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D E C I S I O N
of 3 December 1997

Case Number: T 0579/95 - 3.5.2

Application Number: 87108179.0

Publication Number: 0248444

IPC: G11B 7/085

Language of the proceedings: EN

Title of invention:
Tracking servo system for an information recording disc player

Patentee:
Pioneer Electronic Corporation

Opponent:
Interessengemeinschaft für Rundfunkschutzrechte E.V.

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56
EPC R. 29(1)(a), 27(1)(b)

Keyword:
"Inventive step - yes, after amendment"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0579/95 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 3 December 1997

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 16 May 1995 rejecting the opposition filed against European patent No. 0 248 444 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: A. G. Hagenbucher
A. C. G. Lindqvist

Summary of Facts and Submissions

I. The appellant filed an opposition against European patent No. 0 248 444 and now contests the decision of the opposition division rejecting the opposition.

II. In the notice of opposition the appellant raised the objection that the patent as granted did not meet the requirements of Article 52(1) in conjunction with Article 56 EPC. The following documents cited in support of the opposition remain relevant to the present appeal:

D1: JP-A-61-80529 (with English translation and corresponding patent abstracts of Japan, vol. 10, No. 254 (P-492) 2310, 30 August 1986),

D2: EP-A-095 766.

In the appeal proceedings the appellant additionally referred to

D3: U. Tietze, Ch. Schenk: "Halbleiter-Schaltungstechnik", 5th edn., 1980, Springer Verlag, pages 688-698, especially pages 694/695, and

D4: E. Samal: "Grundriß der praktischen Regelungstechnik", 7th edn., 1967, R. Oldenburg, pages 244-253, especially pages 245/246.

In a communication annexed to the summons to oral proceedings the Board referred to

D5: "Research and Disclosure", No. 248, December 1984, pages 588-599 mentioned in column 1, lines 5 to 21 of the patent specification (EP-B1-248 444).

III. In a response to the communication of the Board the respondent filed a new set of claims 1 to 3 on 29 October 1997 in which granted claim 2 is incorporated into claim 1. Oral proceedings were held on 3 December 1997.

Claim 1 reads now as follows:

"1. A tracking servo system for use in an information recording disc playing system having a pickup, including:
tracking error signal generating means (1-4) for generating a tracking error signal (S2,S3) in accordance with an amount of shift of an information reading spot (S1) of said pickup with respect to a recording track (T) formed on said disc, in a radial direction of said disc;
drive means (12,13) for deflecting said information reading spot (S1) in said radial direction of said disc;
equalizing means (9) connected to said tracking error signal generating means for compensating a frequency characteristic of said tracking error signal and producing an output signal,
a loop switch (11) disposed between said equalizing means (9) and said drive means (12,13) for switching the transmission of said output signal of said equalizing means to said drive means,
control means (14,16,17) for controlling the transmission of said output signal of said equalizing means (9) to said drive means (12,13), wherein
said control means (14,16,17) stops the transmission of said output signal of said equalizing means by opening said loop switch (11) in response to a jump command for a track jump operation by which said information reading spot (S1) moves from a recording track section to another recording track section, and resumes the transmission of said output signal of said equalizing

means by closing said loop switch (11) at a desirable timing during said track jump operation, characterized in that said control means (14,16,17) is further operative to change the equalizing characteristic of said equalizing means (9) for a predetermined time period after the resumption of the transmission of said output signal of said equalizing means, wherein said equalizing means (9) has an integration coefficient (K_I) and a differential coefficient (K_D) both of which are variable and which determine said equalizing characteristic of said equalizing means, and wherein said control means (17) is operative to make said integration coefficient smaller than its value under a normal playing condition of said disc playing system and make said differential coefficient larger than its value under said normal playing condition for said predetermined time period after the resumption of the transmission of said output signal of said equalizing means to close said servo loop."

Claims 2 and 3 are dependent on claim 1.

IV. The appellant argued essentially as follows:

A combined consideration of the subject-matter of D1 or D5 with that of D3 or D4 led to the claimed invention. Both documents D1 and D5 disclosed tracking servo systems with an early and quick response to track jump commands and intermediate interruption of the servo loop. All the features in the preamble of claim 1 were known from D5. According to D1 the loop gain was increased at the end of a jump for a quick stabilisation. For the same purpose, D5 disclosed a compensator 18 including equalizing means of a differentiating nature. Starting from either of these known tracking servo systems the person skilled in the art would immediately arrive at the claimed solution merely by taking into account general knowledge such as

known from D3 and D4. Claim 1 required that at the end of a jump the integration coefficient was decreased and the differential coefficient increased. This was an obvious design of the servo loop. It could be seen from D3 and D4 that servo loops had to react to a sudden change of control conditions in order to obtain quickly a stable state. For this purpose the differential coefficient of the servo loop was normally increased. Afterwards the servo control state had to be conserved. This was normally achieved by increasing the integration coefficient. It was clear that at the end of a jump from one recording track to another one in accordance with D1 or D5 such a servo control adaptation was desirable and therefore obvious for a person skilled in the art.

V. The respondent's arguments can be summarised as follows:

The preamble of claim 1 was neither based on D1 nor on D5 but on the non-documented art indicated in the patent specification, column 1, line 37 to column 2, line 36. D1 suggested in connection with a track jump to increase only the gain, hence to use a P-control. D5 concerned a different solution using a PD-control, and sample and hold circuits instead of a loop switch. None of these documents showed a PID-control. It could be seen from column 2, lines 6 to 36 of the patent specification that the problem underlying the present invention arose only in connection with a PID-control. The equalizers known from the documented prior art did not make use of a PID-control. The use of a PID-control for the claimed tracking servo system was a first step of the inventive contribution. The mention of a PID-control in column 2, line 8 of the patent specification reflected only internal knowledge of the inventor.

VI. The appellant (opponent) requested that the decision under appeal be set aside and that European patent No. 248 444 be revoked.

VII. The respondent (patentee) requested that the patent be maintained in amended form in the following version:

Claims 1 to 3 filed on 29 October 1997, description and drawings of the patent specification.

Reasons for the Decision

1. The appeal is admissible.

2. New claim 1 has been restricted with respect to granted claim 1 by incorporating the features of granted claim 2. Hence, new claim 1 does not infringe Article 123(3) EPC.

3. The subject-matter of claim 1 being undisputedly new, the issue to be decided in the present appeal is whether the subject-matter involves an inventive step.

3.1 Closest prior art and problem underlying the present invention.

In the present appeal case the determination of the closest prior art is in dispute. According to the appellant either of documents D1 or D5 should be considered as the closest prior art. In his view D5 showed all the features in the preamble of claim 1. The respondent explained that the preamble of claim 1 was based on non-documented internal knowledge of the inventor indicated in column 1, line 37 to column 2, line 36 of EP-B1-248 444 (corresponding to column 1, line 33 to column 2, line 15 of EP-A2-248 444).

3.1.1 Document D1 discloses a tracking servo system in which a track jump operation is performed accurately and speedily. In order to achieve this, D1 suggests control means which are operative to change the characteristic for a predetermined time when the jump of the light beam has ended. The characteristic of the servo loop is changed by increasing its gain. This is implemented by short-circuiting a resistor R1 by an analogue switch 21 during the presence of a prescribed pulse. Increasing just the gain is only a P-control measure which does not change any frequency characteristic of the tracking error signal as indicated in the preamble of claim 1. Hence, document D1 does not show all the features in the preamble of claim 1.

3.1.2 Document D5 discloses a tracking servo system for an information disc drive system. The circuit shown in Figure 1 includes a differential amplifier for detecting a difference between output signals T1 and T2 of an optical head and for generating a tracking error signal, a logic circuit for processing the tracking error signal and a drive amplifier 14 for a tracking coil. The logic circuit comprises a first sample and hold circuit 10, a boost and compensation circuit 18 having a PD transfer function and a second sample and hold circuit 18 in serial connection. During a jump operation, the first sample and hold circuit 10 is put into a hold mode, so that the servo loop is held in an initial state, and an accelerate voltage generator 15 applies an accelerating voltage to the amplifier 14. When the lens moves over a groove, zero-crossing of the tracking error signal is detected by a comparator 16. The sample and hold circuit 10 is then put into a sample mode again and the accelerating voltage is turned off. At the same time, the second sample and hold circuit 12 is put into a hold mode, and the boost and compensation circuit 18 can assume a correct initial condition. Subsequently, a peak of the tracking

error signal is detected by means of zero-crossing of the output signal of the boost and compensation circuit 18, and the servo loop is closed in response to the detection.

Therefore, the operation of the system of D5 is basically different from that of the present invention in which the tracking servo loop is only opened between the equalizing means and the drive means in response to a jump command signal and in which the equalizing means is permanently receiving and processing the tracking error signal. The circuit of document D5 has therefore no loop in the sense required by the preamble of claim 1. Moreover, D5 does not disclose an equalizing means with a PID function as implicitly defined in the characterising part of claim 1 of the patent in suit. It is clear from the above that document D5 does not disclose all the features in the preamble of claim 1, either.

3.1.3 Document D2 refers to track jump operations in connection with Figures 30 to 33. The gain of the variable gain amplifier 50 is increased at the beginning of a track jump operation and decreased in one or more steps after the jump during normal playback (see Figure 31 or 33). D2 does not mention opening and closing of the loop or an intermediate change of the parameters of the variable gain amplifier or phase compensation circuit during a track jump operation.

Documents D3 and D4 concern only various controllers such as P, PD, and PID-controllers, but do not mention tracking servo systems.

3.1.4 Thus none of the cited prior art documents corresponds to the preamble of claim 1, and none of them are closer than the tracking servo system described (without reference to a published document) in the patent

specification, starting at column 1, line 37 until column 2, line 36. The preamble of claim 1 is based on this servo system. Although column 2, lines 6 to 10 of the patent specification mentions the incorporation of an equalizing means capable of a proportional integral differential (PID) operation in the servo loop, there is no mention of equalizing means with variable I and D components. The PID operation of the equalizing means recited in claim 1 is thus different from that of the above mentioned servo system. According to the respondent the use of a PID operation was internal knowledge not available to the public and was a first step towards the present invention. As explained at column 2, lines 10 to 36 of the patent specification with reference to Figures 2B and 4, that servo system suffers from the disadvantage that lock-in of the servo loop is performed during an acceleration drive of the actuator, causing a large over-shoot and unstable lock-in of the servo loop.

It is therefore an object of the present invention to provide a tracking servo system in which the lock-in of the servo loop is stably and certainly performed at the time of the track jump operation.

3.2 According to claim 1 this problem is essentially solved by

an equalizing means with variable integration and differential coefficients and wherein the control means is operative to make the integration coefficient smaller than its value under a normal playing condition and to make the differential coefficient larger than its value under the normal playing condition for a predetermined time period after the resumption of the transmission of the output signal of said equalizing means to close the servo loop. It is explained in the patent specification that by means of this variable

control operation during lock-in of the servo loop the gain boost effect for the low frequency range is reduced since the integration coefficient is made small. Therefore the gain in the low frequency range has a reduced effect on the operation of the system and the lock-in of the servo loop during the track jump operation is attained in a stable and certain manner.

3.3 In connection with tracking servo systems, the available prior art documents mention only P- (see document D1) and PD-controllers (see documents D2 and D5), but no PID-controllers. Documents D3 and D4 describe no tracking servo systems but various types of controllers, namely P-, PI- and PID-controllers, the influence of integration and differential components on their operation and experimentally adaptable controllers per se, but no controllers with parameter adaptation triggered by changes in loop conditions. D3 and D4 do not give any hint at using a PID-controller for a tracking servo in an information recording disc playing system. Much less can from the available prior art be derived the idea of changing the equalizing characteristics of an equalizing means for a predetermined time period after the resumption of the transmission of an output signal of an equalizing means by making the integration coefficient smaller than its value under the normal playing condition and making the differential coefficient larger than its value under the normal playing condition. The appellant's arguments in connection with the available prior art explain very well the operation of the present invention, but amount to no more than an ex post facto analysis of the claimed invention. They are not sufficient for convincing the Board that a skilled person would arrive at the claimed invention from the available prior art, especially as no tracking servo system with a PID-controller is known therefrom.

Hence the subject-matter of claim 1 involves an inventive step.

4. In the opinion of the Board, independent claim 1, together with the dependent claims 2 and 3 are allowable. The patent can be maintained in the amended form requested by the respondent.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent as amended in the following version:

claims 1 to 3 as filed 29 October 1997,

description and drawings of the patent specification.

The Registrar:

N. Maslin

The Chairman:

W. J. L. Wheeler