



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
**United States Patent and Trademark Office**  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/047,901	02/19/2016	RAZIK S. AHMED	SJO920150078US1	1019
124717	7590	11/25/2019	EXAMINER	
Russell Ng PLLC (IBM TUC/BOU/SJO) 8729 Shoal Creek Blvd., Suite 100 Austin, TX 78757			ALSIP, MICHAEL	
			ART UNIT	PAPER NUMBER
			2136	
			NOTIFICATION DATE	DELIVERY MODE
			11/25/2019	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

stephanie@russellnglaw.com

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

*Ex parte* RAZIK S. AHMED, CHARLES J. CAMP,  
TIMOTHY J. FISHER, AARON D. FRY, NIKOLAS IOANNOU,  
JASON MA, MATTHEW R. ORR, ROMAN A. PLETKA,  
LINCOLN T. SIMMONS, and SASA TOMIC

---

Appeal 2018-006860  
Application 15/047,901  
Technology Center 2100

---

Before CATHERINE SHIANG, CARL L. SILVERMAN, and  
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

AMUNDSON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant<sup>1</sup> seeks our review under 35 U.S.C. § 134(a) from a final rejection of claims 1, 2, 9, 10, 17, and 18, i.e., the pending claims that have not been withdrawn from consideration. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

---

<sup>1</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42 (2017). Appellant identifies the real party in interest as International Business Machines Corporation. Appeal Br. 2.

## STATEMENT OF THE CASE

### *The Invention*

According to the Specification, the invention “is generally directed to regrouping data and, more specifically, to regrouping data during relocation to facilitate write amplification reduction in a storage system.” Spec. ¶ 1.<sup>2</sup> The Specification describes a technique for “garbage collection” in a storage system that includes “generating regrouping metadata for one or more pages of at least two logical erase blocks (LEB),” where the “regrouping metadata indicates an associated stream for each of the pages.” *Id.* ¶ 7, Abstract; *see id.* ¶¶ 24–27. The Specification explains that based on the regrouping metadata “[m]ultiple of the LEBs that include valid pages associated with a first stream are selected” for regrouping, and the “valid pages associated with the first stream from the selected LEBs are regrouped into a new LEB.” *Id.* ¶ 7, Abstract. The Specification also explains that the regrouping metadata may assign host writes “associated with a single stream to a single LEB during data regrouping” or may “separate initial host writes into different LEBs.” *Id.* ¶ 27.

### *Exemplary Claim*

Independent claim 1 exemplifies the claims at issue and reads as follows:

---

<sup>2</sup> This decision uses the following abbreviations: “Spec.” for the Specification, filed February 19, 2016; “Final Act.” for the Final Office Action, mailed June 14, 2017; “Appeal Br.” for the Appeal Brief, filed November 13, 2017; “Ans.” for the Examiner’s Answer, mailed April 19, 2018; and “Reply Br.” for the Reply Brief, filed June 19, 2018.

1. A method of garbage collection in a storage system, comprising:

generating, by a controller, regrouping metadata for one or more pages in at least two logical erase blocks (LEBs ), wherein the regrouping metadata indicates an associated stream for each of the pages;

selecting by the controller, based on the regrouping metadata, a first LEB that includes one or more valid pages associated with a first stream and a second LEB that includes one or more valid pages associated with the first stream for regrouping; and

regrouping, by the controller, the valid pages associated with the first stream from the selected first and second LEBs into a new LEB.

Appeal Br. 9 (Claims App.). Independent claims 9 and 17 include similar limitations. *Id.* at 9–10.

*The Rejection on Appeal and the Prior Art*

Claims 1, 2, 9, 10, 17, and 18 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Patent Application Publication 2014/0244897 A1 to Goss et al., titled “Metadata Update Management in a Multi-Tiered Memory,” filed February 26, 2013, and published August 28, 2014 (“Goss”). Final Act. 4–6.

ANALYSIS

We have reviewed the rejection in light of Appellant’s arguments that the Examiner erred. For the reasons explained below, we agree with the Examiner’s determination that Goss anticipates the claims at issue. To the extent consistent with our analysis below, we adopt the Examiner’s findings and reasoning in the Final Office Action and Answer. *See* Final Act. 4–6;

Ans. 3–4. We add the following to address and emphasize specific findings and arguments.

*The § 102 Rejection of Independent Claims 1, 9, and 17*

Appellant argues that the Examiner erred in rejecting claims 1, 9, and 17 for three reasons. *See* Appeal Br. 3–6; Reply Br. 2. *First*, Appellant asserts that Goss does not satisfy the requirement for “regrouping metadata” because Goss’s metadata does not “indicate[] an associated stream for each of the pages” as required by the claims. Appeal Br. 6; *see* Reply Br. 2. In addition, Appellant contends that “Goss does not even include the word ‘stream’.” Appeal Br. 6.

We disagree that Goss’s metadata does not “indicate[] an associated stream for each of the pages” as required by claims 1, 9, and 17. *See* Final Act. 4–5; Ans. 3. The Specification indicates that a “stream” includes write data originating from one or more locations in a host. *See* Spec. ¶¶ 23–27, 60, 63; Final Act. 5; Ans. 3. In particular, the Specification describes “streams of host data” and “host data placement” such that certain locations in a storage device “only contain data from a single stream.” Spec. ¶ 23. In addition, the Specification explains that “write amplification may be reduced by maintaining regrouping metadata on a stream origin for associated data” and that “regrouping metadata” preferably “includes a stream origin for associated data.” *Id.* ¶¶ 24, 60; *see id.* ¶ 63. Thus, according to the Specification, a “stream” of write data originates from one or more locations in a host. Further, the Specification expressly states that “regrouping metadata” may indicate either a “host address” or a host “logical unit number (LUN) ID.” *Id.* ¶¶ 26, 63; *see* Final Act. 5; Ans. 3.

Goss discloses a storage device that generates and maintains metadata “to track the locations and status of the stored data.” Goss ¶ 21; *see id.* ¶¶ 1, 4–7, 17, 28–31, 35, 38–40, code (54), code (57), Figs. 1–4; Final Act. 5–6. Goss’s metadata includes “address information” indicating “the memory location of the stored data,” e.g., metadata denoting a “logical address” and a “corresponding physical address.” Goss ¶¶ 21, 35, 63, Fig. 2; *see id.* ¶ 31. Goss’s metadata “tracks the relationship between logical elements (such as logical block addresses, LBAs)” and “physical locations (such as physical block addresses, PBAs).” *Id.* ¶ 21; *see id.* ¶ 63. A “logical block address (LBA)” identifies “data at the requestor level,” e.g., data at a “host device.” *Id.* ¶¶ 28, 32; *see id.* ¶¶ 24, 31. In addition, Goss’s metadata provides “logical to physical address conversion information” for the stored data. *Id.* ¶ 35; *see id.* ¶¶ 60, 64, Fig. 8 (reverse directory 248), Fig. 11. Thus, for data written from a host device to a storage device, Goss’s metadata tracks host “logical block addresses.” *See id.* ¶¶ 21, 23–24, 35, 64, Fig. 11 (logical block addresses 272).

Because “regrouping metadata” may indicate either a “host address” or a host “logical unit number (LUN) ID” and because Goss’s metadata tracks host “logical block addresses,” Goss’s metadata satisfies the requirement for “regrouping metadata.”

*Second*, Appellant asserts that “Goss does not teach (or suggest) selecting, based on regrouping data . . . multiple of the LEBs for regrouping that include valid pages associated with a first stream.” Appeal Br. 6; *see* Reply Br. 2.

We disagree that Goss fails to disclose selecting multiple LEBs as required by claims 1, 9, and 17. *See* Final Act. 4–5; Ans. 3. As explained below, Goss employs metadata for the same purpose as the claims.

According to the Specification, data writes to a flash memory occur “in units called pages,” but a flash memory “can only be erased in larger units called blocks (made up of multiple pages).” Spec. ¶ 5; *see id.* ¶¶ 2, 21, 39. The Specification defines a “logical erase block” or “LEB” as “a garbage collection unit that may include one or more erase blocks.” *Id.* ¶ 22. Claims 1, 9, and 17 recite “at least two logical erase blocks (LEBs).” Appeal Br. 9–10 (Claims App.).

Similar to the Specification, Goss defines a “garbage collection unit” or “GCU” as “a group of memory cells in a selected memory tier that is allocated and reset as a unit.” Goss ¶ 54. Goss explains that a GCU includes multiple pages. *Id.* ¶¶ 62–63; *see id.* ¶ 35; Final Act. 5. Thus, Goss’s GCUs correspond to “at least two logical erase blocks (LEBs)” as recited in claims 1, 9, and 17.

Further, the Examiner analyzes at least two of Goss’s GCUs that contain data related to the same file or data set. Ans. 3; *see* Goss ¶¶ 19, 66. The Examiner correctly finds that when garbage collection occurs in at least two of Goss’s GCUs that contain data related to the same file or data set, “valid pages are migrated to a different GCU (new to the valid data being moved).” Ans. 3 (citing Goss ¶¶ 55–58); *see* Final Act. 5; Goss ¶¶ 54–58. As discussed above, Goss’s metadata tracks host “logical block addresses,” e.g., host “logical block addresses” related to the same file or data set. *See id.* ¶¶ 19, 21, 23–24, 35, 64, 66, Fig. 11 (logical block addresses 272). Consequently, when garbage collection occurs in at least two of Goss’s

GcUs that contain data related to the same file or data set, GCU selection occurs “based on the regrouping metadata” according to claims 1, 9, and 17. *See* Final Act. 4–5; Ans. 3; Goss ¶¶ 21–24, 32, 35, 54–58, 60, 63–64.

*Third*, Appellant asserts that “Goss does not teach (or suggest) regrouping valid pages associated with the first stream from the selected LEBs into a new LEB (i.e., a same LEB).” Appeal Br. 6; *see* Reply Br. 2.

We disagree that claims 1, 9, and 17 require regrouping into the same LEB. *See* Final Act. 5; Ans. 3–4. Claim 1 recites “regrouping” valid pages associated a first selected LEB and a second selected LEB “into a new LEB.” Appeal Br. 9 (Claims App.). Claims 9 and 17 include similar limitations reciting regrouping “into a new LEB.” *Id.* at 9–10. The “indefinite article ‘a’ or ‘an’ in patent parlance carries the meaning of ‘one or more’ in open-ended claims containing the transitional phrase ‘comprising.’” *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000). Claims 1, 9, and 17 contain the transitional phrase “comprising.” Appeal Br. 9–10 (Claims App.). So regrouping “into a new LEB” encompasses regrouping into “one or more” new LEBs.

Thus, the Examiner properly reasons that the “regrouping” limitation in claims 1, 9, and 17 “only require[s] the valid pages associated with the first stream from the first LEB to be regrouped together and stored in a new LEB and the valid pages associated with the first stream from the second LEB to be regrouped together and stored in a new LEB” where “the new LEB can be the same LEB or two different new LEBs.” Ans. 4. Consistent with the Examiner’s reasoning, the Specification explains that the “regrouping metadata may . . . separate initial host writes into different LEBs.” Spec. ¶ 27. “[D]uring examination proceedings, claims are given

their broadest reasonable interpretation consistent with the specification.” *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000).

For the reasons discussed above, Appellant’s arguments have not persuaded us that the Examiner erred in rejecting claims 1, 9, and 17 under § 102 as anticipated by Goss. Hence, we sustain the § 102 rejection of claims 1, 9, and 17.

*The § 102 Rejection of Dependent Claims 2, 10, and 18*

Claim 2 depends from claim 1 and specifies that “the associated stream is indicated by at least one of a set including a data heat, a stream identifier (ID) supplied by a host, a host address, a thread ID, and a logical unit number (LUN) ID.” Appeal Br. 9 (Claims App.). Claims 10 and 18 depend from claims 9 and 17, respectively, and include limitations similar to claim 2. *Id.* at 10.

Appellant argues that the Examiner erred in rejecting claims 2, 10, and 18 because Goss’s metadata “does not include at least one of a set including a data heat, a stream identifier (ID) supplied by a host, a host address, a thread ID, and a logical unit number (LUN) ID that indicates an associated stream.” Appeal Br. 7; Reply Br. 3. Appellant asserts that Goss’s metadata “does not include any information . . . that indicates an associated stream.” Reply Br. 3.

Again, we disagree. As discussed above for claims 1, 9, and 17, Goss’s metadata tracks host “logical block addresses.” Goss ¶¶ 21, 23–24, 35, 64, Fig. 11 (logical block addresses 272). Because Goss’s metadata tracks host “logical block addresses,” that metadata satisfies the requirement for either a “host address” or a host “logical unit number (LUN) ID” in claims 2, 10, and 18.

For the reasons discussed above, Appellant's arguments have not persuaded us that the Examiner erred in rejecting claims 2, 10, and 18 under § 102 as anticipated by Goss. Hence, we sustain the § 102 rejection of claims 2, 10, and 18.

### CONCLUSION

We affirm the Examiner's decision to reject claims 1, 2, 9, 10, 17, and 18.

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 2, 9, 10, 17, 18	102	Goss	1, 2, 9, 10, 17, 18	

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). *See* 37 C.F.R. § 41.50(f).

**AFFIRMED**