

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).