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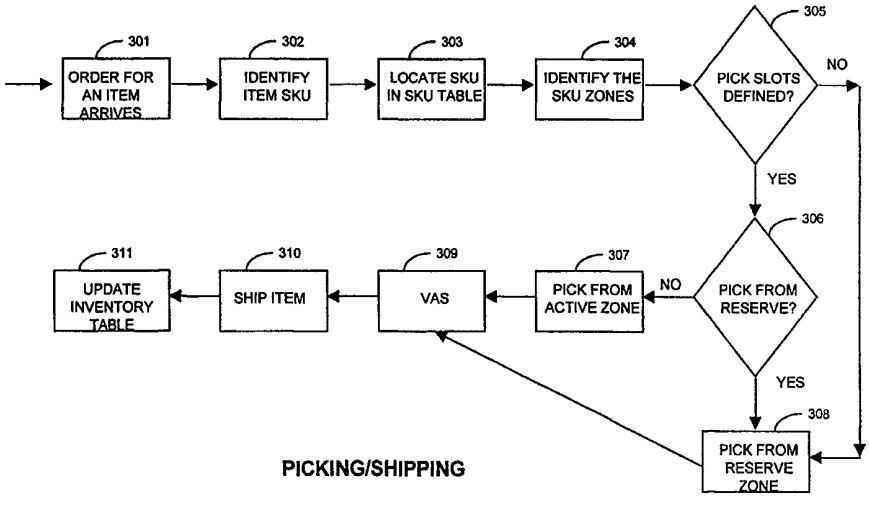
(57) Abstract

In one aspect, the invention is directed to a method for picking a product from a reserve area in a distribution center. One embodiment includes designating a zone in distribution center as a reserve zone and designating products as pick from reserve products. The method also includes determining whether an item in the distribution center is designated as a pick from reserve product. In another aspect, the invention is directed to a distribution center management system. The distribution center management system includes a configuration module, a product designation module, an inventory module, an identification module and an assigning module. The configuration module designates a zone in a distribution center to be a reserve zone. The product designation module designates products as pick from reserve products. The inventory module catalogs received items. The identification module determines whether an item is a pick from reserve product. The retrieving module retrieves pick from reserve products from reserve zones. In one embodiment, the retrieving module includes a locator that locates the reserve zone in which an item is stored. A worker is then directed to the located reserve zone. In another aspect, the invention is directed to a computer-aided method for distributing items requiring a value added service in a distribution center. A zone within the distribution center is designated as a zone for providing the value added service. Inventory items required for providing the value added service are identified. Pickers are directed to pick these inventory items. These picked inventory items are collected in the designated zone, where the value added service is provided using the collected items. The finished item is shipped after the value added service has been completed. In another aspect, the present invention is directed to a method for displaying distribution center management system information on a graphical display. This graphical display provides a system operator with an overview of the distribution center's status by simultaneously displaying a plurality subwindows of information.



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DISTRIBUTION CENTER MANAGEMENT SYSTEM

Technical Field

This invention relates to managing distribution centers. More particularly, the invention relates to computer aided methods and systems for managing the distribution of items in a distribution center.

Background

Products are traditionally stored in and distributed from product distribution centers. Traditional product distribution centers are subdivided into zones. There are usually at least three types of zones: active picking, reserve, and staging. Active picking zones are used to temporarily store small quantities of inventory to be shipped from the distribution center. Reserve zones store the bulk of the distribution center inventory for the purposes of replenishing inventory in the active pick zones. Staging zones are used for all in-transit inventory within the distribution center, including receipts (material received from outside the distribution center), shipments (inventory to be shipped to outside the distribution center), and packing. There may be any number of zones, and the zones may be located throughout the distribution center.

The staging and active picking zones are usually located in easily accessible areas of the distribution center. When items arrive at a distribution center, they are stored either directly in reserve zones or first placed in a staging zone from which they are later moved to a reserve zone. When an order is received for a quantity of particular items, the items must be moved from their reserve zone to an active picking zone. Once in the active picking zone, the items can be shipped from the distribution center to their destination. Thus, the active picking zone serves as a central portal for items shipped from a distribution center. Due to its specialized function, the active picking zone is necessarily limited in size. Items that are placed in an active picking zone must be quickly shipped to make room for new items. It is, therefore, not practical or even possible to store items in an active picking zone for longer than a transitional length of time.

A special problem arises in the case of high-volume items, that is items that are in particularly high demand. For example, a promotional item that is being retailed at a discount will be in high demand for the duration of the promotion. Distribution centers must be able to quickly respond to the temporarily high demand for high-volume items. To insure quick delivery

of orders for high-volume items, distribution centers typically move quantities of high-volume items to active picking zones prior to receiving orders for these items. The items are moved from a reserve zone to an active picking zone as soon as the distribution center learns that the items will become high-volume.

One limitation of the traditional management of high-volume items is the inefficiency created by the practice of storing high-volume items in reserve zones and the necessity to subsequently move them to active picking zones prior to shipping. This two-step process is particularly inefficient when the distribution center receives items that are already known to be high-volume items. In this case, items are first placed in reserve zones, despite advance notice that, as high-volume items, they may soon have to be moved to active picking zones. Attempting to remedy this inefficiency by placing arriving high-volume items directly into an active picking zone does not solve the problem, since active picking zones are not large enough to accommodate all incoming high-volume items as well as all other items that are being prepared for shipment.

In certain cases, additional work must be performed on an item either upon receipt or prior to shipping. This additional work is known as value added services ("VAS"). Some examples of VAS are kit assembly, labeling and final finishing. The rendering of VAS may involve the use of other items from the distribution center. For example, if VAS comprises integrating an item with other items as part of a kit, then all items necessary to complete the kit must be retrieved from their locations in the distribution center and collected into one area in order for the VAS to take place. Although it would logically make sense to place all items required by the same VAS process in near proximity to each other, this is usually not possible because strategic placement of inventory based on VAS requirements is outweighed by the strategic placement of inventory based on inventory flow. Thus, items required by the same VAS process may be located throughout the distribution center, creating inefficiencies in the retrieval of these items. Furthermore, using multiple inventory items to perform VAS can sporadically decrease physical inventory of these items by small quantities, making inventory difficult to track and exposing the distribution center's inventory control to discrepancies and inaccuracies.

In addition to these issues, effective management of a distribution center requires the constant oversight of many related elements of information about the distribution center and its operation, such as inventory control, shipping and receiving, and staff assignments. Because one element can affect other elements, the overall efficiency of the entire distribution center operation

can be impacted by any one or a combination of events that take place in the distribution center. Thus, the ability to examine and change all or most of the elements of information that affect the operation of the distribution center can help make continuous, real-time improvements to the overall efficiency of the distribution center. Traditional distribution center management systems do not provide users with a simultaneous view of all or most distribution center operations at one time. This inability prevents users from managing the distribution center operation as well as would otherwise be possible.

Summary of the Invention

In one aspect, the invention is directed to a method for picking a product from a reserve area in a distribution center. In one embodiment, the method includes designating a zone in distribution center as a reserve zone and designating products as pick from reserve products. The method includes determining whether an item in the distribution center is designated as a pick from reserve product. The method can also include directing pickers to pick products that are designated as pick from reserve products from the designated reserve zone.

In another aspect, the invention is directed to a method for picking a product from a reserve area in a distribution center. The method includes designating a zone in the distribution center as a reserve zone. Products are designated as pick from reserve products. An item is received, and storers are directed to store it in reserve zones. Pickers are subsequently directed to pick the item from reserve zones.

In one embodiment, a reserve zone is designated by specifying a zone identifier and a zone type. In another embodiment, pick from reserve products are designated by specifying a product identifier and a product attribute. The product attribute specifies whether the product specified by the product identifier is a pick from reserve product. In another embodiment, each item has a product identifier. A product list consisting of pairs of product identifiers and product attributes is maintained. An item is determined to be a pick from reserve product by locating the item's product identifier in the list and then determining if the item's product attribute indicates that the item is a pick from reserve product.

In another aspect, the invention is directed to a distribution center management system. The distribution center management system includes a configuration module, a product designation module, an inventory module, an identification module and an assigning module. The configuration module designates a zone in a distribution center to be a reserve zone. The

product designation module designates products as pick from reserve products. The inventory module catalogs received items. The identification module determines whether an item is a pick from reserve product. The retrieving module retrieves pick from reserve products from reserve zones. In one embodiment, the retrieving module includes a locator that locates the reserve zone in which an item is stored. A worker is then directed to the located reserve zone.

In one embodiment, the configuration module includes a zone list. This zone list contains a zone identifier and a zone type for each zone in the list. In another embodiment, the product designation module includes a product list. This product list contains a product identifier and a product attribute for each product in the list. In another embodiment, the product identifier is a stock keeping unit identifier. In another embodiment, the inventory module includes an item list. This item list contains an item identifier, an item quantity, and an item location for each item in the list.

In another embodiment, the identification module includes a matching module. The matching module searches the product list for a product identifier of a specific item. The product identifier is located, and the matching module examines the product attribute associated with the product identifier and determines whether the product attribute indicates that the item is a pick from reserve product.

In another aspect, the invention is directed to a computer-aided method for distributing items requiring a value added service in a distribution center. A zone within the distribution center is designated as a zone for providing the value added service. An order for a finished item requiring value added service is received, and inventory items required for providing the value added service are identified. Pickers are directed to pick these inventory items. These picked inventory items are collected in the designated zone, where the value added service is provided using the collected items. The finished item is shipped after the value added service has been completed. Examples of value added services include on or more of the following: assembling, modifying, adjusting, cutting, painting, coloring, and applying labels to the item.

In another aspect, the invention is directed to a computer-aided method for receiving items requiring a value added service in a distribution center. A zone within the distribution center is designated as a zone for providing the value added service. An item requiring value added service is received in the distribution center, and inventory items required for providing the value added service are identified. Pickers are directed to pick these inventory items. These picked inventory items are collected in the designated zone, where the value added service is

provided using the collected items. The finished item is stored in the distribution center after the value added service has been completed.

In another aspect, the present invention is directed to a method for displaying distribution center management system information on a graphical display. This graphical display provides a system operator with an overview of the distribution center's status by simultaneously displaying a plurality subwindows of information. The inbound staging subwindow displays inventory located in the inbound staging area. The outbound staging subwindow displays inventory scheduled for distribution. The item locator subwindow displays the location of inventory in the distribution center. The waves subwindow displays pending orders to be fulfilled. The receiving subwindow displays inventory scheduled to be received. The shipping subwindow displays inventory scheduled to be shipped.

Brief Description of the Drawings

In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. 1 is a block diagram of an example distribution center.

FIG. 2 is a block diagram of an embodiment of a distribution center management system.

FIG. 3 is an embodiment of an SKU record.

FIG. 4 is an embodiment of an SKU maintenance screen.

FIG. 5 is an embodiment of a zone record.

FIG. 6 is an embodiment of a zone maintenance screen.

FIG. 7 is a flowchart of an embodiment of the receiving process.

FIG. 8 is a flowchart of an embodiment of the picking and shipping process.

FIG. 9 is a flowchart of an embodiment of the value added services operation.

FIG. 10 is a block diagram of an embodiment of a graphical display.

FIG. 11 is a portion of the graphical display of FIG. 10.

FIG. 12 is a portion of the graphical display of FIG. 10.

FIG. 13 is a portion of the graphical display of FIG. 10.

FIG. 14 is an embodiment of the graphical display of FIG. 10.

Detailed Description

Referring to FIG. 1, an example distribution center (or warehouse) 100, is used to demonstrate generally the flow of goods within a typical distribution center. It should be clear that the figure depicts only one of many possible distribution center designs. The embodiments of the invention described with reference to FIG. 1 are intended to explain and clarify the invention, and not to limit the scope of the invention to any particular distribution center design.

Items 101, also referred to as goods, products, or inventory, enter the distribution center 100 from an outside location, such as a manufacturing facility. For example, items 101 can enter the distribution center on a conveyer belt 112, and/or from transportation vehicles 122 via an entry, such as the entry 120. In FIG. 1, transportation vehicles are depicted as trucks, but it should be understood that trucks 122 are one of the many types of transportation vehicles (e.g., planes, trains, and automobiles) that can service a distribution center.

Items are stored by storers, which can be human workers or machines, within a distribution center in a location. A location can be within a zone 114, 116, 118, 124, 126, 128, 130, 132, 142, and is also identified by an aisle, a bay, and/or a level (e.g. a shelf number and/or position). A zone 114, 116, 118, 124, 126, 128, 130, 132, 142 represents the highest order of the hierarchy and can include more than one aisles, bays, levels and/or positions. An aisle can include bays, levels and/or positions. A bay can include levels and/or positions. A level can include positions. Zones 114, 116, 118, 124, 126, 128, 130, 132, 142 are used to define specific sets of unique locations that share a common attribute. For example, pallet racks 118 and shelves 116 each requires a different zone due to the need to issue fork trucks to the pallet racks and hand carts to the shelves. A zone 142 can include a combination of aisles, bays, levels and/or positions. As will be described further below, zones 114, 116, 118, 124, 126, 128, 130, 132, 142 have attributes assigned to them. For example, a zone may be a reserve zone, it may be

an active pick zone, or it may be a staging zone. Active pick zones 126, 128, 130 are used to identify dedicated slots for retrieving items stored in cases or split cases. These slots are known as pick slots and the act of retrieving an item from a slot is called picking, and is performed by a human or machine picker. As inventory is depleted from the active pick zones 126, 128, 130 in a typical distribution center, it is replenished by moving inventory from reserve zones 114, 116, 118, 124, 142 to active pick zones 126, 128, 130. Reserve zones 114, 116, 118, 124, 142 are used to store bulk quantities of items for the purposes of replenishing pick slots in the active pick zones 126, 128, 130. Staging zones 132 are used for all in-transit inventory within the distribution center 100, including receipts, shipments, and packing.

As the items are received into the distribution center 100, they are packed in movable units. Movable units are units or containers that store one item or a quantity of items packed together to facilitate the movement of items from one physical location to another. Items are generally stored in reserve zones, and so received items are generally stored in bulk in large cartons or on pallets in the reserve zones 114, 116, 118, 124, 142. As shown, received items could be stored in reserve zones (e.g., shelves of size A 114, size B 116, size C 124), pallet racks 118, or a combination of shelves and pallet racks 142.

As necessary, items from a reserve zone 114, 116, 118, 124, 142 are moved to an active pick zone 126, 128, 130. An active pick zone 126, 128, 130 is generally close to the staging area 132 of the distribution center 100. The active pick zones of the distribution center 100, shown as pick shelf D 126, pick pallet rack E 128, and pick shelf F 130 are the zones that are proximate to the staging zone 132. Items to be distributed are taken from the active pick zones 126, 128, 130, and grouped in staging zone 132. From the staging zone 132, items are loaded onto a transport vehicle 122.

The picking process, which is the process of gathering the items for a particular order together in the staging area for outbound shipment, is made more efficient by locating the active pick zones close to the staging zones 132. Therefore, the active pick zones 126, 128, 130, generally are located physically proximate to the staging zones 132, so that the relatively small quantities of a variety of items can be quickly picked. It would not be possible to have all of the distribution center 100 inventory be located physically proximate to the staging area. Therefore, often a compromise is made between the quantity of a particular item that can be kept in an active pick zone close to the staging area, and the variety of the items that are stored close to the staging zone 132. Also, if items are different sizes, the items have associated with them different storage space requirements, for example different shelf height requirements, or weight requirements, and these factors are considered in allocating pick zones to items.

Periodically, depending on the quantity of an item that has been picked from an active pick zone 126, 128, 130, the active pick zone 126, 128, 130 will be replenished by moving items from the reserve zone. Workers are directed to move a subset of the items from a reserve zone 114, 116, 118, 124, 142 to an active pick zone 126, 128, 130. The placement of goods in a reserve zone and subsequent transfer of those goods to an active pick zone 126, 128, 130 requires the goods to be moved twice, which can be inefficient. However, this inefficiency is generally outweighed by the efficiency gains associated with having a variety of items located close to the staging area for pickers to quickly move from the active pick zones 126, 128, 130 to the staging area 132.

In an embodiment according to the present invention, high volume items (also referred to as high velocity items) are identified and picked directly from a reserve zone 114, 116, 118, 124, 142 in a distribution center. High volume items are those items with a heavier than normal flow through a distribution center. For example, a high volume item might be an item that is on sale,

meaning that consumers of that item will have incentive to buy higher quantities. Thus, a high volume of that item would be expected to come in and go out (flow through) the distribution center.

Picking from reserve zones provides a benefit by eliminating the step of moving goods within the distribution center from the reserve zone to the active pick zone. For high-volume goods, this movement of goods from a reserve zone to an active pick zone is particularly costly. By definition, there is a large quantity of high-volume goods being shipped, so there is a large quantity of goods that needs to be moved. The active pick zone quickly runs out of stock of a high volume goods and, therefore, requires frequent replenishment. This benefit comes at the tradeoff cost of picking from zones that are further away from the staging area. For high volume items, larger quantities will be picked at one time, and there is greater efficiency in picking high volume items from reserve than from moving high volume items from reserve to a pick area.

In one embodiment, picking from reserve is accomplished by identifying high volume items to a computer-based distribution center management system. The system tracks inventory and the physical locations of the inventory within a distribution center and can include portable terminals that direct distribution center workers in their daily tasks. For example, the system recognizes when the quantity of an item in an active pick zone 126, 128, 130 is below a predetermined threshold, and automatically directs one or more workers to replenish the active pick zone 126, 128, 130 with items from the reserve zone.

In certain cases, additional work must be performed on an item either upon receipt or prior to shipping. This additional work is known as value added services ("VAS"). Some examples of VAS are kit assembly, labeling and final finishing. In a typical distribution center, VAS is performed in a staging zone. For example, if an arriving item must be painted prior to being stored, upon receipt it is moved to a staging zone designated as the zone where painting is

performed. If additional items, such as paint, are required in order to perform the VAS, then these items are located in the distribution center and moved to the same staging zone as the item that must be painted. Once the item is painted, it is stored in a designated reserve zone or staging zone, depending on whether the item is being received or shipped.

The distribution center management system helps manage the VAS process by maintaining a list of VAS tasks that must be performed for each item and managing the workflow associated with the performance of each VAS task. This management includes the ability to dynamically maintain and modify VAS tasks, identifying which VAS tasks must be performed for each received or shipped item, identifying all items required to perform the VAS, identifying the appropriate staging zone where VAS may be performed, and directing distribution center personnel to move all necessary items to the appropriate staging zone.

Referring to FIG. 2, in one embodiment of a distribution center management system 10 according to the present invention includes eleven subsystems 11-21. The receiving subsystem 11 manages all receipts to the distribution center 100 (FIG. 1), internal receipts from stock, external receipts from vendors and all operations relating to putting away the received items. The receiving subsystem 11 manages the location of items as the items come into the distribution center, including planning for the expected receipts of items, initiating a receipt session, processing receipts of items, transferring inventory, and closing the receipt session. Planning for the expected receipts of items includes staff planning and assignment and the identification of items whose in-stock quantity is particularly low. Items with low in-stock quantity are marked as "hot" items and, upon receipt, can be processed with priority over other items. Initiating a receipt session includes assigning a trailer (transportation vehicle) to a particular bay door and directing the trailer in the assigned bay. Processing receipts of items includes verifying the item stock keeping unit numbers, recording received items and their quantities, and assigning items to

storage locations in the distribution center. Transferring inventory includes directing staff to physically move the inventory from trailers to the distribution center. Closing the receipt session includes moving the trailer away from the bay door and issuing the appropriate paperwork to signify that the items from the trailer have been received, including any statements of discrepancy.

A location and inventory management subsystem 12 monitors inventory and provides inventory control management. This subsystem performs re-warehousing of inventory, adjustments to inventory, inventory locking, and location discrepancy. Re-warehousing of inventory includes moving inventory from one location within the distribution center to another, for example in order to consolidate previously stored inventory, and maintaining accurate information about inventory location. Adjustments to inventory is performed to maintain accuracy between the physical inventory and the distribution center management system counts, based on damaged or lost inventory. Inventory locking is used for instances where temporary "freezing" of inventory is needed in order to analyze inventory in specific locations. The lock disallows the execution of tasks to the inventory, but does not prohibit the planning of orders to inventory. Location discrepancy is a status that can be assigned to a location in the event that there is a discrepancy between the physical inventory and the distribution center management system counts. The location and inventory management subsystem 12 supports various inventory-related queries, including how and when the inventory was stored, and whether adjustments should be made to the entire distribution center management system 10.

A distribution scheduler subsystem 13 plans orders for shipment. The primary function of this subsystem is to create a group of orders that are scheduled based upon a logistics purpose or a business reason. Each group of orders are referred to as a "wave." Once orders have been selected, they undergo wave generation which results in reservation of inventory to orders. The

distribution scheduler subsystem 13 builds "what if" shipment plans that simulate actual activities without having to actually commit the orders. This subsystem includes the transactions of order selection techniques, inventory and labor review, and wave generation. Order selection techniques are used to create a mix of orders that best meet the business and operational objectives of the distribution center. Orders may be selected by criteria, including the preferred ship date and geographic region. Inventory and labor review uses labor requirements and other shipping factors such as order destination to create an efficient order mix through order selection techniques. Once the group of orders meets the distribution center's business objectives, the orders may be released to wave generation. Wave generation hard allocates the inventory in the locations for the orders selected by order selection techniques and generates picking and replenishment tasks.

The tasks subsystem 14 defines and generates various tasks either on demand or in response to an event such as a receipt of a new item or an order for shipment of an item already in inventory. All movement of inventory tracked by the distribution center management system 10 is based on tasks, which may be grouped into picking tasks, replenishment tasks and moveable unit tasks. Picking tasks are tasks associated with retrieving inventory from its location, for example in order to ship it. Replenishment tasks are tasks associated with adding inventory to a location, for example when the inventory in a location within an active pick zone is depleted and inventory from a reserve zone must be moved to the active pick zone to replenish it. Moveable unit tasks are tasks related to receiving and shipping of inventory, including performing value added services to items.

The graphical display subsystem 15 enables the viewing and management of tasks in the distribution center using a graphical display that includes ten subwindows. Tasks are visible through a single set of transactions, which enable a dynamic restructuring of tasks within the

distribution center operation using the graphical display subsystem 15 based on the information provided by the graphical display subsystem 15. The graphical display subsystem 15 is described in detail below in the discussion of FIGs. 10 - 14.

The trailer management subsystem 16 manages the accurate loading of inventory for customer orders onto specific transportation vehicles. This subsystem manages packing, shipping carton quality assurance, trailer preparation, shipping documentation, trailer loading, and trailer closure and departure. Packing management includes the merging of inventory from one or more containers into a single container to save storage costs when the containers contain a small amount of inventory, and merging multiple containers together to save freight costs. Merging includes the merging of contents completely, merging from one container into another, or re-packing and moving a partial amount of inventory from one container to another. Shipping carton quality assurance management includes a reconciliation of confirmed items and quantities based upon picking against visual quality assurance, such as weight scale checks or visual quantity audits, performed by distribution center personnel. Trailer preparation management includes assigning trailers to staging doors and assigning unique IDs to trailers for load management purposes. Shipping documentation management includes the preparation of ship-to labels, pack slips, customer compliant labels, trailer manifests, invoices, export documentation, and bills of lading. The trailer management subsystem 16 monitors the status of orders to ensure that the printing of documents occurs at the time when the information is complete. Trailer loading management includes the accumulation of containers onto assigned trailers, and ensures that the correct orders are loaded onto the assigned trailers and that orders are not loaded across multiple trailers. Trailer loading management is accomplished through confirming that the unique trailer ID assigned during trailer preparation matches the trailer ID assigned to a

container. Trailer closure and departure includes the validation that the load is complete for the order and the issuance of advance shipping notices.

The physical inventory ("PI") and cycle counting subsystem 17 ensures inventory quantity and location accuracy by tracking the location and quantity of all items in the distribution center. It supports a "four walls" PI program as well as an ongoing cycle count program. The four walls PI program establishes the actual disposition of inventory within the four walls of the distribution center. The four walls PI process includes the following steps: startup PI, definition of counting method, entry of counts, reporting variances, entry of re-counts, end PI. The startup PI step includes the shutting down of all transactions in the distribution center management system other than PI transactions in order to restrict any business activity other than PI. The definition of counting methods specifies what type of counting method will be used to count the PI. For example, PI can be counted using tag count sheets generated for each zone's location or using radio frequency ("RF") counting. The entry of counts step includes the manual entry of counts into workstations by distribution center personnel and the generation of audit reports to insure that all count sheets generated by the system are entered and voided. The reporting variances step reports on variances and exceptions, reporting the difference between the distribution center management system location level inventory and the PI counts per location, as well as standard cost. The entry of re-counts step includes re-counting all locations that reported variances and the re-issue of the variance report in order to check the variances again. The end PI step includes the application of the PI counts to overlay the distribution center management system location level inventory with new count information, the cancellation of the PI process, and the resumption of all transactions supporting regular business activities once all locations have been counted, recounted and verified for quality counting.

The on-going cycle counts program supports inventory counting that can be conducted during daily activities. The on-going cycle counts program includes the opportunity counting and scheduled counting methods of counting inventory. The opportunity counting method includes providing to the distribution center personnel instructions to count inventory during picking and replenishment activities. The scheduled counting method includes scheduling counting activities using various counting criteria, including location ranges and discrepancy locations. The on-going cycle counts program includes the generation of count audit and exceptions reports.

The operations parameters subsystem 18 modifies the behavior of the distribution center management system 10 based on specific needs of the distribution center. In one embodiment, the modifications of operations parameters include choosing paper or radio frequency (RF) processing, modifying user authorities, setting distribution center default parameters, by-passing scheduling for specific orders, picking items from reserve, specifying what percentage of items undergo quality assurance, specifying which items should undergo quality assurance upon first time receipt, defining zones and zone types, zone classification and storage types in the distribution center, tracking of movable units, setting queue/zone relationships, defining locations, defining location cost, defining split and full case pick slots within zones, maintaining an SKU table, setting replenishment trigger levels, maintaining value added services information, and tracking labor within the distribution center.

The ERP interface subsystem 19 allows the distribution center management system 10 to interface with an Enterprise Resource Planning ("ERP") application using a series of interface file sets and information replication logic. This subsystem provides immediate real-time information regarding the current status of operations and any other information required by the ERP, including maintenance information, inbound and outbound control numbers,

acknowledgment of receipts and shipments, and adjustments to inventory. Maintenance information is information that usually remains static and is managed almost entirely by the ERP. Maintenance information includes information relating to billing, shipping, carriers, vendors, reason codes for inventory adjustments, value added services codes and descriptions, and stock keeping unit master lists. Inbound and outbound control numbers are generated by the ERP and communicated to the distribution center management system. The acknowledgments of receipts and shipments are generated by the distribution center management system and communicated to the ERP. The acknowledgments of receipts and shipments information includes stock keeping unit IDs and quantities of received or shipped items, so that the ERP can apply this information to the available on-hand inventory quantities. The adjustments to inventory information is generated by the distribution center management system based on receiving, shipping, and counting operations, and communicated to the ERP.

The end-of-day archiving subsystem 20 optimizes the performance of the distribution center management system 10 through routine resource maintenance, including daily backups of the system, file re-organization, and shedding of information to an archiving system in order to store information for a protracted period of time.

The management reporting subsystem 21 generates day-to-day and weekly/monthly/annual reports. The day-to-day reports enable the review of activities currently in the operation, including expected workload and the accomplishments of the personnel based on inbound, outbound, or planning operations. Weekly, monthly, and annual reports are generated based on the information archived by the end-of-day archiving subsystem 20 and provide information on medium and long-term trends in the distribution center operation.

Referring to FIG. 3, the distribution center management system of FIG. 2 tracks the flow of items in, through, and out of the distribution center in part using information stored in a stock

keeping unit ("SKU") record 30. A SKU record is created for each type of item to be processed by the distribution center management system. In one embodiment, the SKU record 30 is stored in a database, such as an object-oriented database. The SKU associated with an item can be defined in the system regardless of whether there are currently any of those items in inventory in the distribution center.

SKU records are maintained in an SKU table 36 that contains an SKU record 30 for each defined item. In one embodiment, the SKU record 30 includes a stock keeping unit ID (SKU ID) 32, item description, item unit of measure, item weight, weight unit of measure, item family ID, item product code, item commodity code, item ABC code, pick from reserve code 34, variable case pack quantities, hot SKU code, hot SKU horizon (days), safety stock quantity, lot control, serial number control, expiration date control, shelf life, and value added services ("VAS") information 38. The depicted record is one embodiment, and the SKU record layout takes other forms in other embodiments. For example, in another embodiment, information associated with an SKU ID is stored and maintained in two or more records that are linked together using a common identification field, so that one record contains an SKU ID, item description and item product code, while another record contains an SKU ID and item weight. Not all field values are required in order to create an SKU record. For example, an SKU record may be created by specifying only the SKU ID. Other fields values may be specified later or not specified at all.

In the embodiment of Figure 3, the SKU ID 32 is the primary key used to identify and locate an SKU record in the SKU table 36. The SKU ID 32 is used throughout the distribution center management system to identify inventory. A pick from reserve code 34 indicates whether the item is a "pick from reserve" item. Items that are not pick from reserve items may only be picked from an active picking zone to fill a shipping order. However, if an item is a pick from reserve item, then it may be picked directly from a reserve zone, thereby saving the step of first

moving the item to an active picking zone. For example, a pick from reserve code value of 1 may signify that the item is a pick from reserve item and a value of 0 may signify that it is not. The pick from reserve code 34 can be changed at any time in order to affect the storage of items that are subsequently received.

In one embodiment, the SKU record 30 contains information about value added services ("VAS") 38 that are to be performed on the item. In one embodiment, the VAS information includes a VAS identifier. The distribution center management system maintains a list of all value added services in a VAS table. In one embodiment, the VAS table is a database such as an object-oriented database. The VAS table consists of VAS records. Each VAS record includes a unique VAS identifier, used in SKU records 30 to identify what kind of value added services should be performed on the item represented by the SKU record 30. The information in the VAS record includes a description of the type of services that must be performed, whether the services must be performed upon receipt or upon shipping of the item, whether this item is a kit or a component of a kit, what other items are required in order to perform the value added services, and in which staging zone the value added services should be performed. Value added services are also described below with regard to FIG. 9.

Referring to FIG. 4, the SKU Maintenance Screen 40, allows a user to enter and edit information about items. The SKU ID is an alphanumeric string entered into the SKU ID field 42. The Pick From Reserve checkbox 44 is checked by a user to signify that the item should be picked from reserve locations. When the Pick From Reserve checkbox 44 is checked, the value of the pick from reserve code (34 in FIG. 3) in the SKU record for this item is set to signify that the item should be picked from reserve. For example, if a pick from reserve value of 1 signifies that the item is a pick from reserve item, then the pick from reserve code will be set to 1.

Referring to FIG. 5, the physical space of a distribution center is divided into zones and information about each zone is maintained in the zone record. A zone record 50 is maintained in a zone table 56 for each defined zone. In one embodiment, the zone record 50 of FIG. 5 includes a zone ID 52, zone description, active attribute, zone type 54, storage type, resource type, default class, ABC code, inbound attribute, outbound attribute, cross dock attribute, hot SKU attribute, quality assurance attribute, Work in Process/Value Added Services Attribute, Radio Frequency (RF) Enabled Attribute, Moveable Units (MU) Tracked Attribute, Outside Location Attribute, and Maximum Pallets to Stack.

The depicted record is one embodiment, and in other embodiments the zone record layout can take other forms. For example, in another embodiment, information associated with a zone is stored and maintained in two or more records that are linked together using a common identification field, so that one record contains a zone ID, zone description and active attribute, while another record contains a zone ID and a zone type. Not all field values are required in order to create a zone record. For example, a zone record may be created by specifying only the zone ID. Other fields values may be specified later or not specified at all.

In one embodiment, the zone ID 52 is a key used to identify and locate a zone record in the zone table 56. It is used throughout the distribution center management system to identify zones. The zone type 54 indicates whether the zone is an active picking, a reserve, or a staging zone. For example, in one embodiment a value of 1 indicates that the zone is a reserve zone, a value of 2 indicates that it is an active picking zone, and 3 indicates that it is a staging zone. Staging zones are used for the temporary storage of inventory, for example to perform value added services. Active picking zones are used to identify dedicated pick slots from which items are retrieved to fill a shipping order. Reserve zones are used to store bulk quantities of items for the purposes of pick slot replenishment when the quantity of items in a pick slot of an active

picking zone is low. Thus, unless an item is designated as a pick from reserve item, it may not be picked from a reserve zone to fill a shipping order. Items that are not marked as pick from reserve may only be picked from zones that are marked as active picking zones. The zone type 54 can be changed at any time in order to affect the picking of items marked as pick from reserve items.

Referring to FIG. 6, the Zone Maintenance Screen 60 allows a user to enter and edit information about zones. A zone ID is an alphanumeric string entered into the Zone ID field 62. The Zone Type field 64 can be set to active picking, reserve, or staging. The value specified in the Zone Type field 64 is stored in the Zone Type field (54 in FIG. 5) in the zone record for this zone. In one embodiment, a Zone Type field value of 1 is for "reserve," 2 is for "active picking," and 3 is for "staging area."

Referring to FIG. 7 which depicts the process for receiving an item into the distribution center, an item arrives into the distribution center 71 by one of a number of means including from a transportation vehicle or a conveyer belt. For each arriving item, the distribution center management system identifies its SKU ID 72. The SKU ID may be identified from a specification on the shipment itself, or from the SKU table (36 in FIG. 3) based on item description 73. If the SKU table does not contain a record with the SKU ID of the arriving item, then a new SKU record may be created. As described with regard to FIG. 3, the SKU record contains information about the item, including value added services ("VAS") information and a pick from reserve attribute. If the VAS information indicates that value added services must be performed, then these services are performed 74 according to the process described below with regard to FIG. 9. The SKU record or the zone table (56 in FIG. 5) is searched 76 for a reserve zone (54 in FIG. 5) that can be used to store the arriving item. Once the appropriate zone in which to store the item has been identified 76, distribution center personnel are directed to store

the item in the appropriate zone 78. In one embodiment, directions to the distribution center personnel are communicated using radio frequency ("RF") terminals. The item location, and any other relevant information such as quantity, is recorded in the inventory table 79.

Referring to FIG. 8 which depicts the process for picking and shipping an item out of the distribution center, an order for an item arrives into the distribution center 301 for example, via mail, telephone or computer network. The SKU ID of the item being ordered is identified 302. If the SKU ID is specified, then the SKU table (36 in FIG. 3) is searched for an SKU record containing this SKU ID 303. Otherwise, the SKU table is searched for an item description that matches the ordered item. Once the SKU record is identified, the zone IDs of the zones where the item is located are extracted from the SKU record 304. If the SKU record does not identify active picking zones from which the item must be picked 305, the item is picked from a reserve zone 308. If the SKU record identifies active picking zones from which the item can be picked 305 and the SKU record indicates that the item is not a pick from reserve item 306, then the item is picked from an active picking zone specified in the SKU record 307. If the SKU record identifies active picking zones from which the item must be picked 305, but the SKU record indicates that the item is a pick from reserve item 306, then the item is picked from a reserve zone specified in the SKU record 308.

If the value added services "VAS" information in the SKU record indicates that value added services must be performed, then these services are performed 309, for example according to the process described below with regard to FIG. 9. The item is then shipped to its destination 310 and the inventory table is modified to reflect the change in quantity on hand and any other information relevant to the shipping of the item 311.

Referring to FIG. 9, which depicts the process for performing value added services to an item 91, the VAS information field (38 in FIG. 3) of the item's SKU record (30 in FIG. 3) is

examined to determine whether value added services are to be performed. If the VAS information does not indicate that VAS must be performed, then VAS is not performed. Otherwise, the VAS table is searched to locate the VAS record of the VAS specified in the item's SKU record (30 in FIG. 3) in order to determine the staging zone where the VAS should be performed 92. Once the staging zone is identified, the item is moved to that zone 93. The VAS record of the VAS specified in the item's SKU record (30 in FIG. 3) is examined to determine whether other items are required in order to perform the value added services 94. Any identified items are moved to the appropriate staging zone 95. Once all the required items are assembled in the staging zone, the value added services are performed 96. Once the value added services are completed, the item continues to be processed by either the receiving process depicted in FIG. 7 or by the Picking/Shipping process depicted in FIG. 8.

Referring to FIG. 10, in one embodiment, information about the distribution center management system is displayed using a graphical display 200, which provides a comprehensive view of the activities in the distribution center. The graphical display 200, includes ten subwindows, each presenting information regarding specific sets of distribution practices. The subwindows are user configured and may be set to display on the display at the same time. Any number or combination of subwindows can be displayed simultaneously. The graphical display 200 presents information in a hierarchical manner, using icons and color to present information, including alerts, to its users. The graphical display 200 refreshes itself without user intervention, so that the user is constantly kept abreast of the activities in the distribution center. The graphical display 200 also provides click and drag functionality. For example, an emergency order that is not being currently processed may be dragged into the current process order ahead of the line. In doing so, standard systemic rules of order, receipt or assembly planning and release

strategies may be established, and yet disregarded at the user's discretion. One embodiment of the graphical display 200 is depicted in FIG. 14, and described below.

The Inbound Trailer subwindow 201 includes a listing of any transportation vehicles scheduled to arrive at the distribution center, including trailers that are in transit, those that are being currently unloaded, and those that have been unloaded and are now closed. In one embodiment, this information includes details about each inbound trailer, including trailer ID, seal ID, trailer status, door ID, as well as information about the inbound orders (ICNs) associated with each trailer, including ICN ID, status, due date, total order quantity, total received quantity, unit of measure, SKU ID, SKU description, transaction confirmation date, transaction confirmation time, total order quantity for this transaction, source of inventory, target of inventory, movable unit ID, and zone ID. One embodiment of the Inbound Trailer subwindow 201 is depicted in FIG. 11 as 405. Referring further to FIG. 11, the Inbound Trailer subwindow 405 includes a trailer ID field 406, a seal ID field 407, a status field 408, and a door ID field 409.

Referring to FIG. 10, the ICNs Receiving subwindow 202 includes a listing of all Inbound Orders (ICNs) scheduled to be received at the distribution center. In one embodiment, the ICNs Receiving subwindow 202 includes information about open, in transit, and closed orders, including ICN ID, ICN date, due date, vendor ID, purchase order ID, order quantity, quantity received to date, unit of measure for the SKU, SKU ID, SKU description, transaction ID, transaction confirmation date, transaction confirmation time, total order quantity for this transaction, source of inventory, target of inventory, movable unit ID, and zone ID. One embodiment of the ICNs Receiving subwindow 202 is depicted in FIG. 11 as 410. Referring further to FIG. 11, the ICNs Receiving subwindow 410 includes an order quantity field 411, a received quantity field 412, a number of ICNs arrived field 413 and a number of ICNs expected field 414.

Referring to FIG. 10, the Inbound Staging subwindow 203 includes information about inventory that has been removed from trailers, but requires additional processing before being placed in stock. Inventory requiring additional processing is placed in staging zones. These are areas of the distribution center where moveable units (MUs) are stored until the processing location is available. In one embodiment, the Inbound Staging subwindow 203 includes information about staging zones and about zone contents, such as zone ID, queue ID, queue description, total number of movable units, movable unit threshold for the current staging zone, movable unit ID, total number of SKUs, SKU ID, SKU unit of measure, SKU description, on-hand quantity of SKU, quantity of on-hand SKU that is available for picking, transaction ID, transaction confirmation date, transaction confirmation time, total quantity of SKU for this transaction, source of inventory, target of inventory, and target location ID. The Inbound Staging subwindow 203 also includes progress monitors indicating the completion percentage for tasks assigned to the staging zone by displaying aggregate completion of the inbound staging activity using a graphical bar. One embodiment of the Inbound Staging subwindow 203 is depicted in FIG. 11 as 415. Referring further to FIG. 11, the Inbound Staging subwindow 415 includes a graphical bar 416, a zone ID field 417, a queue ID field 418 and a queue description field 419.

Referring to FIG. 10, the Locator subwindow 204 includes a listing of all the locations in the distribution center and displays the entire structure of the distribution center layout. In one embodiment, this information includes SKU quantities on hand, available, pickable, in demand, on hold, and on order, as well as information about SKU locations, zones, aisles, bays, levels, and positions, and SKU details listed under each location. The Locator subwindow 204 also provides the ability to define a large number of locations to the distribution center. One embodiment of the Locator subwindow 204 is depicted in FIG. 11 as 420. Referring further to

FIG. 11, the Locator subwindow 420 includes a locations field 421, a quantity on hand field 422, a quantity available field 423, and a quantity on order field 424.

Referring to FIG. 10, the OCNs Shipping subwindow 205 includes information about orders expected to be shipped from the distribution center. In one embodiment, this information includes the OCN ID, order status, order date, due date, SKU quantity, number of units arrived, and number of units expected. One embodiment of the OCNs Shipping subwindow 205 is depicted in FIG. 12 as 440. Referring further to FIG. 12, the OCNs Shipping subwindow 440 includes an OCN ID field 441, a status field 442, an order date field 443 and a due date field 444.

Referring to FIG. 10, the Waves subwindow 206 includes information about orders that have been planned and included in batches of manageable work ("waves"). In one embodiment, this information includes queues, orders, SKU ID, SKU quantity, pick location, pick date, pick time, transaction ID and transaction type. Aggregate completion of the waves activity is displayed using a graphical bar. One embodiment of the Waves subwindow 206 is depicted in FIG. 12 as 425. Referring further to FIG. 12, the Waves subwindow 425 includes a graphical bar 426, a transaction ID field 427 and a transaction type field 428.

Referring to FIG. 10, the Outbound Staging subwindow 207 includes information about orders that have been completed and committed to staging areas for post pick activities, including packing, quality assurance, and trailer loading. In one embodiment, this information includes zone ID, and, for each zone, moveable unit ID and SKU quantities. Aggregate completion of the outbound staging activity is displayed using a graphical bar. One embodiment of the Outbound Staging subwindow 207 is depicted in FIG. 12 as 430. Referring further to FIG. 12, the Outbound Staging subwindow 430 includes a graphical bar 431, a zone ID field 432, a queue ID field 433 and a description field 434.

Referring to FIG. 10, the Outbound Trailer subwindow 208 includes information about trailers that are used to ship the orders. In one embodiment, this information includes trailer ID, seal ID, and trailer status. One embodiment of the Outbound Trailer subwindow 208 is depicted in FIG. 12 as 435. Referring further to FIG. 12, the Outbound Trailer subwindow 435 includes a trailer ID field 436, a seal ID field 437 and a trailer status field 438.

Referring to FIG. 10, the Services subwindow 209 includes information about services performed in the distribution center. In one embodiment, this information includes zone ID, queue ID, description of services, SKU ID, and order status. Aggregate completion of the services activity is displayed using a graphical bar. One embodiment of the Services subwindow 209 is depicted in FIG. 13 as 445. Referring further to FIG. 13, the Services subwindow 445 includes a graphical bar 446, a zone ID field 447, a queue ID field 448 and a description of services field 449.

Referring to FIG. 10, the Users subwindow 210 includes information about the users of the distribution center management system. In one embodiment, this information includes User ID, User name, user status, user activity, user location, order, and picking location. One embodiment of the Users subwindow 210 is depicted in FIG. 13 as 450. Referring further to FIG. 13, the Users subwindow 450 includes a user ID field 451, a user name field 452 and a user activity field 453.

Referring to FIG. 14, in one embodiment, the graphical display screen 500 provides a comprehensive view of the activities in the distribution center by displaying six subwindows simultaneously. As described above with regard to FIG. 11, the Inbound Staging subwindow 505 displays information about inventory that has been removed from trailers, but requires additional processing before being placed in stock. The ICNs Receiving subwindow 510 (FIG. 11) displays a listing of all Inbound Orders (ICNs) scheduled to be received at the distribution center. The

Waves subwindow 515 (FIG. 12) displays information about orders that have been planned and included in batches of manageable work. The Outbound Staging subwindow 520 (FIG. 12) displays information about orders that have been completed and committed to staging areas for post pick activities. The OCNs Shipping subwindow 525 (Fig. 12) displays information about orders expected to be shipped from the distribution center.

Equivalents

Variations, modifications, and other implementations of what is described herein will occur to those of ordinary skill in the art without departing from the spirit and the scope of the invention as claimed. Accordingly, the invention is to be defined not by the preceding illustrative description but instead by the spirit and scope of the following claims.

Claims

1. A computer-aided method for picking a product from a reserve zone in a distribution center comprising the steps of:

(a) designating a zone in the distribution center to be a reserve zone;

(b) designating products as pick from reserve products; and

(c) determining whether an item in the distribution center is designated as a pick from reserve product.

2. The method of claim 1 further comprising the step of:

(d) directing pickers to pick an item designated as a pick from reserve product from the zone in the distribution center designated as reserve zone.

3. A computer-aided method for picking a product from a reserve zone in a distribution center, comprising the steps of:

(a) designating a zone in the distribution center to be a reserve zone;

(b) designating a product as a pick from reserve product;

(c) receiving an item of product;

(d) directing storers to store the item in the zone in the distribution center designated as the reserve zone;

(e) determining whether the item is designated as a pick from reserve product; and

(f) directing pickers to pick the item designated as a pick from reserve product from the zone in the distribution center designated as the reserve zone.

4. The method of claim 3 wherein step (a) comprises designating a zone in the distribution center to be a reserve zone by specifying a zone identifier and a zone type.

5. The method of claim 3 wherein step (b) comprises designating a product as a pick from reserve product by specifying a product identifier and a product attribute.

6. The method of claim 5 wherein the product identifier is a stock keeping unit identifier.

7. The method of claim 3 wherein step (e) comprises locating a product identifier associated with the item in a product list and determining whether the list includes a product attribute indicating that the product is designated as a pick from reserve product.

8. A computer-aided distribution center management system, comprising:

a configuration module for designating a zone in a distribution center to be a reserve zone;

a product designation module for designating products as pick from reserve products;

an inventory module for cataloging a received item;

an identification module for determining whether an item is designated as a pick from reserve product; and,

a retrieving module for facilitating the retrieval the item determined to be a pick from reserve product from the reserve zone.

9. The distribution center management system of claim 8 wherein the configuration module comprises a zone list comprising a zone identifier and a zone type for each zone in the zone list.

10. The distribution center management system of claim 8 wherein the product designation module comprises a product list comprising a product identifier and a product attribute for each product in the product list.

11. The distribution center management system of claim 10 wherein the identification module comprises a matching module for locating a specific product identifier in the product list and determining from the product list whether the item is product designated as pick from reserve product.

12. The distribution center management system of claim 8 wherein the inventory module comprises an item list comprising an item identifier, an item quantity, and item location for each item in the item list.

13. The distribution center management system of claim 8 wherein the retrieving module comprises:

a locator for locating the reserve zone in which the item is stored; and

a navigator for directing a worker to the reserve zone.

14. A computer-aided method for distributing items requiring a value added service in a distribution center, comprising the steps of:

(a) designating a zone within the distribution center for providing the value added service;

(b) receiving an order for a finished item requiring the value added service;

(c) identifying the inventory items required for providing the value added service;

(d) directing pickers to pick the inventory items required for providing the value added service;

(e) directing pickers to collect, in the designated zone, the inventory items required for providing the value added service;

(f) providing the value added service using the items collected in the designated zone; and

(g) shipping the finished item after the value added service has been completed.

15. The method of claim 14 wherein the value added service is at least one of assembling, modifying, adjusting, cutting, painting, coloring, and applying labels to the item.

16. A computer-aided method for receiving items requiring a value added service in a distribution center, comprising the steps of:

(a) designating a zone within the distribution center for providing the value added service;

(b) receiving in the distribution center an item requiring the value added service;

(c) identifying the inventory items required for providing the value added service;

(d) directing pickers to pick the inventory items required for providing the value added service;

(e) directing pickers to collect, in the designated zone, the inventory items required for providing the value added service;

(f) providing the value added service using the items collected in the designated zone; and

(g) storing the finished item in the distribution center after the value added service has been completed.

17. The method of claim 16 wherein the value added service is at least one of assembling, modifying, adjusting, cutting, painting, coloring, and applying labels to the item.

18. A method for displaying distribution center management system information on a graphical display, comprising the steps of simultaneously:

displaying inventory located in the inbound staging area in an inbound staging subwindow;

displaying inventory scheduled for distribution in an outbound staging subwindow;

displaying the location of inventory in the distribution center in an item locator subwindow;

displaying pending orders to be fulfilled in a waves subwindow;

displaying inventory scheduled to be received a receiving subwindow; and

displaying inventory scheduled to be shipped in a shipping subwindow;

thereby providing a system operator with an overview of the distribution center's status.

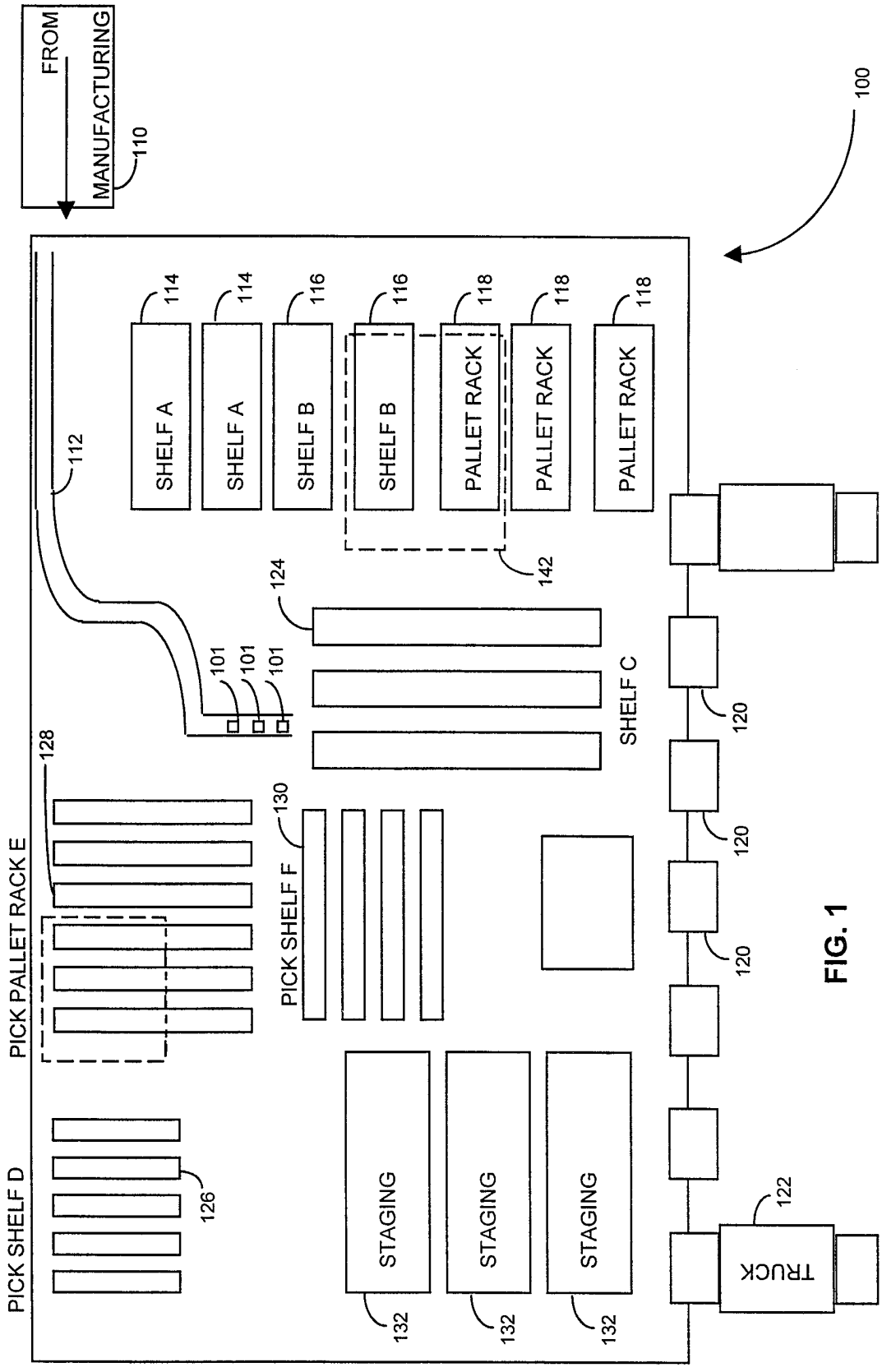
FROM MANUFACTURING
110
100
SHELF A
SHELF A
SHELF B
SHELF B
PALLET RACK
PALLET RACK
PALLET RACK
114
114
116
116
118
118
118
112
142
124
101
101
101
SHELF C
120
120
120
128
PICK PALLET RACK E
130
PICK SHELF F
PICK SHELF D
126
STAGING
STAGING
STAGING
132
132
132
TRUCK
122

FIG. 1

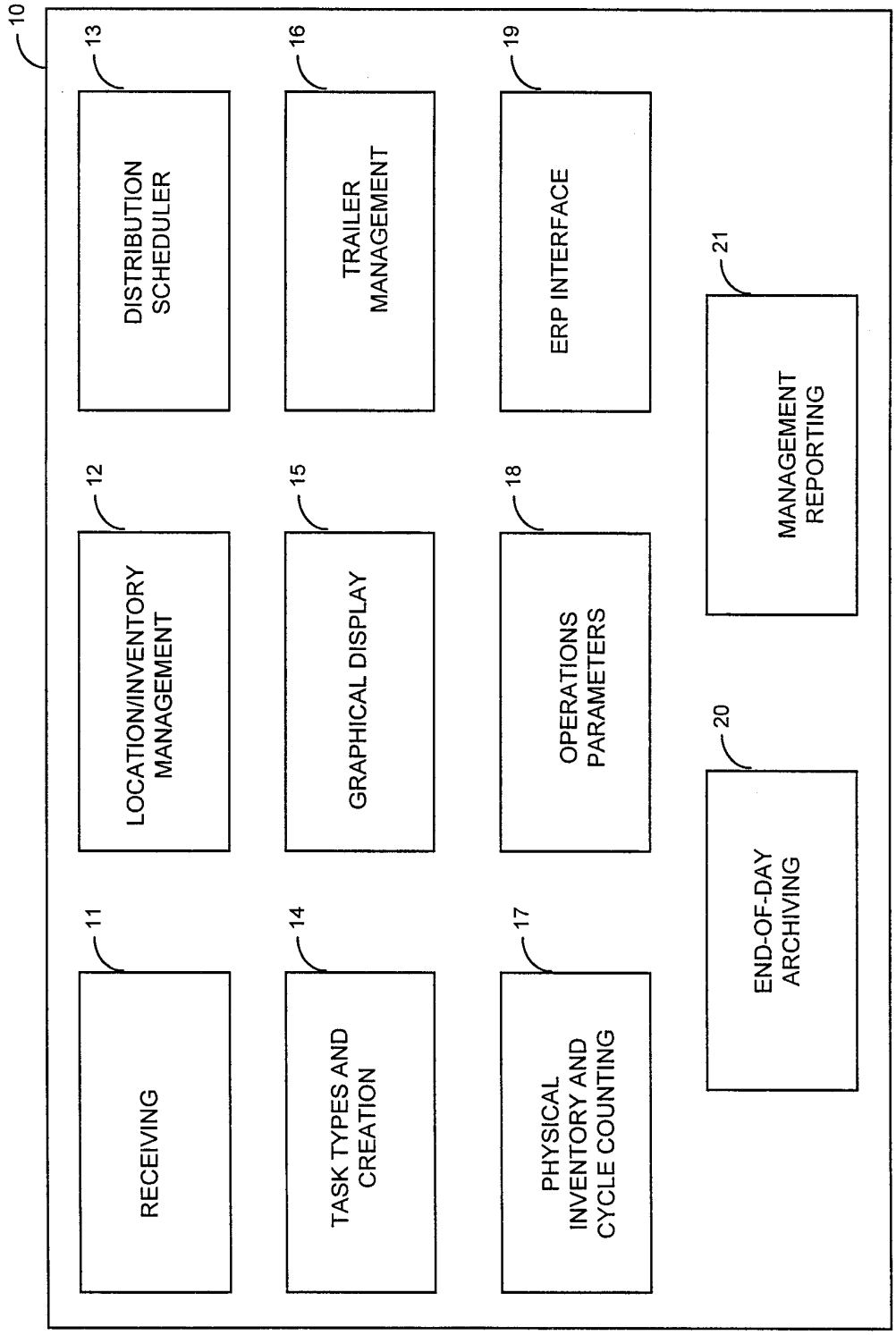

FIG. 2 - DISTRIBUTION CENTER MANAGEMENT SYSTEM

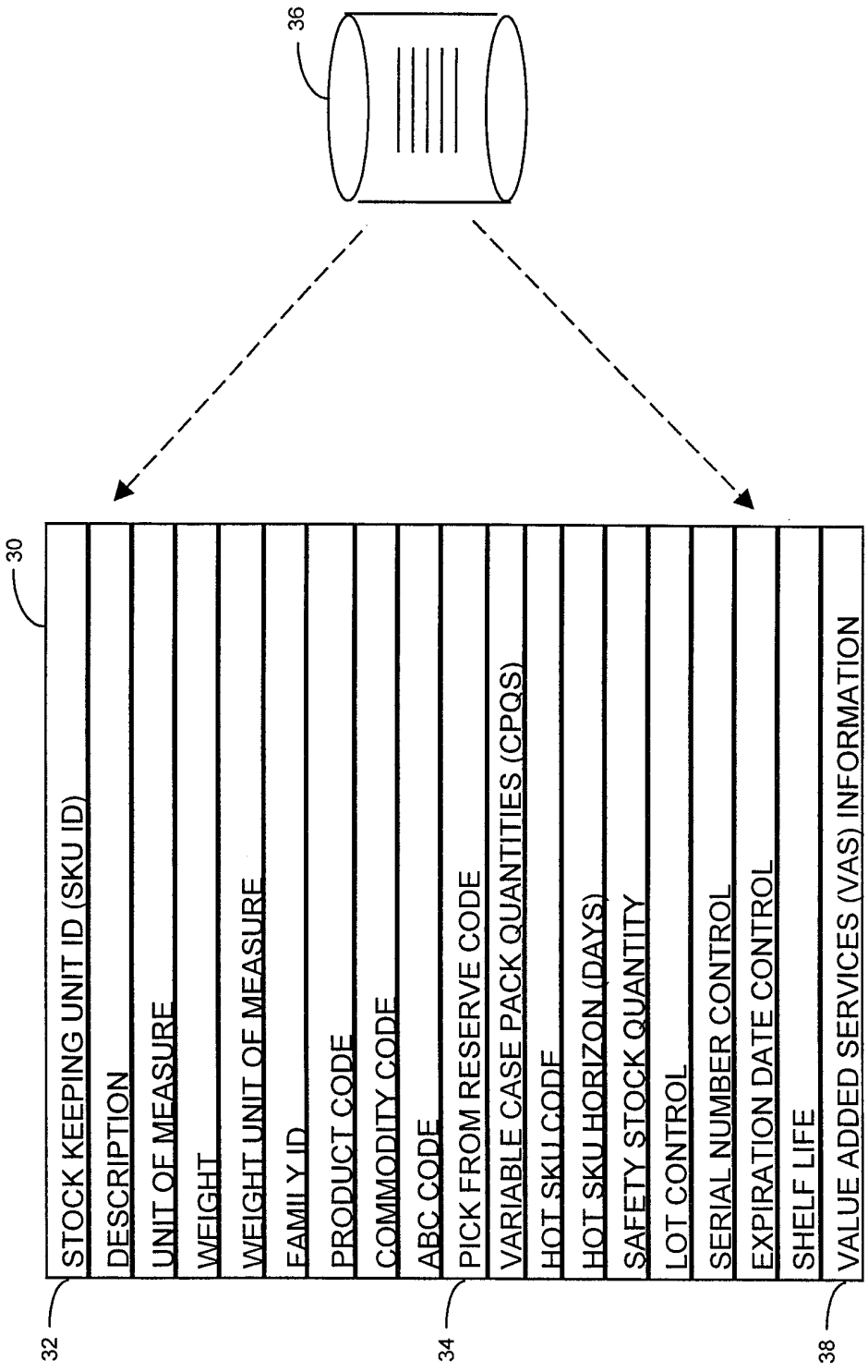

FIG. 3 - SKU RECORD

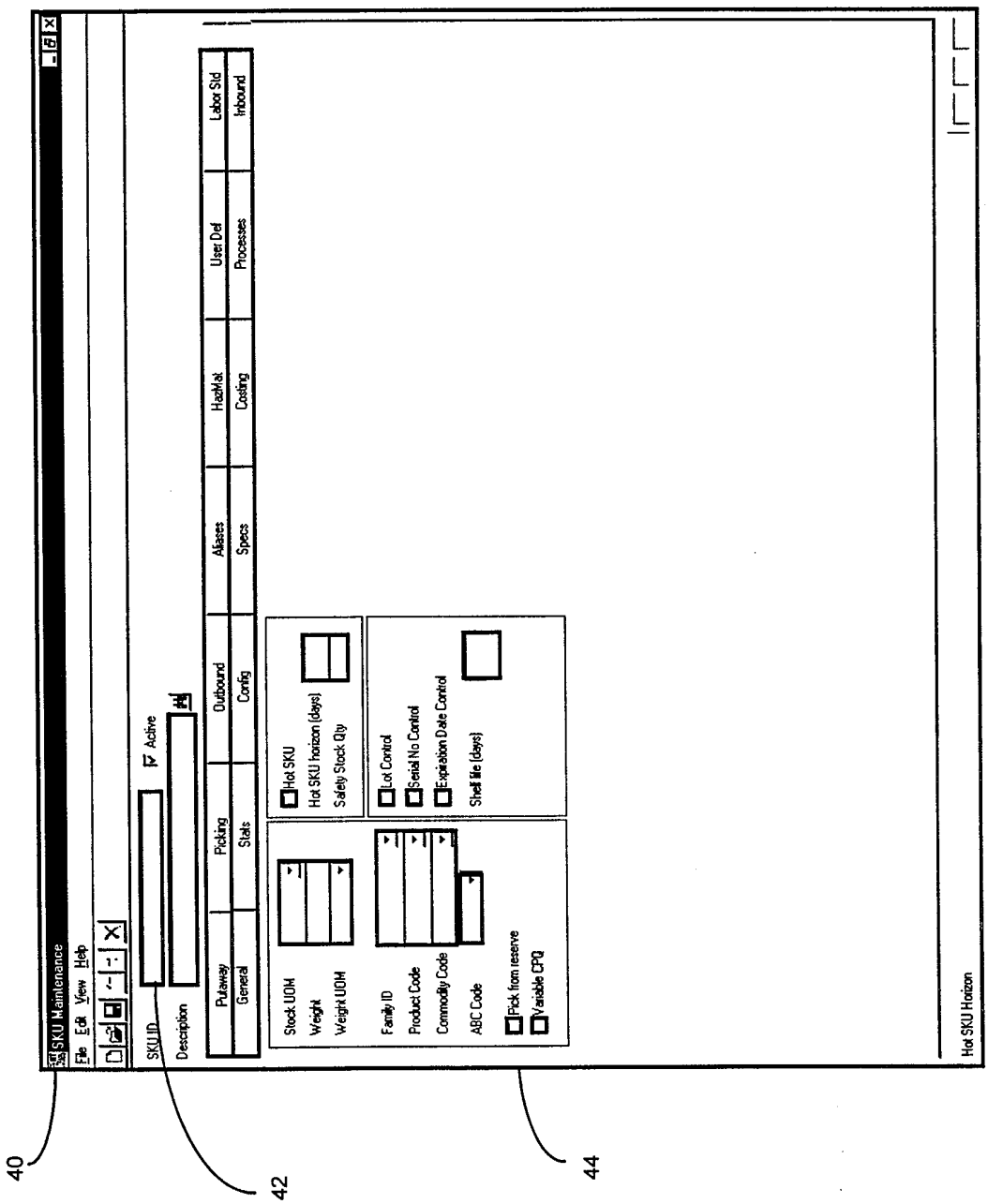

FIG. 4 - SKU MAINTENANCE SCREEN

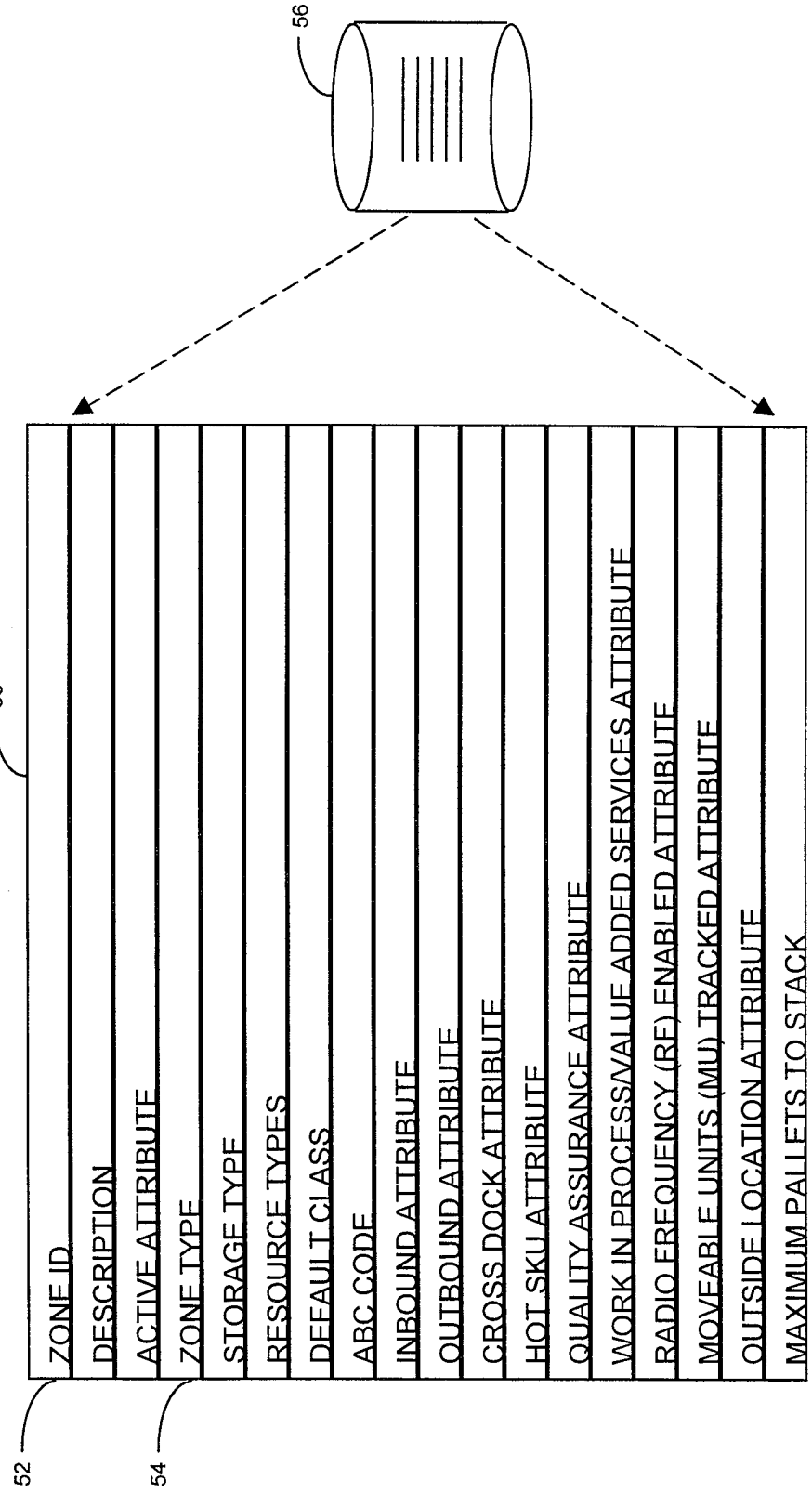

FIG. 5 - ZONE RECORD

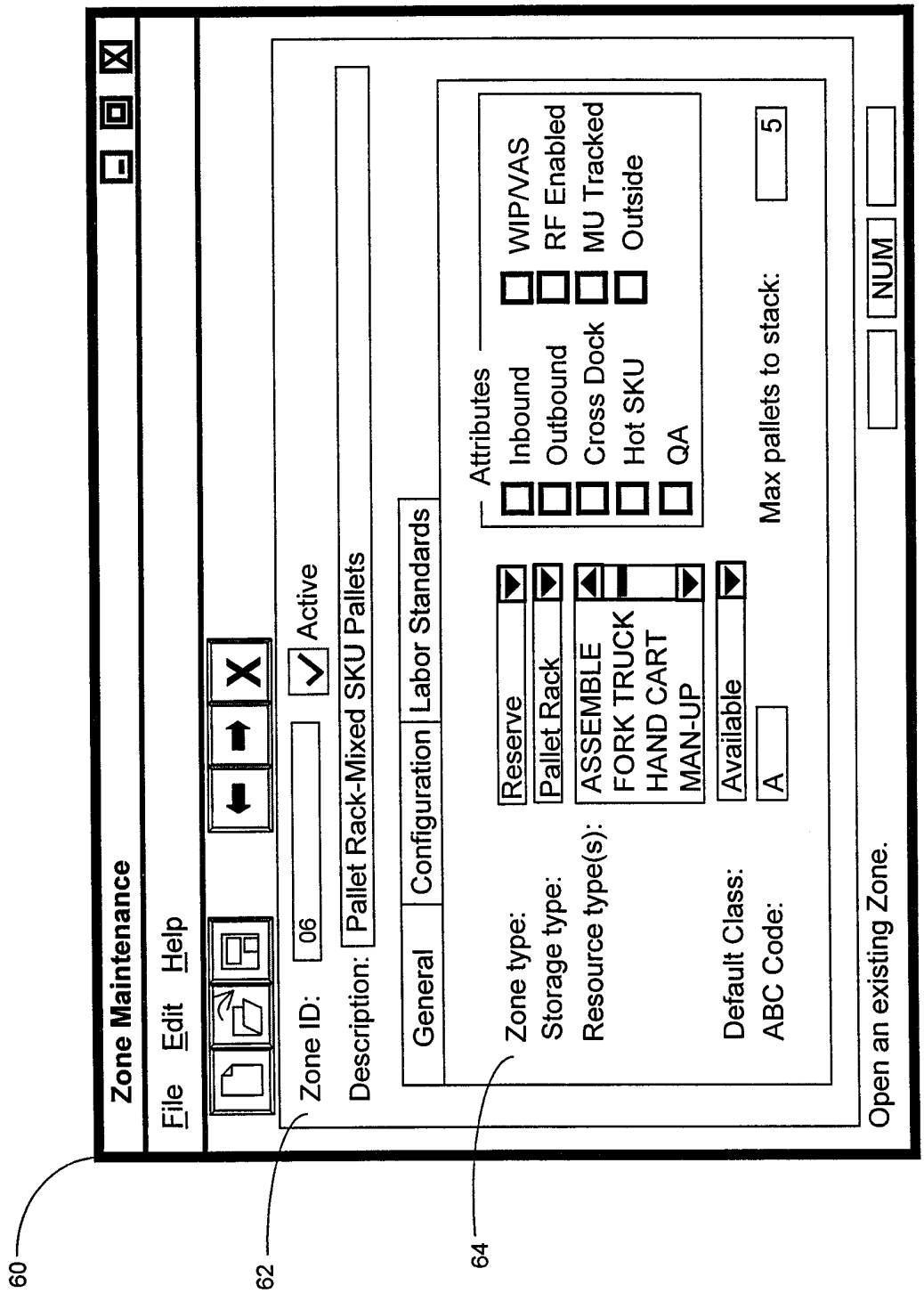

FIG. 6 - ZONE MAINTENANCE SCREEN

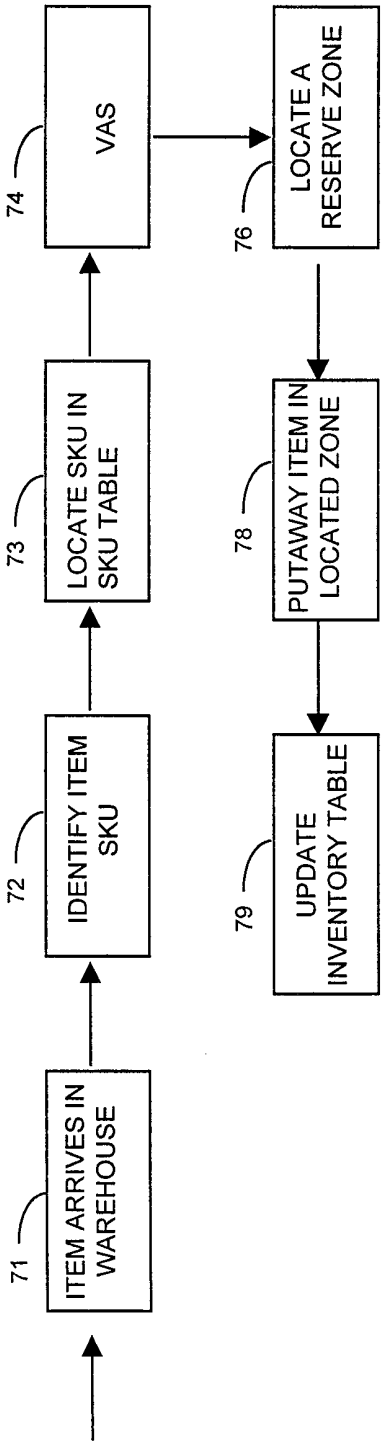

FIG. 7 - RECEIVING PROCESS FLOWCHART

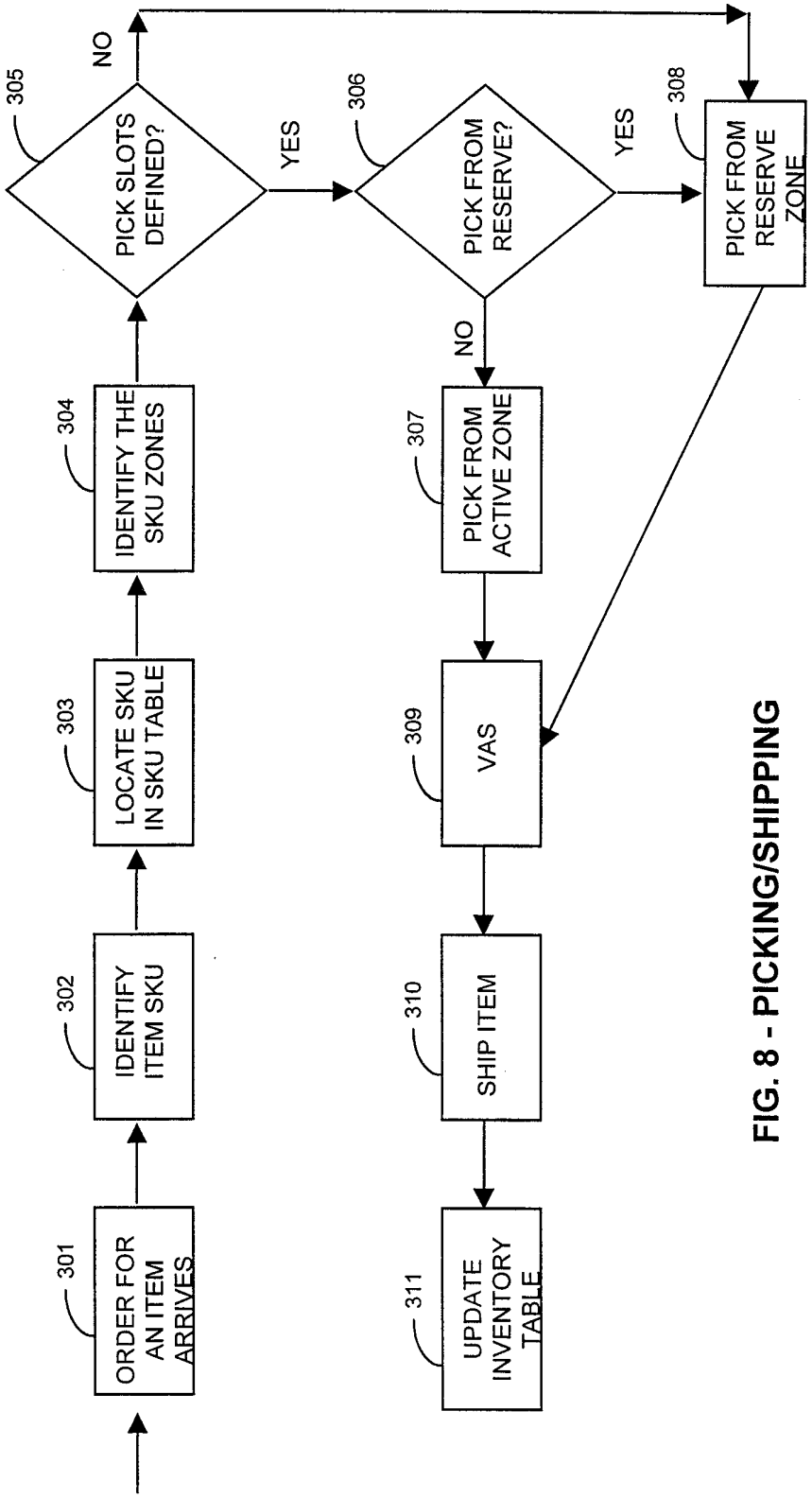

FIG. 8 - PICKING/SHIPPING

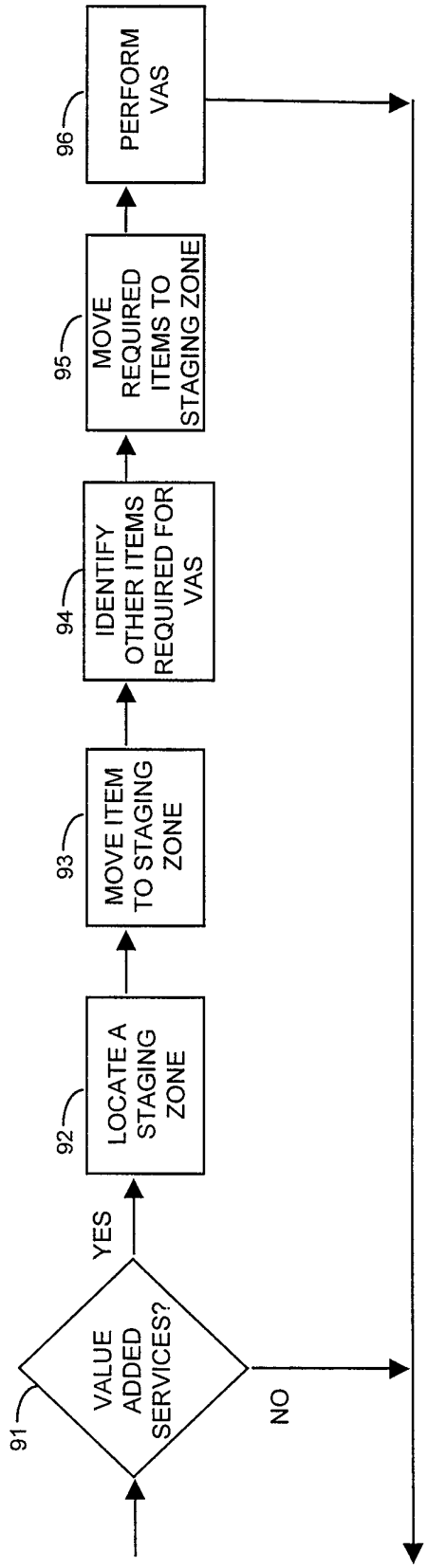

FIG. 9 - VALUE ADDED SERVICES

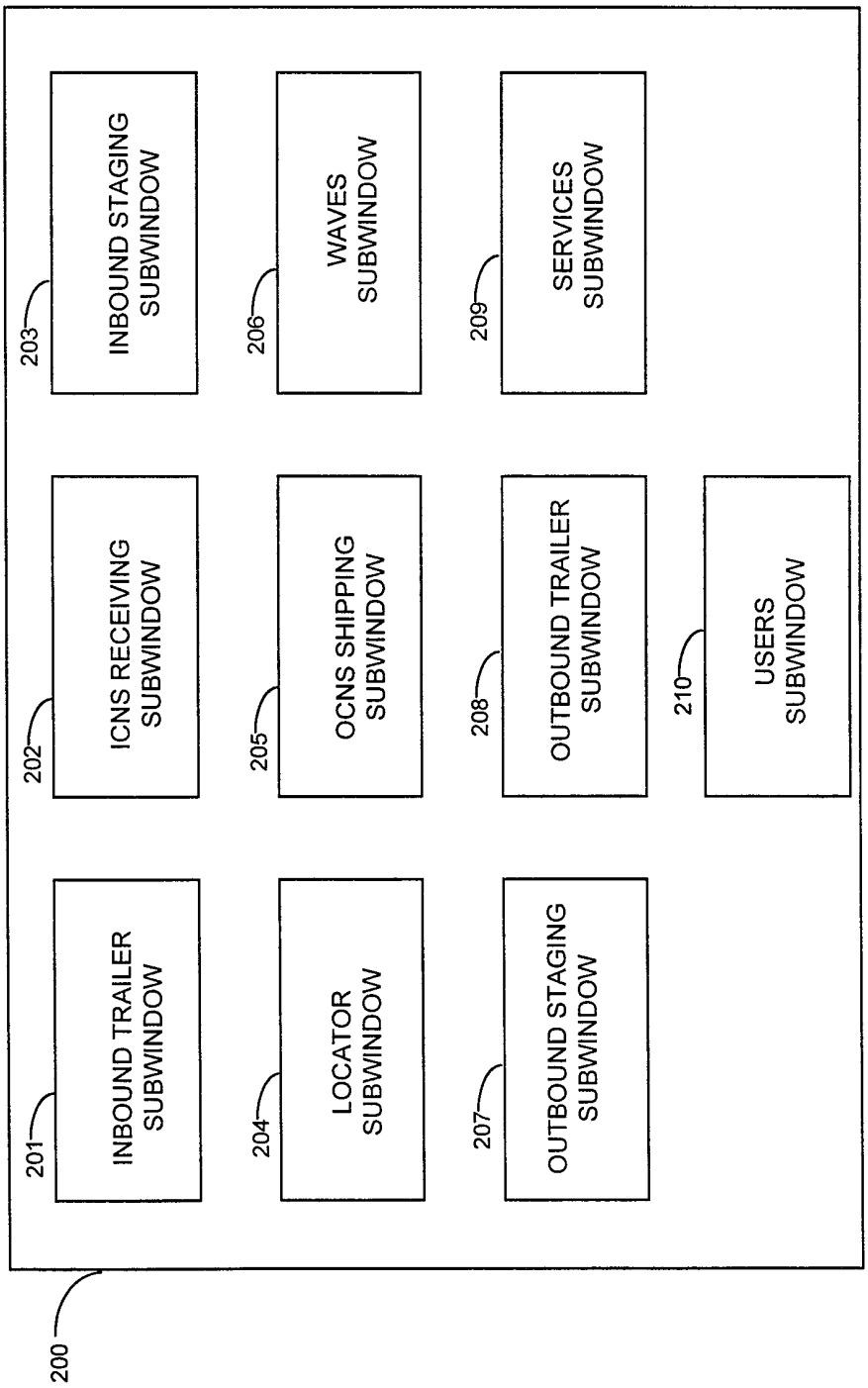

FIG. 10 - GRAPHICAL DISPLAY BLOCK DIAGRAM

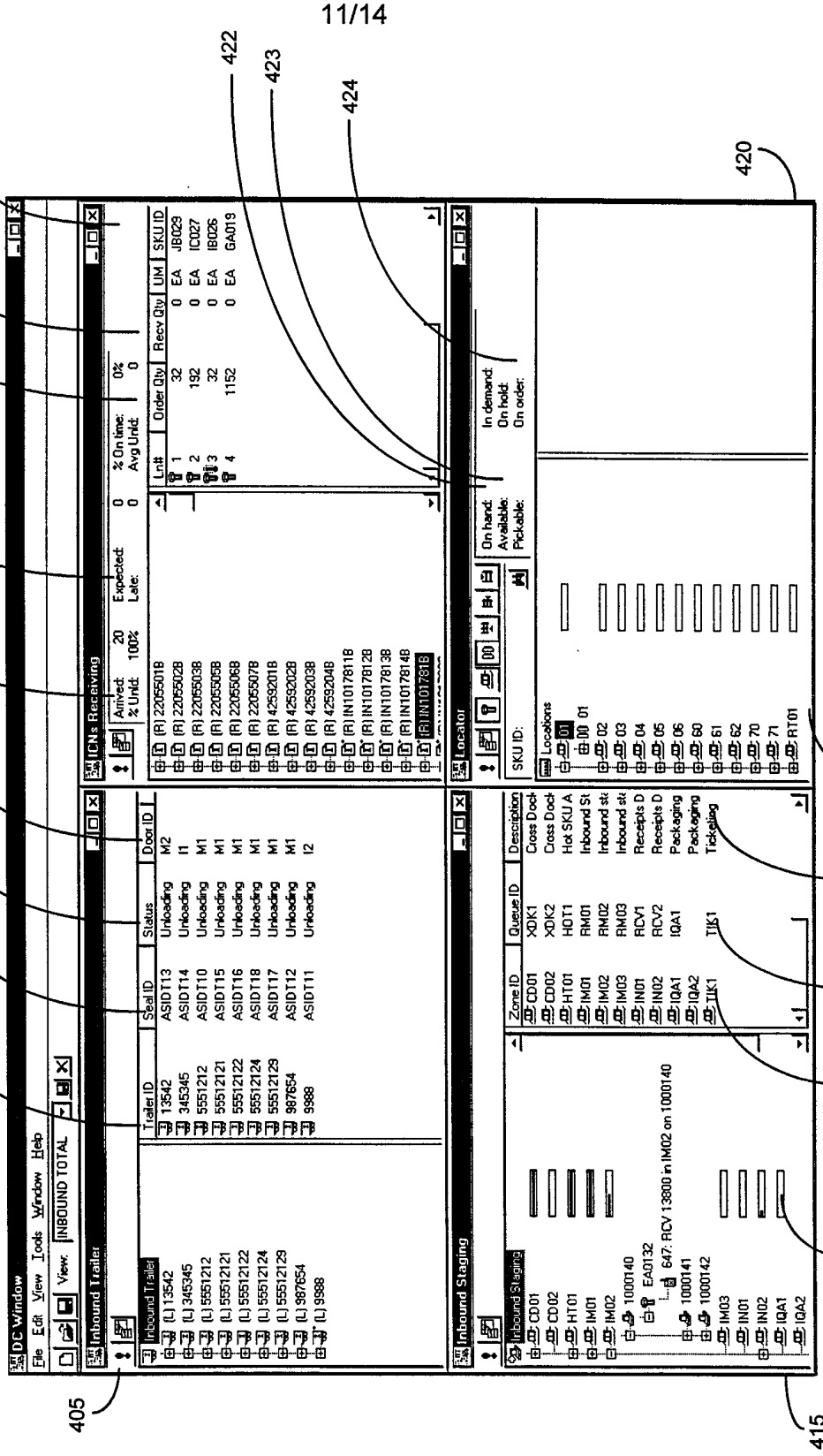
DC Window
File Edit View Tools Window Help
View: INBOUND TOTAL
Inbound Trailer
Trailer ID
Seal ID
Status
Door ID
(L) 13542 ASIDT13 Unloading M2
(L) 345345 ASIDT14 Unloading I1
(L) 5551212 ASIDT10 Unloading M1
(L) 55512121 ASIDT15 Unloading M1
(L) 55512122 ASIDT16 Unloading M1
(L) 55512124 ASIDT18 Unloading M1
(L) 55512129 ASIDT17 Unloading M1
(L) 987654 ASIDT12 Unloading M1
(L) 9988 ASIDT11 Unloading I2
INDNs Receiving
Arrived: 20 Expected:
% Until: 100% Late:
% On time:
Avg Until:
Ln# Order Qty Recv Qty UM SKU ID
1 32 0 EA JB029
2 192 0 EA IC027
3 32 0 EA IB026
4 1152 0 EA GA019
Locator
SKU ID:
On hand:
Available:
Pickable:
In demand:
On hold:
On order:
Locations
Inbound Staging
Zone ID Queue ID Description
CD01 XDK1 Cross Dock
CD02 XDK2 Cross Dock
HT01 HOT1 Hot SKU A
IM01 RM01 Inbound St
IM02 RM02 Inbound st
IM03 RM03 Inbound st
IN01 RCV1 Receipts D
IN02 RCV2 Receipts D
IQA1 IQA1 Packaging
IQA2 Packaging
TIK1 TIK1 Tickeling
647: RCV 13800 in IM02 on 1000140
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424

FIG. 11

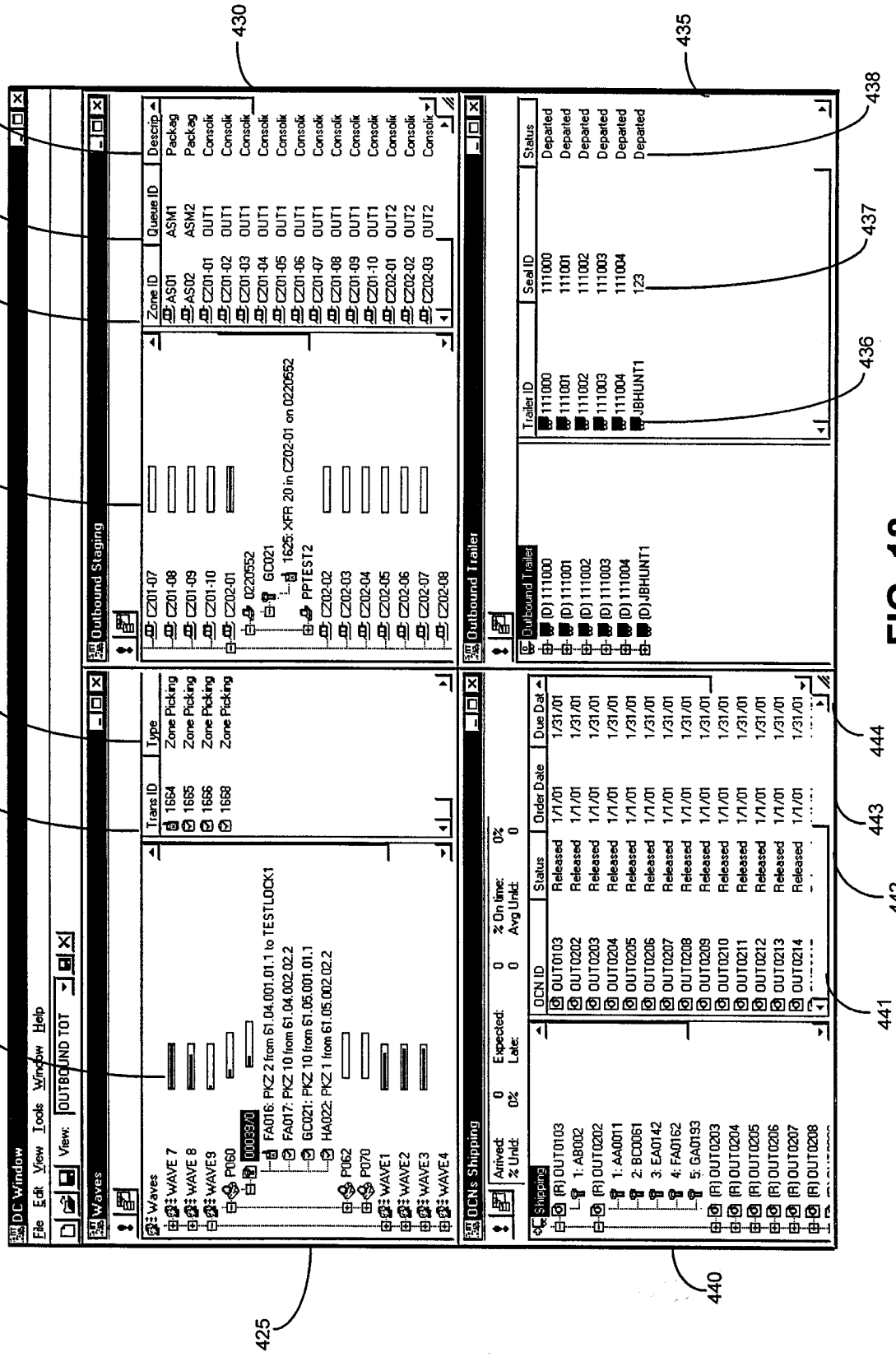
DC Window
File Edit View Tools Window Help
View: OUTBOUND TOT
Waves
Outbound Staging
OCNs Shipping
Outbound Trailer
425
426
427
428
430
431
432
433
434
435
436
437
438
440
441
442
443
444

FIG. 12

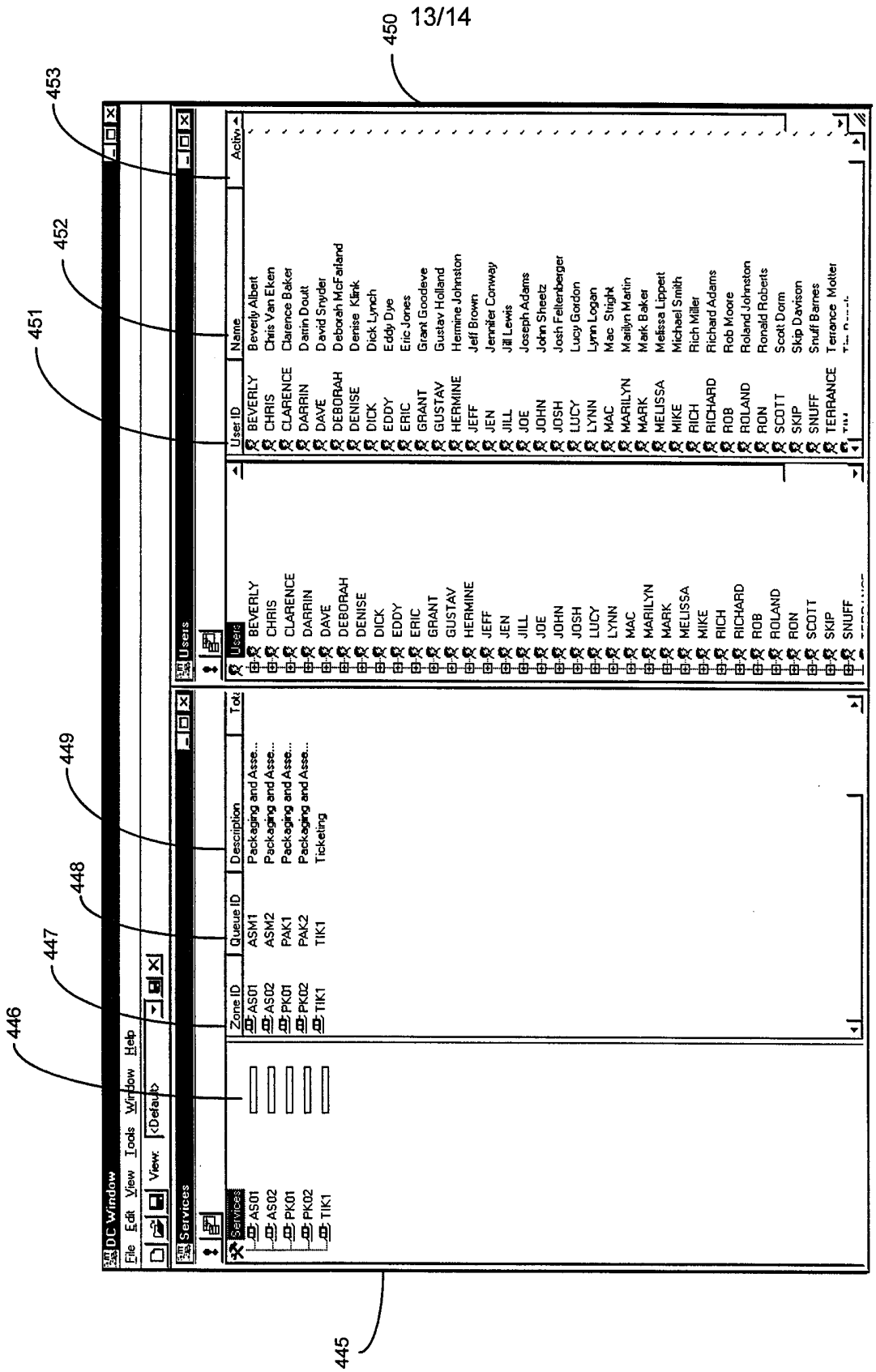
445
446
447
448
449
450
451
452
453
DC Window
File Edit View Tools Window Help
View: <Default>
Services
Zone ID
Queue ID
Description
Tot
AS01 ASM1 Packaging and Asse...
AS02 ASM2 Packaging and Asse...
PK01 PAK1 Packaging and Asse...
PK02 PAK2 Packaging and Asse...
TIK1 TIK1 Ticketing
Users
User ID
Name
Activ
BEVERLY Beverly Albert
CHRIS Chris Van Eken
CLARENCE Clarence Baker
DARRIN Darrin Doutt
DAVE David Snyder
DEBORAH Deborah McFarland
DENISE Denise Klink
DICK Dick Lynch
EDDY Eddy Dye
ERIC Eric Jones
GRANT Grant Goodeve
GUSTAV Gustav Holland
HERMINE Hermine Johnston
JEFF Jeff Brown
JEN Jennifer Conway
JILL Jill Lewis
JOE Joseph Adams
JOHN John Sheetz
JOSH Josh Fellenberger
LUCY Lucy Gordon
LYNN Lynn Logan
MAC Mac Slight
MARILYN Marilyn Martin
MARK Mark Baker
MELISSA Melissa Lippert
MIKE Michael Smith
RICH Rich Miller
RICHARD Richard Adams
ROB Rob Moore
ROLAND Roland Johnston
RON Ronald Roberts
SCOTT Scott Dorn
SKIP Skip Davison
SNUFF Snuff Barnes
TERRANCE Terrance Molter

FIG . 13

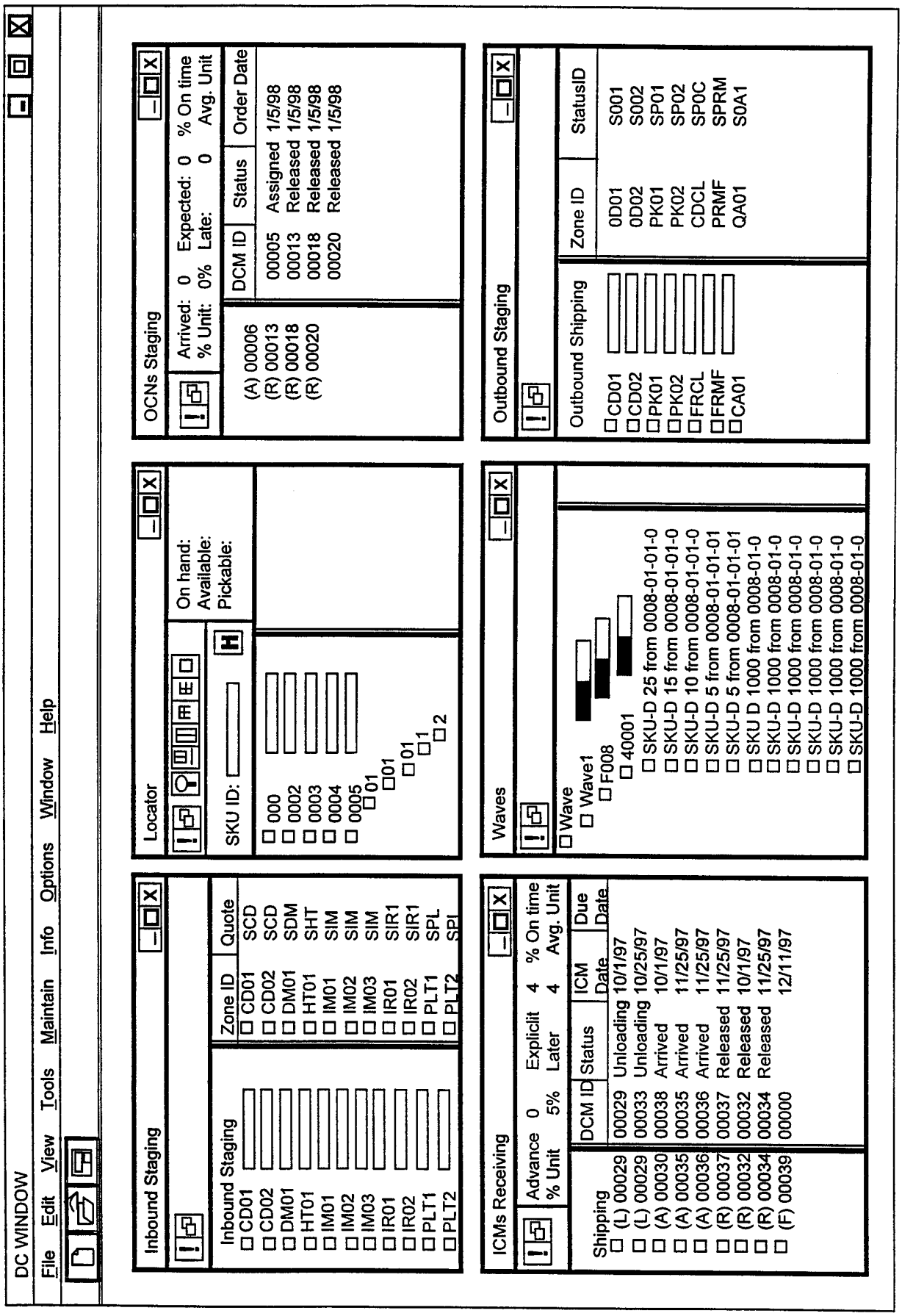
DC WINDOW
File Edit View Tools Maintain Info Options Window Help
Inbound Staging
Inbound Staging
Zone ID Quote
CD01 SCD
CD02 SCD
DM01 SDM
HT01 SHT
IM01 SIM
IM02 SIM
IM03 SIM
IR01 SIR1
IR02 SIR1
PLT1 SPL
PLT2 SPI
Locator
SKU ID:
On hand:
Available:
Pickable:
000
0002
0003
0004
0005
01
01
01
1
2
OCNs Staging
Arrived: 0 Expected: 0 % On time
% Unit: 0% Late: 0 Avg. Unit
DCM ID Status Order Date
(A) 00006 00005 Assigned 1/5/98
(R) 00013 00013 Released 1/5/98
(R) 00018 00018 Released 1/5/98
(R) 00020 00020 Released 1/5/98
Outbound Staging
Outbound Shipping
Zone ID StatusID
CD01 0D01 S001
CD02 0D02 S002
PK01 PK01 SP01
PK02 PK02 SP02
FRCL CDCL SP0C
FRMF PRMF SPRM
CA01 QA01 S0A1
ICMs Receiving
Advance 0 Explicit 4 % On time
% Unit 5% Later 4 Avg. Unit
Shipping
DCM ID Status ICM Date Due Date
(L) 00029 00029 Unloading 10/1/97
(L) 00029 00033 Unloading 10/25/97
(A) 00030 00038 Arrived 10/1/97
(A) 00035 00035 Arrived 11/25/97
(A) 00036 00036 Arrived 11/25/97
(R) 00037 00037 Released 11/25/97
(R) 00032 00032 Released 10/1/97
(R) 00034 00034 Released 11/25/97
(F) 00039 00000 12/11/97
Waves
Wave
Wave1
F008
40001
SKU-D 25 from 0008-01-01-0
SKU-D 15 from 0008-01-01-0
SKU-D 10 from 0008-01-01-0
SKU-D 5 from 0008-01-01-01
SKU-D 5 from 0008-01-01-01
SKU D 1000 from 0008-01-0
SKU-D 1000 from 0008-01-0
SKU-D 1000 from 0008-01-0
SKU-D 1000 from 0008-01-0
SKU-D 1000 from 0008-01-0
SKU-D 1000 from 0008-01-0

FIG. 14