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D E C I S I O N
of 4 February 1998

Case Number: T 0320/96 - 3.5.2

Application Number: 89307065.6

Publication Number: 0362987

IPC: G11B 7/09

Language of the proceedings: EN

Title of invention:
Servo device for disc player

Patentee:
Pioneer Electronic Corporation

Opponent:
Interessengemeinschaft für Rundfunkschutzrechte E.V.

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0320/96 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.3
of 4 February 1998

Appellant: (Proprietor of the patent)
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Representative: -

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 9 February 1996 rejecting the opposition filed against European patent No. 0 362 987 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: M. R. J. Villemin
A. C. G. Lindqvist

Summary of Facts and Submissions

I. The appellant (opponent) contests the decision of the opposition division rejecting the opposition to European patent No. 0 362 987.

II. The patent has not been amended in the appeal proceedings. Claim 1 reads as follows:

"A disk player servo device comprising:

an A/D converter (2) for digitizing at least one analog error signal (FE,TE) formed from an output signal of a pickup adapted to read data from a disk;

means for driving the pickup according to the level of the error signal (FE,TE);

a variable gain amplifier (9,10) provided on the input side of the A/D converter (12) for amplifying the at least one error signal (FE,TE) and supplying the amplified error signal to the A/D converter (2);

characterised by

digital signal variable amplification means (13) connected to receive the digitized output signals from the A/D converter (2); and,

control means (15,18) connected to the variable gain amplifier (9,10) and the variable amplification means (13) and responsive to the open/closed loop condition of the servo for controlling the amplification factors of the amplifier (9,10) and amplification (13) means to achieve substantially equal overall gain for both open loop and closed loop error signals while greatly increasing the voltage range of the at least one closed loop error signal input to the A/D converter (12)."

Claims 2 to 7 are dependent on claim 1.

III. In the notice of opposition the opponent argued that the claimed subject-matter was not patentable because of lack of an inventive step having regard to the prior art documents:

D1: EP-A-0 247 829 and

D2: DE-A-3 503 983.

With the grounds of appeal the appellant cited for the first time the following additional prior art documents:

D3: DE-C-3 333 071 and

D4: Book by Oppenheim, entitled "Applications of Digital Signal Processing", Prentice-Hall, Englewood Cliffs, N.J., 1978, Chapter 2: "Digital Processing in Audio Signals" pages 32 to 41 and 108 to 116.

IV. Oral proceedings were held on 4 February 1998.

V. The appellant's arguments during the appeal proceedings can be summarized as follows:

D3 and D4 should be admitted in view of the object of the patent in suit which concerned the amplification of signals with amplitudes differing by orders of magnitude. The claimed subject-matter was not limited to audio discs; a video disc was explicitly mentioned in the patent in suit at column 1, line 6. The technical field of the patent in suit therefore also comprised the amplification of television signals, to which D3 related. D4 concerned the principles of analog-to-digital conversion and would be considered

for alternatives when a solution was sought for faithfully converting signals of different orders of magnitude (see description of the patent in suit, column 1, lines 34 to 43).

A servo device as defined in the preamble of claim 1 was known from D1.

D3 taught the use of controllable amplifiers 24 and 31 to achieve substantially equal overall gain for large and small signals which corresponded to the "open loop and closed loop error signals" of claim 1 of the patent in suit, respectively. In particular, amplifier 24 considerably increased the voltage range of the input signal to A/D converter 10. A person skilled in the art would recognize the basic principle of D3 and would thus disregard any intermediate circuits between the A/D-converter 10 and the D/A converter 14. D3 therefore, see column 3, lines 3 to 6, provided a solution for the problem which the patent in suit sought to solve.

The subject-matter of claim 1 was therefore not inventive over D1 and D3.

Moreover, a person skilled in the art knew that the conversion range of an A/D-converter could be optimally exploited by providing controlled preamplification together with a floating point format, see D4, page 40, Figure 2-3 and related text.

VI. The respondent's arguments can be summarized as follows:

The documents, D3 and D4, cited as the only basis for the appeal and without justification, should be disregarded in accordance with Article 114(2) EPC.

D3 was a document relating to the reduction of signal-to-noise ratios in colour television signal processing and was therefore not related to the invention's problem of servo control in a disc player. There was no indication that a skilled person addressing himself to this problem would consider any documents concerning signal processing in colour televisions.

D4 was a 20-year old standard textbook and of background relevance only. It was unlikely that the teaching of D4 could influence the consideration of a person seeking servo control improvement.

VII. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

VIII. The respondent requested that the documents D3 and D4 be disregarded and that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. The subject-matter of claim 1 being undisputedly new, the single issue to be decided in this appeal is whether the subject-matter involves an inventive step, having regard to the prior art cited by the appellant.

2.1 *Closest prior art and problem underlying the present invention*

In the present appeal, both parties and the Board agree that D1 represents the prior art closest to the claimed disk player servo device. D1 describes a digital servo device according to the preamble of claim 1 (see Figure 3). A focus error signal generation circuit 1

produces an error signal which is amplified by a variable gain amplifier 2 and fed to an A/D-converter 16. A microprocessor 17 receives the digitized amplified error signal and generates a drive signal to be applied to an actuator via a D/A converter 20 and an amplifier 8. A detected peak-to-peak value of the error signal is used to adjust the gain of the variable gain amplifier 2.

The level of the error signals generated by the focus error signal generation circuit of D1 varies over a wide range, dependent on whether the servo loop is open or closed. The drawback of D1 is therefore the required wide operating range of the A/D converter 16. The problem for the assessment of inventive step is thus as defined in column 1, lines 44 to 48 of the patent in suit, namely "to provide a servo device for a disc player in which the bits of the A/D converter are effectively utilized so that the digital servo can perform with higher accuracy whether the servo loop is open or closed".

According to claim 1 this problem is essentially solved by the provision of a digital signal variable amplification means on the output side of the A/D converter and a means to control the amplification factors on either side of the A/D converter such that a substantially equal overall gain is achieved, both in the open and closed conditions of the servo loop, while greatly increasing the voltage range of the closed loop error signal input to the A/D converter.

In D1, (see Figure 3), the variable gain amplifier 2 on the input side of the A/D converter 16 is used to change the loop gain to compensate for light source power variations. No hint can be found in D1 that this amplifier could be used together with a complementarily controlled digital amplifier on the output side of the

A/D-converter to widen the range of the closed loop error signal input to the A/D converter, while maintaining substantially equal overall gain in the open and closed loop conditions. A skilled practitioner could therefore not derive the claimed solution from D1.

2.2 In the disk player apparatus with a focus servo system disclosed in D2 (see Figure 1), the output of the variable gain focus servo amplifier E is connected to the focus actuator 3. This amplifier is used to control the gain of the focus servo loop to adjust the loop sensitivity, depending on the occurrence frequency of detected errors detected in circuits A, B and due to dropouts in the output signal delivered by the optical sensor 4. No attention is paid to the problem of having a constant overall gain when the servo loop is open or closed. Thus the teaching of D2 provides no hint for solving the problem addressed in the patent in suit.

2.3 The question which falls therefore to be decided by the Board is whether the skilled person, starting from D1, and addressing the problem as stated in the second paragraph of point 2.1 above, would, as contended by the appellant, seek and find a suggestion in the documents D3 or D4 leading to the solution according to claim 1 of the patent in suit.

2.3.1 D3 describes, see Figure 1, a circuit for processing colour television signals to be conveyed on a transmission path ("Übertragungsstrecke U") and subjected to analog-digital-analog conversions. This known circuit shows several crucial differences with the claimed device, in particular:

- it is intended to increase the signal-to-noise ratio of a colour television signal;

- it does not include any servo system or a open/closed loop system,

- it does not include a digital signal variable amplification means connected to receive the digitised output from the A/D converter 10, but an analog variable gain amplifier 31 provided on the output of a D/A converter 14 which receives signals from the A/D converter 10 via a coder 3, a gate 32 and a decoder 11.

The combination of the variable gain amplifier 24 disposed on the input side of the A/D converter 10 with the analog variable gain amplifier 31 disposed on the output of the D/A converter 14 permits achieving an equal overall gain for the transmission of colour television signals B-Y and R-Y. The Board does not see, however, why the skilled person would be prompted to apply the teaching of D3 to a disk player device such as is known from D1, disregarding the intermediate circuits between the A/D converter 10 and the D/A converter 14. D3 does not concern the technical field of servo systems, or the problem of the patent in suit. A person skilled in the art would therefore disregard D3 when searching for a solution to the problem posed.

2.3.2 D4 (see in particular section 2.2.2) describes the floating-point converter technique. The circuit of Figure 2-3 and the corresponding text shows and mentions switchable variable gain amplifiers (0dB, +6dB, +12dB and + 18dB) which can be individually connected on the input side of the A/D converter, a particular amplifier being selected according to the test value of the signal level at its input and in such a way that the gain is maximised without producing overload of the converter. There is no suggestion in D4 that the gain control circuit of Figure 2-3 could be replaced by control means able to respond to the

open/closed loop mode condition of a servo device and that a substantially equal overall gain for any input signal level could be achieved by providing a controllable digital amplification means connected to receive the digitised output signal from the A/D converter. A person skilled in the art would therefore also disregard D4 when searching for a solution to the problem posed.

2.3.3 The Board therefore concludes that documents D3 and D4 are not of such relevance that they could put the maintenance of the patent at risk. The Board therefore disregards D3 and D4 according to Article 114(2) EPC.

3. The Board therefore concludes that the subject-matter of claim 1 as granted involves an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani W. J. L. Wheeler