

EXHIBIT 6

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

RE: Control No.: 90/010,856
Inventor(s): Richard Michael NEMES
Filing Date: February 9, 2010
For: METHODS AND APPARATUS FOR INFORMATION STORAGE
AND RETRIEVAL USING A HASHING TECHNIQUE WITH
EXTERNAL CHAINING AND ON-THE-FLY REMOVAL OF
EXPIRED DATA
Group Art Unit: 3992
Examiner: A. J. Kosowski

SIR:

Attached hereto for filing are the following papers:

**Amendment in *Ex Parte* Reexamination of U.S. Patent No. 5,893,120
in Reply to Office Action of July 23, 2010 w/Exhibits A-C
Statement under 37 C.F.R. §1.560
Submission under 37 C.F.R. §1.555/1.565 in *Ex Parte* Reexamination of
U.S. Patent No. 5,893,120 w/Attachments (7)
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Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.



Scott A. McKeown

Registration No. 42,866

Customer Number

22850

(703) 413-3000 (phone)
(703) 413-2220 (fax)
(OSMMN 10/09)

DOCKET NO: 358121US91RX

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE REEXAMINATION OF :
U.S. PATENT NO. 5,893,120

INVENTOR: : EXAMINER: A. J. KOSOWSKI
RICHARD MICHAEL NEMES

CONTROL NO: 90/010,856 :

FILED: FEBRUARY 9, 2010 : GROUP ART UNIT: 3992

FOR: METHODS AND APPARATUS FOR :
INFORMATION STORAGE AND
RETRIEVAL USING A HASHING
TECHNIQUE WITH EXTERNAL
CHAINING AND ON-THE-FLY
REMOVAL OF EXPIRED DATA

AMENDMENT IN *EX PARTE* REEXAMINATION OF U.S. PATENT NO. 5,893,120

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

In response to the Office Action in *ex parte* reexamination dated July 23, 2010, please consider the following:

Description of claim status and support of claims begin on page 3.

A listing of claims begins on page 4 of this paper.

Remarks begin on page 7 of this paper.

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DESCRIPTION OF CLAIM STATUS AND SUPPORT

Claim 1 is maintained in the originally issued scope of U.S. Patent 5,893,120.

Claim 2 is maintained in the originally issued scope of U.S. Patent 5,893,120.

Claim 3 is clarified herein. Support for the clarifying change is found in the claims as originally submitted, as well as at least Fig. 3 boxes 39-40.

Claim 4 is maintained in the originally issued scope of U.S. Patent 5,893,120.

Claim 5 is maintained in the originally issued scope of U.S. Patent 5,893,120.

Claim 6 is maintained in the originally issued scope of U.S. Patent 5,893,120.

Claim 7 is clarified herein. Support for the clarifying changes is found in the claims as originally submitted, as well as at least Fig. 3 boxes 39-40.

Claim 8 is maintained in the originally issued scope of U.S. Patent 5,893,120.

New Claims 9-12 find support as follows:

Claim 9 – at least Fig. 4, box 55; col. 7, lines 48-50.

Claim 10 – at least col. 8, lines 14-29; FIG. 5, boxes 78-81; and pseudo code.

Claim 11 – at least Fig. 4, box 55; col. 7, lines 48-50.

Claim 12 – at least col. 8, lines 14-29; FIG. 5, boxes 78-81; and pseudo code.

IN THE CLAIMS

1. An information storage and retrieval system, the system comprising:
a linked list to store and provide access to records stored in a memory of the system,
at least some of the records automatically expiring,
a record search means utilizing a search key to access the linked list,
the record search means including a means for identifying and removing at least some
of the expired ones of the records from the linked list when the linked list is accessed, and
means, utilizing the record search means, for accessing the linked list and, at the same
time, removing at least some of the expired ones of the records in the linked list.

2. The information storage and retrieval system according to claim 1 further including
means for dynamically determining maximum number for the record search means to remove
in the accessed linked list of records.

3. (Amended) A method for storing and retrieving information records using a linked
list to store and provide access to the records, at least some of the records automatically
expiring, the method comprising the steps of:

accessing the linked list of records to search for a target record,
identifying at least some of the automatically expired ones of the records while
searching for the target record, and
removing at least some of the automatically expired records from the linked list when
the linked list is accessed.

4. The method according to claim 3 further including the step of dynamically
determining maximum number of expired ones of the records to remove when the linked list

is accessed.

5. An information storage and retrieval system, the system comprising:
a hashing means to provide access to records stored in a memory of the system and using an external chaining technique to store the records with same hash address, at least some of the records automatically expiring,

a record search means utilizing a search key to access a linked list of records having the same hash address,

the record search means including means for identifying and removing at least some expired ones of the records from the linked list of records when the linked list is accessed, and

means, utilizing the record search means, for inserting, retrieving, and deleting records from the system and, at the same time, removing at least some expired ones of the records in the accessed linked list of records.

6. The information storage and retrieval system according to claim 5 further including means for dynamically determining maximum number for the record search means to remove in the accessed linked list of records.

7. (Amended) A method for storing and retrieving information records using a hashing technique to provide access to the records and using an external chaining technique to store the records with same hash address, at least some of the records automatically expiring, the method comprising the steps of:

accessing a linked list of records having same hash address to search for a target record,

identifying at least some of the automatically expired ones of the records while searching for the target record,

removing at least some of the automatically expired records from the linked list when the linked list is accessed, and

inserting, retrieving or deleting one of the records from the system following the step of removing.

8. The method according to claim 7 further including the step of dynamically determining maximum number of expired ones of the records to remove when the linked list is accessed.

9. (New) The method of claim 3, further comprising:

deallocating memory of the at least some of the automatically expired records.

10. (New) The method of claim 9, further comprising:

inserting the target record into the linked list if the target record was not found during the searching.

11. (New) The method of claim 7, further comprising:

deallocating memory of the at least some of the automatically expired records.

12. (New) The method of claim 11, wherein the inserting, retrieving or deleting includes inserting the target record into the linked list if the target record was not found during the searching.

I. REMARKS

Favorable reconsideration of this reexamined patent (hereinafter, '120 Patent), as presently amended, and in light of the following discussion, is respectfully requested.

After entry of the foregoing amendment, Claims 1-12 remain pending in this reexamination. Claims 3 and 7 are clarified herein. New claims 9-12 are added, support for which is separately listed *supra*. No new or broadening matter is added.

By way of summary, the Official Action in *ex parte* reexamination presents the following issues: Claims 1, 3, 5 and 7 stand rejected under 35 U.S.C. §102 as being unpatentable over Morrison, et al. (NPL Doc, A Queuing Analysis of Hashing with Lazy Deletion, hereinafter "Morrison"); Claims 1-8 stand rejected under 35 U.S.C. §102 as being unpatentable over Thatte, et al. (U.S. Patent No. 4,695,949, hereinafter "Thatte"); Claims 2, 4, 6 and 8 stand rejected under 35 U.S.C. §103 as being unpatentable over Morrison in view of Dirks (U.S. Patent No. 6,119,214, hereinafter "Dirks"); Claims 2, 4, 6 and 8 stand rejected under 35 U.S.C. §103 as being unpatentable over Morrison in view of Thatte; and Claims 1-8 stand rejected under 35 U.S.C. §103 as being unpatentable over Dirks in view of Morris, et al. (U.S. Patent No. 5,724,538, hereinafter "Morris").

II. INTERVIEW IN EX PARTE REEXAMINATION

The Patent Holder appreciatively acknowledges the in-person interview conducted on November 19, 2010. Patent Holder's reexamination counsel Mr. Scott McKeown participated in the interview together with inventor Dr. Richard Nemes and Bedrock Computer Technologies President Dr. David Garrod. On behalf of the USPTO, Examiners Alexander Kosowski, Eric Keasel, and Joshua Campbell participated.¹ During the interview, the Patent Holder's representative, together with inventor Richard Nemes discussed the technology of the '120 Patent in light of the outstanding issues presented in the Outstanding Action of July 23, 2010.

The Examiners indicated that the presented distinctions were persuasive, and that the discussion was helpful in focusing the issues.

¹ A complete written statement of the reasons presented at the interview for patentability of the presently presented claims is provided under separate cover in accordance with 37 CFR 1.560.

III. CONCURRENT PROCEEDINGS

The '120 Patent is subject to ongoing litigation styled as *Bedrock Computer Technologies, LLC v. SoftLayer Technologies, Inc., et al.*, No. 6:09cv269.

A notice of concurrent proceedings accompanies this response consistent with MPEP § 2282. More specifically, Patent Holder has submitted a provisional claim construction order and briefing on a motion by the defendants that challenges certain claims of the '120 Patent as indefinite.

IV. DECLARATION EVIDENCE SUBMITTED UNDER 37 C.F.R. § 1.132

Attached, as Exhibits A-C, is declaration evidence submitted herewith under 37 C.F.R. § 1.132. Lawrence Pileggi, Ph.D., as detailed in the opening paragraphs of each declaration, is one of skill in the art.

Exhibits will be discussed in more detail below; however, these Exhibits generally corresponds to the following topics at issue in this reexamination, noted below for ease of reference:

A. (Exhibit A) – The Claimed Structure of the '120 Patent

Dr. Pileggi explains in Exhibit A the structure of the '120 Patent corresponding to the claimed structure of means-plus-function claims 1 and 5.

B. (Exhibit B) – Thatte Suspends Access Prior to Removal of Records

Dr. Pileggi explains in Exhibit B that the claims require access and expired data removal be performed *at the same time*.² Further, Dr. Pileggi explains that Thatte describes suspending access while garbage collection is performed.³

C. (Exhibit C) – Dirks Predetermined Memory Segment Processing

Dr. Pileggi explains in Exhibit C that Dirks describes determinable memory sweeps that are independent of data access.⁴ Moreover, Dr. Pileggi explains that modifying Dirks to provide a linked list would require a change in operating principle.⁵

² Exhibit B, ¶ 14.

³ Exhibit B, ¶ 20.

⁴ Exhibit C, ¶ ¶ 13-14.

⁵ Exhibit C, ¶ ¶ 15-16.

V. THE ADOPTED REJECTIONS FAIL TO IDENTIFY EQUIVALENT STRUCTURES THAT PERFORM IDENTICAL FUNCTIONS TO THAT RECITED BY CLAIMS 1-2 & 5-6

The outstanding rejections of record were proposed by Third Party Request on February 9, 2010. In adopting these rejections, the Official Action suffers from the same fatal flaw as that of the Request, namely, a reliance on the wrong claim interpretation standard.⁶

The broadest reasonable interpretation that may be applied to means-plus-function claims is that defined by 35 U.S.C. § 112, 6th paragraph. The PTO may not disregard the structure disclosed in the patent specification corresponding to such language when rendering a patentability determination. Yet, the Office has adopted proposed rejections of the Third Party that apply a broadest reasonable interpretation, independent of the specification; this is incorrect.⁷

Patent Owner notes that a proper structural equivalent must perform the identical function of the claimed means-plus-function claim elements. In this regard, the PTO's reviewing court has emphasized that conclusory findings that omit analysis as to "means" claim limitations are improper in *Gechter v. Davidson*, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997), as follows:

In addition, the [PTO] never construed the scope of the structures disclosed in the specification for the claimed "receiving means," nor did the [PTO] expressly find that the "receiving means" disclosed in the specification was structurally equivalent to that embodied in [the reference]. Moreover, the [PTO] also failed to define the exact function of the receiving means, as well as to find that [the reference] disclosed the identical function. (emphasis added, citation omitted).

By virtue of adopting flawed proposed rejections, the Office has failed to carry its burden for identifying the structure in the '120 Patent corresponding to the means-plus-function limitations of at least claims 1 and 5, let alone for showing that the prior art structure is the same as or equivalent to such structure. In fact, both the Third Party Request and the Official Action are silent as to their treatment of the means-plus-function claims.

Properly construed, as explained next, claims 1-2 and 5-6 are patentably distinguishable over the art of record.

⁶ See the Request of February 9, 2010 at pages 13-14.

⁷ Patent Holder, pursuant to the Federal Register Notice of June 25, 2010, reserves the right to appeal this fundamental deficiency.

A. The Broadest Reasonable Interpretation Accorded Means-Plus-Function Claims is Mandated by Statute (35 U.S.C. § 112, ¶ 6th)

Claims 1, 2, 5 and 6 of the '120 Patent have been found to invoke 35 U.S.C. § 112, 6th paragraph in the litigation of the '120 Patent styled as *Bedrock Computer Technologies, LLC v. Softlayer Technologies, Inc. et al* (EDTX).⁸ A declaration of Dr. Lawrence Pileggi (Exhibit B) is submitted evidencing the same understanding of the mapping of means-plus-function features to the '120 Patent as found by the District Court.

Claim 1 of the '120 Patent recites,

1. An information storage and retrieval system, the system comprising:

a linked list to store and provide access to records stored in a memory of the system, at least some of the records automatically expiring,

a record search means utilizing a search key to access the linked list.

the record search means including a means for identifying and removing at least some of the expired ones of the records from the linked list when the linked list is accessed, and

means, utilizing the record search means, for accessing the linked list and, at the same time, removing at least some of the expired ones of the records in the linked list.

(emphasis added)

Claim 5 of the '120 Patent recites,

5. An information storage and retrieval system, the system comprising:

a hashing means to provide access to records stored in a memory of the system and using an external chaining technique to store the records with same hash address, at least some of the records automatically expiring,

a record search means utilizing a search key to access a linked list of records having the same hash address,

the record search means including means for identifying and removing at least some expired ones of the records from the linked list of records when the linked list is accessed, and

means, utilizing the record search means, for inserting, retrieving, and deleting records from the system and, at the same time, removing at least some expired ones of the records in the accessed linked list of records.

(emphasis added)

⁸ The court has also determined that claims 2 and 6 recite additional means-plus-function features. As the base claims are distinguishable in their own right, these claims are ignored herein for purposes of brevity, as is the *hashing means* feature of claim 5.

In order to properly interpret means-plus-function claims, 35 U.S.C. § 112, 6th paragraph requires a two-step approach. The first step in construing a means-plus-function claim limitation is to define the particular function of the claim limitation. The second step in construing a means-plus-function claim limitation is to look to the specification and identify the corresponding structure, material or acts for that particular function. *In re Donaldson Co.*, 16 F.3d 1189 (Fed. Cir. 1994); *See also* (MPEP 2181-2183).

Exhibit A (Corresponding Structure of '120 Patent)

In accordance with the underlined claim terms above, each of claim 1 and claim 5 recite three separate means-plus-function claim features. These claimed features are grouped together based upon their related functionality. The claim features are grouped as follows: 1) *record search means*; 2) *means for identifying and removing*; and 3) *means ... for accessing* (claim 1) and *means ... for inserting, retrieving, and deleting* (claim 5).

The '120 Patent provides particular components and algorithmic structure linked to the function(s) of the above underlined means-plus-function features of claims 1 and 5.

Support for the *record search means*, and the *means for identifying and removing* features, is:

CPU 10 and RAM 11 of FIG. 1 and col. 3, lines 52-56; and, portions of the application software, user access software or operating system software, as described at col. 4 lines 22-48, programmed with software instructions as described in Boxes 31-42 of FIG. 3 and in col. 5, line 53 - col. 6, line 34, and/or programmed with software instructions as described in the pseudo-code of Search Table Procedure (cols. 11 and 12) or Alternate Version of Search Table Procedure (cols. 11, 12, 13, and 14). Pileggi Decl., Exh. A at ¶¶ 13-14.

This corresponding structure involves code identified in the '120 Patent as the "search table procedure." The '120 Patent contains three descriptions of the "search table procedure" code, one in flowchart form at FIG. 3, and two pseudo-code versions at cols. 11-14. All three descriptions of the '120 Patent's "search table procedure" share a common structural feature: namely, they all include code that, as part of a single process, both searches for a target record (FIG. 3, boxes 39-40; or code "if p^.recod_contents.key = record_key then begin position := p; previous_position := previous_p" in the pseudo-code descriptions) and identifies expired record(s) (FIG. 3, box 38; or code "if p^.record_contents is expired" in the pseudo-code descriptions). One of skill in the art would understand that this structure is

linked to the above noted function(s) of the *record search means* and the *means for identifying and removing*. Pileggi Decl., Exh. A at ¶ 15.

Support for the *means ... for accessing* of claim 1 is:

CPU 10 and RAM 11 of FIG. 1 and col. 3, lines 52-56; and, Portions of the application software, user access software or operating system software, as described at col. 4, lines 22-48, programmed with software instructions that provide the insert, retrieve, or delete record capability as described in the flowchart of FIG. 5 and col. 7, line 65 – col. 8, line 32, FIG. 6 and col. 8, lines 33-44, or FIG. 7 and col. 8, lines 45-59, respectively, and/or programmed with software instructions that provide the insert, retrieve or delete record capability as described in the pseudo-code of Insert Procedure (cols. 9 and 10), Retrieve Procedure (cols. 9, 10, 11, and 12), or Delete Procedure (cols. 11 and 12), respectively.⁹ Pileggi Decl., Exh. A at ¶ 16.

The structure in the specification that corresponds to the *means ... for accessing and means for inserting, retrieving, and deleting* limitations (in claims 1 and 5, respectively) includes, at least, code that invokes a version of the "search table procedure" as part of an insertion, retrieval, or targeted record deletion, thereby causing the insertion, retrieval, or deletion and the removal of one or more expired records to occur "at the same time." One of skill in the art would understand that this structure is linked to the above noted function(s) of the *means ... for accessing* and the *means ... for inserting, retrieving, and deleting* of claims 1 and 5. Pileggi Decl., Exh. A at ¶ 17.

In comparing means-plus-function claim elements to prior art features, *first* a prior art function must be identified that is identical to the claimed function. After this threshold determination is performed, the structure of the prior art that performs this function is identified and compared to that of the patent specification (such as defined above) for the purpose of determining structural equivalence.

As noted above, the adopted third party rejections provide no such analysis, and for good reason ---the proper analysis demonstrates that the submitted art is systemically different than the claimed invention of the '120 Patent.

⁹ For purposes of brevity, the entire structure corresponding to the *means ... for inserting, retrieving, and deleting* limitation of claim 5 is not separately detailed. It is sufficient to note that it, too, involves code that invokes the "search table procedure" as part of the normal hash table access (i.e., insert, retrieve, delete) routines.

VI THIRD PARTY CLAIM REJECTIONS ADOPTED BY THE OFFICE

A. REJECTIONS UNDER 35 U.S.C. §102

The Official Action has rejected Claims 1, 3, 5 and 7 under 35 U.S.C. §102 as being unpatentable over Morrison. Patent Holder respectfully traverses the rejection.

Morrison describes a mathematical analysis by which an amount of excess space in a dynamic dictionary may be computed. An assumption of the dynamic dictionary studied is that it utilizes a "hashing with lazy deletion" technique.¹⁰

In rejecting the above noted claims as anticipated by Morrison, the Office incorporates the Third Party proposed rejection as detailed in claim charts CC-A (As described by pages 25-32 of the Third Party Request). The cited aspects of the Request merely provide conclusory statements that provide no analysis of any structure of the '120 Patent relative to an equivalent structure of Morrison.

For example, the *record search means* of claims 1 and 5 includes the structure that the '120 Patent identifies as the "search table procedure." The '120 Patent contains three descriptions of the "search table procedure" code, one in flowchart form at FIG. 3, and two pseudo-code versions at cols. 11-14. All three descriptions of the '120 Patent's "search table procedure" share a common structural feature: namely, they all include code that, as part of a single process, both searches for a target record (FIG. 3, boxes 39-40; or code "if p^.recod_contents.key = record_key then begin position := p; previous_position := previous_p" in the pseudo-code descriptions) and identifies expired record(s) (FIG. 3, box 38; or code "if p^.record_contents is expired" in the pseudo-code descriptions). Pileggi Decl., Exh. A at ¶¶13-15.

There is simply no analysis of how Morrison provides any equivalent structure to the *record search means* of claims 1 and 5, which both searches for and identifies a target record and identifies expired ones of the records while searching. In fact, no such structure can be said to exist, as Morrison provides no such functionality.

Morrison simply describes that items *are inserted and sought as usual*.¹¹

Method Claims 3-4 and 7-8

It is believed that the method claims, as issued, include the aforementioned features based upon a proper reading of these claims in light of the specification. Nevertheless, to

¹⁰ Morrison at Abstract.

¹¹ *Id.*

advance this reexamination to conclusion, base claims 3 and 7 are amended to explicitly recite analogous features to those distinguished above. Specifically, the claims are clarified to recite that the accessing of the linked list of records involves (at least in part) searching for a target record, and that identification of expired records is performed while searching for the target record.

Accordingly, Patent Holder respectfully Requests that the Rejection of claims 1, 3, 5 and 7 under 35 U.S.C. §102 be withdrawn.

B. The Official Action has rejected Claims 1-8 under 35 U.S.C. §102 as being unpatentable over Thatte. Patent Holder respectfully traverses the rejection.

Claim 1 of the '120 Patent recites a system for retrieving and storing data, including, among other things,

the record search means including a means for identifying and removing at least some of the expired ones of the records from the linked list when the linked list is accessed, and

means, utilizing the record search means, for accessing the linked list and, at the same time, removing at least some of the expired ones of the records in the linked list.

(emphasis added)¹².

Thatte describes a memory management system "for managing a block oriented memory of the type in which each memory block has an associated reference count representing the number of pointers to it from other memory blocks and itself." (Thatte, abstract.) The memory management system includes a process called "reconciliation," which performs garbage collection. This "reconciliation" process removes records from a block of memory that are identified as "garbage." Pileggi Decl., Exh. B at ¶13.

Thatte "operates in association with the MMU [memory management unit] which performs three operations on the reference count filter, Insert, Delete, and Reconcile." (Thatte, col. 6:64-67.) Pileggi Decl., Exh. B at ¶14.

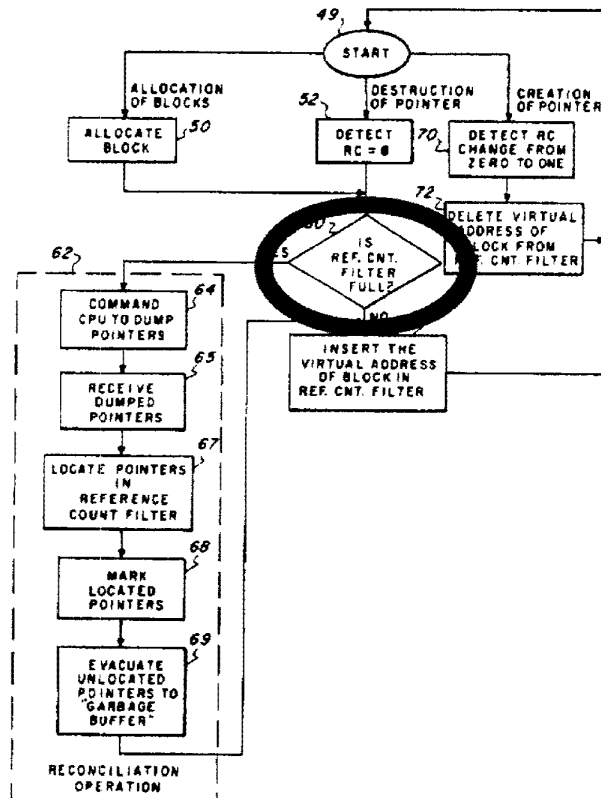
As explained in Thatte, if the system needs to insert a new record into the reference count filter but finds that the reference count filter is full, all operations are **suspended** while a reconciliation (garbage collection) process executes for the entire filter:

If the reference count filter is determined to be full, box 60, the MMU suspends the insertion operation and performs a reconciliation operation, box

¹² For the purposes of this discussion, claim 5 recites substantially similar functionality.

62, on the reference count filter, as described below, to create a room in the reference count filter so that the suspended insertion operation can be completed. (Thatte, col. 7:21-26 (describing FIG. 6).)

Thatte's FIG. 6 shows the above-described suspension/resumption of an insertion operation. As depicted, the suspension/resumption occurs at box 60 ("IS REF. CNT. FILTER FULL?") in the flowchart.



(annotation added)

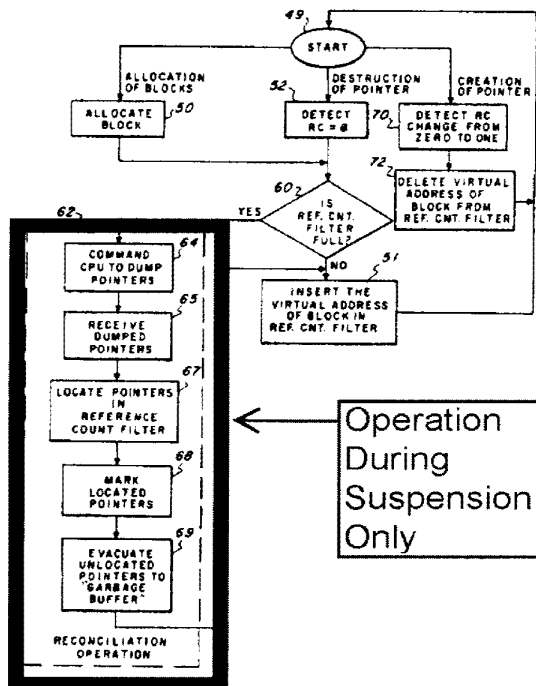
The "Reconcile" or "reconciliation" process of Thatte defines the garbage collection process. It is performed when the table is *full*, and for the *entire table*:

"When the table is full, a reconciliation operation is performed to identify those addresses which are contained in a set of binding registers associated with the CPU, and any address not contained in the binding registers are evacuated into a garbage buffer for subsequent garbage collection operations." (Thatte, abstract.)

"If the reference count filter is determined to be full, box 60, the MMU suspends the insertion operation and performs a reconciliation operation." (Thatte, col. 7:21-23.)

"As mentioned above, after an insert operation is suspended due to a full reference count filter, the MMU needs to make a room in the reference count filter so that the suspended insert operation can be resumed and completed. The MMU 40 makes the necessary room by performing a reconciliation operation, box 62." (Thatte, col. 7:40-45.)

In other words, once processing is suspended based upon the state of the Reference Count Filter, the reconciliation operation sweeps through the entire reference count filter, identifies records that are no longer needed, and moves them to a separate "garbage buffer." These aspects are shown in steps 64-69 of Fig. 6. (See Pileggi Decl., Exh. B at ¶19.)



At the point of a suspension (to garbage collect) at box 60, the insert operation would not have progressed to the point where the linked list into which the new record would ultimately be inserted had been accessed. Thus, once operation is suspended, there cannot be an access to the linked list and removal of expired records *at the same time*. This is because any access of data by Thatte is suspended until **after** global garbage collection for the entire table is completed (See box 51 of Fig. 6). Yet, this functionality is explicitly required by all the means-plus-function claims of the '120 Patent. Thus, not only is the function not found in Thatte, but, as a result, there can be no corresponding structure. Pileggi Decl., Exh. B at ¶20.

Method Claims 3-4 and 7-8

It is believed that the method claims, as issued, include the aforementioned features based upon a proper claim interpretation in light of the specification. Nevertheless, to advance this reexamination to conclusion, base claims 3 and 7 are amended to explicitly recite analogous features to those distinguished above. Specifically, the claims are clarified to recite that the accessing of the linked list of records is (at least in part) to search for a target record, and that identification of expired records is performed while searching for the target record.

Accordingly, Patent Holder respectfully Requests that the Rejection of claims 1-8 under 35 U.S.C. §102 be withdrawn.

C. REJECTIONS UNDER 35 U.S.C. §103

The Official Action has rejected Claims 1-8 under 35 U.S.C. §103 as being unpatentable over Dirks in view of Morris. Patent Holder respectfully traverses the rejection.

Dirks is directed to an open addressed hash table. Dirks attempts to provide a solution to the problem of "efficiently allocating and de-allocating large amounts of address space in a virtual memory system that does not require excessive processing time and therefore does not result in unacceptable delays in the operation of a computer." (col. 2:59-63.) Dirks purportedly addresses this problem, explaining, "virtual memory space is managed in a manner which allows new address ranges to be allocated and de-allocated *in a constant, small amount of time*, such that the need for a single complete sweep of all memory allocation records in a page table, to remove unused entries and prepare the addresses for further use, can be avoided." (col. 2:66-3:5.) "Thus, rather than halting the operation of the computer for a considerable period of time to scan the entire page table when a logical address area is deleted, the memory manager of the present invention carries out *a limited, time-bounded examination* upon each address allocation." (col. 3:26-29.). Pileggi Decl., Exh. C at ¶10

In operation, page table 18 of Dirks is swept to collect inactive mappings by cleaning small sequential segments of the page table. Dirks describes this sweep operation in terms of numerically indexed table entries — "entries 0-19 in the page table are examined. ... entries 20-39 in the page table are examined" (col. 7:19-31). Dirks is not directed to navigation of list-type data structures. For this teaching, the Morris reference has been identified.

Dirks performs its "limited, time-bounded examination" using the following procedures: (i) "each time a VSID is assigned from the free list to a new application or thread,

a fixed number of entries in the page table are scanned to determine whether they have become inactive" (col. 7:2-4); (ii) "the number of page table entries that are examined upon each allocation of a VSID in the free list can be determined from the total number of entries in the page table and the number of threads and applications that are allowed to be active at any given time."¹³; (iii) "The *predetermined number of entries* that are swept is identified as k , where $k = \text{total number of page table entries} / \text{maximum number of active threads}$. In the example given previously, $k=10000/500=20$." (col. 8:27-33); (iv) "it is not necessary that the number of examined entries be fixed for each step. Rather, it might vary from one step to the next. The only criterion is that *the number of entries examined on each step be such that all entries in the page table are examined in a determinable amount of time or by the occurrence of a certain event*, e.g. by the time the list of free VSIDs is empty." (col. 7:40-46.). These operations are generally referred to in Dirks as a "recycle sweep."

The Memory Segment Sweeps of Dirks are Independent of Data Access

Notably, in Dirks, the entries that are examined during a particular segment of the recycle sweep are in no way related to, or associated with, the VSID allocated before the sweep of the entries. The swept entries are also unrelated to any pages that have been mapped to physical memory and entered into the hash table prior to the sweep. Indeed, the sweep proceeds through predetermined portions of the page table without any correlation with non-garbage collection uses of the table (e.g., insertion or searching of pages mapped to physical memory).

The recycle sweeps of Dirks are also triggered by events — the assignment of VSIDs to threads or applications (see col. 7, lines 2-4, "each time a VSID is assigned from the free list to a new application or thread, a fixed number of entries in the page table are scanned ...") — that do not involve accesses to the page table. As Dirks is directed to allocation of new memory space, there is no discussion of initiating recycle sweeps upon, or in response to, non-garbage collection accesses of the page table, for example for insertion, deletion or retrieval operations. Pileggi Decl., Exh. C at ¶¶13-14

¹³ "For example, if the page table contains 10,000 entries and 500 threads/applications are allowed to be active at any given time, the 10,000 page table entries should be covered in a maximum of 500 steps (assuming each thread and application is assigned one segment each). The *number of entries that are swept in each step is therefore $10,000/500=20$ entries per step*." (col. 7:14-25)

Dirks in Combination with Morris

Aside from the failure of Dirks to describe any structure by which a removal of records is correlated to a data access (*record search means*), the combination of Dirks with Morris would require a change in the basic operating principle of Dirks. If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). In this instance, the suggested combination of references would require a substantial reconstruction and redesign of the elements shown in Dirks, as well as a change in the basic principle under which Dirks was designed to operate.

Simply stated, the recycle sweep of Dirks' garbage collection is well suited to the linear array (open) hash table for which it is designed, but would require an entirely different operating principle if used in combination with a chained hash table data structure, such as those claimed in the '120 Patent. This is because Dirks clearly articulates that the sweeps should be arranged such that all entries in the page table are examined on a regular schedule (see col. 7, lines 44-46: "all entries in the page table are examined in a determinable amount of time or by the occurrence of a certain event, e.g. by the time the list of free VSIDs is empty"). Dirks achieves this objective by assuring that the number of entries scanned on each sweep be predetermined, such that the time needed to scan these entries is predictable.

This approach, however, does not translate in a reasonable way to a chained hash table, in which records are unpredictably distributed among chains of different lengths. In a chained hash table, examining a predetermined number of entries on each sweep, as described in Dirks, may require traversing multiple chains and examining a potentially large and **indeterminate** number of table entries (anchor points). In particular, if an initially accessed chain does not contain the predetermined number of records to be examined, then the examination would need to proceed down the table to find another chain on which to continue the examination, but that process might involve examining a potentially large number of anchor points in the table, with the number limited only by the table size. Such a modification would destroy the predictability of the Dirks design, and change its basic operating principle of a "limited, time-bounded examination." Pileggi Decl., Exh. C at ¶¶ 15-16.

Method Claims 3-4 and 7-8

It is believed that the method claims, as issued, include the aforementioned features based upon a proper claim interpretation in light of the specification. Nevertheless, to advance this reexamination to conclusion, base claims 3 and 7 are amended to explicitly recite analogous features to those distinguished above. Specifically, the claims are clarified to recite that the accessing of the linked list of records is (at least in part) to search for a target record, and that identification of expired records is performed while searching for the target record.

Accordingly, Patent Holder respectfully Requests that the Rejection of claims 1-8 under 35 U.S.C. §103 be withdrawn.

D. The Official Action has rejected Claims 2, 4, 6 and 8 under 35 U.S.C. §103 as being unpatentable over Morrison in view of Dirks. Patent Holder respectfully traverses the rejection.

As noted above, Morrison does not provide all of the features of the issued claims for which it has been asserted. Likewise, Dirks has also been demonstrated as deficient in a similar regard. As such, these references in combination cannot present a *prima facie* case of obviousness. Moreover, the proposed combination would destroy the basic premise of Morrison, as its mathematical analysis of the "space complexity" of hashing with lazy deletion expressly relies on an assumption that *all* expired records are deleted.¹⁴

Furthermore, the claimed *means for dynamically determining*. . . has not been properly examined as no structure of the specification or art has been compared to ascertain structural equivalence. MPEP 2183. Therefore, these claims are independently distinguishable in addition to the clear deficiencies of the base claims.

Accordingly, Patent Holder respectfully Requests that the Rejection of claims 2, 4, 6 and 8 under 35 U.S.C. §103 be withdrawn.

E. The Official Action has rejected Claims 2, 4, 6 and 8 under 35 U.S.C. §103 as being unpatentable over Morrison in view of Thatte. Patent Holder respectfully traverses the rejection.

¹⁴ See page 1159, where Morrison observes that " $N(t)+W(t)$ remains constant between arrivals, and $W(t)=0$ immediately after an arrival." The $W(t)$ here represents the number of expired records, which is assumed by Morrison to be zero after a new insertion that triggers a purging of all expired records.

As noted above, Morrison does not provide all of the features of the issued claims for which it has been asserted. Likewise, Thatte has also been demonstrated as deficient in a similar regard. As such, these references in combination cannot present a *prima facie* case of obviousness. Moreover, a person skilled in the art would have no motivation to modify Morrison in the manner proposed because deleting fewer than all expired records in Morrison would destroy its basic premise.

Additionally, the claimed *means for dynamically determining*. . . has not been properly examined as no structure of the specification or art has been compared to ascertain structural equivalence. MPEP 2183. Therefore, these claims are independently distinguishable in addition to the clear deficiencies of the base claims.

Accordingly, Patent Holder respectfully Requests that the Rejection of claims 2, 4, 6 and 8 under 35 U.S.C. §103 be withdrawn.

VII NEW CLAIMS

New Claims 9-12, by virtue of their dependency, are distinguishable over all art of record at least for the aforementioned rationales.

Further, these claims recite more detailed aspects of the '120 Patent neither disclosed nor suggested by the art of record. For example, as the art of record does not disclose or suggest identifying expired records while searching for a target record, the more detailed recitation of this methodology as recited in claims 9-12, by definition, is also absent from all art of record.

Accordingly, Patent Holder respectfully requests that these are allowable.

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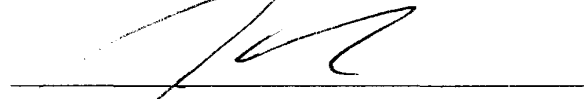
Amendment in *Ex Parte* Reexamination of U.S. Patent No. 5,893,120 in Reply to Office Action of July 23, 2010

VIII CONCLUSION

Consequently, in view of the foregoing amendment and remarks, it is respectfully submitted that the present reexamined patent, is valid over the submitted prior art, in condition for a reexamination certificate, and such action is respectfully requested at an early date.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.



Scott A. McKeown
Attorney of Record
Registration No. 42,866

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 07/09)