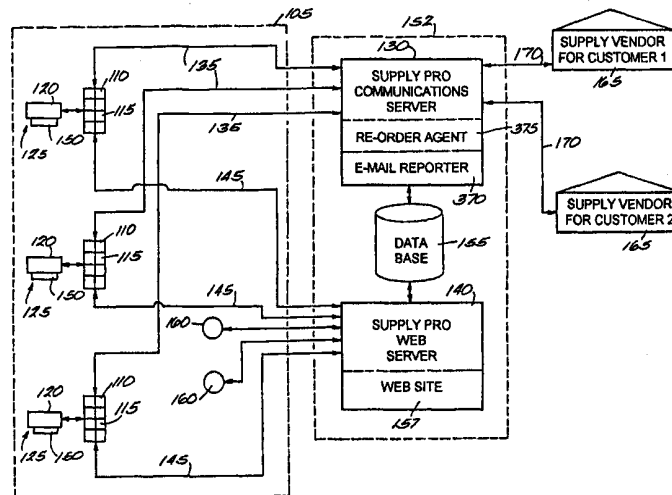




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(54) Title: METHOD AND SYSTEM FOR PROVIDING ON-LINE INVENTORY AND DISPENSING THROUGH A DISTRIBUTED NETWORK



(57) Abstract

A method and system of dispensing items in a controlled manner from cabinets (110) or similar enclosures, re-ordering the dispensed articles or items (375), and providing inventory and other information about the items and users (160) in the system. The invention utilizes a distributed network (145) and permits users (160) to browse and search for any items across multiple enclosures (110) from any location. The method and system can track inventory, generate administrative reports, and independently initiate orders based on aggregate inventory levels or multiple enclosures (110) to gain the benefit of volume discounts, minimize deliveries, maximize availability of items, or generate individual orders based on specific enclosures (110) to maintain just-in-time inventory levels. The method and system also track the removal and stocking of items through unique identification strings, so that individual access, use, and theft of items can be monitored.

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METHOD AND SYSTEM FOR PROVIDING ON-LINE INVENTORY AND  
DISPENSING THROUGH A DISTRIBUTED NETWORK

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to methods and systems for dispensing supplies and similar items in a controlled manner. More particularly, the present invention relates to a method and a system that provides distributed access to product and inventory information for supplies and that generates orders when supplies need to be re-ordered.

2. Background of the Invention

Distributed networks are characterized by a structure where processing, storing, and other functions are carried out by separate nodes rather than on a single main or centralized computer. The Internet is one example of a distributed network and, as is well known, it provides access to a wide array of information. The World Wide Web portion of the Internet provides a graphical, interactive medium that permits businesses to advertise and take orders for goods and services.

The variety of products and services available for sale through the Internet is tremendous. Some sites offer a full range of business supplies ranging from office furniture and computers to envelopes and pencils. However, these sites are often no more than electronic catalogs and some require separate computers, navigation software, and online addresses to shop online. Further, the typical electronic store does not assist users in selecting the right business supply inventory mix, track business supply use, or focus on users' needs to maximize efficiency and economic return. Furtherstill, distributed networks such as the Internet have not, in general, been fully exploited as tools to facilitate the controlled dispensing, inventorying, and re-ordering of supplies. Yet, controlled stocking and dispensing of business supplies can prevent the occurrence of inventory shortages, overstocking (which can result in business inefficiency, increased storage costs, and waste), and pilferage.

## SUMMARY OF THE INVENTION

The invention provides a method and a system for distributing articles, such as business supplies. The invention may be implemented in a system that includes at least one locked enclosure, an input device, a controller, and at least one portal site. A distributed network such as a public landline or a public wireless network interconnects the controller to the portal site and provides public network access between the controller, the portal site, homes, and remote offices.

In operation, a user accesses the system for distributing articles through an input device. The user enters an identification string that uniquely identifies the user and his or her access rights. The controller verifies the user's identification string and allows access to the enclosure when the user is authorized. The controller also obtains data through either the input device or other devices to track articles removed or added to the enclosure. Preferably, the data relates to the quantity of articles in the enclosure. After receiving the data, a connection via the distributed network or a direct modem connection is established between the portal site and the controller. The connection, which may occur on a periodic basis, allows for data and/or message exchanges.

In one preferred aspect, the system includes an identifying device, which preferably may be an audio or visual indicator. When a user selects an article, the audio or visual indicator is activated and identifies an article location.

In another preferred aspect, a connection is established between the portal site and at least one supplier. When the quantity of articles in the enclosure reaches a user-defined threshold or par value, the portal site automatically sends a message to one or more suppliers relating to the quantity of articles in the enclosure. The message may include one or more orders directing one or more suppliers to ship the desired articles to the user and may also instruct the suppliers to stock the enclosure.

In yet another preferred aspect, open access to the controller and the portal site may be provided to any authorized user from any location. Because the controller and the portal site may each have a unique address, the user can inquire as to the availability of a desired article from a remote location using a network browser. Moreover, a portal site can direct the user to one or more enclosures that have the desired article and authorize his or her access to that enclosure or that article when the method and system employ multiple enclosures. An alternative aspect envisions that the controller may also direct the user to

one or more enclosures having a desired article and authorize his or her access and/or establish a direct or distributed network link with at least one supplier.

The disclosed method and system provide access to information and dispensing of articles in ways that are similar in ease-of-use to accessing the World Wide Web. The method and system allow users to browse and search for any article across multiple enclosures from any location. The method and system can track inventory, generate administrative reports, and independently initiate orders based on aggregate inventory levels of multiple enclosures to gain the benefit of volume discounts or generate individual orders based on specific enclosures to maintain just-in-time inventory levels. Moreover, because the method and system track the removal and stocking of articles through unique identification strings, individual access, use, and theft can also be monitored.

These features as well as other advantages of the invention will become apparent upon consideration of the following detailed description and accompanying drawings of the embodiments of the invention described below.

15

#### BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a block diagram of a first embodiment of the invention;

FIG. 2 is a block diagram of a dynamic inventory protocol of FIG. 1;

20 FIG. 3 is a schematic diagram of the system of the invention;

FIG. 4 is a functional block diagram of part of a portal site of FIG. 1;

FIG. 5 is a flow chart showing the methodology used to review the content of a cabinet as implemented in a system made in accordance with the teachings of the present invention;

25 FIG. 6 is a flow chart showing the methodology used to search the contents of a cabinet as implemented in a system made in accordance with the teachings of the present invention;

FIG. 7 is a flow chart showing the methodology used to add authorized users to the system implemented in accordance with the teachings of the present invention;

30 FIG. 8 is a flow chart showing the methodology used to edit user information in a system implemented in accordance with the teachings of the present invention;

FIG. 9 is a flowchart showing the methodology used to delete user information in a system implemented in accordance with the teachings of the present invention;

FIG. 10 is a flowchart of the methodology used to enter new product information in a system implemented in accordance with the teachings of the present invention;

FIG. 11 is a flow chart of the methodology used to edit product information in a system implemented in accordance with the teachings of the present invention;

5 FIG. 12 is a flow chart of the methodology used to delete product information in a system implemented in accordance with the teachings of the present invention;

FIG. 13 is a flow chart of the methodology used to prepare and view user reports in a system implemented in accordance with the teachings of the present invention;

10 FIG. 14 is a flow chart of the methodology used to create and review a consumption report in a system made in accordance with the teachings of the present invention;

FIG. 15 is a flow chart of the methodology used to create and review a discrepancy report in a system made in accordance with the teachings of the present invention;

15 FIG. 16 is a flow chart of the methodology used to poll cabinets in a system made in accordance with the teachings of the present invention;

FIG. 17 is a flow chart of the methodology used to set the minimum and maximum inventory levels for components in a system made in accordance with the teachings of the present invention;

20 FIG. 18A is a flow chart of a part of the process used to generate an order in a system made in accordance with the teachings of the present invention;

FIG. 18B is a flow chart of another part of the process used to generate an order in a system made in accordance with the teachings of the present invention; and

FIG. 18C is a flow chart of yet another part of the process used to generate an order in a system made in accordance with the teachings of the present invention.

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#### DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

In the drawings the same reference numbers through several views designate alike and similar elements.

##### 1. Top-Level Structure and Architecture

30 A system 100 embodying the invention is shown in FIG. 1. The system includes a customer site 105 having 3 cabinets 110, each with a number of pockets or compartments 115 that enclose and secure articles, such as business supplies or any other items that are preferably dispensed in a controlled manner. The compartments 115 may be slidably

interconnected with the cabinet 110 in a drawer-like manner, if desired. Although it is preferred that the compartments 115 have clear acrylic doors to display articles, other types of doors may also be used. The compartments 115 are dimensioned to a variety of heights and widths to enclose and secure a variety of articles.

5           Electronically actuated locks (not shown) facilitate access to the articles enclosed within the cabinet 110. When in a locked state, the locks prevent the doors from being opened and prevent access to the articles. When actuated, the locks release the doors so that the articles are freely accessible. Preferably, the locks are actuated simultaneously to allow unrestricted access to the whole cabinet 110. The system 100, however, may also  
10           actuate locks independently and limit access to certain articles based on user access rights.

          Input mechanisms, such as pressure sensitive switches (not shown), disposed near each drawer and compartment 115 of the cabinet 110 collect inventory information as articles are removed from or stocked within the cabinet 110. Preferably, the switches are “take” and “return” switches that are actuated each time an article is removed from or  
15           stocked within the cabinet 110. The cabinet 110 may also include an input device 120 such as a touch screen or a keyboard to track articles removed or added to the cabinet 110. The input device 120 may supplement or replace the switches.

          Each cabinet 110 may also include devices that identify the location of a desired article. The devices preferably comprise visual (such as light emitting devices) or audio  
20           indicators that are actuated by the user. Such devices may be unitary with one or more of the switches, interconnected with the doors, or may be integrated with or enclosed by the compartments 115 of the cabinet 110.

          With further reference to FIG. 1, a controller 125 (three are shown) is used to manage access to the cabinet 110, collect inventory and administrative data, and interface  
25           with other nodes that are accessible through its input device 120 or modem (not shown). The modem, which converts data from one form to another, interconnects the controller 125 to other nodes. The interconnections shown in FIG. 1 encompass both direct and indirect connections via a communication link. For example, with reference to FIG. 1, the modem may connect the controller 125 directly to a communications server 130 through  
30           landlines or wireless links 135 or may connect the controller 125 to a server 140 through peripheral networks and devices (not shown) that are linked to a distributed network 145 like the Internet. The term “distributed network,” as used herein is intended to broadly encompass any network including public landline or a public wireless networks, in which processing, storage, and other functions are handled by separate nodes rather than a single

controller or computer. As is known, one of the advantages of a distributed system is that functions are decentralized. Therefore, for example, high network traffic does not disrupt the function of the cabinet 110 or data collection that is carried out by the controller 125.

The controller 125 also includes a processor 150 and may include peripheral  
5 devices such as a display and/or a badge reader. The processor 150 controls access to the cabinet 110 and its articles and responds to user commands received through the modem or the input device 120. Preferably, the processor comprises a microprocessor-based system such as a PENTIUM™ based INTEL™ computer, for example, having static and dynamic memory that runs a known operating system such as WINDOWS™, LINUX™,  
10 or SOLARIS™, for example. The input device 120 is preferably a keyboard or a touch screen that allows users to make selections and enter information through a graphical display interface. The display may be a cathode-ray tube or a flat panel.

Although the system 100 is shown as having two servers 130 and 140, the functionality of the servers may be combined or distributed in a variety of ways. As  
15 shown in FIG. 1, a portal site 152 may be constructed to perform the functionality of the servers 130 and 140. Although not shown, the portal site 152 might include more than two servers.

Within the portal site 152 is at least one database 155 that stores information from the communications server 130 and the web server 140. The communications server 130  
20 preferably can support concurrent communication through a direct modem connection or through the distributed network 145 with one or more of the controllers 125 and/or one or more supplier interfaces 165 (two are shown). The communications server 130 provides users with a variety of services, including tracking cabinet 110 activity, analyzing cabinet 110 inventory levels, updating the databases 155, transmitting reports to one or more  
25 nodes, modifying or updating operating and/or application software within the controllers 125 (adding new users, new products, or modifying access rights, for example), and automatically transmitting purchase orders through fax, electronic mail, or electronic data exchange links 170, or through the distributed network 145, for example. Although the purchase orders are preferably based on target inventory goals and user-defined thresholds  
30 or par values, purchase orders may also be transmitted to supplier interfaces 165 on a periodic basis regardless of monitored inventory levels. As user preferences change, it is also envisioned that the portal site 152 will provide additional services.



The one or more databases 155 are used to archive account information in relational tables. The information preferably includes user identification strings, user access rights, inventory records, controller and supplier addresses (Uniform Resource Locators, Domain Name Systems, or Internet Protocols, for example), telephone numbers, controller configuration data, application and operating software, and/or article catalogs. Workers of ordinary skill in the art will appreciate that additional administrative and inventory data can also be stored in the databases 155.

The web server 140 hosts an interactive web site 157 where users can interact with the servers 130 and 140 and the controllers 125 authorized by their user access rights. The web server 140 allows authorized users to browse cabinet inventory, search for articles, review authorized user lists, review inventory and supplier data, review article catalogs, modify article orders and par values, generate inventory reports, generate administrative reports, and generate other standard and customized reports. Because the web and communications servers 130 and 140 share some common databases, changes in these shared databases are accessible to authorized web users 160 (two are shown) and to the controller(s) 125. For example, if an authorized web user 160 connects to the web server 140 through a web browser, the authorized web user 160 may modify a par value that is then transmitted to one or more controllers 125. An authorized web user 160 from any location, thus, can configure and modify many parameters such as target inventory levels of one or more cabinets 110 using a web browser. The system 100 does not require application specific software or hardware.

Although user connections to the web server 140 are shown as direct links via the distributed network 145, connection may be made through commercial networks that provide telephone, satellite, radio, or microwave links, for example, to the distributed network 145.

The supplier interface 165 (two are shown) facilitates communication with vendors or suppliers for re-ordering of products. Preferably, the supplier interface 165 is a fax, an electronic controller, or a computer such as a server (which may support a separate portal site). The supplier interface 165 may allow authorized users to view information relating to the articles it distributes, conduct article searches, issue purchase orders, track purchase orders, track order history, and receive account information and invoices, for example.

Automatic stocking and re-ordering are facilitated by implementing the protocol shown in FIG. 2. By way of example, the web server 140 may implement an inventory analysis engine 200 that receives user preference data 202, consumption data 204, and

cabinet configuration data 206. In many instances, the user preference data 202 and cabinet configuration data 206 will be relatively static while consumption data 204 is likely to be dynamic, but any of the three could change. As will be discussed in greater detail below, the engine 200 generates an optimal inventory level 208, based on the  
5 consumption data 204, preference data 202, and cabinet configuration data 206. The optimal inventory level can be repeatedly calculated or adjusted to respond to changes in the user preference data, the consumption data, or cabinet configuration. Of course, if the inventory falls below a certain level, the communications server 130 issues or transmits an order to a supply vendor through the supplier interface 165 so that the products or articles  
10 in the cabinets 110 are timely replenished.

The overall process, expanded to include three customers 105, is shown in FIG. 3. Vendors 220 receive orders from the portal site 152 and supply customers with the necessary replenishment of the supplies required. Further details of the method and system are provided below.

15

## 2. Functional Description

FIG. 4 illustrates the functional hierarchy of the web site 157. A user may access the site using a browser installed on the controller 125 of the cabinet 110 or any other computer device connected to the distributed network 145. To access the web site 157 a  
20 user must first logon at 230 with a viable user ID and password. Once in the site, a user may select from several options: a browse cabinets option 235, a search option 240, a special order option 245, and an administration option 250.

As may be seen by reference to FIGS. 4 and 5, if the browse cabinets option 235 is selected, the site 157 permits the user to select at 260 one desired cabinet from those  
25 coupled to the portal site 152 and review at 262 the content and inventory of the cabinet. As best seen by reference to FIG. 6, if the search option 240 is selected, the user may enter a query in the form of a partial item name or description at 264 and then view items that match the query at 266, including current cabinet location and inventory. The user may then view detailed item descriptions of items in the cabinet or view cabinet inventory at  
30 268.

The special order option 245 permits a user to connect at 270 with a supply vendor's e-commerce site. The administration option 250 permits modification of the users 275, products 277, areas 280, and billing codes (or departments) 282 maintained by the system and the generation of reports 284. The functionality supported by the site 157  
5 to add new users is illustrated in detail in FIG. 7. A selection 285 to enter a new user is made, and new user information is entered at 286. Once all the desired information is entered, it is saved and a "user created" transaction 287 is automatically generated and queued for transfer by the communications server 130 to each cabinet 110. The user is then queried at 288 whether additional new users are to be added, and if so, steps 285, 286,  
10 and 287 are repeated.

User information may be searched by selecting a search engine option 290. An edit option 295 (FIGS. 4 and 8) may be used to edit user information. User information is displayed and edited at 297 and saved at 299. Similar to the addition of a new user, a "user edit" transaction 301 is created and queued for transfer by the communications  
15 server 130 to each cabinet 110. The user is then queried at 303 whether additional edits are to be made. If so, the process is repeated.

User information may be deleted, by selecting a delete option 305 (FIGS. 4 and 9). A selection is made to delete a user and that selection is confirmed at 310. A "user delete" transaction 312 is created and queued for transfer by the communications server to each  
20 cabinet 110. The user is queried at 315 whether additional users are to be deleted. If so, the process is repeated.

The web site 157 provides functionality for searching, adding, editing, and deleting product information, area information, and billing code information that is similar to that provided with respect to manipulating user information. The functionality for  
25 manipulating product information is illustrated in the flow charts in FIGS. 10-12, but because of the similarity to other processes will not be discussed in detail herein. The functionality, for manipulating area and billing code information should be readily apparent to those of ordinary skill in the art from the drawings and description provided herein. Area information relates to a geographical, functional, or other grouping of  
30 cabinets. As its name implies, billing code information relates to the billing system used in a particular application of the invention.

To support the distribution of information collected and recorded by the system 100, numerous reports 284 may be generated through the web site 157. A report menu 320 (FIG. 4) supports report generation functionality. As best seen in FIG. 13, a user

report may be generated by selecting a user report option 330, entering a department name or identification at 332, and selecting a desired user from the department at 334. The report is then output for viewing at 336.

As shown in FIG. 14, a consumption report may be generated by selecting a  
5 consumption report option 340, entering a department or user identification at 342, and selecting a date range and sort option at 344. The report is then output for viewing at 346. As shown in FIGS. 4 and 15, discrepancy, inventory, and consumption-snapshot reports may also be generated through options 350, 355, and 360. The details of generating each report are similar to those already discussed and, therefore, will not be discussed in detail.

10 An additional feature of the report generation described above provided by the invention relates to automating the creation and delivery of reports. An automated reporter 370 (FIG. 1 and 15A) may be provided in the communications server 130 and accessed by the user through a browser. The automated reporter 370 queries a user for certain report-related data or report attributes 372. The attributes include title, page layout,  
15 SQL (Structured Query Language) query, data or amounts to be totaled, data or amounts to be grouped, e-mail address, start date and time for generating a report, the frequency of the report, and the period during which the report should be generated. The used provided data is saved as a "report request record" in a report query table 373. A polling agent 374  
20 polls the table 373 on an ongoing basis. If a record is found that specifies an elapsed report date and time, the automated reporter 370 executes the SQL query, streams the results of the query into a spreadsheet file, and e-mails the file to the designated e-mail address.

As can be seen from the above, the web server 140 and web site 157 enable  
25 decentralized users to configure and maintain data in a cabinet 110. This eliminates the requirement, common in prior systems, that the user be physically proximate to a desired cabinet or the main computer and memory that processes and stores information for the subject dispensing system.

As noted above, the communications server 130 works in conjunction with the web  
30 server 140, providing a variety of tracking, ordering, and communication services. One job of the communications server is to gather information from each cabinet 110. The communications server 130 also maintains up-to-date information for each cabinet. In order to accomplish this, a reorder agent 375 of the communications server 130 periodically polls each cabinet 110. The frequency of the polling will depend on the configured polling time or polling frequency of each cabinet. For example, a cabinet 110

can be configured to be contacted daily, for example, every day at 3pm. Alternately, the cabinet can be configured to be contacted more often, for example, every 60 minutes. The data polling process is outlined below in Table 1, and shown in FIG. 16.

5

Table 1

Communications Server 130 Polling Process
1. Server checks the communications queue to determine the next available cabinet to contact.
2. Server contacts cabinet via Internet (TCP/IP) or dial-up modem.
3. Server sends transaction information to the cabinet for all activities that occurred on the server prior to the last contact.
4. Server receives transaction information from the cabinet for all activities that occurred at the cabinet prior to the last contact.
5. If communications are successful and error-free, the cabinet is removed from the communications queue. Otherwise, the cabinet is "demoted" to the bottom of the queue to allow for re-transmission after other cabinets have transmitted.
6. The cabinet updates internal databases with new transaction information. Data includes new and modified users, products, billing codes, and cabinet system configuration.
7. Server updates the database 155 with new transaction information. Data includes item withdrawals, returns, inventory restocks, and manual cabinet reconfiguration.
8. Server evaluates cabinet polling times and adds cabinets to the queue as necessary based on the current time of day.
9. Process is repeated by returning to step 1.

Another feature of the present invention is dynamic par leveling. This aspect of the present invention is illustrated in FIG. 17. In order to maximize efficiency in the system 100, a minimum inventory level MIN and a maximum inventory level MAX for each compartment 115 in one cabinet 110 is set in a par-leveler 400 of the portal site 152. In this way, supplies are timely reordered to avoid running out of articles. Overstocking is also prevented.

The par-leveler 400 receives input data at 402. The data includes a delivery interval  $t$ , a lead time  $I$ , and a safety coefficient  $S$ . The maximum consumption for articles

in each compartment 115 of a cabinet during the last four time intervals is determined at 404. That is, the consumption during the time periods  $t$  days ago,  $2t$  to  $t$  days ago,  $3t$  to  $2t$  days, ago, and  $4t$  to  $3t$  days ago is monitored and the largest or maximum consumption  $M$  of the time periods is determined. This process is conducted daily to maintain an up-to-  
 5 date maximum  $M$ . Once  $M$  is calculated for the particular day at hand, the maximum order amount  $MAX$  is determined at 406.  $MAX$  is equal to  $M$  times a safety multiplier or coefficient  $S$ . In this way, the system determines an order amount, based on consumption, that should never be exceeded.

The minimum order amount,  $MIN$ , is calculated from the  $MAX$  value at 408.  $MIN$   
 10 is equal to  $MAX$  times the lead time  $I$  divided by the delivery interval. The  $MIN$  for any compartment is the re-order point because letting the article level fall below the  $MIN$  amount will result in an out-of-stock situation. Once  $MAX$  and  $MIN$  have been established for one compartment, the process is continued until all  $MAX$  and  $MIN$  values for all the compartments have been determined, as shown at 410. As an alternative to the  
 15 algorithm implemented by the par-leveler 400, the  $MAX$  and  $MIN$  may be set by a user to a user determined level.

Once the  $MIN$  and  $MAX$  values have been determined (whether by the user or through the par leveler 400) for each compartment 115 in each cabinet 110, a set of business rules may be applied to automatically generate appropriate orders and deliver  
 20 those orders to vendors. The process is shown in FIGS. 18A-18C. The process starts in FIG. 18A, at 450, where for each vendor, a list of companies served by that vendor is retrieved. Then at 452, for each company served by that vendor, a list of areas for the company is retrieved. An area may be a geographical grouping of one or more cabinets or it may be a grouping of cabinets based on functional or other characteristics. At 454, a list  
 25 of cabinets for each area in a company is retrieved. Then, the business rules shown in Table 2 are applied at 456.

Table 2

**Cabinet Level Rules (can be grouped with boolean AND, OR)**

30

1	At least x high priority items in cabinet are below MIN
2	At least x high priority items in cabinet are out of stock
3	At least x normal priority items in cabinet are below MIN

4	At least x normal priority items in cabinet are out of stock
5	At least x low priority items in cabinet are below MIN
6	At least x low priority items in cabinet are out of stock
7	Dollar value of items ordered (if cabinet was to be restocked) exceeds x
8	Current day of the week is x (Sunday, Monday, etc.)
9	Current day of the month is x (1-31)

As shown at 458, the rules are reviewed to determine if any of them evaluate to true, if so, the particular cabinet is flagged at 460 as being eligible for re-ordering. The process is repeated as shown at 462, until all the cabinets in the area have been reviewed.

5 Depending on the particular application at hand, the cabinet level rules can be grouped together by boolean operators to create compound rules. This is also true of the other rules discussed below. Once all the cabinets have been processed, a determination at 464 is made as to whether any cabinet in the area has been flagged for re-order. If so, then the area business rules of Table 3 are applied, as shown at 466.

10

Table 3

**Area Level Rules (can be grouped with boolean AND, OR)**

1	At least x high priority items in area are below MIN
2	At least x high priority items in cabinet are out of stock
3	At least x normal priority items in cabinet are below MIN
4	At least x normal priority items in cabinet are out of stock
5	At least x low priority items in cabinet are below MIN
6	At least x low priority items in cabinet are out of stock
7	Dollar value of items ordered (if cabinet was to be restocked) exceeds x
8	Current day of the week is x (Sunday, Monday, etc.)
9	Current day of the month is x (1-31)

15 If any of the area business rules evaluate as true (as shown at 468), then the area is flagged for re-order at 470. As shown at 472, the process is repeated until all areas of the company have been analyzed.

Once all the areas in the company have been reviewed, a determination at 500 (FIG. 18B) is made as to whether any area in one company has been flagged for re-order. If an area has been flagged, the company business rules of Table 4 are applied for the company being processed at 502.

5

Table 4

**Company Level Rules (can be grouped with boolean AND, OR)**

1	At least x high priority items in area are below MIN
2	At least x high priority items in cabinet are out of stock
3	At least x normal priority items in cabinet are below MIN
4	At least x normal priority items in cabinet are out of stock
5	At least x low priority items in cabinet are below MIN
6	At least x low priority items in cabinet are out of stock
7	Dollar value of items ordered (if cabinet was to be restocked) exceeds x
8	Current day of the week is x (Sunday, Monday, etc.)
9	Current day of the month is x (1-31)

10 If any of the company business rules evaluate as true at 504, then the company is flagged for reorder at 506. The process continues until all companies for the vendor have been processed as shown at 508. At 510, a determination is made as to whether any company vendor has been flagged for reorder. If so, the vendor business rules of Table 5 are applied at 512.

15

Table 5

**Vendor Level Rules (can be grouped with boolean AND, OR)**

1	At least x high priority items in area are below MIN
2	At least x high priority items in cabinet are out of stock
3	At least x normal priority items in cabinet are below MIN
4	At least x normal priority items in cabinet are out of stock
5	At least x low priority items in cabinet are below MIN
6	At least x low priority items in cabinet are out of stock



7	Dollar value of items ordered (if cabinet was to be restocked) exceeds x
8	Current day of the week is x (Sunday, Monday, etc.)
9	Current day of the month is x (1-31)

If any of the vendor business rules evaluate as true at 514, then the vendor is flagged for re-order at 516. The process is repeated, as shown at 518, until all vendors have been processed. Once all the vendors are processed, orders are generated. As shown at 520, for each vendor flagged for re-order, a list of companies flagged for reorder is retrieved. Then, at 522, the list of areas flagged for reorder for each company is retrieved. At 524, a list of cabinets flagged for re-order is retrieved for each area flagged for reorder.

Each compartment for each cabinet is examined at 550 (FIG. 18C). A determination is made at 552 as to whether an order for a compartment is pending. If so, the current date is checked at 554 against the lead-time needed to deliver an order. If the date is past the lead-time needed, a late notice is sent to the company expecting the order, as shown at 556. Whether or not a late notice is required, the examination of compartments continues as shown at 558 until all compartments in all cabinets have been reviewed. If there is no order pending for a compartment, the system (web server) then checks to see whether an order sufficient to fill or top-off the compartment should be issued. At 560, the system checks to see whether the top-off function is enabled. If it is, then a current inventory, CUR, is compared to the MAX value and a convenience order value CO is checked at 562. If the current value CUR is at the MAX value or the CO value is not greater than zero, then the next compartment is examined. If the CUR value is less than the MAX value **and** the CO value is greater than zero, an order for the CO value is generated at 564. If the top off function is not enabled, the CUR value is checked against the MIN value at 566. If the CUR value is less than or equal to the MIN value and the CO value is greater than zero, an order for the CO amount is generated at 564. If not, the next compartment is checked. If an order is generated, the compartment is flagged as having an order pending and time-stamped at 568. Once all the compartments are examined, orders are generated and transmitted to vendors at 570.

In the process described above, the convenience order concept was introduced. The system of the present invention optimizes ordering of supplies by ensuring that re-orders or made in quantities that not only prevent overstock or out-of-stock situations, but also optimize delivery of items in standard quantities and package sizes that correspond to

the quantities and sizes that manufacturers normally produce. This may be more clearly seen by reference to Table 6.

Table 6  
Re-order Methodology

5

Term	Definition	Example
Unit of Issue (UI)	Description of packaging for each unit dispensed from cabinet	"Disk", "1 Folder", "3-pack", "Box", etc.
Unit of Purchase(UP )	Description of packaging for each unit purchased from supplier/manufacturer	"Disk", "Dozen", "Box", "3-pack", etc.
Quantity Issued Per Unit of Purchase (QIPUP)	Number of units dispensed from cabinet for each UP	If file folders are dispensed individually, but purchased by the box (100/box), then the QIPUP = 100
Convenience Multiple (CM)	UP multiple preferred by the supplier	If supplier sell pens individually (UP = "Each") but pens come packaged in boxes of 12, then the CM = 12, since the vendor prefers not to break packages.
CUR	The current quantity of an item, (based on UI)	If there are 12 pens in the cabinet, CUR = 12
MAX	Maximum quantity (based on UI)	If the cabinet pocked holds 60 pens, and pens are dispensed individually, then MAX = 60

MIN	The minimum quantity (based on UI) of a given item that may be maintained in the cabinet without generating a restock order for the item (i.e., the reorder point)	If MIN = 12, then an order will be generated when CUR<12
Optimal Order (OO)	The maximum reorder quantity possible (based on UP) without exceeding MAX.  $OO = \text{INT} \left\{ \frac{MAX-CUR}{QIPUP} \right\}$	Using the pen example, if MAX = 60, MIN = 12, and CUR = 10, AND QIPUP = 1, then OO = 50. Note that OO disregards the convenience multiple.
Convenience Order (CO)	Same as OO, but includes CM. This results in more "supplier friendly" orders, since packages need not be broken down by the supplier prior to delivery.  $CO = \text{INT} \left\{ \frac{OO}{CM} \right\} * CM$	If the CM = 12 in the above example (i.e., pens sold individually, but packaged in boxes of 12), then CO = 48. Using CO for a restock order ensures that the supplier will not have to break packages.

In the example shown in Table 6, the convenience order value CO is defined based on the vending activity that occurs from a compartment 115 in a cabinet 110. However, it also  
 5 considers the quantity of articles or items present in standard packages and results in orders that generally do not require vendors to provide partial purchase amounts.

As can be seen from the above, the present invention provides a method and system for controlling the dispensing of items from enclosures. The method and system provide enhanced information about the inventory and users who access the system.  
 10 Further, the method and system provide automatic re-orders or replenishment of dispensed items when inventory reaches a certain predetermined level.

The foregoing detailed description describes only a few of the many forms that the present invention can take, and should therefore be taken as illustrative rather than limiting. It is only the following claims, including all equivalents, that are intended to define the scope of the invention.

What is claimed is:

1. A method of distributing articles, the method comprising:  
sending a request to a controller from an input device requesting access to a locked  
5 enclosure;  
processing the request to determine whether the request was received from an  
authorized user;  
allowing access to the enclosure if the user is authorized;  
obtaining data relating to a quantity of articles within the enclosure;  
10 sending the data to the controller;  
establishing a connection between a server and the controller; and  
retrieving the data from the controller at the server through a distributed network.
2. A method as in claim 1, wherein sending a user password is part of sending  
15 a request to a controller from an input device requesting access to a locked enclosure.
3. A method as in claim 1, further comprising:  
sending a description of at least one article from the input device to the controller;  
processing the description; and  
20 identifying the location of said at least one article.
4. A method as in claim 3, further comprising:  
generating an indicator that identifies the location of said at least one article  
through an identifying device.  
25
5. A method as in claim 3, wherein sending a description of at least one article  
from the input device to the controller, includes generating a description of said at least  
one article through the input device.
- 30 6. A method as in claim 4, wherein the identifying device is a light disposed  
near the enclosure.

7. A method as in claim 1, wherein the connection between the server and the controller is established through a modem connected to the distributed network, and the distributed network includes the Internet.

5 8. A method as in claim 1, wherein the data retrieved from the controller is inventory data.

9. A method as in claim 1, wherein the server and the controller are in different locations.

10

10. A method as in claim 1, further comprising the steps of:  
establishing a connection between the server and a supplier;  
generating a message relating to the quantity of articles in the enclosure; and  
sending the message to the supplier.

15

11. A method as in claim 10, wherein the message relating to the quantity of articles in the enclosure is an order.

12. A method as in claim 10, wherein the connection between the server and  
20 the supplier is established through the distributed network.

13. A method as in claim 1, further comprising:  
establishing a connection between a remote site and the server;  
sending a request to the server from the remote site requesting data relating to the  
25 quantity of articles in the enclosure;  
processing the request to determine whether the request was received from an  
authorized user;  
retrieving data relating to the quantity of articles in the enclosure if the user is  
authorized; and  
30 sending a message to the remote site.

14. A method as in claim 13, wherein the connection between the remote site  
and the server is established through the distributed network.

15. A method as in claim 13, wherein the message is an inventory message.
16. A method as in claim 13, wherein the message is a billing message.
- 5 17. A method as in claim 1, wherein the controller is a modem connected to the server through the distributed network.
18. A method as in claim 1, wherein the controller is a processor.
- 10 19. A method as in claim 1, wherein the step of obtaining data relating to the quantity of articles within the enclosure includes receiving user actuated signals.
20. A method as in claim 19, wherein each of the user actuated signals are manually generated by a switch disposed near the enclosure.
- 15 21. A method as in claim 19, wherein each of the user actuated signals are manually generated through the input device.
22. A method as in claim 1, wherein the input device is a touch screen.
- 20 23. A method as in claim 1, wherein the server includes a web site.
24. A system for distributing articles to users, the system comprising:  
a locked enclosure;  
25 a controller associated with the enclosure;  
a first site connected to the controller through a distributed network;  
the controller operable to manage access to the enclosure and track a quantity of  
articles within the enclosure.
- 30 25. A system as in claim 24, wherein the controller includes a computer.
26. A system as in claim 24, further comprising a fourth protocol for allowing a display coupled to the controller, the controller operable to identify the location of at least

one article by displaying an index of articles held within the enclosure on the display, to prompt the user to enter a selection, and identify the location of said at least one article.

27. A system as in claim 26, wherein the location of said at least one article is  
5 identified by at least one visual indicator disposed near said at least one article.

28. A system as in claim 24, further comprising a remote site connected to the  
distributed network, the remote site running a software application that allows access to  
the first site.  
10

29. A system as in claim 24, wherein the first site includes a database having  
user data.

30. A system as in claim 24, wherein the first site includes a database having  
15 inventory data.

31. A system as in claim 24, further comprising a supplier site running a  
software application that allows the supplier site to receive a sales order from the first site  
through the distributed network.  
20

32. A system as in Claim 31, wherein the first site includes a web server and a  
communications server.

33. A system as in Claim 32, wherein the first site includes a reorder agent.  
25

34. A system as in Claim 32, wherein the first site includes an automated  
reporter for generating reports of user selected information.

35. A system for distributing articles to users, comprising:  
30 a locked enclosure;  
a controller having a display and being associated with the enclosure;  
a first site connected to the controller through a distributed network, the controller  
operable to manage access to the enclosure and track a quantity of articles within the  
enclosure.



36. A system as in claim 35, further comprising a remote site running a software application that allows access to the first site and the controller through the distributed network.

5

37. A system as in claim 35, further comprising a supplier site running a software application that allows the supplier site to receive a sales order from the first site and the controller through the distributed network.

10

38. A system as in claim 35, wherein the distributed network is a public and a private network.

39. A method of distributing articles held in at least one enclosure using a distributed network, the method comprising:

15

securing the at least one enclosure;

establishing a group of users authorized to access the at least one enclosure;

opening the at least one enclosure upon receiving a request from one of the group of authorized users;

recording removal of articles from the at one least enclosure;

20

maintaining an inventory of the articles in the at least one enclosure based on the recording of removal of articles; and

requesting replenishment of the articles through the distributed network if the inventory reaches a predetermined level.

25

40. A method of distributing articles as in Claim 39, further comprising checking the inventory of articles through the distributed network.

30

41. A method of distributing articles as in Claim 39, further comprising updating the inventory based on articles received in response to requesting replenishment of articles.

42. A method of distributing articles as in Claim 39, further comprising generating a report based on the inventory of articles.

43. A method of distributing articles as in Claim 39, further comprising determining a maximum amount of articles to be replenished.

5 44. A method of distributing articles as in Claim 43, further comprising determining an amount of articles to be replenished based upon the quantities in which and the type of packaging the articles are manufactured and sold.

45. A method of distributing articles from an enclosure and communicating reorder requests to a vendor of the articles, the method comprising:  
10 securing the enclosure;  
establishing a group of users authorized to access the enclosure;  
opening the enclosure upon receiving a request from one of the group of authorized users;  
recording removal of the articles from the enclosure;  
15 maintaining an inventory of the articles in the enclosure based on the recording of the removal of articles; and  
sending a reorder request to the vendor of the articles if the inventory reaches a predetermined level.

20 46. A method as in Claim 45, further comprising updating the inventory based on articles received in response to sending a reorder request to the vendor.

25 47. A method as in Claim 45, further comprising generating a report based on the inventory of articles.

48. A method as in Claim 45, further comprising recording the consumption of articles over a period of time.

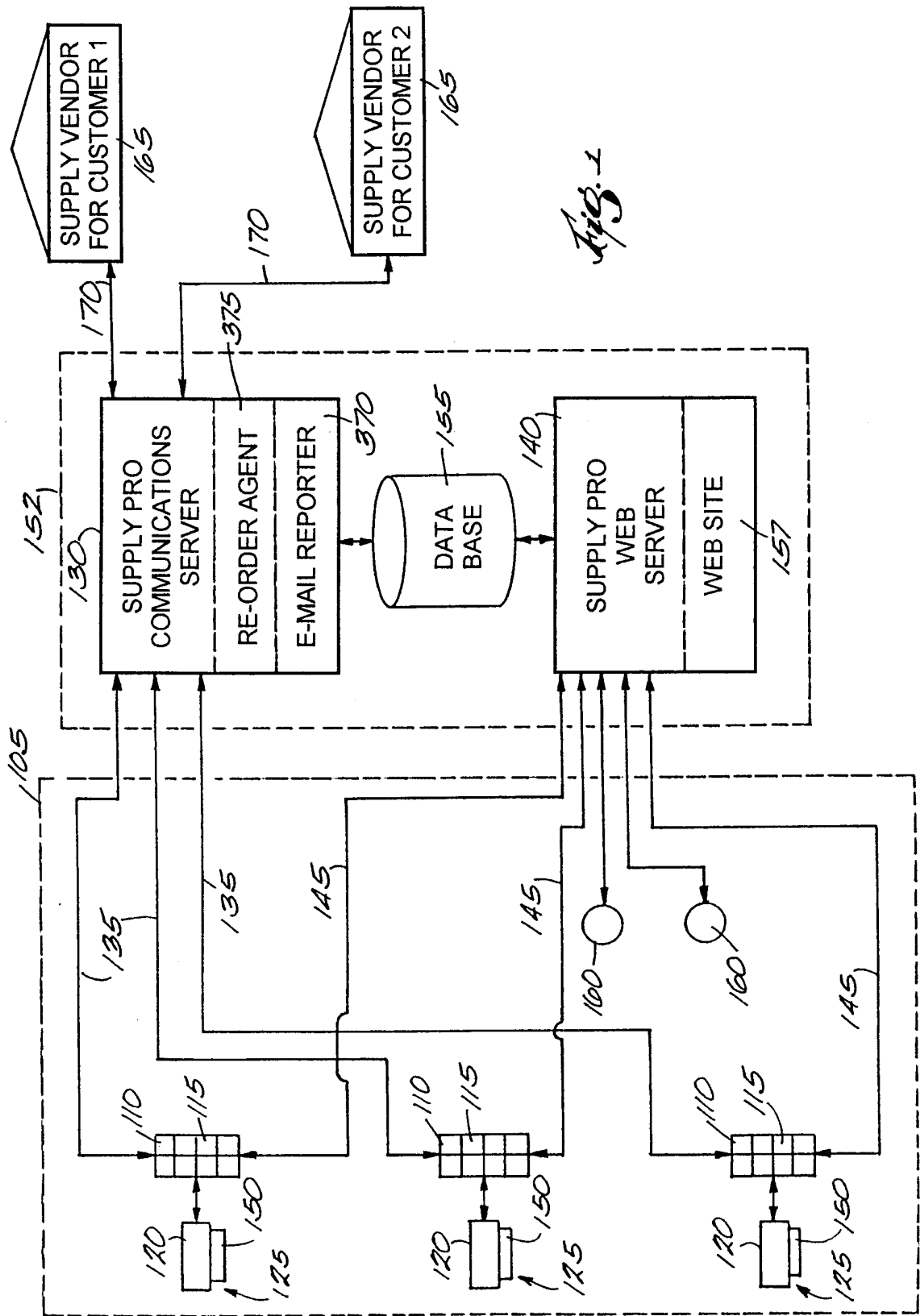
30 49. A method as in Claim 48, further comprising determining a maximum amount of articles to be reordered based on the consumption of articles over a period time.

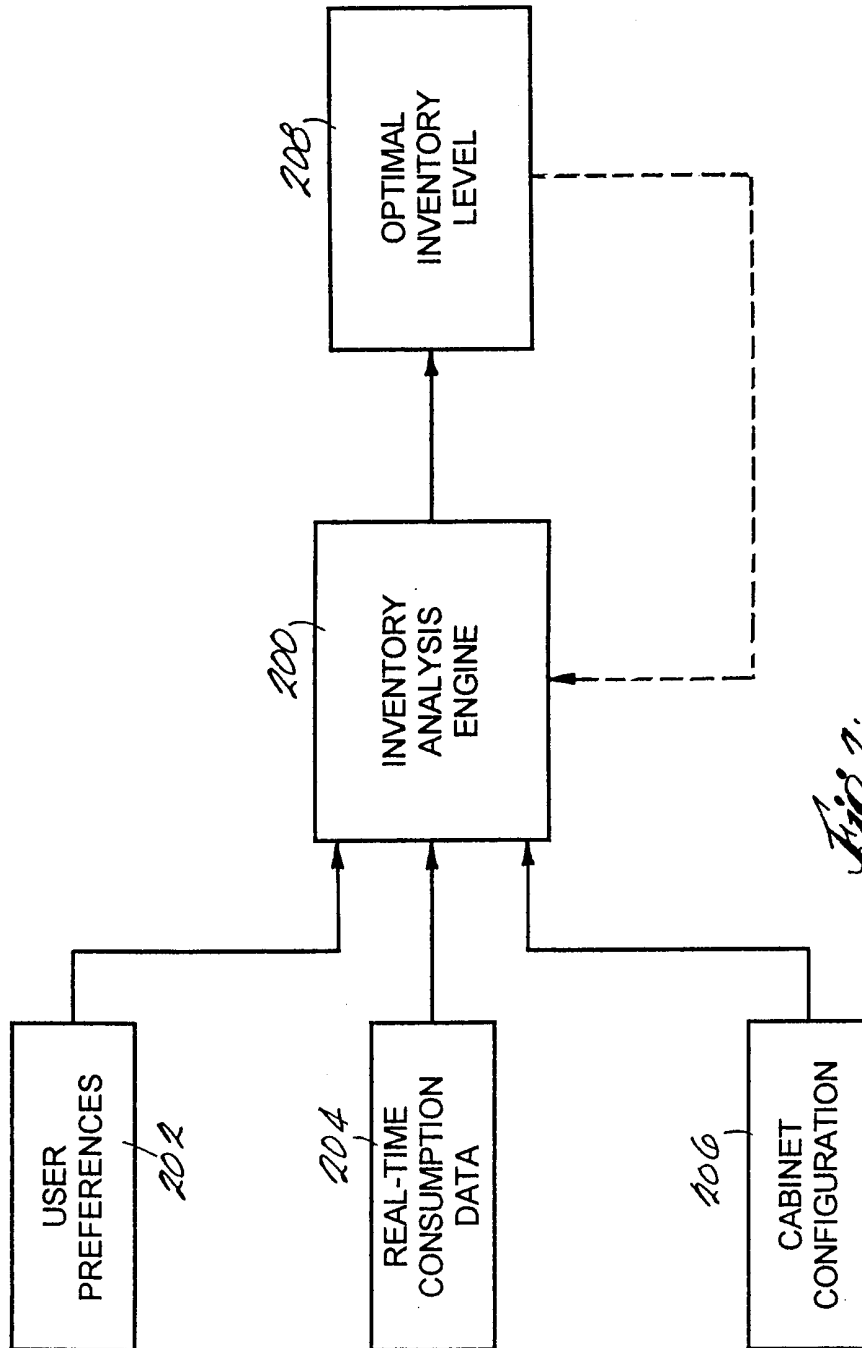
50. A method as in Claim 49, further comprising determining an amount of articles to be reordered based on the maximum amount of articles to be reordered and upon

the quantities in which and type of packaging the articles are manufactured and sold by the vendor.

51. A method as in Claim 49, wherein the consumption of articles over a period  
5 of time is measured according to a delivery interval and the maximum amount of articles to be reordered is determined using a safety multiplier.

52. A method as in Claim 51, further comprising determining a minimum  
10 amount of articles to be reordered based on the maximum amount of articles to be reordered, a lead time, and the delivery interval.





*Fig. 2.*

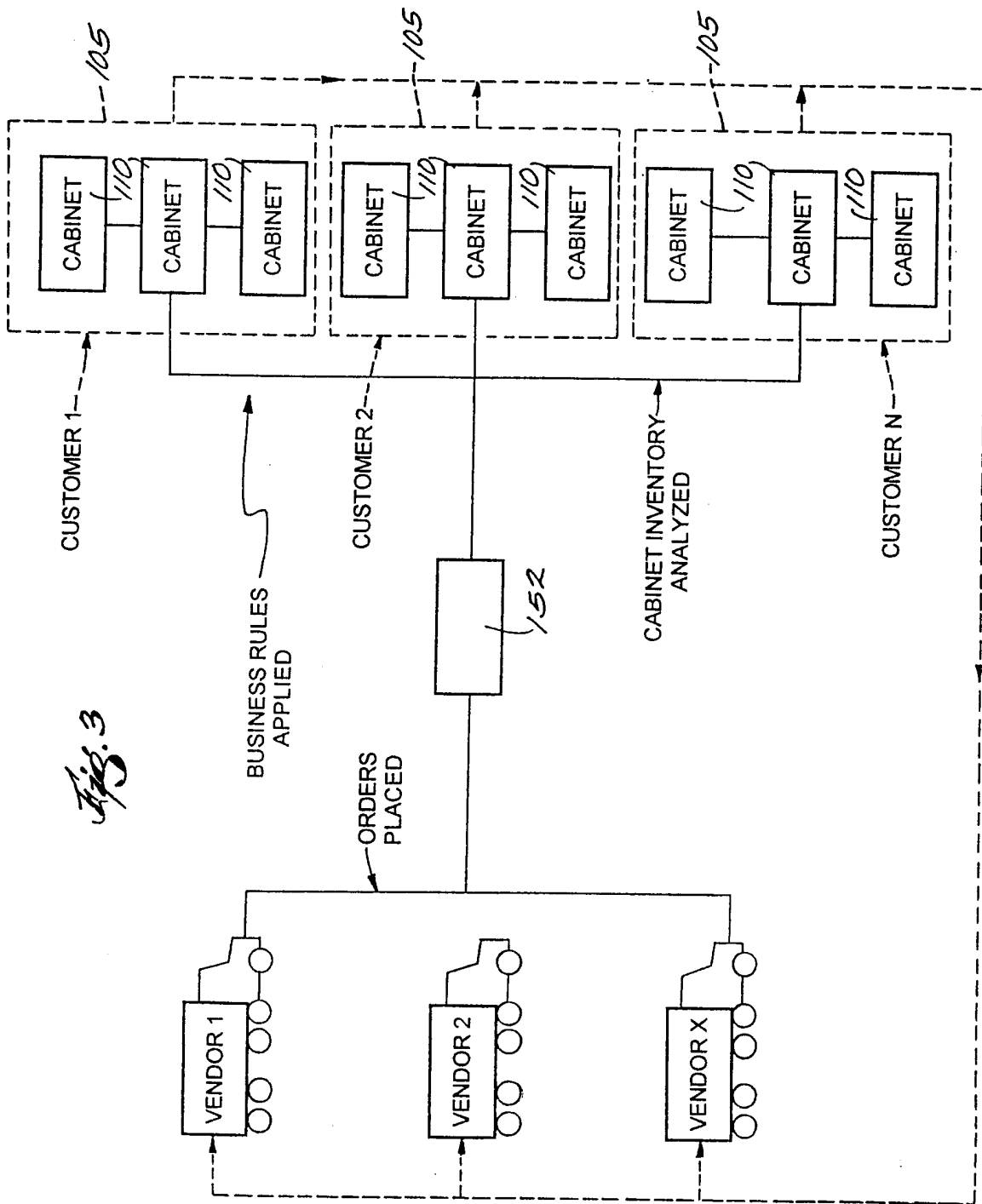


Fig. 3

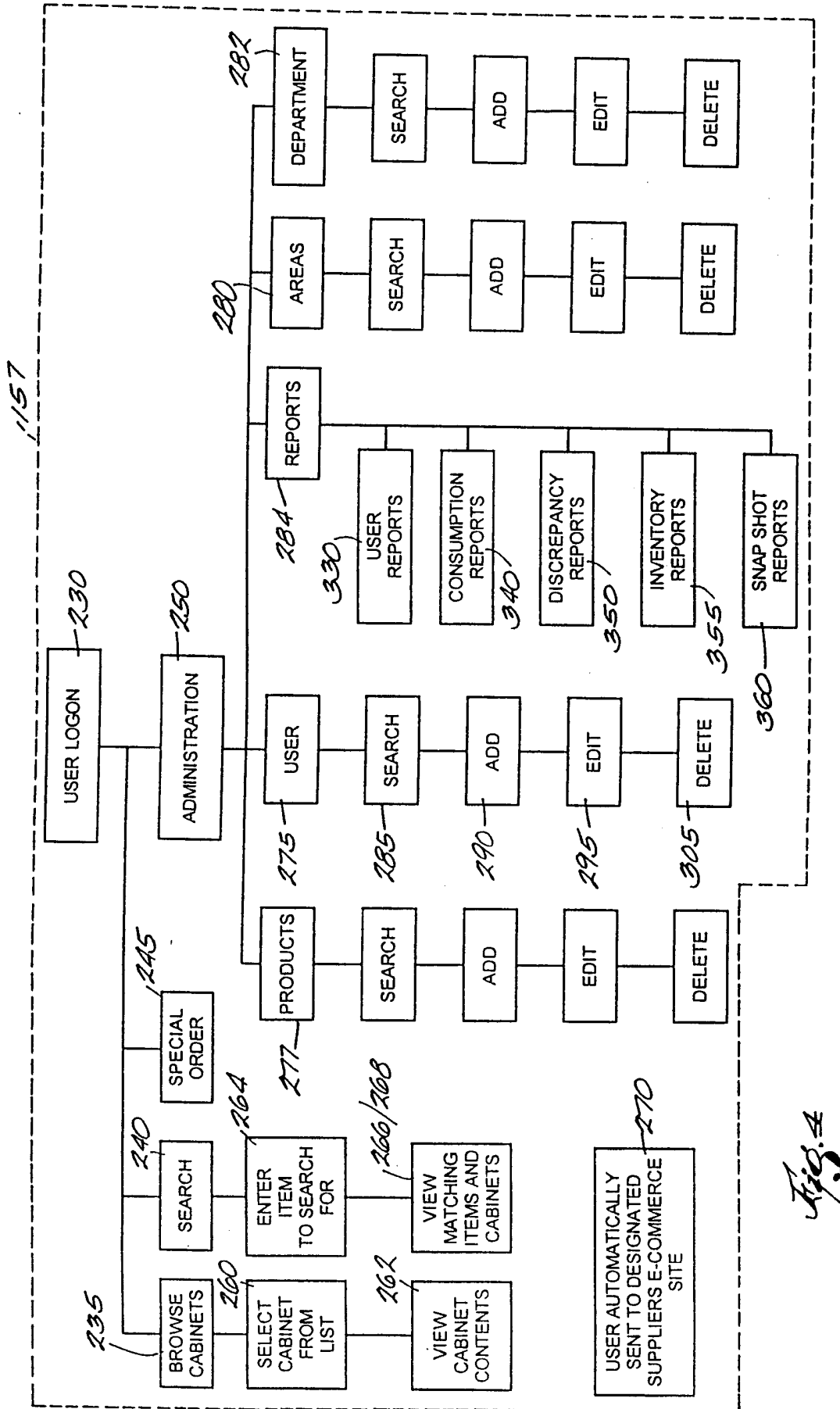
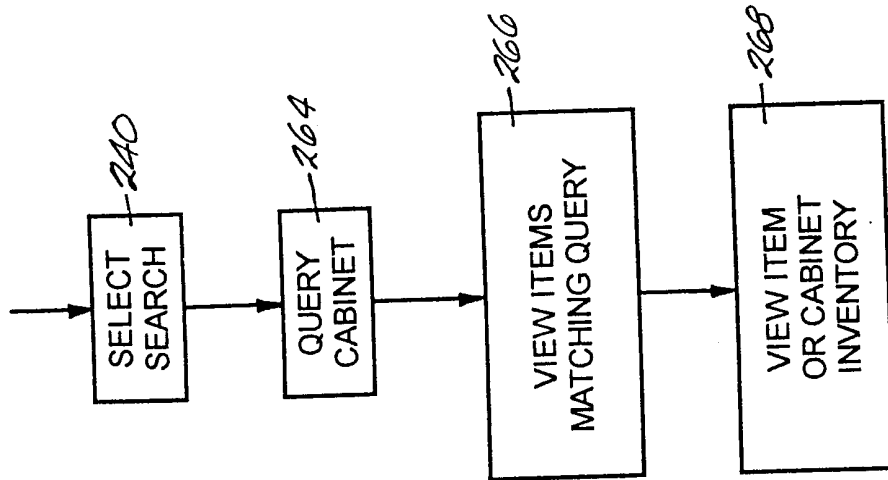
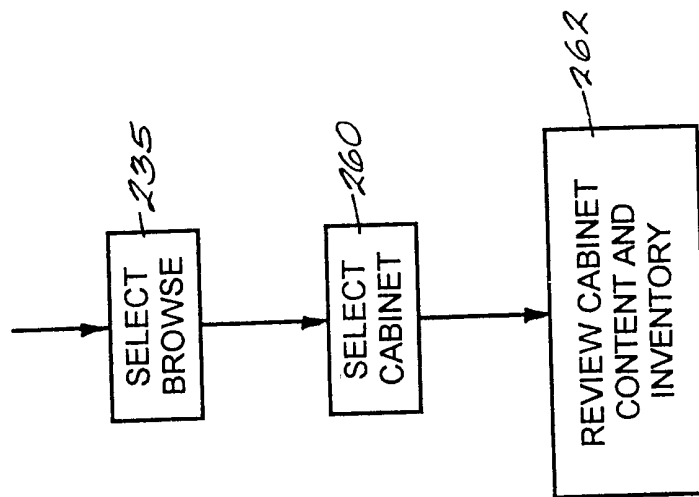


Fig. 4

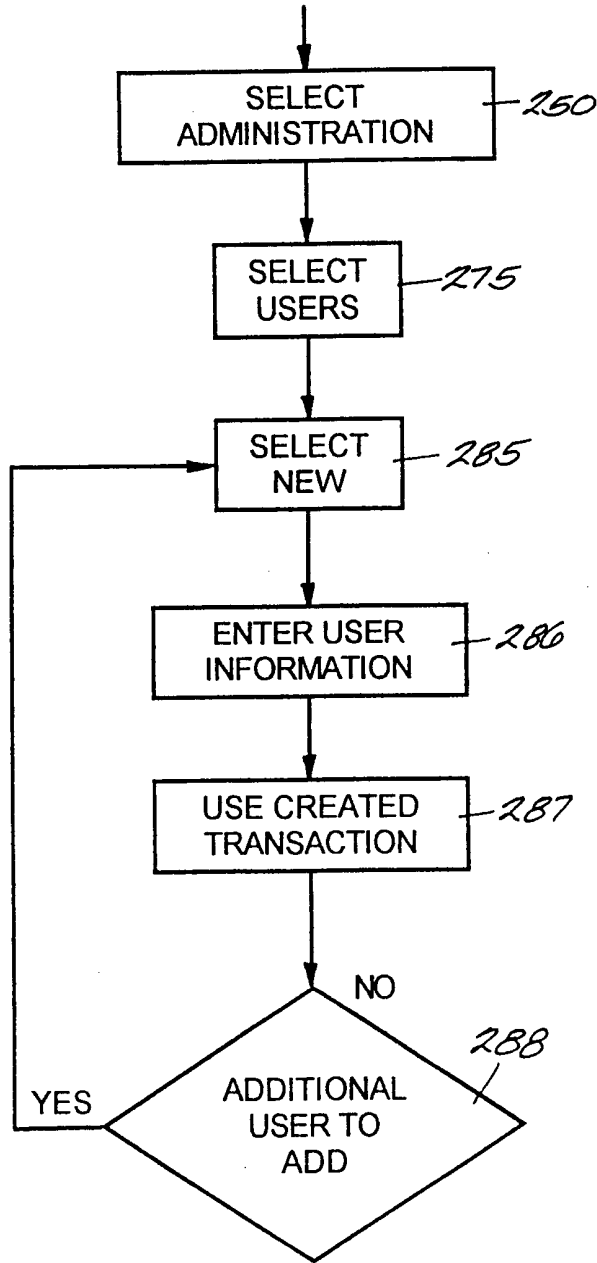


*Fig. 6*



*Fig. 5*





*Fig. 1*

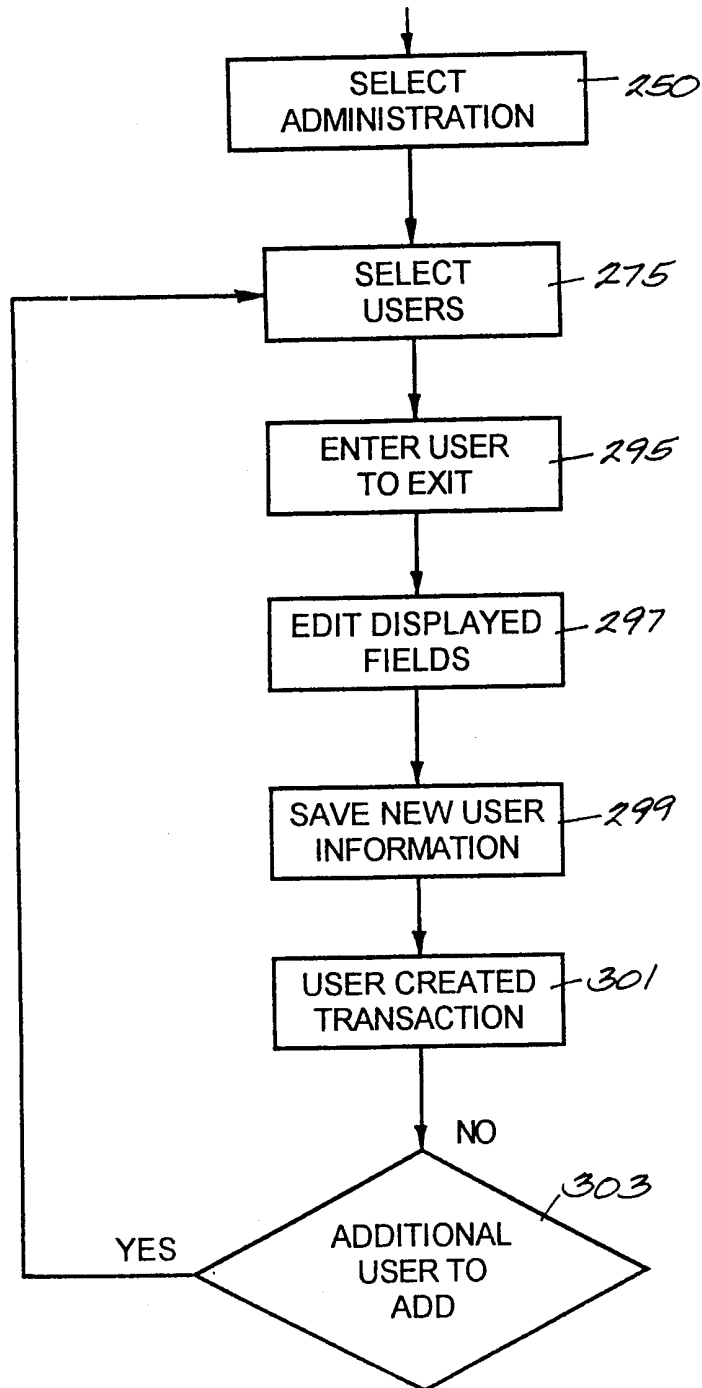
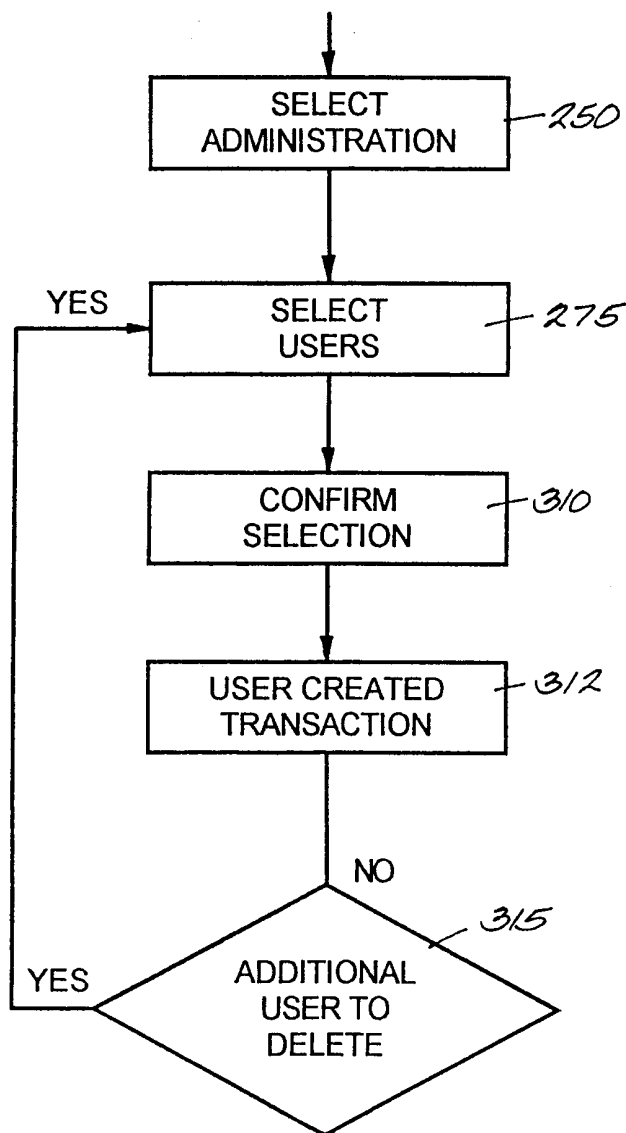
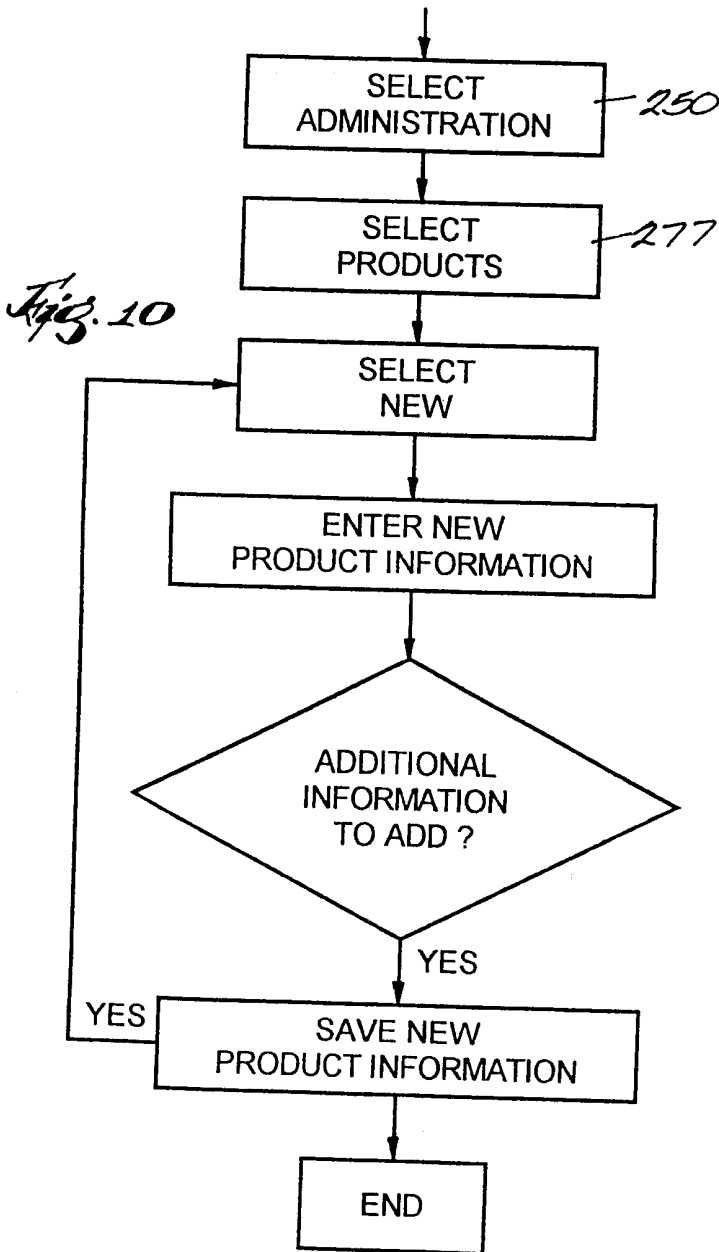
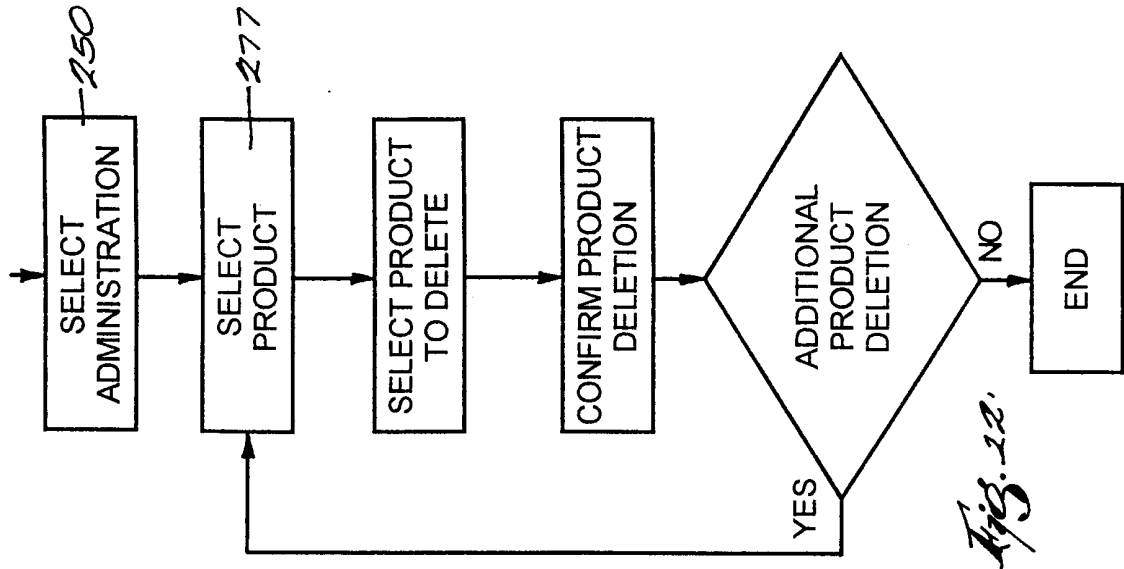


Fig. 8

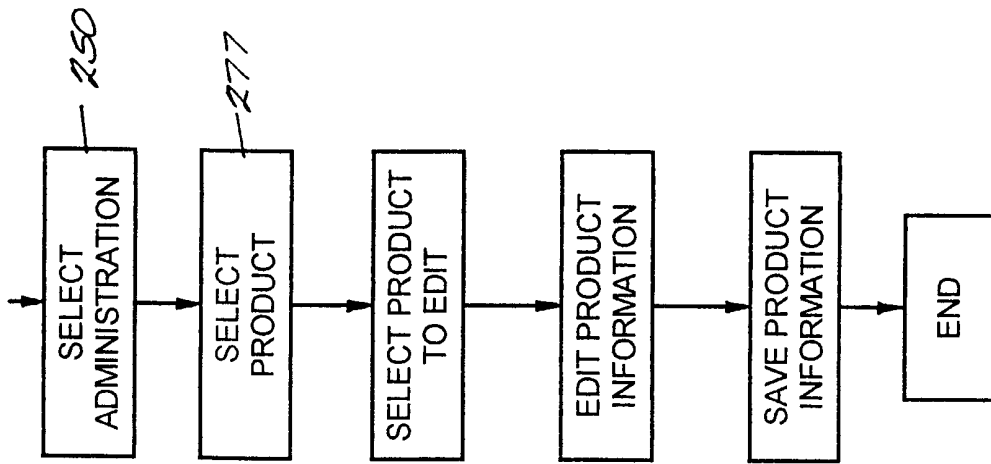


*Fig. 1*

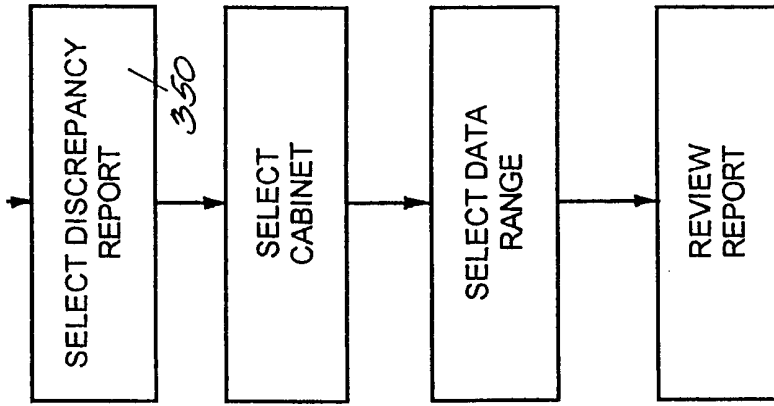




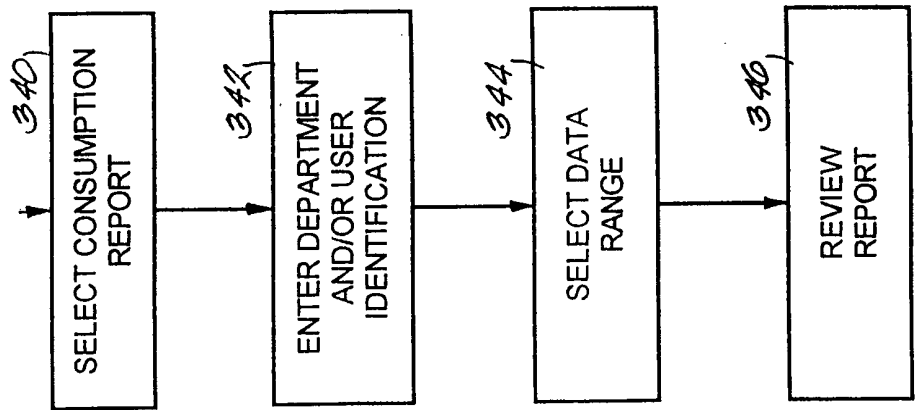
*Fig. 12.*



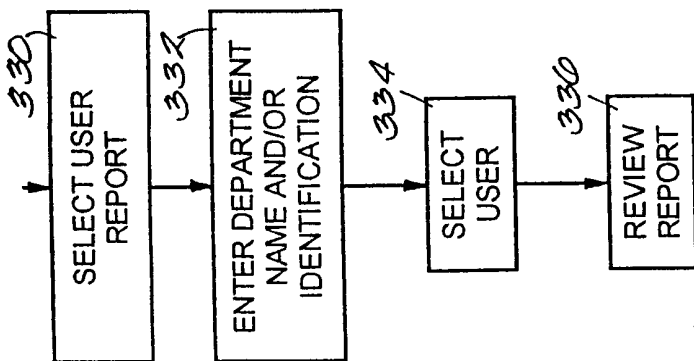
*Fig. 11.*



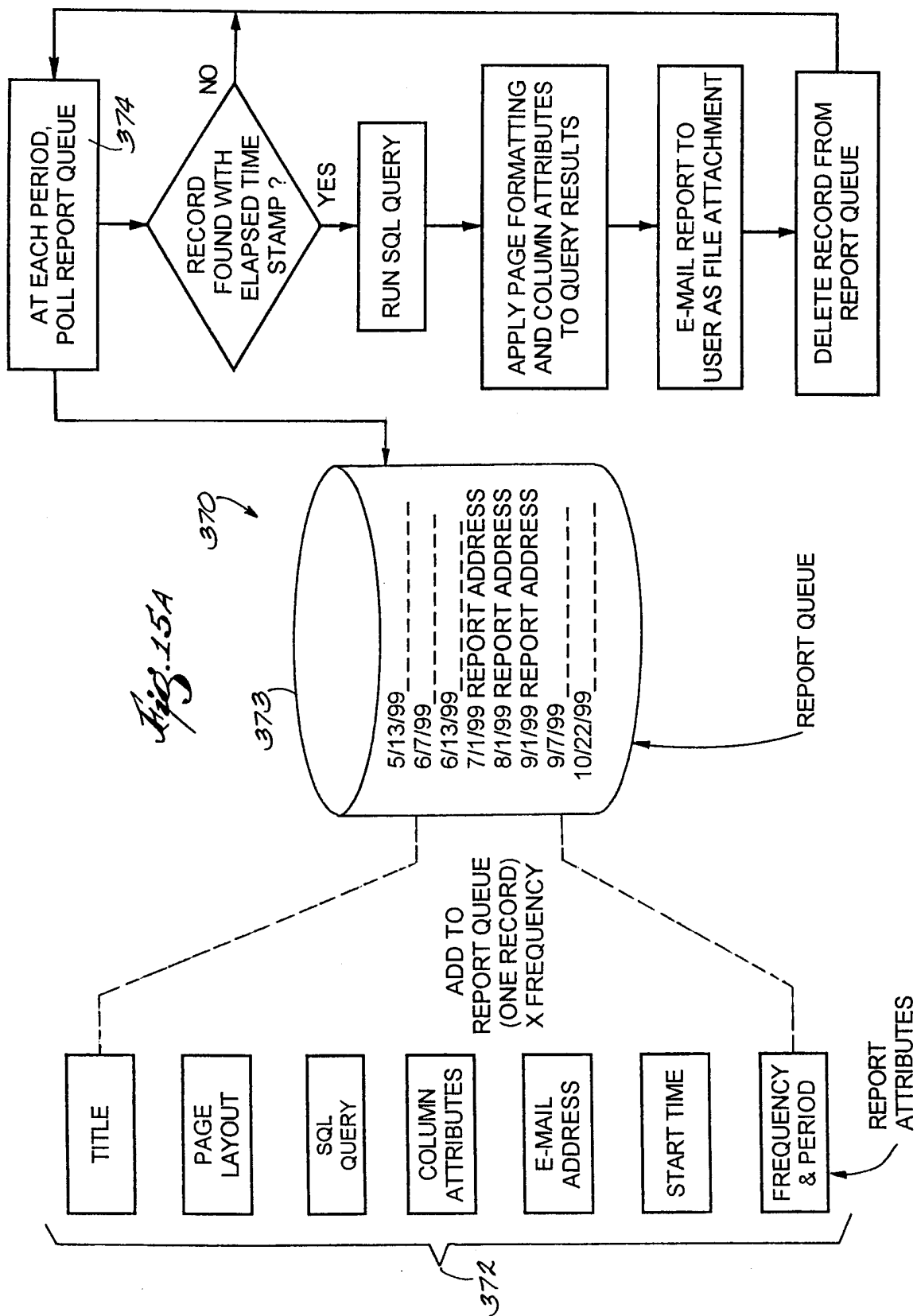
*Fig. 15*

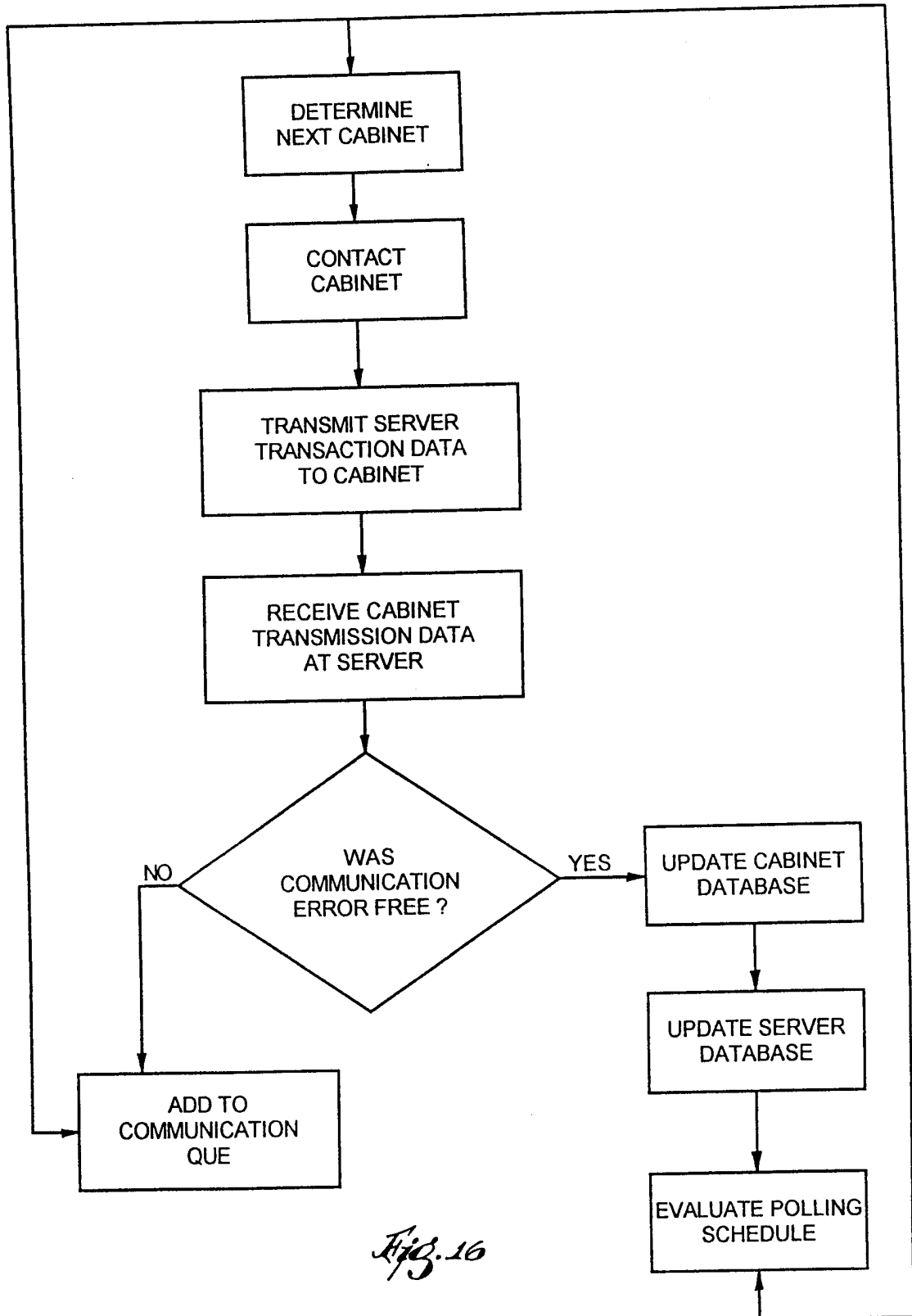


*Fig. 14*



*Fig. 13*





*Fig. 16*



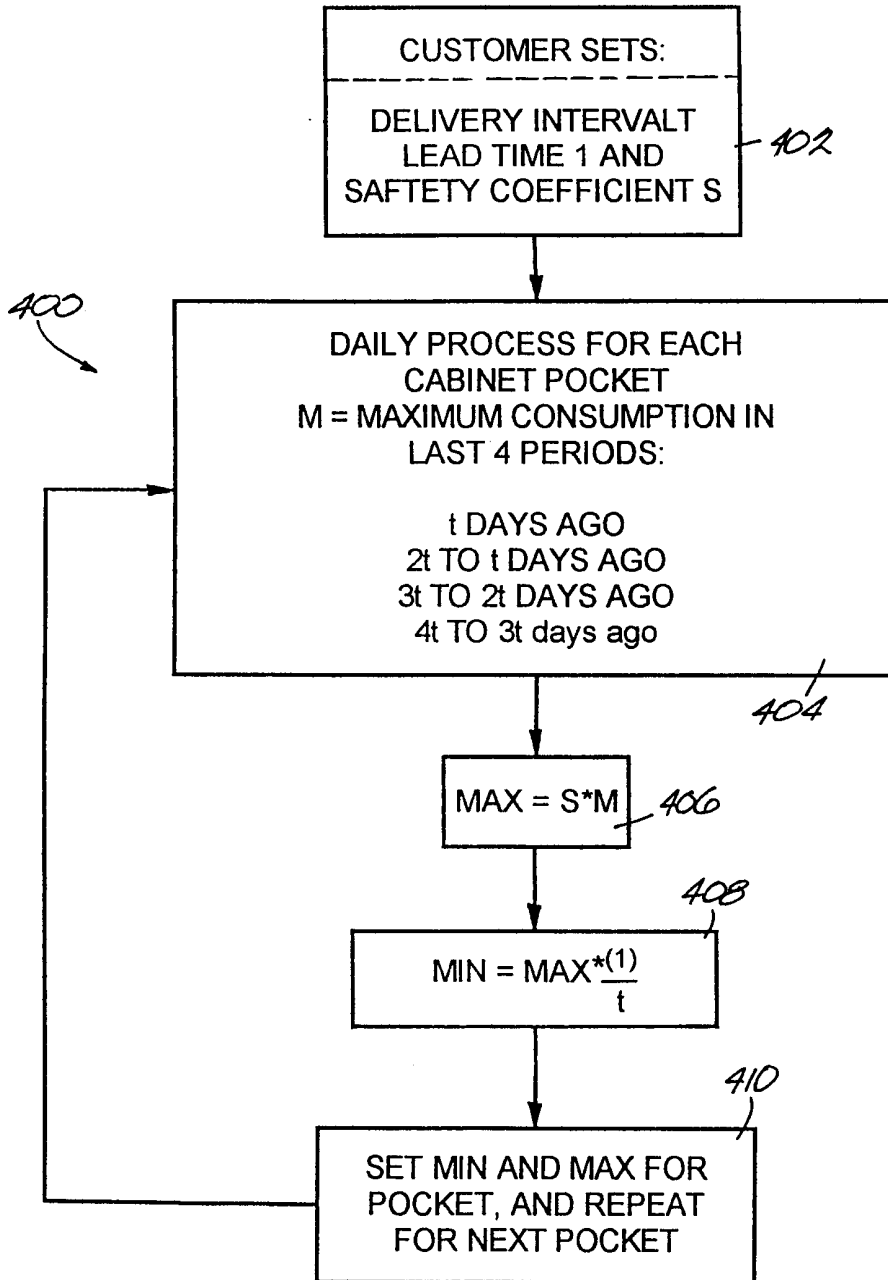
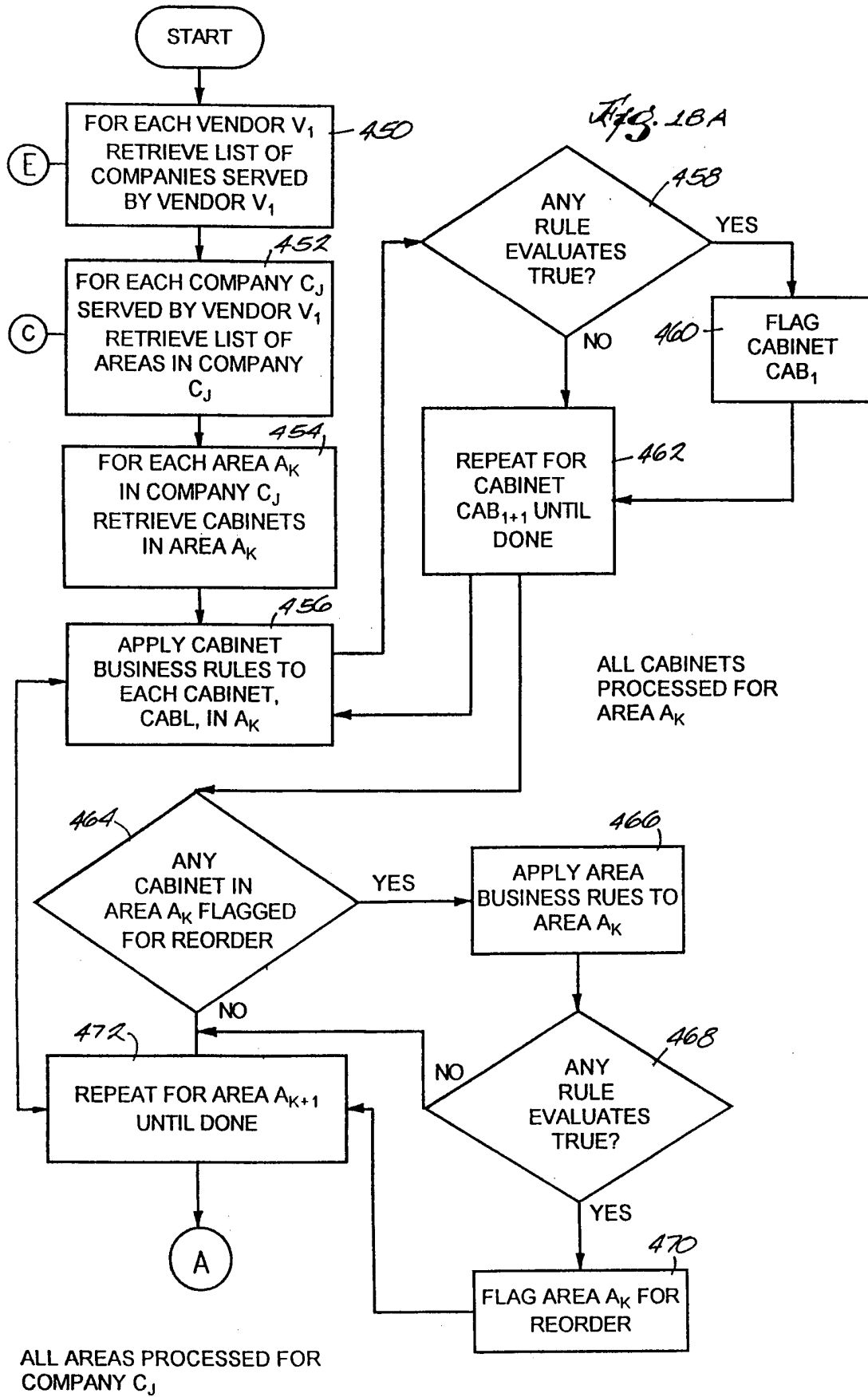
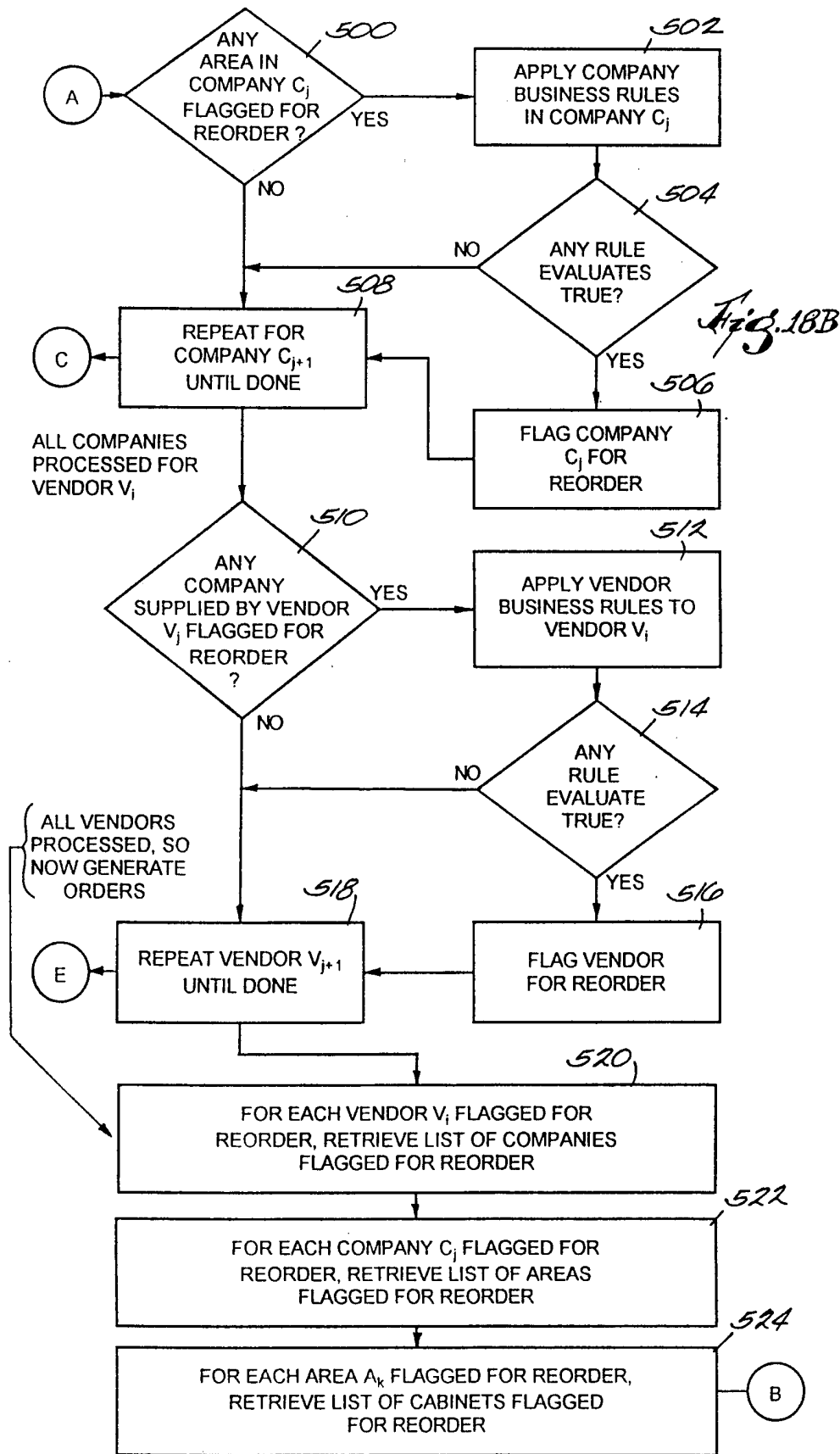
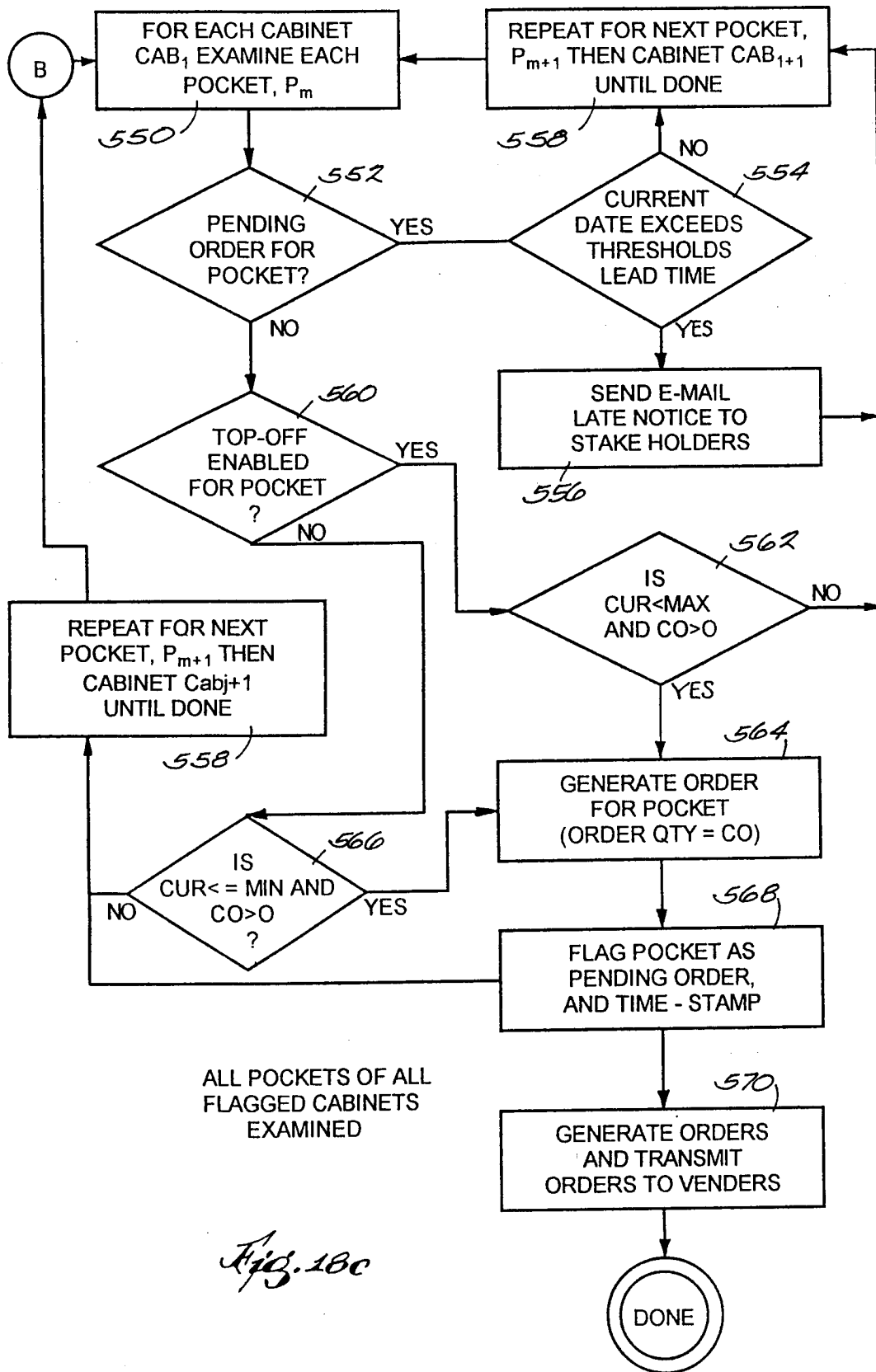


Fig. 17







# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/08474

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : E05B 47/00, A61B 5/00  
 US CL : 705/28, 221/10, 312/215

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/28, 29, 23, 22, 26; 221/10, 12, 28; 312/215; 707/3, 9

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
 Internet

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 Please See Continuation Sheet

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,520,450 A (COLSON, Jr. et al) 28 May 1996 (28.05.1996), column 2, lines 36-55;	1-52
---	column 3, lines 44-57; column 4, lines 37-67 and column 5.	-----
Y		1-52
Y	US 5,842,976 A (WILLIAMSON) 01 December 1998 (01.12.1998), columns 2-4; column 5, lines 12-38; column 6, lines 17-48 and column 7, lines 20-34.	1-52
A	US 5,047,948 A (TURNER) 10 September 1991 (10.09.1991), entirety	1-52
A	US 5,314,243 A (McDONALD et al) 24 May 1994 (24.05.1994), entirety	1-52
A	US 5,434,775 A (SIMS et al) 18 July 1995 (18.07.1995), entirety	1-52
A	US 5,564,803 A (McDONALD et al) 15 October 1996 (15.10.1996), entirety	1-52
A	US 5,832,459 A (CAMERON et al) 03 November 1998 (03.11.1998), entirety	1-52
A	US 5,953,706 A (PATEL) 14 September 1999 (14.09.1999), entirety	1-52
A	US 5,983,200 A (SLOTZNICK) 09 November 1999 (09.11.1999), entirety	1-52

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:		
"A" document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report <b>07 JUL 2000</b>
-----------------------------------------------------------	--------------------------------------------------------------------------

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Tod Swann <i>James R. Matthews</i> Telephone No. 703-305-3900
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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US00/08474

**Continuation of B. FIELDS SEARCHED Item3:** Dialog Information Services; search words: inventory, distributed, data, controller, processor, computer, enclosure, cabinet, station, dispenser, server, access, user, permission, articles, items, dispense