

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WADE HENNESSEY

Appeal No. 1998-2979
Application No. 08/274,923

ON BRIEF

Before HAIRSTON, RUGGIERO, and DIXON, **Administrative Patent Judges**.
DIXON, **Administrative Patent Judge**.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1-17,
which are all of the claims pending in this application.

We REVERSE.

BACKGROUND

The appellant's invention relates to a real-time computer "garbage collector" to reclaim unused memory. An understanding of the invention can be derived from a reading of exemplary claim 1, which is reproduced below.

1. A method for performing real-time computer garbage collection, for use with a plurality of data objects and with one or more mutator programs, each one of said mutators having a corresponding thread and each one of said mutator threads having a corresponding thread state separate from said plurality of data objects, said method comprising the following steps:

commencing a new garbage collection cycle;

temporarily restricting execution of said mutators while processing the corresponding thread state for each one of said mutators;

permitting each one of said mutators to resume unrestricted execution, as soon as said mutator's own corresponding thread state has been processed;

completing the garbage collection cycle by identifying each one of said objects that is currently accessible to at least one of said mutators.

The prior art reference of record relied upon by the examiner in rejecting the appealed claims is:

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Kuechlin et al. (Kuechlin), "On Multi-Threaded List-Processing and Garbage Collection", Department of Computer and Information Science, The Ohio State University, pp 1-18 and abstract (March 22, 1991).

Claims 1-17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Kuechlin.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellant regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 14, mailed Jan. 2, 1998) for the examiner's reasoning in support of the rejections, and to the appellant's brief (Paper No. 13, filed Oct. 20, 1997) and reply brief (Paper No. 15, filed Mar. 2, 1998) for the appellant's arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellant's specification and claims, to the applied prior art reference, and to the respective positions articulated by the appellant and the examiner. As a consequence of our review, we make the determinations which follow.

Appellant argues that the examiner has not set forth a rejection based upon obviousness, but has only rejected claims 1-17 based upon anticipation. (See brief at page 3.) We agree with appellant that the examiner's bases his rejection upon anticipation. Appellant argues that the examiner's chart in the answer establishes that

the steps recited in claim 1 are not present or inherent in the teachings of Kuechlin. (See brief at page 3.) We agree with appellant. The examiner relies at pages 4-5 of the answer upon two quotations within Kuechlin to teach the temporarily restricting execution of the mutators¹. Appellant argues at page 4 of the brief that neither quotation addresses the “temporarily restricting execution of said mutators while processing the corresponding thread state for each one of said mutators.” We agree with appellant that Kuechlin does not expressly set forth the restricting execution for processing the thread state of the mutator programs. The examiner’s reliance upon the parallel and independent operation does not address the thread state. While it may do this function, it does not appear to us to be required or inherent. The examiner notes at page 5 of the answer that it is “well known in the art” that the mark phase causes a temporary restriction on the mutator access.

Furthermore, the examiner relies on the “fully parallel garbage collector” (answer at page 5) to teach a “very brief restriction on mutator access due to the time critical nature of

¹ Here, we note that the examiner addresses the steps of the claims after the preamble and has not clearly addressed the language of the preamble in the rejection. In the rejection the examiner addresses plural mutator programs operating while the preamble of the claim recites “[a] method for performing real-time computer garbage collection, for use with a plurality of data objects and with one or more mutator programs.” (Emphasis added). In our decision, we do not address whether the claims lack correspondence to the recited steps if only one mutator program is operating and whether Kuechlin would teach the recited steps with only one program operating, since the examiner has not used this claim interpretation in the discussion of the claimed invention or the applied prior art. In our view there would be no problems with the collection of memory and thread interaction with the single program and operation would commence after the single collection was completed.

these applications.” While there would be some restriction of operation in Kuechlin, the examiner has not addressed the language of claim 1. The limitation requires the temporary restriction and “permitting each one of said mutators to resume unrestricted execution, as soon as said mutator's own corresponding thread state has been processed.” Here, the mere parallel and independent garbage collection operation with respect to each mutator program would not, in our view, necessarily resume operation as soon as said mutator's own corresponding thread state has been processed, as required by the language of claim 1. Moreover, the examiner has not addressed the “as soon as” limitation in claim 1. (See answer at pages 15-17.) The examiner addresses resuming execution by the mutator prior to completing the entire garbage collection cycle, but the examiner does not address the limitation which requires resuming execution by the mutator program during its own garbage collection after the thread state is completed/processed and prior to completion of the overall collection cycle. The examiner concludes that Kuechlin teaches resuming execution as soon as the garbage collection is done with the thread states. (See answer at page 17.) We disagree with the examiner's conclusion that Kuechlin teaches the claimed limitation under anticipation and inherency.

The examiner maintains that Kuechlin allows the mutator to resume execution prior to completion of the cycle (answer at page 12), but does not cite to any specific

teaching in Kuechlin to support this position. The examiner cites to page 1 [sic, 2], paragraph 2 of Kuechlin to again teach the independent and parallel operation, but in our view, this does not support the examiner's position. The examiner further relies upon Kuechlin at page 4 disclosing algorithms using thread subsystems. From our review of page 4 of Kuechlin, Kuechlin does not disclose that the mutator programs resume execution prior to completion. From our review, page 4 of Kuechlin merely discloses limitation the organization of the S-thread system without detail to the garbage collection. Therefore, the examiner's argument is not persuasive.

Additionally, the examiner maintains that the limitation is not present in the language of claim 1. We disagree with the examiner. The examiner argues that the claim limitations do not set forth requiring the restriction to be lifted prior to completing the garbage collection. (See answer at page 13.) We agree with the examiner, but note that, here, the examiner has not addressed the language of claim 1 with respect to the "as soon as" and "thread state" limitations as defined in the specification at page 5. (See brief at page 4.) The examiner disagrees with appellant's interpretation of the claim language and the examiner's broad interpretation of the individual limitations/words in the claim. (See answer at page 13.) We disagree with the examiner. Here, the examiner has not addressed the claim as a whole, nor has the examiner used a reasonable interpretation of the claim language in light of appellant's arguments and disclosure.

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Since we find that claims 1 and its dependent claims 2-8 are not anticipated by the express teachings of Kuechlin or by inherency, we cannot sustain the rejection under 35 U.S.C. § 102. Claim 9 contains similar limitations to claim 1, and we cannot sustain the rejection of claim 9 and its dependent claims 10-17 under 35 U.S.C. § 102 for the same reasons.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1-17 under 35 U.S.C. § 102 is reversed.

REVERSED

KENNETH W. HAIRSTON)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
JOSEPH F. RUGGIERO)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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