UNDERCOUNTER REFRIGERATOR WITH ACCESS CONTROL

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This present application claims priority under 35 U.S.C. §119(e) to U.S. Provisional Patent Application Ser. No. 62/573,418 titled "UNDERCOUNTER REFRIGERATOR WITH ACCESS CONTROL," filed on October 17, 2017, the entirety of which is hereby incorporated by reference.

TECHNICAL FIELD

[0002] The present disclosure is related to environmentally controlled storage of medical products. More specifically, the present disclosure is related to a storage device that controls environmental conditions for medical products and includes storage containers that are subject to access controls that limit the ability to remove inventory stored in the storage containers subjected to access control and provide a level of security and inventory management for medications that have a high value or commonly diverted from the patient.

BACKGROUND

[0003] Medical supplies such as pharmaceuticals and blood products are high value commodities requiring stringent quality and inventory control measures. Medical products including medications, tissues, and blood products such as whole blood, plasma, or platelets, for example, are in limited supply and have a limited shelf life and stringent quality control requirements to maintain the quality of the products. In some cases, it is important to maintain the environment in which these products are stored within specific parameters. For example, temperature, humidity, and/or exposure to ultraviolet light may all be monitored and/or controlled.

[0004] Another aspect of the quality control requirement is that access to the medical products be limited to only those individuals who are authorized to handle the medical products. Stored items may be pre-matched to a specific individual or storage location. Authorization for access may be controlled to limit those individuals who have access to a particular storage location based on the authorization level of the individual. Some medications that are high value or commonly diverted for illegal sale or usage require additional levels of authority and conformation to remove from environmentally controlled storage device. Access control also assists in preventing materials from being removed unexpectedly and may form part of an inventory control and management system.

[0005] This can be contrasted to the need for ready access to medical products in the event of power loss or an equipment failure may be necessary to prevent medical products from being inaccessible in emergencies. Power loss generally results in the loss of temperature control. In the case of specific stored products, such as blood products, for example, the product must be quickly relocated before the storage conditions fall outside of acceptable

levels. In situations where large numbers of medical products are stored in a single climate control device, quick identification of the particular location of the medical product inventory that is needed assists with productivity and limits the time spent by a user locating appropriate inventory.

SUMMARY

[0006] The present disclosure includes one or more of the features recited in the appended claims and/or the following features which, alone or in any combination, may comprise patentable subject matter.

[0007] According to a first aspect of the present disclosure, there is provided a storage device for medical products including: a cabinet, a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces, a plurality of storage containers, each storage container associated with one of the storage spaces, an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces, wherein the manual release mechanism is secured to the drawer assembly, the manual release mechanism including a user interface that is manually operable to move the manual release mechanism to release the storage containers, where movement of the user interface is transferred to cause longitudinal movement of a rod along a longitudinal axis of the rod, and wherein longitudinal movement of the rod is transferred to a link to cause rotational movement of a shaft about the longitudinal axis of the shaft.

[0007a] According to a second aspect of the present disclosure, there is provided a storage device for medical products including: a cabinet, a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces, a plurality of storage containers, each storage container associated with one of the storage spaces, an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces, wherein the storage device comprises a plurality of drawer assemblies, each drawer assembly including a plurality of storage spaces, each drawer further comprising a separate manual release mechanism to release only the storage containers or the respective drawer, and wherein each manual release mechanism is spring biased to a position that prevents the storage containers of the drawer from being manually released, and wherein each manual release may be manually moved to a released position and locked in the released position, and wherein each manual release includes a handle ~~that is changeable between an accessible position and an~~

~~inaccessible position~~ and a security means to selectively render the handle accessible or inaccessible.

[0008] In some embodiments, the storage space includes an arm movable between a first position in which the arm secures the storage container and a second position in which the arm releases the storage container.

[0009] In some embodiments, the arm includes a hook that engages the storage container when the arm secures the storage container and disengages the storage container when the arm releases the respective storage container.

[0010] In some embodiments, the actuator of the actuation assembly is operable to move a respective arm between the first and second positions.

[0011] In some embodiments, the storage device further includes a detector to detect the position of the arm.

[0012] In some embodiments, each actuator has an associated sensor for detecting the position of an arm adjacent the respective actuator.

[0013] In some embodiments, each actuator comprises a solenoid actuated plunger that engages the arm when the solenoid is energized to thereby move the arm between the first and second positions.

[0014] In some embodiments, the control system compares the state of the solenoid to the signal from the detector to determine if the arm is properly positioned.

[0015] In some embodiments, the arm is formed to include a push rod which acts on the storage container as the arm is moved to the second position to cause the storage container to be moved in the storage space such that a portion of the storage container extends outwardly from the storage space.

[0016] In some embodiments, the storage container is operates as a light pipe and the actuation assembly is operable to illuminate the storage container when the storage container is released from the storage space, or specific information needs to be conveyed by illumination color or illumination characteristic such as fast blink, slow blink, color sequencing etc.

[0017] In some embodiments, the override release mechanism includes a security device to prevent the override release mechanism from being actuated.

[0018] In some embodiments, the security device is a lock that is only moveable by operation of a key.

[0019] In some embodiments, the storage container conducts light and the actuation assembly is operable to illuminate the storage container when the storage container is released from the storage space.

[0020] In some embodiments, the override release mechanism includes a security device to prevent the override release mechanism from being actuated.

[0021] In an embodiment, the storage containers are configured to permit air to flow through the container, without permitting a user to access the contents of the storage container.

[0022] In some embodiments, the drawer assembly is removable from the cabinet.

[0023] In some embodiments, the drawer assembly is secured to the cabinet by an electrically actuable actuator.

[0024] In some embodiments, the manual release mechanism is secured to the drawer assembly, the manual release mechanism including a user interface that is manually operable to move the release mechanism to release the storage containers.

[0025] In some embodiments, movement of the override user interface is transferred to cause longitudinal movement of a rod along a longitudinal axis of the rod.

[0026] In some embodiments, longitudinal movement of the rod is transferred to a link to cause rotational movement of a shaft about the longitudinal axis of the shaft.

[0027] In some embodiments, rotational movement of the shaft cause a link to engage a portion of the actuation assembly to cause the storage containers to be released independently of the actuators. In some embodiments, the rotating override tabs on the shaft include or consist of spring steel features allowing for rotational overtravel to occur ensuring complete actuation of each release mechanism, thus accounting for potential manufacturing variations.

[0028] In some embodiments, the storage containers are configured to permit air to flow through the container, without permitting a user to access the contents of the storage container.

[0029] In some embodiments, the storage container includes a guard that comprises a number of vanes, the vanes spaced apart to allow air to flow through the guard and into a storage space of the storage container.

[0030] In some embodiments, the storage container includes a lower support surface, the lower support surface including at least one fenestration to both permit air to flow through the lower support surface into the storage space, and further provide a means of protection against diversion tools being slid under the storage tray.

[0031] In some embodiments, the control system is operable to monitor the storage conditions of an inventory item stored in the device and to determine if the inventory has been compromised.

[0032] In some embodiments, the storage device includes sensors to monitor environmental conditions and the control system utilizes sensor data to determine if the inventory has been compromised.

[0033] In some embodiments, the control system monitors to determine if a particular inventory item has been absent from a storage location to determine if a particular inventory item has been compromised.

[0034] In some embodiments, if an inventory item has been compromised, the control system may change the status of the stored inventory to a quarantine status. In some

embodiments, the control system is operable to report the quarantine status to an appropriate supervisory authority.

[0035] In some embodiments, the storage device is operable to illuminate a storage container in a particular color that corresponds to the type of inventory or status of the inventory stored in the storage container.

[0036] According to a third aspect of the present disclosure, there is provided a storage device for medical products including: a control system, a cabinet, a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces, a plurality of storage containers, each storage container associated with one of the storage spaces, an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces, wherein the manual release mechanism may be manually moved to a released position and locked in the released position, and wherein each manual release mechanism includes a handle ~~that is changeable between an accessible position and an inaccessible position~~ and a security means to selectively render the handle accessible or inaccessible.

[0037] In some embodiments, the storage device comprises a plurality of drawer assemblies, each drawer assembly including a plurality of storage spaces, each drawer further comprising a separate manual release mechanism to release only the storage containers or the respective drawer.

[0038] In some embodiments, each manual release mechanism is spring biased to a position that prevents the storage containers of the drawer from being manually released.

[0039] In some embodiments, the manual release may be manual moved to a released position and locked in the released position.

[0040] In some embodiments, each manual release includes a handle that is normally inaccessible to a user.

[0041] In some embodiments, the handles are positioned behind a cover that is secured to the cabinet by a lock that requires a security interface to be actuated to release the lock.

[0042] In some embodiments, the manual release mechanism is spring biased to a position that prevents the storage containers of the drawer from being manually released.

[0043] In some embodiments, the manual release may be manual moved to a released position and locked in the released position.

[0044] In some embodiments, each manual release includes a handle that is normally inaccessible to a user. In some embodiments, the handle is positioned behind a cover that is secured to the cabinet by a lock that requires a security interface to be actuated to release the lock.

CLAIMS

1. A storage device for medical products comprises:

a cabinet,

a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces,

a plurality of storage containers, each storage container associated with one of the storage spaces,

an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and

a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces,

wherein the manual release mechanism is secured to the drawer assembly, the manual release mechanism including a user interface that is manually operable to move the manual release mechanism to release the storage containers,

where movement of the user interface is transferred to cause longitudinal movement of a rod along a longitudinal axis of the rod, and

wherein longitudinal movement of the rod is transferred to a link to cause rotational movement of a shaft about the longitudinal axis of the shaft.

2. The storage device of claim 1, wherein the drawer assembly is removable from the cabinet and the drawer assembly is secured to the cabinet by an electrically actuable actuator.

3. The storage device of claim 1, wherein rotational movement of the shaft causes a link to engage a portion of the actuation assembly to cause the storage containers to be released independently of the actuators.

4. The storage device of claim 1, wherein the storage device comprises a plurality of drawer assemblies, each drawer assembly including a plurality of storage spaces, each drawer further comprising a separate manual release mechanism to release only the storage containers or the respective drawer, and wherein each manual release mechanism is spring biased to a position that prevents the storage containers of the drawer from being manually released.

5. A storage device for medical products comprises:

a cabinet,

a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces,

a plurality of storage containers, each storage container associated with one of the storage spaces,

an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and

a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces,

wherein the storage device comprises a plurality of drawer assemblies, each drawer assembly including a plurality of storage spaces, each drawer further comprising a separate manual release mechanism to release only the storage containers or the respective drawer, and wherein each manual release mechanism is spring biased to a position that prevents the storage containers of the drawer from being manually released, and

wherein each manual release may be manually moved to a released position and locked in the released position, and wherein each manual release includes a handle ~~that is changeable between an accessible position and an inaccessible position~~and a security means to selectively render the handle accessible or inaccessible.

6. The storage device of claim 1, wherein the storage device is operable to illuminate a storage container in a particular color that corresponds to the storage container being in at least one of an open position in which the storage container is not properly located in the associated storage space and an unlocked position in which the storage container is unsecured and able to move relative to the storage space.

7. The storage device of claim 6, wherein the storage device is operable to illuminate a storage container in a particular color using a blinking pattern that corresponds to the storage container being in the open position and the unlocked position.

8. The storage device of claim 1, wherein the storage containers are configured to permit air to flow through the container, without permitting a user to access the contents of the storage container.

9. The storage device of claim 8, wherein the storage container includes a guard that comprises a number of vanes, the vanes spaced apart to allow air to flow through the guard and into a storage space of the storage container.

10. The storage device of claim 9, wherein the storage container includes a lower support surface, the lower support surface including at least one fenestration to permit air to flow through the lower support surface and into the storage space.

11. The storage device of claim 8, wherein the storage container includes a lower support surface, the lower support surface including at least one fenestration to permit air to flow through the lower support surface and into the storage space.

12. A storage device for medical products comprises

a control system,

a cabinet,

a drawer assembly positioned in the cabinet, the drawer assembly including a plurality of storage spaces,

a plurality of storage containers, each storage container associated with one of the storage spaces,

an actuation assembly including an array of actuators, each of the actuators of the array being associated with a respective storage container, each of the actuators being independently actuable to secure or release the respective storage container with which the respective actuator is associated relative to the storage space, and

a manual release mechanism actuable by a user to over-ride the actuation assembly and independently release the storage containers from the storage spaces,

wherein the manual release mechanism may be manually moved to a released position and locked in the released position, and wherein ~~each~~the manual release mechanism includes a handle ~~that is changeable between an accessible position and an inaccessible position~~and a security means to selectively render the handle accessible or inaccessible.

13. The storage device of claim 12, wherein the control system is operable to monitor the storage conditions of an inventory item stored in the device and to determine if the inventory item has been changed from its initial status.

14. The storage device of claim 12, wherein the storage device includes sensors to monitor environmental conditions and the control system utilizes sensor data to determine if the inventory has been changed from its initial status.

15. The storage device of claims 14, wherein the control system monitors to determine if a particular inventory item is absent from a storage location to determine if a particular inventory item has been removed.

16. The storage device of claims 14, wherein the control system monitors to determine if a particular inventory item is absent from a storage location to determine if a particular inventory item has been removed, and wherein if an inventory item has been removed, the control system may change the status of the stored inventory to a quarantine status.

17. The storage device of claim 14, wherein the control system monitors to determine if a particular inventory item is absent from a storage location to determine if a particular inventory item has been removed, and wherein if an inventory item has been removed, the control system may change the status of the stored inventory to a quarantine status, and wherein the control system is operable to report the quarantine status.

18. The storage device of claim 12, wherein the storage device is operable to illuminate a storage container in a particular color that corresponds to the type of inventory stored in the storage container.

19. The storage device of claim 4, wherein each manual release may be manually moved to a released position and locked in the released position, and wherein each manual release includes a handle ~~that is changeable between an accessible position and an inaccessible position~~ and a security means to selectively render the handle accessible or inaccessible.