

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* PAUL ASHMORE,  
MICHAEL HUW FRANCIS, AND SIMON WALSH

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Appeal 2007-1352  
Application 10/406,127<sup>1</sup>  
Technology Center 2100

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Decided: October 17, 2007

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Before LEE E. BARRETT, ALLEN R. MACDONALD,  
and SCOTT R. BOALICK, *Administrative Patent Judges*.

BOALICK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1-16, all the claims pending in the application. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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<sup>1</sup> Application filed April 3, 2003. The real party in interest is International Business Machines Corporation.

## STATEMENT OF THE CASE

Appellants' invention relates to a fault-tolerant computing system that uses write data caching. (Specification 1:6-7.) In the words of the Appellants:

As will be explained in greater detail below, the primary adapter (150 or 160) creates a non-volatile record (in non-volatile memory 150C or 160C respectively) of each cache update before it is applied to either cache's non-volatile memory 150B or 160B respectively. Each such record is cleared when the primary adapter knows that the cache update has been applied to both adapters' non-volatile memories.

Consequently, the primary adapter has, at all times, a non-volatile list (in non-volatile memory 150C or 160C respectively) of all ongoing transfers.

(Specification 6:10-21.)

Claims 1, 7, and 16 are exemplary:

1. A cache memory system for use in a data storage system, the system comprising:
  - a first cache comprising non-volatile memory for storing a first copy of data; and
  - second cache comprising non-volatile memory for storing a second copy of said data, and
  - additional non-volatile memory associated with at least one of the first cache and the second cache, the additional non-volatile memory being arranged to hold a list of ongoing cache data

storage transactions for which data storage in the non-volatile memory of both the first and second cache have not been completed, where a record in the list is created prior to the storage of either the first copy of data or the second copy of data in the first cache and in the second cache, respectively, the list being arranged to be cleared of records corresponding to cache data storage transactions for which data storage in the non-volatile memory of both the first and second cache have been completed.

7. A method for operation of a cache memory system including a first cache comprising non-volatile memory for storing a first copy of data, a second cache comprising non-volatile memory for storing a second copy of said data, and additional non-volatile memory associated with at least one of the first cache and the second cache for storing a list of ongoing cache data storage transactions for which data storage in the non-volatile memory of both the first and second cache have not been completed, the method comprising:

re-synchronising the first and second cache by:

reading from the list stored in the additional non-volatile memory; and

for each transaction in the list, transferring data from the non-volatile memory of one of the first and second cache to the non-volatile memory of the other of the first and second cache, where a record in the list is created prior to the storage of either the first copy of data or the second copy of data in the first cache and in the second cache, respectively.

16. A first cache adaptor comprising first cache memory, the first cache adaptor for coupling between at least one data storage disk and at least one data processor and for receiving write data from the at least one data processor and for temporarily storing the write data in the first cache memory prior to the write data being written to the at least one data storage disk, said first cache adaptor for further being coupled to at least one second cache adaptor comprising second cache memory for temporarily storing the received write data that is sent to the second cache adaptor from the first cache adaptor, said first cache adaptor further comprising memory for storing a list containing at least one record of write data received from the at least one data processor, where a record in the list is created prior to the storage of the write data in the first cache memory and in the second cache memory, and where the record is removed after the write data is stored in the first cache memory and in the second cache memory, the first cache adaptor being responsive to an occurrence of a reset/failure event for reading the list and, for any record found in the list, sending corresponding write data to the second cache adaptor for storage in the second cache memory.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Ohmura	6,237,046	May 22, 2001
Duprey	6,671,705	Dec. 30, 2003 (filed Aug. 17, 1999)

Claim 16 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Duprey.

Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as being obvious over Duprey and Ohmura.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Briefs and the Answer for their respective details. Only those arguments actually made by Appellants have been considered in this decision. Arguments that Appellants did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2004).<sup>2</sup>

#### ISSUES

1. Whether Appellants have shown that the Examiner erred in rejecting claim 16 under 35 U.S.C. § 102(e).
2. Whether Appellants have shown that the Examiner erred in rejecting claims 1-15 under 35 U.S.C. § 103(a).

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<sup>2</sup> Except as will be noted in this opinion, Appellants have not presented any substantive arguments directed separately to the patentability of the dependent claims or related claims in each group. In the absence of a separate argument with respect to those claims, they stand or fall with the representative independent claim. *See* 37 C.F.R. § 41.37(c)(1)(vii).

## FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence.

1. Duprey describes a remote mirroring system in which a master storage unit 130 stores information in a log and uses that information to resynchronize slave images stored in slave storage units 140<sub>1</sub> through 140<sub>N</sub> by copying only those portions of the master image indicated in the log to the slave images. (Abstract; col. 2, l. 67 to col. 3, l. 13; col. 5, ll. 50-55; Fig. 1.) Figure 2 shows exemplary storage units, such as the master storage unit 130 and slave storage units 140<sub>1</sub> through 140<sub>N</sub>. (Col. 3, ll. 29-31; col. 5, ll. 64-67; col. 6, ll. 8-61.) Figure 3 shows relevant blocks of the storage processor 204, 208 shown in Figure 2, including a write cache. (Col. 3, ll. 32-34; col. 6, ll. 62-67.)
2. Duprey teaches that the master storage unit 130 maintains a "write intent log" that identifies portions of the slave images stored on slave storage units 140<sub>1</sub> through 140<sub>N</sub> that may be unsynchronized. (Col. 4, ll. 5-8; col. 5, ll. 50-55; Fig. 1.) The write intent log is maintained so as to survive a failure and be available to the master storage unit 130 following a failure. (Col. 4, ll. 8-112.) After a failure, the master storage unit 130 resynchronizes the slave images by resynchronizing only those portions of the slave images that may be unsynchronized. (Col. 4, ll. 11-26.)

3. Duprey teaches that the master storage unit 130 stores a write entry in the write intent log when it receives a write request from the host 110. (Col. 4, ll. 27-29; col. 5, ll. 61-62; Fig. 1.) The write entry includes information identifying an affected portion of the mirror image and also may include the actual data to be written to the mirror image. (Col. 4, ll. 29-33.) During normal operation, the master storage unit 130 maintains the write intent log in the write cache of a storage processor 204. (Col. 4, ll. 37-40; col. 6, ll. 62-67; col. 7, ll. 12-17; Figs. 2-3.) The master storage unit 130 may have redundant storage processors 204, 208 that maintains a write intent log that also is replicated on the peer storage processor so that one storage processor may take over if the other storage processor fails. (Col. 4, ll. 42-48.) After the master storage unit 130 stores a write entry in the write intent log, it then updates the master image and the slave images based upon the write request received from the host 110. (Col. 4, ll. 58-61; col. 16, ll. 3-18; Fig. 6.) The master storage unit 130 deletes the write entry from the write intent log once it is no longer needed. (Col. 4, ll. 61-65.)
  
4. Duprey teaches that the write intent log is stored in non-volatile storage if the master storage unit 130 fails. (Col. 5, ll. 31-33.) Following a failure, the master storage unit 130 resynchronizes the slave images to the master image by updating only the portions of the slave images identified in the write intent log. (Col. 5, ll. 42-49; Fig. 9.) Duprey also teaches that the write intent log may be restored

to a volatile memory, such as a Random Access Memory (RAM).  
(Col. 15, ll. 52-60.)

5. Ohmura teaches that cache memory 44 may include both non-volatile memory 46 and volatile memory 48. (Col. 11, l. 62 to col. 12, l. 19; Figs. 4, 5.)

#### PRINCIPLES OF LAW

On appeal, all timely filed evidence and properly presented arguments are considered by the Board. *See In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

In the examination of a patent application, the Examiner bears the initial burden of showing a prima facie case of unpatentability. *Id.* at 1472, 223 USPQ at 788. When that burden is met, the burden then shifts to the applicant to rebut. *Id.*; *see also In re Harris*, 409 F.3d 1339, 1343-44, 74 USPQ2d 1951, 1954-55 (Fed. Cir. 2005) (finding rebuttal evidence unpersuasive). If the applicant produces rebuttal evidence of adequate weight, the prima facie case of unpatentability is dissipated. *In re Piasecki*, 745 F.2d at 1472, 223 USPQ at 788. Thereafter, patentability is determined in view of the entire record. *Id.* However, on appeal to the Board it is an appellant's burden to establish that the Examiner did not sustain the necessary burden and to show that the Examiner erred -- on appeal we will not start with a presumption that the Examiner is wrong.

Anticipation is established when a single prior art reference discloses expressly or under the principles of inherency each and every limitation of

the claimed invention. *Atlas Powder Co. v. IRECO Inc.*, 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1946 (Fed. Cir. 1999); *In re Paulsen*, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734, 82 USPQ2d 1385, 1391 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966). *See also KSR*, 127 S. Ct. at 1734, 82 USPQ2d at 1391 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls."). The Court in *Graham* further noted that evidence of secondary considerations, such as commercial success, long felt but unsolved needs, failure of others, etc., "might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented." 383 U.S. at 18, 148 USPQ at 467. "If a court, or patent examiner, conducts this analysis and concludes the claimed subject matter was obvious, the claim is invalid under § 103." *KSR*, 127 S. Ct. at 1734, 82 USPQ2d at 1391.

In *KSR*, the Supreme Court emphasized "the need for caution in granting a patent based on the combination of elements found in the prior

art," *id.* at 1739, 82 USPQ2d at 1395, and discussed circumstances in which a patent might be determined to be obvious. In particular, the Supreme Court emphasized that "the principles laid down in *Graham* reaffirmed the 'functional approach' of *Hotchkiss*, 11 How. 248 [(1850)]." *KSR*, 127 S. Ct. at 1739, 82 USPQ2d at 1395 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 12, 148 USPQ 459, 464 (1966)), and reaffirmed principles based on its precedent that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* The operative question in this "functional approach" is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.* at 1740, 82 USPQ2d at 1396.

In sustaining a multiple reference rejection under 35 U.S.C. § 103(a), the Board may rely on one reference alone without designating it as a new ground of rejection. *In re Bush*, 296 F.2d 491, 496, 131 USPQ 263, 266-67 (CCPA 1961); *In re Boyer*, 363 F.2d 455, 458 n.2, 150 USPQ 441, 444 n.2 (CCPA 1966).

During examination of patent application, a claim is given its broadest reasonable construction consistent with the specification. *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969). "[T]he words of a claim 'are generally given their ordinary and customary meaning.'" *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312, 75 USPQ2d 1321, 1326 (Fed. Cir. 2005) (en banc) (internal citations omitted). The "ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention,

i.e., as of the effective filing date of the patent application." *Id.* at 1313, 75 USPQ2d at 1326.

An intended use of a claimed device does not limit the scope of the claim. *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997) (product claim's intended use recitations not given patentable weight); *see also Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp.*, 320 F.3d 1339, 1345, 65 USPQ2d 1961, 1965 (Fed. Cir. 2003) ("An intended use or purpose usually will not limit the scope of the claim because such statements usually do no more than define a context in which the invention operates."). Although "[s]uch statements often . . . appear in the claim's preamble," *In re Stencel*, 828 F.2d 751, 754, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987), a statement of intended use or purpose can appear elsewhere in a claim. *Id.*

## ANALYSIS

Appellants contend that Examiner erred in rejecting claim 16 as being anticipated by Duprey and in rejecting claims 1-15 as being obvious over Duprey and Ohmura. Reviewing the documents of record and the findings of facts cited above, we do not agree. In particular, we find that the Appellants have not shown that the Examiner failed to make a prima facie showing of anticipation with respect to claim 16 and a prima facie showing of obviousness with respect to claims 1-15. Appellants failed to meet the burden of overcoming these prima facie showings.

Issue 1: Anticipation of claim 16.

Appellants argue that Duprey does not disclose a first cache adapter that has both a cache memory and a memory for storing a list containing at least one record of write data. (Br. 16; Reply Br. 6.) We do not agree.

Initially, we note that the claim limitation "for storing a list containing at least one record of write data received from the at least one data processor" is merely an intended use of the recited "memory" of the first cache adaptor. Therefore, this limitation is not entitled to patentable weight. As will be explained, however, even if this limitation is given patentable weight it is met by Duprey.

As the Examiner correctly found, Duprey teaches a storage processor for the master storage unit that includes a write cache and functions as a cache adaptor to temporarily store data from the host that is destined for the disk array. (Answer 3, 16; FF 3.) The storage processor corresponds to the first cache adaptor and the write cache corresponds to the first cache memory. Also, the Examiner correctly found that Duprey teaches a write intent log that identifies portions of the slave images that may be unsynchronized and also teaches that the master storage unit stores a write entry in the write intent log when it receives a write request from the host. (Answer 5; FF 2-3.) We agree with the Examiner that the limitation of the first cache adaptor "further comprising memory" recited by claim 16 does not require the memory to be physically separate from the first cache memory and we agree that that such an interpretation is consistent with the Specification. (Answer 17; Specification 8:4-8.)

Appellants argue that, even though the Specification clearly states that the non-volatile "list" memory may be provided within the "main" non-volatile memory and need not be separate (Specification 8:4-8), "these other embodiments are not the claimed embodiment found in claim 16." (Reply Br. 7.) Further, Appellants argue that "[e]ven if there were a memory in a cache adapter that was partitioned, . . . Duprey does not disclose such a memory in a cache adapter." (Reply Br. 7.) We disagree.

Claim 16 recites "said first cache adaptor further comprising memory." There is nothing in claim 16 that compels the memory to be separate from the first cache memory. Therefore, the Examiner's construction of claim 16 is reasonable. Also, contrary to Appellants' argument regarding the memory disclosed in Duprey (Reply Br. 7), Duprey teaches that the master storage unit stores a write entry in the write intent log, that the master storage unit includes write cache, that the master storage unit maintains the write intent log in the write cache during normal operations, and that actual data also may be stored in the write cache. (FF 3.)

Accordingly, we conclude that the Examiner did not err in rejecting claim 16 under 35 U.S.C. § 102(e).

Issue 2: Obviousness of claims 1-15.

Regarding claim 1, Appellants repeat the arguments made with respect to claim 16 (Br. 17-18, Reply Br. 7-10). As discussed with respect to claim 16, we do not find these arguments to be meritorious. Appellants also argue that the recitation of "a first cache," a "second cache," and an

"additional memory" requires three memories. (Br. 18; Reply Br. 8-9.) We do not agree.

The Examiner correctly found that Duprey teaches: (1) a write cache in the master storage unit which stores actual data, corresponding to a first cache (Answer 7-8, 18; FF 3); (2) a write cache in a slave storage unit that stores data, corresponding to a second cache (Answer 8; FF 1); and (3) a write cache in the master storage unit which stores "meta data," corresponding to an additional memory (Answer 8-9, 19-20; FF 3). As with claim 16, there is nothing in claim 1 that requires the first cache to be separate from the additional memory.

We have considered Appellants' remaining arguments and find them unpersuasive. Accordingly, we conclude that the Examiner did not err in rejecting claim 1 under 35 U.S.C. § 103.

With respect to claim 2, Appellants argue that "Duprey does not appear to disclose or fairly suggest a desire or need for two kinds of memory to serve as a cache." (Br. 18; Reply Br. 10.) We do not agree.

Instead, we agree with the Examiner that volatile and non-volatile memories, including their properties, merits, and limitations, were well known in the art at the time of the invention. (Answer 20.) We also agree that Ohmura teaches a cache memory having volatile and non-volatile memory. (Answer 20-21; FF 5.) Therefore, claim 2 is a combination of familiar elements according to known methods that yields predictable results. In addition, Duprey teaches both volatile and non-volatile memory. (FF 4.)

Accordingly, we conclude that the Examiner did not err in rejecting claim 2 under 35 U.S.C. § 103.

Claim 3 was argued on the same basis as claims 1 and 16 (Br. 18-19; Reply Br. 10), and we find that Appellants have failed to show error in the rejection of claim 3 for the same reasons discussed with respect to claims 1 and 16.

Claim 4 was argued on the same basis as claims 1, 3, and 16 (Br. 19; Reply Br. 11), and we find that Appellants have failed to show error in the rejection of claim 4 for the same reasons discussed with respect to claims 1, 3, and 16.

Claim 5 was argued on the same basis as claims 2 and 4 (Br. 19; Reply Br. 11), and we find that Appellants have failed to show error in the rejection of claim 5 for the same reasons discussed with respect to claims 2 and 4.

Dependent claim 6 was not argued separately from independent claim 4,<sup>3</sup> and thus falls with claim 4.

With respect to claim 7, Appellants argue that "Duprey fails to teach re-synchronization of caches because each storage processor maintains its own write intent log." (Br. 20; Reply Br. 12.) We do not agree.

Instead, we agree with the Examiner that Duprey teaches that the master storage unit resynchronizes the slave images by resynchronizing the portions of the slave images that may be unsynchronized. (Answer 12-14; FF 1-2, 4.) The master storage unit maintains a write intent log, which is

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<sup>3</sup> Although the Briefs include a point heading for claims 4 and 6, no argument was presented with respect to claim 6. (Br. 19; Reply Br. 11.)

used in the resynchronization. (Answer 12-13; FF 2, 4.) Even though the slave storage units are described as having a write intent log (FF 1), Duprey only describes one write intent log being used for resynchronization (FF 1-2, 4).

Appellants also argued for patentability of claim 7 on the same basis as claims 1 and 16 (Br. 20; Reply Br. 12), and we find that Appellants have failed to show error in the rejection of claim 7 for the same reasons discussed with respect to claims 1 and 16.

Accordingly, we conclude that the Examiner did not err in rejecting claim 7 under 35 U.S.C. § 103.

Claim 8 was argued on the same basis as claims 2 and 7 (Br. 20; Reply Br. 12), and we find that Appellants have failed to show error in the rejection of claim 8 for the same reasons discussed with respect to claims 2 and 7.

Dependent claim 9 was not argued separately from independent claim 7,<sup>4</sup> and thus falls with claim 7.

Claim 10 was argued on the same basis as claims 1 and 16 (Br. 21; Reply Br. 13), and we find that Appellants have failed to show error in the rejection of claim 10 for the same reasons discussed with respect to claims 1 and 16.

Claim 11 was argued on the same basis as claims 1, 7, and 16 (Br. 21-22; Reply Br. 13-14), and we find that Appellants have failed to show error

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<sup>4</sup> Although the Briefs include a point heading for claims 7 and 9, no argument was presented with respect to claim 9. (Br. 20; Reply Br. 11-12.)

in the rejection of claim 11 for the same reasons discussed with respect to claims 1, 7, and 16.

Claim 12 was argued on the same basis as claims 1 and 16 (Br. 22-23; Reply Br. 14-15), and we find that Appellants have failed to show error in the rejection of claim 12 for the same reasons discussed with respect to claims 1 and 16.

Claim 13 was argued on the same basis as claims 1, 7, and 16 (Br. 23-24; Reply Br. 15-16), and we find that Appellants have failed to show error in the rejection of claim 13 for the same reasons discussed with respect to claims 1, 7, and 16.

Claim 14 was argued on the same basis as claims 1 and 16 (Br. 24-25; Reply Br. 16-17), and we find that Appellants have failed to show error in the rejection of claim 14 for the same reasons discussed with respect to claims 1 and 16.

Dependent claim 15 was not argued separately from independent claim 14,<sup>5</sup> and thus falls with claim 14.

We have considered Appellants' remaining arguments and find them unpersuasive. Accordingly, we conclude that the Examiner did not err in rejecting claims 1-15 under 35 U.S.C. § 103(a).

#### CONCLUSION OF LAW

Based on the findings of facts and analysis above, we conclude that the Examiner did not err in rejecting claims 1-16.

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<sup>5</sup> Although the Briefs include a point heading for claims 14 and 15, no argument was presented with respect to claim 15. (Br. 24-25; Reply Br. 16-17.)

Appeal 2007-1352  
Application 10/406,127

DECISION

The rejection of claim 16 for anticipation under 35 U.S.C. § 102(e) is affirmed.

The rejection of claims 1-15 for obviousness under 35 U.S.C. § 103(a) is affirmed.

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

AFFIRMED

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