TRANSPORT AND HANDLING SYSTEM AND METHODS OF TRANSPORTING A COMMODITY

BACKGROUND

The field of the disclosure relates generally to transportation systems, and more specifically, to a transport and handling system and method of transporting a commodity.

At least some known commodity transportation systems include automated systems configured to receive a plurality of commodities from a delivery vehicle such as a ship or a railcar, and store the commodity in a receiving location. Vehicle operators operate manned vehicles to convey the commodities from the storage location to a delivery location for delivery to a railcar or truck for delivery to an end user of the commodity.

In known commodity transportation systems, delays due to congestion are common, because of the extensive manpower required to convey the commodities from the receiving location to the destination location. When the number of commodities entering a transportation system exceeds the number of commodities that can be safely handled by available vehicle operators (limited by the number of vehicle operators, vehicles, and available space to operate the vehicles), delays are imposed on commodity delivery. This uncertainty results in decreased system capacity and increased cost to convey commodities due to the increased time the commodity is stored within the system.

BRIEF DESCRIPTION

In one aspect, a transport and handling system for use in transporting commodities, said system comprising: a transportation network comprising a plurality of predefined paths of travel extending between a plurality of locations; a plurality of transport vehicles, each transport vehicle of said plurality of transport vehicles is configured to independently travel along said transportation network; a plurality of motor assemblies oriented along said transportation network, each motor assembly of said plurality of motor assemblies is oriented with respect to a predefined segment of said

transportation network and configured to convey each of said transport vehicles along the predefined segment, each motor assembly comprising a passive breaking system that is configured to brake said plurality of transport vehicles upon a loss of electrical power to said motor assembly; and a control system operatively coupled to each motor assembly of said plurality of motor assemblies to selectively operate each motor assembly to independently convey each transport vehicle of said plurality of transport vehicles along said transportation network, said control system configured to: assign a transport vehicle to convey a commodity along a predetermined vehicle path trajectory; and transmit a notification to a user input device when the predetermined vehicle path trajectory is different from an actual vehicle path trajectory.

In another aspect, a transportation management system for use in automatically conveying a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations, said transportation management system comprising a processor configured to: receive a request to convey a commodity along the transportation network; assign a transport vehicle to convey the commodity along the transportation network; calculate a vehicle path trajectory along the transportation network including an origin waypoint for receiving the commodity and a destination waypoint for offloading the commodity based at least in part on the location of the assigned transport vehicle along the transportation network; convey the assigned transport vehicle along the calculated vehicle path trajectory; and transmit a notification to a user input device when the calculated vehicle path trajectory is different from an actual vehicle path trajectory.

In yet another aspect, a method of transporting a commodity along a transportation network, said method comprising: receiving, by a transport management system, a request to convey a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations; assigning a transport vehicle to convey the commodity along the transportation network; determining a vehicle path trajectory including an origin waypoint and a destination waypoint based at

least in part on the location of the assigned transport vehicle along the transportation network; conveying the assigned transport vehicle along the determined vehicle path trajectory; and transmitting a notification to a user input device when the determined vehicle path trajectory is different from an actual vehicle path trajectory.

In one embodiment, a transportation system for use in transporting commodities is provided. The transportation system includes a transportation network that includes a plurality of predefined paths of travel extending between a plurality of locations, and a plurality of transport vehicles. Each transport vehicle of the plurality of transport vehicles is configured to independently travel along the transportation network. A plurality of motor assemblies is oriented along the transportation network. Each motor assembly of the plurality of motor assemblies is oriented with respect to a predefined segment of the transportation network, and configured to move the transport vehicle along the predefined segment. A control system is operatively coupled to each

CLAIMS

1. A transport and handling system for use in transporting commodities, said system comprising:
a transportation network comprising a plurality of predefined paths of travel extending between a plurality of locations;
a plurality of transport vehicles, each transport vehicle of said plurality of transport vehicles is configured to independently travel along said transportation network;
a plurality of motor assemblies oriented along said transportation network, each motor assembly of said plurality of motor assemblies is oriented with respect to a predefined segment of said transportation network and configured to convey each of said transport vehicles along the predefined segment, each motor assembly comprising a passive breaking system that is configured to brake said plurality of transport vehicles upon a loss of electrical power to said motor assembly; and
a control system operatively coupled to each motor assembly of said plurality of motor assemblies to selectively operate each motor assembly to independently convey each transport vehicle of said plurality of transport vehicles along said transportation network, said control system configured to:
assign a transport vehicle to convey a commodity along a predetermined vehicle path trajectory; and
transmit a notification to a user input device when the predetermined vehicle path trajectory is different from an actual vehicle path trajectory.

2. A transport and handling system in accordance with claim 1, wherein each of said plurality of motor assemblies comprises a magnetic induction motor configured to generate a magnetic field to move a corresponding transport vehicle along the associated predefined network segment.

3. A transport and handling system in accordance with claim 2, wherein said control system is configured to energize a motor assembly of said plurality of motor assemblies when a transport vehicle of said plurality of transport vehicles is within a predefined network segment associated with said motor assembly, and to de-energize said motor assembly when said transport vehicle is not located within the associated predefined network segment.

4. A transport and handling system in accordance with claim 2, wherein each transport vehicle of said plurality of transport vehicles comprises at least one magnetic plate that is configured to

interact with a magnetic field generated by a corresponding magnetic induction motor to facilitate moving said transport vehicle along said transportation network.

5. A transport and handling system in accordance with claim 1, wherein said transportation network comprises:
a central travel line;
a plurality of branch lines extending from said central travel line to couple each location of said plurality of locations with said central travel line; and
a plurality of passive switching structures coupled between said central travel line and each branch line of said plurality of branch lines, each passive switching structure of said plurality of switching structures is configured to enable a transport vehicle of said plurality of transport vehicles to travel along said central travel line when said transport vehicle is traveling in a first direction, and to enable said transport vehicle to travel from said central line to a corresponding branch line when said transport vehicle is traveling in a second direction than is different that the first direction.

6. A transport and handling system in accordance with claim 1, wherein said control system further comprises a plurality of sensors, at least one sensor of said plurality of sensors is coupled to each motor assembly of said plurality of motor assemblies, each sensor is configured to sense a position of said assigned transport vehicle with respect to a corresponding motor assembly.

7. A transportation management system for use in automatically conveying a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations, said transportation management system comprising a processor configured to:
receive a request to convey a commodity along the transportation network;
assign a transport vehicle to convey the commodity along the transportation network;
calculate a vehicle path trajectory along the transportation network including an origin waypoint for receiving the commodity and a destination waypoint for offloading the commodity based at least in part on the location of the assigned transport vehicle along the transportation network;
convey the assigned transport vehicle along the calculated vehicle path trajectory; and
transmit a notification to a user input device when the calculated vehicle path trajectory is different from an actual vehicle path trajectory.

8. A transportation management system in accordance with claim 7, wherein said processor is further configured to selectively operate a plurality of motor assemblies oriented along the transportation network to convey the assigned transport vehicle along the transportation network.

9. A transportation management system in accordance with claim 8, wherein said processor is further configured to:
determine a location of the assigned transport vehicle associated with the unique vehicle identifier along the transportation network; and
selectively operate a motor assembly adjacent the assigned transport vehicle to convey the assigned transport vehicle along the transportation network.

10. A transportation management system in accordance with claim 9, wherein each motor assembly of the plurality of motor assemblies is oriented with respect to a predefined segment of the transportation network, said processor is configured to energize a motor assembly of the plurality of motor assemblies when the assigned transport vehicle is located within a predefined segment associated with the motor assembly, and to de-energize the motor assembly when the assigned transport vehicle is not located within the associated predefined segment.

11. A transportation management system in accordance with claim 10, wherein said processor is further configured to:
receive a request to deliver the commodity to a destination location along the transportation network;
determine a location of the requested commodity along the transportation network; and
calculate the vehicle path trajectory including an origin waypoint associated with the determined commodity location, and a destination waypoint associated with the destination location.

12. A method of transporting a commodity along a transportation network, said method comprising:
receiving, by a transport management system, a request to convey a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations;
assigning a transport vehicle to convey the commodity along the transportation network;

determining a vehicle path trajectory including an origin waypoint and a destination waypoint based at least in part on the location of the assigned transport vehicle along the transportation network;

conveying the assigned transport vehicle along the determined vehicle path trajectory; and

transmitting a notification to a user input device when the determined vehicle path trajectory is different from an actual vehicle path trajectory.

13. A method in accordance with claim 12, further comprising selectively operating a plurality of motor assemblies that are oriented along the transportation network to convey the assigned transport vehicle along the transportation network, wherein each motor assembly is oriented with respect to a predefined segment of the transportation network.

14. A method in accordance with claim 13, further comprising:

receiving a signal indicative of a position of the transport vehicle along the transportation network; and

selectively operating a motor assembly adjacent the sensed position to convey the transport vehicle along the transportation network.

15. A method in accordance with claim 13, further comprising:

transmitting, from the transport management system to a vehicle registry device, a request to assign a transport vehicle to deliver the commodity;

determining a status of a plurality of transport vehicles along the transportation network;

assigning the transport vehicle to convey the commodity based at least in part on the determined status of each transport vehicle; and

receiving, from the vehicle registry device, a verification message including a unique vehicle identifier associated with the assigned transport vehicle.

16. A method in accordance with claim 15, further comprising:

determining a location of the assigned transport vehicle associated with the unique vehicle identifier along the transportation network; and

selectively operating a motor assembly adjacent the assigned transport vehicle to convey the assigned transport vehicle along the transportation network.

17. A method in accordance with claim 15, further comprising:

receiving a signal indicative of a position of each transport vehicle along the transportation network; and

assigning the transport vehicle to convey the commodity based at least in part on the sensed position of each transport vehicle.

18. A method in accordance with claim 15, further comprising:

receiving a signal indicative of an operating status of each transport vehicle of the plurality of transport vehicles along the transportation network; and

assigning the transport vehicle to convey the commodity based at least in part on the operating status.

19. A method in accordance with claim 12, further comprising:

receiving a request to deliver the commodity to a destination location along the transportation network;

determining a location of the requested commodity along the transportation network; and

determining the vehicle path trajectory including an origin waypoint associated with the determined commodity location, and a destination waypoint associated with the destination location.

WHAT IS CLAIMED IS:

1. A transportation management system for use in automatically conveying a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations, said transportation management system comprising a processor configured to:
receive a request to convey a commodity along the transportation network;
assign a transport vehicle to convey the commodity along the transportation network;
calculate a vehicle path trajectory along the transportation network including an origin waypoint for receiving the commodity and a destination waypoint for offloading the commodity based at least in part on the location of the assigned transport vehicle along the transportation network; and
convey the assigned transport vehicle along the determined transportation trajectory.

2. A transportation management system in accordance with Claim 1, wherein said processor is further configured to selectively operate a plurality of motor assemblies oriented along the transportation network to convey the assigned transport vehicle along the transportation network.

3. A transportation management system in accordance with Claim 2, wherein said processor is further configured to:
determine a location of the assigned transport vehicle associated with the unique vehicle identifier along the transportation network; and
selectively operate a motor assembly adjacent the assigned transport vehicle to convey the assigned transport vehicle along the transportation network.

4. A transportation management system in accordance with Claim 3, wherein each motor assembly of the plurality of motor assemblies is oriented with respect to a predefined segment of the transportation network, said processor is configured to energize a motor assembly of the plurality of motor assemblies when the assigned transport vehicle is located within a predefined segment associated with the motor

assembly, and to de-energize the motor assembly when the assigned transport vehicle is not located within the associated predefined segment.

5. A transportation management system in accordance with Claim 4, wherein said processor is further configured to:

receive a request to deliver the commodity to a destination location along the transportation network;

determine a location of the requested commodity along the transportation network; and

calculate the vehicle path trajectory including an origin waypoint associated with the determined commodity location, and a destination waypoint associated with the destination location.

6. A method of transporting a commodity along a transportation network, said method comprising:

receiving, by a transport management system, a request to convey a commodity along a transportation network, the transportation network including a plurality of predefined paths of travel extending between a plurality of locations;

assigning a transport vehicle to convey the commodity along the transportation network;

determining a vehicle path trajectory including an origin waypoint and a destination waypoint based at least in part on the location of the assigned transport vehicle along the transportation network; and

conveying the assigned transport vehicle along the determined vehicle path trajectory.

7. A method in accordance with Claim 6, further comprising selectively operating a plurality of motor assemblies that are oriented along the transportation network to convey the assigned transport vehicle along the transportation network, wherein each motor assembly is oriented with respect to a predefined segment of the transportation network.

8. A method in accordance with Claim 7, further comprising:

receiving a signal indicative of a position of the transport vehicle along the transportation network; and

selectively operating a motor assembly adjacent the sensed position to convey the transport vehicle along the transportation network.

9. A method in accordance with Claim 7, further comprising:

transmitting, from the transport management system to a vehicle registry device, a request to assign a transport vehicle to deliver the commodity;

determining a status of a plurality of transport vehicles along the transportation network;

assigning a transport vehicle to convey the commodity based at least in part on the determined status of each transport vehicle; and

receiving, from the vehicle registry device, a verification message including a unique vehicle identifier associated with the assigned transport vehicle.

10. A method in accordance with Claim 9, further comprising:

determining a location of the assigned transport vehicle associated with the unique vehicle identifier along the transportation network; and

selectively operating a motor assembly adjacent the assigned transport vehicle to convey the assigned transport vehicle along the transportation network.

11. A method in accordance with Claim 9, further comprising:

receiving a signal indicative of a position of each transport vehicle along the transportation network; and

assigning the transport vehicle to convey the commodity based at least in part on the sensed position of each transport vehicle.

12. A method in accordance with Claim 9, further comprising:

receiving a signal indicative of an operating status of each transport vehicle of the plurality of transport vehicles along the transportation network; and

assigning a transport vehicle to convey the commodity based at least in part on the operating status.

13. A method in accordance with Claim 6, further comprising:

receiving a request to deliver the commodity to a destination location along the transportation network;

determining a location of the requested commodity along the transportation network; and

determining the vehicle path trajectory including an origin waypoint associated with the determined commodity location, and a destination waypoint associated with the destination location.