Material Handling Apparatus with Vehicle Track for Reducing Vehicle Damage

Priority Claim

[001] This application claims priority under 35 U.S.C. §119 to U.S. Provisional Patent Application No. 63/150,909 filed on February 18, 2021. The entire disclosure of U.S. Appl. No. 63/150,909 is hereby incorporated herein by reference.

Field of the Invention

[002] The present invention relates to material handling systems and, more particularly, to systems that utilize a plurality of storage locations in one or more storage racks. More particularly, the present invention relates to such material handling systems that utilize one or more automated delivery vehicles for delivering items to the storage locations

Background of the Invention

[003] The use of automated storage and retrieval has significantly improved the efficiency of material handling. For instance, in the order fulfillment application, automated storage and retrieval systems have significantly reduced the time required to retrieve the items required to fulfill a customer order. A variety of automated storage and retrieval systems are currently known. One exemplary type of system utilizes one or more storage racks, a plurality of vehicles and a track for guiding the vehicles to the storage locations on the racks. The vehicles deliver items to storage locations or bins where operators may remove the items from the storage locations to fulfill orders. Over time, the vehicles may tend to jam or become damaged from interaction with the track. Accordingly, it would be desirable to provide a system having a track that minimizes wear and damage to the vehicles that travel along the track.

Summary ~~of the Invention~~

[003a] In an aspect, the present disclosure refers to a material handling apparatus for sorting items into a plurality of destination areas, comprising: a plurality of destination areas for items wherein the destination areas are arranged in a plurality of columns or

rows; a plurality of vehicles for transporting items to or from the destination areas; and a track for guiding the delivery vehicles to the destination areas, wherein the track comprises a plurality of columns or rows adjacent the plurality of destination areas, wherein the track comprises engagement elements; wherein at least one of the vehicles comprises: a motor for driving the vehicle to one of the destination areas; a drive system cooperable with the track to guide the vehicle to one of the destination areas, wherein the drive system comprises: a first wheel; a second wheel; and a plurality of drive elements that positively engage the engagement elements on the track; wherein the track comprises a reorientation section configured to selectively disengage the drive elements of the vehicle from the engagement elements of the track to selectively reorient the first wheel relative to the second wheel.

[003b] In an aspect, the present disclosure refers to method for sorting items into a plurality of sort locations, comprising the steps of: providing a plurality of sort locations for receiving items such that an aisle is formed between the plurality of sort locations; loading an item onto a vehicle; driving the vehicle within the aisle to deliver an item to one of the sort locations, wherein the step of driving comprises driving a first drive element along a first track having a plurality of first engagement elements and driving a second drive element along a second track spaced apart from the first track having a plurality of second engagement elements; disengaging the first drive element from the first engagement elements while engaging the second engagement element with the second drive elements to allow the first drive elements to slide along the first track; and engaging the first drive element with the first engagement elements to drive the vehicle along the track after the step of disengaging.

[004] According to one ~~aspect~~example, the present ~~invention~~ disclosure provides a material handling apparatus that includes a plurality of sort locations for receiving items. The system may include one or more vehicles for delivering items to the sort location. The vehicles may travel along a track. The track may include a section for improving interaction between the vehicles and the track. In one ~~embodiment~~example, the section

includes a portion that reduces engagement between driving elements on the vehicle and the track.

[005] Optionally, the vehicle includes a drive mechanism that engages the track and the track includes a section that allows portions of the drive mechanism to disengage portions of the track.

[006] The track may optionally include a profile configured to positively engage the drive mechanism of the vehicles.

[007] According to a preferred ~~embodiment~~example, the track optionally includes teeth or recesses that engage mating elements of the drive mechanism of the vehicles.

[008] While the methods and apparatus are described herein by way of example for several embodiments and illustrative drawings, those skilled in the art will recognize that the inventive methods and apparatus for sorting items using a dynamically reconfigurable sorting array are not limited to the embodiments or drawings described. It should be understood that the drawings and detailed description thereto are not intended to limit embodiments to the particular form disclosed. Rather, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the methods and apparatus for sorting items using one or more dynamically reconfigurable sorting array defined by the appended claims. Any headings used herein are for organizational purposes only and are not meant to limit the scope of the description or the claims. As used herein, the word “may” is used in a permissive sense (i.e., meaning having the potential to), rather than the mandatory sense (i.e., meaning must). Similarly, the words “include”, “including”, and “includes” mean including, but not limited to.

Brief Description of the Drawings

[009] The foregoing summary and the following detailed description of the preferred embodiments of the present invention will be best understood when read in conjunction with the appended drawings, in which the same reference numbers will be used throughout the drawings to refer to the same or like parts:

[0010] Figure 1 is a perspective view of a material handling apparatus incorporating aspects of the present invention.

[0011] Figure 2 is a plan view of the material handling apparatus illustrated in