~~High Reliability Retrieval Guide System with Closed Loop Feedback and Alarm~~

Description of Invention

Field of Invention:

This invention is a method to achieve a high degree of speed, accuracy and reliability in a retrieval guide system. The system not only indicates to a user the correct compartment amongst multiple compartments to retrieve an item(s) but would also feedback via an alarm should the user retrieve the item(s) from a wrong compartment. The system employs a method that does not involve any mechanical moving parts and is thus inherently more speedy and reliable. The same method can be used when the user is depositing an item(s) into a compartment. The system can also be enhanced to distinguish an authorized and unauthorized person depositing and retrieving the item(s).

Background:

In many storage and retrieval systems where the retrieval is done manually, it is always challenging to achieve a high degree of accuracy and reliability in an environment where high throughput is needed. An example would be a manual pick system in a pharmacy.

In a conventional approach, a secure system will need to have the indicators to the correct compartment, a locking mechanism such that the door of the compartment can be open only when it is selected for the contents to be retrieved. The doors and electromechanical locks needed would make it difficult to achieve high reliability in a high throughput environment. The ability to distinguish between authorized and unauthorized users would also not normally be included.

Instead of preventing access via a mechanical barrier like a locked door, this invention improves the accuracy of the system by detecting the user's retrieval action and alarms when an unauthorized user accesses the selected compartment or the user accesses a wrong compartment .

The elimination of mechanical parts means fewer parts to breakdown and thus improved reliability. Because it does not need user to open and close a mechanical barrier, it is inherently faster.

Summary of Invention:

1) The contents placed in each compartment can be accessed directly without a physical barrier like a door or a lid.

2) Each compartment has an indicator to indicate to the user that the compartment is selected for the contents to be retrieved. It is possible to have different indicators, like different coloured lights for different users so that they can work simultaneously at the same system.

3) Detectors are installed such that each compartment can detect if ~~someone~~ is accessing it.

4) There are various embodiments of the detection system. One embodiment is a proximity switch based on an infra-red emitter and sensor pair at each compartment.

5) Another embodiment of the detection system is a matrix sensing system for a group of compartments, where each compartment does not have its own individual detectors. The emitters and detectors are placed strategically at the peripherals of the group of compartments and through the pattern detected or blocked, determine the location of the compartment that is being accessed.

6) The basic embodiment of this invention is the method of indicating the compartment where the content are to be retrieved and the detection that the compartment has been accessed. If the correct compartment is being accessed, the job is done. If any wrong compartment is accessed, an alarm will sound. This alarm can be in the form of a loud beep, flashing lights or messages on a supervision screen. This feedback can be used by the user or supervisor for corrective action. In addition, a recording of the incident in the form of an entry into an electronic log or even a video recording of the incident can be triggered.

7) The second embodiment of this invention is an enhancement of the basic system. An additional identifier recognition system is added so that the different users can be identified. This further enhances the system, allowing the detector to detect whether the authorised user is accessing the compartment. In this case, the alarm will not sound only if the person accessing the chosen compartment is authorized.

8) One implementation of the second embodiment is for the user to wear a bracelet on his wrist that has an NFC (Near Field Communication) tag. Each compartment will have a corresponding NFC reader.

9) Another implementation of the second embodiment is for the user to wear a bracelet on his wrist that has an LED (Light Emitting Diode) that emits a unique signature via visible light or infra-red. This signature is detected at the compartment and thus the user can be identified.

10) This second embodiment allows multiple users to work simultaneously within the same system and is able to ensure that each user can only access the compartments they are assigned to access.

Brief description of drawings:

Figure 1

1) Figure 1 shows the algorithm for the basic embodiment of the invention.
2) The controller at each compartment will operate with this algorithm.
3) Once it starts (1), the controller will check if it is selected for access(2). When the controller receives instructions from the central that it is selected, it will turn on the LED indicator (3) to tell the user to access its contents.
4) The controller will keep checking until it detects an access by the user (4).
5) If the controller detects that there is an access by the user, the job is completed. It turns off the indicator light (5) and returns back to the start.
6) If the controller does not receive any instructions from the central system that it is selected for access(2), it checks if an access is detected(6). If an access is detected, the alarm (7) will sound. This will alert that there is an unauthorized access to that compartment.
7) The controller will continue to sound the alarm (7) until it receives a signal from the central system to stop the alarm (8).
8) If the controller does not detect an access at step (6), it starts all over again by checking if it is selected for access(2).

Figure 2

9) Figure 2 shows the embodiment of invention with identifier recognition enhancement.
10) The algorithm is the same as the basic embodiment if the compartment is select in step (2) and this corresponds to steps (1) to (4). If access is detected at (4), the additional checks in step (9) and step (10) is applied. The result of these checks is that an alarm will sound if no signature is detected or the wrong signature is detected. In an embodiment where the signature is emitted by a bracelet worn on a user's hand, these conditions correspond to a user's hand having no bracelet or a user with the wrong bracelet at the wrist.
11) If the compartment is not selected in step (2), steps (6) to (8) are identical to the corresponding steps in Figure 1.
12) The final steps in all alarm recovery involve turning off the indicator light if it is still on before starting all over again at step (2).

Claims:

What is claimed is:

1) A method for controlling access to a plurality of compartments of a storage and retrieval system without the need for a physical barrier to control access at each compartment comprising: indication to guide a user or users to access the selected compartment or compartments; detection of access of compartment or compartments by a user or users; and an alarm triggered if one or more user is detected accessing a compartment or many compartments that is not designated to be access by the said user or set of users.

2) The method of claim 1, wherein access can be simultaneous access by a plurality of sets of users to a plurality of sets of compartments.

3) The method of claim 1, wherein each user has a device attached which emits a signature detected by the detection system when the user access any compartment; allowing the detection system to distinguish if the user accessing the compartment belongs to the set of users selected to access that particular compartment.

4) A device for controlling access to a plurality of compartments of a storage and retrieval system without the need for a physical barrier to control access at each compartment comprising: indicator sub-system; sensor sub-system; and alarm sub-system.

5) The device of claim 4, wherein the indicator sub-system comprises indicator or indicators at the compartments; and a central indicator or a plurality of central indicators.

6) The device of claim 4, wherein the sensor sub-system comprises an electro-magnetic wave emitter or a plurality of electro-magnetic wave emitters; or ultra-sound emitter or a plurality of ultra-sound emitters; or both; working with the corresponding sensor sub-system at the compartment.

7) The device of claim 4, wherein the sensor sub-system further comprises an array of electro-magnetic emitters or ultra-sound emitters or both working with the corresponding array of sensors placed at the edge of a group of compartments so that through the pattern of which sensor or sensors receives the signals sent out by the emitters, is able to deduce which compartments are being accessed.

8) The device of claim 4, wherein the alarm sub-system comprises an audio module that will sound when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

9) The device of claim 4, wherein the alarm sub-system further comprises signs at the compartments that will be switched on, switched off or flashed when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

10) The device of claim 4, wherein the alarm sub-system further comprises symbols or messages on a computer that will indicate when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

11) The device of claim 4, further comprises a signature generator attached to the user.

12) The signature generator of claim 11, wherein the signature generator sends out a signal to the sensor sub-system to allow the user to which this signature generator is attached to be identified.

13) The signature generator of claim 11 comprises a bracelet at the wrist.

14) The signature generator of claim 11 further comprises a ring or ring-like device on the user's finger.

15) The signature generator of claim 11 further comprises a glove or glove-like device on a user's hand.

16) The device of claim 4, further comprises a Near Field Communications (NFC) Tag reader attached to the user.

17) The reader of claim 16, wherein the reader reads the signature of the NFC Tag or plurality of NFC Tags attached to the compartment and sends the signature back to the central system.

18) The reader of claim 16 comprises a bracelet at the wrist.

19) The reader of claim 16 further comprises a ring or ring-like device on a user's finger.

20) The reader of claim 16 further comprises a glove or glove-like device on to a user's hand.

METHOD AND DEVICE TO GUIDE ACCESS IN A STORAGE AND RETRIEVAL SYSTEM

Description of Invention

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3) Detectors are installed such that each compartment can detect if a user is accessing it.

4) There are various embodiments of the detection system. One embodiment is a proximity switch based on an infra-red emitter and sensor pair at each compartment.

5) Another embodiment of the detection system is a matrix sensing system for a group of compartments, where each compartment does not have its own individual detectors. The emitters and detectors are placed strategically at the peripherals of the group of compartments and through the pattern detected or blocked, determine the location of the compartment that is being accessed.

6) The basic embodiment of this invention is the method of indicating the compartment where the content are to be retrieved and the detection that the compartment has been accessed. If the correct compartment is being accessed, the job is done. If any wrong compartment is accessed, an alarm will sound. This alarm can be in the form of a loud beep, flashing lights or messages on a supervision screen. This feedback can be used by the user or supervisor for corrective action. In addition, a recording of the incident in the form of an entry into an electronic log or even a video recording of the incident can be triggered.

7) The second embodiment of this invention is an enhancement of the basic system. An additional identifier recognition system is added so that the different users can be identified. This further enhances the system, allowing the detector to detect whether the authorised user is accessing the compartment. In this case, the alarm will not sound only if the person accessing the chosen compartment is authorized.

8) One implementation of the second embodiment is for the user to wear a bracelet on his wrist that has an NFC (Near Field Communication) tag. Each compartment will have a corresponding NFC reader.

9) Another implementation of the second embodiment is for the user to wear a bracelet on his wrist that has an LED (Light Emitting Diode) that emits a unique signature via visible light or infra-red. This signature is detected at the compartment and thus the user can be identified.

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Figure 1

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4) The controller will keep checking until it detects an access by the user (4).
5) If the controller detects that there is an access by the user, the job is completed. It turns off the indicator light (5) and returns back to the start.
6) If the controller does not receive any instructions from the central system that it is selected for access(2), it checks if an access is detected(6). If an access is detected, the alarm (7) will sound. This will alert that there is an unauthorized access to that compartment.
7) The controller will continue to sound the alarm (7) until it receives a signal from the central system to stop the alarm (8).
8) If the controller does not detect an access at step (6), it starts all over again by checking if it is selected for access(2).

Figure 2

9) Figure 2 shows the embodiment of invention with identifier recognition enhancement.
10) The algorithm is the same as the basic embodiment if the compartment is select in step (2) and this corresponds to steps (1) to (4). If access is detected at (4), the additional checks in step (9) and step (10) is applied. The result of these checks is that an alarm will sound if no signature is detected or the wrong signature is detected. In an embodiment where the signature is emitted by a bracelet worn on a user's hand, these conditions correspond to a user's hand having no bracelet or a user with the wrong bracelet at the wrist.
11) If the compartment is not selected in step (2), steps (6) to (8) are identical to the corresponding steps in Figure 1.
12) The final steps in all alarm recovery involve turning off the indicator light if it is still on before starting all over again at step (2).

13) If access is detect at step 4, the controller will check if any signature is detected at step 9. If the controller does not detect any signature, it will go into the alarm state in step 7.

14) If the controller detects a signature in step 9, it will check if it is the correct signature. If it is the wrong signature, it will also go to the alarm state in step 7.

15) If the correct signature is detected in step 9, it will turn the indicator light off at step 5 and returns back to the start.

Claims:

What is claimed is:

1) A method for controlling access to a plurality of compartments of a storage and retrieval system without the need for a physical barrier to control access at each compartment comprising: indication to guide a user or users to access the selected compartment or compartments; detection of access of compartment or compartments by a user or users; and an alarm triggered if one or more user is detected accessing a compartment or many compartments that is not designated to be access by the said user or set of users.

2) The method of claim 1, wherein access can be simultaneous access by a plurality of sets of users to a plurality of sets of compartments.

3) The method of claim 1, wherein each user has a device attached which emits a signature detected by the detection system when the user access any compartment; allowing the detection system to distinguish if the user accessing the compartment belongs to the set of users selected to access that particular compartment.

4) A device for controlling access to a plurality of compartments of a storage and retrieval system without the need for a physical barrier to control access at each compartment comprising: indicator sub-system; sensor sub-system; and alarm sub-system.

5) The device of claim 4, wherein the indicator sub-system comprises indicator or indicators at the compartments; and a central indicator or a plurality of central indicators.

6) The device of claim 4, wherein the sensor sub-system comprises an electro-magnetic wave emitter or a plurality of electro-magnetic wave emitters; or ultra-sound emitter or a plurality of ultra-sound emitters; or both; working with the corresponding sensor sub-system at the compartment.

7) The device of claim 4, wherein the sensor sub-system further comprises an array of electro-magnetic emitters or ultra-sound emitters or both working with the corresponding array of sensors placed at the edge of a group of compartments so that through the pattern of which sensor or sensors receives the signals sent out by the emitters, is able to deduce which compartments are being accessed.

8) The device of claim 4, wherein the alarm sub-system comprises an audio module that will sound when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

9) The device of claim 4, wherein the alarm sub-system further comprises signs at the compartments that will be switched on, switched off or flashed when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

10) The device of claim 4, wherein the alarm sub-system further comprises symbols or messages on a computer that will indicate when the device detects a user or a plurality of users accessing any compartment that is not selected for access.

11) The device of claim 4, further comprises a signature generator attached to the user.

12) The signature generator of claim 11, wherein the signature generator sends out a signal to the sensor sub-system to allow the user to which this signature generator is attached to be identified.

13) The signature generator of claim 11 comprises a bracelet at the wrist.

14) The signature generator of claim 11 further comprises a ring or ring-like device on the user's finger.

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16) The device of claim 4, further comprises a Near Field Communications (NFC) Tag reader attached to the user.

17) The reader of claim 16, wherein the reader reads the signature of the NFC Tag or plurality of NFC Tags attached to the compartment and sends the signature back to the central system.

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