2 and D3, for instance page 3, lines 116 ff. of D3 referring to comparer 12 and gate 13. The second characterising feature of Claim 1 is therefore to be regarded as implicit in D1.

Audio signals being asymmetrical with respect to a zero potential, they must further necessarily be rectified before being processed as claimed. For this reason the first characterising feature in Claim 1 is obvious.

The same applies to the feature of Claim 2. Delay device 1107 of the patent corresponds, in effect, to store 14 of D3.

Although multiplier 5 of the patent is not present in D3, its multiplication factor can be 1 and in this case a multiplier would be unnecessary.

If Claim 1 is interpreted as implying that the peak detector (11) has no attack time, it must be considered that, although D1 refers to an attack time, peak detectors in general use to have no attack time and this is confirmed by D3.

XI. The Respondent's counter-arguments can be summarised as follows:

The Appellant's arguments are based on hindsight. D1 does not say that the attack time of its peak detector can be varied to zero. D2 does not disclose any idea for a dynamic range converter's peak detector. D3 is only concerned with recording a maximum value of a measurable variable (such as temperature); it is too far from a dynamic range converter to be considered by the skilled person having to deal with this kind of audio signal processor.

An attack time is necessary in any dynamic range converter but, in contradiction to D1, in the invention it is completely in the low pass filter (14) with the consequence that it can be minimised to its absolutely necessary value, preferably by a much more sophisticated filter than that of D1, for instance by the one mentioned in column 8, lines 40 to 43 of the patent.

Reasons for the Decision

1. The appeal is admissible (Articles 106 to 108 and Rule 64 EPC).

2. The amendments made to the patent documents are admissible. More particularly:

2.1 The preamble of Claim 1 is based on granted Claim 2 (including the features of Claim 1 to which it refers) and the characterising features are taken from granted Claims 3 and 4.

Claim 1 is thus, in effect, a combination of granted Claims 2 and 4.

This combination is, as such, supported by the description of the invention, Figure 1 showing this combination (means 10 + 11 and means 13).

2.2 The expression "each" in line 29 of Claim 1 has not been used in granted Claim 4 but it is clear from Figure 2 and its description that in 1109 each signal sample (from 1100) is compared with an auxiliary sample (from 1108).

In effect, this means that the peak detector of the claimed dynamic range converter has no attack time.

2.3 Figure 2 shows a combination of features including also that of granted Claim 5; i.e. it does not disclose a subcombination not having this feature. Thus, prima facie, Figure 2 would not seem to support present Claim 1 which does not include said feature. Despite this impression, however, the absence of said feature does not render Claim 1 inadmissible for the following reasons:

The "auxiliary sample" in Claim 1 implies that it is also a sample out of the sequence of audio signal samples and as it is not the actual signal sample, it can only be a preceding sample. How this preceding sample is treated before it is used as the auxiliary sample is not, however, essential to the claimed invention. Other means than a multiplier (1108) are envisageable or this multiplier can be omitted in case C(0) is made as exemplified in column 6, line 32. This view is moreover in accordance with the fact that said multiplier was not in granted Claim 4 but in a separate dependent Claim 5.

2.4 Having thus established the admissibility of Claim 1 with respect to the granted statement of claims (Article 123(3) EPC), there remains to be noted that there is also no reason to question its admissibility with respect to the original application documents (Article 123(2) and 100(c) EPC).

2.5 For the aforementioned reasons (paragraph 2.3), Claim 1 is further regarded as not lacking clarity (Article 84 EPC).

2.6 The two-part form of Claim 1 (Rule 29(1)(a)/(b) EPC) requires no objection. The Appellant's submission that the peak detector of D1 necessarily implies a comparer and a switch, is not convincing because it cannot be derived from D1 that its peak detector is inevitably implemented in the way D3 shows; other possibilities can clearly not be excluded.

2.7 Claims 2 to 4 are based on granted Claims 5 to 7 and supported by the original application documents.

3. Sufficiency of the disclosure (Article 100(b) EPC) was never disputed by the Appellant but in the context of lack of clarity of Claim 1 (Article 84 EPC), the Appellant has

questioned that its subject-matter is susceptible of industrial application (Article 52(1) EPC). He based this contention on the consideration that Claim 1 does not contain all the features necessary for, or essential to, the function of the dynamic range converter, implying that - without the feature of Claim 2 - its subject-matter cannot be "used" in the sense of Article 57 EPC.

This submission would raise the general question whether a device which can be "made" but could not be "used" because it would serve no useful purpose is "susceptible of industrial application", Article 57 mentioning these two kinds of application as alternatives. However, no answer to this question is required in the present case because the subject-matter of Claim 1 can clearly be used in the sense of Article 57.

The Respondent's submission that the feature of Claim 2 is not essential to the claimed invention can be accepted in view of the considerations made in paragraph 2.3 above.

Besides, in his opposition the Appellant silently accepted the industrial applicability of the subject-matter of granted Claim 1. Present Claim 1 being narrower in scope than granted Claim 1 its subject-matter cannot, as a matter of course, be insusceptible of industrial application.

4. The subject-matter of Claim 1 undoubtedly being novel, it is only left to decide on the actual issue in the present case, namely whether it involves an inventive step.

In the Board's opinion this is indeed the case for the following reasons:

4.1 D1 coming clearly nearer to the claimed invention than D0, D1 represents the prior art document coming closest to it and showing all the features in the preamble of Claim 1.

The means mentioned in feature (iia), i.e. a peak detector, is described, in D1, as one of several alternatives, namely means measuring "according to peak and/or r.m.s. value specified by an attack time, recovery time and averaging time" (page 592). The implementation of this "peak/r.m.s. detection" (Figure 3) is not further specified in D1.

D1 mentions that in more demanding applications, the attack and recovery times or averaging time are short (page 592) but it makes no reference to the possibility of reducing the attack time to zero. On the contrary, it mentions larger attack times (in the control path) in combination with a compensatory delay in the signal path (cf. Figure 3) as an improvement (page 593).

This view is confirmed by the fact that the other alternative mentioned, i.e. r.m.s. detection cannot, by definition, be without any attack time.

Clearly therefore, from D1 it cannot be derived to implement the peak detector in the manner claimed by the characterising features of Claim 1.

4.2 This view cannot be refuted by the submission that peak detectors in general have no attack time. While this submission is, as such, certainly correct, D1 clearly proposes to use a peak detector having an attack time and it does not envisage, as an alternative, the use of a peak detector without an attack time, or generally, the use of whatever kind of peak detector.

4.3 Furthermore, this view is not refuted by D3.

Firstly, it appears to be no accident but a matter of usual language in the respective particular technical field that D3 does not use an expression like "peak detector"

although, considering the effect of a maximum recorder in measuring technology and the similar effect of a peak detector in audio technology, this term could have been used.

Secondly, in a maximum recorder for temperatures, pressures or the like as that of D3, it is intrinsic that the recorded value is updated at every cycle of measurement, i.e. without attack time and with, theoretically, infinite release time. In contrast, in audio signal processing circuits, peak detectors used for rectifying the AC signal into a DC signal, do not necessarily give an instantaneous response but some attack time is often allowed, the release time will never be infinite and some averaging time is allowable depending on the application, for instance in a power meter.

The Respondent's submission that the maximum recorder of D3 is too far from a dynamic range converter, appears therefore not unreasonable.

4.4 Even if, however, the skilled person dealing with dynamic audio signal range converters were aware of D3, he would not see a good reason for considering abolishing, against the teaching of D1, the attack time of the peak detector of this document for the only reason that an apparatus which can also be called "peak detector" but has no attack time is known from D3.

4.5 The Appellant's attempt to pose D3 nearer to the claimed invention by submitting that, when comparing the claimed invention with D3, the multiplier 5 can be disregarded because it can be omitted when its multiplication factor is 1, is not acceptable. The multiplication factor of multiplier 5 can only temporarily by chance take the value

1. What has been pointed out for multiplier 1108 (cf. paragraph 2.3) is therefore in no way applicable to multiplier 5.

4.6 In the opinion of the Board it is therefore not obvious to the person skilled in the art of audio technology to implement the peak detector in the dynamic range converter defined in the preamble by replacing that of D1 by the means defined in the characterising portion of Claim 1 exhibiting no attack time.

This the more so as the result of this replacement is not immediately evident.

According to the Respondent, this result consists in the fact that the response time of the dynamic range converter, which is now reduced to that of the low pass filter (13 in the patent), can thus be optimised in the sense that it is only as large as absolutely necessary. As a particular advantage, a special filter can be used instead of the simple first order recursive section of D1.

4.7 D2 is clearly not more relevant than D3.

4.8 In view of the prima facie pertinence of D1, D2 and D3, no other prior art document cited either in the notice of opposition or during the opposition procedure, has played a role in the appeal procedure.

A look through those other documents has not revealed that any of them might be of greater relevance to the decision to be taken. They do not therefore require any specific attention under Article 114(1) EPC.

5. The dependent claims derive their allowability from that of Claim 1 and the description and drawings on file require no observation.

6. Taking into consideration the amendments made, the patent and the invention to which it relates thus meet the requirements of the Convention.

The decision under appeal is therefore to be confirmed and the patent maintained as amended on the basis of the documents specified in the Opposition Division's communication pursuant to Rule 58(4) EPC dated 10 March 1989.

Order

For these reasons, it is decided that:

The appeal is dismissed and the case remitted to the first instance with the order to maintain the patent as amended on the basis of the documents specified in the communication pursuant to Rule 58(4) EPC dated 10 March 1989.

The Registrar: The Chairman:

M. Beer P.K.J. van den Berg