United States Patent [19]

Bowman et al.

[54] **REFINING SEARCH QUERIES BY THE SUGGESTION OF CORRELATED TERMS FROM PRIOR SEARCHES**

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[73] Assignee: **Amazon.Com**, Seattle, Wash.

[21] Appl. No.: **09/145,360**

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Related U.S. Application Data

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[51] **Int. Cl.^{6}** **G06F 17/30**
[52] **U.S. Cl.** **707/5**; 707/2; 707/4; 707/10
[58] **Field of Search** 707/5, 2, 10, 4

[56]   **References Cited**

U.S. PATENT DOCUMENTS

5,675,819	10/1997	Schuetze	704/10
5,721,897	2/1998	Rubinstein	707/2
5,787,422	7/1998	Tukey et al.	707/5
5,794,233	8/1998	Rubinstein	707/4
5,864,845	1/1999	Voorhees et al.	707/5
5,911,140	6/1999	Tukey et al.	707/5
5,913,215	6/1999	Rubinstein	707/10

OTHER PUBLICATIONS

Bartell et al., "Automatic Combination of Multiple Ranked Retrieval Systems", Proceedings of SIGIR '94, Jul. 1994, pp. 173–181.
Belkin et al., "The Effect of Multiple Query Representations on Information System Performance" Proceedings of SIGIR '93, Jun. 1993, pp. 339–346.
Shaw et al., "Combination of Multiple Searches", Proceedings of TREC–3, Apr. 1995, pp. 105–108.

QuarterDeck Web Page, Downloaded Sep. 9, 1996, http://aracnid.qdeck.com/qdeck/products/webcompass.
Towell et al. "Learning Collection Fusion Strategies for Information Retrieval", Proceedings of the 12th Annual Machine Learning Conference, Jul. 1995, pp. 540–548.
Voorhees et al., "Learning Collection Fusion Strategies", Proceedings of SIGIR '95, Jul. 1995, pp. 172–179.
Voorhees et al., "The Collection Fusion Problem" Proceedings of TREC–3, NIST Special Publication 500–225, Apr. 1995, pp. 95–104.
Abstract of *Generating Advanced Query Interfaces,* Lee, Srivastava and Vista, Computer Networks and ISDN Systems Conference Title: Comput. Netw. ISDN Syst. (Netherlands) vol. 30, No. 1–7, pp. 656–657 (1998).
Abstract of *Using Combination of Evidence for Term Expansion,* Wilkinson, Information Retrieval Research, Proceedings of the 19th Annual BCS–IRSG Colloquium on IR Research (1997).

(List continued on next page.)

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Attorney, Agent, or Firm—Knobbe, Martens, Olson & Bear, LLP

[57]   **ABSTRACT**

A search engine is disclosed which suggests related terms to the user to allow the user to refine a search. The related terms are generated using query term correlation data which reflects the frequencies with which specific terms have previously appeared within the same query. The correlation data is generated and stored in a look-up table using an off-line process which parses a query log file. The table is regenerated periodically from the most recent query submissions (e.g., the last two weeks of query submissions), and thus strongly reflects the current preferences of users. Each related term is presented to the user via a respective hyperlink which can be selected by the user to submit a modified query. In one embodiment, the related terms are added to and selected from the table so as to guarantee that the modified queries will not produce a NULL query result.

28 Claims, 10 Drawing Sheets
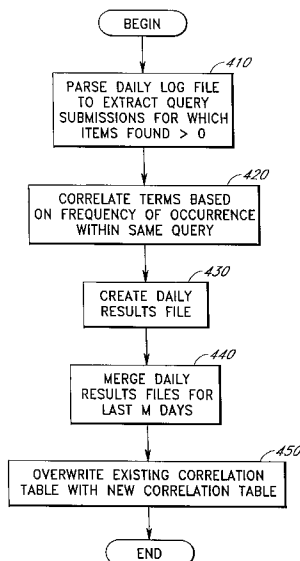
OTHER PUBLICATIONS

Abstract of *Inquirus, the NECI Meta Search Engine,* Lawrence and Giles, Computer Networks and ISDN Systems Conference Title: Comput. Netw ISDN Syst. (Netherlands) vol. 30, No. 1–7, pp. 95–105 (1998).

Abstract of *Facilitating Complex Web Queries Through Visual User Interfaces and Query Relaxtion,* Li and Shim, Computer Networks and ISDN Systems Conference Title: Comput. Netw. ISDN Syst. (Netherlands) vol. 30, No. 1–7, pp. 149–159 (1998).

A User–centred Evaluation of Ranking Algorithms for Interactive Query Expansion, Efthimiadis, Proceedings of the 16th Annual International ACM SIGIR Conference, Pittsburgh, pp. 146–159 (1993).

Concept Based Query Expansion, Qiu and Frei, Proceedings of the 16th Annual International ACM SIGIR Conference, Pittsburgh, pp. 160–169 (1993).

Improving Retrieval Performance by Relevance Feedback, Salton and Buckley, J. of Am. Society for Info. Science 41(4):288–297 (1990).

Query Expansion Using Domain–Adapted, Weighted Thesaurus in an Extended Boolean Model, Kwon, Kim and Choi, Proceedings of the 3rd International Conference on Information and Knowledge Management (CIKM'94), pp. 140–146 (1994).

Browsing Through Querying: Designing for Electronic Books, Charoenkitkarn, Tam, Chignell and Golovichinsky, at the 5th ACM Conference on Hypertext, Seattle, WA 206–216 (1993).

A Survey of Information Retrieval and Filtering Methods, Faloutsos and Oard, Univ. of Maryland, 22 pages (undated).

A Corpus Analysis Approach for Automatic Query Expansion, Gauch and Wang, Proceedings of the 6th International Conference on Information and Knowledge Mangement, pp. 278–284 (1997).

Discovering Web Acess Patterns and Trends by Applying OLAP and Data Mining Technology on Web Logs, Zaiane, Xin and Han, Proceedings of the IEEE Forum on Research and Technology Advances in Digital Libraries (IEEE ADL'98), pp. 19–29 (1998).
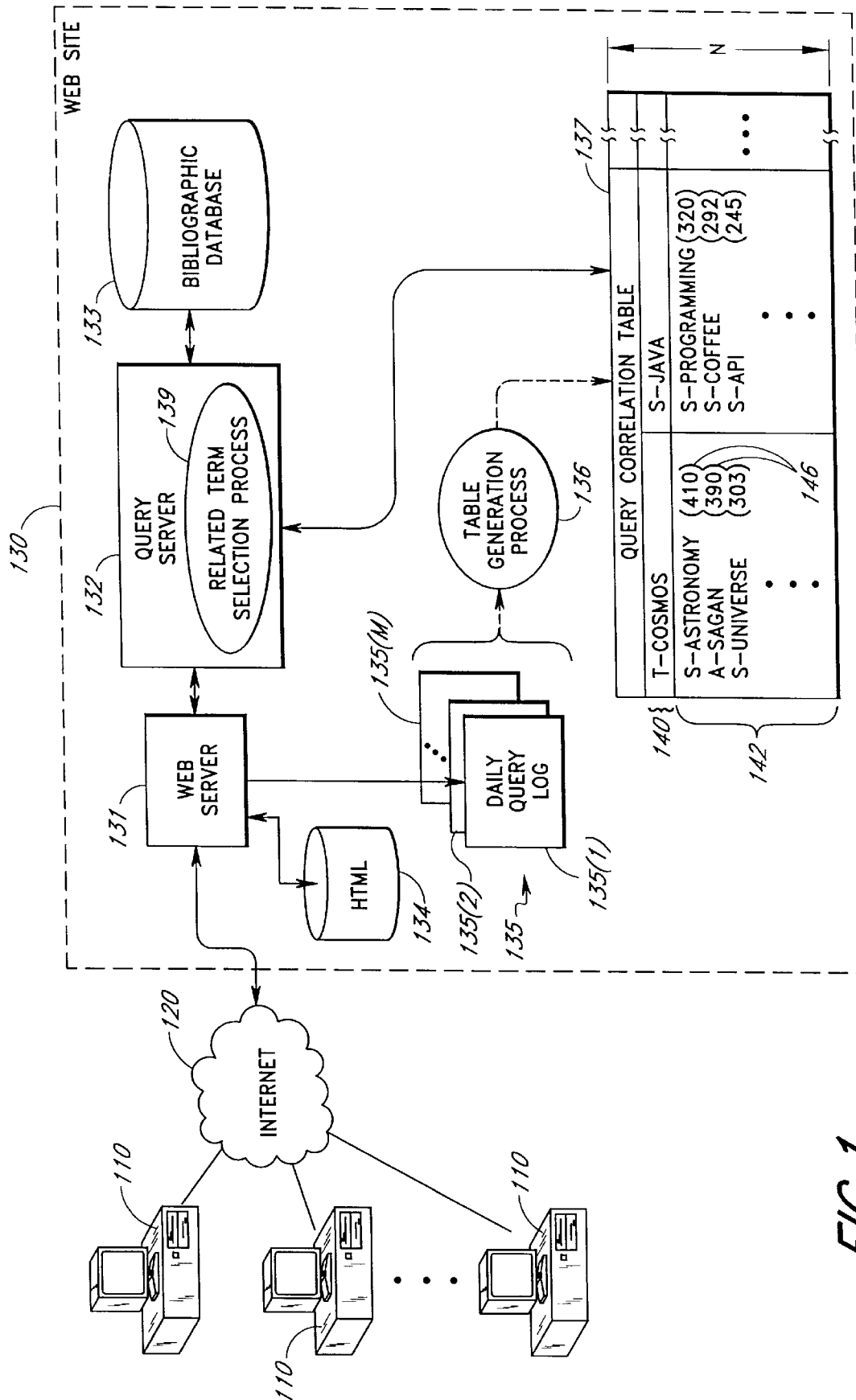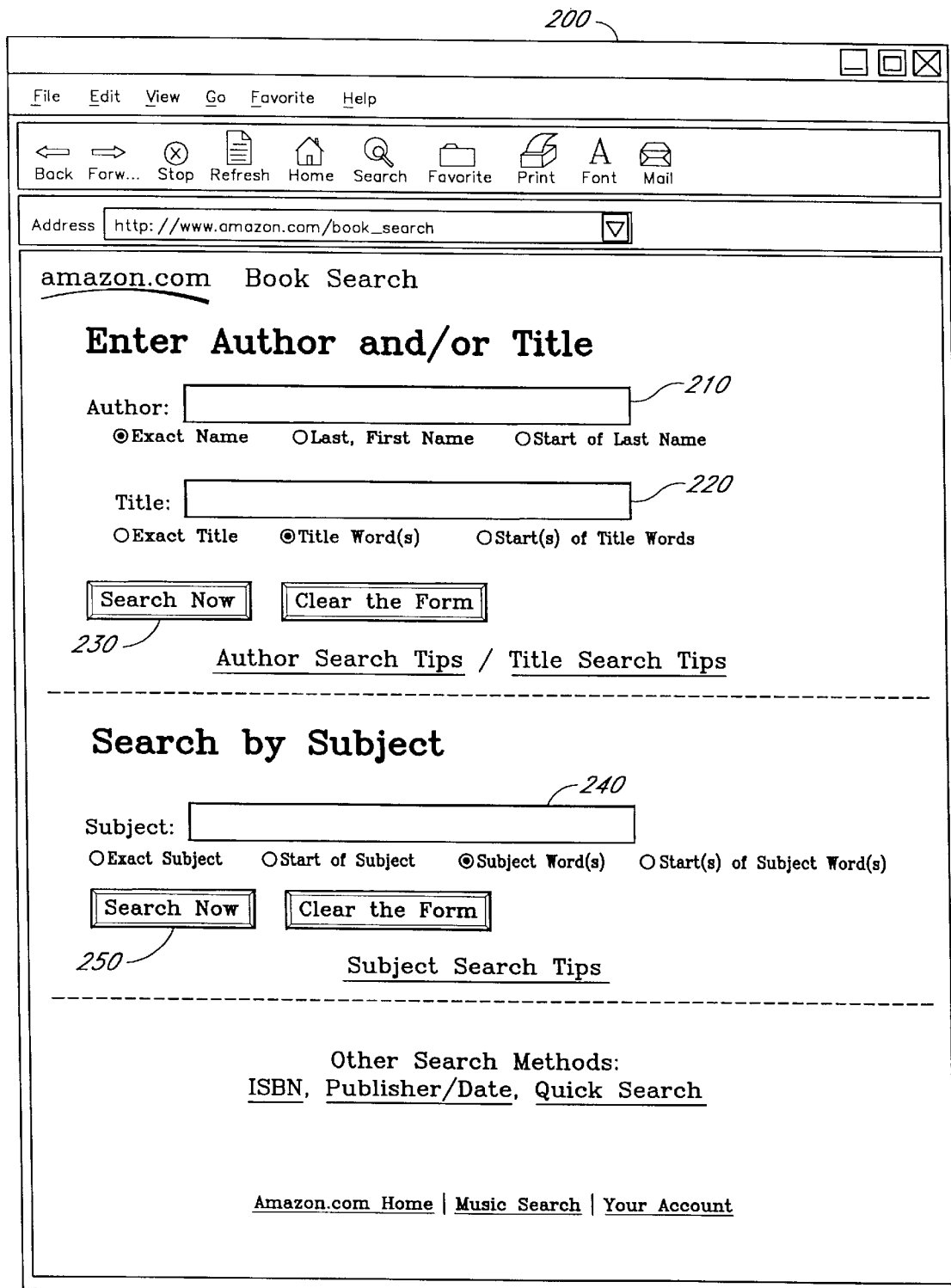
FIG. 1

200

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┌──────────────────────────────────────────────────────────┐
│                                              ▭ ▭ ⊠          │
├──────────────────────────────────────────────────────────┤
│  File   Edit   View   Go   Favorite   Help                 │
├──────────────────────────────────────────────────────────┤
│  ⇐    ⇒     ⊗      📄       🏠      🔍       📁      🖨     A      ✉  │
│  Back Forw... Stop  Refresh  Home   Search  Favorite Print Font  Mail│
├──────────────────────────────────────────────────────────┤
│  Address │ http://www.amazon.com/book_search         │▽│   │
├──────────────────────────────────────────────────────────┤
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amazon.com   Book Search

Enter Author and/or Title

Author: [   ] ⟋210

⦿ Exact Name   ○ Last, First Name   ○ Start of Last Name

Title: [   ] ⟋220

○ Exact Title   ⦿ Title Word(s)   ○ Start(s) of Title Words

[Search Now]   [Clear the Form]

230 ⟋

Author Search Tips / Title Search Tips

- -

Search by Subject

240

Subject: [   ]

○ Exact Subject   ○ Start of Subject   ⦿ Subject Word(s)   ○ Start(s) of Subject Word(s)

[Search Now]   [Clear the Form]

250 ⟋

Subject Search Tips

- -

Other Search Methods:
ISBN, Publisher/Date, Quick Search

Amazon.com Home | Music Search | Your Account

FIG.2

135

310
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> items_found = 2

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> Friday, 13-Feb-98 02:24:11
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330
> Friday, 13-Feb-98 06:15:03
> User Identifier = 54730543261
> HTTP_REFERRER= http://www.amazon.com/music_search_page
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> artist = This and That
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340
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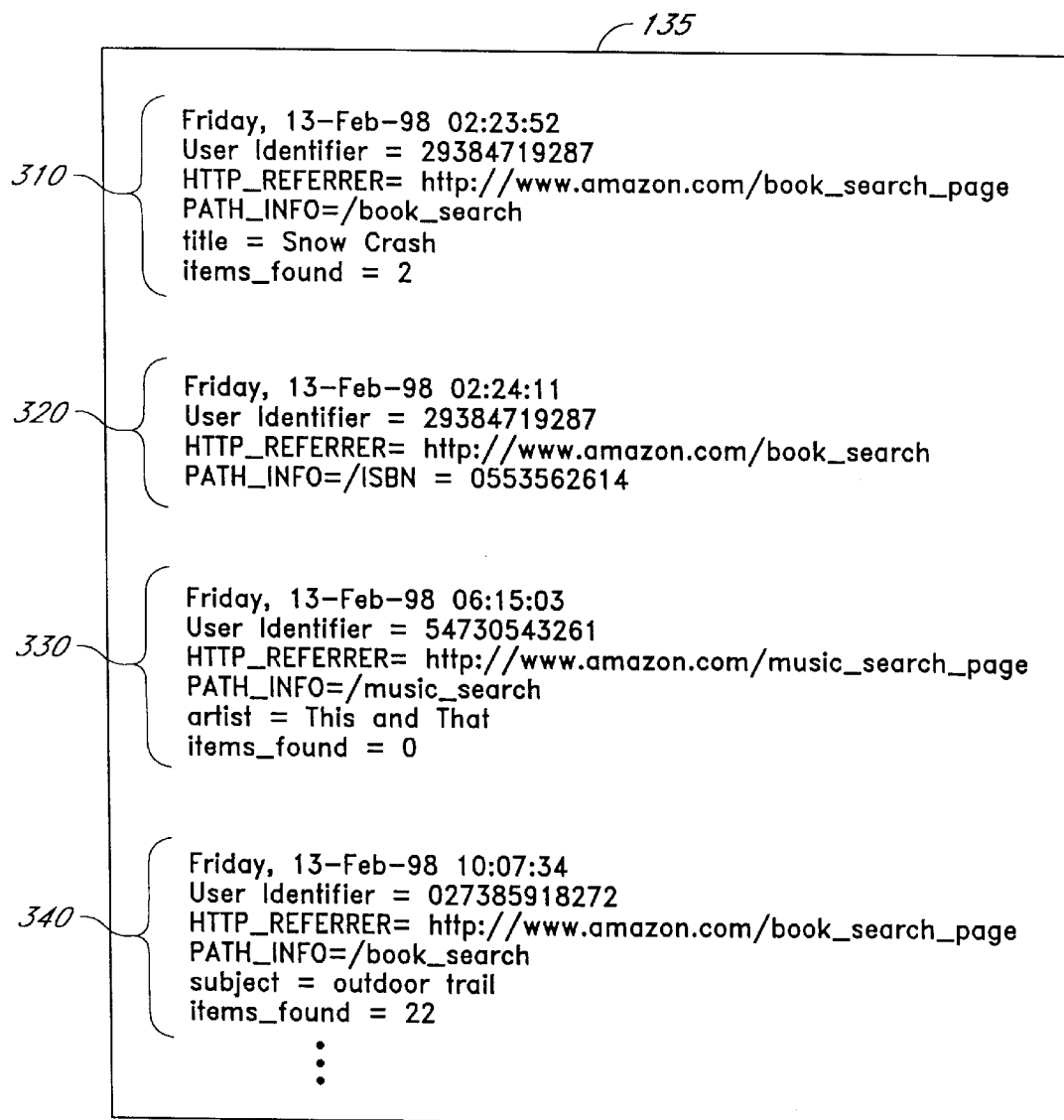> subject = outdoor trail
> items_found = 22

⋮

FIG.3

DOCKET ALARM

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