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D E C I S I O N
of 25 November 1997

Case Number: T 0407/96 - 3.5.1

Application Number: 89111122.1

Publication Number: 0347807

IPC: H04N 5/62

Language of the proceedings: EN

Title of invention:
Detecting circuit

Patentee:
Sanyo Electric Co., Ltd.

Opponent:
Interessengemeinschaft für Rundfunkschutzrechte E.V.
Philips Electronics N.V.

Headword:
PLL-circuit with correction filter for Nyguist slope/SANYO

Relevant legal provisions:
EPC Art. 52(1), 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 25 November 1997

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 28 February 1996 rejecting the opposition filed against European patent No. 0 347 807 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: R. Randes
C. Holtz

Summary of Facts and Submissions

I. This appeal is against the decision of the opposition division to reject the oppositions because the grounds for opposition invoked under Article 100(a) EPC did not prejudice the maintenance of the patent unamended. Inter alia the following documents were cited in the decision:

D1.2: Schwartz, H.: "Empfängertechnik für das Zwei-Tonträger-Verfahren", Nachrichtenelektronik, 35(1981), Heft 4, pp. 157-163.

D2.1: Davidse, J. Et al.: 'Synchrondemodulation von Fernsehsignalen', NTZ 1969, Heft 4, pp. 525-530.

D3.3: US-A-4 253 118

D2.3: Voigt, K.C.: 'Verfahren zur Synchrondemodulation von Fernseh-ZF-Signalen', Rundfunktechnische Mitteillungen 19(1975) H.3, pp. 91-96.

D3.1: Patent Abstract of JP-A-62-145973

D3.2: Patent Abstract of JP-A-55-158782

II. On 2 May 1996 the appellant (opponent II) lodged an appeal against the decision and paid the fee on the same day. On 5 July 1996 a statement of grounds of appeal was filed. A request for oral proceedings was also filed.

III. At the oral proceedings before the Board, the appellant requested that the decision be set aside and the patent be revoked. The respondent requested that the appeal be

dismissed and the patent be maintained on the basis of claims 1 and 2 as submitted with the letter of 23 October 1997.

IV. Claim 1 of the respondent's request reads as follows:

"A detecting circuit for detecting a video signal and a sound signal in response to a video intermediate frequency, comprising:
input filter means (8) having a frequency characteristic sloped with respect to the video intermediate frequency signal included in an input television signal;
video intermediate frequency amplifying means (9) for amplifying the video intermediate frequency signal output from said input filter means;
correction filter means (10) receiving the intermediate frequency signal output from said video intermediate frequency amplifying means for correcting said video intermediate frequency signal, said correction filter means having a characteristic with a slope which is the inverse of that of said input filter means;
sound signal detecting means (20) responsive to an sound FM signal for detecting a sound signal;
characterised by
phase-locked loop means receiving an output signal of said correction filter means for phase-locking the same to said video intermediate frequency signal; and
synchronous detecting means (16) responsive to an output signal of said phase-locked loop means for synchronously detecting said uncorrected video intermediate frequency signal and outputting said sound FM signal,
wherein said correction filter means comprises a differential amplifying circuit (24, 25) for amplifying said video intermediate frequency signal, and
a resonating circuit (26) connected between outputs of said differential amplifying circuit and having a phase shift amount set in the range from 45° to 75°."

V. The appellant argued as follows:

The problem and causes of buzz in a television receiver using an intercarrier sound system were well known at the priority date of the patent. It would have been obvious to consider using a synchronous detector with a phase locked loop (PLL) in the carrier extraction path, such as that disclosed in D3.3. In fact, D2.3 disclosed this combination. Furthermore, it would have been obvious from D2.1 that phase modulation of the reference carrier and hence buzz could have been reduced by using a correction in the carrier extraction path. Finally, the use of a resonating circuit and a differential amplifier for the correction circuit were routine circuit design considerations which were suggested in D2.1.

VI. The respondent argued as follows:

The appellant has used an impermissible ex post facto analysis in picking one way to arrive at the invention from all the possibilities in the many prior art documents. Having reduced the buzz by using a synchronous detector the skilled person would not have looked for further improvements in the intercarrier sound technique, but would have considered other techniques such as the quasi-parallel system shown in D1.2 which had better sound performance. Moreover, the skilled person would not have expected that the type of buzz actually improved by the invention ("type <3>"), namely that caused by a beat signal between the sideband of the video carrier and the sound carrier, would have resulted from the use of a correction filter which normally reduced buzz caused by phase modulation ("type <2>").

D2.1, relied on by the appellant to show that it would be obvious to use such a correction filter in the carrier extraction path of the PLL, teaches away from the invention. This is because it states at page 527, at the end of section 3.2, that the use of a PLL to derive the reference carrier is subject to the problem of locking on the side bands of the IF carrier which is not easy to solve.

The invention also involves two further advantages, namely that the sound volume is not degraded and the capture range of the PLL is more stable.

Reasons for the Decision

1. The appeal is admissible.

2. *Background to the patent*

2.1 The patent concerns the problem of buzz in the demodulated sound of a television receiver using an intercarrier sound system. D1.2 describes the advantages and disadvantages of this well known sound system in the introduction at page 157. The main advantage is that the intermediate frequency (IF) signal, which contains both the video and sound signal, is processed by common IF amplifier, filter and demodulator stages. D1.2 explains that there is, however, the problem of buzz caused by phase modulation of the picture carrier used for demodulation of the intercarrier signal. It also states at page 157, top of column 3 that this is caused by the sideband asymmetry introduced by the Nyquist-slope characteristic of the IF filter.

2.2 D2.1 is concerned with synchronous detection of the television signal from the IF signal. After a description of the principles and advantages of synchronous detection, D2.1 explains, at page 526 under the section headed "3.2 Gewinnung des Referenzträgers", how to extract a reference carrier for a synchronous detector. It proposes a first method using the IF signal itself. This requires a correction filter F1 to remove the phase modulation caused, as in D1.2, by the Nyquist-slope. D2.1 also discloses a second method at page 527, end of column 1, in which the reference carrier is extracted using a PLL.

3. *Inventive step*

3.1 It is common ground that claim 1 of the patent describes an intercarrier detecting circuit which differs from that of D1.2 by the following:

(1) a synchronous detector having a detection carrier extraction path of the phase-locked loop (PLL) type, and

(2) a Nyquist-slope correction filter in the detection carrier extraction path

(3) whereby the correction filter consists of a resonating circuit connected between the outputs of a differential amplifier, and having a phase shift in the range from 45° to 75°.

It is also common ground that these differences solve the problem of buzz on the demodulated sound signal.

3.2 The Board considers that the use of a synchronous detector and a PLL in the carrier extraction path is extremely well known in the field of television

receivers, for example from D3.3. The use of such a detector in the intercarrier demodulator of D1.2, according to difference (1), is therefore an obvious consideration. Moreover, the Board is of the opinion that this combination is disclosed in the single document D2.3, in Figure 5. Although the figure does not show sound detecting means, this is considered to be implicit because of the reference to the intercarrier system and the sound carrier at page 95, first full paragraph.

3.3 The Board considers that if the above circuit exhibited the problem of buzz, the skilled person would immediately recognise this in the course of the normal operation of the circuit and set about finding a solution. Thus the Board does not agree with the respondent that the skilled person would be satisfied with the circuit as it stood and would not look for further improvements. Furthermore, the Board does not agree with the respondent that the skilled person would not develop the "outdated" intercarrier sound technique further, but would consider the superior quasi-parallel system, described in D1.2, instead. On the contrary, it would make sense to retain the former technique because of its well known advantages of low cost and simplicity.

3.4 Faced with the problem of reducing buzz in an intercarrier sound demodulator with a synchronous detector, and knowing from D1.2 that buzz is caused by phase modulation of the picture carrier due to the sideband asymmetry introduced by the Nyquist-slope characteristic in the IF stage, the skilled person would look for ways to eliminate this effect. As explained above at paragraph 2.2, D2.1 is also concerned with eliminating sideband asymmetry and it proposes a first solution of using a Nyquist-slope correction filter in the carrier extraction path. There

is even more reason to consider D2.1 in combination with a demodulator using a PLL because D2.1 suggests a second solution which also involves using a PLL to extract the carrier. The Board therefore concludes that the use of a Nyquist-slope correction filter according to difference (2) is obvious.

3.5 The Board does not consider that the problems encountered using a PLL reported in D2.1 at the end of section 3.2 on page 527 would steer the skilled person away from applying the correction filter to a PLL carrier extraction path. D2.1 does not state that the problems cannot be overcome, but merely that they are not easy to overcome. The problem of false locking of PLLs had been improved by the use of more sophisticated circuitry since D2.1 was published in 1969 when suitable PLLs were not easy to implement. This is evidenced by the number of subsequently published documents which show that, since then, PLLs in television receivers have become practicable and widely accepted (see, for example, D3.1, D3.2 and D3.3 - all published in the 1980s). Thus, by the priority date of the patent in suit, the skilled person would have considered that the problems had been overcome.

3.6 The above conclusion follows from the desire to improve buzz caused by the phase modulation of the picture carrier which the respondent refers to as "type <2>". If, as maintained by the respondent, the circuit of the patent also reduces noise of "type <3>", this would follow automatically. Thus it is not necessary to investigate the nature of this difference, or whether the skilled person would consider improving such a type of buzz.

3.7 The Board regards the use of a resonating circuit connected between the outputs of a differential amplifier as an obvious implementation of the

correction circuit. D2.1 states at page 527, section 3.3, end of first paragraph, that the correction filter consists of a narrow band filter which is set just off the IF frequency. This suggests that it is a filter with a sloping amplitude response on at least one side of the centre frequency, such as a filter with the characteristic shown in Figure 7 of the patent. A resonant circuit is an obvious example of such a filter. A resonant circuit has a phase shift which varies over the range from 0 to $\pi/2$ on one side of the centre frequency. The choice of phase shift values of 45° to 75°, according to difference (3), ensure that the circuit operates in the substantially linear portion of the response and would be determined by normal design procedures.

3.8 Claim 1 accordingly does not involve an inventive step.

4. There being no other requests, it follows that the patent must be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

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