

**EXHIBIT 9
TO DECLARATION
OF SHAWN T. GORDON**



US007293228B1

(12) **United States Patent**
Lessing et al.

(10) Patent No.: US 7,293,228 B1
(45) Date of Patent: Nov. 6, 2007

(54) **MALTWEB MULTI-AXIS VIEWING INTERFACE AND HIGHER LEVEL SCOPING**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 817 days.

(21) Appl. No.: **09/689,927**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/108,999, filed on Jul. 1, 1998, now Pat. No. 6,233,592, which is a continuation of application No. PCT/AU1998/000050, filed on Jan. 30, 1998.

(30) **Foreign Application Priority Data**

Jan. 31, 1997 (AU) P04892

See application file for complete search history.

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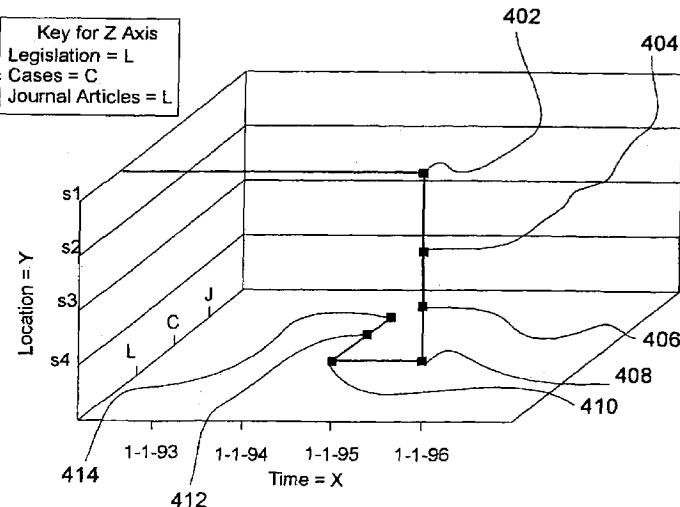
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ABSTRACT

A method, apparatus and computer program product for navigating in a multi-dimensional space containing an electronic publication formed from predefined portions of text-based data encoded using a markup language are disclosed. A selected predefined portion is displayed in a first display region. A point on a primary axis of the multi-dimensional space corresponding to the displayed pre-defined portion is also displayed. Also, a method, apparatus and computer program product for publishing an electronic publication formed from predefined portions of text-based data encoded using a markup language are also disclosed. Predefined portions are stored in terminal nodes. Higher level nodes are provided for organizing the terminal nodes into an hierarchical structure embodied in said electronic publication. Each higher level node contains the identity of a parent node, a position indicator for the higher level node and an associated identifier.

48 Claims, 23 Drawing Sheets



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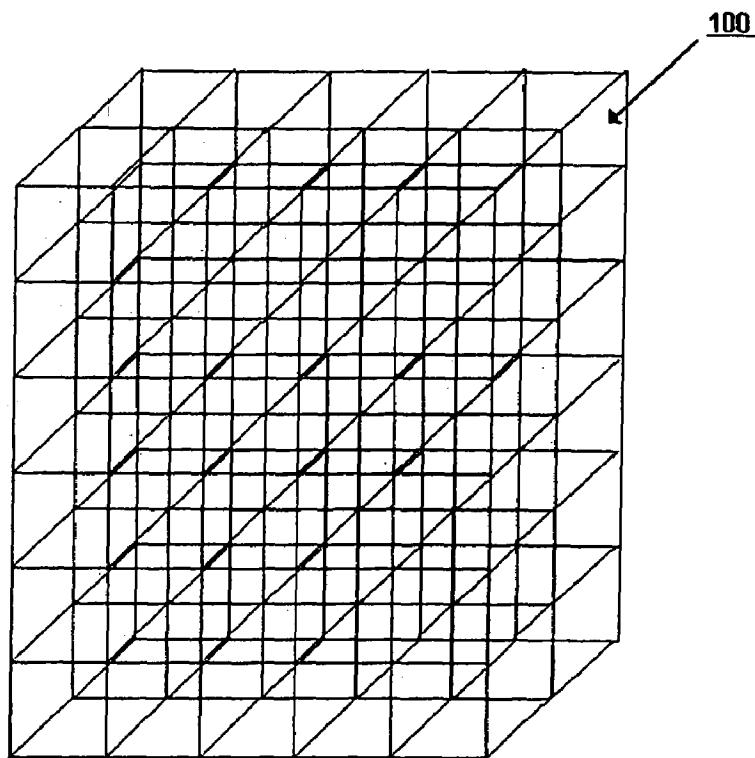


Fig. 1

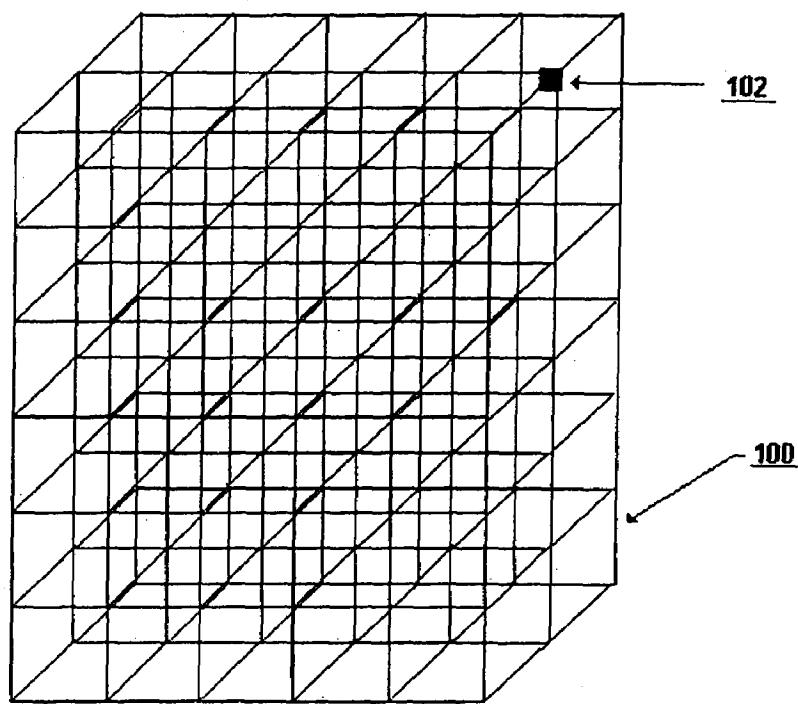
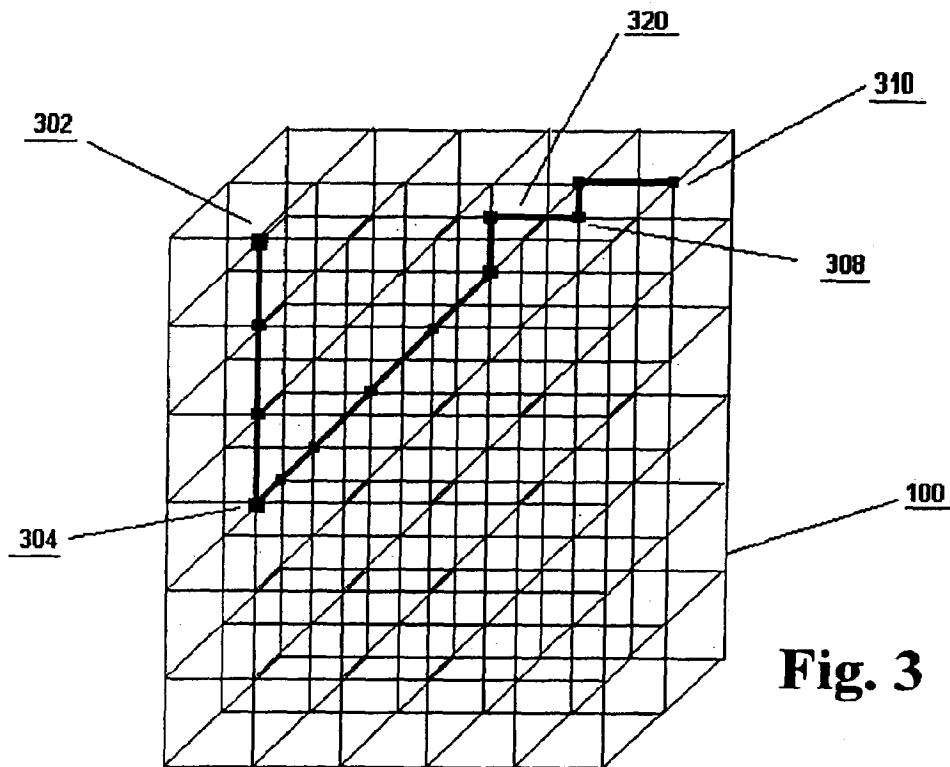
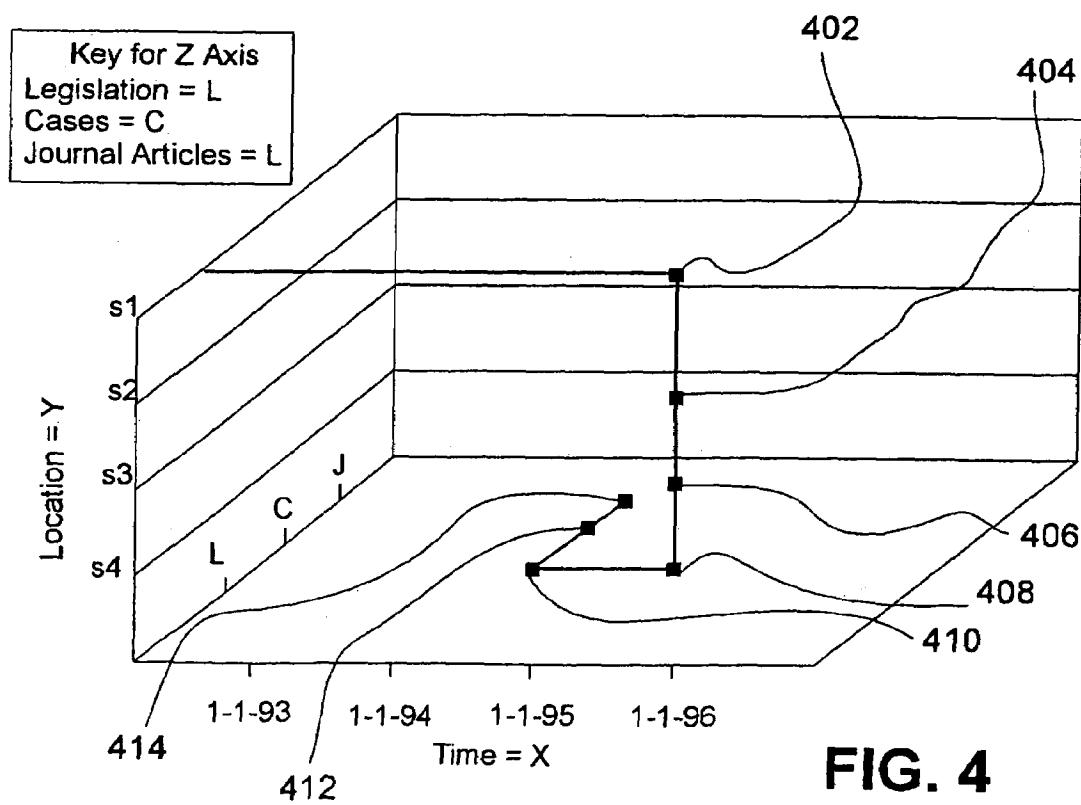


Fig. 2

**Fig. 3****FIG. 4**

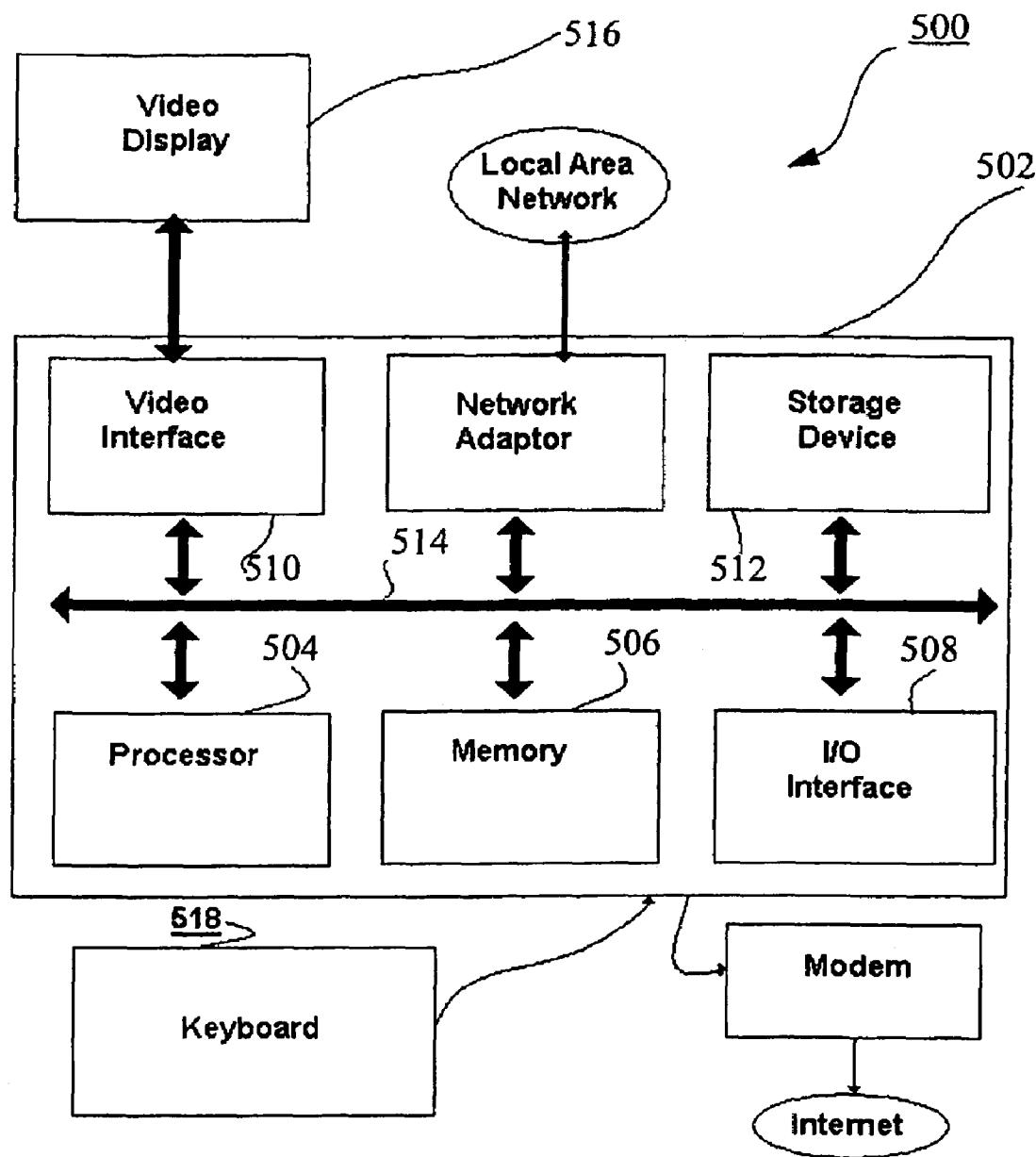
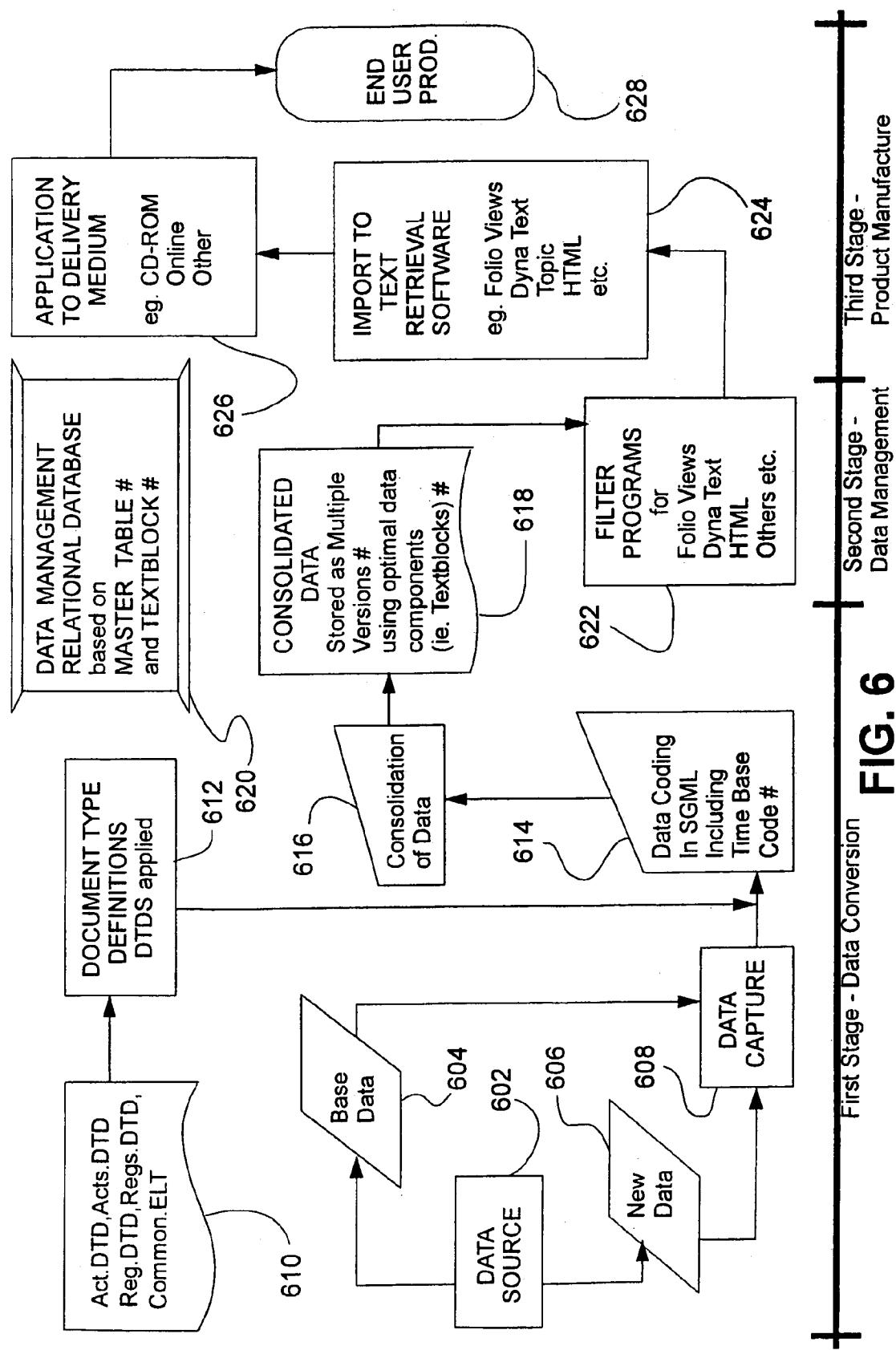


Fig. 5



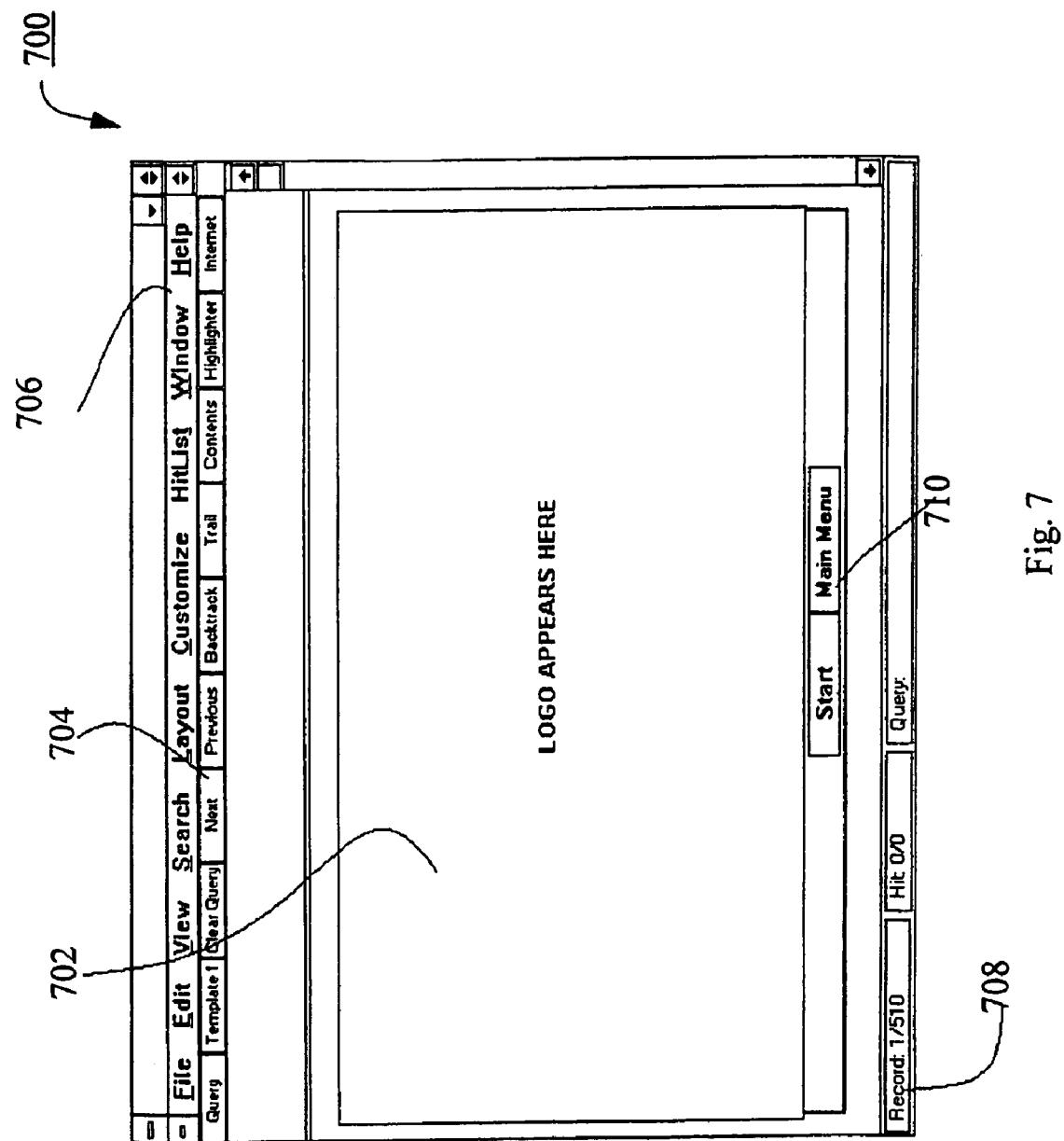


Fig. 7

800

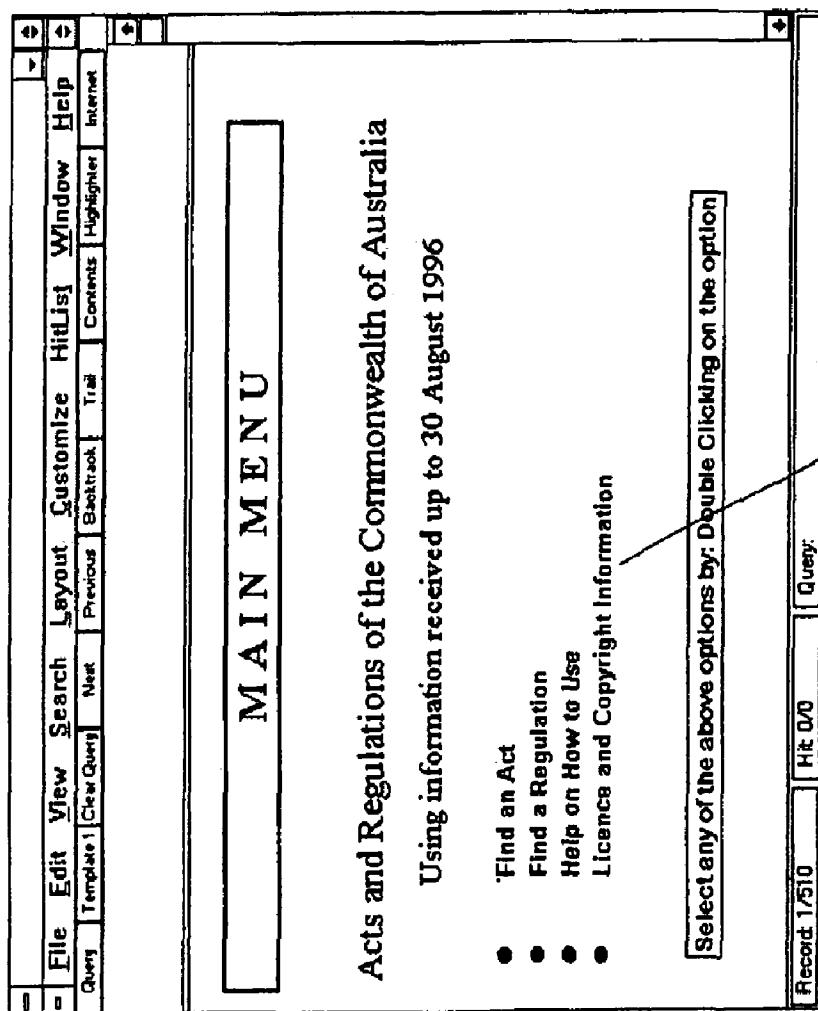
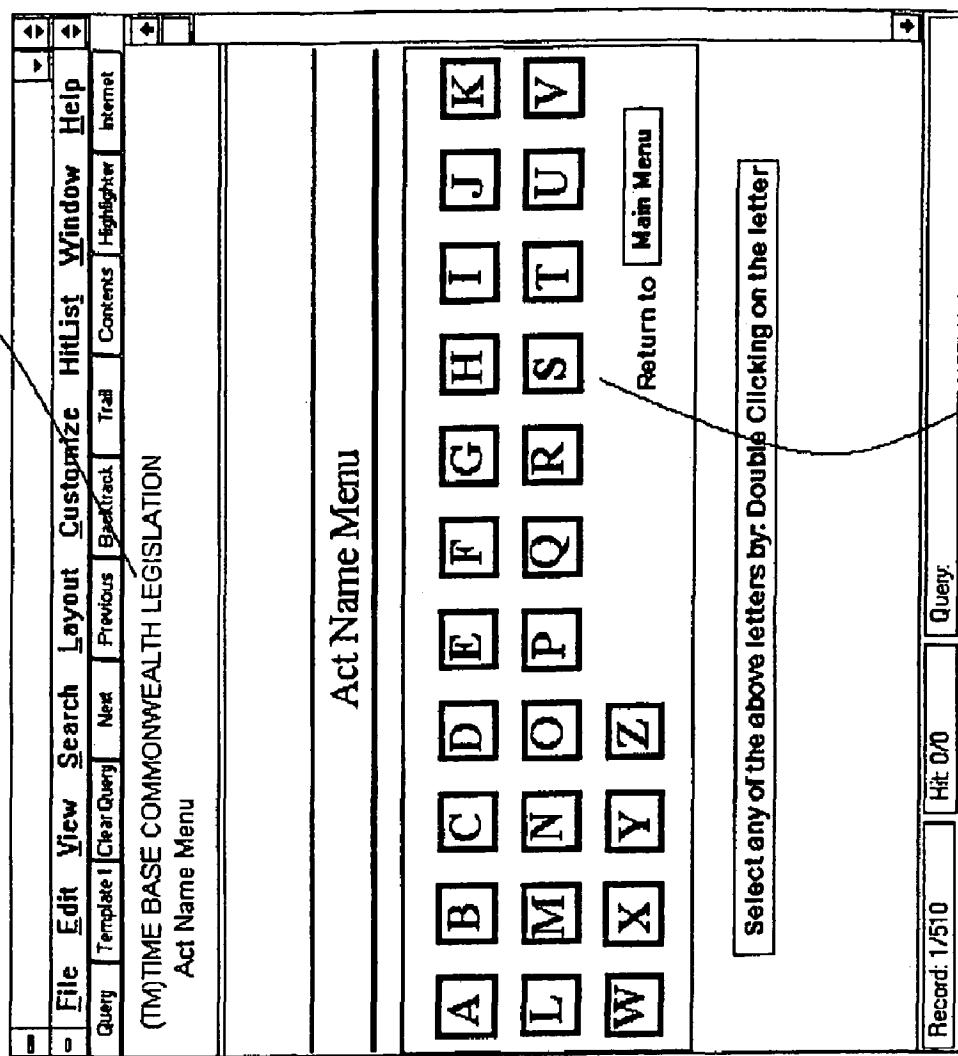


Fig. 8

902



900

904

Fig. 9

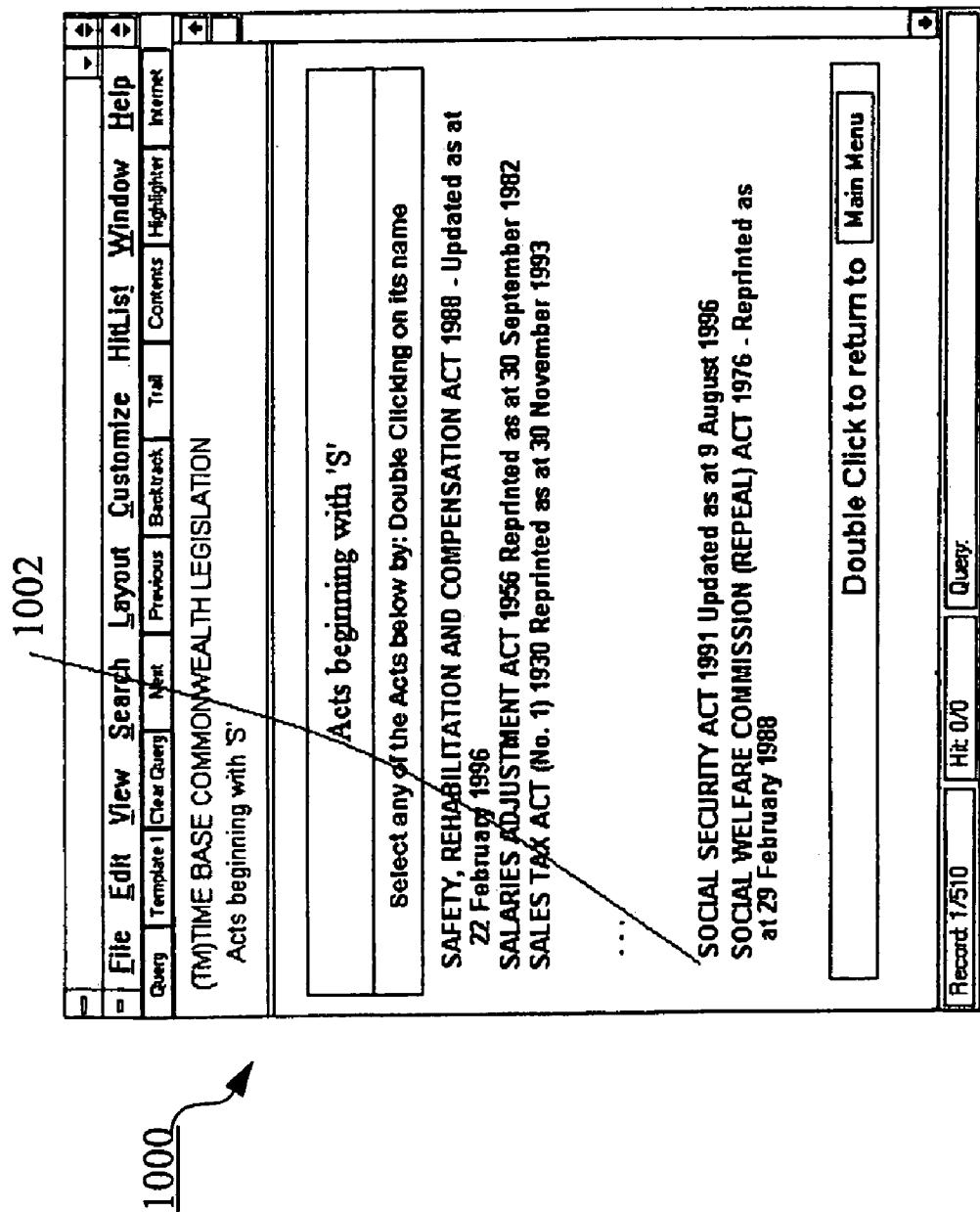


Fig. 10

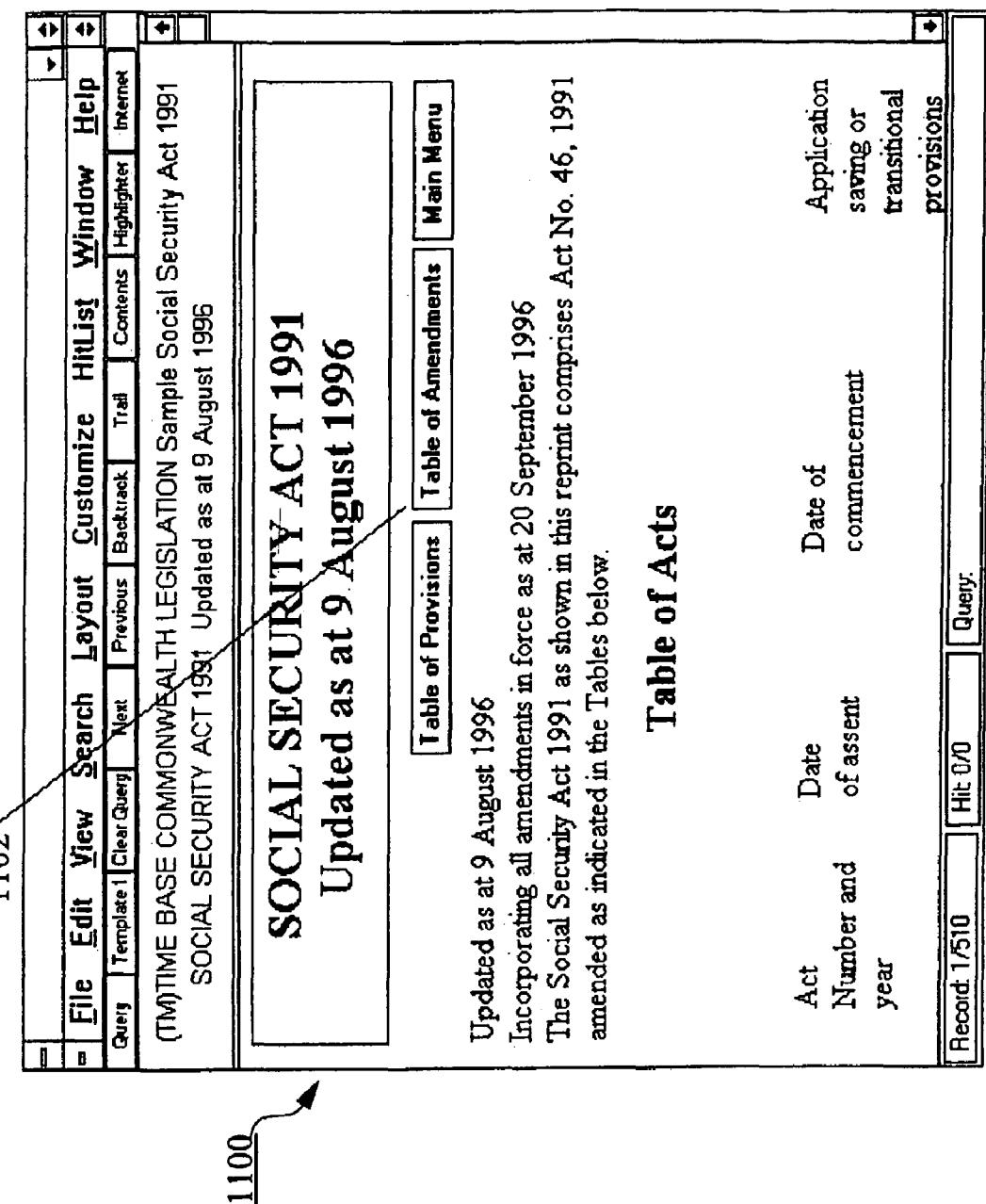


Fig. 11

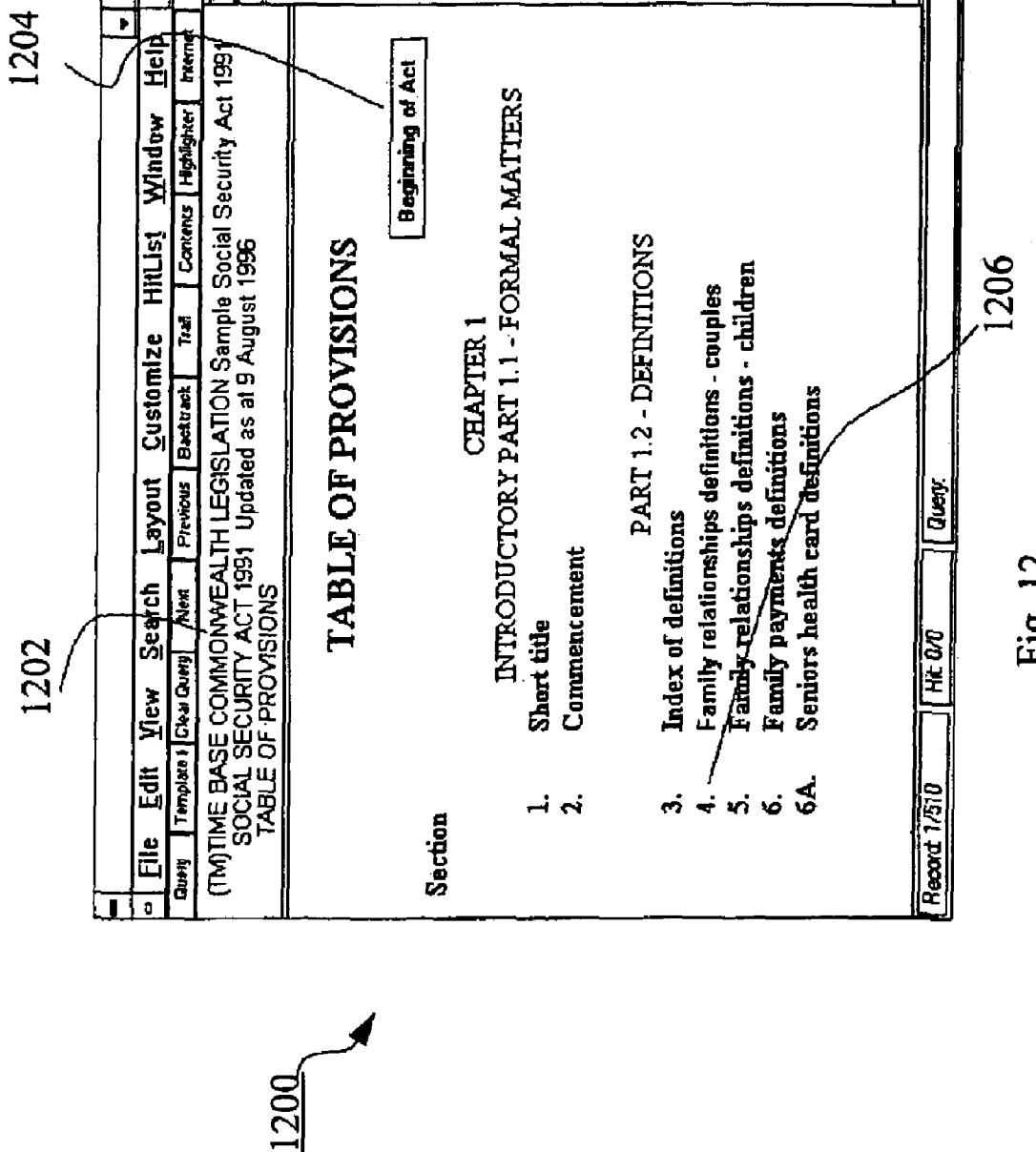


Fig. 12

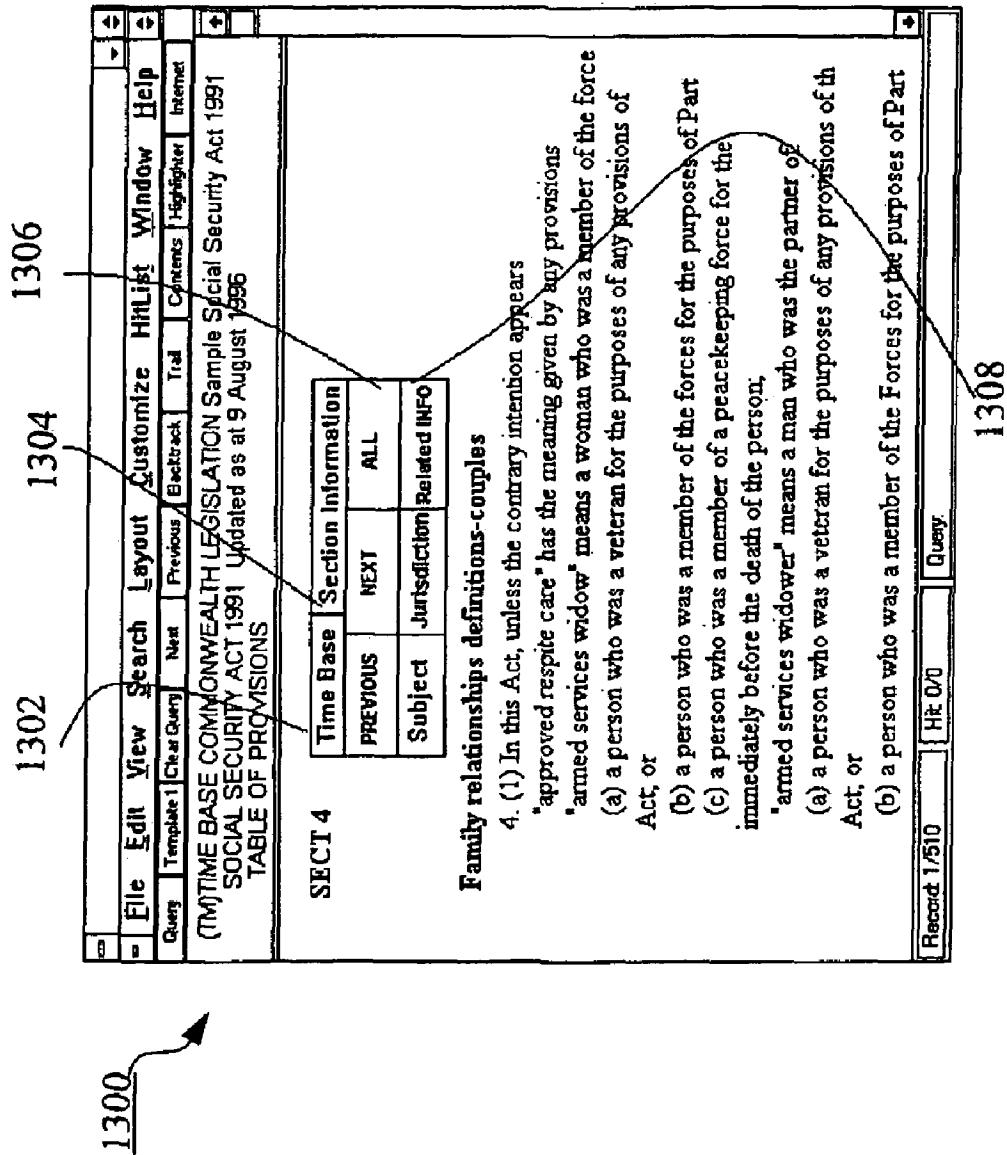


Fig. 13

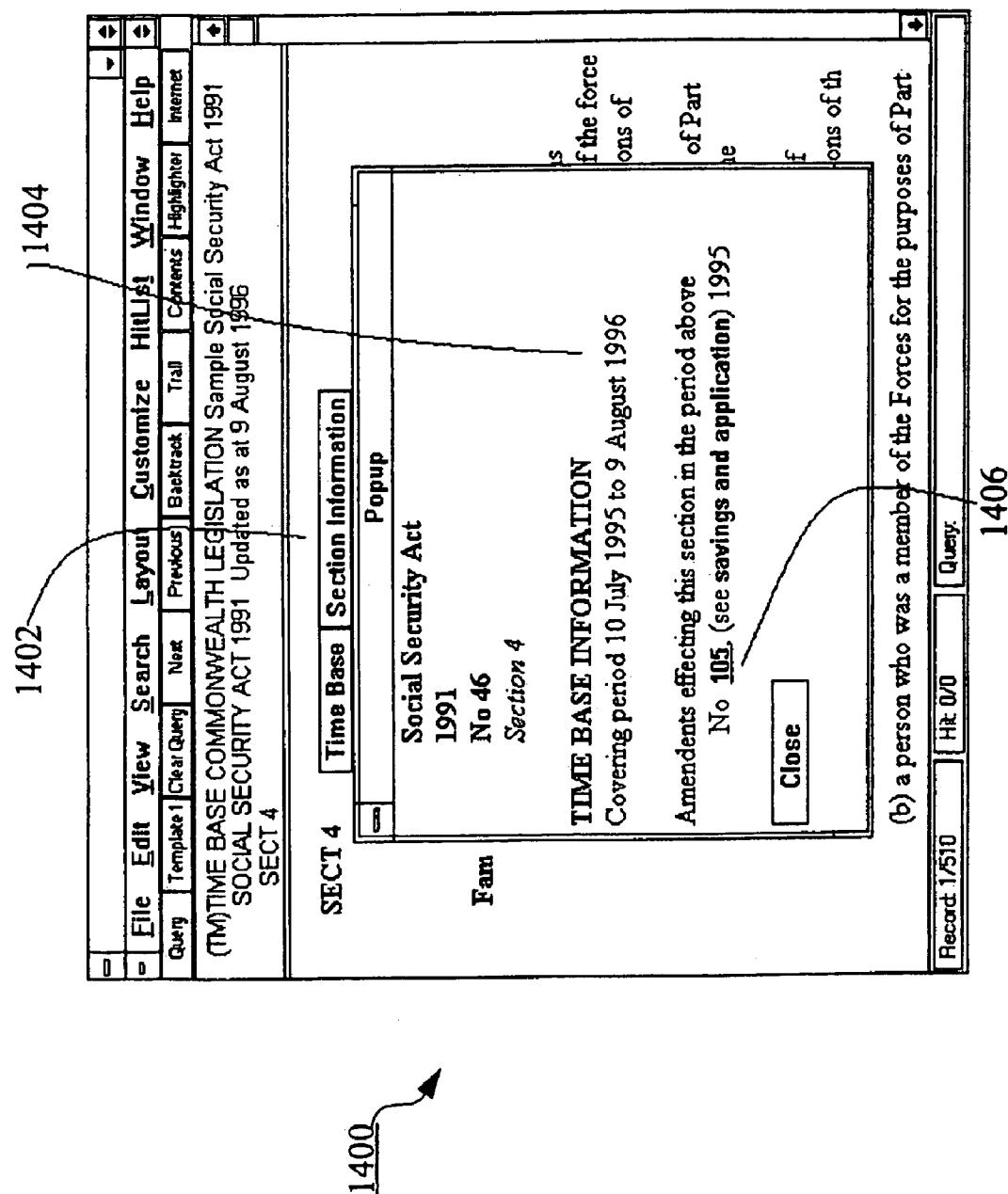


Fig. 14

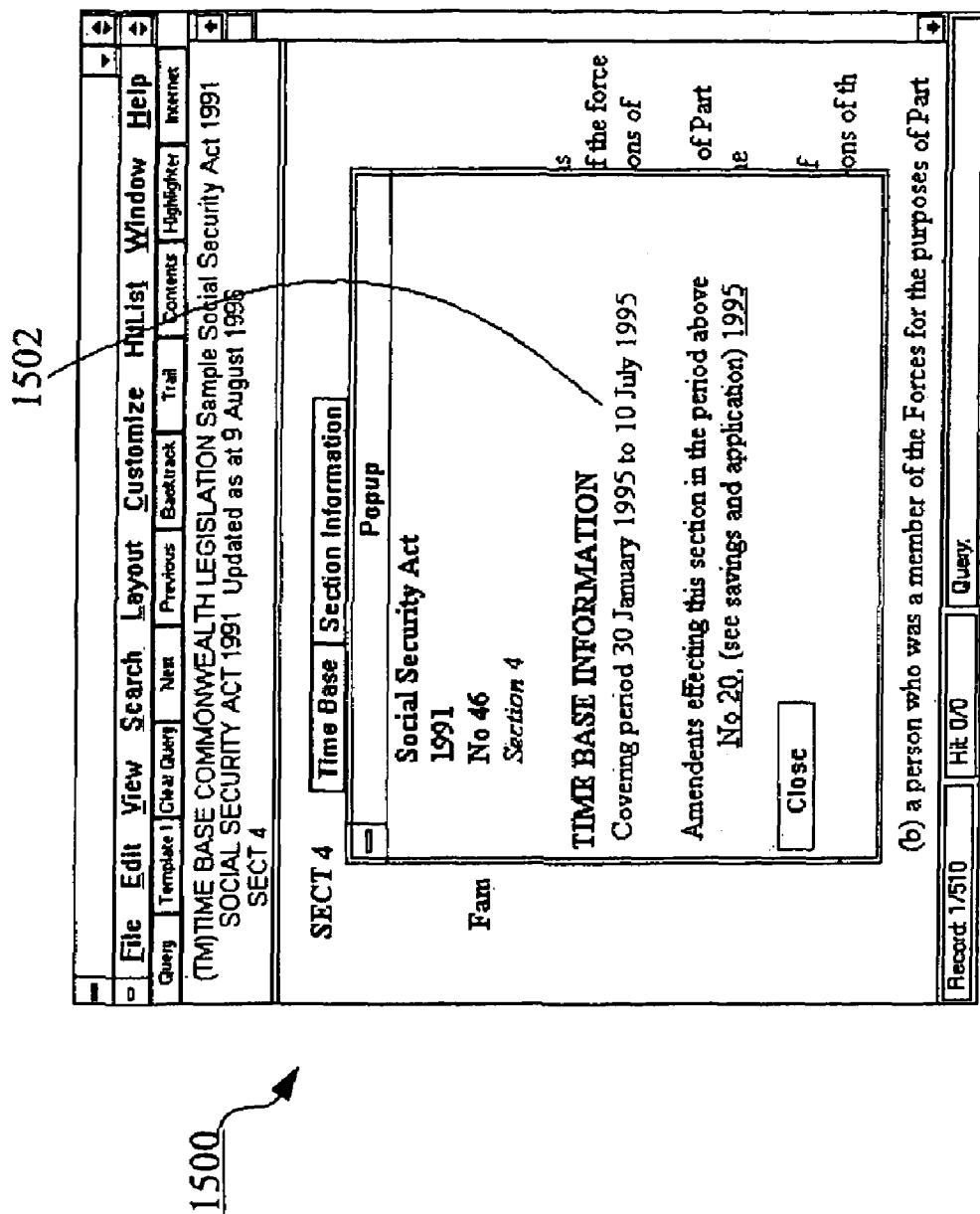


Fig. 15

1602

1600

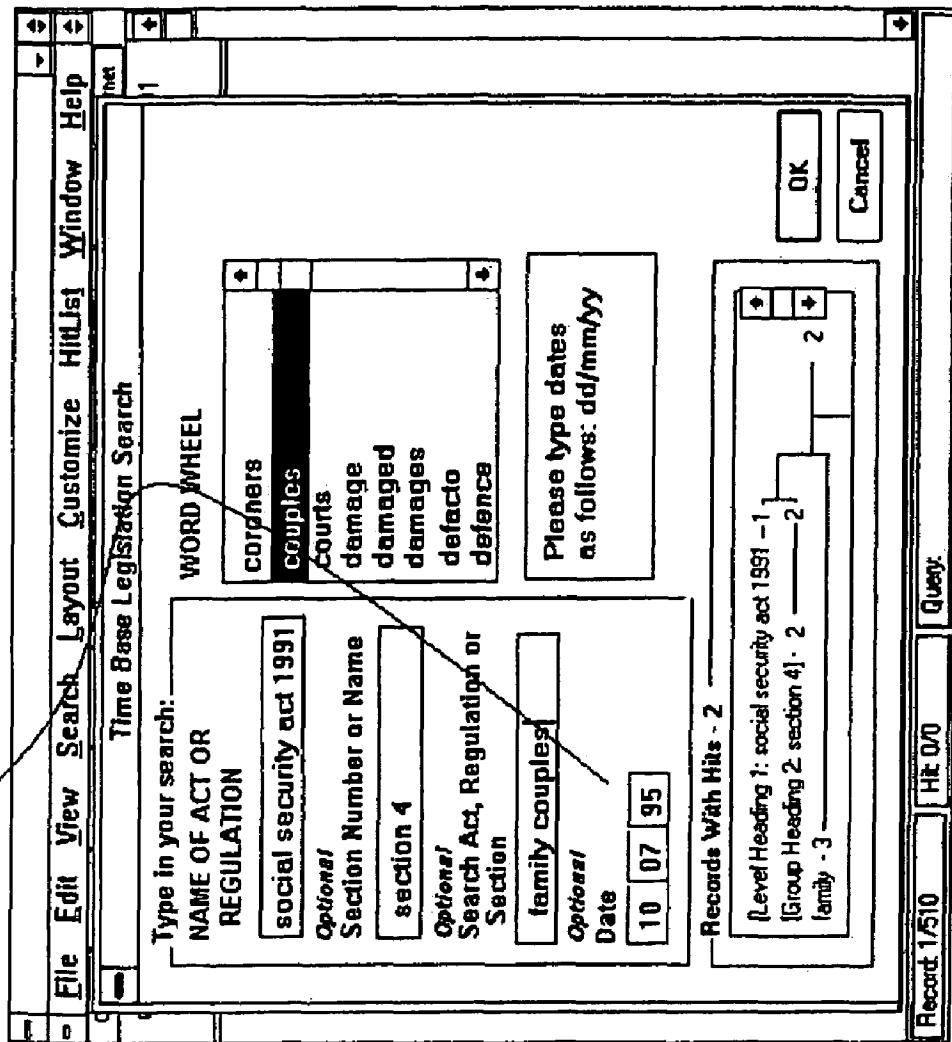
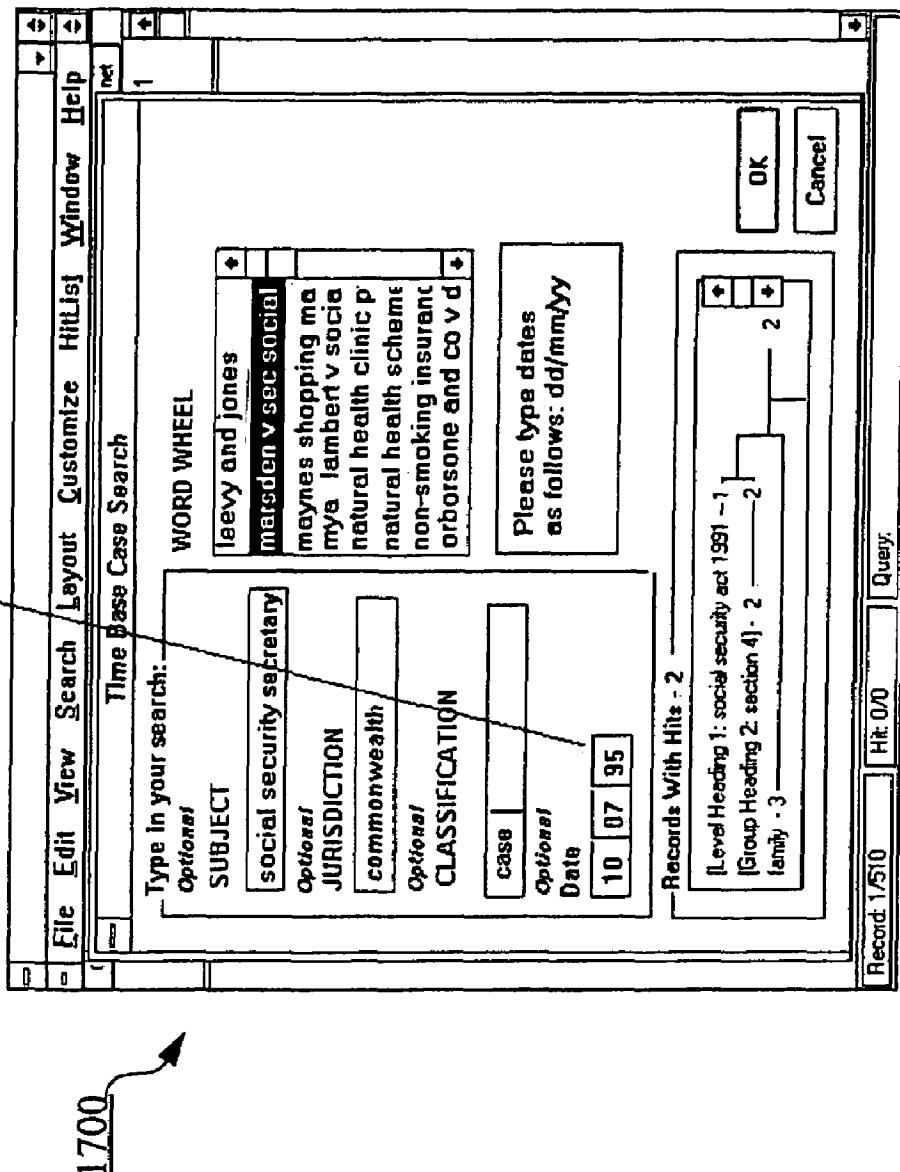


Fig. 16

1702



1700

Fig. 17

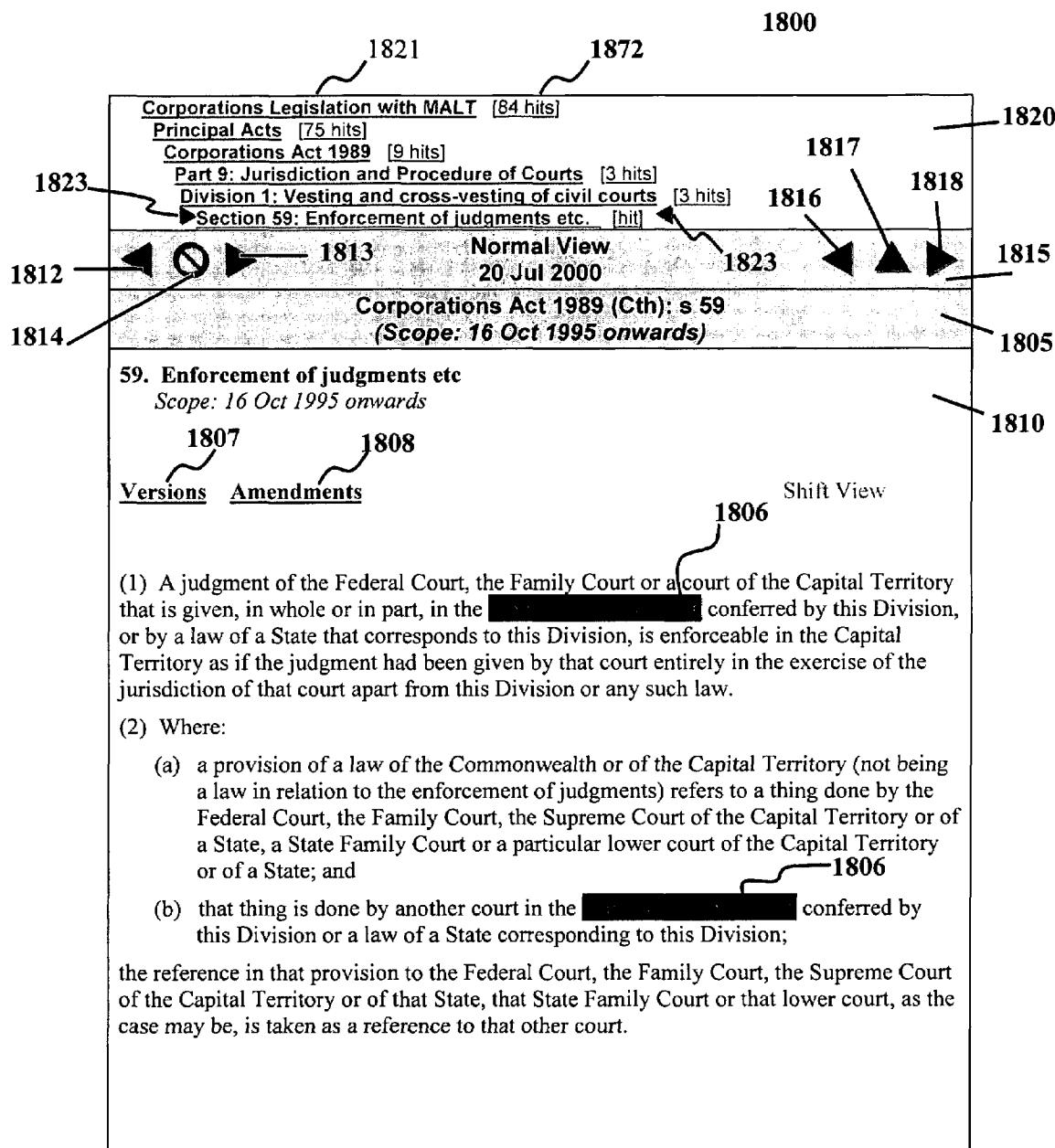
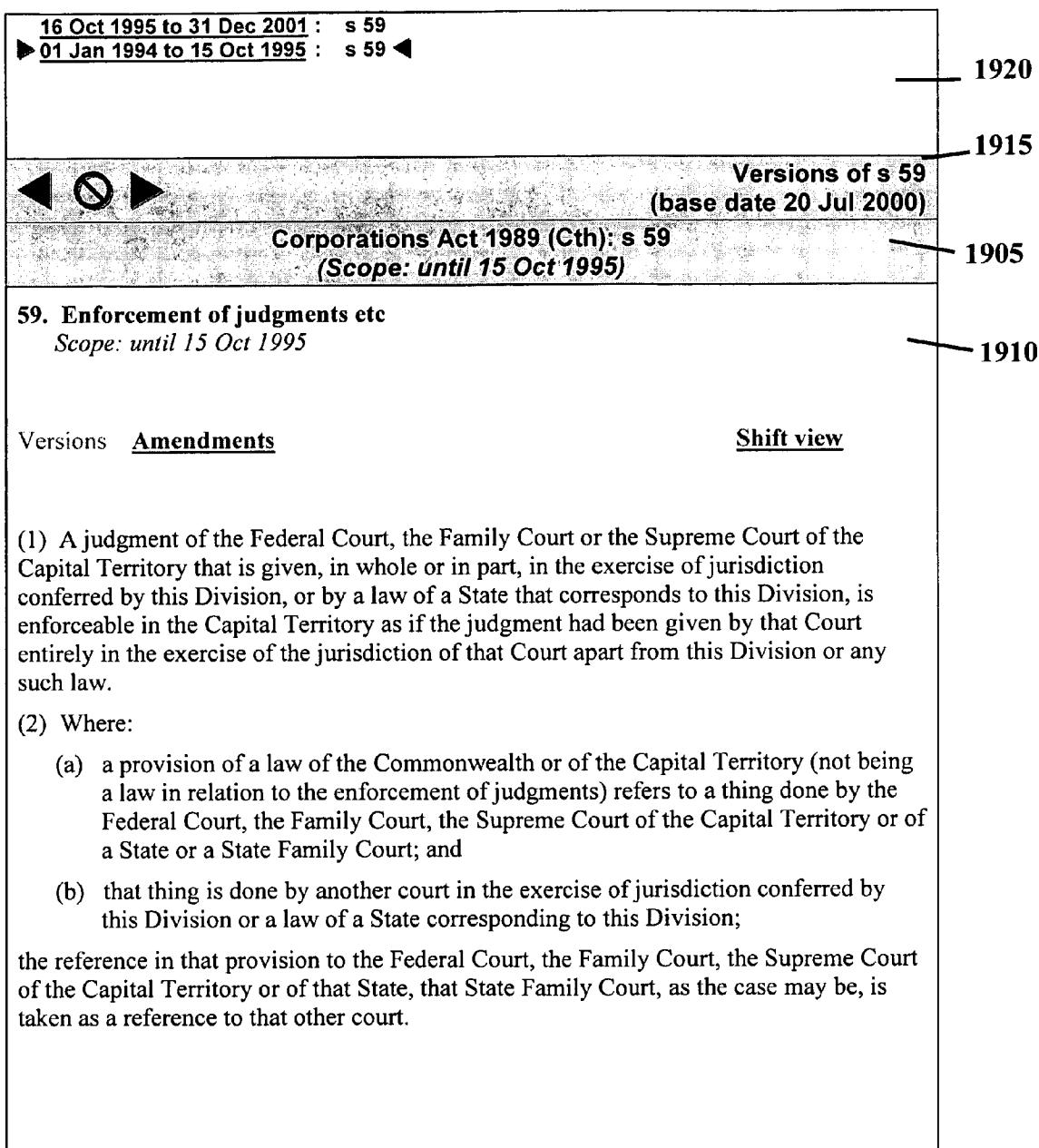


Fig. 18

1900**Fig. 19**

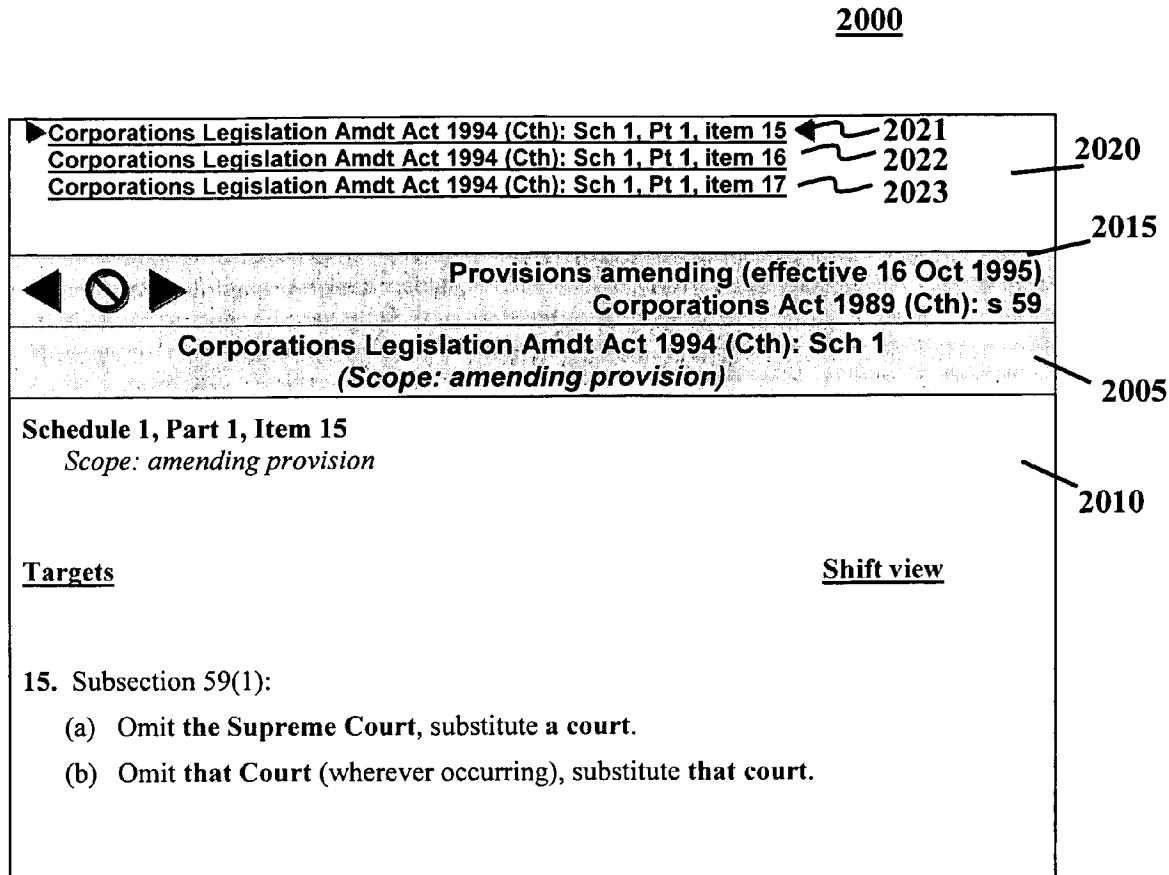
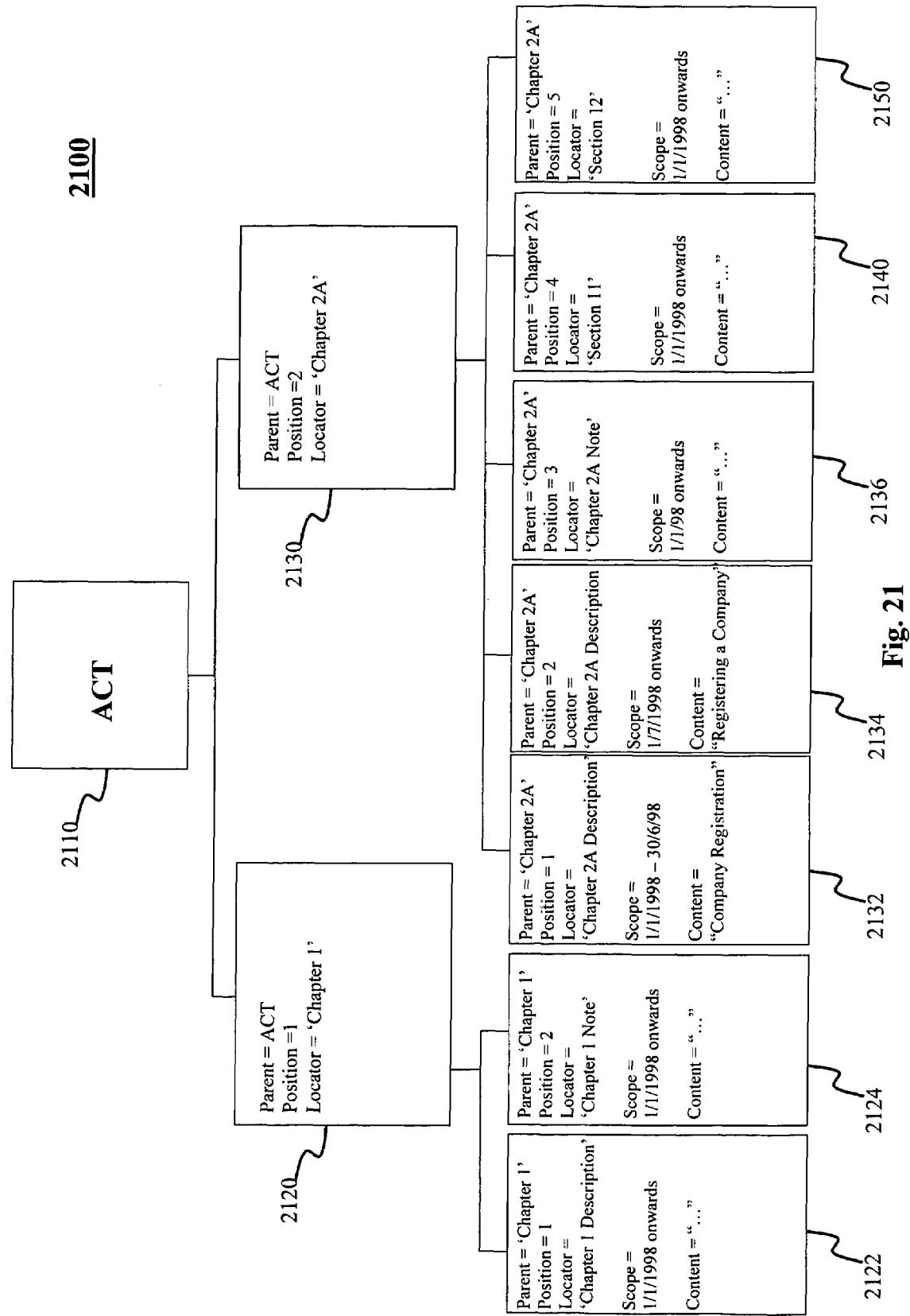


Fig. 20



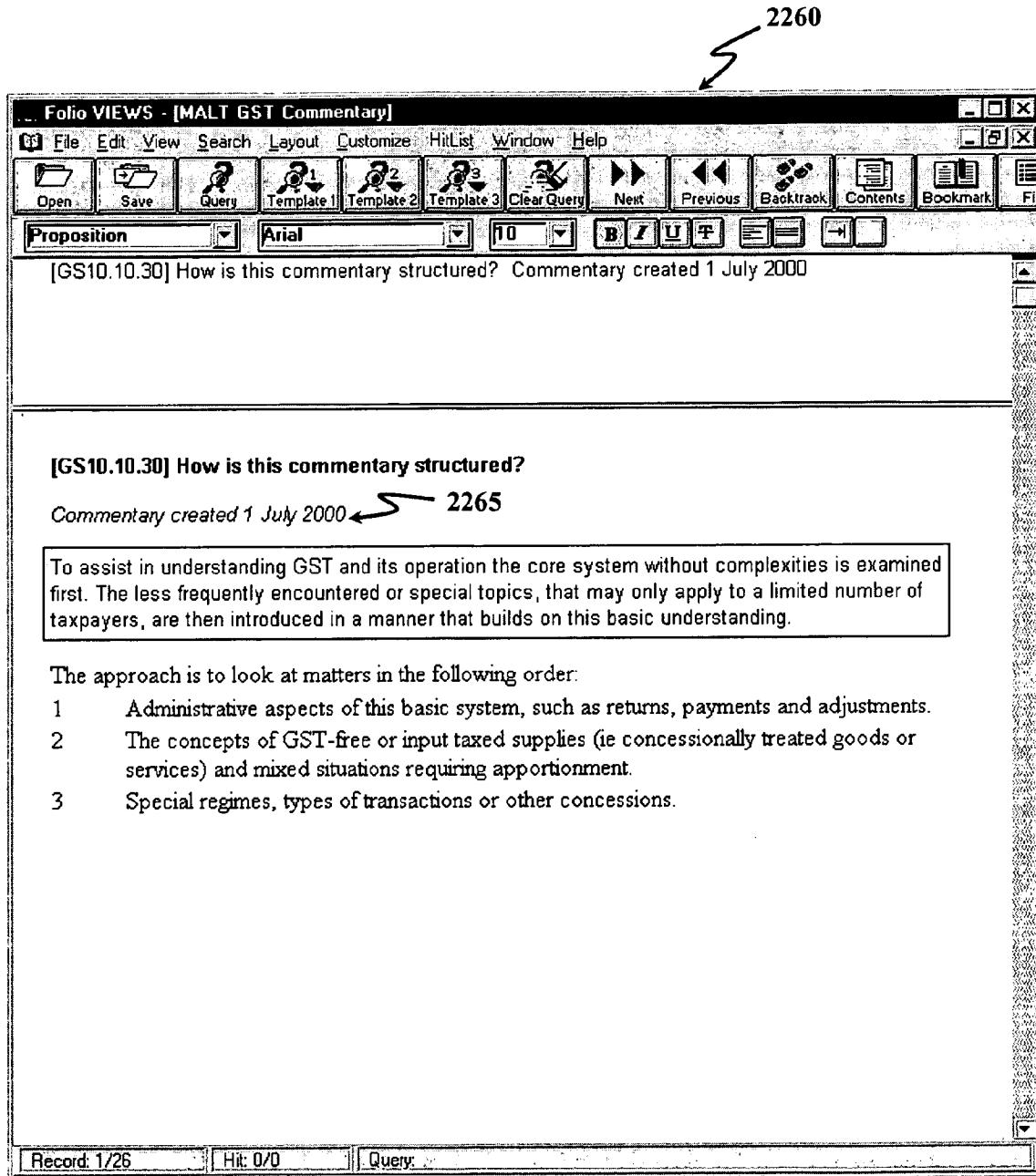


Fig. 22A

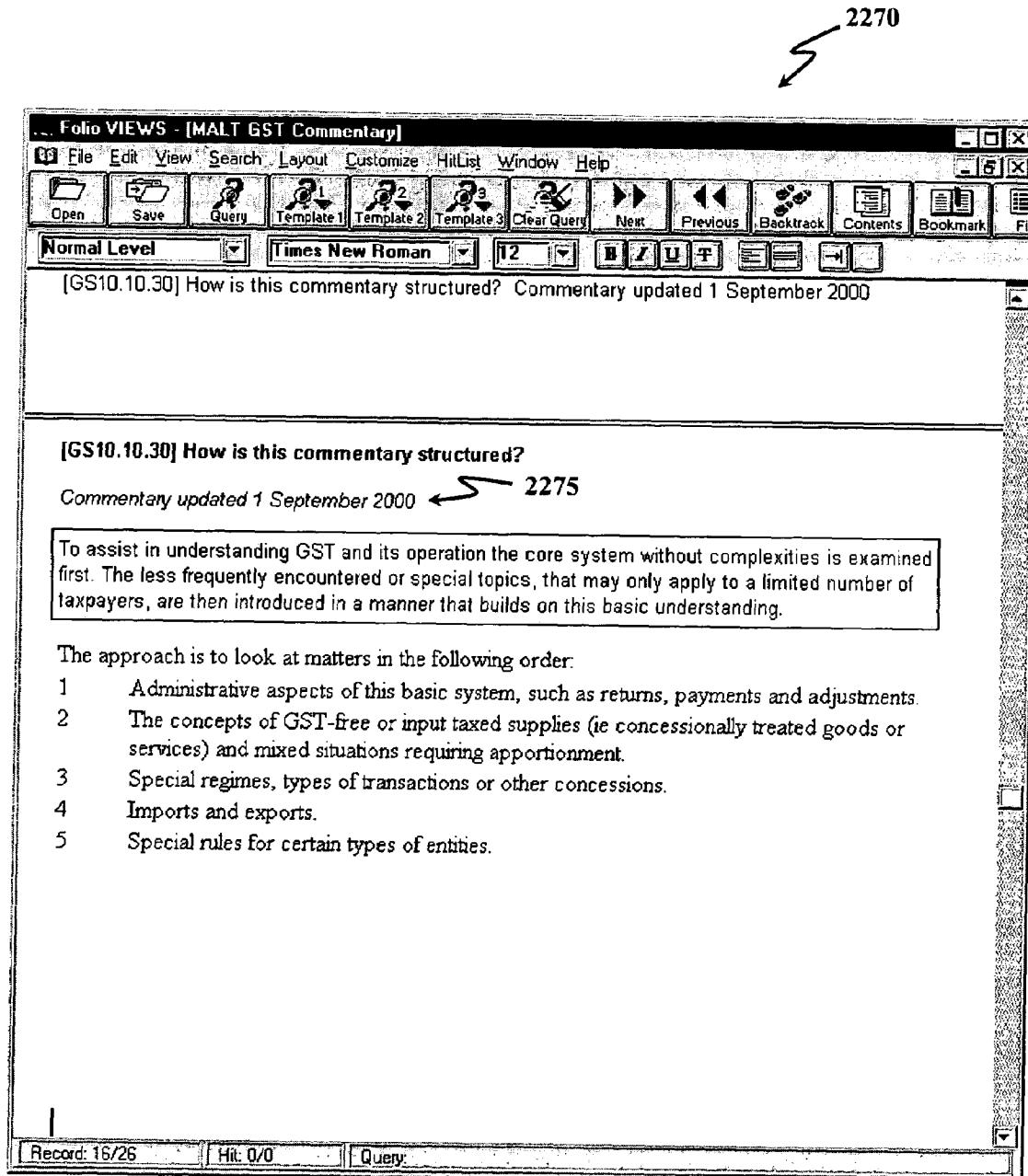


Fig. 22B

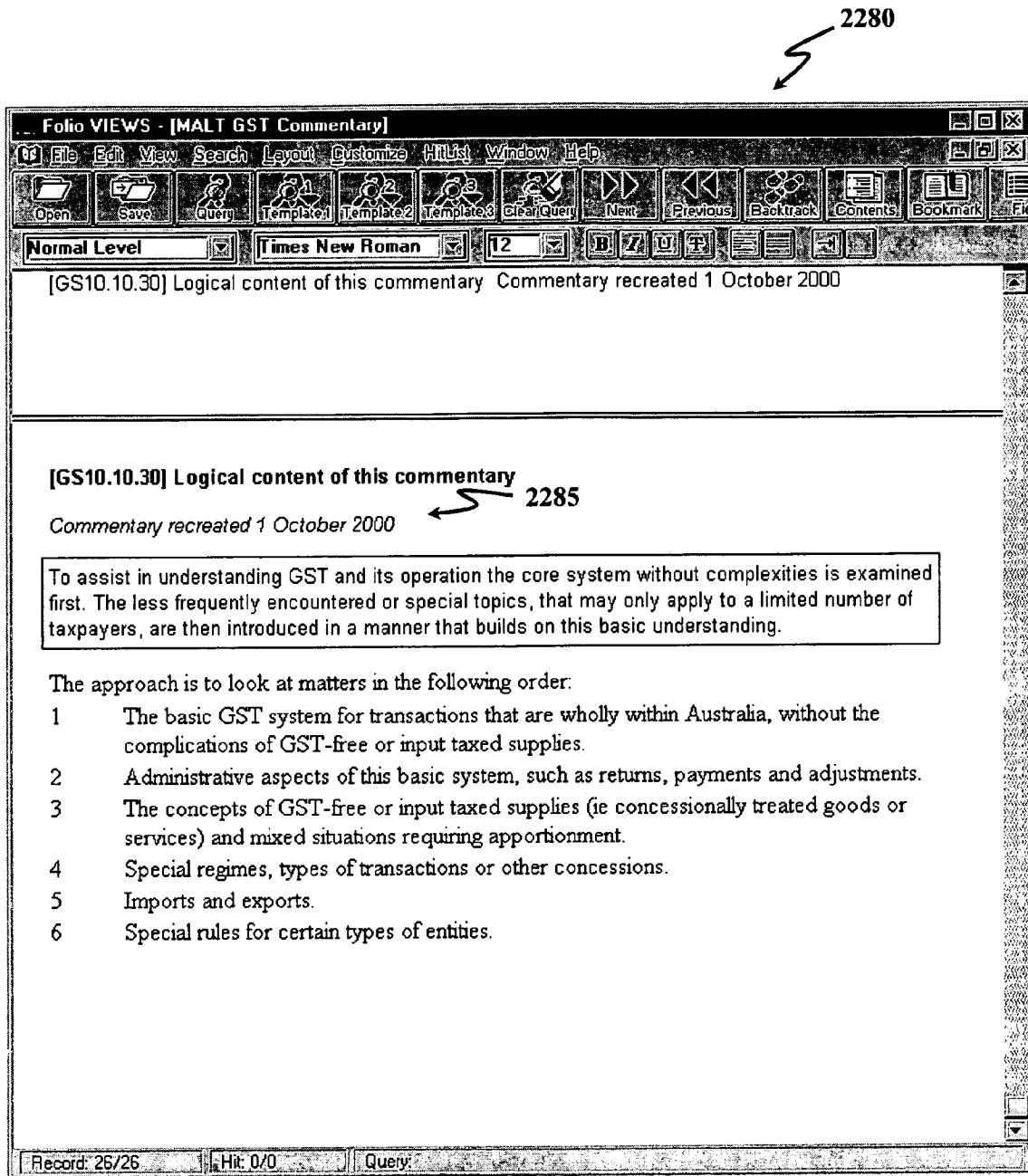


Fig. 22C

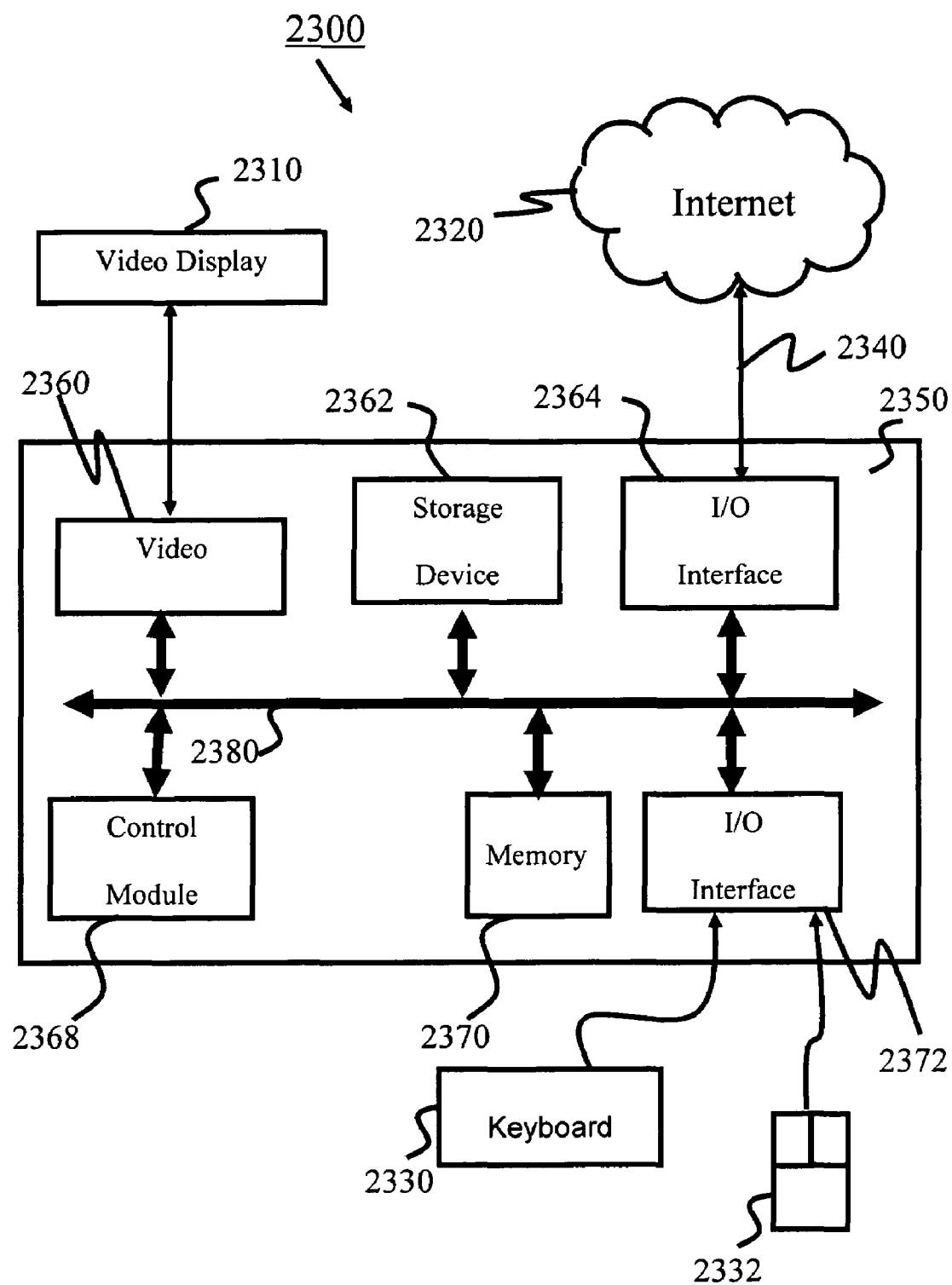


FIG. 23

MALTWEB MULTI-AXIS VIEWING INTERFACE AND HIGHER LEVEL SCOPING

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. application Ser. No. 09/108,999, filed on Jul. 1, 1998, now U.S. Pat. No. 6,233,592, which is a continuation of International Application No. PCT/AU1998/000050, filed Jan. 30, 1998, which designated the United States and was published in English, and which claimed priority to Australian Application No. P04892, filed on Jan. 31, 1997. These applications are incorporated by reference herein.

FIELD OF THE INVENTION

The present invention relates to an electronic publishing system, and in particular to an electronic publishing system for the delivery of information which is not limited as to storage space and is not governed by predetermined pathways.

The present invention relates generally to an electronic publishing system and, in particular, to aids for navigating in an electronic publishing system and a method of organising data in an electronic publishing system.

BACKGROUND

Conventionally, information is published in document form as a printed publication, or in electronic form but again using the document or book metaphor. In the past, the concept of a "multidimensional space" in electronic publishing has been intuitively understood (that is, instinctively desired). However, a comprehensive display, discussion or treatment has been rejected by publishers and information providers as too difficult to develop and manage. Instead, publishers and information providers have managed large amounts of data:

- (1) by limiting the size or coverage of the information space; and
- (2) by setting or predetermining the path through that information space.

The effect of this is clearest when the dimension of time is considered. The conventional approach to information storage and publishing is centred on the notion that information is either "current information" (ie, present day) or "historical information" (ie, the day before the present day and all days prior to that). Thus, information is traditionally retained (stored) and/or published (sold) as either current or historical information.

The effect of this has been to leave the end user with a collection of non-integrated repositories and many additional tasks to do before the information is useful to them. For example, the end user is required to:

- (1) make most of their own connections between related pieces of information;
- (2) do their own analysis of the type and subject of information they require or are seeking; and
- (3) find information appropriate to the point in, or period of, time with which they are concerned.

To illustrate the disadvantages of conventional publishing systems, an example of using such conventional techniques and publishing systems to research information is provided. If a person were interested in information regarding the powers of the Secretary under Australian legislation with respect to couples in a family relationship, when and how

the Secretary is restricted, and what did the relevant legislation provide prior to that, the person would refer to relevant legal information, which is the Social Security legislation of the Commonwealth of Australia. The relevant provisions are set forth in Appendix A under the heading "Example Research". This would be determined by the end user's own knowledge of the broad subject and/or reference to secondary material.

The relevant legislative provision is Section 4, which in 10 conventional electronic legal publishing systems might be found by looking for words or phrases such as "family", "family relationships", and "family relationships" AND "social security", where AND is a logical operator.

Once the above is established, it can be seen from the 15 information found that Section 4 of the Social Security Act, as at Sep. 8, 1996, has been amended ten times (see Appendix A: A1. AMENDMENTS TO SECTION AT Sep. 08, 1996).

There is however nothing in the current Commonwealth 20 Government Reprint, in either the electronic or print versions (see heading EXAMPLE RESEARCH of Appendix A), that allows the end user to see the text of those amendments or what part(s) of Section 4 were changed by them.

25 Thus, unless the end user is prepared to refer to many statute books, reading each piece of text against another, the end user is not able to see easily or reliably what section 4 looked like before it was amended by any one of a number of prior amending Acts. However, if the end user has a library complete enough to provide access to the prior amending Acts, the person would eventually determine that Act No 105 of 1995 is the relevant amending Act.

Further, it should be noted that, while the Commonwealth Government Reprint indicates that the Social Security Act 30 was amended by Act No 105 of 1995, it does not indicate what section or schedule in Act No 105 of 1995 actually amended Section 4. This again requires the end user to have access to the amending Acts themselves and renders the information provided by the Reprint as to commencement 35 (see Appendix A: B. COMMENCEMENT INFORMATION FOR ACT NO 105 OF 1995 CONTAINED IN REPRINT) of little utility without a copy of the amending Act No 105 of 1995 from which it can be established that Section 14 of Act No 105 amended Section 4 of the Social Security Act 40 with respect to powers of the Commissioner (see Appendix A: D. AMENDING ACT 1995 NO 105 AMENDING SECTION 14).

Eventually, the required information can be found but 45 several pieces of information need to be searched by the end user. This is an arduous, time consuming, tedious and complex task that must be manually repeated for each research topic and if the same search is to be carried out again.

Conventional publishing systems, including electronic 50 publishing systems that typically are speeded-up, paper-based publishing systems, are based on a book-metaphor. The smallest piece of information used by such conventional publishing systems is either (I) an Act or Regulation (in the case of reprints, a whole Act or Regulation is printed again), or (II) a word. Typically, conventional publishing systems choose a word as the smallest piece when legislation is amended. To track such amendments, a lawyer or their 55 assistant may actually use scissors to cut and paste pieces of legislation or the publisher cuts and pastes each word electronically. If a whole Act or Regulation is tracked as in (I) above, it is necessary to store each new version of an Act or Regulation in its entirety.

This has a number of consequences, including:

- a) only a few versions of each Act or Regulation are stored;
- b) the end user rarely searches more than one reprint at a time;
- c) it is very difficult to know which particular section or schedule has changed, to track how that particular section or schedule has changed, to find the relevant section of the Amending Act or Regulation that effected the section or schedule as shown in the reprint;
- d) if multiple changes have occurred on a particular section or schedule between reprints, the latest version of the section or schedule can only be seen in the reprint;
- e) issues like commencement of the latest version of a particular section or schedule and so-called "Application, Saving or Transitional Provisions" are difficult to recreate; and
- f) it is difficult to come to a full understanding of the legislation by means of the reprints.

If every single word is tracked, as in (II) above, a level of complexity results that is difficult to administer and maintain without a large number of errors. For example, some legislative sections and schedules are amended several times annually.

Table 1 provides an example where Section 6 of the Income Tax Assessment Act has been amended 70 times:

TABLE 1

S. 6	am. No. 88, 1936; No. 30, 1939; No. 50, 1942; No. 3, 1944; No. 6, 1946; No. 44, 1948; No. 48, 1950; No. 1, 1953; No. 65, 1957; No. 55, 1958; No. 85, 1959; Nos. 18 and 108, 1960; No. 17, 1961; No. 69, 1963; No. 110, 1964; No. 103, 1965; No. 85, 1967; Nos. 4, 60 and 87, 1968; No. 93, 1969; No. 54, 1971; Nos. 51 and 164, 1973; No. 216, 1973 (as am. by No. 20, 1974); No. 126, 1974; Nos. 80 and 117, 1975; Nos. 50, 143 and 205, 1976; Nos. 87 and 172, 1978; No. 27, 1979; No. 24, 1980; Nos. 108 and 154, 1981; No. 103, 1983; Nos. 47 and 123, 1984; No. 168, 1985; Nos. 41, 48, 52 and 154, 1986; No. 138, 1987; Nos. 73, 97, 105 and 107, 1989; Nos. 20, 35 and 135, 1990; Nos. 4, 5, 100 and 216, 1991; Nos. 80, 98 and 224, 1992; Nos. 17, 18, 57 and 82, 1993; Nos. 138 and 181, 1994; Nos. 5 and 169, 1995
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It is both difficult and impractical to store the complete amendment history of every word and phrase within section 6. Trying to track all changes on such a detailed level leads to unmanageable complexity.

Largely, the split between historical and present information has come about because of the publishing and information industry's own development, and not because such is the desired or best way to manage information. Thus, a need clearly exists for an electronic publishing system that can overcome one or more of the disadvantages of conventional techniques and systems.

International Publication No. WO 98/34179 (PCT/AU98/00050), corresponding to U.S. patent application Ser. No. 09/108,999, is incorporated herein by cross reference and discloses an electronic publishing system that provides a sparse multidimensional matrix of data using a set of flat file records. In particular, the computer-implemented system publishes an electronic publication using text-based data. Predefined portions of the text-based data are stored and used for the publication. At least one of the predefined portions is modified, and the modified version is stored as well. The predefined portion is typically a block of text, greater in size than a single word, but less than an entire document. Thus, for example, in the case of legislation, the predefined portion may be a section of the Act. Each predefined portion and the modified portion(s) are marked

up with one or more links using a markup language, preferably SGML or XML. The system also has attributes, each being a point on an axis of a multidimensional space for organising the predefined portions and the modified portion(s) of the text-based data. This system is simply referred to as the Multi Access Layer Technology or "MALT" system hereinafter.

Existing methods of navigating electronic publications have been derived from traditional methods used to navigate 10 printed publications. Typical of these methods is the use of a bookmark, which is merely an indicator which identifies a page or section of interest. Bookmarks are typically limited in the information provided to users. Bookmarks follow a single axis, perhaps indicating the current page, chapter and 15 title of the publication. However, bookmarks do not necessarily provide the user with adequate context pertaining to how the user arrived at the current page. If a user knows the exact publication desired and then navigates through the same publication, a bookmark is probably adequate for the user's needs. In the event that the user has conducted a number of searches and trawled through various versions of different documents to arrive at the current page of a publication, it is impossible for a bookmark to capture all the relevant information and provide the user with an adequate 20 reading context. The book metaphor fails to address the reading and complexities of electronic publications.

Existing methods of navigating compact disc based publications and Internet sites are typically ill-suited to displaying the complex data provided by MALT. Known web solutions, for example, typically handle two axes, sequential and hierarchical, using either embedded links such as Previous, Next and Contents, or expandable content frames, as provided in Windows Explorer. Further axes may be handled by incorporating embedded links in the body of the text. 25 Such embedded links are point to point, and provide limited navigational value to the user.

Object databases are capable of providing the required 30 functionality, but search queries employed by these databases are too complicated for untrained users, both in terms of the complexity and amount of information required.

Thus, a need clearly exists for a detailed context to be 35 provided to users of electronic publishing, overcoming one or more disadvantages of existing systems.

SUMMARY

In accordance with a first aspect of the invention, there is 40 provided a system for publishing electronic information, comprising:

a plurality of predefined portions of data with each predefined portion being encoded with at least one linking means, and, for each predefined portion, the each predefined portion is stored and, where such predefined portion has been modified, each such modified predefined portion is stored; and

a plurality of attributes, each attribute being a point on an axis of a multidimensional space for organising the data.

In accordance with a second aspect of the invention, there is 45 provided a recording medium for publishing electronic information, comprising:

a plurality of predefined portions of data with each predefined portion being encoded with at least one linking means, and, for each predefined portion, the each predefined portion is stored and, where such predefined portion has been modified, each such modified predefined portion is stored; and

a plurality of attributes, each attribute being a point on an axis of a multidimensional space for organising the data.

In accordance with a third aspect of the invention, there is provided a method for publishing electronic information, comprising:

providing a plurality of predefined portions of data with each predefined portion being encoded with at least one linking means, and, for each predefined portion, the each predefined portion is stored and, where such predefined portion has been modified, each such modified predefined portion is stored; and

providing a plurality of attributes, each attribute being a point on an axis of a multidimensional space for organising the data.

According to a first aspect of the invention, there is provided a method of navigating in a multidimensional space having three or more dimensions. The method includes the steps of:

displaying in a first display region a selected predefined portion of an electronic publication formed from predefined portions of text-based data encoded using a markup language, each predefined portion having at least one attribute being a coordinate of an axis of the multidimensional space, wherein logical connections among the predefined portions, and any logical connections between the predefined portions and predefined portions of any further electronic publication data in the multidimensional space, correspond to one or more axes of the multidimensional space;

displaying a point on a primary axis of the multidimensional space dependent upon an attribute of the displayed predefined portion;

displaying a second point on a second, viewing axis orthogonal to the first axis, the second point being derived from the first point dependent upon a logical connection between the displayed predefined portion and a predefined portion associated with the second point; and

displaying information regarding the second point of the second axis in a second display region, the first and second points being displayed in two display regions.

According to a second aspect of the invention, there is provided a method of navigating in a multidimensional space having three or more dimensions, the multidimensional space containing an electronic publication formed from predefined portions of text-based data encoded using a markup language. The method includes the steps of:

providing a view comprising at least two anchor sets;

displaying at least one base point and at least a first axis depending from the base point;

displaying at least one of a further point and an axis derived from the base point;

navigating a multidimensional space formed by the points and axes;

returning to the base point when required; and

adjusting the view so a current view point becomes a new base point.

According to a third aspect of the invention, there is provided an apparatus for navigating in a multidimensional space having three or more dimensions. The apparatus includes:

a device for displaying in a first display region a selected predefined portion of an electronic publication formed from predefined portions of text-based data encoded using a markup language, each predefined portion having at least one attribute being a coordinate of an axis of the multidimensional space, wherein logical connections among the predefined portions, and any logical connections between the predefined portions and predefined portions of any further electronic publication data in the multidimensional space, correspond to one or more axes of the multidimensional space;

ther electronic publication data in the multidimensional space, correspond to one or more axes of the multidimensional space;

a device for displaying a point on a selected axis of the multidimensional space dependent upon an attribute of the displayed predefined portion;

a device for displaying a second point on a second, viewing axis orthogonal to the selected axis, the second point being derived from the first axis at the first point dependent upon a logical connection between the displayed predefined portion and a predefined portion associated with the second point; and

a device for displaying information regarding the second point of the second axis in a second display region, the first and second points being displayed in two display regions.

According to a fourth aspect of the invention, there is provided an apparatus for navigating in a multidimensional space having three or more dimensions, the multidimensional space containing an electronic publication formed from predefined portions of text-based data encoded using a markup language. The apparatus includes:

a device for providing a view comprising at least two anchor sets;

a device for displaying at least one base point and at least a first axis depending from said base point;

a device for displaying at least one of a further point and an axis derived from the base point;

a device for navigating a multidimensional space formed by the points and axes;

a device for returning to the base point when required; and

a device for adjusting the view so a current view point becomes a new base point.

According to a fifth aspect of the invention, there is provided a computer program product having a computer readable medium having a computer program recorded therein for navigating in a multidimensional space having three or more dimensions. The computer program product includes:

a computer program code module for displaying in a first display region a selected predefined portion of an electronic publication formed from predefined portions of text-based data encoded using a markup language, each predefined portion having at least one attribute being a coordinate of an axis of the multidimensional space, wherein logical connections among the predefined portions, and any logical connections between the predefined portions and predefined portions of any further electronic publication data in the multidimensional space, correspond to one or more axes of the multidimensional space;

a computer program code module for displaying a point on a primary axis of the multidimensional space dependent upon an attribute of the displayed predefined portion;

a computer program module for displaying a second point on a second, viewing axis orthogonal to the first axis, the second point being derived from the first point dependent upon a logical connection between the displayed predefined portion and a predefined portion associated with the second point; and

a computer program code module for displaying information regarding the second point of the second axis in a second display region, the first and second points being displayed in two display regions.

According to a sixth aspect of the invention, there is provided a computer program product having a computer readable medium having a computer program recorded therein for navigating in a multidimensional space having three or more dimensions, the multidimensional space con-

taining an electronic publication formed from predefined portions of text-based data encoded using a markup language. The computer program product includes:

a computer program code module for providing a view comprising at least two anchor sets;

a computer program code module for displaying at least one base point and at least a first axis depending from said base point;

a computer program code module for displaying other points, axes or both derived from said base point;

a computer program code module for navigating a multidimensional space formed by said points and axes;

a computer program code module for returning to said base point when required; and

a computer program code module for adjusting the view so a current view point becomes a new base point.

According to a seventh aspect of the invention, there is provided a method of publishing an electronic publication formed from predefined portions of text-based data encoded using a markup language. The method includes the steps of:

storing predefined portions in terminal nodes; and

providing one or more higher level nodes for organising the terminal nodes to correspond with a hierarchical structure embodied in the electronic publication, wherein each higher level node consists of the identity of a parent node, a position indicator for the higher level node, and an identifier;

wherein one of the higher level nodes has a null parent identity, and the position indicator indicates a position of the higher level node relative to a sibling node.

According to an eighth aspect of the invention, there is provided an apparatus for publishing an electronic publication formed from predefined portions of text-based data encoded using a markup language. The apparatus includes:

a device for storing predefined portions in terminal nodes; and

a device for providing one or more higher level nodes for organising the terminal nodes to correspond with a hierarchical structure embodied in the electronic publication, wherein each higher level node consists of the identity of a parent node, a position indicator for the higher level node, and an identifier;

wherein one of the higher level nodes has a null parent identity, and the position indicator indicates a position of the higher level node relative to a sibling node.

According to a ninth aspect of the invention, there is provided a computer program product having a computer readable medium having a computer program recorded therein for publishing an electronic publication formed from predefined portions of text-based data encoded using a markup language. The computer program product includes:

a computer program code module for storing predefined portions in terminal nodes; and

a computer program code module for providing one or more higher level nodes for organising the terminal nodes to correspond with a hierarchical structure embodied in the electronic publication, wherein each higher level node consists of the identity of a parent node, a position indicator for said higher level node, and an identifier;

wherein one of the higher level nodes has a null parent identity, and the position indicator indicates a position of the higher level node relative to a sibling node.

According to a tenth aspect of the invention, there is provided a method of publishing an electronic publication

formed from predefined portions of text-based data encoded using a markup language. The method includes the steps of:

storing predefined portions in terminal nodes; and

providing one or more higher level nodes for organising the terminal nodes to correspond with a hierarchical structure embodied in the electronic publication, wherein each higher level node consists of the identity of a parent node, a position indicator for the higher level node, and an identifier, the predefined portion includes text associated with a commentary, and a scope including a start date, an end date and an update date, the update date being later than the start date and earlier than the end date;

further wherein one of the higher level nodes has a null parent identity, and the position indicator indicates a position of the higher level node relative to a sibling node.

Other aspects of the invention are also disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

20 A small number of embodiments of the invention are described with reference to the drawings, in which:

FIG. 1 illustrates a grid of a multidimensional space according to the first embodiment;

FIG. 2 illustrates the effect of the various axes;

25 FIG. 3 illustrates the mapping of various axis intersection points, or nodes, that is used to organize, present, and find information (present and past) according to the first embodiment;

FIG. 4 illustrates the application of legal information to mapped nodes according to the first embodiment;

FIG. 5 is a block diagram illustrating a general purpose computer that can be used to implement the electronic publishing system according to the first embodiment;

FIG. 6 is a flow diagram illustrating the method of electronic publishing according to the first embodiment; and

FIGS. 7 to 17 are screen shots illustrating operation of the first embodiment as a software application executing on a general purpose computer.

40 One or more embodiments of the present invention are described hereinafter with reference to the drawings, in which:

FIG. 18 is a screen shot of a Normal axis view of a MALT publication (with a search mode enabled) in accordance with an embodiment of the present invention;

FIG. 19 is a screen shot of a Versions axis view of a MALT publication in accordance with an embodiment of the present invention;

FIG. 20 is a screen shot of a Source axis view of a MALT publication in accordance with an embodiment of the present invention;

FIG. 21 is a block diagram representation of higher level scoping in accordance with an embodiment of the present invention;

55 FIGS. 22A, 22B and 22C are screen shots illustrating a commentary in accordance with a further embodiment of the invention; and

FIG. 23 is a computer program product block diagram.

DETAILED DESCRIPTION

The present invention is directed towards a system of electronic publishing that can overcome the disadvantages of conventional information publishing, both in print and electronic form. The present invention reduces, if not eliminates, end user problems with conventional information publishing including:

- (1) the connectivity between related pieces of information;
- (2) analysis of the type and subject of information; and
- (3) finding information appropriate to the point in time with which they are concerned.

Overview of Embodiments

The embodiments of the invention provide an entirely new way of delivering, storing and publishing information. The embodiments allow publishers to add an arbitrary number of logical connections to a set of data, and even permit the publisher to display the precise evolution of that data set over time. This can be done without getting bogged down in the complexity of the logical connections and without limit as to storage space.

Frequently, people desire to have more "information" available. However, with the advent of the Internet and new technology, many people suffer from information overload. The embodiments of the invention provide an easy and effective way to navigate large complex volumes of information.

Conventionally, information may only contain very rudimentary (i.e., haphazard hyperlinks) or non-existent logical connections. Thus, conventional techniques of investigating how a set of data has evolved and changed over time can only be done for small data sets and are very expensive.

However, with the embodiments of the invention, it is possible to list all logical connections within a data set no matter how complex those connections may be. The embodiments of the invention and the principles of those embodiments described hereinafter can be applied to many different types of information such as medical, scientific, pharmaceutical, etc. For ease of description, however, the embodiments are set forth in relation to legal information.

Conventionally, legislation is often purchased in two ways: (1) The individual Numbered Acts and Regulations that give each piece of legislation as it is passed; and (2) Consolidated legislation that provides the latest consolidated version.

In the embodiments of the invention, legislation is stored using every version of each Act or Regulation. The end user can search every version of any section, schedule, or provision. For example, the required version of a section is immediately available as is the opportunity to view every preceding and subsequent version of the same section. Also, links are available to any relevant amending legislation commencing that change, as well as the one that repealed it. Relevant Application, Saving or Transitional Provisions can also be easily accessed.

In this manner, it is possible to come to a full understanding of the legislation just by looking at the data provided through the embodiments of the invention. In contrast, using conventional techniques, it would have been impossible or very hard, expensive and time consuming to do so.

Using conventional means, a person wishing to view a particular section of a particular Act (e.g., the Income Tax Assessment Act) as of a particular date (e.g., 30th Jun. 1996), a significant amount of work would be required to do so. The end user would need to track all Amendments since the last reprint of the legislation, which may take a long time and involve referring to many volumes. This may even possibly involve using scissors and paste to actually cut and replace words. Even to figure out which Acts amended a particular section and to trace those commencement dates can be difficult, time consuming and trying. However, a piece of research that may have taken an experienced

researcher days or even weeks can be accomplished in minutes using the embodiments of the invention.

The ability to move through information in time is outlined above. The embodiments of the invention also give additional flexibility and SCOPE to the end user. Further dimensions and interconnections may include: type, jurisdiction, subject, depth.

Some examples are:

- 1 Doing research on the subject evidence at depth confession for types Acts and Case for time period 12 months.
- 2. Doing research on type cases within jurisdictions NSW and Queensland subject murder and depth statutes dealing with subject.

The ability to associate the relevance and interconnection contained within the information is highly advantageous to the end user.

A key aspect of the embodiments of the invention in successfully providing a multi-dimensional repository of information has been in deciding the "optimum storage unit". In the past publishers have chosen to either store new versions of the entire Act (too big) or new versions of each and every change, in a method similar to red lining (too complex). The first aspect of the invention was to analyse the data and choose to store every version of every section or provision level of legislation.

Structured Generalised Markup Language (SGML) is a recognised way to mark up data. SGML allows logical structure to be added to a document (unlike HTML and word processors which only allow the addition of visual content). SGML alone is not enough to deal with text-based data that contains a highly complex logical structure. The complexity increases exponentially until the complexity cannot be managed any more. Large legal publishers have stored their data in SGML, but those legal publishers that are successful in dealing with their SGML-based data have purposely kept their markup as simple as possible. When such publishers have tried to encode a complex structure on text-based data their costs of creating the data set and maintaining the data set simply went through the roof, and it became impossible to maintain the integrity of the data set.

In contrast, the embodiments of the invention allow SGML data to be encoded with a much more complex structure whilst remaining manageable. Alternatively, Extensible Markup Language (XML) may be used. For example, with SGML it is possible to encode all 71 versions of Section 6 of the Australian Federal Income Tax Assessment Act in a single file (that Act has about 6,000 sections) but this would be utterly unmanageable when applied to the 6,000 other sections of the Income Tax Assessment Act. It becomes even more unmanageable if anybody would try to use the above method on all the sections within all other Acts and Regulations of the Commonwealth. A significant problem with using SGML, even well executed SGML, is that it is possible to quickly get bogged down in unmanageable levels of complexity. The embodiments of the invention have overcome these problems.

Another key aspect of the invention is the use of database technologies in the management of the SGML encoded techniques. Database technology provides a large number of ready tools to deal with complex structured data. The embodiments combine these technologies (SGML, XML and database technologies) in an advantageous manner.

In the past, traditional publishers have been limited by the size and speed of available storage systems. Only a limited amount can be reproduced in paper and until recently hard

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disk costs prohibited the storing of multiple gigabytes of data, for both publishers and clients alike.

The embodiments of the invention have the ability to look at situations from a new and up-to-date view point and therefore come up with innovative conclusions that can be radically different to processes employed in the past.

Thus, the embodiments of the invention provide a new computer publishing system that changes the availability of electronic information from being merely "speeded up paper" to being electronic information taking advantage of new electronic media by providing users with enhanced functionality of data retrieval and manipulation. The information included in the electronic format is of a publishable standard, meets cost constraints and is able to be accessed under any combination of dimensions from the multi-dimensional space (Acts, cases, time, jurisdiction, subject). The publishing system facilitates-continual updates to the data contained in the databases, without any adverse effects on the operating capabilities that make the publishing system unique. Due to the extra functionality, the publishing system is also designed in such a way that it can still be made available in as many different electronic media as possible, and all search functions are able to operate in a time-efficient manner.

The embodiments of the invention organize, process and present information in a way that is significantly different than conventional structures, processes and presentation. They provide an information storage and publishing system, and in particular, an information storage and publishing system that stores and manages large and comprehensive amounts of information (eg, legal information).

Publication data, being preferably legal information, is encoded using Standard Generalized Markup Language (SGML) or Extensible Markup Language (XML) which adds codes to the publication data and provides functionality to the data. The publication data is processed as a plurality of predefined portions, which in the case of legislation is preferably at the section, schedule level, or provision level. A hierarchy of divisions of the legislation may be implemented. For each of the predefined portions, the system stores a copy of the predefined portion and a modified predefined portion in the first database whenever it is changed. A second (relational) database is preferably provided that comprises plural attributes for managing the information of the first database, with each attribute being a point on an axis of a multidimensional space for organising the data for publication. Alternatively, a single repository of information may be practised as described with reference to the second embodiment.

The system enables the first database to be searched for one of the predefined portions of the publication data using attributes of the second database by following one or more pathways through the multidimensional space. The plurality of attributes are connected to by the plurality of links. Once the desired predefined portion is located, the predefined portions can be retrieved using the attributes to define a point in the multidimensional space.

Preferably, the system implements, *inter alia*, time-based legislation in which sections of legislation that have been amended are not discarded and replaced with the current provision only as of the publication date. Instead, each version of an amended section is retained in the first database. Thus, the systems according to the embodiments of the invention are particularly advantageous in that legal information is published so that a user can obtain such sections or provisions at a particular time point.

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The embodiments advantageously divide information into "suitably" small pieces (or blocks) of text, each of which is a predefined portion of data, and add to each piece of text, either expressly or implicitly, a number of attributes (characteristics or descriptors). The suitability as to size of text pieces is determined by an analysis of the information and its naturally occurring structure based on knowledge of how the information is used and consumed by the end user.

This makes it possible to locate each piece or block of text 10 at a particular point in a "multidimensional space" using as coordinates the attributes added to the piece or block of text. Multidimensional space refers to an area not having boundaries and that is capable of, or involves, more than three dimensions.

FIG. 1 illustrates a multi-dimensional space 100 as used 15 in embodiments of the invention. The multidimensional space is represented by a layered grid. The diagram represents axes or pathways as vertical and horizontal lines; in reality (in the case of more than two dimensions), they are 20 at all angles and inclines.

Referring to FIG. 2, the ability to locate (assign) or map 25 each node 102 (or key intersection point of the various axes or pathways) is a significant functional aspect of the embodiments of the invention. This mapping is explained further hereinafter. With such coordinates 102 known (located or mapped), it is possible to move easily between points in the multidimensional space 100.

The effect of mapping nodes as shown in FIG. 3 is that a 30 course 320 through the information represented in the three-dimensional space 100 can be easily plotted. The user begins the course 320 at node 302 and progresses vertically downward to the fourth node 304. Further, the plotted course 320 is flexible to the extent of the relationships a user chooses to 35 follow or seek out.

First Embodiment

A first embodiment of the invention provides information management in the multidimensional space and allows 40 movement along different axes or "pathways":

location of the information (its address);
type of information (its genesis);
jurisdiction (its class);
subject (its content description);
45 depth (extent of content); and
time (the point in time at which the information is viewed).

In the first embodiment, coding of information or data for 50 publication is based on SGML or XML and one or more specifically developed Document Type Definitions (DTD), which preferably is specifically designed for legal information. Alternatively, in the case of XML, a Style Sheet Mechanism (SSM) may be used. This coding can then be related back to information retained in a specifically developed 55 database that enables the code information to be managed and updated. For a detailed description of this aspect of the invention, reference is made to Appendix C. The DTDs according to the first embodiment are set forth in detail in Appendix B. A DTD is used to define the structure 60 of publication data, preferably being legislation, down to a comprehensive level. This is done by using information coded in conjunction with any one of a number of off-the-shelf, free-text retrieval software packages (eg, Folio Views or Dynatext) to deliver the information to the end user.

65 A DTD describes the markup for the SGML publication data, or "repository", which may contain legislation, case law, journal articles and other types of material that are

stored in computer files. The files contain publication data in text form and the markup, which is extra information about the text included with the text. An example of a markup is '<BD+>' which indicates that "the data from this point on is bold". A further example is

'<SECTION ID="CWACT-19950104-SEC-1" LBL="1">'. This markup indicates that: the data from this point on is part of a section of legislation; the section has an identifier of CWACT-19950104-SEC-1; and the section has a label of "1".

There are a number of different ways to add markup to data. The first embodiment adds markup to data using SGML. Alternatively, XML may be used. Still further, in the case of XML being used, an SSM may be used. Even within SGML, there are many ways to add markup to text. Each particular way of adding markup within SGML is described by using a DTD. In the first embodiment, the data for publication is marked up using a number of different DTDs. In particular, the DTDs are used to mark up the logical structure of the legislation, case law or journal articles. Significant amounts of information about the data for publication is stored in the markup. For example, the markup '<SECTION ID="CWACT-19950104-SEC-1" LBL="1">' provides the following information: the data is a piece of Commonwealth of Australia legislation (indicated by 'CW' at the beginning of the string); the section is part of an Act ('ACT' after 'CW') and not a regulation; the act is Act No. 104 of 1995 ('19950104' in the middle of the string), the data is a Section ('SEC') within the Act; and it is Section 1 ('1' at the end).

The preparation of such DTDs necessitates that the author has a sound knowledge of the data that will be marked up using the DTD. It is especially important that the underlying structure of the data to be marked up using the DTD be understood. The process of becoming acquainted with the structure of the data to be marked up is referred to herein-after as "content analysis".

In particular, the section-level or schedule-level portion of legislation is used in the first embodiment. That is, the section-level portion is preferably the predefined portion of the publication data, which is the smallest piece of information to be tracked. This is unlike conventional publishing systems. For example, with reference to Table 1, the first embodiment stores every version of Section 6. In this manner, complexity (tracking every word) is reduced by increasing storage. However, unlike example (I) of conventional publishing systems, the first embodiment does not lose any pertinent information:

- a) every version of each Act or Regulation is stored;
- b) the end user can search every version of any section or schedule at the same time;
- c) it is easy to know which particular section or schedule has changed, to track how that particular section or schedule has changed, and to find the relevant section of the Amending Act or Regulation that affected the section or schedule;
- d) if multiple changes have occurred on a particular section or schedule, every version of the section or schedule can be seen;
- e) issues like commencement of the latest version of a particular section or schedule and so-called "Application, Saving or Transitional Provisions" can easily be recreated;
- f) it is possible to come to a full understanding of the legislation just by looking at the data provided through the first embodiment.

A further advantage of tracking every version of each section or schedule is that it is possible to store some of the information, not in the markup, but in a database, as noted hereinbefore. This simplifies the updating process.

5 While SGML is a powerful way of storing information, it is not a retrieval medium. Therefore, the stored information needs to be converted into a format that the end user of the information can access. The first embodiment uses an electronic format for retrieval. For this electronic retrieval, a 10 software application called 'high-end text retrieval software' is used. Examples of high-end, text-retrieval software applications include Folio Views and Dynatext. In the first embodiment, Folio Views is used.

Folio Views has its own proprietary markup language, 15 which is not part of the SGML family. A complete guide to the Folio Views markup language is provided in the text Folio Views Infobase Production Kit Utilities Manual, Version 3.1, Provo, Utah: Folio Corporation (1 Jun. 1994). Storing the data for publication in SGML allows other 20 retrieval software applications besides Folio Views to be used.

In the first embodiment, a process is implemented to 25 convert the SGML marked-up data into the format used by the retrieval software application. The example given for Folio Views hereinafter is but one example of the process involved. The conversion program basically maps the SGML markup to Folio Views markup. For example, for the SGML markup '<SECTION ID="CWACT-19950104-SEC-1" LBL="1">', the conversion process marks all ID's substantively unchanged as Jump Destinations (JD's): 30 '<JD:="CWACT-19950104-SEC-1">'.

A Keying Guide for Australian Legislation Documents with instructions for the conversion process to Folio Views 35 added is provided in Appendix D.

Movement through legal information can be as follows (the flexibility and scope is largely up to the end user):

- 35 (1) doing research on the subject of fences and boundaries at the depth fences that are hedges looking for types Acts and Regulations in jurisdictions NSW and Victoria for the time period last 20 years;
- (2) doing research on the subject evidence at depth confession for types Acts and cases for time period last 12 months;
- (3) doing research on type cases with jurisdictions NSW and Queensland, subject murder and depth statutes dealing with subject.

The application of legal information to mapped nodes is 40 shown in FIG. 4. However, this is only one of numerous possible applications. Information from medical, technical and scientific areas are all open to the application of this invention. This diagram substitutes the technical terminology of FIG. 3 with legal terms to show the way information appears according to the first embodiment. Further, FIG. 4 45 provides an example of how legal information is navigated by an end user. The user may be seeking information on the following matters:

- 45 (1) Does NSW legislation on fences presently cover hedge rows between the boundary of a private property and a public road?
- (2) If not, have such hedge rows ever come under NSW legislation?
- (3) Are there any cases under current law or previous law?
- (4) How have the cases been interpreted?

Some general assumptions are made about legal information 50 for the purposes of this example. Broadly, legal information has two main primary sources: statute law (including subordinate legislation), and case law. There is also second-

ary information such as commentary which can be added to aid interpretation. Each of these sources is interconnected and relevant to the other in terms of both past and present information. This may also apply to future information in terms of bills or other forms of uncommenced legislation. It is the association of this relevance and interconnection that is advantageous to the end user.

In FIG. 4, the X-, Y-, and Z-axes indicate time (Time), the legislative provision (location), and type (eg, legislation=L, cases=C, and journal articles=J). To simplify the diagram, only three axes are illustrated, however, other axes may be included dependent upon the number of dimensions of the space. In the first embodiment, the multidimensional space also includes another three axes: jurisdiction=U, subject-V, and depth=W. Thus, the space according to the first embodiment has six dimensions. In the six-dimensional case, it is possible to move along each axis and at the points of intersection change direction, as well as find and/or follow new or additional information.

The end user begins at legislation (L) along the Z-axis, where the Fences 10 and Boundaries Act is located and then selects Section 1 of legislation (indicated by L allowing the Z-axis) at node 402, as of 1 Jan. 1996. The user then follows a path in the legislation through nodes 404, 406 and 408 for Sections 2, 3 and 4, respectively, as of that same date (ie, the Y-axis), to find a definition of the term "fences". Node 408 contains Section 4 at 1 Jan. 1996 which contains the current definition of "fences". This would provide information in response to above query (1).

The user then selects Section 4 of the legislation as of 1 Jan. 1995, which in this case is an earlier version of the section prior to amendment, by moving to node 410 (along the X-axis). This provides information about the prior law for above query (2). The user can then move to other information on Section 4 as of 1 Jan. 1995 by going to nodes 412 and 414 for case and journal article information, respectively, along the Z-axis. For example, a case on the earlier Section 4 might be identified at node 412 and articles on interpretation of Section 4 at node 414. The foregoing is only one possible route through the multidimensional space of information. Other more complicated and interrelated pathways involving axes U, V and W are possible. For example, the user can move to axis U (jurisdiction) and compare the definition in Section 4 of New South Wales with that in another jurisdiction (eg, Victoria).

FIG. 6 is a flow diagram illustrating the method of electronic publishing according to the first embodiment. A data source 602, preferably for legal information, is provided. In steps 604 and 606, base data and new data are input from the data source 602, respectively, and in step 608 the data is captured. The DTDs 610 are input to step 612. The DTDs 610 include Act.DTD, Acts.DTD, Reg.DTD, Regs.DTD, and Common.ELT, which are shown in detail in Appendix B. In step 612, the DTDs 610 are applied to the captured data from step 608. In step 614, the data is coded in SGML, including the Time Base Code. In step 616, the data is consolidated. As indicated in FIG. 6, steps/items 602 to 616 comprise the (first) data conversion stage.

A data management database 620 is provided to step 618. The database is based on a master table and a textblock table (see Appendix C for further detail). The output of step 616 is also provided to step 618. In step 618, the data is consolidated; the data is stored as multiple versions, if applicable, and uses the predefined portions of data (ie, textblocks). In step 622, a filter program(s) is applied to the consolidated data to convert the data from SGML to the relevant format for the retrieval software application, includ-

ing Folio Views, DynaText, Topic, HTML, and the like. Steps/item 618 to 622 comprise the (second) data management stage.

The filtered data output by step 622 can then be provided to step 624. In step 624, the filter consolidated data is imported to the text retrieval software. In step 626, the data is provided to the delivery medium, which may include CD-ROM, DVD, tape, electronic online services, and other media. The output of this is the end user product 628. Steps/item 624 to 628 comprise the (third) product manufacture stage.

The first embodiment is preferably practiced using a conventional general-purpose computer, such as the one shown in FIG. 5, wherein processes for providing and managing the information are carried out using software executing on the computer. In particular, the legislation database, the database and the DTD(s) may be stored after a filtering process on a CD-ROM used by the computer system, and the computer system is operated using Folio View. The computer system 500 includes a computer 502, a video display 516, and input devices 518. A number of output devices, including line printers, laser printers, plotters, and other reproduction devices, can be connected to the computer 502. Further, the computer system 500 can be connected to one or more other computers using an appropriate communication channel such as a modem communications path, a computer network, or the like.

The computer 502 consists of a central processing unit 504 (simply, processor hereinafter), an input/output interface 508, a video interface 510, a memory 506 which can include random access memory (RAM) and read-only memory (ROM), and one or more storage devices generally represented by a block 512 in FIG. 5. The storage device(s) 512 can consist of one or more of the following: a floppy disc, a hard disc drive, a magneto-optical disc drive, CD-ROM or any other of a number of non-volatile storage devices well known to those skilled in the art. Each of the components 504 to 512 is typically connected to one or more of the other devices via a bus 514 that in turn can consist of data, address, and control buses.

The video interface 510 is connected to the video display 516 and provides video signals from the computer 502 for display on the video display 516. User input to operate the computer 502 can be provided by one or more input devices. For example, a operator can use the keyboard 518 and/or a pointing device such as the mouse to provide input to time computer 502. Exemplary computers on which the embodiment can be practiced include Macintosh personal computers, Sun SparcStations, and IBM-PC/ATs and compatibles.

In an alternate embodiment of the invention, the computer system 500 can be connected in a networked environment by means of an appropriate communications channel. For example, a local area network could be accessed by means of an appropriate network adaptor (not shown) connected to the computer, or the Internet or an Intranet could be accessed by means of a modem connected to the I/O interface or an ISDN card connected to the computer 502 by the bus 514. In such a networked configuration, the electronic publishing system can be implemented partially on the user's computer 500 and a remote computer (not shown) coupled over the network. The legislation database, the database and the DTD(s) can be implemented on the remote computer and the computer system 500 can be operated using Folio View.

The operation of the first embodiment is described with reference to the screen shots shown in FIGS. 7 to 17. All screen shots are derived from the first embodiment which uses Folio Views as the retrieval software. Broadly, FIGS. 7

to 15 are screen shots illustrating navigation or movement around the information. FIGS. 16 and 17 are screen shots that show search capacities.

FIG. 7 shows the opening screen 700, which the end user sees when the program is started. The interface is a standard windows interface featuring drop menus that provide access to all functions. The functions include basic searching and customised search templates such as the ones shown in FIGS. 16 and 17 that allow users to exploit time-based and multidimensional searching.

The title screen 702 is presented when the process is commenced and is the first screen. A customisable toolbar 704 is provided for searching functions. Also, drop menus 706 are provided above the toolbar 704. In the lower portion of the screen 700 contains a status bar 708 showing information relevant to searching. The Start and Main menu buttons 710 in FIG. 7 are both navigational tools. The Start button takes a new user to information providing help on how to use the invention. The Main Menu button takes the end user to the menu shown in the second screen shot of FIG. 8.

FIG. 8 shows a main selection menu 800. At this menu 800, the user can see the currency of the total information. The user is also able to make broad choices as to the type of information that the person might like to see. All items preceded by bullet points in the menu are jump links 802 which lead the user to further menus for the items selected. The jump links 802 also provide a uniform or consistent form of movement. Thus, if searching the Social Security Act, selecting the first jump link "Find an Act" takes the user to the next screen which would be the "Act Name Menu".

FIG. 9 shows the "Act Name Menu" screen 900. In this menu 900, all letter buttons are links 904 to Acts beginning with the letter selected. That is, the jump links 904 allow access to sub-menus for Acts with the corresponding selected letter. If "S" is clicked, this leads to the "Acts beginning with S" menu (see FIG. 10) where an entry linked to the most current version of the Social Security Act 1991 appears. A similar menu may be provided for Regulations. Further, locational information 902 is provided in the upper portion of the screen 900.

FIG. 10 illustrates acts beginning with "S", as selected in the screen 900 of FIG. 9. By selecting jump link 1002, the Social Security Act can be accessed. Likewise, other acts in this screen 1000 may be accessed using the respective jump link (e.g. Safety, Rehabilitation and Compensation Act).

Assuming the appropriate jump link 1002 is selected in FIG. 10, FIG. 11 shows how the beginning of the Social Security Act appears in screen 1100, and the buttons that link the user to the provisions of the Act. This is the start of the most current version of the Social Security Act preferably. From this screen, provisions of the Act can be accessed. By accessing the Table of Provisions box, the Table of Provisions menu can be accessed. FIG. 12 shows the Table of Provisions screen 1200, and illustrates how a specific provision, say Section 4, can be accessed again using links 1206. Different sections of the Act (e.g. ss 3, 4 and 6A) may be accessed as well using corresponding jump links. Again, location information 1202 is provided in the upper portion of the screen. A return button 1204 is also provided that provides access back to the beginning of the Act.

FIG. 13 shows screen 1300 containing the Time Base Toolbar 1302, which preferably provides eight buttons for accessing time based information. This Toolbar 1302 is not a feature of Folio Views, but is a designed addition added to Folio Views by the first embodiment. It is made possible by the way in which the publication data is coded. The Section

Information button 1304 takes the user to an overview of information. The Previous, Next and All buttons 1306 allows the user to have access to the previous, next and all versions of the relevant section. The Subject, Jurisdiction and Related Info buttons 1308 allow the user to view and access sections dealing with a similar subject, or similar sections in other jurisdictions, or related information such as cases and articles on or about the section. This Toolbar 1302 allows a user to cycle through previous and subsequent 10 versions of sections and as shown in screens in FIGS. 14 and 15 to refer to the text of sections amending the section. As well, the user can also call to the screen all versions of the section as one view (or display) using the "ALL" button.

FIG. 14 illustrates a screen 1400 which appears when the 15 user selects the Section information button 1402 (button 1304 in FIG. 13). The resulting popup screen illustrates the time period or date range 1404 covered by this version of section 4. It also indicates the Year and Number jump link 1406 to text of the amending act which created this version 20 of section 4.

FIG. 15 illustrates a screen 1500 which appears when the 25 user selects the previous button 1502 (not shown—it is located behind the popup screen), which corresponds to previous button 1306 of FIG. 13. This shows an earlier version of section 4 that the user can access by using the previous button 1502. The pop-up screen indicates that this 30 version covers a different time span than that shown in FIG. 14.

The screen shots in FIGS. 7 to 15 display a step-through 35 or navigation-based way of locating information. There is also the more direct approach of searching for terms using text retrieval. The screen shots in FIGS. 16 and 17 illustrate such searching provided by the first embodiment. Screen 1600 shown in FIG. 16 provides a customised search template 1602 that includes a time base option allowing a user to search for versions of a section, for example. Screen 1700 shown in FIG. 17 illustrates a customised search template 1702 for case law which includes a time base option connecting cases to legislation at a particular date, for example. Again, the ability to relate such to time and then to mix and match types of information from different sources 40 jurisdictions) is a feature provided by the coding technique used for the data and not the Folio Views software used to deliver the data to the end user.

Second Embodiment

The second embodiment stores all the information in a 45 single repository which is marked up in SGML or XML. The information is divided in that repository into suitable pieces or blocks of text (as described in the first embodiment) and any relevant markup marks up a whole suitable piece or block of text by (a) choosing suitable pieces or blocks of text, and (b) demanding that relevant markup belongs to a 50 whole suitable piece or block of text, the following becomes possible. A relational database consisting of records consisting of fields can be created with one and only one record per suitable piece or block of text where the actual text of each suitable piece or block of text is the content of one field of the above record and where each item of the markup is 55 assigned its own field in the above record.

For example, a version of Section 6 of the Income Tax 60 Assessment Act (ITAA) 1936 may be stored as a record in the above relational database. The first field of that record contains the actual text of that version of Section 6. The next field identifies it as Section 6 of the ITAA, the next field gives the date this version came into being, the next field