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Datasheet for the decision of 6 March 2014

Case Number: T 1732/09 - 3.5.07

Application Number: 99310093.2

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Language of the proceedings: EN

Title of invention:
Recording medium and method for managing data

Applicant:
Samsung Electronics Co., Ltd.

Headword:
Recording medium defect management/SAMSUNG

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no) (all requests)

Decisions cited:

Catchword:

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Case Number: T 1732/09 - 3.5.07

D E C I S I O N
of Technical Board of Appeal 3.5.07
of 6 March 2014

Appellant: (Applicant)	Samsung Electronics Co., Ltd. 129, Samsung-ro Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 (KR)
Representative:	Robinson, Ian Michael Appleyard Lees 15 Clare Road Halifax HX1 2HY (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 6 April 2009 refusing European patent application No. 99310093.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: R. Moufang
Members: M. Rognoni
P. San-Bento Furtado

Summary of Facts and Submissions

I. The applicant appealed against the decision of the examining division refusing European application no. 99310093.2.

II. In the contested decision, the examining division came, *inter alia*, to the conclusion that the subject-matter of the independent claims 1 and 9 according to the main request, filed with letter dated 23 September 2008, and according to the first and second auxiliary requests, submitted at the oral proceedings held on 23 October 2008, did not define an inventive concept with respect to the following document:

D1: EP-A2-0 798 711.

The refusal of the application was thus based on Articles 52(1) and 56 EPC.

III. In the notice of appeal, the appellant implicitly requested that the decision under appeal be set aside and a patent be granted on the basis of the main request or of the first or second auxiliary request considered in the contested decision.

IV. In a communication dated 26 November 2013, accompanying the summons to oral proceedings, the Board acknowledged that the reasons given in the contested decision did not appear to justify the refusal of the application.

In the light of the appellant's arguments, however, the Board found it expedient to introduce the following prior art into the appeal proceedings:

D2: US-A-5 848 438

D3: US-A-5 835 930.

In the Board's view, the subject-matter of claims 1 according to the main request and according to the first and second auxiliary requests did not appear to involve an inventive step with respect to the teachings of D2 and D3.

V. Further to the summons to oral proceedings and to the Board's communication, the appellant's representative informed the Board with letter dated 6 February 2014 that the appellant would not attend the oral proceedings scheduled for 6 March 2014.

VI. Oral proceedings were held on 6 March 2014 in the absence of the appellant.

VII. Claim 1 according the main request reads as follows:

"A recording medium comprising:

a data area which has a plurality of zones;

characterised by:

a spare area (204) disposed in an area after the zones of the data area to record replacement data for defective areas of zones of the data area;

a predetermined area in which start position information for each zone is stored; and

the start position information for each zone includes a start logical sector number for controlling access to data recorded on the recording medium, the start logical sector number for each zone being

calculated after slipping replacement is preformed [*sic*] to reflect the number of replacements being made during the slipping replacement."

Claims 2 to 8 are dependent on claim 1.

Claim 9 reads as follows:

"An apparatus for managing data on a disc, the disc comprising a data area which has a plurality of zones that form a group, each zone having a user data area (201) to store user data, a spare area (204) disposed in an area after the zones of the data area to record replacement data for defective areas of zones of the data area, and a predetermined area to store start position information for each zone, the apparatus comprising:

a controller to control the recording of start position information to the disc;

characterised in that the start position information for each zone includes a start logical sector number for controlling access to data recorded on the disc, the start logical sector number for each zone being calculated after slipping replacement is performed to reflect the number of replacements being made during the slipping replacement."

Claims 10 to 16 are dependent on claim 9.

Claim 1 according to the first auxiliary request reads as follows:

"A recording medium comprising:

a data area having at least one group;

characterised in that:

the at least one group comprises a plurality of zones and a spare area (204) disposed in an area adjacent the plurality of zones to record replacement data for defective areas of the plurality of zones;

a predetermined area in which start position information for each of the plurality of zones is stored; and

the start position information for each zone includes a start logical sector number for controlling access to data recorded on the recording medium, the start logical sector number for each zone being calculated after slipping replacement is preformed [sic] to reflect the number of replacements having been made during the slipping replacement."

Claim 1 according to the second auxiliary request reads as follows:

"A recording medium comprising:

a data area having two or more groups;

characterised in that:

each group comprises a plurality of zones and a spare area (204) disposed in an area adjacent the respective plurality of zones to record replacement data for defective areas of the respective plurality of zones;

a predetermined area in which start position information for each of the plurality of zones is stored; and

the start position information for each zone includes a start logical sector number for controlling access to data recorded on the recording medium, the start logical sector number for each zone being calculated after slipping replacement is preformed [sic] to reflect the number of replacements being made during the slipping replacement."

VIII. The appellant did not reply to the objections raised in the Board's communication and, in particular, did not make any submissions relating to D2 and D3.

In the statement of grounds of appeal, however, the appellant put forward essentially the following arguments directed against the contested decision:

In a conventional method for managing defects of a recording medium, as shown in D1, a spare area was allocated at the end of each zone of the data area. When spare areas were arranged at the end of each zone, any shifting in the logical sector numbers caused by slipping replacement ended at the spare area of the corresponding zone. Thus, the start of the logical sector number of the next zone was predetermined and not affected by the number of defects. However, in this arrangement the number of defective sectors that were slipped had to be less than the number of usable sectors in the corresponding spare area. The restriction that a defect generated in a zone had to be processed within the same zone limited the maximum size

of a defect that could be replaced by slipping replacement.

The slipping replacement algorithm mentioned in D1 seemed to be nearly the same as the DVD-RAM standard version 1.0 as shown in Figure 1 of the present application. Accordingly, D1 had the same restriction that the number of defective sectors that were slipped had to be less than the number of usable sectors in the spare area of the corresponding group. In D1, if the spare sector area of a group became exhausted during certification, the certification would be regarded as a failure and thus the group would be entirely unusable.

To solve this problem, the invention provided a recording medium and apparatus for managing defects in which a group was formed of a plurality of zones and a spare area was allocated at the start and/or the end of such group. However, in this case the start of the logical sector number for each zone depended on the number of defects in the preceding zones within a group and was thus unpredictable.

In order to solve this particular problem, the present invention calculated the start logical sector number with respect to each zone after slipping replacement and stored the start logical sector number with respect to each zone in the disc.

In summary, the present invention provided not just a unique spare area arrangement, quite different from the spare area arrangement in D1, but also provided a solution to the further problem of reliably knowing the unpredictable logical sector numbers for each zone. Both new aspects combined with one another provided a

recording medium and apparatus with more flexible, efficient and reliable defect management.

Reasons for the Decision

Admissibility

1. The appeal is admissible.

Decision of the examining division

2. In the contested decision, the examining division relied essentially on the following paragraph of D1 (see page 11, "Slipping Replacement Algorithm"):

> *"The slipping replacement algorithm shall be applied individually to each and every group in the data area when certification is performed.*
>
> *A defective data sector found during certification shall be replaced by the first good sector following the defective sector, to thereby cause a slip of one sector towards the end of the group. The last data sector will slip into the spare sector area of the group.*
>
> *The address of the defective sector is written in the PDL. The defective sector shall not be used for recording user data. If no defective sectors are found during certification, an empty PDL is recorded.*
>
> *The addresses of spare sectors, beyond the last data sector slipped into the spare area (if any), which are found to be defective during certification, shall be recorded in the PDL. Thus, the number of available spare sectors is diminished or decreased accordingly.*

If the spare sector area of a group becomes exhausted during certification, the certification shall be regarded as a failure" (underlining added).

The examining division noted that in D1 the sector position of the start of a zone did not depend on any slipping replacement that had taken place. Thus, the start logical sector number of each zone was predetermined and, consequently, there was no need to record the start position for each zone.

In the opinion of the examining division, claim 9 of the main request differed from D1 only in that the start position information including the start logical sector number was nevertheless stored for each zone. Therefore, claim 9 did not solve any "meaningful" technical problem with respect to D1 and did not define an inventive concept with respect to this document, contrary to Articles 52(1) and 56 EPC.

The same objection applied, *mutatis mutandis*, to claim 1 of the main request.

2.1 In assessing the difference between the apparatus for managing data on a disc according to claim 9 and an apparatus as taught in D1, the examining division seems to have overlooked the implications of the combination of features recited in claim 9, and in particular the reason for storing "*start position information for each zone*" which includes "*a start logical sector number*".

As clearly explained in the description of the application as filed (page 8, second paragraph), in "*a conventional method for managing defects, a group is formed of one zone, and a spare area is allocated at the end of each group. Each group is managed as defect*

management area. [...] However, when spare areas are arranged in each zone, the shifting phenomenon of a logical sector number ends at the spare area of the corresponding zone and the start logical sector number of the next zone is predetermined without being affected by the number of defects as shown in Figure 1A".

In the above example of prior art defect management, which as pointed out by the appellant corresponds essentially to the one described in D1, there is no need to store a *"start logical sector number"* for a group (*ie* for a zone), because this parameter is not affected by the number of defects detected in the previous group (or zone).

2.2 As recited in claim 9, the disc of the present invention comprises a *"data area"* which has a *"plurality of zones"*, *"a spare area"* after the zones and *"a predetermined area to store a start position information for each zone"*. The particular disc structure described in claim 9 together with the feature that the *"start position information for each* zone" includes a *"start logical sector number"*, required for controlling access to data recorded on the disc and *"calculated after slipping replacement"*, necessarily implies that the start logical sector number of each zone is not predetermined, but depends on the number of defective sectors to be "slipped".

Hence, the apparatus of claim 9 differs from the apparatus according to D1 not only in that *"the start logical sector is nevertheless stored for each zone"*, but also in that the start logical sector number of each zone is a function of the number of slipping replacements being made in the preceding zones.

Consequently, the claimed apparatus addresses the problem of providing the start logical sector of a zone when this parameter is affected by the number of defects occurring in the preceding zones. There can be no doubt that this is a *"meaningful"* technical problem.

2.3 As to the first auxiliary request, the examining division found that claim 1 did not imply that the spare area would be larger than that of D1. *"Therefore, claim 1 allows that there will be less spare area than there is in D1. It is not clear what the technical purpose of this difference would be compared to D1. The idea of D1 is clearly to provide each zone with a spare area with a size that reflects the practical need of spare area, and removing spare areas except the last one from a group of zones (claim 1 allows that only one spare area is present for all zones of the recording medium) would therefore cause the problem of not having enough spare area under typical conditions.*
It is therefore not clear what the technical purpose of claim 1 would be compared to D1. Therefore claim 1 does not define an inventive concept compared to D1, contrary to Art. 52(1) and 56 EPC. This objection also applies to claim 9" (cf. page 4 of contested decision).

2.4 In the Board's opinion it is immaterial to speculate on the possible size of the spare area since this is not a feature relevant to the actual teaching of the application. Moreover, it is evident that it can be left to the skilled person wishing to implement the present invention to select the size of the spare area, or of the zones, as appropriate, so as to arrive at a viable recording medium.

2.5 In summary, the Board finds that the reasons given in the contested decision do not justify the refusal of the application, in particular because the formats of the claimed medium and of the medium of D1 are essentially different. In fact, D1 does not even consider the main problem addressed in the present application.

2.6 However, as pointed out in the communication dated 26 November 2013, the Board considers that the patentability of the present invention is put into question by the prior art D2 and D3 introduced by the Board into the appeal proceedings.

Main Request

3. Claim 1 is directed to a "*recording medium*" comprising:

(a) a data area which has a plurality of zones;

(b) a spare area disposed in an area after the zones of the data area to record replacement data for defective areas of zones of the data area;

(c) a predetermined area in which start position information for each zone is stored;

(d) the start position information for each zone includes a start logical sector number for controlling access to data recorded on the recording medium;

(e) the start logical sector number for each zone being calculated after slipping replacement is performed to reflect the number of replacements being made during the slipping replacement.

3.2 According to the description (page 1, lines 3 and 4), the present invention relates to the field of optical recording media and indeed the term "zone" recited in claim 1 is usually applied to areas of a recording medium with constant linear velocity (CLV) or constant angular velocity (CAV), such as an optical recording disc (cf. D1, page 2, lines 3 to 32).

However, claim 1 is not directed to an optical disc, but to an unspecified "*recording medium*" and, in the context of the claim wording, the term "zone" may simply identify any data area of any recording medium, such as a hard disc drive or even a solid state drive.

This interpretation of the claimed subject-matter is further supported by the fact that the management of defects in addressable portions of the medium's data area taught in the present application does not depend on the terminology used to define these portions.

Article 56 EPC

4. The gist of the present invention consists essentially in providing a recording medium with a spare area allocated to a plurality of zones of the data area for replacing defective sectors, which are detected when the medium is initialized, and in storing the start position information for each zone in a predetermined area of the medium.

5. D2 relates to "*a defect management method and apparatus for a rotating media storage system*" (see column 1, lines 14 and 15). Starting from column 3, line 10, D2 gives some background information on different defect

management schemes based on "linear replacement" and "skipping replacement".

According to D2, column 6, lines 5 to 15, a *"segment is a set of logically related tracks which are positioned adjacent to each other on the disk or media. The tracks within a segment are consecutively numbered from 0 to M. The physical sectors within a segment are consecutively numbered from 0 to SN-1, where SN is the number of physical sectors per segment, SL is the number of logical sectors per segment and P is the number of spare sectors per segment. Spare sectors are included at the end of a segment and defective sectors within a segment are slipped as described above for a track. The segment is treated as one contiguous storage space such that a defective sector is mapped to the next good sector within the segment and slipping occurs across the tracks within a segment"* (underlining added).

Figure 5b of D2 shows a *"segment or partition"* comprising *"four tracks", "each with thirty two physical sectors and two spare sectors at the end of the segment. A track base value TB for each track, specifies the beginning physical sector number PSN for the first sector of each track. A track displacement value TD includes the number of defective sectors in the tracks previous to the current track that were slipped across a track. The logical sectors are numbered consecutively throughout the segment, skipping the defective sectors. The first logical sector number of each track can be calculated by subtracting the track displacement value TD from the track base TB"* (D2, column 6, lines 30 to 41 - underlining added).

D2 explains in column 7, lines 3 to 26, how defective sectors are skipped and replaced by spare sectors located at the end of the segment and how a Local Block Address (LBA) relates to a Physical Block Address (PBA).

5.1 Under the assumption that the term "zone" in claim 1 relates to a specific data area of a recording medium, D2 thus discloses a recording medium comprising the following features recited in claim 1 of the main request:

- a data area (segment) which has a plurality of zones (tracks),

- a spare area disposed in an area after the zones (i.e. tracks) of the data area (i.e. segment) to record replacement data for defective areas of zones of the data area,

- the start logical sector number for each zone (track) being calculated after slipping replacement is performed to reflect the number of replacements being made during the slipping replacement.

5.2 The subject-matter of claim 1 differs from D2 in that:

(c) start position information for each zone (track) is stored in a predetermined area, and

(d) the start position information for each zone includes a start logical sector number for controlling access to data recorded on the recording medium.

5.3 As pointed out on page 12, lines 5 to 10 the application, *"when defects are managed in the group forming a plurality of zones, the start logical sector number for each zone is changed so that the recording and/or reproducing apparatus must calculate the start logical sector number for each zone to perform normally recording and/or reproduction of a disc"* (emphasis added).

To avoid possible errors in the calculation of the start logical sector number, the present application proposes to store the start logical sector number of each zone in a predetermined area of the disc.

Hence, a problem solved by the claimed invention may be seen in the provision of a more reliable way of obtaining start logical sector numbers.

5.4 It is generally known in the field of recording media that predetermined areas of a medium can be reserved for storing data required for addressing particular portions of the data area and, in particular, a list of defective sectors (cf. for instance D2, col. 3, lines 10 to 43 and D1, page 13, lines 49 to 58).

Starting from D2 and facing the problem of ensuring a quick and reliable determination of the start logical sector numbers of each zone of a data area where defects are managed by "*slipping replacement*", the skilled person would be aware that these parameters of the disc need not be calculated every time they are needed, but that, once calculated, they can be advantageously stored on the disc, ready to be quickly and reliably retrieved.

Thus, features (c) and (d) which distinguish the method of claim 1 from D2 can be regarded as an obvious and advantageous alternative to repetitive calculations of the start logical sector numbers.

Furthermore, D3 offers an example of storing logical track parameters on a medium in connection with a particular defect management scheme.

5.5 D3 relates, *inter alia*, to a recording medium having logical tracks that do not coincide with physical tracks. In fact, as pointed out in column 5, lines 47 to 53, physical *"tracks comprise a plurality of physical addresses. Due to track defects, however, the usable physical sectors are not always contiguous. For this reason, physical tracks are usually mapped into logical tracks comprising logical blocks of contiguous data fields so that the host device can address data without regard to its precise location on the disk".* Hence, D3 teaches to remap a physical track *"into two or more logical tracks if it is found to have the maximum number of allowable defects and/or spares. Each of these tracks is then treated like a physical track. The present invention applies both at manufacturing time and during normal operation*" (D3, column 5, lines 56 to 59). As explained in column 5, second paragraph, Figure 3 shows the track details required to specify each logical track and identify the correspondent physical sectors. As pointed out in column 5, lines 23 to 25 the *"logical track parameters 306 include the starting logical track sector number 322* (emphasis added)*".*

As recited in claims 14 and 16, D3 foresees the possibility of storing track details in an area of the storage medium.

5.6 In summary, D2 teaches to manage defects by placing a spare area at the end of a segment, which comprises a plurality of tracks, and by skipping defective sectors during the formatting of the medium. As shown in D2, column 6, lines 39 to 41, the first logical sector number of each track can be calculated by subtracting the "track displacement value TD" from the corresponding "track base value TB", *i.e.* from the physical sector number for the first sector of the track. On the other hand, the skilled person is aware that storing logical addresses of tracks in an area of the medium has the evident advantage of avoiding repetitive and possibly error-prone calculations of start logical sector numbers.

In the light of the cited prior art, it would be obvious to a skilled person, starting from a recording medium provided with a spare area disposed after a plurality of addressable portions of the data area, to foresee the possibility of storing the start logical sector number of each addressable portion on the medium. In doing so, the skilled person would arrive at a recoding medium falling within the terms of claim 1 of the appellant's main request.

5.7 Hence, the subject-matter of claim 1 does not involve an inventive step within the meaning of Article 56 EPC.

The same applies to claim 9 which relates to an apparatus for managing data on a disc comprising the features specified in claim 1.

Auxiliary requests

6. Claim 1 of the first auxiliary request differs from claim 1 of the main request essentially in that it defines the *"data area"* as *"having at least one group"*, and in that *"the at least one group comprises a plurality of zones"*.

6.1 Claim 1 of the second auxiliary request further specifies that the data area has *"two or more groups"*.

6.2 The recording medium shown in D2 has a data area divided into segments or partitions ("groups") which in the example of Figure 5b comprise four tracks ("zones"), each with thirty two physical sectors.

6.3 As the structure of the data area of the recording medium specified in claim 1 of the first and second auxiliary requests is already known from D2, the same objections raised against the inventive step of the main request apply also to the auxiliary requests.

7. In summary, none of the appellant's requests provides a basis for granting a patent. Hence, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

I. Aperribay R. Moufang

Decision electronically authenticated