Material Handling Apparatus with Item Scanning Station

Related Applications

[001] This application claims priority under 35 U.S.C. §119 to U.S. Provisional Patent Application No. 63/349,587 filed June 6, 2022. The entire disclosure of the foregoing application is hereby incorporated herein by reference.

Field of the Invention

[002] The present invention relates to a material handling system and in particular to a system operable to receive and sort items using a plurality of automated vehicles. The system may include a station for scanning items to identify a characteristic of the items being sorted.

Background of the Invention

[003] Sorting and retrieving items to fill a customer order can be a laborious and time consuming. Many large organizations have extensive storage areas in which numerous items are stored. Sorting and retrieving items from the hundreds or thousands of storage areas requires significant labor to perform manually. In many fields, automated picking has developed to reduce labor cost and improve customer service by reducing the time it takes to fill a customer order.

[004] In many automated material handling systems, the throughput of the material handling system is determined, among other things, by the rate at which each object is accurately identified and fed into the system. One of the issues that may arise is differentiating pieces as the feed rate increases. Accordingly, it is desirable to provide a system for accurately reading items to be sorted at a high rate, while also differentiating adjacent pieces in the workflow.

SUMMARY

[004a] In an aspect, the present disclosure refers to a material handling apparatus, comprising:

an input station comprising:

a conveyor having an input segment for receiving items, a scanning segment for receiving items from the input segment and an output segment for receiving items from the scanning segment, wherein the scanning segment comprises a non-conductive element for supporting items on the scanning section;

a scanning station for scanning items on the scanning segment of the conveyor, comprising:

a housing having one or more conductive walls adjacent the scanning segment;

an RFID scanner comprising an emitter for emitting a radio frequency signal toward one or more walls of the housing and toward the scanning segment of the conveyor and a receiver for receiving signals emitted from the emitter;

a delivery mechanism for receiving items from the output segment of the conveyor and delivering the items to a plurality of storage locations;

a central controller operable to receive information from the scanning station regarding an identification for each item and determining the storage location to which each of the items is to be delivered, wherein the delivery mechanism is configured to deliver each item to the storage location determined for each item.

[004b] In an aspect, the present disclosure refers to a material handling apparatus for delivering a plurality of items to a plurality of storage locations, comprising:

a conveyor operable to convey a first of the items from an input location to a scanning area and then to a loading location;

a delivery mechanism operable to receive the first item from the conveyor at the loading location and deliver the first item to one of the storage locations;

an RFID scanner positioned adjacent the scanning area to scan items for RFID tags having identification information;

a housing positioned along the conveyor, comprising:

a first wall extending across a width of the conveyor and configured to allow items on the conveyor to pass from the input location to the scanning area wherein the first wall is formed of a conductive material;

a second wall extending across the width of the conveyor and spaced apart from the first wall so that the scanning area is between the first wall and the second wall, wherein the second wall is configured to allow items on the conveyor to pass from the scanning area to the loading location wherein the second wall is formed of a conductive material

wherein the conveyor comprises a moveable surface for moving the first item through the scanning area and a fixed support surface supporting the moveable surface wherein the moveable surface and fixed support surface are formed from non-conductive materials.

[004c] In an aspect, the present disclosure refers to a method for delivering items to one or more destinations, comprising the steps of:

conveying a first item along a first conveyor section;

conveying the first item under a first conductive wall and onto a second conveyor section wherein the first conductive wall separates the first conveyor section from the second conveyor section;

emitting an RF signal toward an RFID tag on the first item on the second conveyor section while the first item is supported on a non-conductive support;

receiving an RF signal from the RFID tag on the first item while the first item is supported on the non-conductive support;

determining the destination for the first item based on the step of receiving the RF signal from the RFID tag;

conveying the first item under a second conductive wall separating the second conveyor section from a third conveyor section;

loading the first item from the third conveyor section onto a delivery mechanism;

displacing the delivery mechanism to deliver the first item to the determined destination; and

discharging the item from the delivery mechanism to the determined destination.

[004d] In an aspect, the present disclosure refers to a material handling apparatus for delivering a plurality of items to a plurality of storage locations, comprising:

means for conveying a first of the items from an input location to a scanning area and then to a loading location;

means for receiving the first item from the conveyor at the loading location and delivering the first item to one of the storage locations;

an RFID scanner positioned adjacent the scanning area to scan items for RFID tags having identification information;

means for shielding items in the input location and the loading location from radio frequency signals from the RFID scanner;

wherein the means for conveying comprises a moveable surface for moving the first item through the scanning area and a fixed support surface supporting the moveable surface wherein the moveable surface and fixed support surface are formed from non-conductive materials.

[005] The Summary is provided to introduce a selection of concepts in a

simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[006] The disclosure provides a number of aspects that may form part of a material handling system. The system may include one or more of a number of examples of the disclosure as further described below.

[007] According to one example, the disclosure may provide an apparatus for sorting a plurality of items is provided. The apparatus includes a plurality of sort destinations and a plurality of a plurality of delivery vehicles for delivering items to the sort destinations. A controller provides control signals for controlling the operation of the vehicles.

[008] According to another example, the disclosure may comprise a track system for guiding the delivery vehicles to the sort destinations.

[009] According to another example, the disclosure may comprise a scanner for scanning an item to detect a characteristic of each item, wherein the detected characteristic is the characteristic determined for an item that the controller uses to identify the sort destination to which the item is to be sorted.

[010] According to another example a method is provided for sorting a plurality of items. The method may include the step of loading an item onto a vehicle to be delivered to an output bin and driving the vehicle to the output bin. The method may further include the steps of discharging the item from the vehicle into the output bin and monitoring the position of the item on the vehicle.

[011] In another example, the disclosure provides an apparatus for sorting a plurality of items that includes a plurality of delivery vehicles guided by a track to deliver items to one or more destination. The apparatus may include a loading station for loading items onto the vehicles. The items may be analyzed to detect a first characteristic before the items are loaded onto a vehicle. A recirculation system may be

provided for recirculating items to an input station from a point along the track.

[012] According to another example, a method is provided for delivering items to one or more destinations. The method may include the step conveying an item past a first conductive wall. The first conductive wall separates a first conveyor section from a second conveyor section. When the item is conveyed past the first conductive wall, the item may be conveyed under the first wall or through an opening in the first conductive wall. An RFID scanner scans an RFID tag on the first item on the second conveyor section while the first item is supported on a non-conductive support. A destination for the first item may be determined based on the step of scanning the RFID tag.

[013] The method optionally includes the step of conveying the first item past a second conductive wall separating the second conveyor section from a third conveyor section. When the item is conveyed past the second conductive wall, the item may be conveyed under the second wall or through an opening in the second conductive wall.

[014] The method may include the step of loading the item from the third conveyor section onto a delivery mechanism. The delivery mechanism may be displaced to deliver the item to the determined destination. After the delivery mechanism is displaced to the determined destination, the item may be discharged into the delivery destination.

[015] According to another example, the system includes a material handling apparatus that includes an input station having a conveyor and a scanning station. The conveyor may include a first segment for receiving items, a second segment for receiving items from the first segment and a third segment for receiving items from the second segment. The second segment may include a non-conductive element for supporting items on the second segment.

[016] The scanning station may be configured to scan items on the second segment of the conveyor. Optionally, the scanning station may include one or more conductive walls along the second segment and an RFID scanner. For instance, the scanning station may include a first conductive wall extending across the conveyor to

separate from the first segment from the segment. Similarly, the scanning station may include a second conductive wall extending across the conveyor to separate the second segment from the third segment.

[017] The system may also include a delivery mechanism for receiving one of the items from the third segment of the conveyor and delivering the item to a storage location. Optionally, the system also includes a central controller operable to receive information from the scanning station regarding an identification for the item scanned in the scanning station. Based on the scanned information, the central controller may be configured to determine the storage location for the item. Optionally, the central controller provides controls signals to the delivery mechanism to deliver the item to the determined storage location.

[018] In yet another example, the system may include a conveyor and a delivery mechanism for delivering items from the conveyor to a storage location. An RFID scanner may scan RFID tags on the items as the items are conveyed toward the delivery mechanism. The system may include a housing positioned along the conveyor. Optionally, the housing includes a first wall extending across a width of the conveyor and configured to allow items on the conveyor to pass from an input location to a scanning area. The first wall is preferably formed of a conductive material. The housing may include a second wall extending across a width of the conveyor and spaced apart from the first wall so that the scanning area is between the first wall and the second wall. Optionally, the second wall is configured to allow items on the conveyor to pass from the scanning area to a loading location. Preferably, the second wall is formed of a conductive material.

[019]The conveyor of the system may be configured so that in the scanning area the item is supported on a moveable surface for moving the item through the scanning area. The system may include a fixed support surface for supporting the moveable surface. Preferably, the moveable surface and fixed support surface are formed from non-conductive materials.

[020] In one example, the system may include a conveyor having an input