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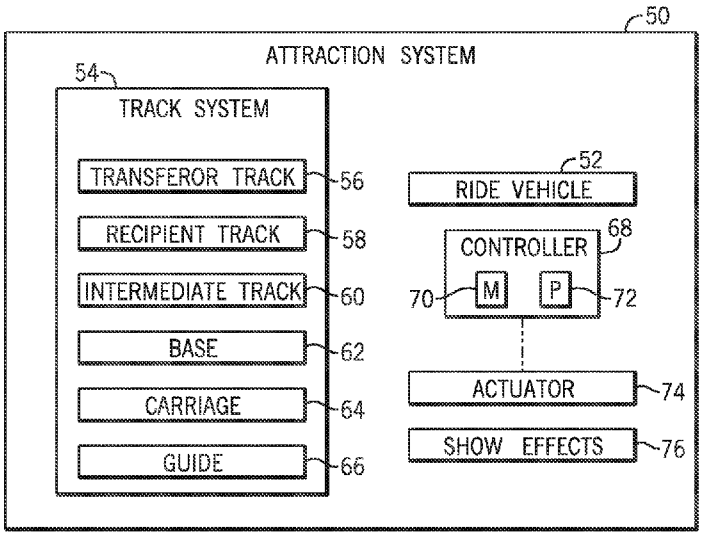

FIG. 1

(57) Abstract: An amusement park attraction system includes a first track, a second track configured to move relative to the first track, one or more ride vehicles configured to move along the first track and toward the second track, and one or more camages coupled to the second track. The one or more carriages are configured to receive the one or more ride vehicles from the first track and to move along and/or about the second track to drive movement of the one or more ride vehicles along and/or about the second track.

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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PATH TRANSFER ATTRACTION SYSTEM FOR AMUSEMENT PARK

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to and the benefit of U.S. Provisional Application No. 63/444,706, filed February 10, 2023, entitled "PATH TRANSFER ATTRACTION SYSTEM FOR AMUSEMENT PARK," which is hereby incorporated by reference in its entirety for all purposes.

BACKGROUND

[0002] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present disclosure, which are described below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

[0003] Amusement parks include a variety of features to entertain guests and patrons. For example, an amusement park may include an attraction system, which may have a ride vehicle. A guest may be positioned within the ride vehicle, and the ride vehicle may travel along a path. Movement of the ride, such as along the path, may entertain the guest. For instance, movement of the ride vehicle carrying the guest may impart various sensations onto the guest and/or transport the guest to various locations. The attraction system may also provide show effects to entertain the guest positioned within the ride vehicle.

BRIEF DESCRIPTION

[0004] A summary of certain embodiments disclosed herein is set forth below. It should be understood that these aspects are presented merely to provide the reader with a brief summary of these certain embodiments and that these aspects are not intended to limit the scope of this disclosure. Indeed, this disclosure may encompass a variety of aspects that may not be set forth below.

[0005] In an embodiment, an amusement park attraction system includes a first track, a second track configured to move relative to the first track, one or more ride vehicles configured to move along the first track and toward the second track, and one or more carriages coupled to the second track. The one or more carriages are configured to receive the one or more ride vehicles from the first track and to move along and/or about the second track to drive movement of the one or more ride vehicles along and/or about the second track.

[0006] In an embodiment, an amusement park attraction system includes a first track, a second track, and one or more ride vehicles configured to move along the first track, transition from the first track to the second track, and move along the second track. The second track is configured to rotate relative to the first track, thereby driving rotation of the one or more ride vehicles relative to the first track while the one or more ride vehicles move along the second track.

[0007] In an embodiment, an attraction system for an amusement park includes a first track, a guide, a second track, and one or more ride vehicles configured to move along the first track, transition from the first track to the second track, and move along the second track. The second track is configured to move along the guide while the one or more ride vehicles move along the second track.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] These and other features, aspects, and advantages of the present disclosure will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

[0009] FIG. 1 is a schematic diagram of an embodiment of an amusement park attraction system, in accordance with an aspect of the present disclosure;

[0010] FIG. 2 is a schematic perspective view of an embodiment of an amusement park attraction system having a ride vehicle configured to travel along a track, in accordance with an aspect of the present disclosure;

[0011] FIG. 3 is a schematic perspective view of an embodiment of an amusement park attraction system having a ride vehicle configured to transition between different tracks, in accordance with an aspect of the present disclosure;

[0012] FIG. 4 is a schematic perspective view of an embodiment of an amusement park attraction system having a ride vehicle configured to travel along a track, in accordance with an aspect of the present disclosure;

[0013] FIG. 5 is a schematic perspective view of an embodiment of an amusement park attraction system having a ride vehicle configured to transition between different tracks, in accordance with an aspect of the present disclosure;

[0014] FIG. 6 is a schematic perspective view of an embodiment of an amusement park attraction system having a ride vehicle configured to travel along a track, in accordance with an aspect of the present disclosure;

[0015] FIG. 7 is a schematic diagram of an embodiment of an amusement park attraction system, in accordance with an aspect of the present disclosure; and

[0016] FIG. 8 is a flowchart of an embodiment of a method for operating an amusement park attraction system, in accordance with an aspect of the present disclosure.

DETAILED DESCRIPTION

[0017] When introducing elements of various embodiments of the present disclosure, the articles "a," "an," and "the" are intended to mean that there are one or more of the elements. The terms "comprising," "including," and "having" are intended to be inclusive and mean that there may be additional elements other than the listed elements. Additionally, it should be understood that references to "one embodiment" or "an embodiment" of the present disclosure are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features.

[0018] One or more specific embodiments will be described below. In an effort to provide a concise description of these embodiments, not all features of an actual implementation are described in the specification. It should be appreciated that in the

development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

[0019] As used herein, the terms "approximately," "generally," "substantially," and so forth, are intended to convey that the property value being described may be within a relatively small range of the property value, as those of ordinary skill would understand. For example, when a property value is described as being "approximately" equal to (or, for example, "substantially similar" to) a given value, this is intended to convey that the property value may be within +/- 5%, within +/- 4%, within +/- 3%, within +/- 2%, within +/- 1%, or even closer, of the given value. Similarly, when a given feature is described as being "substantially parallel" to another feature, "generally perpendicular" to another feature, and so forth, this is intended to convey that the given feature is within +/- 5%, within +/- 4%, within +/- 3%, within +/- 2%, within +/- 1%, or even closer, to having the described nature, such as being parallel to another feature, being perpendicular to another feature, and so forth. Mathematical terms, such as "parallel" and "perpendicular," should not be rigidly interpreted in a strict mathematical sense, but should instead be interpreted as one of ordinary skill in the art would interpret such terms. For example, one of ordinary skill in the art would understand that two lines that are substantially parallel to each other are parallel to a substantial degree, but may have minor deviation from exactly parallel.

[0020] The present disclosure is directed to an amusement or theme park. The amusement park may include a variety of attraction systems, such as rides (e.g., a roller coaster), theatrical shows, set designs, performers, and/or decoration elements, to entertain guests. An attraction system may employ different features to provide guests with a unique experience. For example, the attraction system may include a ride vehicle that moves along a path, such as a track. The ride vehicle may carry a guest, and movement of the ride vehicle may impart movement sensations onto the guest carried by the ride vehicle, thereby entertaining the guest.

[0021] More unique ways to entertain amusement park guests are desirable to satisfy the guests' increasing expectations. In other words, an attraction system that entertains guests in a unique manner may increase guest satisfaction. As an example, a ride vehicle that moves along a path in a unique manner may impart new movement sensations to guests positioned within the ride vehicle and provide a unique experience to the guests.

[0022] Thus, it is now recognized that a creative and improved manner in which a ride vehicle may move (e.g., along a path) may entertain guests in a unique manner to increase guest satisfaction. Accordingly, embodiments of the present disclosure are directed to an attraction system having a ride vehicle configured to transition between different tracks and move along and/or about each track in various manners (e.g., directions). For example, the attraction system may include a first track (e.g., a transferor track) along and/or about which the ride vehicle may move. The first track may direct the ride vehicle to move toward a second track (e.g., an intermediate track). The ride vehicle may then move along and/or about the second track, the second track may direct the ride vehicle to a third track (e.g., a recipient track), and the ride vehicle may move along and/or about the third track. In an embodiment, the ride vehicle may transition from the first track to a carriage coupled to the second track. The carriage may be configured to move along and/or about the second track to drive movement of the ride vehicle along and/or about the second track. The carriage may also be configured to cause other movement, such as a roll movement, a yaw movement, and/or a pitch movement, of the ride vehicle while driving movement of the ride vehicle along and/or about the second track. In an additional or alternative embodiment, the second track may be configured to move relative to the first track and/or relative to the second track. By way of example, the second track may be configured to rotate relative to the first track and/or relative to the second track. Thus, the second track and/or the carriage may cooperatively drive different movements of the ride vehicle. The transition of the ride vehicle between the different tracks and/or the various movements of the ride vehicle caused by the different tracks may provide a unique experience to entertain the guests.

[0023] With the preceding in mind, FIG. 1 is a schematic diagram of an embodiment of an attraction system 50, such as a roller coaster, a dark ride, or a water ride, that may

be used in conjunction with the disclosed embodiments. The attraction system 50 includes a ride vehicle 52 in which a guest may be positioned during operation of the attraction system 50. The ride vehicle 52 may be configured to travel (e.g., translate) along and/or about a track system 54. The track system 54 may include multiple tracks, such as one or more transferor tracks 56, one or more recipient tracks 58, and one or more intermediate tracks 60. These may be referred to herein as the tracks 56, 58, 60. The ride vehicle 52 may be configured to transition between and travel along and/or about each of the tracks 56, 58, 60. The tracks 56, 58, 60 may cause the ride vehicle 52 to move in different manners, such as in different directions (e.g., a linear direction, a rotational direction), which may not be easily enabled by a single track (e.g., a single, unified, integral track). In an embodiment, the ride vehicle 52 may initially travel along and/or about the transferor track 56. The transferor track 56 may direct the ride vehicle 52 onto the intermediate track 60, and the ride vehicle 52 may travel along and/or about the intermediate track 60. The intermediate track 60 may direct the ride vehicle 52 onto the recipient track 58, and the ride vehicle 52 may travel along and/or about the recipient track 58. In this manner, the ride vehicle 52 may travel from the transferor track 56, to the intermediate track 60, and to the recipient track 58.

[0024] It should be noted that a track (e.g., the tracks 56, 58, 60) may include any of various different path structures with which the ride vehicle 52 is configured to engage either directly (e.g., via wheels of the ride vehicle 52) or indirectly (e.g., via a carriage system that couples to the track and ride vehicle 52). In an embodiment, a track may include a beam or set of beams with cross-sectional geometry features that facilitate engagement with a wheel system (e.g., roller coaster wheels, including road wheels, up-stop wheels, and guide wheels) of the ride vehicle 52 or an intermediate transfer mechanism. In accordance with present embodiments, one track may differ from another track. For example, the transferor track 56 may have characteristics that differ from the intermediate track 60 and may even engage with different features of the ride vehicle 52 or a separate transfer mechanism. For example, features of the tracks may include or cooperate with a carriage system, as will be discussed further below. In an additional or alternative embodiment, the ride vehicle 52 may move or transfer between other components, such as an open ride path (e.g., that does not include coupling or securement features), a cab, a cable, or a support, using the technique discussed herein.

[0025] In an embodiment, the ride vehicle 52 may be directly engaged with (e.g., coupled to) any of the tracks 56, 58, 60, and the tracks 56, 58, 60 may contact the ride vehicle 52 to direct movement of the ride vehicle 52. In an additional or alternative embodiment, an intermediate component referred to as a carriage system 61 may be used to direct movement of the ride vehicle 52 along and/or about any of the tracks 56, 58, 60. By way of example, a base 62 of the carriage system 61 may be directly engaged with (e.g., coupled to) one of the tracks 56, 58, 60, and the base 62 may be configured to move (e.g., translate, rotate) along and/or about the corresponding track 56, 58, 60. A carriage 64 of the carriage system 61 may be coupled to the base 62, and movement of the base 62 along and/or about the corresponding track 56, 58, 60 may drive movement of the carriage 64 along and/or about the corresponding track 56, 58, 60. The carriage 64 may be configured to receive and secure to the ride vehicle 52. As such, movement of the base 62 along and/or about one or more of the corresponding tracks 56, 58, 60 may further drive movement of the ride vehicle 52 along and/or about the corresponding track 56, 58, 60 when the ride vehicle 52 is coupled to the carriage 64. In one embodiment, the carriage 64 may also be configured to move (e.g., rotate, translate) relative to the base 62, thereby driving corresponding movement of the ride vehicle 52 relative to the base 62. Thus, the carriage 64 may cause additional movement of the ride vehicle 52 as the ride vehicle 52 moves along and/or about the corresponding track 56, 58, 60. The carriage 64 may also release the ride vehicle 52 to allow it to engage with a track or another carriage 64. It should be noted that each of several tracks (e.g., tracks 56, 58, 60) may include a respective carriage system 61, and the ride vehicle 52 may be transferred between these carriage systems 61 as the ride vehicle 52 progresses through an overall ride course or path.

[0026] Additionally, in one embodiment, any of the tracks 56, 58, 60 may be configured to move relative to one another. Relative movement between the tracks 56, 58, 60 may also cause movement of the ride vehicle 52. In this manner, the ride vehicle 52 may move along and/or about a corresponding track 56, 58, 60, and the corresponding track 56, 58, 60 may drive additional movement of the ride vehicle 52. For instance, one of the tracks 56, 58, 60 may be coupled to a guide 66, and the track 56, 58, 60 may be configured to move along and/or about the guide 66. By way of example, the attraction system 50 may include a controller 68 (e.g., an automation controller, a programmable controller, an electronic controller, a cloud-computing

system, control circuitry) configured to operate the attraction system 50. The controller 68 may include a memory 70 and a processor 72 (e.g., processing circuitry). The memory 70 may include volatile memory, such as random-access memory (RAM), and/or non-volatile memory, such as read-only memory (ROM), optical drives, hard disc drives, solid-state drives, or any other non-transitory computer-readable medium that includes instructions to operate the attraction system 50. The processor 72 may be configured to execute such instructions. For example, the processor 72 may include one or more application specific integrated circuits (ASICs), one or more field programmable gate arrays (FPGAs), one or more general purpose processors, or any combination thereof. The controller 68 may be communicatively coupled to an actuator 74 (e.g., representative of one or more actuators), such as an electromechanical actuator, a hydraulic actuator, a pneumatic actuator, and the controller 68 may instruct the actuator 74 to drive movement of the track 56, 58, 60 along and/or about the guide 66.

[0027] In an embodiment, the guide 66 may physically direct movement of the track 56, 58, 60. For example, the guide 66 may include a rail track, a channel, and/or a slide to which the track 56, 58, 60 may be coupled, and the physical coupling between the track 56, 58, 60 and the guide 66 may direct or steer movement of the track 56, 58, 60 along and/or about the guide 66 in a particular manner (e.g., a particular direction). In an additional or alternative embodiment, the track 56, 58, 60 may direct movement of the track 56, 58, 60 along and/or about the guide 66 via a different technique. The controller 68 may receive input data (e.g., light, such as visible light, infrared light, ultraviolet light emitted by or deflected off the guide 66, data output via a wired or wireless connection, sound emitted by or deflected off the guide 66, a radio wave emitted by or deflected off the guide 66) indicative of a position of the track 56, 58, 60 relative to the guide 66. The controller 68 may instruct the actuator 74 to drive movement of the track 56, 58, 60 along and/or about the guide 66 based on the input data to direct movement of the track 56, 58, 60 along and/or about the guide 66 in a particular manner. Thus, the ride vehicle 52 may move along and/or about the track 56, 58, 60, as well as along and/or about the guide 66. Such compound movement of the ride vehicle 52 (e.g., via movement of one or more of the tracks 56, 58, 60 in conjunction with the guide 66) may provide a unique experience to a guest positioned within the ride vehicle 52.

[0028] The controller 68 may also instruct the actuator 74 to cause movement of the ride vehicle 52. As an example, the actuator 74 may be a motor (e.g., of the ride vehicle 52) and may cause the ride vehicle 52 to move along and/or about any of the tracks 56, 58, 60. As another example, the actuator 74 may drive relative movement between any of the tracks 56, 58, 60. As a further example, the actuator 74 may drive movement of the base 62 along and/or about a corresponding track 56, 58, 60. Further still, the actuator 74 may drive movement of the carriage 64 relative to the base 62. The controller 68 may instruct the actuator 74 to cause any suitable movement of the ride vehicle 52 to entertain a guest. In an additional or alternative embodiment, movement of the ride vehicle 52 may be caused without being actively driven by the actuator 74. By way of example, movement of the ride vehicle 52 may be naturally induced. For instance, a gravitational force, inertia, and/or momentum may cause movement of the ride vehicle 52 along and/or about any of the tracks 56, 58, 60, movement of the tracks 56, 58, 60 relative to one another, movement of the base 62 relative to a corresponding track 56, 58, 60, and/or movement of the carriage 64 relative to the base 62. It should be noted that the actuator 74 may be representative of one or more actuators that may coordinate or operate separately to facilitate movement of components (e.g., the ride vehicle 52, the tracks 56, 58, 60, and/or the carriage system 61) of the attraction system 50.

[0029] Moreover, the attraction system 50 may include show effects 76 that may be activated to provide further entertainment for the guests. The show effects 76 may include, for instance, at least a visual output (e.g., an image, a video, a light), audio output (e.g., music, a sound effect), a fluid output (e.g., a mist effect, a fog effect, a smoke effect, water fountain), a solid output (e.g., confetti), or an animated figure. For example, the ride vehicle 52 may move a guest to different locations along the track system 54, and certain show effects 76 adjacent to the ride vehicle 52 may be activated (e.g., via the controller 68) to entertain the guest. Thus, the movement of the ride vehicle 52 and the activation of the show effects 78 may cooperatively entertain the guest. Additionally or alternatively, the show effects 76 may visually conceal certain components of the attraction system 50, such as any of the tracks 56, 58, 60. For instance, the show effects 76 may provide a visual cover (e.g., a layer of output light) and/or a physical coating (e.g., colorized fluid droplets) to obscure visibility of any of the tracks 56, 58, 60. In this manner, the guest may not be able to see any of the tracks

56, 58, 60 during operation of the attraction system 50. Thus, movement of the ride vehicle 52 may appear to be more realistic, mysterious, or unexpected, thereby further enhancing the experience provided to the guest.

[0030] FIG. 2 is a schematic perspective view of an embodiment of the attraction system 50. The illustrated attraction system 50 includes the transferor track 56, two intermediate tracks 60, and the recipient track 58. The ride vehicle 52 is coupled to the transferor track 56 and is configured to move along and/or about the transferor track 56 and toward a first intermediate track 60A. For example, the ride vehicle 52 may be directly engaged or in contact with the transferor track 56 (e.g., a rail of the transferor track 56). The illustrated first intermediate track 60A is coupled to the base 62, and the base 62 is coupled to a first carriage 64, 64A. The transferor track 56 may be aligned with the first carriage 64, 64A in a manner that allows the ride vehicle 52 to move out of engagement with the transferor track 56 and into engagement with the first carriage 64, 64A. Specifically, the ride vehicle 52 may be configured to move in a first direction 100 (e.g., a first linear direction, a tangential direction) toward the first carriage 64, 64A and toward the first intermediate track 60A. The ride vehicle 52 may engage with the carriages 64, 64A (e.g., a rail component shaped like the transferor track 56) and then be secured on or in the carriage 64, 64A with a lock.

[0031] Once the ride vehicle 52 is properly engaged with the carriage 64, 64A further movement may be imparted to the ride vehicle 52 via the base 62. Indeed, the base 62 may be configured to move along and/or about the first intermediate track 60A, such as in a second direction 102 (e.g., a second linear direction, a radial direction) toward the recipient track 58 and crosswise to the first direction 100. Thus, the ride vehicle 52 may move in a different direction along and/or about the first intermediate track 60A relative to the direction of movement along and/or about the transferor track 56. In an embodiment, the transferor track 56 and the recipient track 58 may be positionally fixed relative to one another. However, in an embodiment, the first intermediate track 60A may be configured to move in a third direction 104 (e.g., a rotational direction) relative to the transferor track 56 and/or relative to the recipient track 58. For example, the first intermediate track 60A may be coupled to a first guide 66A (e.g., an inner guide). In one embodiment, the first guide 66A may extend in a circular or oval configuration about a rotational axis 106. The first intermediate track

60A may be configured to travel along, about, and/or with the first guide 66A. For instance, at least one bogey 107 may be coupled to the first guide 66A and to the first intermediate track 60A. The bogey 107 may move along and/or about the first guide 66A and drive movement of the first intermediate track 60A coupled to the bogey 107 along and/or about the first guide 66A. As such, the first intermediate track 60A may be configured to rotate about the rotational axis 106 in the third direction 104, thereby driving the first carriage 64A and the ride vehicle 52 coupled to the first carriage 64A about the rotational axis 106 in the third direction 104. Thus, the ride vehicle 52 may travel in the second direction 102 and/or in the third direction 104 while coupled to the first carriage 64A. It should be noted that, in an embodiment, one or both of the intermediate tracks 60A, 60B may be coupled to or integral with the first guide 66A, which may be caused to rotate via a rotation actuator of a supporting structure.

[0032] In one embodiment, the first intermediate track 60A may be coupled to and/or configured to move along and/or about a second guide 66B (e.g., an outer guide). The second guide 66B may be implemented with or without the first guide 66A. Like the first guide 66A, the second guide 66B may also extend in a circular or oval configuration about the rotational axis 106 to enable the first intermediate track 60A to move in the third direction 104. By way of example, the first guide 66A and the second guide 66B may be concentrically aligned with one another (e.g., the rotational axis 106 may extend through a centroid of a cross section of each guide 66A, 66B).

[0033] Additionally, the illustrated attraction system 50 includes a second intermediate track 60B. The second intermediate track 60B may be coupled to a second carriage 64B (e.g., via an additional base (not shown) coupled to the second intermediate track 60B), which may be configured to receive an additional ride vehicle (not shown) of the attraction system 50. The second intermediate track 60B may further be configured to rotate in the third direction 104. As an example, the intermediate tracks 60A, 60B may be positionally fixed to one another such that movement of one of the intermediate tracks 60A, 60B drives corresponding movement of the other of the intermediate tracks 60A, 60B. The operation of multiple intermediate tracks 60A, 60B may increase efficiency of the attraction system 50 to entertain guests. By way of example, while the ride vehicle 52 moves along and/or about the first intermediate track 60A (e.g., in the second direction 102, in the third direction 104), the second

intermediate track 60B may be moved to prepare to receive an additional ride vehicle (not shown). Thus, the intermediate tracks 60A, 60B may receive respective ride vehicles 52 and collectively direct multiple ride vehicles 52 from the transferor track 56 toward the recipient track 58. Any number of intermediate tracks 60 may be employed to accommodate a size of the attraction system 50.

[0034] As an example, after the first carriage 64A receives the ride vehicle 52, the first intermediate track 60A may move (e.g., in the third direction 104) away from the transferor track 56. During this time, the second intermediate track 60B may move (e.g., in the third direction 104) toward the transferor track 56. The second intermediate track 60B may then position the second carriage 64B in alignment with the transferor track 56 while the first carriage 64A is still in engagement with the ride vehicle 52 or is otherwise not able to receive an additional ride vehicle. In this manner, the second intermediate track 60B may readily receive an additional ride vehicle before the first intermediate track 60A is able to receive the additional ride vehicle. Indeed, separate ride vehicles 52 may simultaneously move along and/or about the respective intermediate tracks 60A, 60B. Thus, the track system 54 may readily receive ride vehicles 52 of the attraction system 50 more frequently as compared to operation of a single intermediate track 60 to transition the ride vehicle 52 from the transferor track 56 to the recipient track 58.

[0035] As discussed herein, movement of the first carriage 64A along and/or about the first intermediate track 60A may drive movement of the ride vehicle 52 toward the recipient track 58. Additionally, the first intermediate track 60A may be configured to transition the ride vehicle 52 to the recipient track 58. For example, the first intermediate track 60A may align the first carriage 64A with the recipient track 58, and the ride vehicle 52 may transition from the first carriage 64A to the recipient track 58 (e.g., a flume, a slide, a track segment with or without a carriage system). This applies to the second carriage 64B and the second intermediate track 60B as well.

[0036] In the illustrated embodiment, the first guide 66A forms or defines an opening 108, and a portion of the recipient track 58 may extend into the opening 108. Thus, the carriage 64 may move (e.g., in the second direction 102) toward the opening 108 and drive movement of the carriage 64 through the opening 108 to transition the ride vehicle 52 onto the recipient track 58. By way of example, the first intermediate

track 60A may cause the ride vehicle 52 to move toward the recipient track 58 along an inwardly spiraling course via the second direction 102 and the third direction 104. However, it should be noted that the recipient track 58 may be positioned in any suitable manner with respect to the transferor track 56 and/or the first intermediate track 60A, and the first intermediate track 60A may cause the ride vehicle 52 to move in any suitable direction from the transferor track 56 to the recipient track 58. For example, in an embodiment, the intermediate tracks 60A, 60B may travel relative to the transferor track 56 and/or relative to the recipient track 58 in a linear direction to align the carriages 64A, 64B with the recipient track 58 and enable the ride vehicle 52 to transition to the recipient track 58. In an additional or alternative embodiment, the intermediate tracks 60A, 60B may be fixed relative to the transferor track 56 and/or relative to the recipient track 58. By way of example, the carriages 64A, 64B may drive movement of the ride vehicle 52 toward the recipient track 58, while the intermediate tracks 60A, 60B remain fixed relative to the transferor track 56 and/or relative to the recipient track 58.

[0037] Furthermore, although the transferor track 56 and the intermediate tracks 60A, 60B include generally linear configurations in the illustrated attraction system 50, the transferor track 56 and/or the intermediate tracks 60A, 60B may have any other suitably shaped configuration in an additional or alternative embodiment. As an example, the transferor track 56 and/or the intermediate tracks 60A, 60B may have a turn or curve and may drive movement of the ride vehicle 52 in a curved or rotational direction (e.g., at least partially in the third direction 104). As another example, the transferor track 56 and/or the intermediate tracks 60A, 60B may include other features, such as a hill, a drop, an inversion, a corkscrew, a roll or twist, and so forth.

[0038] The attraction system 50 also includes a concealment 110 (e.g., a part of the show effects 76) that may be used to obscure visualization of the track system 54 (e.g., the recipient track 58, the intermediate tracks 60A, 60B, the guides 66A, 66B), from the transferor track 56 and/or from the carriages 64A, 64B. To this end, while the ride vehicle 52 moves along and/or about the transferor track 56 and/or along and/or about the first intermediate track 60A, the ride vehicle 52 may be positioned on or in a first side 112 (e.g., a topside) of the concealment 110, and the recipient track 58, the intermediate tracks 60A, 60B, and/or the guides 66A, 66B may be positioned at a

second side 114 (e.g., an underside) of the concealment 110. Additionally, each carriage 64A, 64B may be respectively coupled to the intermediate tracks 60A, 60B at the second side 114, and each carriage 64A, 64B may extend from the second side 114 to the first side 112 to position the ride vehicle 52 at the first side 112 while secured to the ride vehicle 52. As an example, the concealment 110 may include colored objects (e.g., water droplets, fog, granular material) and/or a light (e.g., a laser) output across the track system 54. Specifically, for example, laser light may be projected into a fog or mist to create the illusion of structure or water (e.g., a vortex). As another example, the concealment 110 may include a physical, contiguous object (e.g., a sheet, a block, a vessel or container) extending across the track system 54, and the object may include an opening or slot to enable the carriages 64A, 64B to extend from the second side 114 to the first side 112.

[0039] The concealment 110 may reduce visualization of various parts of the track system 54 without affecting movement of the ride vehicle 52 (e.g., movement of the intermediate tracks 60A, 60B along and/or about the guides 66A, 66B, movement of the carriages 64A, 64B along and/or about the intermediate tracks 60A, 60B). Reducing the visualization of the concealment 110 may further enhance the experience of a guest in the ride vehicle 52, such as by causing more realistic, mysterious, unexpected, unpredictable, or thrilling movement of the ride vehicle 52 along and/or about the track system 54. In an embodiment, surface coloring and/or texturing of the parts of the track system 54 may provide camouflage with respect to the concealment 110.

[0040] FIG. 3 is a schematic perspective view of a portion of the attraction system 50 illustrating transition of the ride vehicle 52 from the transferor track 56 to the first carriage 64A configured to travel along and/or about the first intermediate track 60A. For example, the first carriage 64A may include a platform 130. The platform 130 may be aligned with the transferor track 56 to enable receipt of the ride vehicle 52. For instance, the first intermediate track 60A may be moved (e.g., in the third direction 104) to position a first end 132 of the first intermediate track 60A adjacent to the transferor track 56. Additionally, the base 62 may be moved to position the first carriage 64A at the first end 132 of the first intermediate track 60A to align the platform 130 with the transferor track 56. For example, rails of the transferor track 56 may align with

corresponding rails of the platform 130, and the ride vehicle 52 may move (e.g., slide) along and/or about the rails to translate from the transferor track 56 to the platform 130.

[0041] The ride vehicle 52 may then be secured to the platform 130 to fix the ride vehicle 52 and the platform 130 to one another and enable movement of the first carriage 64A to drive movement of the ride vehicle 52. As an example, a lock 134 (e.g., of the ride vehicle 52, of the platform 130) may be actuated to secure the ride vehicle 52 and the platform 130 to one another. For instance, the lock 134 may secure the ride vehicle 52 (e.g., wheels of the ride vehicle 52) to the rails of the platform 130. As such, the movement of the first carriage 64A (e.g., driven by movement of the base 62 along and/or about the first intermediate track 60A, driven by movement of the first intermediate track 60A along and/or about the first guide 66A) may cause the ride vehicle 52 to move away from the transferor track 56.

[0042] FIG. 4 is a schematic perspective view of the attraction system 50 illustrating movement of the ride vehicle 52 along and/or about the first intermediate track 60A, as driven by the first carriage 64A. For example, the base 62 may move in the second direction 102 along the first intermediate track 60A from the first end 132 of the first intermediate track 60A toward a second end 160 of the first intermediate track 60A. Such movement of the base 62 may drive movement of the first carriage 64A and the ride vehicle 52 secured to the platform 130 of the first carriage 64A toward the recipient track 58 (e.g., toward the rotational axis 106, toward the first guide 66A, toward the opening 108). Additionally, the first intermediate track 60A may move in the third direction 104. As such, the ride vehicle 52 may move in the second direction 102 and in the third direction 104 while secured to the platform 130. This creates a spiraling movement effect. In other words, the ride vehicle 52 is moved in a spiraling manner toward the toward the rotational axis 106.

[0043] Furthermore, the first carriage 64A may drive movement of the ride vehicle 52 relative to the base 62. By way of example, the first carriage 64A may include an extension 162 coupled to the base 62, and the platform 130 may be coupled to the extension 162. The extension 162 may be configured to move relative to the base 62 and/or the platform 130 may be configured to move relative to the extension 162. As an example, the extension 162 may be configured to extend (e.g., translate) the platform 130 toward and/or retract (e.g., translate) the platform 130 away from the base 62,

thereby adjusting a distance (e.g., a height) between the ride vehicle 52 and the first intermediate track 60A. As another example, the extension 162 may be configured to rotate the platform 130 about a first axis 164 (e.g., a radial axis) or an axis parallel to the first axis 164, such as to cause a roll motion of the ride vehicle 52, to rotate the platform 130 about a second axis 166 (e.g., a vertical axis) or an axis substantially parallel to the second axis 166, such as to cause a yaw motion of the ride vehicle 52, and/or to rotate the platform 130 about a third axis 168 (e.g., a tangential axis) or an axis substantially parallel to the third axis 168, such as to cause a pitch motion of the ride vehicle 52. Thus, while the ride vehicle 52 is coupled to the platform 130, the ride vehicle 52 may be moved in the second direction 102, in the third direction 104, about the first axis 164, about the second axis 166, and/or about the third axis 168 to impart different movement sensations onto a guest positioned in the ride vehicle 52, thereby entertaining the guest.

[0044] FIG. 5 is a schematic perspective view of a portion of the attraction system 50 illustrating transition of the ride vehicle 52 from the first intermediate track 60A to the recipient track 58. As an example, the base 62 may be positioned at the second end 160 of the first intermediate track 60A, thereby positioning the platform 130 and the ride vehicle 52 coupled to the platform 130 adjacent to the opening 108 and adjacent to the recipient track 58. At the second end 160, the platform 130 may be rotated in a fourth direction 190 (e.g., about the third axis 168) to align the platform 130 with a first segment 192 of the recipient track 58. For example, rails of the platform 130 may align with corresponding rails of the recipient track 58. Additionally or alternatively, the recipient track 58 (e.g., a flume) may form a channel or groove, and the platform 130 may align with the channel. Movement of the platform 130 in the fourth direction 190 may position the platform 130 and/or the ride vehicle 52 at least partially into the opening 108.

[0045] The ride vehicle 52 may then be coupled to and/or engaged with and may move along the aligned rails to transition from the platform 130 to the recipient track 58. By way of example, the lock 134 may be decoupled and/or disengaged to enable movement of the ride vehicle 52 relative to the platform 130. A force may then cause the ride vehicle 52 to move (e.g., translate) in a fifth direction 194, which may be crosswise to the first direction 100 along the transferor track 56 and/or the second

direction 102 along the first intermediate track 60A, to transition from the platform 130 to the recipient track 58. In an embodiment, a gravitational force (e.g., applied in a downward direction) may cause the ride vehicle 52 to move in the fifth direction 194. In an additional or alternative embodiment, the platform 130 may actively drive movement of the ride vehicle 52 in the fifth direction 194. For example, the platform 130 may include a conveyor or slider that may move to initiate movement of the ride vehicle 52 in the fifth direction 194. Movement of the ride vehicle 52 in the fifth direction 194 may cause the ride vehicle 52 to disengage from the platform 130 (e.g., the rails of the platform 130) and to engage with the recipient track 58 (e.g., the rails of the recipient track 58).

[0046] After the first carriage 64A transitions the ride vehicle 52 onto the recipient track 58, the first intermediate track 60A may be moved relative to the transferor track 56 and relative to the recipient track 58 to drive movement of the first carriage 64A to prepare for receipt of an additional ride vehicle. By way of example, the first intermediate track 60A may continue to move in the third direction 104 along the guides 66A, 66B, and the base 62 may translate along the first intermediate track 60A, such as in a sixth direction 196 that is opposite the second direction 102, toward the first end of the first intermediate track 60A. As such, movement of the first intermediate track 60A and of the base 62 may cooperatively position the platform 130 toward alignment with the transferor track 56 to enable the platform 130 to readily receive another ride vehicle 52.

[0047] FIG. 6 is a schematic perspective view of a portion of the attraction system 50 illustrating movement of the ride vehicle 52 along the recipient track 58. By way of example, the ride vehicle 52 may travel along the first segment 192 of the recipient track 58 in the fifth direction 194, which may extend at least partially in a downward direction. In this manner, the first segment 192 of the recipient track 58 may include a drop, and the ride vehicle 52 may move through the opening 108 via the first segment 192. Movement of the ride vehicle 52 from the platform 130, to the first segment 192, and/or along the first segment 192 may cause the ride vehicle 52 to move through the concealment 110. The movement of the ride vehicle 52 through the concealment 110 may provide an unexpected change of environment, further enhancing an experience of a guest positioned in the ride vehicle 52.

[0048] In an embodiment, the recipient track 58 may also include a second segment 220 coupled to the first segment 192, and the first segment 192 and the second segment 220 may extend crosswise to one another. For instance, the ride vehicle 52 may transition from the first segment 192 to the second segment 220 and travel along the second segment 220 in a seventh direction 222. The seventh direction 222 may be another radial direction, such as a direction parallel to movement along the transferor track 56 and/or parallel to movement along the first intermediate track 60A. As an example, the second segment 220 may extend toward a portion of the second guide 66B, and the ride vehicle 52 may move toward the portion of the second guide 66B in the seventh direction 222. However, the second segment 220 may position the ride vehicle 52 sufficiently away from or clear of the second guide 66B to block contact between the ride vehicle 52 and the second guide 66B as the ride vehicle 52 travels along the second segment 220.

[0049] FIG. 7 is a schematic diagram of an embodiment of the attraction system 50 having multiple openings 108 and multiple recipient tracks 58 disposed in the respective openings 108 and configured to receive the ride vehicle 52. By way of example, the controller 68 may be configured to instruct the actuator 74 to move the ride vehicle 52 toward any of the recipient tracks 58 via a corresponding opening 108. For instance, the ride vehicle 52 may be configured to move along and/or about the intermediate track 60, and the intermediate track 60 may be configured to move along and/or about the guide 66. Movement of the intermediate track 60 may adjust the position of the intermediate track 60 relative to the openings 108.

[0050] For example, movement of the intermediate track 60 may cause the intermediate track 60 to align with one of the recipient tracks 58 positioned within its corresponding opening 108. While the intermediate track 60 is aligned with the recipient track 58, movement of the ride vehicle 52 along the intermediate track 60 may enable the ride vehicle 52 to be transferred from the intermediate track 60 to the recipient track 58. The ride vehicle 52 may then travel along and/or about the recipient track 58. It should be noted that the ride vehicle 52 may transfer from the intermediate track 60 to a different one of the recipient tracks 58 during different ride cycles. As an example, for a first ride cycle, the intermediate track 60 may transfer the ride vehicle 52 to a first recipient track 58A of a first opening 108A. For a subsequent second ride

cycle, the intermediate track 60 may transfer the ride vehicle 52 to a second recipient track 58B of a second opening 108B. For a following third ride cycle, the intermediate track 60 may transfer the ride vehicle 52 to a third recipient track 58C of a third opening 108C. In this manner, different ride cycles may provide different experiences. For instance, each recipient track 58 may direct movement of the ride vehicle 52 in different manners (e.g., at different speeds, in different movement directions). Additionally or alternatively, different show effects 76 may be provided for the different recipient tracks 58. For example, first show effects 76A that include a jungle theme may be provided for the first recipient track 58A, second show effects 76B that include a desert theme may be provided for the second recipient track 58B, and third show effects 76C that include an arctic theme may be provided for the third recipient track 58C. As such, each recipient track 58 may provide a unique experience to entertain the guests.

[0051] In an embodiment, the controller 68 may receive one or more user inputs and may operate to cause the ride vehicle 52 to transfer to a particular recipient track 58 based on the user input(s). For instance, the user input(s) may directly indicate a target recipient track 58, and the controller 68 may instruct the actuator 74 to move the intermediate track 60 and/or the ride vehicle 52 to transfer the ride vehicle 52 to the target recipient track 58. In an additional or alternative embodiment, the controller 68 may cause the ride vehicle 52 to transfer to a particular recipient track 58 using a different technique, such as based on a random determination (e.g., provided by a random number generator).

[0052] FIG. 8 is a flowchart of a method 250 for operating an attraction system (e.g., the attraction system 50 of FIGS. 1-6). Any suitable device may perform the method 250. In one embodiment, the operations may be implemented by executing instructions stored in a tangible, non-transitory, computer-readable medium (e.g., the memory 70 of the controller 68 of FIG. 1). For example, the method 250 may be performed at least in part by one or more software components, one or more software applications, and the like. While the method 250 is described as having operations performed in a specific sequence, additional operations may be performed, the described operations may be performed in a different sequence than the sequence illustrated, and/or certain described operations may be skipped or not performed altogether.

[0053] At block 252, a ride vehicle may be directed along and/or about a transferor track. For instance, the ride vehicle may be directly coupled to the transferor track (e.g., a rail of the transferor track) and may translate along the transferor track. The transferor track may be aligned with a carriage coupled to an intermediate track. Thus, movement of the ride vehicle along and/or about the transferor track may cause the ride vehicle to move toward the carriage.

[0054] At block 254, the ride vehicle may be transitioned from the transferor track to the carriage. The ride vehicle and the carriage may be secured to one another after the ride vehicle is transferred to the carriage. Thus, relative movement between the ride vehicle and the carriage may be blocked.

[0055] At block 256, the carriage may be moved along and/or about the intermediate track. As an example, a base may couple the carriage to the intermediate track, and the base may move along and/or about the intermediate track to drive movement of the carriage along and/or about the intermediate track. In this manner, the carriage may drive movement of the ride vehicle along and/or about the intermediate track, such as toward a recipient track. In an embodiment, the carriage may drive additional movement of the ride vehicle, such as rotational movement (e.g., to roll, to yaw, to pitch), relative to the base and relative to the intermediate track. Additionally or alternatively, the intermediate track may be moved relative to the transferor track. By way of example, the intermediate track may be rotated, thereby driving rotation of the carriage and of the ride vehicle secured to the carriage. For instance, a bogey may be coupled to the intermediate track and may travel along and/or about a guide to drive movement of the intermediate track along and/or about the guide. As such, the ride vehicle may move with the intermediate track along and/or about the guide. The different movements of the ride vehicle may impart movement sensations that entertain a guest positioned in the ride vehicle.

[0056] Movement of the carriage along and/or about the intermediate track may also align the carriage with the recipient track. At block 258, the ride vehicle may be transitioned from the carriage to the recipient track. In an embodiment, the carriage, such as a conveyor, may move to urge movement of the ride vehicle toward the recipient track. In an additional or alternative embodiment, a gravitational force may cause movement of the ride vehicle from the carriage to the recipient track.

[0057] At block 260, the ride vehicle may be directed along and/or about the recipient track. For example, the ride vehicle may be directly coupled to the recipient track (e.g., a rail of the recipient track) and may translate along and/or about the recipient track after transitioning from the carriage to the intermediate track. As such, the ride vehicle may move from the transferor track, to the intermediate track, and to the recipient track during operation of the attraction system.

[0058] The method 250 may be continually performed during operation of the attraction system. For example, the ride vehicle may be directed along and/or about the recipient track toward the transferor track to re-initiate performance of the method 250. Indeed, multiple cycles of the attraction system may be operated, and a ride vehicle may be directed along and/or about the transferor track, transitioned from the transferor track to the carriage, transitioned from the carriage to the recipient track, and directed along and/or about the recipient rack during each cycle.

[0059] While only certain features of the disclosure have been illustrated and described herein, many modifications and changes will occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the disclosure.

[0060] The techniques presented and claimed herein are referenced and applied to material objects and concrete examples of a practical nature that demonstrably improve the present technical field and, as such, are not abstract, intangible or purely theoretical. Further, if any claims appended to the end of this specification contain one or more elements designated as "means for (perform)ing (a function)..." or "step for (perform)ing (a function)...", it is intended that such elements are to be interpreted under 35 U.S.C. 112(f). However, for any claims containing elements designated in any other manner, it is intended that such elements are not to be interpreted under 35 U.S.C. 112(f).

CLAIMS

1. An amusement park attraction system, comprising:

a first track;

a second track configured to move relative to the first track;

one or more ride vehicles configured to move along the first track and toward the second track; and

one or more carriages coupled to the second track, wherein the one or more carriages are configured to receive the one or more ride vehicles from the first track and to move along and/or about the second track to drive movement of the one or more ride vehicles along and/or about the second track.

2. The amusement park attraction system of claim 1, comprising a third track, wherein the one or more carriages are configured to move along and/or about the second track toward the third track.

3. The amusement park attraction system of claim 2, wherein the one or more carriages are configured to transition the one or more ride vehicle to the third track, and the one or more ride vehicles are configured to move along the third track.

4. The amusement park attraction system of claim 1, comprising one or more guides, wherein the second track is configured to move along or with the one or more guides to drive movement of the one or more carriages and the one or more ride vehicles along the one or more guides.

5. The amusement park attraction system of claim 1, wherein the second track is configured to rotate about a rotational axis, and the one or more carriages are configured to drive movement of the one or more ride vehicles along and/or about the second track and toward the rotational axis.

6. The amusement park attraction system of claim 1, comprising one or more bases coupling the one or more carriages to the second track, wherein the one or more bases are configured to move along and/or about the second track to drive movement of the one or more carriages along and/or about the second track.

7. The amusement park attraction system of claim 6, wherein the one or more carriages comprises one or more extensions coupled to the one or more bases and one or more platforms coupled to the one or more extensions, the one or more platforms are configured to receive the one or more ride vehicles, and the one or more extensions are configured to move the one or more platforms relative to the one or more bases, thereby driving relative movement between the one or more bases and the one or more ride vehicles received by the one or more platforms.

8. The amusement park attraction system of claim 7, wherein the one or more extensions are configured to:

roll the one or more ride vehicles relative to the one or more bases;

pitch the one or more ride vehicles relative to the one or more bases;

yaw the one or more ride vehicles relative to the one or more bases;

extend the one or more platforms away from the one or more bases;

retract the one or more platforms toward the one or more bases; or

any combination thereof.

9. An amusement park attraction system, comprising:

a first track;

a second track; and

one or more ride vehicles configured to move along the first track, transition from the first track to the second track, and move along the second track, wherein the second track is configured to rotate relative to the first track, thereby driving rotation of the one or more ride vehicles relative to the first track while the one or more ride vehicles move along the second track.

10. The amusement park attraction system of claim 9, comprising one or more guides, wherein the second track is configured to move along the one or more guides to rotate relative to the first track.

11. The amusement park attraction system of claim 10, wherein the one or more guides define one or more openings, and the one or more ride vehicles are configured to move along the second track toward the one or more openings.

12. The amusement park attraction system of claim 11, comprising a third track, wherein the second track is configured to direct the one or more ride vehicles through the one or more openings to transition the one or more ride vehicles from the second track to the third track.

13. The amusement park attraction system of claim 12, wherein the second track is configured to rotate relative to the first track and relative to the third track.

14. An attraction system for an amusement park, the attraction system comprising:

a first track;

a guide;

a second track; and

one or more ride vehicles configured to move along the first track, transition from the first track to the second track, and move along the second track, wherein the second track is configured to move along the guide while the one or more ride vehicles move along the second track.

15. The attraction system of claim 14, comprising a plurality of third tracks, wherein the one or more ride vehicles are configured to transition from the second track to a third track of the plurality of third tracks.

16. The attraction system of claim 15, comprising a controller configured to instruct one or more actuators to:

move the second track along the guide; and

move the one or more ride vehicles along the second track to transition the one or more ride vehicles from the second track to the third track of the plurality of third tracks.

17. The attraction system of claim 16, wherein the controller is configured to:

receive a user input; and

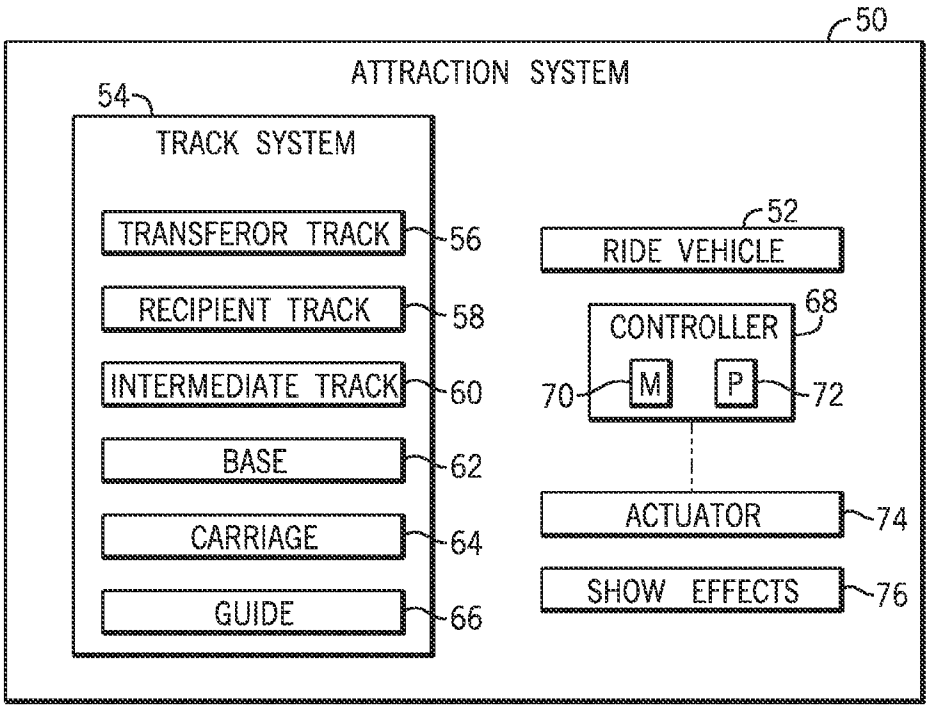
instruct the one or more actuators to move the second track along the guide and to move the one or more ride vehicles along the second track to transition the

one or more ride vehicles to the third track of the plurality of third tracks based on the user input.

18. The attraction system of claim 15, comprising respective show effects provided to each third track of the plurality of third tracks.

19. The attraction system of claim 15, wherein each third track is disposed in a respective opening.

20. The attraction system of claim 15, wherein the first track and the third track of the plurality of third tracks are fixed relative to one another.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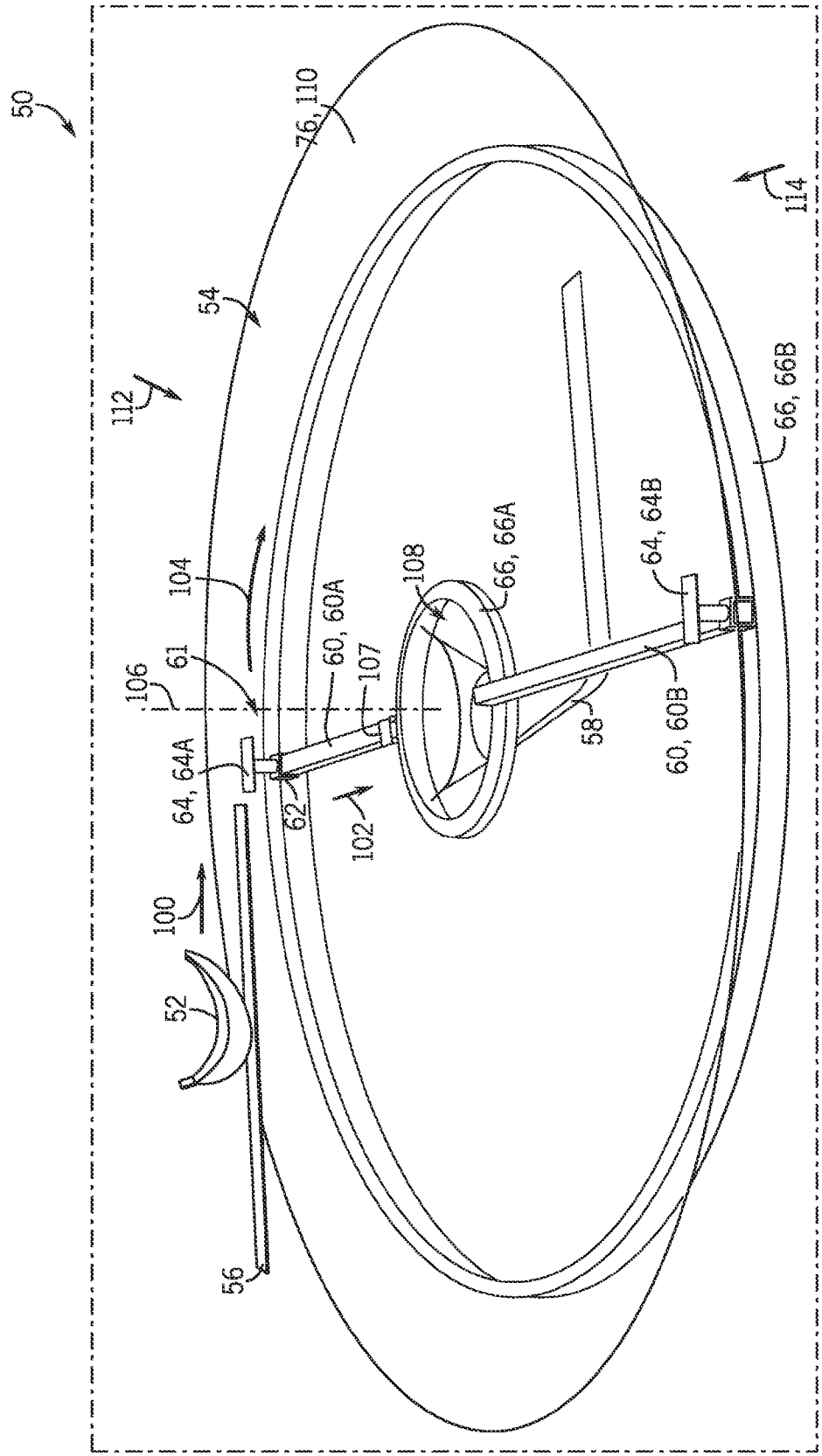
TRACK SYSTEM
TRANSFEROR TRACK
56
RECIPIENT TRACK
58
INTERMEDIATE TRACK
60
BASE
62
CARRIAGE
64
GUIDE
66
52
RIDE VEHICLE
68
CONTROLLER
70
M
P
72
ACTUATOR
74
SHOW EFFECTS
76

FIG. 1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112
66, 66B
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56

FIG. 2

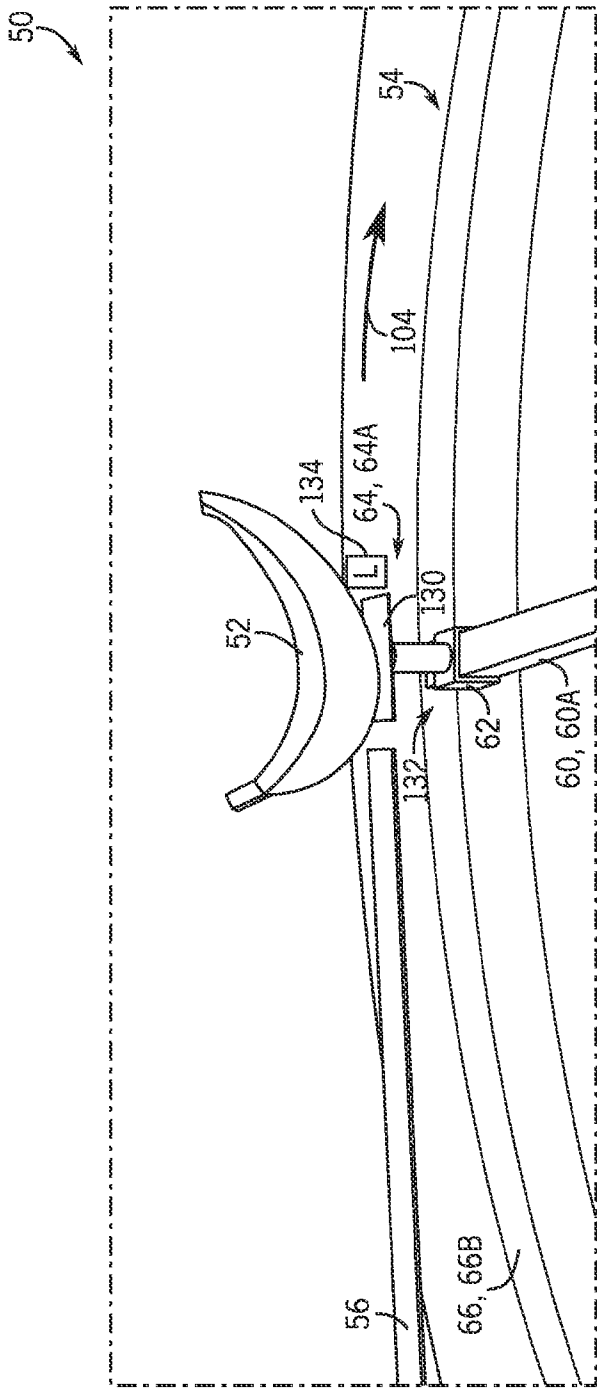
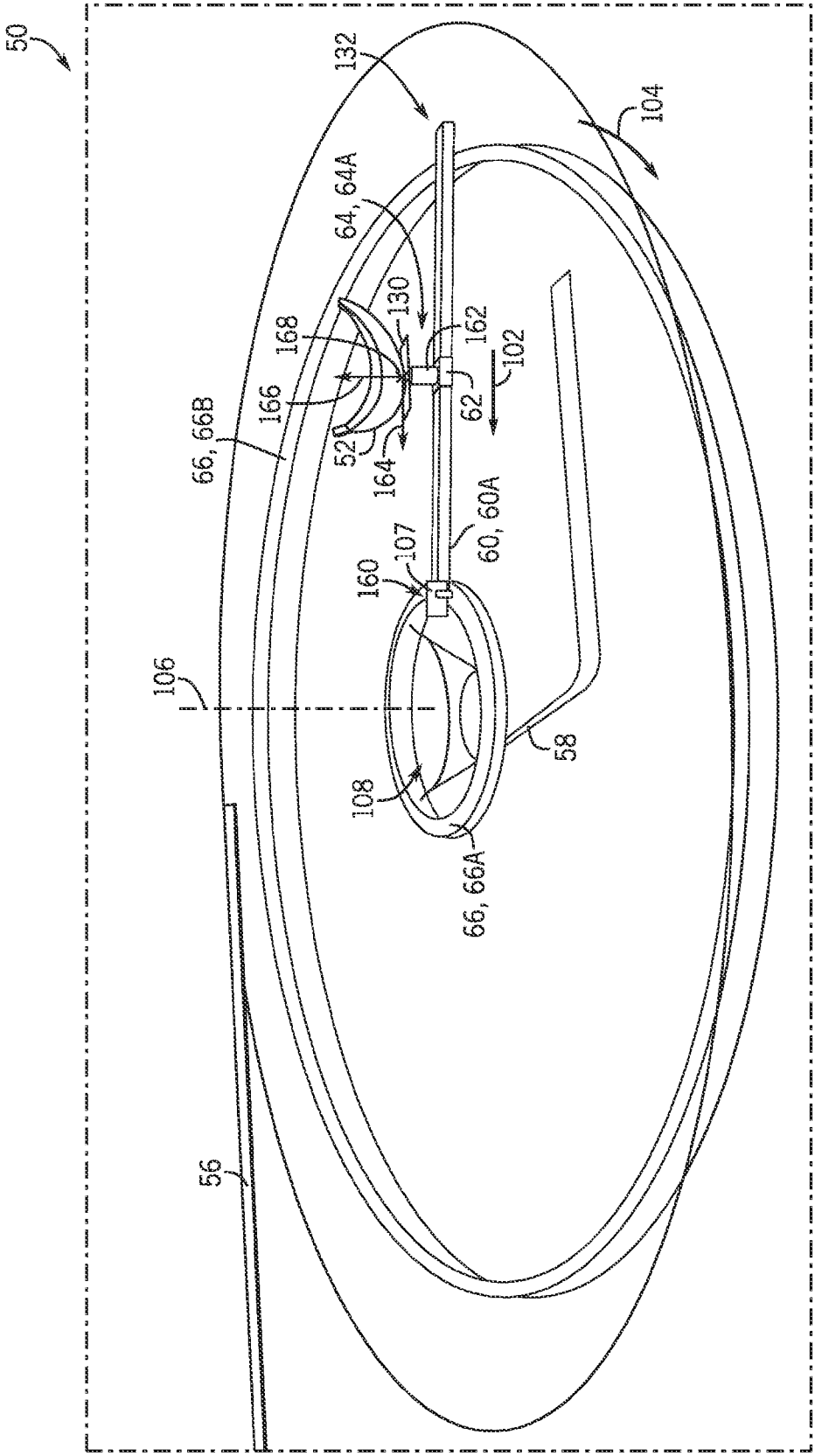


FIG. 3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64, 64A
130
168
162
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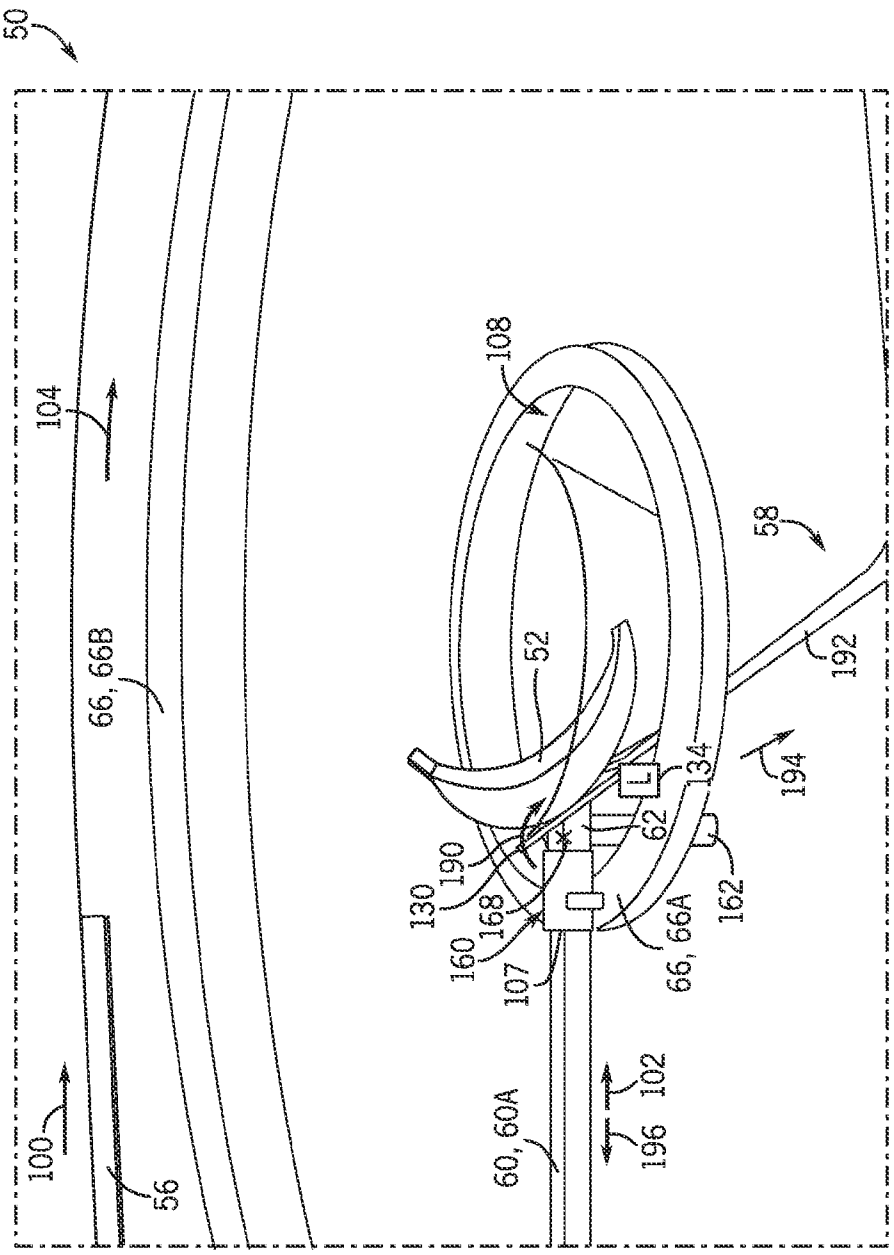
108
66, 66A
56

FIG. 4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60, 60A
102
196

FIG. 5

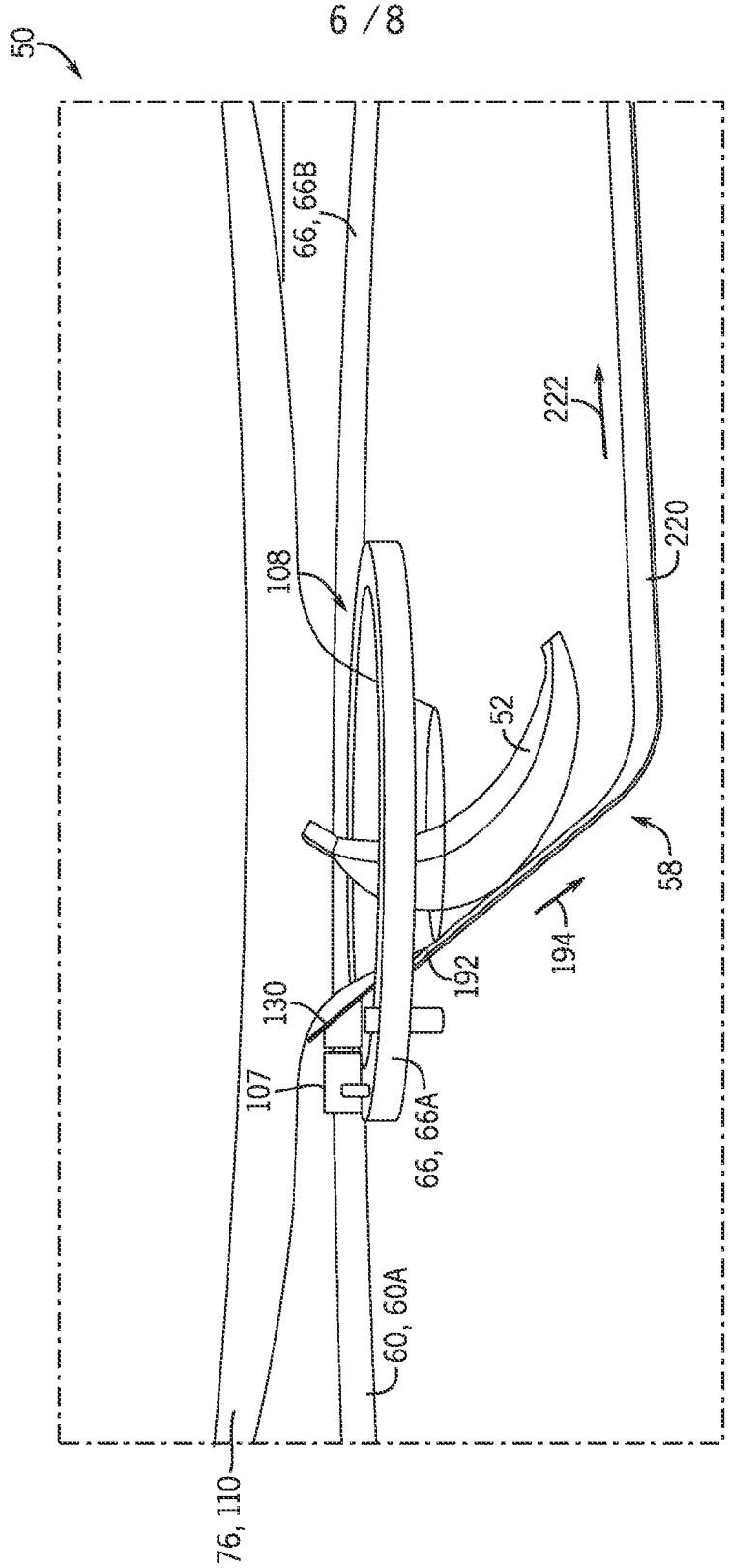
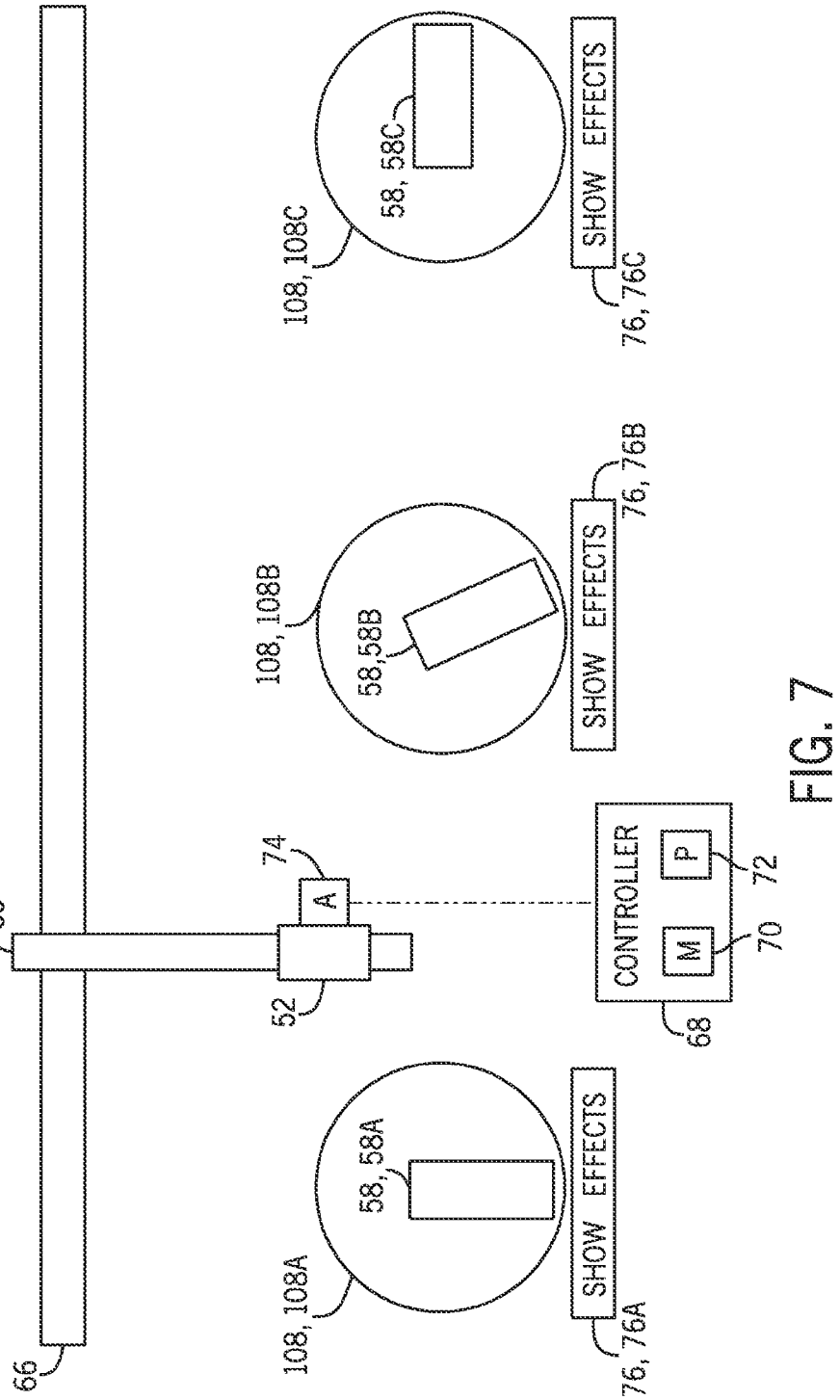


FIG. 6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74
A
CONTROLLER
M
P
72
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68
108, 108A
58, 58A
SHOW EFFECTS
76, 76A
108, 108B
58, 58B
SHOW EFFECTS
76, 76B
108, 108C
58, 58C
SHOW EFFECTS
76, 76C

FIG. 7

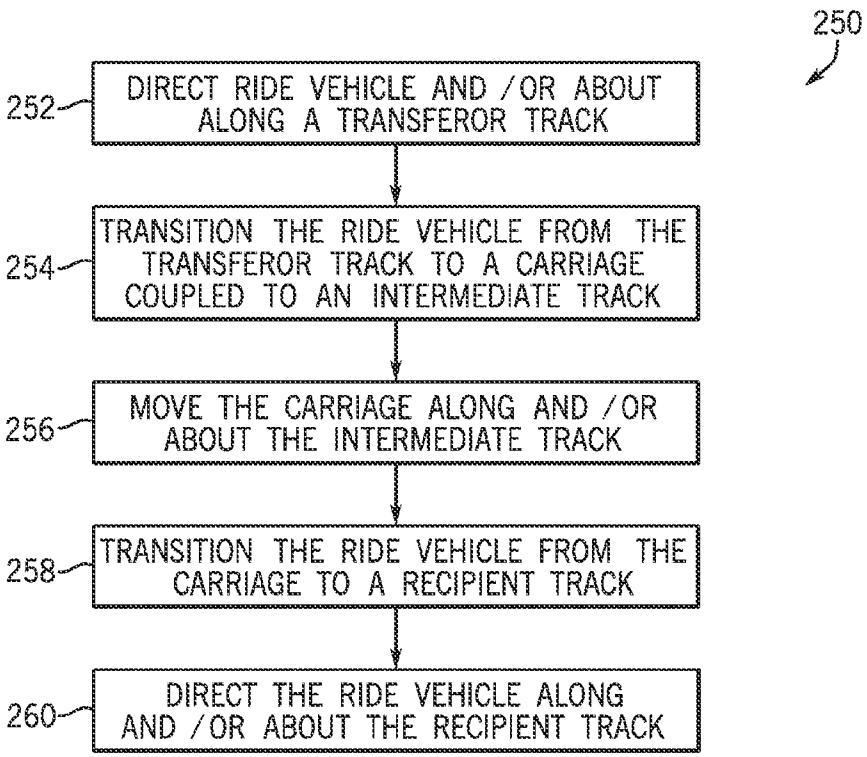
250
252
DIRECT RIDE VEHICLE AND /OR ABOUT ALONG A TRANSFEROR TRACK
254
TRANSITION THE RIDE VEHICLE FROM THE TRANSFEROR TRACK TO A CARRIAGE COUPLED TO AN INTERMEDIATE TRACK
256
MOVE THE CARRIAGE ALONG AND /OR ABOUT THE INTERMEDIATE TRACK
258
TRANSITION THE RIDE VEHICLE FROM THE CARRIAGE TO A RECIPIENT TRACK
260
DIRECT THE RIDE VEHICLE ALONG AND /OR ABOUT THE RECIPIENT TRACK

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2024/015119

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63G7/00 A63G21/14
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 265 193 B1 (DYNAMIC ATTRACTIONS LTD [CA]) 30 October 2019 (2019-10-30)	9-20
Y	paragraphs [0024]-[0031], [0034]-[0036], [0038]-[0049]; figures 1-3	1-8
Y	US 2020/338462 A1 (DAGLEY JAMES FRANCIS [US]) 29 October 2020 (2020-10-29) paragraphs [0029]-[0039]; figures 2-8	1-8
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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19 April 2024	30/04/2024

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Information on patent family members

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