US00RE44478E

(19) **United States**

(12) **Reissued Patent**

**Godfredsen et al.**

(10) **Patent Number: US RE44,478 E**

(45) **Date of Reissued Patent: Sep. 3, 2013**

(54) **METHOD AND SYSTEM FOR NAVIGATING A LARGE AMOUNT OF DATA**

(75) Inventors: **Niels Godfredsen**, San Francisco, CA (US); **Spencer Lord**, San Francisco, CA (US); **Yusuf Bashir**, San Francisco, CA (US); **Eric Ying**, Emeryville, CA (US); **Oliver Tse**, Sunnyvale, CA (US)

(73) Assignee: **Informatica Corporation**, Redwood City, CA (US)

(21) Appl. No.: **11/122,214**

(22) Filed: **May 3, 2005**

**Related U.S. Patent Documents**

Reissue of:

(64) Patent No.: **6,820,077**
Issued: **Nov. 16, 2004**
Appl. No.: **10/082,486**
Filed: **Feb. 22, 2002**

(51) **Int. Cl.**

| | |
|---|---|
| ***G06F 17/30*** | (2006.01) |
| ***G06F 7/00*** | (2006.01) |
| ***G06F 3/048*** | (2013.01) |

(52) **U.S. Cl.**
USPC ..... **707/769**; 715/763; 715/764

(58) **Field of Classification Search**
USPC ..... 707/3, 101, 102; 715/763, 764
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 5,403,147 | A | 4/1995 | Tanaka |
| 5,404,513 | A | 4/1995 | Powers et al. |
| 5,405,531 | A | 4/1995 | Hitzman et al. |
| 5,410,688 | A | 4/1995 | Williams et al. |
| 5,420,688 | A | 5/1995 | Farah |
| 5,455,945 | A | 10/1995 | Vanderdrift |
| 5,511,190 | A | 4/1996 | Sharma et al. |
| 5,519,859 | A | 5/1996 | Grace |
| 5,537,589 | A | 7/1996 | Dalal |
| 5,563,999 | A | 10/1996 | Yaksich et al. |

(Continued)

FOREIGN PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| EP | 0987868 | A3 | 3/2000 |
| EP | 1043671 | A2 | 10/2000 |

(Continued)

OTHER PUBLICATIONS

Barclay et al.: "Microsoft TerraServer: A Spatial Data Warehouse", Technical Report MS-TR-99-29, Jun. 1999, Microsoft Corporation.*

(Continued)

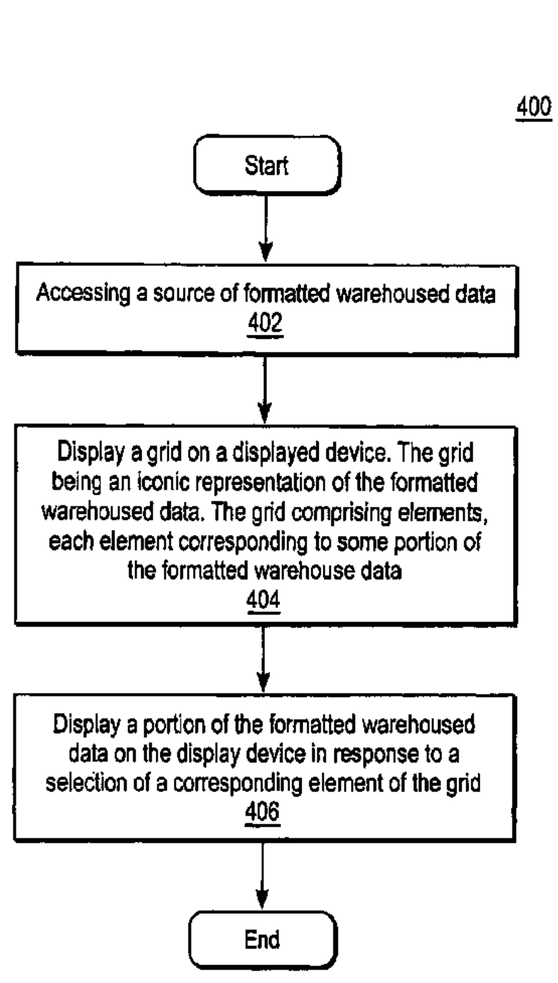
*Primary Examiner* — Kuen Lu

(74) *Attorney, Agent, or Firm* — Fenwick & West LLP

(57) **ABSTRACT**

Methods for navigating a large amount of data are disclosed. In one embodiment, the present invention accesses a source of formatted warehoused data. The present invention then displays a grid on a display device. In one embodiment, the grid is an iconic representation of the formatted warehoused data. The grid is comprised of elements, each element corresponding to some portion of the formatted warehoused data. The present invention displays a portion of the formatted warehoused data on the display device in response to a selection of a corresponding element of the grid. In another embodiment, the formatted warehoused data is condensed so that it can be read in summary form to a user using a voice-based protocol. The user can issue voice commands to drill down deeper into the data, until the desired information is reached. The user thus doesn't need to hear all of the information in the formatted warehoused data, but instead can make inquiries to directly navigate to a particular item of interest.

**30 Claims, 7 Drawing Sheets**



(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 5,603,024 | A | | 2/1997 | Goldring |
| 5,655,101 | A | | 8/1997 | O'Farrell et al. |
| 5,675,785 | A | | 10/1997 | Hall et al. |
| 5,692,181 | A | | 11/1997 | Anand et al. |
| 5,706,495 | A | | 1/1998 | Chadha et al. |
| 5,708,828 | A | | 1/1998 | Coleman |
| 5,713,020 | A | | 1/1998 | Reiter et al. |
| 5,721,903 | A | | 2/1998 | Anand et al. |
| 5,721,911 | A | | 2/1998 | Ha et al. |
| 5,778,355 | A | | 7/1998 | Boyer et al. |
| 5,781,911 | A | | 7/1998 | Young et al. |
| 5,787,415 | A | | 7/1998 | Jacobson et al. |
| 5,794,030 | A | | 8/1998 | Morsi et al. |
| 5,794,228 | A | | 8/1998 | French et al. |
| 5,794,229 | A | | 8/1998 | French et al. |
| 5,794,246 | A | | 8/1998 | Sankaran et al. |
| 5,799,310 | A | | 8/1998 | Anderson et al. |
| 5,806,060 | A | | 9/1998 | Borgida et al. |
| 5,822,751 | A | | 10/1998 | Gray et al. |
| 5,826,258 | A | | 10/1998 | Gupta |
| 5,832,496 | A | | 11/1998 | Anand et al. |
| 5,842,213 | A | | 11/1998 | Odom et al. |
| 5,848,415 | A | | 12/1998 | Guck |
| 5,854,890 | A | | 12/1998 | Ramachandran et al. |
| 5,857,197 | A | | 1/1999 | Mullins |
| 5,870,746 | A | | 2/1999 | Knutson et al. |
| 5,870,747 | A | | 2/1999 | Sundaresam |
| 5,873,102 | A | | 2/1999 | Bridge, Jr. et al. |
| 5,884,262 | A | | 3/1999 | Wise et al. |
| 5,898,431 | A | | 4/1999 | Webster et al. |
| 5,915,019 | A | | 6/1999 | Ginter et al. |
| 5,933,796 | A | * | 8/1999 | Ashida et al. ..... 702/181 |
| 5,982,890 | A | | 11/1999 | Akatsu |
| 5,987,454 | A | | 11/1999 | Hobbs |
| 5,991,742 | A | | 11/1999 | Tran |
| 6,002,402 | A | | 12/1999 | Schacher |
| 6,003,024 | A | | 12/1999 | Bair et al. |
| 6,014,670 | A | | 1/2000 | Zamanian et al. |
| 6,026,388 | A | | 2/2000 | Liddy et al. |
| 6,032,145 | A | | 2/2000 | Beall et al. |
| 6,032,158 | A | | 2/2000 | Mukhopadhyay et al. |
| 6,044,374 | A | | 3/2000 | Nesamoney et al. |
| 6,065,007 | A | | 5/2000 | Muthukrishnan et al. |
| 6,078,994 | A | | 6/2000 | Carey |
| 6,119,167 | A | | 9/2000 | Boyle et al. |
| 6,122,628 | A | | 9/2000 | Castelli et al. |
| 6,128,624 | A | | 10/2000 | Papierniak et al. |
| 6,141,699 | A | | 10/2000 | Luzzi et al. |
| 6,151,584 | A | | 11/2000 | Papierniak et al. |
| 6,151,601 | A | | 11/2000 | Papierniak et al. |
| 6,173,310 | B1 | | 1/2001 | Yost et al. |
| 6,192,364 | B1 | | 2/2001 | Baclawski |
| 6,205,472 | B1 | | 3/2001 | Gilmour |
| 6,208,990 | B1 | | 3/2001 | Suresh et al. |
| 6,216,125 | B1 | | 4/2001 | Johnson |
| 6,233,575 | B1 | | 5/2001 | Agrawal et al. |
| 6,269,336 | B1 | | 7/2001 | Ladd et al. |
| 6,269,369 | B1 | | 7/2001 | Robertson |
| 6,272,485 | B1 | | 8/2001 | Sragner |
| 6,272,598 | B1 | | 8/2001 | Arlitt et al. |
| 6,292,657 | B1 | | 9/2001 | Laursen et al. |
| 6,308,203 | B1 | | 10/2001 | Itabashi et al. |
| 6,336,137 | B1 | | 1/2002 | Lee et al. |
| 6,339,775 | B1 | | 1/2002 | Zamanian et al. |
| 6,369,840 | B1 | * | 4/2002 | Barnett et al. ..... 715/853 |
| 6,385,604 | B1 | | 5/2002 | Bakalash et al. |
| 6,393,386 | B1 | | 5/2002 | Zager et al. |
| 6,404,884 | B1 | | 6/2002 | Marwell et al. |
| 6,408,292 | B1 | | 6/2002 | Bakalash et al. |
| 6,411,936 | B1 | | 6/2002 | Sanders |
| 6,418,200 | B1 | | 7/2002 | Ciccolella et al. |
| 6,421,781 | B1 | | 7/2002 | Fox et al. |
| 6,424,426 | B1 | | 7/2002 | Henry |
| 6,430,624 | B1 | | 8/2002 | Jamtgaard et al. |
| 6,438,552 | B1 | | 8/2002 | Tate |
| 6,446,059 | B1 | | 9/2002 | Berger et al. |
| 6,446,062 | B1 | | 9/2002 | Levine et al. |
| 6,446,096 | B1 | | 9/2002 | Holland et al. |
| 6,449,619 | B1 | | 9/2002 | Colliat et al. |
| 6,457,030 | B1 | | 9/2002 | Adams et al. |
| 6,466,969 | B1 | | 10/2002 | Bunney et al. |
| 6,477,525 | B1 | | 11/2002 | Bello et al. |
| 6,480,711 | B1 | | 11/2002 | Guedalia |
| 6,487,584 | B1 | | 11/2002 | Bunney |
| 6,493,800 | B1 | | 12/2002 | Blumrich |
| 6,502,101 | B1 | | 12/2002 | Verprauskus et al. |
| 6,526,335 | B1 | | 2/2003 | Treyz et al. |
| 6,535,872 | B1 | * | 3/2003 | Castelli et al. ..... 707/3 |
| 6,539,359 | B1 | | 3/2003 | Ladd et al. |
| 6,549,910 | B1 | | 4/2003 | Tate |
| 6,549,937 | B1 | | 4/2003 | Auerbach et al. |
| 6,553,366 | B1 | | 4/2003 | Miller et al. |
| 6,563,912 | B1 | | 5/2003 | Dorfman et al. |
| 6,564,264 | B1 | | 5/2003 | Creswell et al. |
| 6,574,599 | B1 | | 6/2003 | Lim et al. |
| 6,581,062 | B1 | | 6/2003 | Draper et al. |
| 6,591,304 | B1 | | 7/2003 | Sitaraman et al. |
| 6,601,062 | B1 | | 7/2003 | Deshpande et al. |
| 6,616,701 | B2 | * | 9/2003 | Doyle ..... 715/201 |
| 6,629,102 | B1 | | 9/2003 | Malloy et al. |
| 6,631,497 | B1 | | 10/2003 | Jamshidi et al. |
| 6,636,870 | B2 | | 10/2003 | Roccaforte |
| 6,671,689 | B2 | * | 12/2003 | Papierniak ..... 707/100 |
| 6,721,728 | B2 | | 4/2004 | McGreevy |
| 2002/0035565 | A1 | | 3/2002 | Shah et al. |
| 2002/0056081 | A1 | | 5/2002 | Morley et al. |
| 2002/0059267 | A1 | | 5/2002 | Shah et al. |
| 2002/0077787 | A1 | | 6/2002 | Rappaport et al. |
| 2002/0099691 | A1 | | 7/2002 | Lore et al. |
| 2002/0112237 | A1 | | 8/2002 | Kelts |
| 2002/0161770 | A1 | | 10/2002 | Shapiro et al. |
| 2003/0172247 | A1 | | 9/2003 | Bayer et al. |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| EP | 1164511 A2 | 12/2001 |
| GB | 2350758 | 12/2000 |
| GB | 2357596 | 6/2001 |
| WO | WO 99/24922 | 5/1999 |
| WO | WO 00/04466 | 1/2000 |
| WO | WO 00/08581 | 2/2000 |
| WO | WO 00/77707 | 12/2000 |
| WO | WO 01/18728 | 3/2001 |
| WO | WO 01/20438 | 3/2001 |
| WO | WO 01/24040 | 5/2001 |
| WO | WO 02/44953 | 6/2002 |

OTHER PUBLICATIONS

24X7 The Magazine of Nonstop Computing, "Compaq's Zero Latency Enterprise Initiative," vol. 1, No. 2, Oct. 2000, pp. 1-25.

"A Process for Selective Routing of Servlet Transcoding Modules," IBM Technical Disclosure Bulletin, vol. 42, Issue 422, Jun. 1999 UK.

Multi-Modal Data Access Research Disclosure, Kenneth Mason Publications, Hampshire, GB, No. 426, Oct. 1999, pp. 133-1386.

"Parameterized XSL Style Sheets," Research Disclosure, vol. 42, No. 423, Jul. 1, 1999, Havant, UK, Article No. 423110.

Anand, V. J. et al. "Data Warehouse Architecture for DDS Applications." Australian Journal of Information Systems. Sep. 1996, AJIS Publishing, Australia, vol. 4, No. 1, pp. 43-53.

Ballinger, C. et al., "Born to be Parallel. Why Parallel Origins Give Teradata an Enduring Performance Edge," Bulletin of the Technical Committee on Data Engineering, vol. 20, No. 2, Jun. 1997, IEEE Comput. Soc., Los Alamitos, CA, US.

Barrett, R. et al., "Intermediaries: An Approach to Manipulating Information Streams," IBM Systems Journal, IBM Corp., Armonk, New York, U.S. vol. 38, No. 4, 1999, pp. 629-641.

Bellatreche, L. et al., "OLAP Query Processing for Partitioned Data Warehouses," Proceedings 1999 Int'l. Symposium on Database Applications in Non-Traditional Environments (Dante'99) (Cat. No. PR00496), Kyoto, JP, Nov. 28-30, 1999, pp. 35-42, IEEE Comput. Soc., Los Alamitos, CA US ISBN: 0-7695-0496-5.

Bello, R.G. et al., "Materialized Views in Oracle," Proceedings of the Int'l. Conf. On Very Large Data Bases, NY, Aug. 24, 1998, pp. 659-664.
Chamberlin, D. et al., "A Complete Guide to DB2 Universal Database," 1992, pp. 659-600.
Chan, R. "12 Steps of Creating a Successful Data Warehouse," Proceedings of the 8th International Database Workshop (Industrial Volume), Proceedings of the 8th International Hong Kong Computer Society Database Workshop, Data Mining, Data Warehousing and CLI, pp. 227-248, ISBN 981-3083-53-0, 1997, Singapore, Springer-Verlag Singapore, Singapore.
Chaudhuri, S. et al., "An Overview of Data Warehousing and OLAP Technology," SIGMOD Record, Sigmod, New York, No. US, vol. 2, No. 1, Mar. 1997, pp. 65-74.
Curley, K. et al. "The Rationale for Developing a Corporate Data Warehouse and the Development of a Model for Sharing Data in a Data Warehouse Environment." OOIS '95. 1995 International Conference on Object Oriented Information Systems Proceedings, Proceedings of 1995, International Conference on Object Oriented Information Systems, Dublin, Ireland, Dec. 18-20, 1995, pp. 351-366, Berlin, Germany, Springer-Verlag, Germany.
Datta, A., et al., "A Case for Parallelism in Data Warehousing and OLAP," Ninth Int'l. Workshop on Database and Expert Systems Applications, Vienna, AT, IEEE Comput. Soc., Los Alamitos, CA, US, Aug. 26, 1998, pp. 226-231.
Dawson, F. et al., "RFC 2426 vCard MIME Directory Profile," Network Working Group, Request for Comments 2426, Sep. 1998.
Deutsch, A. et al., "Storing Semistructured Data with STORED," ACM SIGMOD Record, Proceedings of the 1999 ACM SIGMOD International Conference on Management of Data, Jun. 1999, vol., 28, Issue 2.
Duncan, K., et al., "Optimizing the Data Warehousing Environment for Change: the Persistent Staging Area," Cutter IT Journal, Jun. 1999, Cutter Inf. Corp. USA, vol. 12, No. 6, pp. 28-35.
Fernanez, M. et al., "SilkRoute: Trading Between Relations and XML," WWW9/Computer Networks, 33(1-6), pp. 723-745, 2000.
Florescu, D. et al., "A Performance Evaluation of Alternative Mapping Schemes for Storing SML in a Relational Database," Technic Report 3680, INRIA, 1999.
Freytag, C. et al., "Resource Adaptive WWW access for Mobile Applications," Computers and Graphics, Pergamon Press Ltd., Oxford, GB, vol. 23, No. 6, Dec. 1999, pp. 841-848.
Fry, J.P, "Conversion Technology, An Assessment," ACM SIGMIS Database, vol. 12-13, No. 4-1, Jul. 1981, pp. 39-61.
Hammer, J. et al., "Extracting Semistructured Information From the Web," Proceedings of the Workshop on Management of Semi-structured Data, Mar. 16, 1997, pp. 1-25.
Hori, M. et al., "Annotation-Based Web Content Transcoding," Computer Networks, Elsevier Science Publishers B.V., Amsterdam NL., vol. 33, No. 106, Jun. 2000, pp. 197-211.
Housel, B. et al., "A High-Level Data Manipulation Language for Hierarchical Data Structures," International Conference on Management of Data, 1976, pp. 155-169.
Informatica Press Releases, "Informatica Delivers Industry's First Synchronized Data Marts With Newest Version of Powermart Suite," <http://www.informatica.com/syndata_-_052798.html>, pp. 1-4, May 27, 1997.
Jaczynski, M. et al., "Broadway: A Case-Based System for Cooperative Information Browsing on the World Wide Web," Collaboration Between Human and Artificial Societies, Online 1999.
Jones, Katherine, "An Introduction to Data Warehousing: What are the Implications for the Network," 1998, International Journal of Network Management, vol. 8, pp. 42-56.
Juhne, J., et al., "Ariadne: a Java-Based Guided Tour System for The World Wide Web," Computer Networks and ISDN Systems, North Holland Publishing, Amsterdam, NL, vol. 30, No. 107, Apr. 1, 1998, pp. 131-139.
Kim, W., "On Optimizing an SQL-Like Nested Query," ACM Transactions on Database Systems, Association for Computing Machinery, New York, US, vol. 7, No. 3, Sep. 1, 1982, pp. 443-469.
Kitayama, F. et al., "Design of a Framework for Dynamic Content Adaptation to Web-enabled Terminals and Enterprise Applications," Software Engineering Conference, 1999. Proceedings Sixth Asian Pacific Takamatsu, Japan, Dec. 7-10, 1999, Los Alamitos, CA, US.
Kovacs, L. et al., "Aqua: An Advanced User Interface for the Dienst Digital Library System," 8th Delos Workshop: User Interfaces for Digital Libraries, Online, Oct. 21-23, 1998, Sweden, p. 2.
Lum, V. Y. et al., "A General Methodology for Data Conversion and Restructuring," IBM Journal of Research and Development, IBM Corporation, Armonk, US, vol. 20, No. 5, Sep. 1, 1976, pp. 483-497.
Makpangou, M. et al., "Replicated Directory Service for Weakly Consistent Distributed Caches," INRIA SOR group—78143 Le Chesnay Cedex, France.
Mohania, M. et al.: "Advances and Research Directions in Data Warehousing Technology," Ajis. Australian Journal of Information Systems, Wollongong, Au. vol. 7, No. 1, Sep. 1999, pp. 41-59.
Mumick, I. S. et al. "Maintenance of Data Cubes and Summary Tables in a Warehouse," SIGMOD 1997. ACM SIGMOD International Conference on Management of Data, Tucson, AZ, USA, May 13-15, 1997, vol. 26, No. 2, pp. 100-111, XP002074807, Jun. 1997, ACM, USA.
Mumick, I.S., "Magic is Relevant," Sigmod Record, Sigmod, New York, NY, US, vol. 19, No. 2, Jun. 1, 1990, pp. 247-258.
Rodriguez, J. et al., "IBM WebSphere Transcoding Publisher V1:1: Extending Web Applications to the Pervasive World," <http://ibm.com/redbooks>, Jul. 2000, pp. 1039.
Rousskov, A., "Cache Digests," Computer Networks and ISDN Systems, 30 (1998) 2144-2168.
Roy, P. et al., "Don't Trash Your Intermediate Results, Cach'em," Technical Report, Online, Mar. 2, 2000, pp. 1-22.
Schneiderman, B. et al., "An Architecture for Automatic Relational Database System Conversion," ACM Transactions on Database Systems, vol. 7, No. 2, 1982.
Schneier, B., "Applied Cryptography, Second Edition," 1996, pp. 189-196, 226-227.
Shanmugasundaram, J. et al., "Relational Databases for Querying SML Documents Limitations and Opportunities," Proc. Of VLBD, pp. 302-314, 1999.
Seshadri, P. et al., "SQLServer for Windows CE-A Database Engine for Mobile and Embedded Platforms," Data Engineering 2000. Proceedings 16th International Conference in San Diego, CA, US, Feb. 29, 2000, IEE Computer Soc., US, Feb. 29, 2000, pp. 642-644.
Shimura, T. et al., "Storage and Retrieval of XML Documents Using Object-Relational Databases," Proc. Of DEXA, pp. 206-217, 1999.
Shu, N. et al., "Convert: A High Level Translation Definition Language for Data Conversion," Communications of the ACM, vol. 18, No. 10, Oct. 1975 (Oct. 1975), pp. 557-567.
Shu N. et al., "Convert: A High Level Translation Definition Language for Data Conversion," Proceedings of the 1975 ACM SIGMOD International Conference on Management of Data, May 1975 (May 1975), p. 111.
Shu, N. et al., "Express: A Data Extraction, Processing, and Restructuring System," ACM Transactions on Database Systems, vol. 2, No. 2, Jun. 1977, pp. 134-174.
Shu, N., "Automatic Data Transformation and Restructuring," IEEE, 1987, pp. 173-180.
Squire, C., "Data Extraction and Transformation for the Data Warehouse," ACM Proceedings of SIGMOD. International Conf. On Management of Data, vol. 24, No. 1, Mar. 1, 1995, p. 446.
Weyman, P.J., "The Case for a Process-Driven Approach to Data Warehousing," Database and Network Journal, A.P. Publications, London, FB, vol. 27, No. 1, Feb. 1, 1997, pp. 3-6.
White, C., "Data Warehousing: Cleaning and Transforming Data," Info DB, vol. 10, No. 6, Apr. 1997, pp. 11-12.
White, C., "Managing Data Transformations," byte, McGraw-Hill Inc., St. Peterborough US, vol. 22, No. 12, Dec. 1, 1997, pp. 53-54.
Informatica Corporation, Release Notes, PowerCenter 1.6, PowerMart 4.6, Aug. 1999, pp. 1-30.
Informatica Corporation, User Guide, PowerCenter 1.6, PowerMart 4.6, Jul. 1999, pp. i-xxvii and 144-186 (Table of Contents, Preface, Chapters 6 & 7).

* cited by examiner

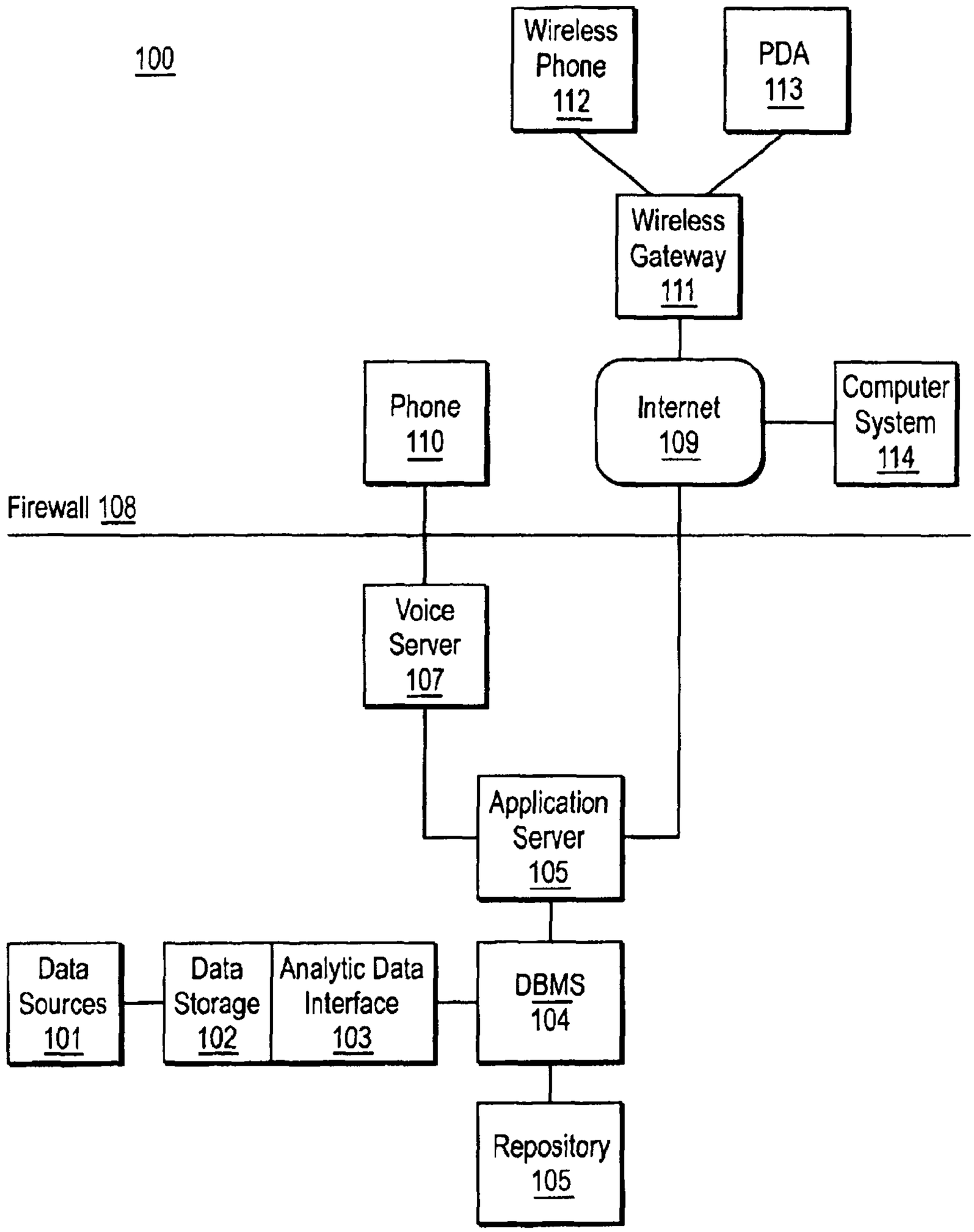

100
Wireless Phone 112
PDA 113
Wireless Gateway 111
Phone 110
Internet 109
Computer System 114
Firewall 108
Voice Server 107
Application Server 105
Data Sources 101
Data Storage 102
Analytic Data Interface 103
DBMS 104
Repository 105

FIG. 1

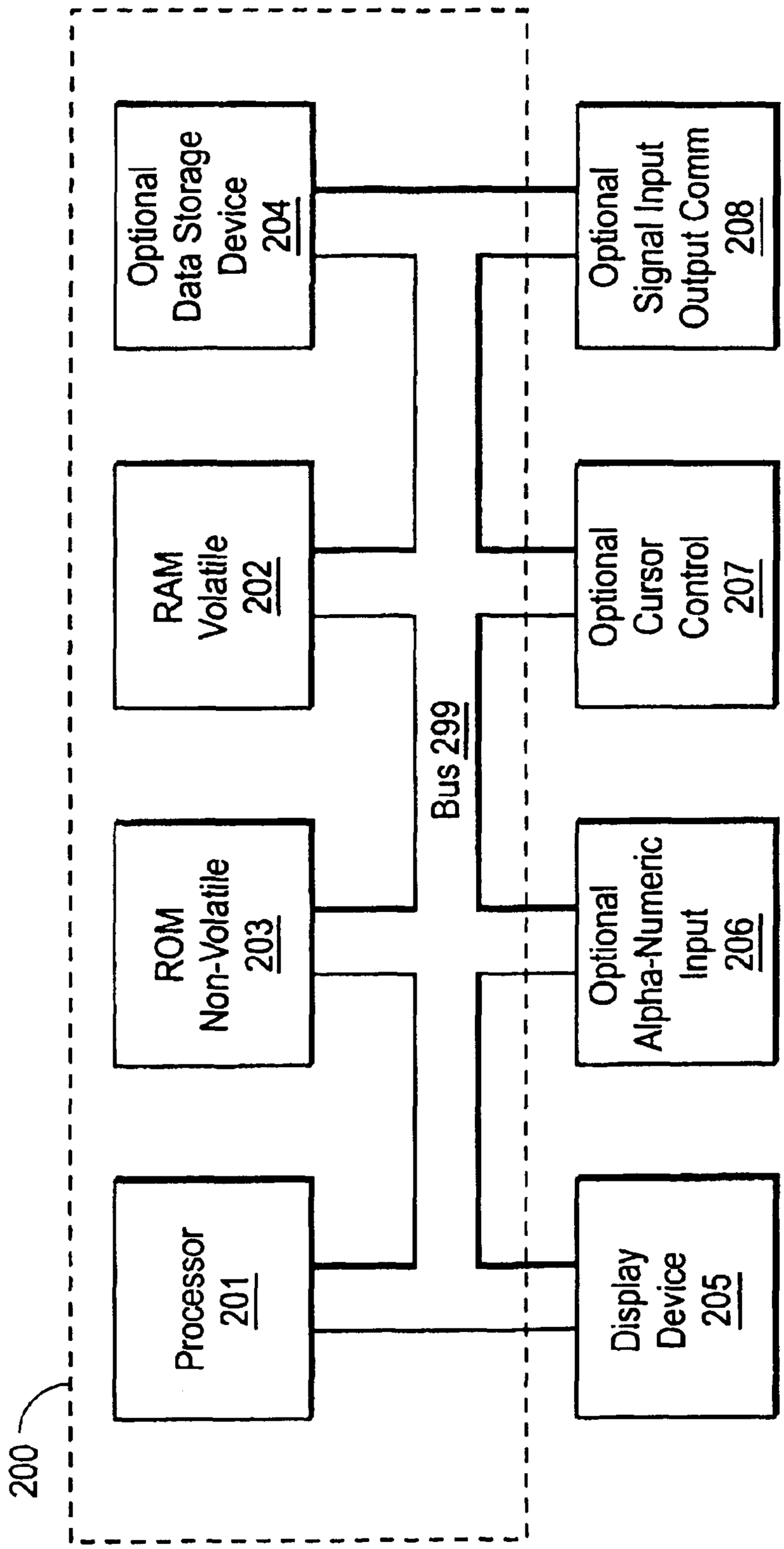

Optional Data Storage Device 204
Optional Signal Input Output Comm 208
RAM Volatile 202
Optional Cursor Control 207
Bus 299
ROM Non-Volatile 203
Optional Alpha-Numeric Input 206
Processor 201
Display Device 205
200

FIG. 2

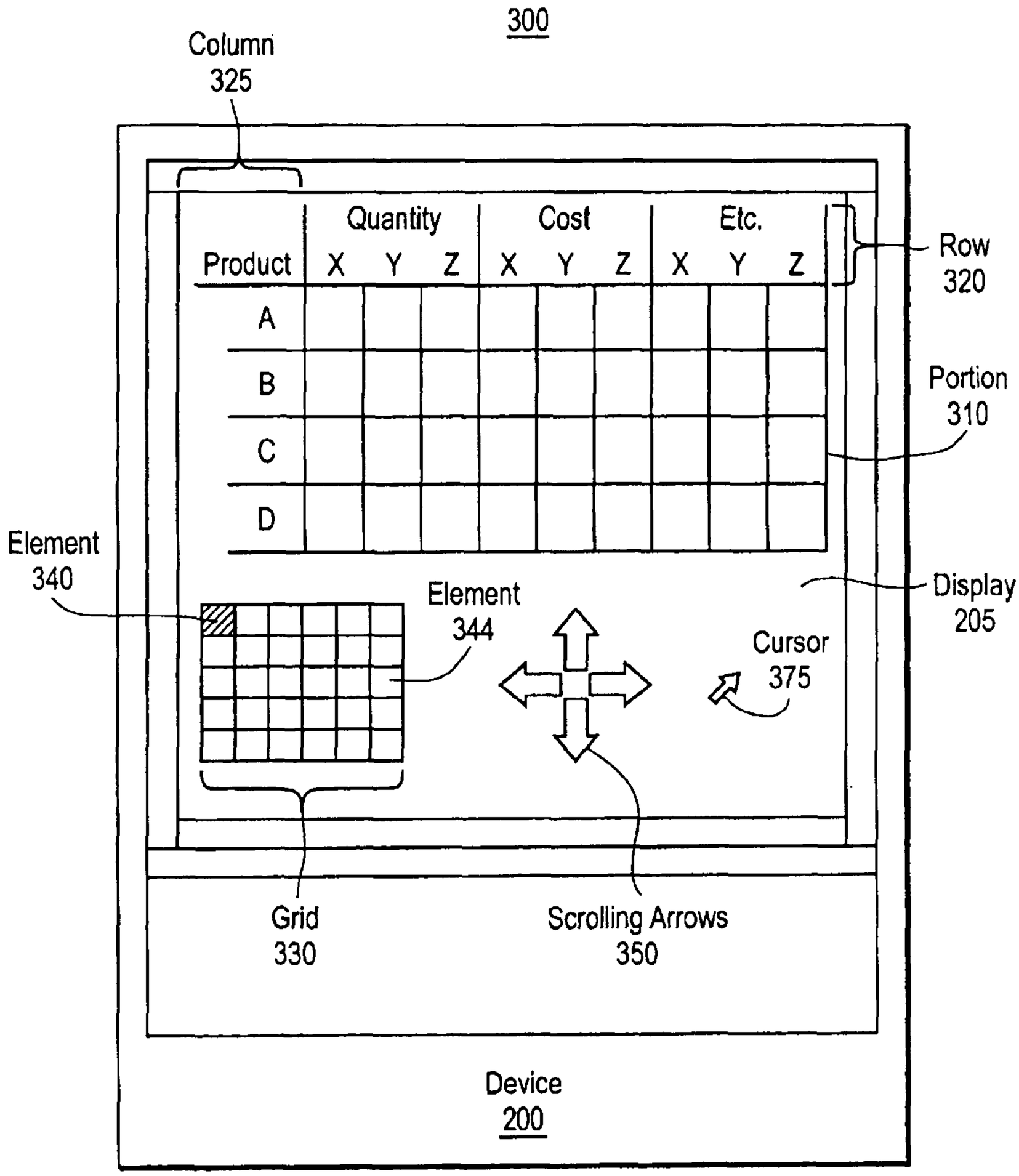

300
Column
325
Quantity
Cost
Etc.
Product
X Y Z X Y Z X Y Z
A
B
C
D
Row
320
Portion
310
Element
340
Element
344
Cursor
375
Display
205
Grid
330
Scrolling Arrows
350
Device
200

FIG. 3

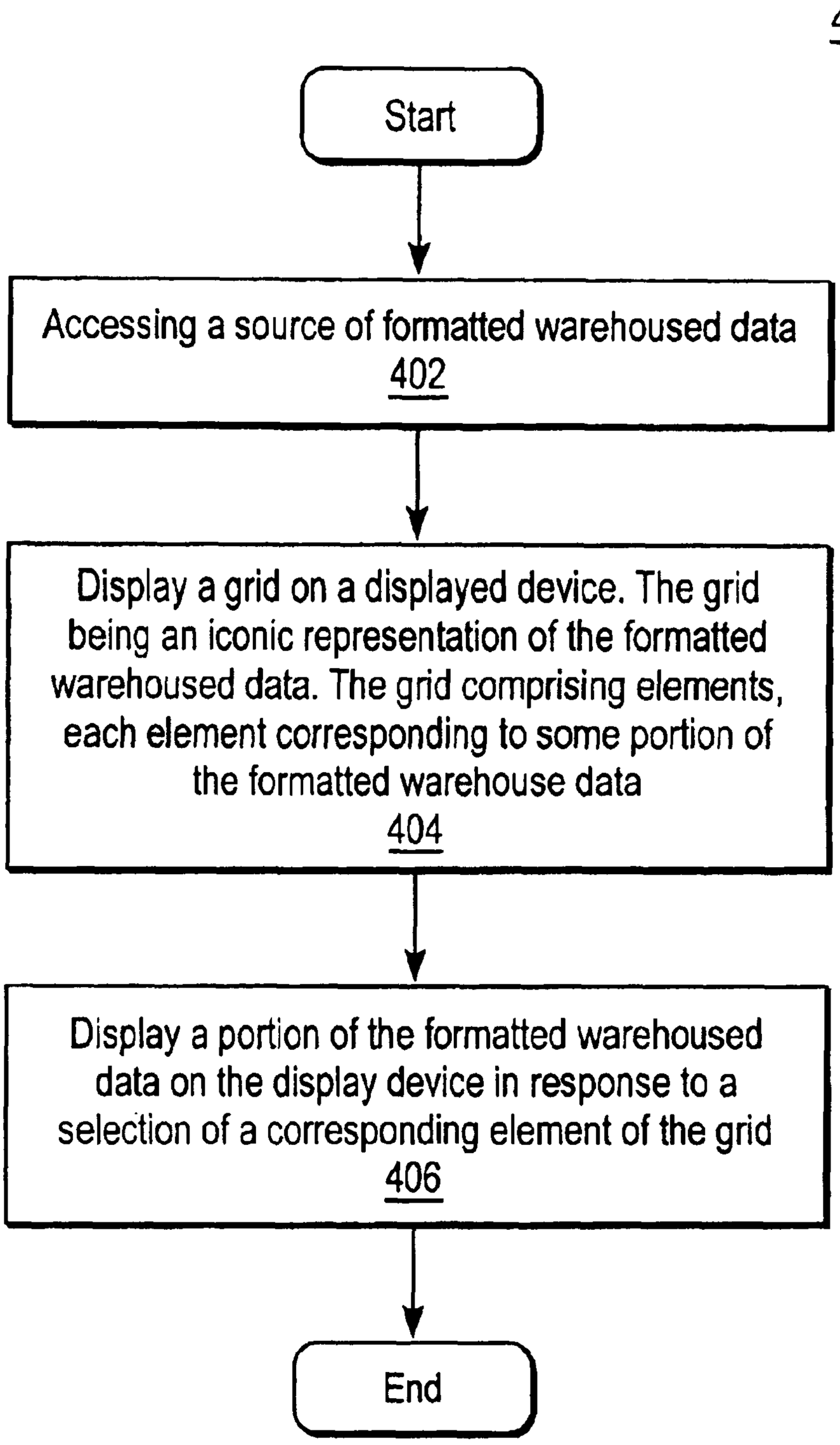

400
Start
Accessing a source of formatted warehoused data
402
Display a grid on a displayed device. The grid being an iconic representation of the formatted warehoused data. The grid comprising elements, each element corresponding to some portion of the formatted warehouse data
404
Display a portion of the formatted warehoused data on the display device in response to a selection of a corresponding element of the grid
406
End

FIG. 4

500

| Size / Product | S | | M | | L | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Quantity | Cost | Quantity | Cost | Quantity | Cost | Quantity | Cost |
| A | 1NA | 1XA | 2NA | 2XA | 3NA | 3XA | NA | XA |
| B | 1NB | 1XB | 2NB | 2XB | 3NB | 3XB | NB | XB |
| C | 1NC | 1XC | 2NC | 2XC | 3NC | 3XC | NC | XC |
| Total | NS | XS | NM | XM | NL | XL | NA+NB +NC | XA+XB +XC |

FIG. 5A

520

| Product | Quantity | Cost |
|---|---|---|
| A | NA | XA |
| B | NB | XB |
| C | NC | XC |
| Total | NA+NB+NC | XA+XB+XC |

FIG. 5B

540

| Products | Quantity | Cost |
|---|---|---|
| Total | NA+NB+NC=N | XA+XB+XC=X |

FIG. 5C

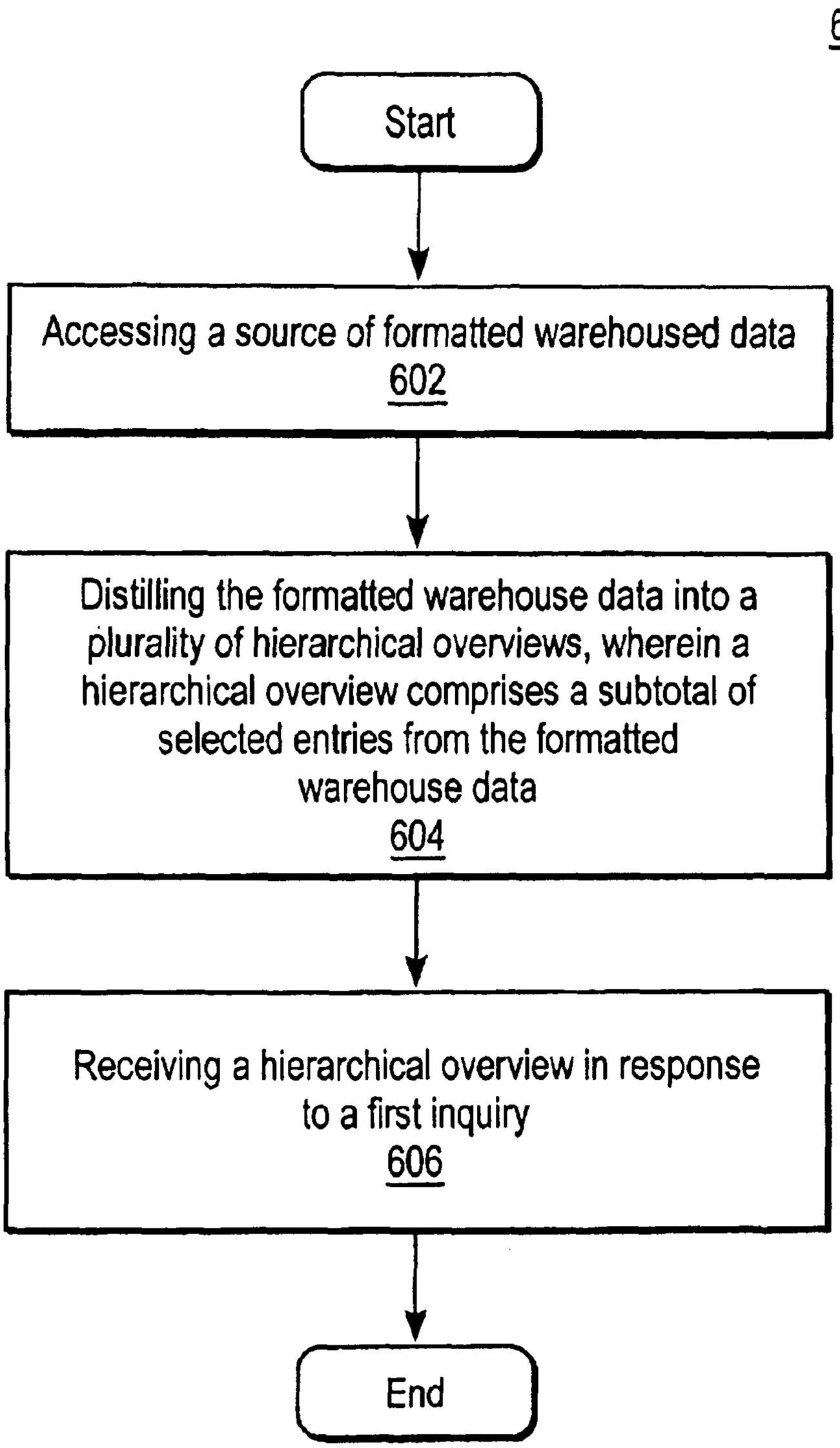

600
Start
Accessing a source of formatted warehoused data
602
Distilling the formatted warehouse data into a plurality of hierarchical overviews, wherein a hierarchical overview comprises a subtotal of selected entries from the formatted warehouse data
604
Receiving a hierarchical overview in response to a first inquiry
606
End

FIG. 6

# METHOD AND SYSTEM FOR NAVIGATING A LARGE AMOUNT OF DATA

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.**

## FIELD OF THE INVENTION

The present invention relates to database management systems. Specifically, the present invention pertains to a method and system for navigating a large amount of data.

## BACKGROUND ART

Computers are used to perform a wide variety of applications in such diverse fields as finance, traditional and electronic commercial transactions, manufacturing, health care, telecommunications, etc. Most of these applications typically involve inputting or electronically receiving data, processing the data according to a computer program, then storing the results in a database, and perhaps transmitting the data to another application, messaging system, or client in a computer network. As computers become more powerful, faster, and more versatile, the amount of data that can be processed also increases.

Unfortunately, the raw data found in operational databases often exist as rows and columns of numbers and codes which, when viewed by individuals, appears bewildering and incomprehensible. Furthermore, the scope and vastness of the raw data stored in modern databases is overwhelming to a casual observer. Hence, applications were developed in an effort to help interpret, analyze, and compile the data so that it may be readily and easily understood by a human. This is accomplished by sifting, sorting, and summarizing the raw data before it is presented for display, storage, or transmission. Thereby, individuals can now interpret the data and make key decisions based thereon.

Extracting raw data from one or more operational databases and transforming it into useful information (e.g., data "warehouses" and data "marts") is the function of analytic applications. In data warehouses and data marts, the data are structured to satisfy decision support roles rather than operational needs. A data warehouse utilizes a business model to combine and process operational data and make it available in a consistent way. Before the data are loaded into the data warehouse, the corresponding source data from an operational database are filtered to remove extraneous and erroneous records; cryptic and conflicting codes are resolved; raw data are translated into something more meaningful; and summary data that are useful for decision support, trend analysis and modeling or other end-user needs are pre-calculated. A data mart is similar to a data warehouse, except that it contains a subset of corporate data for a single aspect of business, such as finance, sales, inventory, or human resources.

In the end, the data warehouse or data mart is comprised of an "analytical" database containing extremely large amounts of data useful for direct decision support or for use in analytic applications capable of sophisticated statistical and logical analysis of the transformed operational raw data. With data warehouses and data marts, useful information is retained at the disposal of the decision-makers and users of analytic applications and may be distributed to data warehouse servers in a networked system. Additionally, decision-maker clients



can retrieve analytical data resident on a remote data warehouse servers over a computer system network.

An example of the type of company that would use data warehousing is an online Internet bookseller having millions of customers located worldwide whose book preferences and purchases are tracked. By processing and warehousing these data, top executives of the bookseller can access the processed data from the data warehouse, which can be used for sophisticated analysis and to make key decisions on how to better serve the preferences of their customers throughout the world.

The rapid increase in the use of networking systems, including Wide Area Networks (WAN), the Worldwide Web and the Internet, provides the capability to transmit operational data into database applications and to share data contained in databases resident in disparate networked servers. For example, vast amounts of current transactional data are continuously generated by business-to-consumer and business-to-business electronic commerce conducted over the Internet. These transactional data are routinely captured and collected in an operational database for storage, processing, and distribution to databases in networked servers.

The expanding use of "messaging systems" and the like enhances the capacity of networks to transmit data and to provide interoperability between disparate database systems. Messaging systems are computer systems that allow logical elements of diverse applications to seamlessly link with one another. Messaging systems also provide for the delivery of data across a broad range of hardware and software platforms, and allow applications to interoperate across network links despite differences in underlying communications protocols, system architectures, operating systems, and database services. Messaging systems and the recent development of Internet access through wireless devices such as enabled cellular phones, two-way pagers, and hand-held personal computers, serve to augment the transmission and storage of data and the interoperability of disparate database systems.

In the current data warehouse/data mart networking environment, one general concern involves the sheer volume of data that must be dealt with. Often massive, multi-terabyte data files are stored in various server sites of data warehouses or in operational databases. Transmitting these massive amounts of data over WANs or the Internet is a troublesome task. The space needed to store the data is significant, and the transmission time is often lengthy.

Furthermore, accessing the resulting data is difficult on a wireless device due to the vast size of the data file. Portable and/or wireless services such as cellular phones, two-way pagers, and hand-held personal computers, have limited computational and display resources.

Accordingly, there is a need for a reliable, convenient and rapid method and/or system for the navigating through the large amounts of data, such as data in a data warehouse/mart. There is a further need to accomplish the navigation through the large amounts of data on a wireless device such as enabled cellular phones, two-way pagers, and hand-held personal computers.

## SUMMARY OF INVENTION

The present invention provides a reliable, convenient and rapid method and/or system for the navigating through the large amounts of data, such as data in a data warehouse/mart. The present invention further provides a method and/or system for navigating through a large amount of data on a wireless device such as enabled cellular phones, two-way pagers, and hand-held personal computers.

Specifically, in one embodiment, the present invention accesses a source of formatted warehoused data. The present invention then displays a grid on a display device. In one embodiment, the grid is an iconic representation of the formatted warehoused data. The grid is comprised of elements, each element corresponding to some portion of the formatted warehoused data. In addition, a portion of the formatted warehoused data is displayed on the display device in response to a selection of a corresponding element of the grid.

In another embodiment, a source of formatted warehoused data is accessed. The formatted warehoused data is then distilled into a plurality of hierarchical overviews. In general, a hierarchical overview comprises a subtotal of selected entries from the formatted warehoused data. Specifically, in response to a first inquiry, a hierarchical overview is received.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

FIG. **1** illustrates a schematic block diagram of an exemplary client/server computer system network upon which embodiments of the present invention may be implemented.

FIG. **2** illustrates an exemplary computer system upon which embodiments of the present invention may be practiced.

FIG. **3** illustrates an exemplary display device in accordance with an embodiment of the present invention for navigating a large amount of data.

FIG. **4** is a flowchart of steps performed in accordance with an embodiment of the present invention for navigating a large amount of data.

FIGS. **5**A-**5**C illustrate an exemplary version of formatted warehoused data in accordance with embodiments of the present invention for navigating a large amount of data.

FIG. **6** is a flowchart of steps performed in accordance with another embodiment of the present invention for navigating a large amount of data.

The drawings referred to in this description should be understood as not being drawn to scale except if specifically noted.

## DETAILED DESCRIPTION

A method and system for the wireless delivery of data, including business metrics, transformed data, untransformed data, or raw data are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be obvious, however, to one skilled in the art that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to avoid obscuring the present invention.

Some portions of the detailed descriptions that follow are presented in terms of procedures, logic blocks, processing, and other symbolic representations of operations on data bits within a computer memory. These descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. In the present application, a procedure, logic block, process, etc., is conceived to be a self-consistent sequence of steps or instructions leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily,



these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated in a computer system. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like.

It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussions, it is appreciated that throughout the present invention, discussions utilizing terms such as "transmitting", "receiving", "determining", "creating", "storing", "delivering", "accessing", "generating", "distilling", "providing", "displaying", "outputting", "compressing", "decompressing" or the like, can refer to the actions and processes (e.g., processes **400** and **600** of FIGS. **4** and **6**, respectively) of a computer system or similar electronic computing device. The computer system or similar electronic computing device manipulates and transforms data represented as physical (electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission, or display devices.

FIG. **1** is a block diagram depicting one embodiment of a system **100** for the delivery of data, particularly the wireless delivery of data, in accordance with the present invention. Data sources **101** include one or more sources of data resulting from business and financial transactions, equipment performance logs, and the like.

These data sources can based on and formatted according to a Relational Database Management System (RDBMS) (such as from Oracle, Informix, Sybase, Microsoft, etc.), an Enterprise Resource Planning (ERP) system, Service Advertising Protocol (SAP), flat files, and other data transmission formats, either planned or envisioned, including XML, WML, HDML, HTML, and compact (lightweight) HTML.

Data storage **102** is for storing operational data and the like from data sources **101**, typically using a high capacity mass storage device (such as hard disk drives, optical drives, tape drives, etc.). In one embodiment, data storage **102** is a data warehouse. Data storage **102** is coupled to a database management system (DBMS) **104** by analytic data interface **103**. DBMS **104** executes an analytic application such as a data mart application. A repository **105** is coupled to (or integrated with) DBMS **104** for storing information from the database management system.

There are at least three styles of calculating data (e.g., business metrics): periodic, on demand, and continuous (real time). In the periodic style, data are calculated at predetermined intervals (e.g., hourly, daily, weekly, etc.) and stored in repository **105**, and the most recent data are provided to the requester. In the on demand style, the data are calculated in response to a user request. These data may be cached or persisted in some manner (e.g., in repository **105**), but do not exist or have value until they are initially requested. In the continuous (real time) style, data are updated as underlying data are updated. For example, a business metric describing the moving average for the inventory of a particular item gets updated as the inventory level for that item is updated. In each case, the requester gets the freshest data.

Returning to FIG. **1**, in the present embodiment, an application server **106** is interposed between the DBMS **104** and a voice server **107** or the Internet **109**. In one embodiment, application server **106** is accessible to users via a unique Uniform Resource Locator (URL). Application server **106**

provides information (e.g., business metrics and transformed data, but also untransformed or raw data) to users from DBMS **104** and/or repository **105**.

Voice server **107** provides voice-to-text and text-to-voice services for converting voice messages received from a user via a conventional telephone **110**, and for similarly converting information from application server **106** into an audible message. A user can thereby access application server **106** using a conventional telephone **110** via voice server **107**, and receive information from application server **106** via the same path. For security purposes, a firewall **108** encloses voice server **107**, application server **106**, and the other devices and components coupled with those devices on the internal side of the firewall.

Wireless gateway **111** enables communication between wireless devices and application server **106** within the framework of a wireless service provider (WSP). Wireless devices are exemplified as wireless phone **112** and PDA **113**; however, it is appreciated that other types of wireless devices such as a pager or two-way pager, or any other data-capable or data-enabled device operable for wireless communication, may be used. Preferably, the wireless devices have display capability, but other means for conveying information to a user may be utilized. For example, information can be converted into an audible message (e.g., text-to-voice).

Coupled to the Internet **109** may be a computer system **114** that is also capable of communicating with application server **106**. For example, information can be exchanged between computer system **114** and application server **106** via electronic mail (e-mail). Computer system **114** may also incorporate a Web browser or other such elements allowing it to access a Web site on application server **106** using the URL for application server **106**.

In summary, system **100** supports a number of various different types of end-user devices, as well as different types of service providers (e.g., Internet Service Providers, WSPs, etc.). In accordance with the present invention, a user can register a variety of devices and device types utilizing different service providers, protocols (e.g., wireless application protocol (WAP)), Communication standards, and data formats, and use these devices to receive information (e.g., business metrics, etc.) at remote locations (e.g., at field locations worldwide).

FIG. **2** is a block diagram of an embodiment of an exemplary device **200** used in accordance with the present invention. It should be appreciated that device **200** of the present embodiment is well suited to be any type of computing device (e.g., server computer, portable computing device, desktop computer, mobile phone, pager, personal digital assistant, etc.). Within the following discussions of the present invention, certain processes and steps are discussed that are realized, in one embodiment, as a series of instructions (e.g., software program) that reside within computer readable memory units of device **200** and executed by a processor(s) of device **200**. When executed, the instructions cause device **200** to perform specific actions and exhibit specific behavior which is described in detail herein.

Device **200** of FIG. **2** comprises an address/data bus **299** for communicating information, one or more central processors **201** coupled with bus **299** for processing information and instructions. Central processor unit(s) **201** may be a microprocessor or any other type of processor. The device **200** also includes data storage features such as a computer usable volatile memory unit **202** (e.g., random access memory, static RAM, dynamic RAM, etc.) coupled with bus **299** for storing information and instructions for central processor(s) **201**, a computer usable nonvolatile memory unit **203** (e.g., read only memory, programmable ROM, flash memory, EPROM, EEPROM, etc.) coupled with bus **299** for storing static information and instructions for processor(s) **201**. Device **200** also includes one or more signal generating and receiving devices **208** coupled with bus **299** for enabling device **200** to interface with other electronic devices and computer systems. The communication interface(s) **208** of the present embodiment may include wired and/or wireless communication technology. For example, within the present embodiment, the communication interface **208** may be a serial communication port, a Universal Serial Bus (USB), an Ethernet adapter, a Fire Wire (IEEE 1394) interface, a parallel port, a small computer system interface (SCSI) bus interface, infrared (IR) communication port, Bluetooth wireless communication port, a broadband interface, or an interface to the Internet, among others.

Optionally, device **200** may include an alphanumeric input device **206** including alphanumeric and function keys coupled to the bus **299** for communicating information and command selections to the central processor(s) **201**. In one embodiment, alphanumeric input device **206** is a touch screen device; in this implementation, alphanumeric input device **206** is capable of registering a position where a stylus element (not shown) makes contact. The device **200** can include an optional cursor control or cursor directing device **207** coupled to the bus **299** for communicating user input information and command selections to the central processor (s) **201**. The cursor-directing device **207** may be implemented using a number of well known devices such as a mouse, a track-ball, a track-pad, an optical tracking device, among others. In one embodiment, cursor control **207** is a touch screen device incorporated with display device **205**. In this implementation, cursor control **207** is capable of registering a position on display device **205** where a stylus element makes contact. Alternatively, it is appreciated that a cursor may be directed and/or activated via input from the alphanumeric input device **206** using special keys and key sequence commands. The present embodiment is also well suited to directing a cursor by other means such as, for example, voice commands.

A display device **205** is coupled to bus **299** of device **200** for displaying video and/or graphics. It should be appreciated that display device **205** may be a cathode ray tube (CRT), flat panel liquid crystal display (LCD), field emission display (FED), plasma display or any other display device suitable for displaying video and/or graphic images and alphanumeric characters recognizable to a user. The device **200** of FIG. **2** may also include one or more optional computer usable data storage devices **204** such as a magnetic or optical disk and disk drive (e.g., hard drive or floppy diskette) coupled with bus **299** for storing information and instructions.

FIG. **3** illustrates an exemplary display device **205** in accordance with an embodiment of the present invention for navigating a large amount of data. Specifically, FIG. **3**, in combination with process **400** of FIG. **4**, enables a user of a device **200** to access a large amount of formatted warehoused data, such as formatted warehoused data **500** of FIG. **5**A. Additionally, FIG. **3** in combination with process **400** enables the user of device **200** to easily navigate the formatted warehoused data **500**. For example, when device **200** accesses a source of formatted data (e.g., analytic data interface **103** of FIG. **1**), FIG. **3** portrays the formatted data in an easily navigable environment. In one embodiment, the easily navigable environment of display **205** includes a grid **330**, grid elements **340**, and a displayed portion of warehoused data **500**.

In one embodiment, the source of formatted warehoused data (e.g., **500**) is stored on a content server (e.g., application server **106**). Furthermore, application server **106** may be a

web server, WAP gateway, or the like. In addition, the present embodiment prevents a server timeout between application server **106** and device **200**. Specifically, the timeout is prevented by utilizing a separate thread for query execution that also allows for query cancellation. In so doing, the "pipeline" between device **200** and application server **106** remains open until the user chooses to close it. Thus, during the accessing of formatted warehoused data **500**, device **200** will not be disconnected from application server **106** if an amount of idle time has passed. Therefore, the user of device **200** is does not have to re-access the formatted warehoused data **500** and re-enter a password.

More specifically, the formatted warehoused data **500** may be formatted in a cross-tabular manner (as a "report"). In addition, formatted warehouse data **500** is presented in a scaled iconic representation on display **205**. In one embodiment, grid **330** is the scaled iconic representation of the formatted warehoused data **500** shown on a portion of display **205**. Specifically, grid **330** is comprised of many elements, such as **340** and **344**, which correspond to some portion of formatted warehoused data **500**. An element in grid **330** may correspond to an entry in formatted warehoused data **500**, or an element may correspond to multiple entries.

In addition, by selecting different elements (e.g., **340**, **344**, etc.) located within grid **330**, a user can easily navigate the entire formatted warehoused data **500**. As mentioned, each element **340** represents some portion of the total formatted warehoused data **500**. Therefore, if a user desires to view a specific portion of the formatted warehoused data **500**, the user need only select an element, such as element **340**, from grid **330**. In one embodiment, the user selects an element by contacting display device **205** with a stylus element, as described above. Upon selection of an element, such as element **340**, a corresponding portion **310** of the formatted warehoused data **500** is downloaded to, and displayed on, display device **205**. Hence, a user can easily read portion **310** on display device **205** without being overwhelmed with the entire formatted warehoused data **500** file.

Furthermore, by utilizing the iconic representation (e.g., grid **330**), a user can intuitively deduce the size of the formatted warehoused data **500** being navigated. In one embodiment, display device **205** further utilizes analytic data interface **103** in conjunction with repository **105** to download only portion **310** to display device **205**. Therefore, device **200** is not overloaded with the entire version of formatted warehoused data **500**, but instead receives only the portion **310** selected for viewing.

Furthermore, in one embodiment, the corresponding portion **310** of grid **330** may retain the axis labels of the formatted warehoused data **500** while the user navigates through grid **330**. For example, in the initial representation of portion **310** both a row **320** label and a column **325** label are included. The content of row **320** and column **325** will pertain to the content of element **340**. If element **344** is then selected as the next portion **310** to be represented, the column **325** and row **320** will remain a visual part of portion **310**; however, the content of row **320** and column **325** will now pertain to the content of element **344**. Even if the user selects an element (e.g., **344**) of grid **330** that does not intrinsically include column **325** and row **320** headings, column **325** and row **320** headings will remain in the displayed portion **310**.

In one embodiment, elements of grid **330** can be navigated upon display device **205** with the use of alpha-numeric input **206** (e.g. hot keys, keyboard arrows, etc.) and/or a graphical user interface (GUI) displayed on device **200**. Examples of a GUI may include, but not limited to, a cursor **375**, or scrolling arrows **350**. The actual navigation of grid **330** can therefore be accomplished by scrolling through the elements (e.g., **340**, **344**) utilizing scrolling arrows **350**, cursor **375**, stylus element, or any specified keys. In addition, a specific element, such as element **340** or element **344**, of grid **330** may be selected by utilizing hot keys, cursor **375**, stylus element, etc., to choose the desired element (e.g., **340**, **344**) for viewing.

With reference still to FIG. **3**, examples of device **200** may include, but are not limited to, a mobile phone, and a portable-computing device (e.g. personal digital assistant, pager, and the like). It is also appreciated, that in one embodiment, the element (e.g., **340**) of grid **330** which is displayed as portion **310** may be visually modified (e.g., highlighted, darkened, lightened, shaded, etc.) to signify the element (e.g., **340**) of grid **330** presently being viewed.

In the present embodiment, the dimensions of grid **330**, element **340**, and displayed portion **310** are all adjusted by analytic data interface **103** according to specific metrics supplied to analytic data interface **103** by device **200**. For example, if device **200** has a display **205** of x-by-y dimensions, then analytic data interface **103** formats the warehoused data **500** such that a presentation of size x-by-y dimensions will appear on display device **205**. Therefore, the present method for navigating a large amount of data can account for the characteristics of the display **205** utilized by device **200**, and thus can be used with a variety of such devices.

FIG. **4** is a flowchart **400** of the steps performed in accordance with an embodiment of the present invention for navigating a large amount of data. Flowchart **400** includes processes of the present invention which, in one embodiment, are carried out by processors and electrical components under the control of computer readable and computer executable instructions. The computer readable and computer executable instructions may reside, for example, in data storage features such as data storage device **202**, **203**, and/or **204** of FIG. **2**. However, the computer readable and computer executable instructions may reside in any type of computer readable medium. Although specific steps are disclosed in flowchart **400**, such steps are exemplary. That is, the present embodiment is well suited to performing various other steps or variations of the steps recited in FIG. **4**. Within the present embodiment, it should be appreciated that the steps of flowchart **400** may be performed by software, by hardware, or by any combination of software and hardware.

With reference now to step **402** of FIG. **4**, the present embodiment causes device **200** to access a source of formatted warehouse data (e.g., **500** of FIG. **5**A). It is understood that step **402** may be implemented in a wide variety of ways in accordance with an embodiment of the present invention. For example, the present embodiment may cause device **200** to access formatted warehouse data **500** in any manner similar to that described herein.

In step **404** of FIG. **4**, the present embodiment causes device **200** to display a grid **330** on display device **205** (FIG. **3**). In general, grid **330** is an iconic representation of the formatted warehoused data **500**. It is further appreciated that grid **330** is comprised of elements, such as element **340**. In addition, each element (e.g., **340**) corresponds to a portion of the formatted warehouse data **500**. It is understood that step **404** may be implemented in a wide variety of ways in accordance with an embodiment of the present invention. For example, at step **404**, the present embodiment may cause device **200** to display a grid **330** in any manner similar to that described herein.

At step **406** of FIG. **4**, the present embodiment causes the device (e.g. **200**) to display a portion of the formatted warehoused data **500** on the display (e.g., **205**) in response to a selection of a corresponding element (e.g. **340**) of grid **330**.

Step **406** may be performed in diverse ways in accordance with an embodiment of the present invention. For example, the present embodiment may cause device **200** to display a portion of the formatted warehoused data **500** on display **205** in response to a selection of a corresponding element of grid **330** in any manner similar to that described herein.

FIGS. **5**A-**5**C illustrate exemplary versions of formatted warehoused data in accordance with an embodiment of the present invention for navigating a large amount of data. Specifically, formatted warehoused data **500** is a cross-tabular illustration of one embodiment for representing the formatted warehoused data stored in repository **105**. Although a specific cross-tabular version of formatted warehoused data **500** is shown, many organizational formats of warehoused data **500** may be used. The cross-tabular format is shown merely for purposes of brevity and clarity.

With reference still to FIGS. **5**B-**5**C, the present embodiment illustrates further hierarchical overview versions of FIG. **5**A. Specifically, FIGS. **5**B-**5**C are subtotal versions of the initial formatted warehoused data **500**. In one embodiment, subtotaling data is a method for dynamically rolling formatted warehoused data **500** up to a higher level to make it more digestible. Specifically, subtotaling refers to trying to distill as much information as possible from a larger more detailed table of data. That is, table **520** is a subtotal of table **500**, table **540** is a subtotal of table **520**. Therefore, table **540** shows the least amount of detail while table **500** shows the most detail. It is appreciated that tables **500**, **520**, and **540** are exemplary and are shown in the present embodiment merely for purposes of clarity.

FIG. **6** is a flowchart of the steps performed in accordance with an embodiment of the present invention for navigating a large amount of data. Flowchart **600** includes processes of the present invention which, in one embodiment, are carried out by processors and electrical components under the control of computer readable and computer executable instructions. The computer readable and computer executable instructions may reside, for example, in data storage features such as data storage device **202**, **203**, and/or **204** of FIG. **2**. However, the computer readable and computer executable instructions may reside in any type of computer readable medium. Although specific steps are disclosed in flowchart **600**, such steps are exemplary. That is, the present embodiment is well suited to performing various other steps or variations of the steps recited in FIG. **6**. Within the present embodiment, it should be appreciated that the steps of flowchart **600** may be performed by software, by hardware, or by any combination of software and hardware.

In one embodiment, process **600** is an exemplary process for navigating a large amount of formatted warehoused data **500** utilizing voice commands. In general, device **200** may be any device which can transmit and/or receive voice data, such as, but not limited to, a regular phone **110**, wireless phone **112**, PDA **113**, and/or computer system **114**. Further, in one embodiment, the formatted warehoused data **500** of process **600** is the same formatted warehoused data **500** of process **400**. However, due to the voice navigation abilities of process **600**, the format in which analytic data interface **103** represents the formatted warehoused data **500** to process **600** may be different

For example, in one embodiment, process **600** uses a voice recognition interface, such as voice server **107**, to convey easily digestible portions of formatted warehoused data **500**. In one embodiment, voice server **107** conveys inquiries and responses to inquiries audibly according to a voice-based communications protocol.

In order to distill the formatted warehoused data **500** into pieces that can be readily conveyed by voice, analytic data interface **103** formats the warehoused data **500** into a plurality of hierarchical overviews (e.g., FIGS. **5**A-**5**C). Specifically, formatted warehoused data **500** is reduced in scope by subtotaling the contents thereof. Then, at each subtotal (e.g. overview), a user has the option of drilling deeper into a specific result in order to review the underlying data. For example, if process **600** were to deliver an initial hierarchical overview (e.g., table **540** of FIG. **5**C) to device **200**, the initial information received in response to an inquiry may be a quantity statement then a cost statement. The user may then wish to hear more information or hear the information from a different perspective by selecting a new level of clarity. For example, in a report with Year and Product attributes, the user could first hear sub-totaled metric values for a given year for all products. Then after selecting a specific product, they could hear the metric values for the given year for the selected product. In order to obtain this information, the user formulates an inquiry. In one embodiment, the user accomplishes this with a voice command.

Process **600** may respond with the quantities NA, NB, NC of each product A, B, C. The user can drill down to the next level (e.g., table **510** of FIG. **5**A) by initiating an inquiry for more information about one of the products in particular (e.g., product A), receiving in response a breakdown of the components of the quantity NA. Such "drilling down" can be continued in infinitum.

In general, a report exemplified by table **500** of FIG. **5**A is generated and resides in applications server **106** of FIG. **1**. When a user at a wireless device accesses this information, instead of hearing an item-by-item recitation of all the entries in table **500**. A hierarchical overview such as that of table **540** is heard. The user can then select one of the items in the hierarchical overview, and receive more details about that item. This process can be repeated until the user reaches the desired level of detail. Thus, according to the present invention, a user can receive detailed information using a voice based communications system, but without having to hear an item-by-item recitation of a multitude of entries. The present invention thus provides a ready mechanism for navigating through a large table of data using voice commands.

With reference still to process **600**, any hierarchical overview is possible with respect to the present embodiment, the examples with regard to FIGS. **5**A-**5**C are shown merely as one example of a multitude of possible overview breakdown criteria. It is further appreciated that the present process **600** can be performed on a screen and may not require voice cues at all. In fact, the hierarchical overview utilized in process **600** may respond to voice inquiries, hot key inquiries, a single click of a cursor, or any other possible input features which are known to one skilled in the art.

Another embodiment for navigating a large amount of formatted warehoused data **500** on a display device **200** (of FIG. **2**) is described herein. Specifically, the formatted warehoused data of table **500** may be represented in a row-by-row format instead of the subtotal format as described above. For example, each row of data from table **500** may be represented in a row-by-row fashion on display **205**. This type of format may be useful when a table of data (e.g., **500**) contains many rows but few columns. Thus instead of viewing a small table (e.g., table **540**) with a limited amount of subtotaled data, the user may choose to view the formatted warehoused data **500** by row. Such a row-by-row format will allow a user to gain a useful view of a table while not being overwhelmed with the entire table (e.g. **500**).

In addition, the row-by-row method for displaying formatted warehoused data **500**, on device **200** may further "freeze" a row for comparison purposes. That is, in the same way as the row **320** and column **325** (of FIG. **3**) headings were maintained on display **205**, a specific row of data may be held on display **205**. Therefore, a user may compare one specific row with many different rows throughout the table. For example, if one row is of particular interest, the user may navigate throughout the other rows of a table (e.g., table **500**) while maintaining the desired row as a fixed part on display **205**.

With reference now to step **602** of FIG. **6**, the present embodiment causes device **200** to access a source of formatted warehouse data. It is understood that step **602** may be implemented in a wide variety of ways in accordance with an embodiment of the present invention. For example, the present embodiment may cause device **200** to access formatted warehouse data in any manner similar to that described herein. It is further appreciated that device **200** may be any device which can transmit and receive voice data, such as, but not limited to, a regular phone **110**, wireless phone **112**, PDA **113**, computer system **114**. **7**.

At step **604** of FIG. **6**, the present embodiment causes formatted warehoused data **500** to be distilled into a plurality of hierarchical overviews (e.g. **500**, **520**, and **540** of FIGS. **5**A-**5**C). Further, the hierarchical overviews (e.g. **500**, **520**, and **540**) comprise a subtotal of selected entries from the formatted warehoused data **500**. Step **604** may be performed in a variety of ways in accordance with embodiment of the present invention. For example, the present embodiment may cause formatted warehoused data **500** to be distilled into a plurality of hierarchical overviews (e.g. **500**, **520**, and **540**) in any manner similar to that described herein.

At step **606** of FIG. **6**, the present embodiment causes device (e.g., **200**) to receive a hierarchical overview (e.g. **540**) in response to a first inquiry. Step **606** may be performed in a variety of ways in accordance with embodiment of the present invention. For example, the present embodiment may cause device **200** to receive a hierarchical overview **540** in any manner similar to that described herein.

Thus, the present invention provides a reliable, convenient and rapid method and/or system for the navigating through the large amounts of data, such as data in a data warehouse/mart. The present invention further provides a method and/or system for navigating through a large amount of data on a wireless device such as enabled cellular phones, two-way pagers, and hand-held personal computers.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

What is claimed is:

**1**. A method for navigating **[**a large amount of**]** *formatted warehouse* data, **[**said**]** *the* method comprising:

accessing a source of *the* formatted warehoused data;

displaying a grid on a display device, **[**said**]** *the* grid being an iconic representation of **[**said**]** *the* formatted warehoused data, **[**said**]** *the* grid comprising elements, each element corresponding to some portion of **[**said**]** *the* formatted warehoused data; and

displaying a portion of **[**said**]** *the* formatted warehoused data on **[**said**]** *the* display device, *the portion concurrently displayed with and visually distinguished from the grid,* in response to a selection of a corresponding element of **[**said**]** *the* grid.

**2**. The method as recited in claim **1**, wherein content server timeouts are prevented while accessing **[**said**]** *the* source of formatted data.

**3**. The method as recited in claim **1**, wherein **[**said**]** *the* warehoused data is formatted in a cross-tabular manner.

**4**. The method as recited in claim **1**, wherein **[**said**]** *the* portion of **[**said**]** *the* formatted warehoused data is indicated by a distinctive marking of **[**said**]** *the* corresponding element of **[**said**]** *the* grid.

**5**. The method as recited in claim **1**, wherein only **[**said**]** *the* portion of **[**said**]** *the* formatted warehoused data is downloaded to **[**said**]** *the* display device in response to **[**said**]** *the* selection.

**6**. The method as recited in claim **1**, wherein a different portion of **[**said**]** *the* formatted warehoused data is displayed on **[**said**]** *the* display device by selecting a different element of **[**said**]** *the* grid.

**7**. The method as recited in claim **1**, wherein a graphical user interface (GUI) comprising a cursor and scrolling arrows is also displayed on **[**said**]** *the* display device.

**8**. The method as recited in claim **7**, wherein a different portion of **[**said**]** *the* formatted warehoused data is displayed by utilizing **[**said**]** *the* GUI to navigate within **[**said**]** *the* grid and to select a different element of **[**said**]** *the* grid.

**9**. A device comprising:

a bus;

a display coupled with **[**said**]** *the* bus;

a memory unit coupled with **[**said**]** *the* bus; and

a processor coupled with **[**said**]** *the* bus, **[**said**]** *the* processor for executing a method for navigating a large amount of data, **[**said**]** *the* method comprising:

accessing a source of formatted warehoused data;

displaying a grid on **[**said**]** *the* display, **[**said**]** *the* grid being an iconic representation of **[**said**]** *the* formatted warehoused data, **[**said**]** *the* grid comprising elements, each element corresponding to some portion of **[**said**]** *the* formatted warehoused data; and

displaying a portion of **[**said**]** *the* formatted warehoused data on **[**said**]** *the* display, *the portion concurrently displayed with and visually distinguished from the grid,* in response to a selection of a corresponding element of **[**said**]** *the* grid.

**10**. The device of claim **9**, wherein content server timeouts are prevented while accessing **[**said**]** *the* source of formatted data.

**11**. The device of claim **9**, wherein **[**said**]** *the* warehoused data is formatted in a cross-tabular manner.

**12**. The device of claim **9**, wherein **[**said**]** *the* portion of **[**said**]** *the* formatted warehoused data is indicated by a distinctive marking of **[**said**]** *the* corresponding element of **[**said**]** *the* grid.

**13**. The device of claim **9**, wherein only **[**said**]** *the* portion of **[**said**]** *the* formatted warehoused data is downloaded in response to **[**said**]** *the* selection.

**14**. The device of claim **9**, wherein a different portion of **[**said**]** *the* formatted warehoused data is displayed on **[**said**]** *the* display by selecting a different element of **[**said**]** *the* grid.

**15**. The device of claim **9**, wherein a graphical user interface (GUI) comprising a cursor and scrolling arrows is also displayed on **[**said**]** *the* display.

**16**. The device of claim **15**, wherein a different portion of **[**said**]** *the* formatted warehoused data is displayed by utilizing **[**said**]** *the* GUI to navigate within **[**said**]** *the* grid and to select a different element of **[**said**]** *the* grid.

**17**. **[**A**]** *The* method **[**for navigating a large amount of data, said method**]** *as recited in claim 1, further* comprising:

**[**accessing a source of formatted warehoused data;**]**

distilling **[**said**]** *the* formatted warehoused data into a plurality of hierarchical overviews, wherein a hierarchical overview comprises a subtotal of selected entries from **[**said**]** *the* formatted warehoused data; and

receiving a hierarchical overview in response to a first inquiry, *the received hierarchical overview corresponding to the portion*.

**18**. The method as recited in claim **17**, wherein content server timeouts are prevented while accessing **[**said**]** *the* source of formatted data.

**19**. The method as recited in claim **17**, wherein *the formatted* warehoused data is formatted in a cross-tabular manner.

**20**. The method as recited in claim **17**, wherein **[**said**]** *the* device is a communications device.

**21**. The method as recited in claim **17**, wherein information about **[**said**]** *the* selected entries is received in response to a subsequent inquiry.

**22**. The method as recited in claim **17**, wherein inquiries and responses to inquiries are conveyed audibly according to a voice-based communications protocol.

**23**. The method as recited in claim **21**, wherein a response to an inquiry is displayed.



**24**. **[**A**]** *The* device *of claim 9, the processor for executing the method further* comprising:

**[**a bus;**]**

**[**a memory unit coupled with said bus; and**]**

**[**a processor coupled with said bus, said processor for executing a method for navigating a large amount of data, said method comprising:**]**

**[**accessing a source of formatted warehoused data;**]**

distilling **[**said**]** *the* formatted warehoused data into a plurality of hierarchical overviews, wherein a hierarchical overview comprises a subtotal of selected entries from **[**said**]** *the* formatted warehoused data; and

receiving a hierarchical overview in response to a first inquiry, *the received hierarchical overview corresponding to the portion*.

**25**. The device of claim **24**, wherein content server timeouts are prevented while accessing **[**said**]** *the* source of formatted data.

**26**. The device of claim **24**, wherein *the formatted* warehoused data is formatted in a cross-tabular manner.

**27**. The device of claim **24**, wherein **[**said**]** *the* device is a communications device.

**28**. The device of claim **24**, wherein information about **[**said**]** *the* selected entries is received in response to a subsequent inquiry.

**29**. The device of claim **24**, wherein inquiries and responses to inquiries are conveyed audibly according to a voice-based communications protocol.

**30**. The device of claim **28**, wherein a response to an inquiry is displayed.

* * * * *