UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JAMES E. DIBB

Appeal No. 2006-3036
Application No. 09/879,554

ON BRIEF

Before JERRY SMITH, BARRY, and MACDONALD, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1-14 and 16-19, which constitute all the claims pending in this application.

The disclosed invention pertains to a method and system for repairing a redundant array of disk drives. When a disk drive fails, a mirrored subsystem is created within the array that includes a temporary disk drive and the failed disk drive slot. The mirrored subsystem is substituted for the failed disk drive in the

redundancy group. Each data block of the failed disk drive is reconstructed and written to the mirrored subsystem. After a replacement disk drive is inserted into the failed disk drive slot, data is copied from the temporary disk drive to the replacement disk drive. The mirrored subsystem can be replaced by the replacement disk after the data thereon matches the data on the temporary disk drive.

Representative claim 1 is reproduced as follows:

1. A method for handling a failed disk drive in a redundancy group of disk drives in an array of disk drives, the failed disk drive located in a failed disk drive slot, comprising:
creating a mirrored subsystem within the array, the subsystem including a temporary disk drive and the failed disk drive slot; and
reconfiguring the redundancy group to consist of the disk drives of the redundancy group that have not failed and the mirrored subsystem, such that the mirrored subsystem is substituted for the failed disk drive in the redundancy group and the redundancy of the redundancy group is restored, when the failed disk drive contains redundancy data for the redundancy group [sic][1]

The examiner relies on the following reference:

Kedem	6,154,853	Nov. 28, 2000

The following rejections are on appeal before us:

1. Claims 1-14[2] stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

[1] Claim 1 lacks a period. See brief, claims appendix. See also amendments filed Nov. 02, 2005 and Feb. 16, 2005. Although the amendment filed Feb. 16, 2005 deleted the period via a strikethrough, we nevertheless presume that the omission of a period is a typographical error.
[2] Although the examiner includes claim 15 in this rejection [see answer, page 3], claim 15 has been cancelled. See brief, page 21 and reply brief, page 6 (indicating cancellation of claim 15). See also answer, page 2.

2. Claims 16-19 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Kedem.

Rather than repeat the arguments of appellant or the examiner, we make reference to the briefs and the answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of anticipation relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellant's arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer. Only those arguments actually made by appellant have been considered in this decision. Arguments which appellant could have made but chose not to make in the briefs have not been considered and are deemed to be waived [see 37 CFR § 41.37(c)(1)(vii)(2004)].

It is our view, after consideration of the record before us, that the specification reasonably conveys to the skilled artisan that the inventor had possession of the invention of claims 1-14 at the time the application was filed. Moreover, we conclude that the disclosure of Kedem fully meets the invention as set forth in claims 16-19. Accordingly, we affirm-in-part.

We first consider the examiner's rejection of claims 1-14 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. The examiner asserts that the specification does not reasonably support the limitation in claim 1 calling for substituting the failed disk drive in the redundancy group and restoring the redundancy of the redundancy group when the failed disk drive contains redundancy data for the redundancy group [answer, page 3]. The examiner notes that the specification teaches reconstructing each "data block" of the failed drive [answer, pages 6 and 7]. But since the specification distinguishes "user data" (data blocks) from "redundancy data" (parity blocks),[3] the examiner concludes that the specification refers only to reconstructing data blocks (i.e., logical data only) – not reconstructing both data blocks and parity blocks as claimed [answer, page 8].

Appellant argues that the application as originally filed teaches using a mirrored subsystem to completely restore redundancy even when the failed drive contains redundancy data. In this regard, appellant notes that the originally-filed application expressly states that the invention reconstructs each data block of the failed drive. Accordingly, the skilled artisan would understand that such reconstruction includes all data sectors on the failed drive – sectors with logical and redundancy data [brief, pages 13 and 14; reply brief, page 2; emphasis added]. Thus, if drive A fails, the skilled artisan would understand from the originally-filed disclosure that repairing the redundant disk drive array requires

[3] Specifically, the examiner quotes the following sentence from page 5 of the specification: "Data is stored in redundancy group 7 in stripes that contain a plurality of data blocks and at least one associated error-correction block" [specification, page 5].

restoring drive A to its former condition (i.e., reconstructing all data that was formerly on drive A). Significantly, if drive A contained logical and redundancy data (or redundancy data only), reconstructing less than all data blocks (i.e., both logical and redundancy data) would not restore drive A to its former condition; consequently, the array would not be repaired. Rather, array repair under such conditions is only possible by reconstructing both logical and redundancy data [reply brief, pages 6 and 7].

We will not sustain the examiner's rejection. We agree with appellant that the skilled artisan would readily understand from the originally-filed disclosure that reconstructing the data that was formerly on the failed drive (e.g., drive A in the disclosure) necessarily requires reconstructing all data that was on the drive prior to failure. Otherwise, the array would not be repaired. Therefore, if the failed drive contains both logical and redundancy data, both the logical and redundancy data must be restored to effect repair.

Turning to claim 1, the claim calls for restoring redundancy of the redundancy group "when the failed disk drive contains redundancy data for the redundancy group." Such a limitation essentially imposes a condition: if the failed drive should contain redundancy data for the redundancy group, then redundancy is restored for that particular type of array by substituting the mirrored subsystem for the failed drive.[4]

[4] Reciting such a condition in the claim, however, raises an additional issue regarding the scope of the claim. Specifically, we note that the claimed condition does not recite an active step, but in effect recites alternative limitations: (1) when the failed disk drive contains redundancy data, and (2) when the failed drive does not contain redundancy data. Significantly, dependent claims 4, 5,

Although individual disk drives configured in redundant arrays do not necessarily have to contain both logical and redundancy data, the originally-filed disclosure nevertheless teaches repairing arrays with disk drives containing both types of data. For example, the disclosure expressly states that the redundancy group may be a RAID-3 or RAID-5 array [specification, pages 3-5; see also claims 4, 5, 8, and 9]. As is well known in the art, a RAID-3 array utilizes byte-level striping with a dedicated parity drive, and a RAID-5 array utilizes block-level data striping with distributed parity.[5] In short, these arrays utilize drives that contain redundancy data (i.e., parity data). If one of these drives should fail, all data on the drive – including the redundancy data – must be reconstructed to restore the drive to its former condition and effect repair in accordance with the invention.

For at least the above reasons, the originally-filed disclosure reasonably supports the limitations of claim 1. Accordingly, we will not sustain the examiner's rejection of claims 1-14 under 35 U.S.C. § 112, first paragraph.

We next consider the rejection of claims 16-19 under 35 U.S.C. § 102(e) as being anticipated by Kedem. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each

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8, and 9 recite arrays with drives having parity (redundancy) data (RAID-3 and RAID-5 arrays). Dependent claims 6, 7, and 10-13, however, recite arrays with drives that do not contain parity (redundancy) data (RAID 1 and 1/0 arrays). See RAID Technology, Technick.net, at http://www.technick.net/public/code/cp_dpage.php?aiocp_dp=guide_raid, at 3-4 (last visited Nov. 2, 2006) ("RAID Technology"). See also id., at 7 ("Parity is used by RAID levels 2, 3, 4, and 5. RAID 1 does not use parity because all data is completely duplicated (mirrored)."). The issue is not before us, however, and we leave the question of the scope of the claim to the examiner and the appellant.

[5] See RAID Technology, at 3-4.

and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984); W.L. Gore and Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983).

The examiner has indicated how the claimed invention is deemed to be fully met by the disclosure of Kedem [answer, pages 3-5]. Regarding independent claim 16, appellant argues that Kedem does not disclose reconstructing each data block of the failed disk drive in the redundancy group, and writing each reconstructed data block to the mirrored subsystem as claimed [brief, page 17; emphasis added]. Specifically, appellant contends that "reconstructing each data block" of the failed drive as claimed must be construed as reconstructing all data blocks – both logical and redundancy [brief, page 18]. With this construction, appellant argues that Kedem does not anticipate the claim since Kedem does not reconstruct redundancy data of the failed drive, but rather copies only logical data to temporary drives [id.; reply brief, page 8]. Similarly, appellant contends that Kedem does not anticipate independent claim 18 since Kedem does not reconstruct redundancy data blocks [brief, page 18].

We will sustain the examiner's anticipation rejection. In short, appellant's arguments are not commensurate with the scope of the claims. Although Kedem's mirroring system does not copy the parity data stored on failing device 34 to the spare device 31, each of the failed device's logical volumes are

nevertheless copied to the spare device 31 [Kedem, col. 5, lines 5-17; Figs. 4 and 5]. In our view, Kedem's reconstructing the logical blocks of the failed drive fully meets the limitation calling for "reconstructing each data block" giving the term its broadest reasonable interpretation. We decline to adopt appellant's construction that "each data block" necessarily includes redundancy data blocks. As we noted previously, certain RAID arrays have drives that do not contain parity data (redundancy data), but rather contain only logical data. In short, the scope and breadth of the term "data block" as claimed does not preclude logical data. Accordingly, "reconstructing each data block" as claimed does not preclude Kedem's copying of logical data blocks.

Since Kedem fully meets independent claims 16 and 18, we will sustain the examiner's anticipation rejection of those claims. Since appellant has not separately argued the patentability of dependent claims 17 and 19, these claims fall with independent claims 16 and 18. See In re Nielson, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987). See also 37 CFR § 41.37(c)(vii).

In summary, we have not sustained the examiner's rejection with respect to claims 1-14. We have, however, sustained the examiner's rejection with respect to claims 16-19. Therefore, the decision of the examiner rejecting claims 1-14 and 16-19 is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

JERRY SMITH Administrative Patent Judge	)	
LANCE LEONARD BARRY Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
ALLEN R. MACDONALD Administrative Patent Judge	)	

JS/jaj/rwk

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