[0005a] According to an aspect, the present disclosure refers to a method for delivering items to a storage assembly having a plurality of storage locations, comprising the steps of: driving a vehicle along a horizontal surface to a position adjacent a moveable track, wherein the vehicle comprises: first driving means for driving the vehicle in a horizontal direction; second driving means; and transfer means; operating the vehicle to lift the moveable track, wherein operating the vehicle to lift the moveable track comprises driving the second driving means in a first direction to lift the moveable track off the ground; driving the vehicle horizontally to carry the moveable track to a position adjacent the storage assembly; driving the vehicle vertically upwardly along the moveable track to an elevated position, wherein driving the vehicle vertically upwardly along the moveable track to an elevated position comprises driving the second driving means of the vehicle in a second direction to drive the vehicle vertically upwardly to an elevated position; transferring, by the transfer means, an item between the vehicle and a storage location in the storage assembly while the vehicle is in the elevated position; driving the vehicle vertically down the track after the step of transferring an item.

[0005b] According to another aspect, the present disclosure refers to a material handling system, comprising: a storage assembly having a plurality of elevated storage locations for storing items; a vehicle configured to deliver items to the storage locations and retrieve items from the storage locations, wherein the vehicle comprises: first driving means for driving the vehicle in a horizontal direction; second driving means; and transfer means; a moveable track having an opening configured to receive a portion of the vehicle wherein the moveable track comprises means for engaging the second driving means of the vehicle, wherein the means for engaging cooperates with the second driving means so that driving the second driving means in a first direction is operable to lift the moveable track off the ground and so that driving the second means in a second direction is operable to drive the vehicle vertically upwardly to an elevated position; wherein the vehicle is configured to lift the moveable track and drive the vehicle along a horizontal surface to a location adjacent the storage assembly, to carry the moveable track to the location adjacent the storage assembly; wherein the transfer means is configured to transfer an item between the vehicle and a storage location of the storage assembly while the vehicle is in the elevated position adjacent the storage location.

[0006] According to one example, a method for delivering items to a storage assembly having a plurality of storage locations is provided. The method includes the step of providing a vehicle having a first drive system for driving the vehicle in a horizontal direction and a second drive

system. A moveable track is provided having an opening configured to receive a portion of the vehicle. The first drive system is actuated to drive the vehicle along a horizontal surface to a position adjacent the moveable track. The vehicle is aligned with the opening in the moveable track. At least a portion of the vehicle is driven into the opening. The second drive system is actuated to raise the moveable track vertically to lift the moveable track off the ground. The first drive system is actuated to drive the vehicle with the moveable track in a horizontal direction toward the storage assembly. The second drive system is actuated to drive the vehicle vertically up the moveable track to a position adjacent one of the storage locations. An item is transferred between the vehicle and the one storage location while the vehicle is adjacent the one storage location. Additionally, the second drive system is actuated to drive the vehicle downwardly toward the ground.

[0007] According to another example, a method is provided for delivering items to a storage assembly having a plurality of storage locations. The method includes a plurality of steps, which may include the step of driving a vehicle along a horizontal surface to a position adjacent a moveable track. The method may also include the step of operating the vehicle to lift the moveable track. Optionally, the method includes the step of driving the vehicle horizontally to carry the moveable track to a position adjacent the storage assembly. Additionally, the method may include the step of driving the vehicle vertically upwardly along the moveable track to an elevated position. Further, the method optionally includes the step of transferring an item between the vehicle and a storage location in the storage assembly while the vehicle is in the elevated position. The method may also include the step of driving the vehicle vertically down the track after the step of transferring an item.

[0008] According to another example, a method for delivering items to a storage assembly may include the step of transferring an item from a storage location onto a vehicle, wherein the method comprises the step of driving the vehicle horizontally with the item to deliver the item to a location remote from the one storage location.

[0009] According to yet another example, a method for delivering items to a storage assembly may include a moveable track that comprises a frame configured to receive the vehicle and the method may include the step of driving the vehicle into the frame.

CLAIMS

We claim:

1. A method for delivering items to a storage assembly having a plurality of storage locations, comprising the steps of:

driving a vehicle along a horizontal surface to a position adjacent a moveable track, wherein the vehicle comprises:

first driving means for driving the vehicle in a horizontal direction;

second driving means; and

transfer means;

operating the vehicle to lift the moveable track, wherein operating the vehicle to lift the moveable track comprises driving the second driving means in a first direction to lift the moveable track off the ground;

driving the vehicle horizontally to carry the moveable track to a position adjacent the storage assembly;

driving the vehicle vertically upwardly along the moveable track to an elevated position, wherein driving the vehicle vertically upwardly along the moveable track to an elevated position comprises driving the second driving means of the vehicle in a second direction to drive the vehicle vertically upwardly to an elevated position;

transferring, by the transfer means, an item between the vehicle and a storage location in the storage assembly while the vehicle is in the elevated position;

driving the vehicle vertically down the track after the step of transferring an item.

2. The method of claim 1 wherein the step of transferring comprises transferring an item from the storage location onto the vehicle, wherein the method comprises the step of driving the vehicle horizontally with the item to deliver the item to a location remote from the one storage location.

3. The method of claim 1 or 2 wherein the moveable track comprises a frame configured to receive the vehicle, wherein the method includes the step of driving the vehicle into the frame.

4. The method of claim 3 wherein the step of driving the vehicle into the frame, comprises positioning a vertical drive element of the vehicle in operative engagement with a vertical track of the moveable track.

5. The method of any of claims 1-4 comprising the step lowering the moveable track after the step of driving the vehicle with the moveable track.
6. The method of any of claims 1-5 comprising the step of controlling the vehicle to displace the moveable track to releasably connect the moveable track with the storage assembly.
7. The method of claim 6 wherein the step of connecting comprises releasably connecting the moveable track with the storage assembly to impede displacement of the moveable track relative to the storage assembly along at least one horizontal axis.
8. The method of claim 6 or 7 wherein the moveable track comprises a connector and wherein the step of releasably connecting comprises operating the vehicle to displace the moveable track vertically to connect the connector of the moveable track with the storage assembly.
9. The method of any of claims 6-8 comprising the step of controlling the vehicle to disconnect the moveable track from the storage assembly.
10. The method of claim 9 wherein the step of disconnecting comprises vertically displacing the moveable track.
11. The method of any of claims 1-10 wherein the step of raising the moveable track comprises operating a vertical drive system of the vehicle in a first direction.
12. The method of claim 11 wherein the step of driving the vehicle vertically up comprises driving the vertical drive system in a second direction that is opposite the first direction.
13. The method of any of claims 1-12 wherein the step of driving the vehicle vertically up comprises maintaining the orientation of the vehicle relative to the horizon as the vehicle is driven upwardly.
14. The method of claim 13 wherein the moveable track comprises a plurality of track sections extending vertically upwardly wherein the step of maintaining the orientation comprises the step of synchronously driving a plurality of vertical drive elements on the vehicle.
15. The method of any of claims 1-14 wherein the step of transferring comprises the step of actuating a transfer mechanism on the vehicle.
16. The method of claim 15 wherein the step of actuating a transfer mechanism comprises extending a transfer mechanism horizontally toward the storage location.
17. The method of claim 16 wherein the step of actuating a transfer mechanism comprises detachably connecting the transfer mechanism with a horizontal drive system operable to drive the vehicle in a horizontal direction.

18. The method of any of claims 1-17 wherein the step of driving the vehicle with the moveable track comprises driving the vehicle horizontally while the moveable track is lifted off the ground.

19. The method of claim 18 wherein the step of driving the vehicle horizontally while the moveable track is lifted off the ground comprises the steps of:

identifying a column of the storage assembly in which the storage location is located

aligning the moveable track with the column so that a transfer opening in the moveable track aligns with an opening in the column.

20. The method of claim 19 wherein the step of transferring comprises transferring the item through the transfer opening.

21. A material handling system, comprising:

a storage assembly having a plurality of elevated storage locations for storing items;

a vehicle configured to deliver items to the storage locations and retrieve items from the storage locations, wherein the vehicle comprises:

first driving means for driving the vehicle in a horizontal direction;

second driving means; and

transfer means;

a moveable track having an opening configured to receive a portion of the vehicle wherein the moveable track comprises means for engaging the second driving means of the vehicle, wherein the means for engaging cooperates with the second driving means so that driving the second driving means in a first direction is operable to lift the moveable track off the ground and so that driving the second means in a second direction is operable to drive the vehicle vertically upwardly to an elevated position;

wherein the vehicle is configured to lift the moveable track and drive the vehicle along a horizontal surface to a location adjacent the storage assembly, to carry the moveable track to the location adjacent the storage assembly;

wherein the transfer means is configured to transfer an item between the vehicle and a storage location of the storage assembly while the vehicle is in the elevated position adjacent the storage location.

22. The system of claim 21 wherein the moveable track comprises a frame configured to receive the vehicle, wherein the vehicle is configured to drive through the opening into the frame.

23. The system of claim 22 wherein the second drive and the moveable track are configured to matingly engage so that driving the vehicle into the frame positions the second drive in operative engagement with a vertical track of the moveable track.

24. The system of any of claims 21-23 wherein the moveable track comprises means for releasably connecting the moveable track with the storage assembly.

25. The system of claim 24 wherein the means for releasably connecting is configured to impede displacement of the moveable track relative to the storage assembly along at least one horizontal axis.