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Datasheet for the decision of 04 December 2008

Case Number: T 1297/05 - 3.5.04

Application Number: 97112141.3

Publication Number: 0820053

IPC: G11B 7/00

Language of the proceedings: EN

Title of invention:
Optical disk, optical disk device, and optical disk recording method

Applicant:
Sony Corporation

Headword:
-

Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art.56

Keyword:
"Inventive step - no"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1297/05 - 3.5.04

D E C I S I O N
of the Technical Board of Appeal 3.5.04
of 04 December 2008

Appellant: Sony Corporation
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 14 April 2005 refusing European application No. 97112141.3 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chairman: F. Edlinger
Members: C. Kunzelmann
B. Müller

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse European patent application No. 97 112 141.3.

II. The application was refused on the ground that the subject-matter of all the claims lacked an inventive step having regard to the prior art document

D3: EP 0 552 936 A1.

III. The applicant appealed and filed respective claims 1 and 6 in accordance with a main request and first and second auxiliary requests.

IV. In a communication annexed to a summons to oral proceedings, the board raised doubts whether the newly filed claims of each request complied with Article 123(2) EPC.

V. Replying to the summons with a letter dated 4 November 2008, the appellant filed respective replacement claims 1 and 6 in accordance with a main request and first and second auxiliary requests. With a further reply letter dated 6 November 2008, the appellant filed replacement description pages 2, 5 to 8, 10, 11, 23, 27 and 29.

VI. Claim 1 of the main request reads as follows.

"An optical disk producing device comprising:
means (42) adapted to reproduce a signal (RF) from a recording medium;

means (43, 44) adapted to generate a correction value table (20; 51), comprising a jitter detecting (43) means adapted to detect jitter contained in the reproduced signal (RF) and a calculating means (44) adapted to calculate correction values of the correction value table (20; 51) based on the detected jitter;

means (14; 57) adapted to correct an edge position of a modulation signal to be recorded, comprising a signal delaying means (22) adapted to delay the modulation signal, the delaying time being determined based on a value stored in said correction value table (20; 51);

characterised in that

a recording means is provided operable to record the modulation signal to be corrected on a mother disk (2) by an electroforming processing, comprising means adapted to switch a signal level of the modulation signal at a period equivalent to an integer multiple of a predetermined fundamental period according to data recordable by using pits, such as audio data (D1) to be recorded, and means adapted to conduct on-off control on a laser beam (L) by using said modulation signal, wherein an optical disk (41) is produced by using a stamper (40) produced from said mother disk (2) and said reproducing means (42) is operable to reproduce said signal (RF) from said optical disk (41);

said jitter detecting means (43) is operable to measure (SP5..SP9) jitter for all rising and falling edges of the reproducing signal (RF); and

said calculation means (44) is operable to calculate correction values corresponding to all combinations of pit length (p) and pit interval length (b)."

VII. Claim 1 of the first auxiliary request has the same wording and includes the phrase "by averaging (SP10) the jitter detection results for each combination" which is added after the last word of claim 1 of the main request ("length (b)").

Claim 1 of the second auxiliary request has the same wording and includes the phrase "wherein an optical disk (41) is newly produced so as to modify the correction value table (20;51) by using the newly produced optical disk (41) for evaluation" separated by a comma from the last word of claim 1 of the main request ("length (b)").

VIII. The reasons given in the decision under appeal can be summarised as follows.

D3 described an optical disk producing device having the features of the pre-characterising portion of claim 1. Namely the optical disk producing device disclosed in D3 comprised means adapted to reproduce an RF signal, to detect jitter in the RF signal and to calculate a correction value table based on the detected jitter. The correction value table stored edge shift amounts for jitter compensation during a recording operation in which a modulation signal was recorded on the optical disk. The table values were determined by trial recordings and therefore based on the detected jitter in the reproduced signal of a previous recording. The edge position of the modulation signal to be recorded on the optical disk was corrected by delaying the modulation signal based on the correction value table.

A person skilled in the art of producing optical ROM disks faced with the problem of jitter occurring in the signal read from a ROM disk would consider the teaching of D3 because it disclosed a way of correcting jitter. He would apply the correction principle disclosed in D3 to the recording signal used in the production process of ROM disks. Both in the optical disk producing device of D3 and that of the application the jitter of the signal reproduced from the recorded information was measured and the edge timing in the recording signal of a subsequent recording operation was correspondingly corrected. Thus it was not important which physical effects caused the jitter on the disks.

IX. The appellant's arguments can be summarised as follows.

The invention of claim 1 according to the main request concerned quality control during the mass production of optical disks, such as ROM disks, which were produced by a stamper. An entire commercial ROM disk which was ready for sale was evaluated in order to be able to adjust the production parameters if production conditions had changed. Since the final product of the mass production process was used to detect jitter and to accordingly change the production of the mother disk, the ROM disk could be correctly produced, even if changes of the production condition occurred, because jitter for all rising and falling edges of the reproduction signal was measured. The invention avoided inter-symbol interference when the ROM disk was reproduced. None of the documents cited in examination proceedings suggested applying jitter correction to a mass production process. D3 related to an initial test phase of the production process in which the correct

production parameters were determined using disks having test patterns recorded thereon. A person skilled in the art would not have applied the teaching of D3 in an ongoing mass production process for ROM disks. The argumentation of the examining division was based on hindsight. Even if a person skilled in the art had considered applying the teaching of D3 to the mass production of ROM disks, he would have measured the jitter on the mother disk in an initial test phase, not on the final product of the production process. Otherwise expensive waste production of ROM disks with no jitter correction would have resulted.

Claim 1 of the first auxiliary request expressed more specifically how precise jitter determination was possible, and claim 1 of the second auxiliary request specified that the final product of the ongoing production process was used for evaluation in an iterative correction process wherein with each (iteration) step jitter was further reduced.

X. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the independent claims 1 and 6 of the main request or of the first and second auxiliary requests, all requests filed with the letter dated 4 November 2008, the dependent claims being unchanged (as indicated in the decision under appeal).

XI. Oral proceedings before the board were held on 4 December 2008. At the end of the oral proceedings, the chairman pronounced the board's decision.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request: inventive step (Article 56 EPC 1973)*

2.1 It is common ground that the features of the pre-characterising portion of claim 1 are known from document D3. Furthermore the appellant has not contested that the first feature of the characterising portion of claim 1 ("a recording means ... to reproduce said signal (RF) from said optical disk (41)") corresponds to a conventional recording means known from the production of optical disks by a stamper, such as Read Only Memory (ROM) or compact disks (CD). D3 discloses jitter correction in the context of magneto-optic disks where user data is recorded by means of a laser, not as heights and depressions (as with disks produced by a stamper), but as the direction of magnetization of a magnetic film, which is achieved by heating the recording medium beyond the Curie temperature (see D3, page 2 and page 3, lines 8 to 11).

2.2 The board agrees with the appellant that one important question is whether a person skilled in the art would have applied the teaching of D3 to a conventional compact disk (CD) producing device. The appellant's main argument concerning this question is essentially based on the understanding that the "optical disk (41)" which "is produced by using a stamper (40)" in claim 1 (referred to as "compact disk 41 for evaluation" in the description, for example page 19, paragraphs 2 and 3, and page 22, first paragraph) was a mass product intended for sale to an end user. Claim 1 does not

however specify whether the "optical disk (41)" is a mass product. There is no clear indication in the description whether the calculation of the correction values and the production of corrected mother disks are carried out during mass production or during test runs before the start of mass production. In particular, although the description specifies that the compact disk 41 is produced under the same production condition as a usual compact disk (see page 14, last complete sentence, and page 19, first sentence), it is presented as a disk "for evaluation", and the description does not specify how many (evaluation or final) compact disks are produced. Nor does the description specify that the evaluation compact disks are intended for sale to an end user.

2.3 On the other hand, D3 specifies explicitly that "the second invention [disclosed in D3] is not limited to the magneto-optic disk but can also be applied to the recording system for the write-once optical disk, or to the stamper (for example, the pre-groove writer) for fabricating the master substrate of the optical disk" (see page 14, lines 14 to 17). Hence a person skilled in the art would have considered applying the teaching of D3 to a conventional CD producing device.

2.4 According to D3, the delay times, by which the edge positions of the modulation signal are corrected, are determined on the basis of trial recordings which are carried out by recording at least three kinds of data patterns (see page 15, lines 1 and 2). For other patterns the delay or shift amount can be found by interpolation (see page 14, line 27, to page 15, line 4). The interpolation accuracy can be improved by

recording additional data patterns (see page 17, lines 14 to 19). The disks with the trial recordings are optically read using a readout laser (see page 15, lines 28 to 34). The optical signal is then converted to an electrical signal. This electrical signal comprises jitter which is caused by all kinds of sources. Even though the causes for jitter discussed in D3 are various thermal effects caused by the write laser heating the magneto-optic disk when recording on the disk, the electrical signal inherently also comprises any jitter contained in the electrical signal when reading out a pattern of pits by means of a laser beam. This latter kind of jitter was generally known in the art and is referred to as "inter-symbol interference" and presented as the main source of jitter in compact disks in the present application (see current page 2, first and second paragraphs). Therefore when carrying out the teaching of D3 on disks which are finally produced by a stamper, for instance trial recordings for compact disks, inter-symbol interference would at least be partly correctable together with jitter from any other source which manifests itself in the read out electrical signal.

2.5 The present application is primarily concerned with the problem of reducing jitter caused at the time of signal reproduction of an optical disk, which was a generally known problem and was essentially due to inter-symbol interference (see current page 2, first to fourth paragraph). With this problem in mind a person skilled in the art would have applied the teaching of D3 to a conventional CD producing device because D3 takes account of measured jitter in the reproduced signal and is thus also applicable to other types of optical disks

for which jitter changes according to the pattern of pits and lands (see page 2, paragraph 2, of the present description). This is confirmed by the reference in D3 to stamper production (see point 2.3 above).

2.6 D3 already comprised the teaching that an increased number of patterns used for trial recordings improved the interpolation accuracy. Thus one possibility would have been to record all the possible patterns on an evaluation disk to take account of the different possible patterns of rising and falling edges which might change the jitter, thereby avoiding the need for interpolation between patterns of different length. For statistical reasons, recording the same pattern several times would have improved the accuracy of the appropriate delay amount for this pattern. In the board's view the last two features of present claim 1 have the technical meaning that the entire optical disk is read to make sure that all the patterns occurring on the disk are considered in order to reduce jitter for the whole disk. Thus, in the context of applying the teaching of D3 to a conventional CD producing device, a person skilled in the art would have had obvious reasons to implement the last two features of claim 1 in order to determine the appropriate delay amount with improved statistical accuracy.

2.7 It is apparent from the preceding reasoning that the board is not convinced by the argument that the invention of claim 1 is based on a different concept of quality control during mass production. Even if it were, for the sake of argument, the board considers that it would be a matter of usual routine for a person skilled in the art to determine when and how many times in the

course of a mass production an evaluation disk (see D3, page 2, lines 8 to 10) would be appropriately produced and evaluated to ensure proper quality of the final disks, even if changes in the production condition occurred.

2.8 In view of the above, the board judges that the subject-matter of claim 1 of the main request does not involve an inventive step (Article 56 EPC 1973).

3. *Auxiliary requests: inventive step (Article 56 EPC 1973)*

3.1 Claim 1 of the first auxiliary request specifies that the calculation means is operable to calculate the correction values corresponding to all combinations of pit length (p) and pit interval length (b) by averaging the jitter detection results for each combination. As discussed in point 2.6 above, recording the same pattern several times would have improved the accuracy of the appropriate delay amount for this pattern for statistical reasons. Taking the respective average of the jitter detection results for each combination would have been a normal measure for a person skilled in the art in order to arrive at an appropriate correction value when the measured jitter may vary due to production or measurement conditions varying over the disk surface.

3.2 Claim 1 of the second auxiliary request specifies that an optical disk is newly produced so as to modify the correction value table by using the newly produced optical disk for evaluation. Thus the correction value table is not only generated once but modified after it has been generated. It was however common general

knowledge in the technical field of optical disk production that an initial correction value could be (or become) incorrect, for instance if production conditions change over time. Hence evaluating an optical disk in order to determine whether the correction value table needs modification, and if necessary carrying out the correction, would have been a normal measure for a person skilled in the art (see also point 2.7).

3.3 In view of the above the board judges that the subject-matter of claim 1 of the first and second auxiliary requests does not involve an inventive step either (Article 56 EPC 1973).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Sauter F. Edlinger