

SYSTEMS AND METHODS FOR FLUID BEARING-BASED TRANSLATION SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and benefit of U.S. Provisional Application No. 63/600,765, entitled “SYSTEMS AND METHODS FOR FLUID BEARING-BASED TRANSLATION SYSTEMS,” filed November 20, 2024, 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 techniques, which are described and/or claimed 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 often include interactive areas, including rides and attractions. Some interactive areas may include many mechanical parts that are susceptible to damage after repeated use, rendering the mechanical parts inoperable. Maintaining amusement parks can interrupt guest experiences or otherwise prevent guests from experiencing certain interactive areas, which may adversely affect the guests’ attitude towards the park. Accordingly, it is desirable to provide features in interactive areas of amusement parks that are mechanically durable and relatively easier to repair as compared to certain features with many mechanical parts.

BRIEF DESCRIPTION

[0004] Certain embodiments commensurate in scope with the originally claimed subject matter are discussed below. These embodiments are not intended to limit the scope of the disclosure. Indeed, the present disclosure may encompass a variety of forms that may be similar to or different from the embodiments set forth below.

[0005] In one embodiment, the present disclosure relates to a fluid bearing system. The fluid bearing system includes a ride platform and a linear motor subsystem. The linear motor subsystem includes a plurality of linear motors that provide a forward thrust to the ride platform. The fluid bearing system also includes a fluid support subsystem having a plurality of fluid conduits and a pump. Further, the fluid bearing system includes a control system communicatively coupled to the plurality of linear motors and the pump. The control system activates the pump to direct a fluid flow from the plurality of fluid conduits, wherein the pump is configured provide a lift force to the ride platform via the plurality of fluid conduits.

[0006] In one embodiment, the present disclosure relates to a fluid bearing track system. The fluid bearing track system includes a plurality of track pieces and each track piece includes a plurality of linear motors. The fluid bearing track system also includes a fluid support subsystem coupled to the plurality of track pieces and the fluid support subsystem receives and retains a fluid. Further, the fluid bearing track system includes a control system communicatively coupled to the plurality of linear motors and the fluid support subsystem. The control system adjusts fluid flow into the fluid support system and an amount of current supplied to the plurality of linear motors.

[0007] In one embodiment, the present disclosure relates to a method. The method includes determining, via one or more processors, a presence of a ride platform along a track. The method also includes adjusting, via the one or more processors, operation of a fluid support subsystem based on the presence of the ride platform to provide an upward

force to the ride platform via a fluid emitted by a plurality of fluid conduits. Further, the method includes adjusting, via the one or more processors, operation of a linear motor subsystem based on the presence of ride platform to move the ride platform along a direction of travel along the 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 schematic diagram of an amusement park utilizing a fluid bearing system, in accordance with an aspect of the present disclosure;

[0010] FIG. 2 is a block diagram illustrating a control system of the fluid bearing system of FIG. 1, in accordance with an aspect of the present disclosure;

[0011] FIG. 3A is a cross-section view of the fluid bearing system of FIG. 1 along a first direction, in accordance with an aspect of the present disclosure;

[0012] FIG. 3B is a cross-section view of the fluid bearing system of FIG. 1 along a first direction, in accordance with an aspect of the present disclosure;

[0013] FIG. 4 is an aerial view of the fluid bearing system of FIG. 1, in accordance with an aspect of the present disclosure;

[0014] FIG. 5 is a cross-section view of the fluid bearing system of FIG. 1 along a second direction, in accordance with an aspect of the present disclosure;

[0015] FIG. 6 is a cross-section view of the fluid bearing system of FIG. 1 along a third direction, in accordance with an aspect of the present disclosure; and

[0016] FIG. 7 is a flow diagram of a method for operating the hydraulic bearing conveyer system of FIG. 1, in accordance with an aspect of the present disclosure.

DETAILED DESCRIPTION

[0017] One or more specific embodiments of the present disclosure will be described below. In an effort to provide a concise description of these embodiments, all features of an actual implementation may not be 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.

[0018] When introducing elements of various embodiments of the present disclosure, the articles "a," "an," "the," and "said" 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. One or more specific embodiments of the present embodiments described herein will be described below. In an effort to provide a concise description of these embodiments, all features of an actual implementation may not be described in the specification. It should be noted 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 noted 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] The present disclosure relates to a fluid bearing system that may be used in conjunction with amusement park attractions, such as to guide, direct, or otherwise transport guests through the amusement park rides or experiences. Certain amusement park rides may use mechanical conveyance systems having one or more mechanical conveyance parts (e.g., moving mechanical conveyance components), such as wheels on conveyor belts, the conveyor belts, feeders, and so on. While operating the mechanical conveyance systems, the mechanical conveyance parts are subject to mechanical stress, such as strain imparted by the weight of guests and/or ride vehicle and/or friction between the mechanical conveyance parts and a track of the conveyance system and/or the ride vehicle. The repeated mechanical stress may ultimately cause the mechanical conveyance part to break or otherwise be rendered inoperable. As such, a maintenance operator may replace, repair, or otherwise perform maintenance on the mechanical conveyance systems in response to the break or to prevent an occurrence of the break, such by replacing one or more of the mechanical conveyance parts. As the number of mechanical conveyance components increases, maintaining the mechanical conveyance system becomes increasingly expensive due to, for example, downtime of the amusement park rides due to maintenance or repairs. It is presently recognized that it may be desirable to utilize a conveyance mechanism for an amusement park ride that has fewer mechanical conveyance components and/or reduce the mechanical stress subjected to the components of amusement park ride, thereby reducing downtime of the amusement park ride due to maintenance.

[0020] Provided herein is a fluid bearing system that uses a fluid support to permit a ride platform (e.g., a ride vehicle) to glide along a track. The fluid bearing system includes a linear motor subsystem and a fluid support subsystem (e.g., fluid support system). The linear motor subsystem includes motors (e.g., linear motors, electromagnetic coils) or other conveyance components that provide a forward thrust (e.g. in the direction of travel) to the ride platform running along the track. The fluid support subsystem may provide a force to the ride platform that reduces the friction between the track and ride platform, thereby reducing the load imparted by the motors. The fluid support subsystem includes fluid

conduits that provide a fluid flow through an outlet of the conduit. The pressure of the fluid flow imparts a buoyant force that lifts the ride platform, (e.g., in a direction that is substantially perpendicular to the direction of travel), thereby reducing the friction between the ride platform and the track. Reducing the friction between the ride platform and the track improves longevity of the track by reducing the amount of mechanical stress subjected to the ride vehicle and/or the track. Further, reducing the friction may reduce the amount of power provided by the motors to provide a desired amount of thrust, thereby improving the longevity of the motors.

[0021] With the foregoing in mind, FIG. 1 shows a perspective view of an amusement park ride 10 with a fluid bearing system 12. The amusement park ride 10 includes a ride platform 14 that supports, holds, or otherwise transports guests 16 through the amusement park ride 10 or another attraction within an amusement park along a track 18 (e.g., hydrostatic track system). While only one guest 16 and one ride platform 14 are shown, another embodiment of the fluid bearing system 12 may include any number (e.g., 1, 2, 3, 4, 5, or more) of ride platforms 14 with any number of guests 16.

[0022] During operation of the amusement park ride 10, one or more linear motors 20 (e.g., electric motors, electromagnetic motors, motors)) of the fluid bearing system 12 may operate to cause the ride platform 14 to move in a direction of travel 22 along the track 18. As such, the ride platform may transport the guests 16 to different attractions or stages within the amusement park ride 10. In some embodiments, the linear motors 20 may include electric motors that actuate wheels that cause the ride platform 14 to move along the direction of travel 22. Additionally or alternatively, the linear motors 20 may include electromagnetic motors that produce a magnetic field that acts on a magnetic material 24, thereby causing the ride platform 14 to move along the direction of travel. As shown, the linear motors 20 are disposed on the track 18, and the magnetic material 24 is disposed on the ride platform 14. Accordingly, the ride platform 14 may be motorless in an embodiment. However, in some embodiments, the linear motors 20 may be disposed on the ride platform 14 and the magnetic material is disposed on the track 18. That is, in

some embodiments, the rotor(s) (e.g., the ride platform(s) 14) may include the linear motors 20, the stator (e.g., the track 18) may include the motors, or a combination thereof. In some embodiments, the ride platform 14 may include a carriage, basket, benches, seats, and/or platform that holds or otherwise provide support to the guests 16.

[0023] Certain rides within an amusement park may utilize a conveyance system for transporting guests that include a relatively large amount (e.g., 100 or greater, 200 or greater, 500 or greater, 1000 or greater) of mechanical conveyance components or parts (e.g., wheels, conveyers, belts, feeders, and so on). Operating the mechanical conveyance components subjects the mechanical conveyance components and/or mechanical conveyance parts to repeated mechanical stress, which, ultimately, may cause the mechanical conveyance components to break or otherwise render the mechanical conveyance components inoperable. As compared to such systems using only mechanical conveyance components, the disclosed fluid bearing system 12 may substantially reduce the mechanical stress subjected to the components (e.g., mechanical parts) of the fluid bearing system 12 with fluid support devices 26 that provide an upward force 28 to the ride platform 14.

[0024] The fluid support devices 26 may include fluid conduits (not shown) that provide a fluid flow that imparts the upward force 28, as described in more detail in FIG. 3B. For example, the fluid support devices 26 may operate to emit a flow of fluid in the direction of the upward force 28. In some embodiments, the fluid may be a gas (e.g., air) or a liquid (e.g., water). In any case, by providing a lift of the ride platform 14 in the direction of the upward force 28, the fluid support devices 26 may reduce mechanical stress (e.g., friction) between the track 18 and the ride platform 14 and any mechanical conveyance components. In an embodiment when the linear motors 20 are electromagnetic motors, the fluid bearing system 12 may be substantially free of mechanical conveyance components used in conveyance, and thus may be more robust as compared to other conveyance systems that use only are primarily mechanical conveyance components.

[0025] Accordingly, the fluid bearing system 12 may operate under the control system 30, as shown in the block diagram of FIG. 2. The control system 30 may include a processor 32 (e.g., a processing system) which may include one or more processing devices, and a memory 34 storing instructions executable by the processor 32. The memory 34 may include one or more tangible, non-transitory, machine-readable media. By way of example, such machine-readable media can include RAM, ROM, EPROM, EEPROM, CD-ROM, or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by the processor 32 or by any general purpose or special purpose computer or other machine with a processor.

[0026] The control system 30 may also include communications circuitry 36 and/or input and output circuitry 38 to facilitate communication with other components of the fluid bearing system 12, such as an operator interface 39, a fluid support subsystem 42 and/or a linear motor subsystem 44. The fluid support subsystem 42 may include one or more fluid support devices 26 that provide the upward force 28 to the ride platform 14, thereby reducing friction between the ride platform 14. The fluid support devices 24 may include, for example, one or more pumps 46, and other fluid flow devices as described in more detail in FIG. 3B. The linear motor subsystem 44 may include the linear motor 20 and other components to facilitate moving the ride platform 14 in the direction of travel 22. In addition, the control system 30 may be coupled, either directly or wirelessly, to an operator input device or operator interface 39 that, in operation, may be used by a ride technician to provide input used to control one or more ride features. As noted, the operator interface 39, or other components of the fluid bearing system 12, may be located remotely from the control system 30 in certain embodiments and may be, for example, implemented on a mobile device.

[0027] The control system 30 may control operation of the fluid support devices 26 of the fluid support subsystem 42, such as activation of the fluid conduits to provide a fluid

flow, the flow rate and/or type of flow of the fluid flow, and a number and/or set of fluid support devices 26 to operate based on a location of the ride platform 14 determined by the control system 30. For example, the control system 30 may cause the fluid conduits to provide a type of flow such as a pulsed flow (e.g., emitting fluid every 1, 2, 3, or 4 seconds), a continuous flow (e.g., emitting fluid over a time period), and the like. The fluid support devices 26 may include one or more fluid sources in fluid communication with one or more fluid outlet ports (e.g., via a channel, conduit, and the like). Upon receiving a signal from the control system 30, the one or more fluid support devices 26 may open the flow of fluid to a volume below the ride platform 14, such as by opening a valve to release the fluid (e.g., provide a fluid flow) and/or activating the one or more pumps 46 to affect the flow rate and/or flow pressure of the fluid flow. Accordingly, the fluid support devices 26 may include suitable flow control elements, such as valves, and one or more pumps 46 that may be operated under control of the control system 30. In addition, the control system 30 may also control deactivation of fluid flow and/or fluid draining.

[0028] The control system 30 may also control operation of the linear motors 20 of the linear motor subsystem 44, such as activation of the motors to provide a force to the ride platform 14 that causes the ride platform 14 to move along the direction of travel 22. As described herein, the linear motors 20 may include linear motors and/or electromagnetic motors. The control system 30 may control, modify, or adjust (e.g., increase or decrease) an amount of current or power supplied to the linear motors 20 thereby controlling the amount of force provided to the ride platform 14. In some embodiments, the control system 30 may provide a current to each of the linear motors 20 such that an average amount of force (e.g., the average amount of force provided by motors 20 within a particular section of the track, such as a linear section and/or curved section) supplied to the ride platform 14 is substantially equal.

[0029] Accordingly, the control system 30 may manage the position of one or more ride platforms 14 (e.g., ride vehicles) along the track 18 by adjusting operation of the linear motor subsystem 44 and the fluid subsystem 42 in a cooperative manner. That is, the

control system 30 may activate the fluid support devices 26 to provide a fluid flow and also adjust operation of the linear motors 20 to cause the ride platform 14 to move along the direction of travel 22. Further, the control system 30 may adjust the fluid flow such that the frictional force between the one or more ride platforms 14 is increased or decreased. In turn, by adjusting the fluid flow while also providing current to the linear motors 20, the control system 30 may adjust speed of the one or more ride platforms 14, thereby adjusting the position of the one or more ride platforms 14 along the track 18.

[0030] In some embodiments, the control system 30 may determine a distance between two or more ride platforms 14 on the track 18 and utilize the distance to determine whether to adjust the position, velocity, or acceleration of the ride platform 14. For example, the control system 30 may determine that a first ride platform 14 is within a threshold distance from a second ride platform 14. As such, the control system 30 may adjust operation of the linear motor subsystem 44 and/or the fluid support devices 26 to slow down the first ride platform 14, the second ride platform 14, or both. Accordingly, the control system 30 is capable of managing the traffic of multiple ride platforms 14 along the track 18 by controlling the position, velocity (e.g., speed), acceleration, or a combination thereof, of the ride platforms 14.

[0031] The illustrated embodiment of FIG. 3A shows a cross-sectional view of the fluid bearing system 12. The fluid bearing system 12 may facilitate fluid flow within a gap or partial space between the fluid support subsystem 42 and the ride platform 14. Thus, the ride platform 14 may travel on a fluid support within the fluid support subsystem 42 while being propelled by the linear motor subsystem 44. In an embodiment, the linear motors 20 of the linear motor subsystem 44 and the fluid support subsystem 42 may be fixed in position while the ride platform 14 moves relative to the linear motors 20. That is, certain components may be fixed while other components may move. For example, the linear motor 20 (or the magnetic material 24) and the track 18 may be stationary. Further, components of the fluid support subsystem 42 described below may be fixed in position, such as fluid conduits, catchments, and the like. In particular, FIG. 3A shows an example

embodiment of the linear motor subsystem 44 and the fluid support subsystem 42 of the fluid bearing system 12. For simplicity, the linear motor subsystem 44 is generally discussed with respect to FIG. 3A, and the fluid support subsystem 42 is generally discussed with respect to FIG. 3B.

[0032] As discussed herein, the linear motor subsystem 44 may include conveyance components that move the ride platform 14 in the direction of travel 22 (e.g., along an axis extending into the page) and the fluid support subsystem 42 provides the upward force 28 that reduces the amount of power output by the conveyance components of the linear motor subsystem 44 to achieve a desired thrust along the direction of travel 22.

[0033] The linear motor subsystem 44 may include the linear motors 20 (e.g., linear motors, linear induction motor), a ride platform support feature 60, and the magnetic material 24. For example, the linear motor 20 may be an electromagnetic motor component, such as a coil of copper wire wound or transformer in a laminated core. In such an example, the magnetic material 24 may include a magnetic material, such as iron, nickel, cobalt, certain rare earth metals, and so on. In an embodiment where the linear motors 20 are not linear induction motors, the magnetic material 24 may be omitted.

[0034] The linear motors 20 may provide a forward thrust to the ride platform 14 via an interaction with the linear motors 20, thereby causing the ride platform 14 to move in the direction of travel 22. In an embodiment where the linear motor 20 is an electromagnetic motor, the linear motor 20 may produce a magnetic field 40 that may be used to induce a thrust to propel the ride platform 14 along the direction of travel 22. It is presently recognized that it may be advantageous to utilize the control system 30 to adjust the current flowing through the linear motors to provide an average force via the linear motors 20. For example, providing an average force using the linear motors 20 may provide a smooth thrust force over the track 18. However, at least in some instances, such as in thrilling amusement park ride, it may be desirable to provide a choppy, rough, or otherwise not smooth ride. In such embodiments, it may be desirable to vary the force provided by the linear motors 20 in different sections of the track (e.g., linear motors of a first section

provide a first average force, and linear motors of a second section provide a second average force that is different than the first average force.)

[0035] The ride platform support feature 60 (e.g., platen, plate, flat plate, platen support frame) may be a relatively light weight, wear-resistance material. In some embodiments, the ride platform support feature 60 is a metal, such aluminum or an aluminum alloy. In some embodiments, the ride platform support feature 60 is a polymer-material, such as an ultra-high molecular weight (UHMW) polymer, having a tensile strength 1000 psi or greater, 1500 psi or greater, 2000 psi or greater, 2500 psi or greater, 3000 psi or greater, or 3500 psi or greater. At least in some embodiments, such as when the fluid is water, it may be advantageous that the ride platform support feature 60 includes or is formed from a material having a relatively low water absorption (e.g., absorbing minimal to no water). In some embodiments, it may be advantageous for the ride platform support feature 60 to have a relatively low coefficient of friction such that the ride platform 14 may slide relatively easily along the track (e.g., along a top surface of the fluid support subsystem 42 above the fluid conduits described below). For example, the ride platform support feature 60 may have a coefficient of friction with the material of the ride platform 14 that is 0.2 or less, 0.15 or less, 0.12 or less, or 0.1 or less. As one non-limiting example, the ride platform support feature 60 may be UHMW polyethylene, Teflon, or other material that is relatively light weight.

[0036] As shown, the ride platform 14 may include an upper body 65 and a lower body 67. The upper body 65 may be part of, integrated with, or otherwise coupled to the lower body 67 of the ride platform 14. The upper body 65 may include a basket, carriage, or other structure to support the guests 16. The lower body 67 may be at a position that is below or at the level of the track. The lower body 67 may include multiple surfaces. For example, the lower body 67 may include a first surface that supports the ride platform support feature 60, and a second surface (e.g., a lower surface) that is disposed above conduits of the fluid support subsystem 42.

[0037] As illustrated, the fluid support subsystem 42 may include lateral support features 64 (e.g., lateral confinement structures or features). The lateral support features 64 may prevent movement of the ride platform 14 along the transverse axis 66, thereby ensuring a smoother ride for the guests 16 and maintaining the positions of the ride platform 14 above the fluid support subsystem 42. For example, the lateral support features 64 may be guard rails coupled (e.g., physically coupled) to the track 18, and the guard rails guide the ride platform 14 along the track 18 in the direction of travel 22.

[0038] In some embodiments, the fluid support subsystem 42 may include a motor positioning component 68 (e.g., a plate, an arm, a beam, and the like). The motor positioning component 68 may facilitate position of the linear motor 20 along the transverse axis 66 such that there is a suitable flux of the magnetic field 40 flowing through the magnetic material 24. As illustrated, the lateral support features 64 may be coupled to the linear motor 20 via the motor positioning component 68. However, in some embodiments, the motor positioning component 68 may be coupled to a wall 70 that supports the track 18 and/or lateral support features or the motor positioning component may be separate from the wall 70 and/or track 18.

[0039] FIG. 3B illustrates the fluid subsystem 42 of the fluid bearing system 12. As illustrated, the fluid support subsystem 42 (e.g., each fluid support device 26) may include a fluid source 72 (e.g., a plenum chamber, a fluid supply), fluid conduits 74, a catchment 76, valves 78, one or more pumps 80, and a return line 82 that operate to provide a suitable flow and pressure of a fluid to suspend the ride platform 14 for one or more sections of the track 18. The one or more fluid conduits 74 (e.g., fluid circuits) of the fluid support subsystem 42 may each be selectively coupled to receive fluid (e.g., water) from the fluid source 72 (e.g., a container, reservoir, collecting chamber) via corresponding valves 78. The one or more fluid pumps 80 may modify (e.g., increase or decrease) the flow rate of the fluid flow provided by the one or more fluid support devices 26 (e.g., thereby providing a force to a lower surface of the lower body 67 of the ride platform 14) such that the ride platform 14 is at least partially suspended due to the pressure of fluid. The fluid bearing

12 also may include a catchment 76 that may be selectively coupled to the fluid source 72 to return the water that may provide the upward force 28 to the ride platform 14. The fluid source 72 may be coupled by one or more conduits to a reservoir for fluid maintenance, replenishment, and/or cleaning. In this way, the fluid flow provided by the one or more fluid support devices 26 may be a closed system, and may facilitate cleaning of the fluid bearing system 12. That is, a control system 30 may adjust operation the pumps 80 to circulate the fluid through the fluid support subsystem 42.

[0040] While the fluid may be either a gas or liquid, it is presently recognized that a liquid may be less load sensitive and less acoustically noisy, attributes that may be desirable to applications accommodating people. As illustrated, the fluid support subsystem 42 may include eight fluid conduits 74 disposed along the transverse axis 66 of the fluid support subsystem 42. While eight fluid conduits 74 are shown, it should be noted that the fluid support subsystem 42 may include any number of fluid conduits (e.g., 1, 2, 3, 4, 5, 6, 7, 9, 10, or more than 10) at a particular track section or position.

[0041] The control system 30 (e.g., a controller) may control operation of the components of the fluid support subsystem 42. For example, the control system 30 may transmit a control signal that adjusts (e.g., increases or decreases) a position of the valves 78, causing the fluid to flow through the conduits 74. The fluid flows along the direction 90 towards the catchment 76. The fluid flow may be at least partially facilitated by gravity. In any case, the control system 30 may also activate the pumps 80, causing the fluid to flow back into the fluid source 72. The control system 30 may adjust the speed of the pumps 80 such that the fluid flows out of the fluid conduits 74 at a suitable pressure to provide the upward force 28. In this way, the control system 30 may adjust the components of the fluid support subsystem 42 to ensure a suitable upward force 28 is provided to the ride platform 14, thereby facilitating movement of the ride platform along the direction of travel 22.

[0042] FIG. 4 shows an aerial view of the track 18 of the fluid bearing system 12. In the illustrated embodiment, the track 18 may include multiple approximately linear track sections 100 (e.g., straight track sections, straight track pieces) and curved track sections

102 (e.g., curved track pieces) that extend along the direction of travel 22 corresponding to each section. Each linear track section 100 and/or curved track section 102 may include the linear motor subsystem 44 and the fluid support subsystem 42. Only a portion of the linear motor subsystem(s) 44 and fluid support system(s) 42 of the linear track sections 100 and the curved track sections 102 are labeled in FIG. 4 for simplicity. During operation, the ride platform 14 traverses the track 18 and moves relative to individual linear motor subsystems 44 and the fluid support systems 42 that remain fixed and/or associated with an individual linear track section 100 and/or curved track section 102. The ride platform is propelled along the track 18 by motive force of successive linear motors 20 of linear motor subsystems 44 that are encountered as the ride platform 14 moves to subsequent track section 100 and/or curved track section 102. As discussed herein, the fluid bearing system 12 permits more efficient traversal along the track 18. In an embodiment, the ride platform 14 may be motorless, while motors 20 are provided on the track 18.

[0043] As illustrated, each fluid support subsystem 42 of the fluid bearing system 12 is fluidly coupled via the return line 82. During operating, the fluid conduits 74 emit a fluid to the ride platform 14, thereby lifting the ride platform 14 via a buoyant force (e.g., the upward force 28 as discussed herein) relative to the fluid support subsystem 42. The fluid then flows into the return line 82 (e.g., as described in FIG. 3B) via a return inlet line 104. During operation, the control system 30 of the fluid bearing system 12 may direct the fluid flow from within the track 18 via the return inlet line 104 and reintroduce the fluid flow back into the track 18 via a return outlet line 106.

[0044] However, at least in some instances, the physical spacing between the components may be different for the linear track sections 100 as compared to the curved tracked sections 102. For example, it may be advantageous to decrease a relative spacing between linear motors 20 along the curved tracked sections 102 as compared to the linear track sections 100. In this way, the ride platform 14 may be subjected to relatively less force along the direction of travel 22, thereby slowing the ride platform 14 as it moves along the curved tracked sections 102 to provide a smoother ride for the guests 16.

[0045] As illustrated, the fluid bearing system 12 may include positional sensors 108 that obtain position information. One or more positional sensors 108 may be disposed in the one or more sections of the track 18. For example, the positional sensors 108 may be disposed in each of the linear track sections 100 and the curved tracked sections 102. In some embodiments, the positional sensors 108 may be disposed on every other track section (e.g., every other linear track section 100 or curved tracked section 102). In any case, the positional sensors 108 may include motion sensors, light sensors, proximity sensors, or other sensors capable of detecting the ride platform 14 or otherwise generate data indicating a position (e.g., a location along the track 18) of the ride platform 14 moving along the direction of travel 22. For example, the positional sensors 108 may be capable of detecting the ride platform 14 when the ride platform 14 is within a threshold range (e.g., 5 cm or greater, 10 cm or greater, 15 cm or greater, or 20 cm or greater) of the positional sensors 108. The control system 30 may be communicatively coupled to the positional sensors 108 and, upon receiving position data from the positional sensor 108, determine the location of the ride platform 14.

[0046] In some embodiments, the control system 30 may determine a subset of the linear motor subsystem 44 and/or fluid support subsystems 42 to activate based on the position data received from the position sensors. For example, the control system 30 may selectively activate one or more sections (e.g., the linear track section(s) 100 and/or the curved track section(s) 102) that are adjacent to a section that corresponds to positional sensor 108 that detected the ride platform. Selectively activating the linear motor subsystem 44 and/or fluid support subsystem 42 may enable the fluid bearing system 12 to individually control different ride platforms 14 moving along the track 18. Further, selectively activating the linear motor subsystem 44 and/or fluid support subsystem 42 may reduce power consumption by the fluid bearing system 12.

[0047] FIG. 5 is a first cross-sectional view of the ride platform 14 along the direction of travel 22. FIG. 5 shows an example layout of the fluid support subsystem 42. In the illustrated embodiment, the bottom surface 112 of the ride platform 14 may cover

approximately five fluid conduits 74 along the axis 114, however this ride platform 14 may cover any suitable number of fluid conduits 74 that may lift the ride platform 14 while it travels along the direction of travel 22. The bottom surface 112 of the ride platform 14 may be formed of a relatively light material, such as those materials described with respect to ride platform support feature 60.

[0048] In this embodiment, the ride platform 14 has a length 110 and each fluid conduit 74 is separated from another fluid conduit 74 by a distance 116 along the axis 114. The distance 116 between each fluid conduit 74 may be any suitable distance such that a sufficient amount of force (e.g., along the axis 118) is applied to the bottom surface 112 of the ride platform by a pressure of the fluid emitted by the fluid conduits 74 to the bottom surface 112 of the ride platform 14. For example, the distance 116 may be greater than or equal to 1 cm, greater than or equal to 2 cm, greater than or equal to 5 cm, greater than or equal to 10 cm, or greater than or equal to 15 cm. Although the illustrated embodiment shows the distances 116 between each fluid conduit 74 to be substantially equal, it should be noted that the distances 116 may be different.

[0049] The fluid support subsystem 42 may include one or more fluid conduits 74 along the axis 120. For example, the fluid support subsystem 42 may include two, three, four, five, or more than five fluid conduits 74 along the axis 120. Moreover, each fluid conduit 74 along the axis 120 may be separated by a distance (e.g., along the axis 120) that is substantially equal to, less than, or greater than the distance 116. Accordingly, the bottom surface 112 of the ride platform 14 may be supported by $N \times M$ fluid conduits 74, where N is the number of fluid conduits along the axis 114 and M is the number of fluid conduits along the axis 120.

[0050] FIG. 6 is an aerial cross-section view of the linear motor subsystem 44. In the illustrated embodiment, each linear motor 20 is separated from another linear motor 20 by a distance 130 (e.g., linear motor separation distance) along the axis 114. The distance 130 may be any suitable distance such that a sufficient amount of force (e.g., in the direction of travel 22) is imparted to the ride platform 14. For example, the distance 130 may be 10 cm

or greater, 15 cm or greater, 20 cm or greater, 25 cm or greater, 30 cm or greater, 35 or greater, or 40 cm or greater.

[0051] In the illustrated embodiment, there are approximately three linear motors 20 along the length 132. A portion (e.g., the length 132) of track 18 may have a linear motor density of X/D , where X is the number of motors 20 and D is a length 132 of the track portion (e.g., corresponding to a linear track section 100 or a curved track section 102). In some embodiments, it may be useful to vary the linear motor density along the track 18. For example, it may be advantageous to increase the linear motor density along the track 18 during a relatively straight portion (e.g., one or more of the linear track sections 100) of the track 18. By increasing the linear motor density, the speed of the ride platform 14 along the track 18 may be increased. For example, a higher linear motor density may allow for the potential acceleration and potential maximum speed of the ride platform 14 to be increased. In some embodiments, it may be advantageous to decrease the linear motor density along the track 18, such as during a curved portion (e.g., one or more of the curved track sections 102) of the track 18. In this way, varying the linear motor density along the track 18 may be used to control the speed of the ride platform 14 as the guests 16 are moved through the amusement park attraction.

[0052] In some embodiments, it may be advantageous for one or more of the linear motors 20 to have an orientation such that motors 20 have an angular offset with respect to one of the axes 114, 118, and 120. For example, the linear motors 20 may have an orientation that is substantially parallel with the axis 114. In some embodiments, the linear motors 20 may have an orientation that is offset with respect to the axis 120. For example, one or motors 20 on curved track section 102 may have an orientation such that the ride platform 14 is directed upwards along the axis 118. Accordingly, the direction of travel 22 may be at least partially along the direction of the upwards force 28.

[0053] FIG. 7 is a flow diagram of a method 150 for operating the hydraulic bearing conveyer system of FIG. 1, in accordance with an aspect of the present disclosure. At block 152, the control system 30 may determine a presence of one or more ride platforms 14.

For example, the control system 30 may receive sensor data from the positional sensors 108 that indicates a location (e.g., a track section) of the ride platform 14 along the track 18. In some embodiments, the control system 30 may determine a number of ride platforms 14 along the track 18.

[0054] At block 154, the control system 30 may adjust operation of the fluid support subsystem 42. In some embodiments, adjusting operation of the fluid support subsystem 42 may include opening one or more valves 78 to provide the upward force 28 to the ride platform 14. In some embodiments, adjusting the operation of the fluid support subsystem 42 may include closing the one or more valves 78, thereby causing the ride platform 14 to lower into a resting position. In an embodiment where the fluid bearing system 12 may include positional sensors 108, the control system 30 may modify a position (e.g., open or close) a subset of valves 78 that corresponding to a current location of the ride platform 14, causing the ride platform 14 to lift off from the track 18. Additionally, the control system 30 may modify the position of an additional subset of valves 78 corresponding to one or more subsequent track sections along the direction of travel 22 of the track 18.

[0055] At block 156, the control system 30 may adjust operation of the linear motor subsystem 44. In some embodiments, adjusting the operation may include activating the linear motors 20 to cause the ride platform 14 to move along the direction of travel 22 along the track 18. In an embodiment where the linear motors 20 are electromagnetic motors, the control system 30 may activate the linear motors 20 by increasing the amount of current flowing through the motors. In some embodiments, adjusting the operation of the motors may include deactivating the motors to cause the ride platform to slow down along the direction of travel 22. In an embodiment where the linear motors 20 are electromagnetic motors, the control system 30 may deactivate the linear motors 20 by decreasing the amount of current flowing through the motors. In some embodiments, the control system 30 may adjust the operation of the linear motor subsystem 44 based on game elements. For example, the control system 30 may cause the ride platform to move along the direction of travel 22 upon determining that the guests 16 have earned an amount of points exceeding

a threshold, finishing hearing a story told by a character of the amusement park ride 10, remained at a station corresponding to a particular track section for a time period exceeding a time threshold, or a combination thereof. In this way, the control system 30 may guide the guests 16 through the amusement park ride 10 in an immersive way.

[0056] As one non-limiting example of the method 150, the control system 30 may be capable of controlling multiple ride platforms 14 independently. For example, the control system 30 may determine that a first ride platform 14 should be moved from a first location along the track 18 to a second location along the track 18. In some embodiments, the control system 30 may determine that the first ride platform 14 should be moved based on game elements, a time duration the first ride platform 14 remained at the first location exceeding a threshold, or a combination thereof. As such, the control system 30 may activate a subset (e.g., one or more fluid support devices 26) of the fluid support subsystem 42 and/or the linear motor subsystem 44 that are within or proximate to (e.g., adjacent to) the first location, the second location, or both. Further, the control system 30 may determine, at approximately the same time period or a different time period, that a second ride platform 14 should be moved from a third location to fourth location. As such, the control system 30 may activate a subset of the fluid support subsystem 42 and/or the linear motor subsystem 44 that are within or proximate to the first location, the second location, or both. In this way, the control system 30 may provide individualized experiences to the guests 16 on the first ride platform 14 and the second ride platform 14.

[0057] Accordingly, the present disclosure is directed to a fluid bearing system that moves a ride platform along a track with relatively fewer moving mechanical parts. The fluid bearing system may include a fluid support system that provides an upward force to the ride platform, thereby reducing friction between the ride platform and the track. Further, the fluid bearing system may include a linear motor subsystem that provides a force the ride platform, causing it to move along a direction of travel. By providing the upward force, mechanical conveyance components such as electromagnetic motors may utilize less power to move the ride platform since the upward force may substantially

reduce the friction between the ride platform and the track. In this way, the ride platform and/or track may be utilized within an amusement park for a longer period of time, thereby reducing costs associated with downtime and/or maintenance.

[0058] While only certain features of the present 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 present disclosure.

[0059] 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. A fluid bearing system, comprising:
 - a ride platform;
 - a linear motor subsystem comprising a plurality of linear motors configured to provide a forward thrust to the ride platform;
 - a fluid support subsystem comprising a plurality of fluid conduits and a pump; and
 - a control system communicatively coupled to the plurality of linear motors and the pump, wherein the control system is configured to:
 - activate the pump to direct a fluid flow from the plurality of fluid conduits, wherein the pump is configured provide a lift force to the ride platform via the plurality of fluid conduits.
2. The fluid bearing system of claim 1, wherein the control system is configured to:
 - receive position information indicating a location of the ride platform; and
 - open a subset of the plurality of fluid conduits based on the position information.
3. The fluid bearing system of claim 1, wherein the ride platform is configured to support one or more guests within an amusement park attraction.
4. The fluid bearing system of claim 1, wherein the ride platform comprises a support frame physically coupled to a plate, wherein the plurality of linear motors is configured to provide the thrust by providing an electromagnetic field to the plate.
5. The fluid bearing system of claim 1, comprising one or more lateral confinement structures configured to maintain a position of the ride platform along a transverse axis.

6. The fluid bearing system of claim 1, comprising a track that guides the ride platform along in the direction of the forward thrust, wherein the plurality of linear motors is disposed along the track.
7. The fluid bearing system of claim 1, wherein the fluid support subsystem and the linear motor subsystem are fixed in position relative to the ride platform.
8. The fluid bearing system of claim 1, wherein the lift force is imparted by a pressure of the fluid flow.
9. The fluid bearing system of claim 1, comprising a fluid supply configured to supply the fluid for the plurality of fluid conduits.
10. The fluid bearing system of claim 1, comprising a catchment configured to receive the fluid after the fluid provides the lift force to the ride platform.
11. A fluid bearing track system, comprising:
 - a plurality of track pieces, wherein each track piece comprises a plurality of linear motors;
 - a fluid support subsystem coupled to the plurality of track pieces and configured to receive and retain a fluid; and
 - a control system communicatively coupled to the plurality of linear motors and the fluid support subsystem, wherein the control system is configured to adjust fluid flow into the fluid support subsystem and an amount of current supplied to the plurality of linear motors.
12. The fluid bearing track system of claim 11, wherein controller is configured to selectively activate the plurality of linear motors of individual track pieces of the plurality of track pieces.

13. The fluid bearing track system of claim 11, comprising one or more sensors positional configured to generate data indicating a position of a ride platform moving along a direction of travel, wherein the control system is configured to activate the fluid support subsystem based on the data indicating the position of the ride platform.

14. The fluid bearing track system of claim 11, wherein the control system is configured to adjust the amount of current supplied to the plurality of linear motors such that an average force in a direction of travel along the plurality of track pieces is substantially equal.

15. The fluid bearing track system of claim 11, comprising a plurality of ride platforms disposed on a track comprising the plurality of track pieces, wherein the control system is configured to individually control the plurality of ride platforms.

16. A method of supporting a ride platform, comprising:
determining, via one or more processors, a presence of a ride platform along a track;
adjusting, via the one or more processors, operation of a fluid support subsystem based on the presence of the ride platform to provide an upward force to the ride platform via a fluid emitted by a plurality of fluid conduits; and
adjusting, via the one or more processors, operation of a linear motor subsystem based on the presence of ride platform to move the ride platform along a direction of travel along the track.

17. The method of claim 16, wherein adjusting, via the one or more processors, the operation of the fluid support subsystem comprises activating one or more pumps to circulate the fluid.

18. The method of claim 16, wherein adjusting, via the one or more processors, the operation of the linear motor subsystem comprises increasing a magnitude of current flowing through the motors.

19. The method of claim 16, comprising:
determining one or more game elements corresponding to guests supported by the ride platform; and
adjusting, via the one or more processors, the operation of the linear motor subsystem based on the one or more game elements.

20. The method of claim 16, comprising:
adjusting a position of the ride platform along the track based on the adjustment to the operation of the fluid support system and the adjustment to the operation of the linear motor subsystem.