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Bezeichnung der Erfindung: FM stereo signal demodulator
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H 04 H 5/00, H 03 D 3/00

ENTSCHEIDUNG / DECISION

vom / of / du 13 December 1988

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : Kakushiki Kaisha Toshiba

Einsprechender / Opponent / Opposant : 01 Interessengemeinschaft für Rundfunktschutzrechte GmbH
02 Grundig E.M.V.

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56, 100(a) and (b), 114(1) and (2)

Schlagwort / Keyword / Mot clé : Inventive step (yes),
Sufficiency of disclosure (yes),
Late filed submission not relevant - disregarded

Leitsatz / Headnote / Sommaire

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Case Number : T 48/87 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 13 December 1988

Appellant : (Opponent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 27 November 1986 rejecting the opposition filed against European patent No. 13 149 pursuant to Article 102(2) EPC.

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W.J.L. Wheeler
E. Persson

Summary of Facts and Submissions

I. The grant of European patent No. 13 149 on European patent application No. 79 302 992.7, filed on 20 December 1979, claiming priority of 25 December 1978 from a previous application in Japan (JP 160435/78), was published on 6 April 1983. The patent has five claims of which Claim 1, the only independent claim, reads as follows:

"1. An FM stereo demodulator for separating a composite signal into separate left and right signals by means of a switching signal, including a demodulator circuit (4) having a signal input to which an output signal from an IF amplifier circuit (3) is applied, and a pair of switching signal inputs to which the switching signal is applied so as to operate the demodulator to alternatively select left and right signal components and supply them to respective audio signal outputs (6, 7), and also including an IF level detector (5) connected to the IF amplifier, characterised in that the output from the IF level detector (5) is supplied as a gain control signal to a variable gain amplifier circuit (123, 124, 127) for the said switching signal so as to continuously vary the amplitude of the switching signal and thus the stereo separation, in accordance with, and in the same sense as, the said IF level."

II. On 21 December 1983 an admissible opposition was filed by Grundig E.M.V. (Opponent I) requesting revocation of the patent on the ground that its subject-matter was not patentable having regard to the prior art known from DE-A-2 511 026 and US-A-4 032 717.

III. On 5 January 1984 an admissible opposition was filed by IGR (Opponent II) requesting revocation of the patent on

the ground that its subject-matter was not patentable having regard to the prior art known from:

- Technische Information der Firma Becker Autoradiowerk GmbH for the apparatus Mexico Cassette Vollstereo, ab Gerät Nr. H 120 001 (which will be referred to as D1)

- Katalog für den Rundfunk-Fernseh-Phonohandel 1972/73, page G4 (D2)

- VALVO-Handbuch: Integrierte Linear-Schaltungen, 1973, pages 193 to 197 (D3).

IV. In a letter received on 25 May 1985, Opponent II referred to a further prior art document, which had been cited in the European Search Report:

- US-A-3 634 626 (D4).

V. In oral proceedings on 16 October 1986, Opponent II argued the subject-matter of Claim 1 of the opposed patent was infeasible. In a decision announced at the oral proceedings and dispatched on 27 November 1986, the Opposition Division rejected both the oppositions.

VI. On 26 January 1987 the Appellant (Opponent II) filed a notice of appeal against the above mentioned decision, paid the fee for appeal, and filed a written statement setting out the grounds of appeal. Opponent I did not appeal.

VII. In the statement of grounds, the Appellant referred to D4 and to the following documents:

- Fig. 7 of DE-B-1 283 931 (D5),

- Siemens: Integrierte Schaltungen, Datenbuch 1972/73, pages 3 to 11 and 428 to 440 (D6) and

- US-A-4 032 717 (D7),

and argued that the subject-matter of Claim 1 of the opposed patent was infeasible. The Appellant also argued that insofar as the opposed patent did contain feasible subject-matter, namely the control of the 38 kHz carrier in response to the level of the IF signal, it did not involve an inventive step, having regard to D4, which disclosed the control of the 38 kHz carrier in response to the noise of the IF signal, the noise and the level of the IF signal being equivalent parameters for the receiving quality.

VIII. In a letter dated 11 June 1987, the Respondent pointed out that the Appellant's arguments on feasibility related to a different type of decoder in which the L+R and L-R components were extracted from the IF signal. As set out in the preamble of Claim 1, the demodulator of the present invention simply selected the alternately occurring L and R components from the IF signal. The way in which the switching signal influenced the stereo separation in accordance with the IF signal level was explained on pages 6 to 9 of the application as filed (corresponding to page 4, line 12, to page 6, line 5, of EP-B-13 149). D4 was not concerned with continuously varying the stereo separation, but with switching between stereo and mono as may be seen from column 2, lines 16 to 27 and column 5, lines 59 to 69 from which it was clear that the transistor 46 (amplifier for the 38 kHz signal) was firmly held in the conducting or non-conducting state if the detected noise was at about the threshold level.

IX. With a letter dated 4 December 1987, the Appellant filed a further document:

- Funkschau, 1972, Heft 5, pages 155 and 156 (D8)

which, according to the Appellant, explained the operation of the circuit shown in D1, which produced a continuous transition between the stereo and mono modes of operation in dependence on the level of the received signal. The skilled person could see from Figs. 1 and 2 of D4 that the circuit shown there had the same organisation and method of operation as the circuit shown in Figs. 1 and 2 of the opposed patent. The nature of the transition between the stereo and mono modes depended on the design of the synchronous detector (22 in Fig. 1 of D4), which was within the ability of the skilled person.

X. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board observed that no submission on the basis of Article 100(b) EPC had been made within the 9 months period specified in Article 99(1) EPC. Furthermore, the Appellant's arguments on this point only appeared to show that a continuous control of the stereo separation could not be obtained by varying the amplitude of the 38 kHz carrier in the TBA 450 integrated circuit, which was not relevant to the question of whether the disclosure in the opposed patent was sufficient. The Board pointed out that, following the principles explained in paragraphs 12 and 15 of the decision T 122/84 (OJ EPO, 1987, 177), it may disregard this submission and the documents D5 and D6 filed in support of it.

XI. Oral proceedings were held on 13 December 1988. The Appellant argued in effect that the expression

"continuous transition" used in Claim 1 of the opposed patent covered all transitions that were not discontinuous. A person skilled in the art studying Fig. 2 of D4 would realise that the transistor 46 could not produce a discontinuous transition between its fully off and fully on states. The circuit configuration around the transistor 46 was typical of that of a variable gain amplifier. The circuit known from D4 would consequently produce transitions between stereo and mono modes of operation which were continuous, at least to some extent. Such continuous transitions were not excluded by the use in D4 of the terms "switching" and "predetermined level." The opposed patent included no clear definition of "continuous variation." The curve showing the variation of the stereo separation with the separation control voltage going up to 4 volts (Fig. 3 of the opposed patent) was misleading, the sloping part of the curve should lie between 0.6 and 0.9 volts, since a base voltage of 0.9 volts would cause saturation of the transistor 127, assuming that it was a silicon transistor. The opposed patent revealed nothing about the IF level detector 5. The circuit 40, comprising transistors 123 and 124 to the bases of which the 38 kHz switching signal was fed, was originally described as a "gate circuit". Claim 1 of the opposed patent did not go beyond the teaching a skilled person would derive from D4.

XII. The Respondent pointed out that the way in which the decoder was controlled to produce the continuous variation of stereo separation was disclosed in the "Druckexemplar" from page 6 onwards (corresponding to page 4, line 12 onwards of EP-B-13 149). As was explained in column 1 of D4, two types of multiplex demodulator were generally known for use in FM stereo receivers, and both types involved synchronous detection. D4 did not say which

type was used in block 22 of Fig. 1. The aim of D4 was to produce hard switching, as may be seen from column 5, line 28 onwards, and column 2, line 21 onwards. It was only with hindsight that one could read into D4 that continuous variation could be achieved. The term "gate circuit" had been used in the application as filed for the circuit 40 because of its role in the alternate selection of the signals and did not refer to the level of the signals let through.

XIII. The Appellant requests revocation of the opposed patent. The Respondent requests dismissal of the appeal.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. Claim 1 of the opposed patent is directed to an FM stereo demodulator for separating a composite signal into separate left and right signals by means of a switching signal, including a demodulator circuit having a signal input to which an output from an IF amplifier circuit is applied, and a pair of switching signal inputs to which the switching signal is applied so as to operate the demodulator to alternately select left and right signal components and supply them to respective audio signal outputs. The claim is thus directed to an FM stereo demodulator of the time division multiplex type.

3. The only mention in any of the documents cited by the Appellant of the time division multiplex type of stereo demodulator occurs in the third paragraph of column 1 of D4, where two conventional types of multiplex demodulator

are briefly described as part of a review of the state of the art from which D4 started. In view of the Appellant's arguments advanced at the oral proceedings, see paragraph XI above, it is appropriate to consider in some detail, exactly what it is that a person skilled in the art would learn from D4, if he had no knowledge of the disclosure in the opposed patent.

3.1 In the fourth paragraph of column 1 of D4 it is stated: "To avoid the reproduction of objectionable noise in the receiver, it is desirable to cut off the 38 kHz demodulating wave, and thereby disable the multiplex demodulator, when ... a relatively weak stereophonic signal is received. This ... has commonly been provided by a manual switching arrangement. As manual switching is inconvenient, however, deluxe FM stereo receivers are generally provided with a ... automatic stereo to mono switch activated upon reception of a pilot signal which exceeds a predetermined threshold." The last sentence of this paragraph mentions that this "does not provide optimum noise avoidance and operates with a relatively unnatural response with respect to the listener."

3.2 According to the first two paragraphs of the section headed "SUMMARY OF THE INVENTION" the purpose of the D4 invention was to provide an improved automatic stereo to monaural switch for FM receivers and an improved means in an FM stereophonic radio receiver for automatically switching from stereophonic to monaural operation in response to a predetermined received noise level.

3.3 The whole tenor of D4 is that the circuit described from column 1, line 70, onwards and shown in Figs. 1 and 2, provides automatic switching from stereophonic to monaural operation in response to a predetermined received noise

level. D4 contains many references to such switching and nowhere is there even the slightest hint of continuously varying the stereo separation.

3.4 Although a person skilled in the art may be able to deduce from the circuit diagram of Fig. 2 of D4 that the amplitude of the 38 kHz demodulating signal appearing at the collector of transistor 46 would not vary discontinuously, as argued by the Appellant, the Board is not persuaded that the D4 circuit must, inevitably, continuously vary the stereo separation in accordance with the detected IF noise level. This would depend on details of the synchronous detector 22 which are not disclosed in D4. According to column 3, lines 18 to 21, the 38 kHz demodulating signal would be applied to the synchronous detector "via its input coupling transformer," which, in the opinion of the Board, does not imply that the synchronous detector 22 is of the time division multiplex type. Nor would it be apparent to a skilled reader with no knowledge of the teaching in the opposed patent that the stereo separation would vary in a continuous manner.

4. In the opinion of the Board, the only teaching in the direction of the FM stereo demodulator claimed in Claim 1 of the opposed patent that a person skilled in the art would obtain from D4 is that the reproduction of objectionable noise can be avoided by automatically cutting off the 38 kHz demodulating signal from the synchronous detector, which may or may not be of the time division multiplex type, when the detected noise in the IF signal is above a pre-determined level. This would not lead him to the FM stereo demodulator according to Claim 1 of the opposed patent, which differs from the prior art known from D4 in that the demodulator (4) has a pair of switching signal inputs to which the switching signal is

applied, in that it includes an IF level detector, and in that the arrangement is such as to continuously vary the stereo separation, in accordance with, and in the same sense as, the said IF level.

5. Documents D1, D2, D3 and D8 all relate to the same prior art apparatus, namely the Becker Mexico car radio. As can be seen from the "Blockschaltbild" in D1, the stereo decoder is of the type in which L+R and L-R signals are derived from the IF composite signal and fed, via the M and S channels respectively, to a decoder matrix circuit which forms the L and R signals. In the event of a weak signal, there is an automatic smooth transition from stereo to mono. This is achieved by the transistor T313 controlling the amplitude of the S channel signal, and hence that of the L-R signal, in accordance with the IF signal level. D8 confirms this interpretation of D1. It is clear from D8, page 156, column 1, line 19 to column 3, line 21 and Fig. 5, that the transistor T2 (equivalent to T313 in Becker) controls the amplitude of the S channel signal, and hence that of the L-R signal, in accordance with the IF signal level.

6. D7, which is the US equivalent of DE-A-2 511 026 cited by Opponent I within the 9 months period specified in Article 99(1) EPC, likewise concerns a stereo decoder which provides an automatic smooth transition from stereo to mono by varying the amplitude of the L-R signal in accordance with the IF signal level.

7. However, as noted in paragraph 2 above, the opposed patent does not concern a stereo demodulator of the type in which L+R and L-R signals are derived from the IF composite signal, but rather one of the type in which the L and R signal components, which occur alternately in the IF

composite signal, are simply switched to their respective outputs.

8. In the opinion of the Board, the fact that it was known to continuously vary the amplitude of the L-R signal and thus the stereo separation, in accordance with, and in the same sense as, the IF signal level does not make it obvious that a continuous variation in stereo separation can be obtained by continuously varying the amplitude of the switching signal in the time division multiplex type of demodulator.

9. The Board therefore finds that the FM stereo demodulator claimed in Claim 1 of the opposed patent is new and involves an inventive step, having regard to the prior art cited by the Appellant.

10. As far as sufficiency of disclosure is concerned, the Board notes that the Appellant's arguments in the statement of grounds, see paragraph VII above, relate to a different type of circuit from that claimed and ignore the explanation given on pages 4 to 9 of the "Druck-exemplar" (or pages 3 to 6 of EP-B-13 149, which, however, contain printer's errors). The Board notes that the operation of circuit 40 as a variable gain differential amplifier (and not simply a gate) is mentioned in the originally filed Claims 2 and 3 and is clear from the explanation on pages 6 to 9 of the description as originally filed. The Board is satisfied that, despite the doubts raised by the Appellant at the oral proceedings about the accuracy of the curve shown in Fig. 3 of the opposed patent, a person skilled in the art would be able to devise a suitable IF level detector to provide a suitable signal to the base of the transistor 127 and would thus be able to carry out the invention.

11. Summarising, none of the grounds for opposition mentioned in Article 100 EPC have been shown to prejudice the maintenance of the patent unamended.

Order

For these reasons, it is decided that :

The appeal is dismissed.

The Registrar

S. Fabiani

S. Fabiani

The Chairman

P.K.J. van den Berg