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— *as to the identity of the inventor (Rule 4.17(i))*

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) Title: FACILITY-WIDE MEDICATION MANAGEMENT SYSTEMS

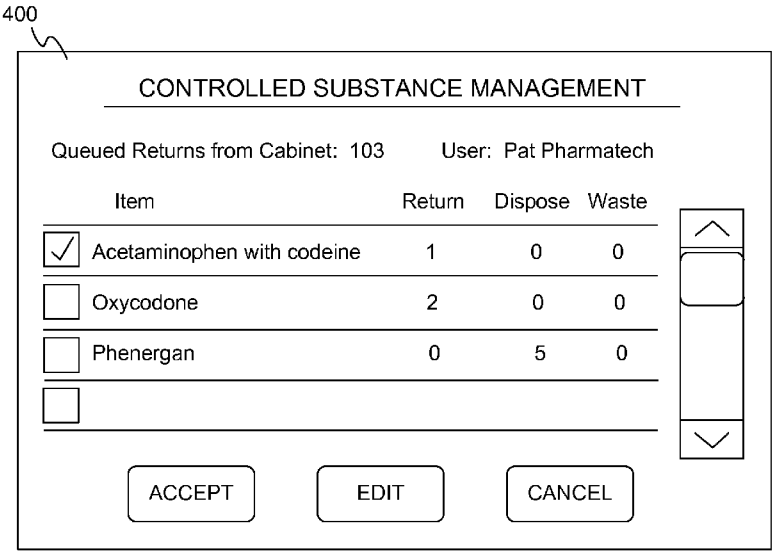

FIG. 4

(57) Abstract: A system for managing medications facilitates documentation of medication returned from remote dispensing units to a central storage location such as a pharmacy vault. The system may be especially useful in facilitating the tracking of controlled substances. The system receives an indication that a medication previously removed from the remote dispensing units has been designated for return to the medication management system. The system computes an estimated return amount of the medication, and causes a queued return list to be displayed at the central storage location. The system can accommodate multiple remote dispensing devices and multiple medications.

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FACILITY-WIDE MEDICATION MANAGEMENT SYSTEMS

[0001] This Patent Cooperation Treaty application claims priority to U.S. Provisional Patent Application No. 61/481,599, filed May 2, 2011 and titled "Facility-Wide Medication Management Systems", the entire disclosure of which is hereby incorporated by reference herein for all purposes.

BACKGROUND OF THE INVENTION

[0002] Medical facilities employ a wide variety of medical items, including medical supply items, pharmaceuticals, and the like. These items are used in a variety of locations, such as operating rooms, patient recovery rooms, labor and delivery rooms, and storage areas, such as secure vaults, dispensing cabinets and the like. Healthcare facilities have a need to track and account for items in an efficient manner. In some cases, for example in the case of supplies such as bandages, tape, and the like, the tracking may be performed primarily for inventory and billing purposes. However, for many medical items such as pharmaceuticals, and especially for legally controlled substances, it is important to carefully track the movement and disposition of the items throughout the facility.

[0003] The accurate and timely tracking of controlled substances depends on the accurate input of information by facility personnel indicating when items are moved throughout the system. There is a need to facilitate the efficient entry of accurate tracking information by health care workers.

BRIEF SUMMARY OF THE INVENTION

[0004] According to one aspect, a medication management system includes an electronic network a computer system. The computer system is programmed to receive over the electronic network one or more indications that a particular medication previously removed from a dispensing device has been designated for return to the medication management system. The

computer system computes an estimated return amount that is an amount of the previously-removed particular medication that is estimated to be returned to a central storage location within the medication management system. The computer system also causes a queued return list of one or more estimated return amounts to be displayed at the central storage location to facilitate documentation of the return of the particular medication to the central storage location.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 illustrates a medication management system in accordance with an embodiment of the invention.

[0006] FIG. 2 illustrates an enlarged view of a cabinet in the system of FIG. 1.

[0007] FIG. 3 illustrates an embodiment of a vault of the system of FIG. 1.

[0008] FIG. 4 illustrates an example user interface.

[0009] FIG. 5 illustrates a system in accordance with another embodiment of the invention.

[0010] FIG. 6 illustrates an example of a queued receiving list.

[0011] FIG. 7 illustrates and example of a queued destocking list.

[0012] FIG. 8 illustrates an example of a queued restocking list.

DETAILED DESCRIPTION OF THE INVENTION

[0013] **FIG. 1** illustrates a medication management system **100** in accordance with an embodiment of the invention. System **100** may be, for example, within a hospital or other health care facility. System **100** will be explained primarily in the context of tracking and accounting for controlled substances, but it will be recognized that embodiments of the invention may be used for other purposes.

[0014] A controlled substance is typically any medication or other substance whose use and possession is subject to government regulation. In the United States, controlled substances are assigned to different schedules depending on their potential for abuse and their applicability for medical use. Schedule I drugs have a high potential for abuse and have no currently acceptable medical use, and are not typically found in a hospital setting. Examples of schedule I drugs

include heroin and LSD. Drugs in Schedules II-V have important medical uses and varying degrees of potential for abuse. Examples of medications assigned to Schedule II include narcotics such as morphine and oxycodone, and stimulants such as methamphetamine. At the other end of the spectrum, examples of Schedule V substances include cough suppressants having limited amounts of codeine.

[0015] Government regulations require healthcare facilities to track and account for controlled substances in order to discourage and detect diversion of these substances to illicit use. System **100** is designed to provide the required accounting and tracking.

[0016] In system **100**, controlled substances flow into the system from suppliers **101**, and may leave the system in various ways. Typically, upon receipt, the substances are stored in a central storage location such as vault **102**. Vault **102** may reside in a hospital's pharmacy, and may include physical security features such as locks and computerized access controls that limit access only to certain personnel. Vault **102** may take any of a number of forms, and may include, for example, open storage such as shelves, a refrigerator, a cabinet as described in more detail below, other storage devices, or any combination of these. Vault **102** may be enclosed in a separate lockable room.

[0017] From vault **102**, medications may be stocked into remote dispensing devices such as cabinet **103**, cart **104**, and movable cabinet **105**. For example, the remote dispensing devices may be located in specific wards or floors of the healthcare facility, and provide convenient access to patient medications for floor personnel. These devices may include one or more locking doors, drawers, or the like, which may further contain storage locations such as compartments, drawers, or bins for storing individual medications. Some storage locations may be for general use, and store only single medication, while other storage locations may be patient-specific, such that they hold medications for the use of a single patient. Patient-specific storage locations may be compartments, drawers, bins, or other kinds of locations, for example the kinds of bins described in the patents and patent applications previously incorporated by reference. Patient specific locations may hold more than one kind of medication. The system may utilize specialized dispensing devices in some locations, for example a dispensing device specially adapted for use in anesthesiology.

[0018] Stocking of medications from vault **102** to the dispensing devices **103-105** may be the responsibility of pharmacy personnel. For example, a pharmacy technician may periodically

service each dispensing device, restocking medications into the dispensing devices, and performing other tasks as described in more detail below.

[0019] A nurse or other healthcare worker can then access the remote storage devices to obtain medication to be dispensed to patients in beds **106a-106e**. Access to the remote dispensing devices may also be controlled. For example, a nurse or other healthcare worker removing any medication may be required to provide an identification each time he or she accesses the device, and may also be required to indicate what medication is being removed and which patient the medication is to be administered to. The remote dispensing device may then open only the drawer or door that provides access to that medication, and may visually indicate which bin contains the medication, for example by flashing a light adjacent the correct bin.

[0020] In FIG. 1, flows of medications are shown using solid arrows.

[0021] It will be recognized that cabinet **103**, cart **104**, and movable cabinet **105** are examples of remote dispensing devices, and that dispensing devices of other configurations may be used. Other example dispensing devices are described in the following commonly owned U.S. Patents and patent applications, the contents of which are hereby incorporated by reference: U.S. Patent No. 6,272,394, issued on August 7, 2001 to Lipps, U.S. Patent No. 6,385,505, issued on May 7, 2002 to Lipps, U.S. Patent No. 6,760,643, issued on July 6, 2004 to Lipps, U.S. Patent No. 5,805,455, issued on September 8, 1998 to Lipps, U.S. Patent No. 6,609,047, issued on August 19, 2003 to Lipps, U.S. Patent No. 5,805,456, issued on September 8, 1998 to Higham et al,, U.S. Patent No. 5,745,366, issued on April 28, 1998 to Higham et al., an U.S. Patent No. 5,905,653, issued on May 18, 1999 to Higham et al., U.S. Patent No. 5,927,540, issued on July 27, 1999 to Godlewski, U.S. Patent No. 6,039,467, issued on March 21, 2000 to Holmes, U.S. Patent No. 6,640,159, issued on October 28, 2003 to Holmes et al., U.S. Patent No. 6,151,536, issued on November 21, 2000 to Arnold et al., U.S. Patent No. 5,377,864, issued on January 3, 1995 to Blechl et al., U.S. Patent No. 5,190,185, issued on March 2, 1993 to Blechl, U.S. Patent No. 6,975,922, issued on December 13, 2005 to Duncan et al., U.S. Patent No. 7,571,024, issued on August 4, 2009 to Duncan et al., U.S. Patent No. 7,835,819, issued on November 16, 2010 to Duncan et al., U.S. Patent No. 6,011,999, issued on January 4, 2000 to Holmes, U.S. Patent No. 7,348,884, issued on March 25, 2008 to Higham, U.S. Patent No. 7,675,421, issued on March 9, 2010 to Higham, U.S. Patent No. 6,170,929, issued on January 9, 2001 to Wilson et al., U.S. Patent No. 8,155,786 to Vahlberg et al., issued on April 10, 2012, U.S. Patent No. 8,073,563 to

Vahlberg et al., issued on December 6, 2011, U.S. Patent Application Publication No. 2008/0319577 of Vahlberg et al., published on December 25, 2008, U.S. Patent No. 8,140,186 to Vahlberg et al., issued on March 20, 2012, U.S. Patent No. 8,126,590 to Vahlberg et al., issued on February 28, 2012, U.S. Patent No. 8,027,749 to Vahlberg et al., issued on September 27, 2011, U.S. Patent Application Publication No. 2008/0319790 of Vahlberg et al., published on December 25, 2008, U.S. Patent Application Publication No. 2008/0319789 of Vahlberg et al., published on December 25, 2008, U.S. Patent No. 8,131,397 to Vahlberg et al., issued on March 6, 2012, U.S. Patent Application Publication No. 2008/0319579 of Vahlberg et al., published on December 25, 2008, and U.S. Patent Application Publication No. 2010/0042437 of Levy et al., published on February 18, 2010.

[0022] The remote dispensing devices are preferably in electronic communication with a central computer system **107** via network **108**. Network **108** may be any suitable network, for example, a facility-wide electronic network, and may be wired, wireless, or a combination thereof. Information flows are shown in FIG. 1 using dashed arrows. Network **108** may also connect directly or indirectly to outside entities, such as suppliers **101**.

[0023] Central computer system **107** may maintain detailed records of the locations of all medications in the system, and receives a notification each time the vault or one of remote dispensing devices is accessed by a nurse, technician, or other worker. The notification may include the identity of the person who has accessed the dispensing device, the medication involved, and what kind of transaction was performed, as is discussed in more detail below. Central computer system **107** may be, for example, a server such as an OmniCenter® server, available from Omnicell, Inc. of Mountain View, California, USA. Central computer system **107** may communication with other systems within the facility, for example pharmacy information system **112** to receive patient admission, transfer, and discharge information, patient medication orders, and the like. In other embodiments, a computer system that performs functions of the invention need not be a centralized computer system, so long as it has access to sufficient information to perform the functions of the invention. While only a single block is used to indicate computer system **107** in FIG. 1, computer system **107** may include multiple computers that may be collocated or widely distributed.

[0024] Ideally, medications leave the system in only three ways. In a first way, medication is administered to a patient. In a second way of leaving the system, medication may be wasted.

For example, if the medication is packaged in a quantity that exceeds the prescribed dose for a particular patient, each administration may result in a leftover amount that is not reusable, and must be discarded **109**. In another example of waste, a vial may be dropped and broken, rendering its contents unusable. In a third way of leaving the system, medication may be returned to vault **102** for disposal in a controlled manner **110**, for example because the medication has reached its expiration date.

[0025] However, controlled substances can also leave the system in other ways, for example due to inadvertent mistake, but also intentionally for illicit use or sale. The illicit removal of controlled substances is known in the art as diversion. In order to discourage and detect diversion, every movement of a controlled substance between vault **102** and dispensing devices **103-105** may be carefully tracked, and an inventory of every controlled substance within vault **102** and dispensing devices **103-105** is kept by a controlled substance management system (CSM) **111**. CSM **111** may be, for example, a dedicated computer system that tracks the controlled substance inventory and communicates via network **108** with central computer system **107**. As central computer system **107** receives indications of the movements of medications, supplies, and other items throughout system **100**, it recognizes that certain transactions involve controlled substances, and notifies CSM **111**. For example, if a nurse removes a quantity of a controlled substance from cart **104** for administration to a patient, the nurse inputs details of that transaction into cart **104**, which in turn sends the transaction details to central computer system **107**. Central computer system **107** recognizes that this transaction affects the facility's inventory of controlled substances, and informs CSM **111**, which can update its records accordingly. Central computer system **107** may also inform CSM **111** of individual patient medication orders and the locations of patient-specific bins or other locations within the system. CSM **111** can then facilitate management of patient medications as explained in more detail below.

[0026] CSM **111** may monitor transactions involving controlled substances for discrepancies that may indicate errors or diversion. For example, if a technician removes a quantity of medication from vault **102** for stocking in one of dispensing devices **103-105**, but a different quantity is actually stocked in the intended dispensing device, CSM **111** may flag the discrepancy for further investigation. Accurate tracking of the flow of controlled substances depends on timely and accurate data entry at all points in the system.

[0027] In one aspect, embodiments of the invention facilitate efficient documentation of returns of medication to vault **102**.

[0028] Returns may occur for a variety of reasons. In a typical scenario, a nurse may dispense one dose of acetaminophen with codeine from cabinet **103** for administration to a patient in bed **106b**. The nurse enters the details of this transaction into cabinet **103**, which communicates them to central computer system **107**. Central computer system **107** recognizes that this transaction affects the facility's inventory of controlled substances, and informs CSM **111**, which can update its records to reflect the fact that the removed medication has left the CSM system and is therefore no longer in the CSM inventory. (The medication may be subject to further tracking outside of CSM **111**, for example the nurse may be required to document what quantity was actually administered to the patient, and may be required to have any waste of medication witnessed by another person.)

[0029] However, not all of the medication may be administered to the patient. For example, the patient may decline to take any pain medication at the time, or the patient may be discharged in the interim. In this kind of situation, some or all of the medication may need to be returned to the system. The return must be accounted for, and the medication recognized as being once again in the controlled substance inventory.

[0030] **FIG. 2** illustrates an enlarged view of cabinet **103**, and shows a return bin **201** attached to cabinet **103**. The nurse typically is not authorized to return medication to bins within cabinet **103** itself. Rather, the nurse places the unused acetaminophen with codeine into return bin **201**, and the medication is then handled at a later time by a pharmacy technician or other person having responsibility for controlled substance management.

[0031] Return bin **201** may be a secure, lockable compartment with a limited access opening **202**, through which items can be deposited in return bin **201**, but through which it is difficult or impossible to remove items without a key or other access mechanism. For example return bin **201** may include a rotating mechanism into which items can be placed through slot **202**, and which can be rotated to drop the items into return bin **201**, but which then blocks access to the interior of return bin **201**. Other mechanisms could be used as well.

[0032] In conjunction with placing returned medication into return bin **201**, the nurse enters information about the return, for example using keyboard **203**. The information includes such

items as the nurse's identity, and the type and quantity of the medication returned. Cabinet **103** forwards the details of the return to central computer system **107**.

[0033] At a later time, the pharmacy technician may service cabinet **103**, restocking bins in cabinet **103** with medications brought from vault **102**, and the like. As part of the service process, the pharmacy technician empties return bin **201**. The pharmacy technician also enters details of all of the transactions performed, including the fact that return bin **201** has been emptied. These details are forwarded to computer system **107**, which in turn informs CSM **111** of any transactions involving controlled substances. CSM **111** thus becomes aware of the controlled medication designated for return. In other embodiments, CSM **111** may have been informed of the pending return when the nurse first deposited the medication in return bin **201**.

[0034] In previous systems, when the pharmacy technician completed his or her rounds to the remote dispensing devices **103-105** and returned to vault **102**, processing the returned items involved keying in information about each item to document its return to vault **102**. The process was time consuming, and presented an opportunity for error. Even in a menu-based system, the technician needed to select the medication being returned from a menu of potentially hundreds of medications, specify the dispensing device at which the medication was found and designated for return, and indicate the quantity of medication. When returning a large number of medications even these steps were very time consuming, and subject to data entry errors.

[0035] According to one aspect of the invention, system **100** computes, based on the return transaction information forwarded from the various remote dispensing devices **103-105**, an amount of medication that is estimated to be returned to vault **102**, and presents a queued list of estimated potential returns at CSM **111**. For many returns, the pharmacy technician then need only verify that the queued return transaction is correct and indicate such to CSM **111**, place the returned medication into vault **102**, and document the transfer. This process is much faster and less prone to error than the manual entry used in past systems. Even when the queued return quantity is does not match the quantity that is actually returned, the technician can edit the list easily to indicate the correct returns and quantities, and the process is still efficient.

[0036] In the simple example described above, the nurse placed an unused dose of acetaminophen with codeine into return bin **201**, and indicated at cabinet **103** that this had been done. Central computer system **107** recorded this event. At a later time, the pharmacy technician removes the medication from return bin **201** and indicates at cabinet **103** that he or she

has done so. Cabinet **103** informs central computer system **107**, which in turn informs CSM **111**. In this simple case, in the absence of any other activity, CSM **111** can expect that the technician will eventually bring all of that medication from return bin **201** back to vault **102** for return to inventory.

[0037] **FIG. 3** illustrates an embodiment of vault **102**. In this example, vault **102** may be a cabinet with characteristics similar to cabinet **103**, for example a set of drawers **301** with bins **302** for holding medications. The particular configuration shown in FIG. 3 is by way of example only, and vault **102** may have any suitable configuration. For example, a vault in a large facility may include several cabinets. Vault **102** may interact with central computer system **107** in a way similar to the dispensing devices, so that access to vault **102** is controlled, and a user is guided to correct bins when adding or removing medications or other items.

[0038] A terminal **303** is provided for interacting with CSM **111**. (The computer system running CSM **111** is not shown in FIG. 3.) Terminal **303** may conveniently be a touchscreen terminal, but other kinds of terminals may be used, for example a separate keyboard and display. In other embodiments, the function of terminal **303** may be built into a cabinet comprised in vault **102**.

[0039] When the pharmacy technician arrives at vault **102** and logs in, he or she is presented with a list of items that CSM **111** has estimated will be returned. **FIG. 4** illustrates an example user interface **400** that may be presented on terminal **303**. It will be understood that user interface **400** is presented by way of example only, and that many other user interface configurations may be used. In this simple example, CSM **111** can easily infer that the one dose of acetaminophen with codeine removed from cabinet **103** is expected to be returned. The pharmacy technician can simply indicate that the list is correct, for example by touching "ACCEPT", and will then be guided to place the dose in the correct bin of vault **102**. CSM **111** can then update its records to reflect that the dose is now in vault **102**.

[0040] Similar queued return lists may be presented for medications being returned from other dispensing devices. Each queued return list may also be specific to the particular technician performing the returns.

[0041] The list presented in user interface **400** may be fully editable. For example, if the pharmacy technician notices that the dose queued for return is expired, he or she may simply edit

the list to indicate that the dose is to be routed for disposal, rather than placed in vault **102**. The technician may then be guided to place the item in the disposal location, and CSM **111** can account for the item as pending for disposal, rather than in vault **102**. Similarly, if the item is dropped and damaged between cabinet **103** and vault **102**, the technician may edit the list in user interface **400** to indicate that the item should be wasted. He or she would then be guided to place the item in a location for wasted items, rather than in vault **102**, and CSM **111** can update its records accordingly. For any movement of medication done at the pharmacy, CSM **111** may also inform central computer system **107** of the transactions.

[0042] In a slightly more complex example, return bin **201** contains three units of a controlled substance, previously placed there and documented by nurses. When the nurses logged the returns at cabinet **103**, cabinet **103** notified computer system **107**. When the pharmacy technician later empties return bin **201**, cabinet **103** notifies computer system **107**, which in turn notifies CSM **111**, that three units of a controlled substance have been removed from return bin **201** by the pharmacy technician. CSM **111** would then count three units as being estimated for return to vault **102**. However, in this example, the technician then uses one of the units to replenish a bin holding that medication within cabinet **103**, as part of his or her normal restocking procedure. That transaction is also logged by cabinet **103**, and details are forwarded to computer system **107**, which then informs CSM **111**. CSM **111** may then decrement the number of items estimated for return, on the assumption that the technician used one of the three items from the return bin to perform the restock. The net result is that CSM will estimate that two of that item to be returned from cabinet **103** by that technician. This example may be represented as follows:

Time	Cabinet	User	Action	Qty
8:00	103	Pat	Empty Return Bin	3
8:05	103	Pat	Restock	1
			Estimated return amount	2

[0043] Yet another example may be represented as follows:

Time	Cabinet	User	Action	Qty
8:00	103	Pat	Empty Return Bin	2
8:30	105	Pat	Restock	2
			Estimated return amount	2

This example is similar to the previous example, except that instead of restocking items back into the same cabinet, the restock transaction occurs at a different cabinet. In this example, return bin **201** of cabinet **103** holds two of a particular controlled item, previously placed there and logged to the system. At the beginning of this scenario, computer system **107** is aware of the two items. When the pharmacy technician removes the items, cabinet **103** informs computer system **107**, which in turn notifies CSM **111** because a controlled substance is involved. CSM **111** may then count two items as being estimated for return from cabinet **103**. Later, the technician restocks two of the same item into cabinet **105**. Cabinet **105** informs computer system **107**, which in turn notifies CSM **111**. CSM **111** may handle this situation in different ways, in different embodiments. A first option is to assume that the two items restocked into cabinet **105** are the same two items that were removed from return bin **201**, and to therefore decrement the number of items estimated to be returned to zero. In this case, CSM **111** would not present that particular item in the queued returns list when the technician arrives back at vault **102**. A second option is to assume that, because of the time and distance separating the two transactions, the items stocked into cabinet **105** are not the same items removed from return bin **201**, and therefore to not decrement the estimated number of items to return. In that case, CSM **111** still would anticipate two returned items, and would present two of that particular item in the queued return list.

[0044] Either option may be used, even though they give different estimates of the return amount. The inventory maintained by CSM **111** is based entirely on the actual documented movements of items into and out of dispensing devices **103-105**, and into and out of vault **102**. Even if the queued return list shown in user interface **400** does not accurately reflect the actual number of items to be returned, the inventory is still kept correctly because the inventory tracking does not rely on the queued returns list. The purpose of the list is for convenient data entry, and it is not used for inventory tracking. For this reason, it may be preferable to make the

assumption that the two items stocked into cabinet **105** are not the same items that were removed from return bin **201**, and to present a list showing two items as being expected back at vault **102**. If the assumption is correct, the technician can simply accept the list entry corresponding to the two items and proceed with the restock transactions. If the assumption is incorrect, the technician can simply delete the entry from the list, change the quantity to zero, or otherwise indicate that no items are to be returned. In either case, whether the assumption was correct or incorrect, very little effort is required.

[0045] However, if it were assumed that the two items were the same, CSM **111** would not present a queued return list for that item. If this assumption is correct, the technician need not do anything with regard to this item back at vault **102**. However, if the assumption is incorrect, the technician will be in possession of two items to be returned, but the items will not appear on the queued return list. In this case, the technician will be required to manually inform CSM **111** that he or she has items to return, select the items from an extended list, indicate which cabinet they came from, and indicate the quantity to be returned. The burden of an incorrect assumption is much higher for the second option than the first, while the benefit of a correct assumption is comparable. For this reason, the system may be programmed to, when in doubt, make assumptions that tend to overestimate the number of entries on the queued return list. In some embodiments, CSM **111** may simply assume that all items removed from return bins will be returned to vault **102**, and may present all of the items on the queued return list, regardless of any other transactions. In this way, it can be assured that the pharmacy technician will not need to perform manual data entry for returning any item, although this broad assumption may require the technician to delete many queued return entries that could have been avoided using other assumptions about item flow.

[0046] In system **100**, CSM **111** includes a separate computer dedicated to controlled substance tracking. CSM **111** is tightly integrated with other parts of the system, for example central computer system **107**. Central computer system **107**, in conjunction with computer-enabled dispensing devices **103-105**, is already configured to track the movements of a variety of medications and other items throughout system **100**. Because central computer system **107** informs CSM **111** of transactions involving controlled substances, CSM **111** has the information necessary to prepare the queued item return list of FIG. 4.

[0047] In other embodiments, even further integration is possible. **FIG. 5** illustrates a system **500** in accordance with one such embodiment. In this embodiment, central computer system **501** performs the functions of both central computer system **107** and CSM **111**. Vault **102** may appear as a specialized cabinet similar to dispensing units **103-105**, but for which special accounting procedures are required because vault **102** contains controlled substances.

[0048] The extensive integration of system **100** provides benefits in the tracking of medications and in the facilitation of patient care. For example, because CSM **111** is made aware of transactions involving controlled substances that occur at dispensing devices **103-105** and other locations in the system, the reach of CSM **111** to track medications throughout the facility is increased as compared with a system that is not so highly integrated, and more detail is provided that is useful for medication tracking. Patient care and safety is improved, in part because manual data entry is reduced. The efficient documentation of medication transactions may result in more efficient overall movement of medications throughout the facility, so that medications are more likely to be in place when needed by patients.

[0049] In some embodiments, CSM **111** and computer system **107** may share a database of medication locations. When only a single database is used, discrepancies cannot arise between multiple databases. Integration of the system also facilitates the handling and tracking of controlled substances stored in patient-specific storage locations, as described in more detail below. Generally, in a highly integrated system, more transaction points can be monitored, and more kinds of medication movement can be tracked than in a less integrated system.

[0050] In one example of integration, computer system **107** may communicate with systems located at suppliers **101**. Orders for medication can be entered electronically, and suppliers **101** can provide advance shipping notice of items being shipped to the health care facility. This advance shipping notice can be used in a way similar to the queued return list shown in FIG. 4. For example, computer system **107** may identify which items on the advance shipping notice from a supplier are controlled substances, and forward a list to CSM **111** detailing which controlled substances are expected to be delivered to the health care facility from that supplier. CSM **111** can then provide a queued receiving list to assist a pharmacy technician in documenting the receipt of new shipments. An example of a queued receiving list **600** is shown in **FIG. 6**. A user of the system can use queued receiving list **600** in a way similar to queued return list **400**. As items are removed from a received shipping container for stocking in vault

102, the technician can locate each item on queued receiving list **600** and compare the received quantity with the expected quantity. If the quantities match, the user can simply accept the list entry for that item, and proceed to stock the item into vault **102**, preferably under guidance from the system. If the quantities do not match, the user can edit a list entry to reflect the amount actually received, and proceed to stock the item. The discrepancy may later appear on an exception report that triggers an investigation of the source of the discrepancy. The provision of the queued receiving list avoids laborious and error-prone manual entry of received items.

[0051] In another example of integration, computer system **107** may be aware of medication orders, by virtue of its communication with pharmacy information system **112**, and designates specific bins or other locations for storing medications intended for particular patients. It is common for a patient to be moved from one area of a health care facility to another. In this situation, the specific location designated for storing medication for the patient may change to another dispensing device in another area of the facility. In order to maintain continuity of patient care, it is desirable that the patient's medications also move quickly and accurately to the dispensing device in the new location. In an example of this situation, computer system **107** learns of the transfer from pharmacy information system **112**, and notifies CSM **111** of the transfer. The system may then cause a queued destocking list to be displayed at the dispensing device from which the patient's medication is being moved, so that a technician removing the medication from the can document its removal by simply accepting the entries on the queued destocking list. The dispensing device may guide the technician to the correct bin from which to remove the medication being transferred. The system can then cause a queued restocking list to be displayed at the destination dispensing device, so that the technician placing the medication in the destination dispensing device can document the restocking by simply accepting entries on the queued restocking list. The destination dispensing device may guide the technician to the correct patient-specific location into which the medication is to be deposited. Examples of a queued destocking list **700** and a queued restocking list **800** are shown in **FIGS. 7 and 8** respectively. For each transaction, the respective dispensing device informs computer system **107** of the transaction, and computer system **107** informs CSM **111** of any transactions involving controlled substances, so that CSM **111** can accurately track the locations of controlled substances in the system. Any discrepancies in quantities destocked and restocked may be identified for investigation, but in any event, the queued lists greatly facilitate the entry of data needed for documentation of the transfer.

[0052] In another example of integration, transactions involving movement of medication from vault **102** to dispensing devices **103-105** may also be facilitated using queued lists. For example, computer system **107** may learn of a new prescription of a controlled medication for a particular patient. In some embodiments, the patient's medications are stored in a patient-specific location. Computer system **107** informs CSM **111** of the need to move a quantity of the prescribed medication to a dispensing device near the patient. The system may cause a queued pick list to be displayed at vault **102** to facilitate documentation of picking the prescribed medication from vault **102**. The system may also cause a queued stocking list to be displayed at the destination dispensing device, to facilitate documentation of the stocking of the medication into the destination dispensing device. The queued pick and stocking lists may be similar to queued destocking and restocking lists **700** and **800**, although this is not a requirement. Queued pick and stocking lists may be used for medications stored in non-patient-specific locations as well.

[0053] In the claims appended hereto, the term "a" or "an" is intended to mean "one or more." The term "comprise" and variations thereof such as "comprises" and " comprising," when preceding the recitation of a step or an element, are intended to mean that the addition of further steps or elements is optional and not excluded. The invention has now been described in detail for the purposes of clarity and understanding. However, those skilled in the art will appreciate that certain changes and modifications may be practiced within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A medication management system, comprising:

an electronic network; and

a computer system programmed to:

receive over the electronic network one or more indications that a particular medication previously removed from a dispensing device has been designated for return to the medication management system;

compute an estimated return amount that is an amount of the previously-removed particular medication that is estimated to be returned to a central storage location within the medication management system; and

cause a queued return list of one or more estimated return amounts to be displayed at the central storage location to facilitate documentation of the return of the particular medication to the central storage location.

2. The medication management system of claim 1, further comprising the central storage location.

3. The medication management system of claim 1, wherein queued return list is editable.

4. The medication management system of claim 1, wherein the estimated return amount includes the total of all amounts of the particular medication designated for return to the medication management system from the dispensing device.

5. The medication management system of claim 1, wherein the estimated return amount is less than the total of all amounts of the particular medication designated for return to the medication management system from the dispensing device.

6. The medication management system of claim 1, wherein the computer system is programmed to:

receive indications that multiple medications previously removed from the dispensing device have been designated for return to the medication management system;

compute estimated return amounts for each of at least two of the multiple medications; and

include the at least two of the multiple medications in the queued return list.

7. The medication management system of claim 1, wherein the dispensing device is one of a plurality of dispensing devices, and wherein a respective queued return list is displayed for each of at least two of the dispensing devices from which medication is estimated to be returned.

8. The medication management system of claim 1, wherein the medication is a controlled substance.

9. The medication management system of claim 8, wherein:

the medication management system is in communication with a central computer system;

the central computer system is in communication with the dispensing device;

the dispensing device informs the central computer system of transactions involving medications occurring at the dispensing device;

the central computer system recognizes that certain transactions reported by the dispensing device involve controlled substances and informs the medication management system of the transactions involving controlled substances.

10. The medication management system of claim 1, further comprising the dispensing device.

11. The medication management system of claim 10, wherein the dispensing device is one of a plurality of dispensing devices comprised in the medication management system.

12. The medication management system of claim 1, wherein the computation of the estimated return amount is based on assumptions that tend to cause overestimation of the number of entries in the queued return list.

13. The medication management system of claim 1, wherein the computer system is further programmed to, upon acceptance of an entry in the queued return list by a user of the system:

guide the user to place the returned quantity of the medication described in the accepted entry into a particular bin in the central storage location; and

make a record of the return of the medication described in the entry.

14. The medication management system of claim 1, wherein the queued return list indicates an amount of an item to be disposed of.

15. The medication management system of claim 1, wherein the queued return list indicates an amount of an item to be wasted.

16. A method of managing medications, the method comprising:

receiving, by a computer system over an electronic network, an indication that a medication previously removed from a dispensing device has been designated for return to a medication management system;

computing an estimated return amount that is an amount of the previously-removed medication that is estimated to be returned to a central storage location within the medication management system; and

causing a queued return list of one or more estimated return amounts to be displayed at the central storage location to facilitate documentation of the return of the medication to the central storage location.

17. The method of claim 16, further comprising altering the queued return list in response to inputs from a user of the system.

18. The method of claim 16, wherein computing the estimated return amount comprises computing the total of all amounts of the particular medication designated for return to the medication management system from the dispensing device.

19. The method of claim 16, wherein the method comprises:

receiving indications that multiple medications previously removed from the dispensing device have been designated for return to the medication management system;

computing estimated return amounts for at least two of the multiple medications, wherein the estimate return amounts are amounts of the previously-removed medications estimated to be returned to the central storage location; and

including the at least two of the multiple medications in the queued return list.

20. The method of claim 16, wherein the dispensing device is one of a plurality of dispensing devices, and wherein the method comprises displaying a respective queued return list for each of at least two of the dispensing devices from which medication is estimated to be returned.

21. The method of claim 16, wherein the medication is a controlled substance.

22. The method of claim 16, wherein computing the estimated return amount comprises computing the estimated return amount based on assumptions that tend to cause overestimation of the number of entries in the queued return list.

23. The method of claim 16, further comprising, upon receipt of an approval of an entry on the queued return list from a user:

guiding the user to place the returned quantity of the medication described in the entry into a particular bin in the central storage location; and

making a record of the return of the medication described in the entry.

24. A medication management system, comprising a computer system programmed to:

receive a description of a movement of a medication, the movement expected to entail a later transaction at a location within a health care facility; and

cause a queued list to be displayed at the location to facilitate entry of data documenting the later transaction.

25. The medication management system of claim 24, wherein the medication is a controlled substance.

26. The medication management system of claim 24, wherein the description of the movement of the medication is an advance shipping notice, and the queued list is a queued receiving list.

27. The medication management system of claim 24, wherein the description of the movement of the medication is a description of the movement of a particular patient's medication from a first patient-specific storage location to a second patient-specific storage location; and

the queued list is a queued destock list displayed at a source dispensing device from which the medication is to be removed.

28. The medication management system of claim 27, wherein the computer system is further configured to cause a queued restock list to be displayed at a destination dispensing device into which the medication is to be placed.

29. The medication management system of claim 24, wherein the description of the movement of the medication is a description of the movement of the medication from a central storage location to a dispensing device remote from the central storage location, and the queued list includes a list of one or more medications to be stocked into the dispensing device.

30. A system, comprising:

a computerized controlled substance management system; and

a number of patient-specific locations for storing medications intended for respective particular patients;

wherein the controlled substance management system tracks the movement of controlled substances into and out of the patient-specific locations.

31. The system of claim 30, wherein the system causes one or more queued lists to be displayed, for facilitating documentation of movement transactions involving the controlled substances.

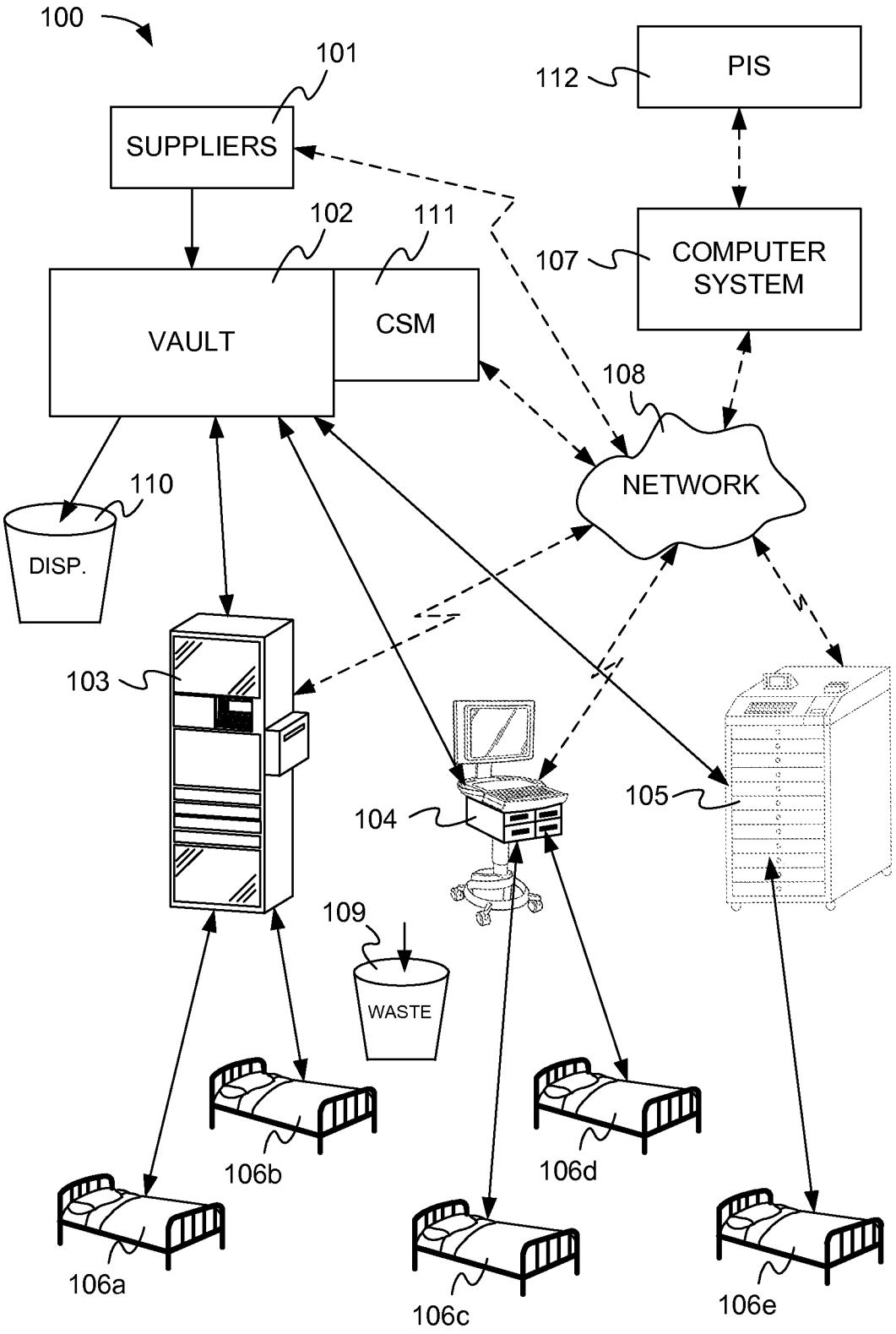
100
101
SUPPLIERS
112
PIS
102
111
VAULT
CSM
107
COMPUTER SYSTEM
108
NETWORK
110
DISP.
103
104
105
109
WASTE
106a
106b
106c
106d
106e

FIG. 1

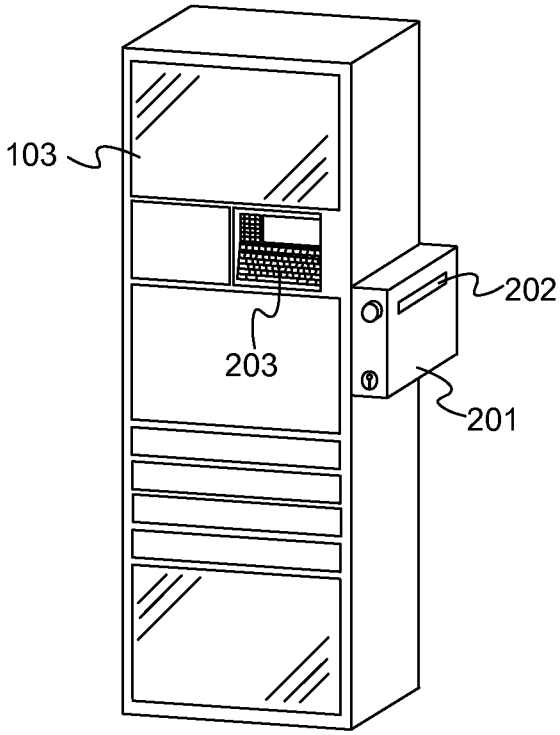

FIG. 2

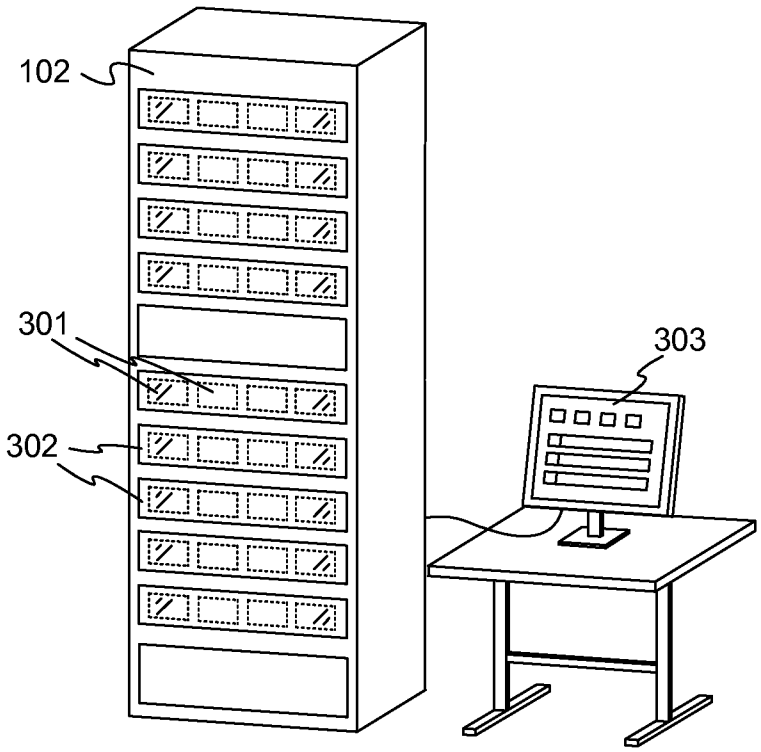

FIG. 3

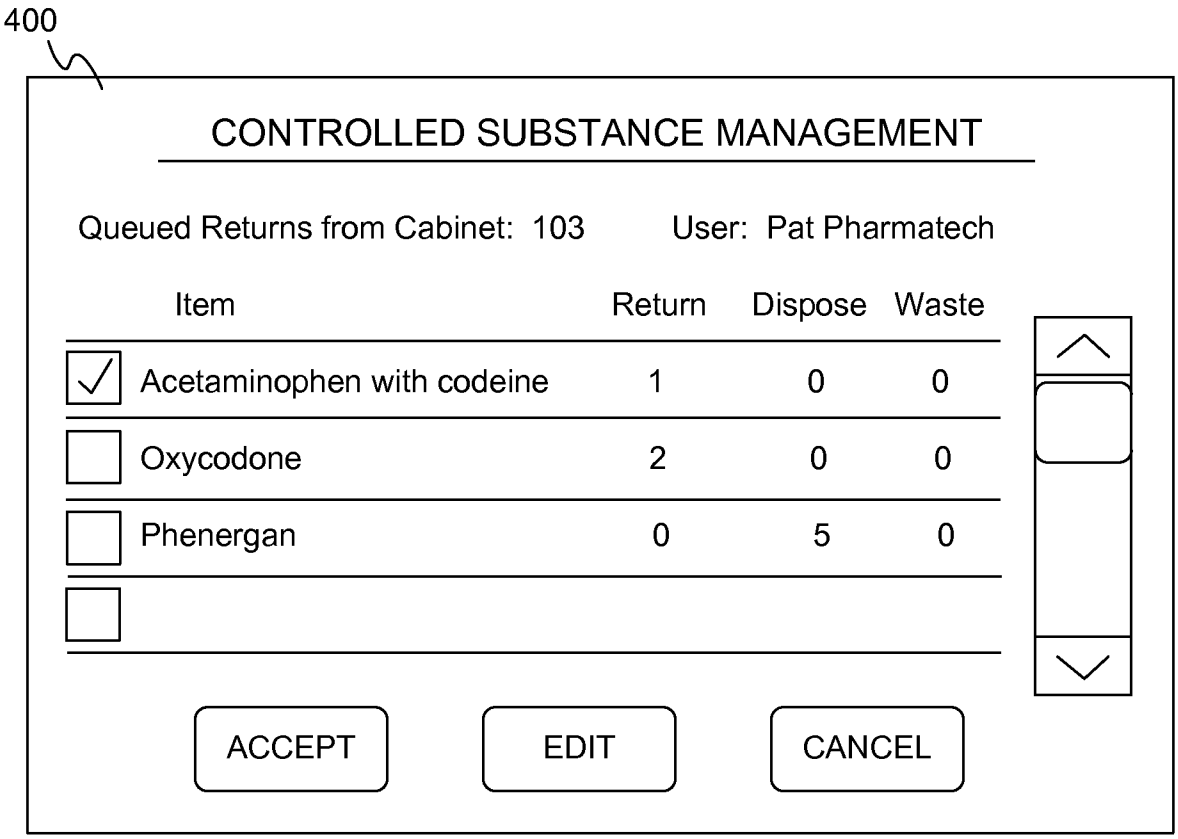
400
CONTROLLED SUBSTANCE MANAGEMENT
Queued Returns from Cabinet: 103
User: Pat Pharmatech
Item
Return
Dispose
Waste
Acetaminophen with codeine
1
0
0
Oxycodone
2
0
0
Phenergan
0
5
0
ACCEPT
EDIT
CANCEL

FIG. 4

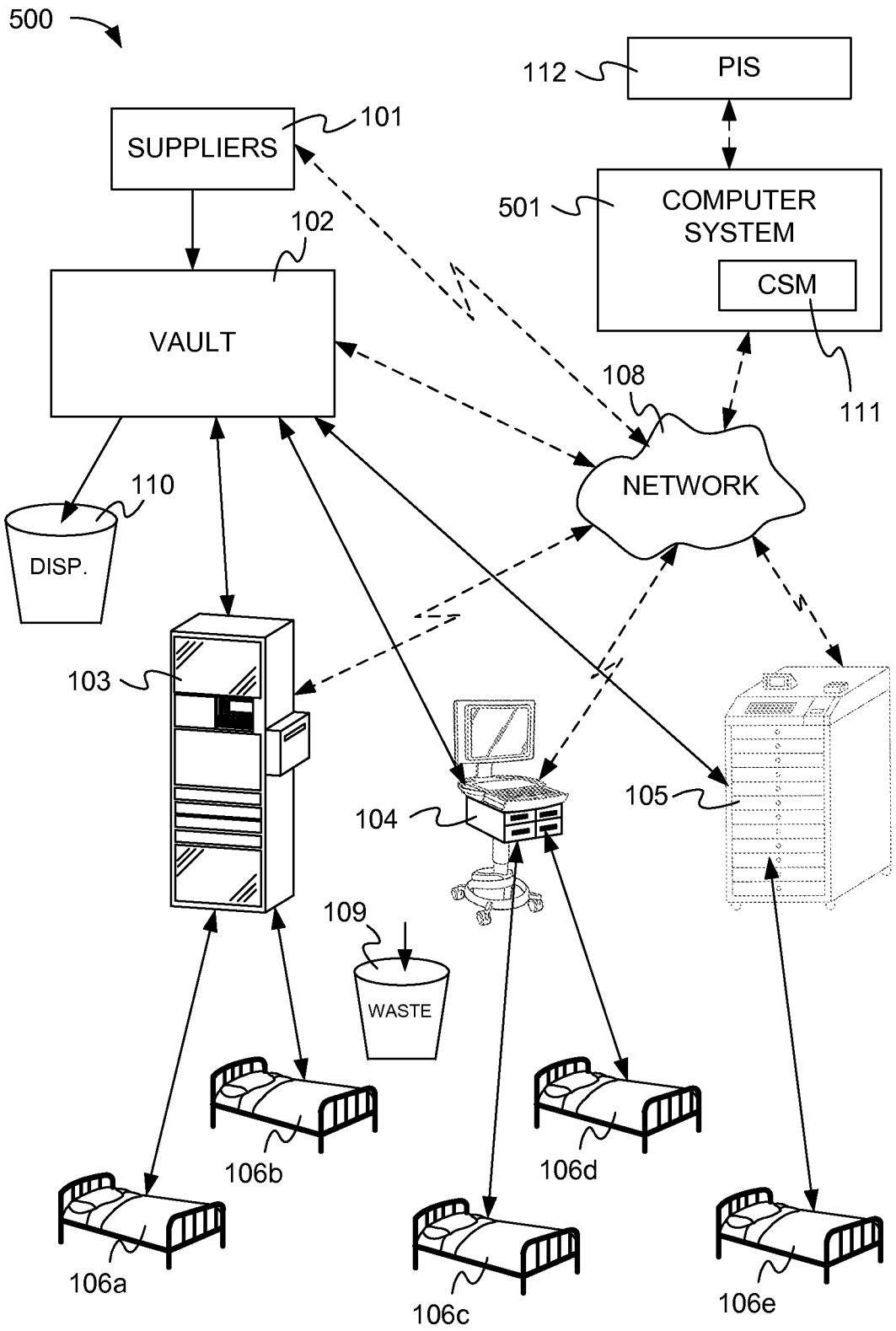
500
112
PIS
101
SUPPLIERS
501
COMPUTER SYSTEM
CSM
102
VAULT
108
111
NETWORK
110
DISP.
103
104
105
109
WASTE
106a
106b
106c
106d
106e

FIG. 5

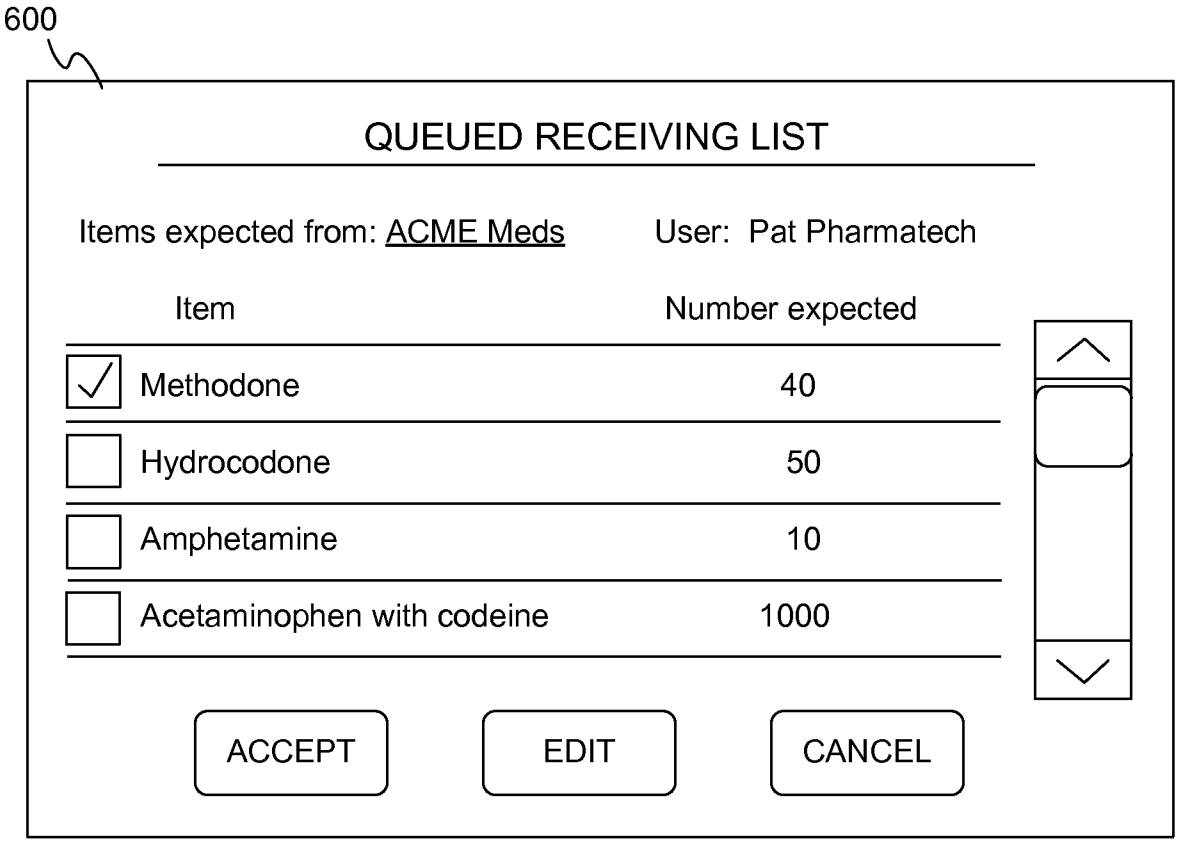
600
QUEUED RECEIVING LIST
Items expected from: ACME Meds
User: Pat Pharmatech
Item
Number expected
Methodone
40
Hydrocodone
50
Amphetamine
10
Acetaminophen with codeine
1000
ACCEPT
EDIT
CANCEL

FIG. 6

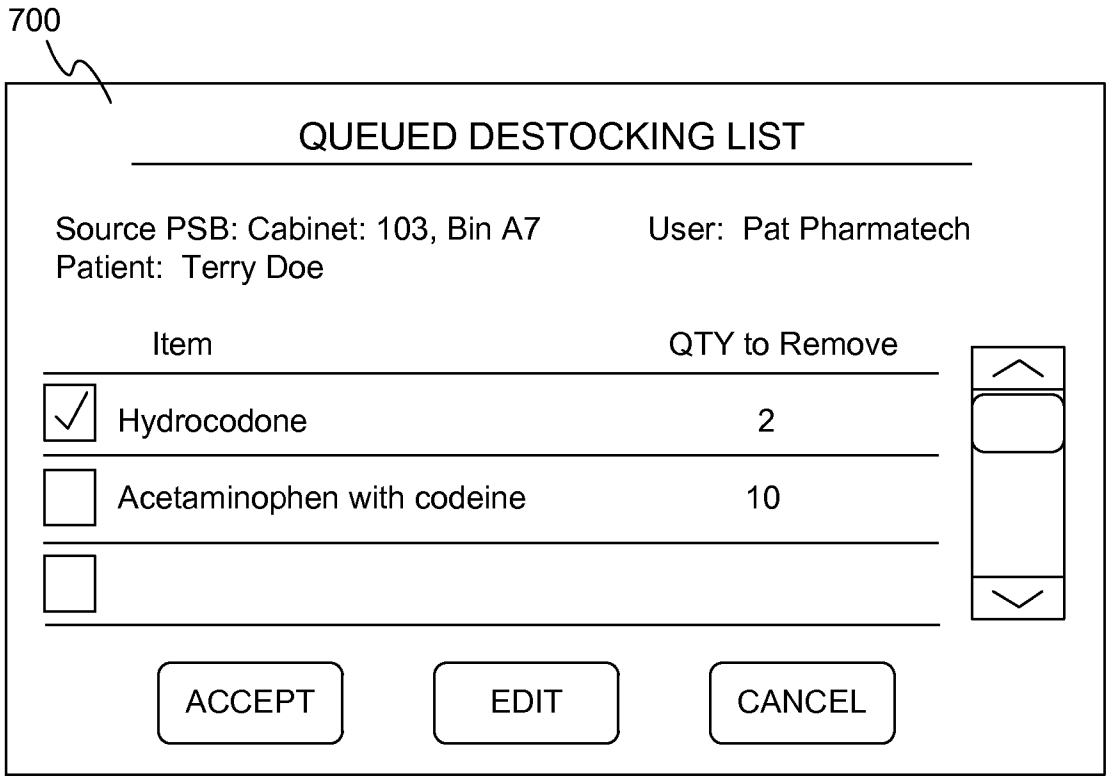
700
QUEUED DESTOCKING LIST
Source PSB: Cabinet: 103, Bin A7
User: Pat Pharmatech
Patient: Terry Doe
Item
QTY to Remove
Hydrocodone
2
Acetaminophen with codeine
10
ACCEPT
EDIT
CANCEL

FIG. 7

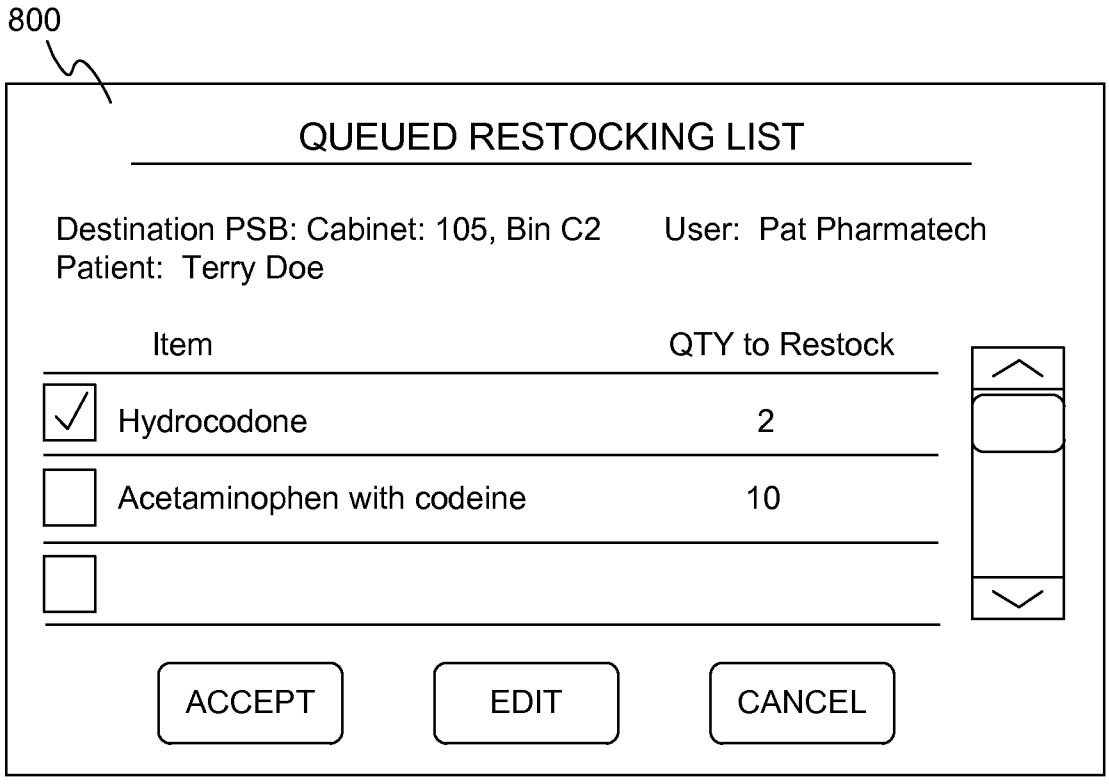
800
QUEUED RESTOCKING LIST
Destination PSB: Cabinet: 105, Bin C2
User: Pat Pharmatech
Patient: Terry Doe
Item
QTY to Restock
Hydrocodone
2
Acetaminophen with codeine
10
ACCEPT
EDIT
CANCEL

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 12/36197

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G06Q 10/00 (2012.01)
USPC - 705/2
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)
IPC(8) - G06Q 10/00 (2012.01)
USPC - 705/2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8) - G06Q 10/00 (2012.01) (Keyword limited - see terms below)
USPC - 705/3 (Keyword limited - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB, USPT, EPAB, JPAB), Google Scholar, Google Patents, Search Terms Used: Medication management, que$5, report$4, pyxis, controlled substance, computer network, remot$4, dispens$4, inventor$4, billing, storage, vault, cabinet, track$4, monitor$4, disposition, dispens$4, medic$7, return, invent, billing, medicine, pharmaceutical$4, drug$4

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	WO 2009/086217 A2 (Holmes) 09 July 2009 (09.07.2009), para. [0050], [0051], [0055], [0056], [0071], [0083], [0089], [0091], [0096], [0099], [00105], [00109], [00114], [00117], [00124]	1-13, 16-23 ---------- 14, 15
X	US 2002/0032582 A1 (Feeny, Jr. et al.) 14 March 2002 (14.03.2002), para[0040], [0099], [0241], [0244]-[0248], [0304]-[0306]; Fig. 6	24-31
Y	US 6,073,834 A (Michael et al.) 13 June 2000 (13.06.2000), col. 4 ln. 35-40; col. 7 ln. 35-50	14, 15
A	US 2008/0319576 A1 (Vahlberg et al.) 25 December 2008 (25.12.2008), entire document	1-31

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"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)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"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
"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
"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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 August 2012 (01.08.2012)	31 AUG 2012

Name and mailing address of the ISA/US	Authorized officer:
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)