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File Number: T 473/91 - 3.5.1
Application No.: 84 304 471.0
Publication No.: 0 130 815
Title of invention: Noise reduction circuit and method

Classification: H03G 9/02

DECISION
of 25 August 1992

Applicant: WEGENER COMMUNICATIONS, INC.

Headword:

EPC Articles 56, 111(1)

Keyword: "Inventive step (main request: no) - no synergistic effect achieved by obvious application in a known apparatus of two features separately known per se"
"Remittal for further prosecution (auxiliary request) - application not ready for grant"



Case Number : T 473/91 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 25 August 1992

Appellant : WEGENER COMMUNICATIONS, INC.
150 Technology Park
Norcross
Georgia 30092 (US)

Representative : Crawford, Andrew Birkby
A.A. THORNTON & CO.
Northumberland House
303-306 High Holborn
London
WC1V 7LE (GB)

Decision under appeal : Decision of Examining Division of the European
Patent Office dated 18 May 1988 refusing European
patent application No. 84 304 471.0 pursuant to
Article 97(1) EPC.

Composition of the Board :

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

Summary of Facts and Submissions

- I. By an interlocutory decision dated 9 April 1992 the Board has already decided that, and for what reasons, the appeal in the present case (T 473/91) is admissible.

The present decision is, therefore, only concerned with the issue of the allowability of the appeal (Articles 110, 111 EPC).

- II. The appeal contests the decision dated 18 May 1988 of the Examining Division to refuse the European patent application No. 84 304 471.0 filed on 29 June 1984 (publication No. 130 815).

The independent claims underlying that decision were filed on 10 February 1987 and relate respectively to:

- Claim 1: a compandor comprising compressor and expander means,
- Claim 8: a method comprising compressing and expanding steps,
- Claim 10: compressor means for a compandor,
- Claim 14: expander means for a compandor.

The reason given for the refusal was that, although no objection was raised in previous communications against Claims 1 to 9 and 11 to 17 (if Claims 11 to 13 were made dependent upon Claim 1), the subject-matter of independent Claim 10, and of Claims 11 to 13 (as dependent upon Claim 10), lacked an inventive step.

More particularly, the Examining Division held that, starting from the compressor known from:

D1: GB-A-1 243 974

it would be obvious to use, as a suitable filter, the filter known from:

D2: 1969 Wescon Technical Papers, August 19-22, part 5 (Components and Microelectronics), pages 4/4-1 to 4/4-5

thus arriving at the claimed compressor.

- III. On 16 September 1988, together with the Statement of Grounds of Appeal, the Appellant filed an auxiliary request consisting of new Claims 1 to 16, no longer comprising the, or any other, independent compressor claim.
- IV. On 15 May 1992, he replaced the claims constituting his main request by new Claims 1 to 15, of which Claim 10 corresponds, in substance, to Claim 13 filed on 10 February 1987 and Claim 11 corresponds to Claim 12 filed on that day.

These claims read as follows:

"10. A compressor means for a compandor for improving transmission of an analog signal on a transmission medium by overcoming noise in the transmission medium, the compressor means comprising frequency division means (22, 24) for dividing an incoming analog signal into at least high and low frequency bands and means (26, 28) for separately compressing the high and low frequency bands,

characterized in that the compressor means comprises summing circuit means (22) having a first input (32) for receiving an analog input signal and a frequency selective means (24) connected between the output (34) and a second input (36) of the summing circuit means whereby to provide a high frequency signal band of said input signal at said output (34) and a low frequency signal band of said input signal at said second input (36), first integer compression means (26) coupled to said output (34) for compressing said high frequency signal band and second integer compression means (28) coupled to said second input for compressing said low frequency signal band, and means (30) for combining said compressed signal for transmission, in that the integer compression means comprising an input (34), an output (38), discreet arithmetic dividing circuit means (62) having a dividend terminal, a divisor terminal, and a quotient terminal, and a divisor feedback loop (66) which provides a divisor signal by connecting the integer compression means output to the divisor terminal of the dividing circuit means, and in that the divisor feedback loop includes rectifier (367), dual speed filter (368), and linearizer (370), and the dual speed filter comprises a fast path (315) for passing sudden bursts of the divisor signal and a slow path having a greater gain than the fast path, which slow path takes over transmission of the divisor signal after a predetermined time.

11. The compressor means of claim 10, wherein the integer compression ratio is 3:1, and the integer compression means comprises two arithmetic dividing circuit means (62, 64)."

V. In a communication pursuant to Article 11(2) Rules of Procedure, the Board, apart from raising a number of

formal objections based on Article 84 and Rule 29 EPC against Claim 10 of the main request, expressed its provisional view that, starting from the compressor known from D1 and having regard to the frequency band divider known from D2, a valid citation against the only new feature in that claim which has not been found to be obvious from a combination of D1 and D2, would be

D3: GB-A-2 073 977.

VI. In the oral proceedings, held on 25 August 1992, the Appellant no longer defended Claim 10 against the lack of inventive step objection based on a combination of D1, D2 and D3 but restricted his main request as far as claims to compressor means as such are concerned to Claim 11 filed on 15 May 1992.

The Board accepted this amendment of the Appellant's request for consideration.

As to substance, in support of this amended request, the Appellant submitted essentially the following arguments:

D1 proposes only for a compression ratio of two (page 6, lines 27 ff) to use a band separation filter (3) of even order (lines 65 to 66); for a compression ratio of 3 (page 6, lines 68 ff) it requires a filter of odd order (line 70). This teaching in D1 would discourage the skilled person, when using a compression ratio of 3:1, to consider using a band separation filter of second order such as that of D2.

Reasons for the Decision

1. Main request

1.1 Although made in a very late procedural stage, the amendment of the main request was regarded by the Board, in the oral proceedings, as an acceptable attempt to overcome the Board's reservations against Claim 10. It was therefore not dismissed as having been filed too late.

1.2 The issue to be decided being whether the subject-matter of Claim 11 filed on 15 May 1992 involves an inventive step, the claim to be considered is, in effect, Claim 10 with the features of Claim 11 directly appended.

It was agreed during the oral proceedings that any formal deficiencies of this claim should, for the time being, be disregarded and that, if the issue were decided positively, the Appellant would correct the partitioning of that claim with regard to the nearest prior art, D1.

The preamble of such a claim would, in the Board's view substantially in agreement with the Appellant's, contain the following features recited from Claims 10 and 11 with reference numerals put in parentheses () and references to D1 put in brackets []:

A compressor means (12) [3-7] for a compandor (10) [2] for improving transmission of an analog signal on a transmission medium (20) [8] by overcoming noise in the transmission medium,

the compressor means comprising

- frequency band division means (22, 24) [3] for dividing the incoming analog signal into at least high and low frequency bands,

- means (26, 28) [4, 7] for separately compressing the high and low frequency bands, these means comprising
 - first integer compression means (26) [7] coupled to a first output (34) of said frequency band division means for compressing said high frequency signal band and
 - second integer compression means (28) [4] coupled to a second output (36) of said frequency band division means for compressing said low frequency signal band, and

the integer compression means (each) comprising

- discrete arithmetic dividing circuit means [20] having a dividend terminal connected to the input (34), a divisor terminal, and a quotient terminal connected to the output (38), and comprising two arithmetic divider circuits (62, 64) [30, 31] connected in series, and
- a divisor feedback loop (66) which provides a divisor signal by connecting the integer compression means output to the divisor terminal of the dividing circuit means, the divisor feedback loop including rectifier (367), filter (368), and lineariser (370) [rectifier and smoothing 32],

wherein the integer compression ratio is 3:1 $[(aF_1)^{1/3}$ vs. $aF_1]$, and

- means (30) [5] for combining said compressed signal bands for transmission.

1.3 It is apparent from the outset that there is no further feature to be found in Claim 11 and that the features of Claim 10, which are new against D1 and therefore could constitute the characterising portion of the claim to be considered, can be formulated as follows:

(a) The frequency band division means comprises

- summing circuit means (22) having a first input (32) for receiving the analog input signal and
- a low frequency band selective means (24) connected between the output (34) and a second, negative input (36) of the summing circuit means to provide the high frequency signal band of said input signal at said output (34) and the low frequency signal band of said input signal at said second input (36);

(b) the filter in the divisor feedback loop is a dual speed filter comprising

- a fast path (315) for passing sudden bursts of the divisor signal and
- a slow path having a greater gain than the fast path, which slow path takes over transmission of the divisor signal after a predetermined time.

1.4 Feature (a) is known per se from D2. This document concerns a frequency band division means [Fig. 1(a)] comprising

- summing circuit means [+] as defined above, and

- a low frequency band selective means $[w_1/s, w_2/s]$ as defined above.

In the present case, it is not relevant that this band separating filter has further means not claimed in the claim considered:

- the attenuator $[F_2]$, if required at all, in the feedback path can be regarded as being a part of either the low pass filter (integrator) or the summing circuit $[+]$;
- the use, as low frequency band selective means, of two low pass filters $[w_1/s, w_2/s]$ connected in series with band pass output and feedback circuit containing an attenuator $[F_1]$ connected to the node between the two low pass filters can apparently be dispensed with if not required; a similar circuitry is an optional addition to embodiments of the claimed compressor as well (e.g. 131, 133).

1.5 According to D1, any filter having a flat overall amplitude-frequency response (page 3, lines 83 to 86), even in the cross-over region (lines 88 to 92 and 94 to 97), may be used as the frequency band separator [3] of the compressor [2] (lines 104 to 107). A Norton filter is only mentioned as an especially convenient form of such a filter (lines 97 to 99).

The frequency band separator of D2 has clearly the required properties (cf. page 4/4-2, left-hand column, bottom paragraph) and since it is apparently simpler than a Norton or other filter combination of high-pass and low-pass filter components this fact is an incentive for the skilled person to use, as the frequency band separator [3]

in D1, the one known from D2 instead of the example mentioned in D1.

1.6 The Appellant's argument submitted against this view is not convincing for the following reasons:

- (i) First of all, the argument (cf. paragraph VI) is not relevant for the claim under consideration, which does not specify the order of the frequency band separator. It covers a filter of first order (as exemplified in Figure 1) as well as a filter of second order (exemplified in Figures 2 and 3) (cf. description page 5b, line 33 and page 6, line 1).
- (ii) During the oral proceedings the question arose whether a further restriction of the independent compressor claim to a second order filter (with the embodiment shown in Figure 1 deleted) would appear promising. For this reason, the Board has considered the Appellant's argument with the following result:

It is true that D1 describes two "practical forms", one (page 6, lines 25 to 94) for a compression factor of two (lines 27 to 28) and the other for a factor of three (line 69) respectively, and that D1 would seem to propose for the first mentioned factor that "even if the response of the filter in the expander is chosen to be of odd order, the order of the filter 3 will be even" (lines 59 to 66) and for the factor mentioned in the second place that "both filter responses are of odd order" (line 70). Prima facie, this would seem to allow the reverse conclusion that D1 proposes not to use a compression factor of three together with an even order frequency band separator.

A closer look at D1's teaching, however, reveals that such a finding would not be conclusive. The kind of frequency band separator [3] is of no importance for the compression factor in the compressor [4], and vice versa. The question whether the frequency band separator is of odd or even order is only relevant for the relative phase between its output signals and, therefore, for the question whether or not a 90° phase shifter [6] will have to be inserted in one of the two frequency band channels (page 6, lines 5 to 24, lines 66-67 and 70 to 74).

The Board is therefore of the opinion that D1 does not, as the Appellant suggests, discourage the skilled person from using, in a compressor as claimed, a second order frequency band separator such as the one known from D2 together with integer compression means having a compression factor of three as in one of the examples of D1 (Figure 5).

1.7 Feature (b) is known per se from D3. This document concerns a gain control circuit having particular utility as a compressor (or expander) for compandors. It comprises a variable gain amplifier [2] which is, in effect, a divider (cf. equation on page 2, line 127) and thus identical in function with the divider [20] of D1, and a divisor feedback loop [4, 15] comprising rectifiers [21, 22] and smoothing circuits (page 3, lines 32 to 33 and 39 to 40), the latter consisting of a dual speed filter having a fast path [23, 27] and a slow path [24-26] as defined above.

1.8 Since that dual speed filter allows a relatively long recovery time to be obtained without adversely affecting the attack time, even with low input signal levels to the

AGC amplifier (cf. summary on title page, last sentence), it is clearly obvious in order to achieve the same advantage in D1's integer compression means [Figure 5] to use such a dual speed filter in the smoothing circuit [32] of its divisor feedback loop.

It is clear from Claim 10 that in the claimed compressor the dual speed filter has the same function, and no other function is derivable from the description.

- 1.9 Features (a) and (b) can be applied fully independently of each other because they serve different purposes, as explained, in different units of the claimed compressor without there being any interrelationship between the application of (a) in the frequency band separator and of (b) in the integer compression means. No effect linking these features to form a real inventive combination has been submitted or can be seen.

Therefore, since it is obvious from D2 to apply feature (a) in the frequency band separator [3] of the compressor of D1 (cf. paragraphs 1.5 and 1.6) and obvious from D3 to apply feature (b) in the integer compression means [4 and Figure 5] of the compressor of D1 (cf. paragraph 1.8), it is equally obvious to implement both measures at the same time.

- 1.10 For these reasons, the subject-matter of the independent compressor claim considered in the Appellant's main request (cf. paragraphs 1.2, 1.3) does not involve an inventive step and that claim is, therefore, not allowable.

Consequently, irrespective of whether or not any of the other claims of the main request would be allowable, that request is not allowable as a whole.

2. Auxiliary request

- 2.1 Claims 10 to 12 correspond to Claims 11 to 13 filed on 10 February 1987 but have been made dependent upon Claim 1.

This change of dependency is admissible because the features recited in these claims have not only been disclosed as features of a compressor as claimed in the independent Claim 10 (main request) but as features of the compressor claimed, within a compressor-expander system (compandor), in Claim 1 as well (Article 123(2) EPC).

- 2.2 For the other claims, Claims 1 to 9 and 13 to 16, the question of admissibility of the amendment does not arise. These claims are identical in substance with Claims 1 to 9 and 14 to 17 filed on 10 February 1987 which the Examining Division did not object to as introducing subject-matter extending beyond the content of the application as filed (Article 123(2) EPC) but, consequently, accepted for consideration.

The Board sees no reason to question the Examining Division's conclusion in this respect.

- 2.3 There being no independent compressor claim in the set of claims filed on 16 September 1988, the ground for refusal, given in the decision under appeal, is effectively removed.

That decision is therefore to be set aside.

- 2.4 The amendments made to the claims according to the auxiliary request result in a set of claims of which the Examining Division stated, in its decision, that no

objection was raised against it in its communication preceding that decision. It did not however expressly confirm, in the decision, the opinion expressed in said communication.

Moreover, the description has not yet been examined as to the requirements for grant of a patent. Apparently it would require amendments at least

- on page 4, D2 not being mentioned despite its apparent relevance for the first characterizing feature of Claim 8, according to Rule 27(1)(b) EPC,
- on page 5a, after the deletion of the independent Claim 10, according to Rule 27(1)(c) EPC,
- on page 7, first paragraph according to Rules 27(1)(c)/(d) and 34(1)(c) in conjunction with Article 84 EPC.

The Board, making use of the discretion given to it by Article 111(1) EPC, finds it therefore appropriate to remit the case to the first instance for further prosecution.

Order

For these reasons, it is decided that:

1. The main request is rejected.
2. The decision under appeal is set aside and the case ~~remitted to the first instance for further prosecution on~~ the basis of the auxiliary request (paragraphs III and 2.4).

The Registrar:

The Chairman:

M. Kiehl

P.K.J. van den Berg