

# FUN SPOT AMERICA ATLANTA



## Arrow of Light Elective Adventure: Engineering

This guide will help your Scout group prepare to complete the “Engineering” Adventure Loop requirements for Arrow of Light at the Fun Spot America Atlanta theme park utilizing primarily the ArieForce One roller coaster.

### Arrow of Light “Engineer” Adventure Requirements

1. Learn the focus, related sciences, and products of civil, electrical, and mechanical engineers.
2. Pick one of the engineering fields from requirement 1 to complete the following requirements.
3. Examine a set of blueprints or specifications used by your choice of engineer.
4. Identify a project that you would like to build.
5. Using the engineering process, build your project.

To Be Completed Prior to, at or after a visit to Fun Spot America Atlanta:

1. Learn about civil, electrical and mechanical engineering.
  - Find YouTube videos about roller coaster engineering. Recommendation of videos or channels that would have mechanical, civil and electrical aspects would include:
    - Roller Coaster Engineering (<https://www.youtube.com/watch?v=jMsF4juzQ-4>)
    - Roller Coaster Engineer Interview ([www.youtube.com/watch?v=ZAv7DaGiF-Q](http://www.youtube.com/watch?v=ZAv7DaGiF-Q))
    - What Controls a Ride (<https://www.youtube.com/watch?v=OefB45MGhpE>)
    - ElToroRyan ([https://www.youtube.com/watch?v=jSyz\\_U79iQ0](https://www.youtube.com/watch?v=jSyz_U79iQ0) and many more)
    - Ryan the Ride Mechanic
  - If possible talk to a local engineer about their job (optional)
2. Pick one of the engineering fields to complete the remaining requirements
  - For a trip to Fun Spot America Atlanta we'd recommend mechanical

*This guide is unofficial and is not affiliated with or endorsed by Fun Spot America. It was created by a fellow Georgia scout leader to meet the 2025 “Engineering” Arrow of Light Adventure requirements. Please check your handbook for current requirements or to modify the activities to fit your needs..*

### 3. Examine blueprints or specifications (see appendix).

- Examine the Rocky Mountain Coasters (RMC) patent for the “Rolling Vehicle Track” or “I-Box Track” for ArieForce One at Fun Spot America Atlanta.
  - Talk about the differences between this track and the track of the Hurricane and Sea Serpent roller coasters at the park.
  - Can you spot features from the patent drawing on the track of ArieForce One?
- Examine the Universal patent for the “boom coaster” Donkey Kong Mine Cart Madness at Epic Universe.
  - How is this track different from the ArieForce One track?
  - What is one advantage and disadvantage of each type of track?
- Examine the site plan for Fun Spot America Atlanta presented to the county board prior to ArieForce One’s construction.
  - Can you find some of the landmarks on the drawing at the park?
  - What were some of the things the engineers had to consider while installing ArieForce One at Fun Spot America Atlanta?

### 4. Build a project using the engineering process

- After your visit, build your own paper roller coaster! Create a plan/blueprint and then build it using scissors, tape, cardboard, cardstock and marbles.
  - Use cardboard to create a base and cardstock to create square tube “u-shaped” track and square support struts. Strategic cuts, bends and tape will allow curves.
  - Further instructions are found in the Arrow of Light handbook
- Alternatively, Fun Spot America Atlanta has a “build your own roller coaster” 30-45 minute activity for groups. This includes a planning worksheet and build using foam pool noodle “u-shaped” track with marbles that would also satisfy the requirement.

### Notes and Options:

These activities could be completed during the October 17, 2025 Scout Weekend or during another day when Fun Spot America Atlanta is open. Fun Spot America Atlanta does not charge an admission fee, however we’d highly recommend you ride ArieForce One as part of this adventure. Possible discussion topics include:

- What was your favorite part of the ride and why?
- What are potential and kinetic energy? Where in the ride do you have the most of each?
- Roller coasters do not run the same speed every time, what factors cause the variation?
- What is a g-force? Did you feel positive and negative g’s on the ride? Why?

It is totally possible for scouts to complete this activity on their own with no official involvement of Fun Spot America Atlanta. However, the park does offer group outing packages that include rides,, food, drinks and activities such as the ready made roller coaster construction activity mentioned previously. **Please contact the park’s group sales department for more information at 678-256-2247 or <https://funspotamericaatlanta.com/groups/>.**

*This guide is unofficial and is not affiliated with or endorsed by Fun Spot America. It was created by a fellow Georgia scout leader to meet the 2025 “Engineering” Arrow of Light Adventure requirements. Please check your handbook for current requirements or to modify the activities to fit your needs..*



US008590455B2

(12) **United States Patent**  
**Schilke et al.**

(10) **Patent No.:** **US 8,590,455 B2**  
(45) **Date of Patent:** **Nov. 26, 2013**

(54) **ROLLING VEHICLE TRACK**

(75) Inventors: **Alan Schilke**, Hayden, ID (US); **Fred Grubb**, Hayden, ID (US); **Dody Bachtar**, Hayden, ID (US)

(73) Assignee: **Rocky Mountain Coasters, Inc.**,  
Hayden, OH (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 121 days.

(21) Appl. No.: **12/881,142**

(22) Filed: **Sep. 13, 2010**

(65) **Prior Publication Data**

US 2011/0146528 A1 Jun. 23, 2011

**Related U.S. Application Data**

(60) Provisional application No. 61/241,785, filed on Sep. 11, 2009.

(51) **Int. Cl.**  
**A63G 21/04** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **104/53**; 238/134; 238/164

(58) **Field of Classification Search**  
USPC ..... 104/53, 55, 56, 63, 64–66, 118, 119  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

3,217,659 A 11/1965 Ford, Jr.  
3,403,633 A 10/1968 Schwarzkopf

4,208,969 A	6/1980	Baltensperger et al.	
4,429,845 A *	2/1984	Stover et al.	246/428
4,752,011 A	6/1988	Pudney	
5,175,405 A *	12/1992	Karimine et al.	219/54
5,291,834 A	3/1994	Quaas	
6,263,800 B1	7/2001	Wilson	
7,047,888 B2 *	5/2006	Richards	104/28
2006/0137563 A1 *	6/2006	Cummins	104/53
2009/0230205 A1 *	9/2009	Hepner et al.	238/2

**FOREIGN PATENT DOCUMENTS**

WO WO-2011032115 3/2011

**OTHER PUBLICATIONS**

“International Search Report and Written Opinion”, PCT Application PCT/US2010/048683, (Nov. 3, 2010), 9 pages.

\* cited by examiner

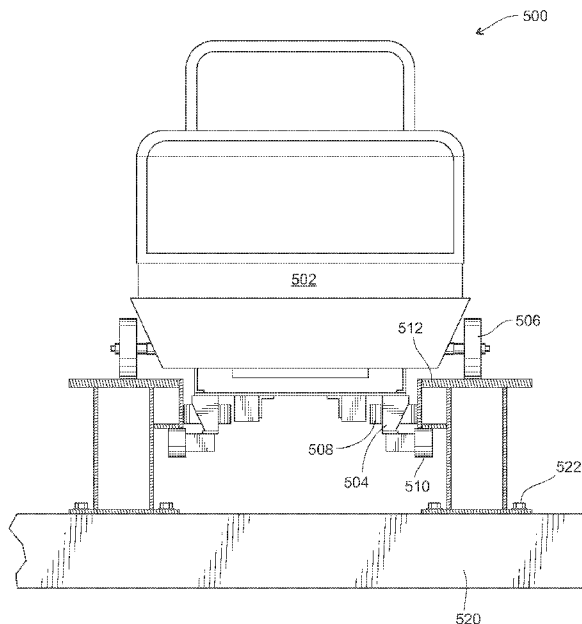
*Primary Examiner* — Zachary Kuhfuss

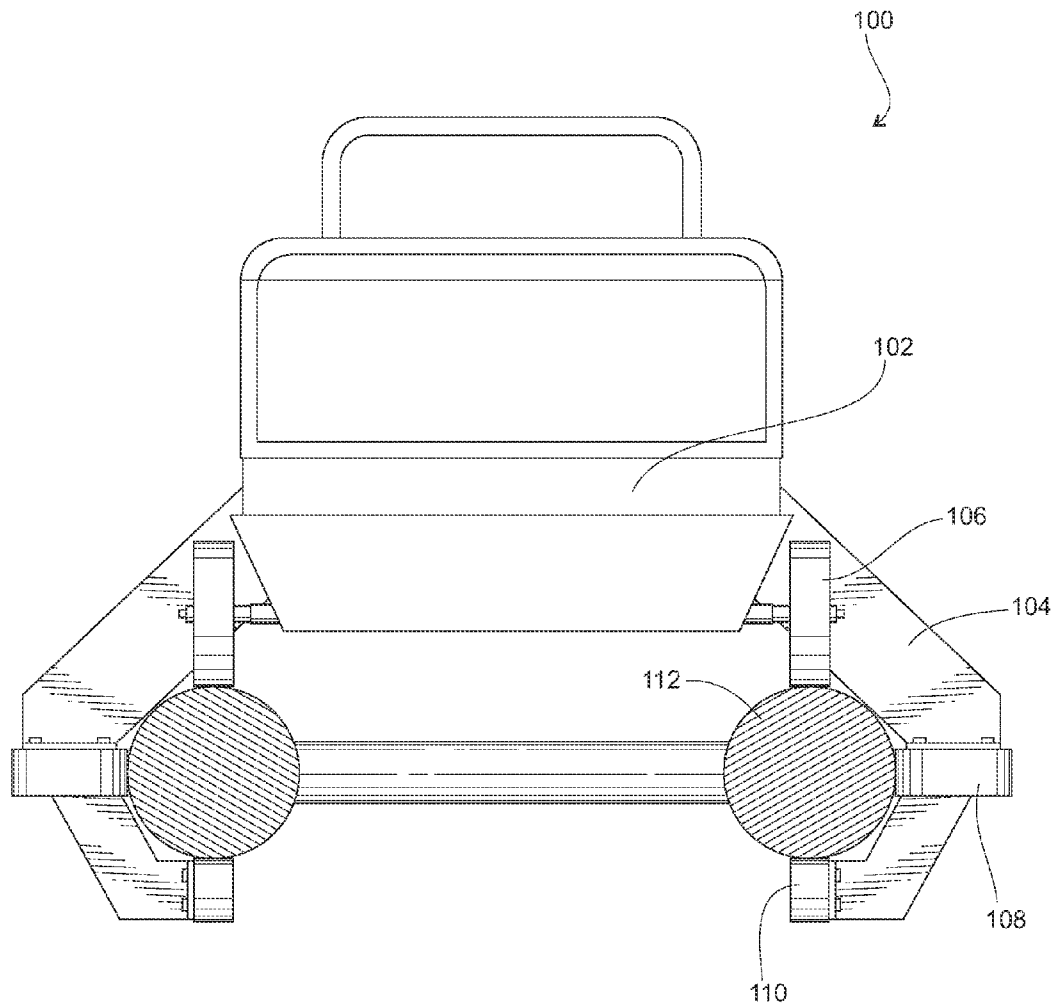
(74) *Attorney, Agent, or Firm* — Cox Smith Matthews Incorporated

(57) **ABSTRACT**

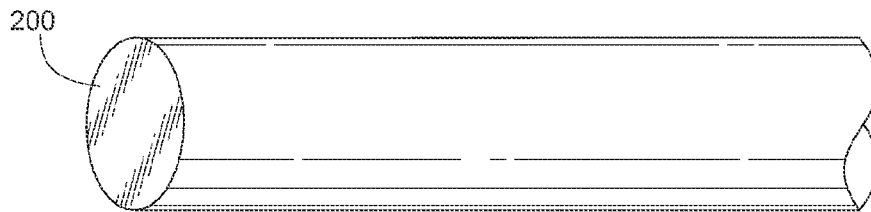
A method of fabricating an amusement park ride track utilizing stock, planar materials, namely comprising of creating elongated, curved structures from planar materials. A roller coaster track capable of being fabricated from multiple planar pieces without heating or bending. Other embodiments are described which utilize elongated, curved structures such as ski lifts, people movers, staircases and architectural structures. A jig is disclosed for providing for ease of manufacture of the elongated, curved structures.

**1 Claim, 9 Drawing Sheets**

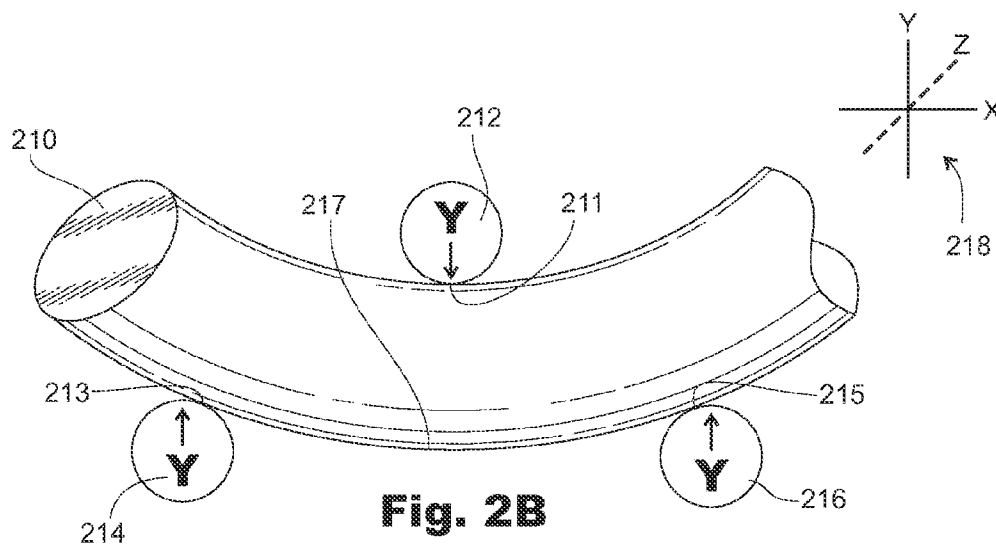




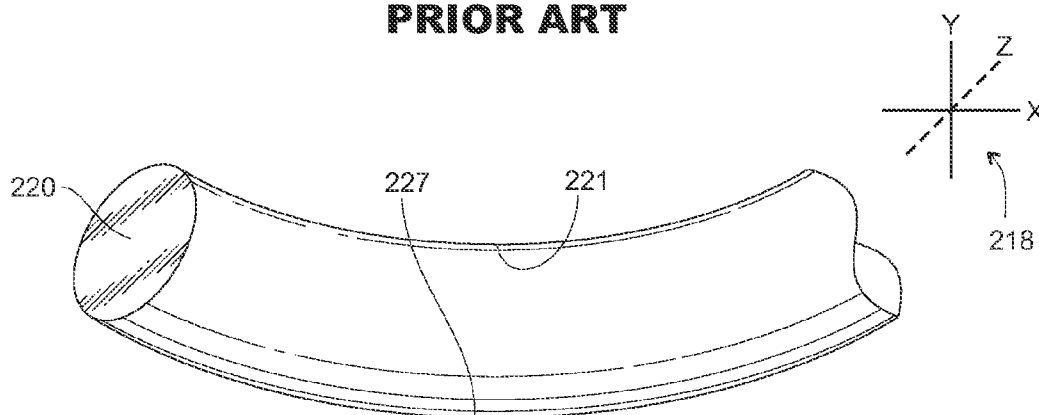
**Fig. 1**  
**PRIOR ART**



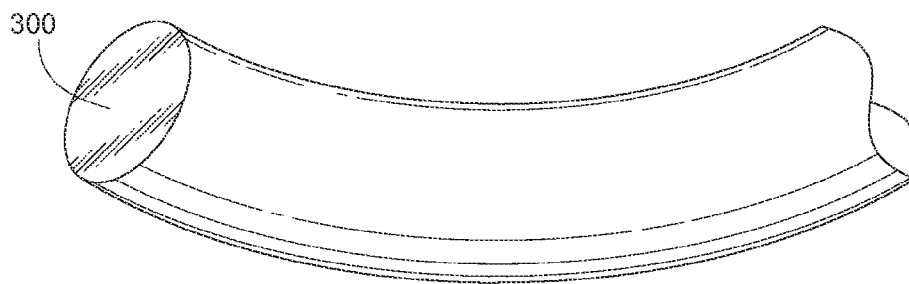
**Fig. 2A**  
**PRIOR ART**



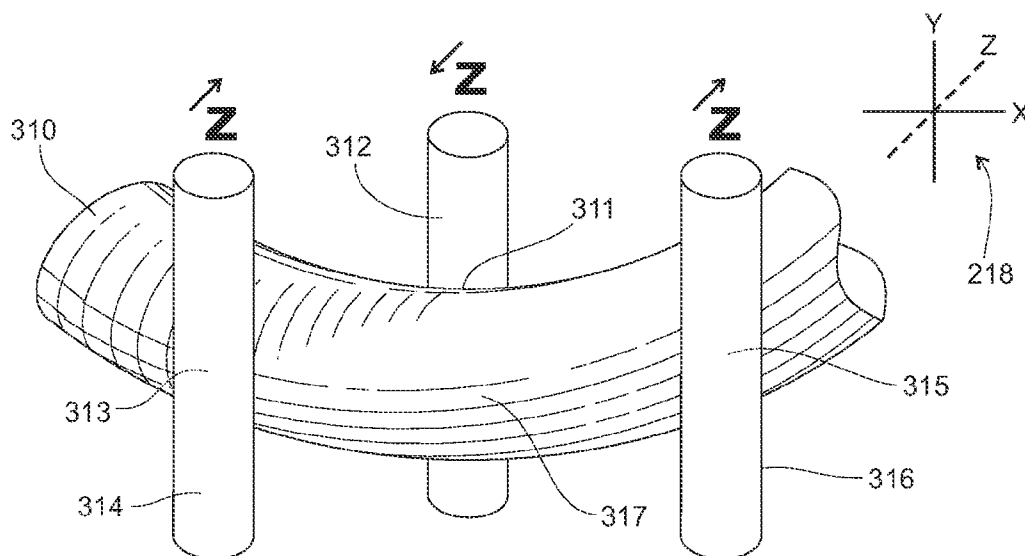
**Fig. 2B**  
**PRIOR ART**



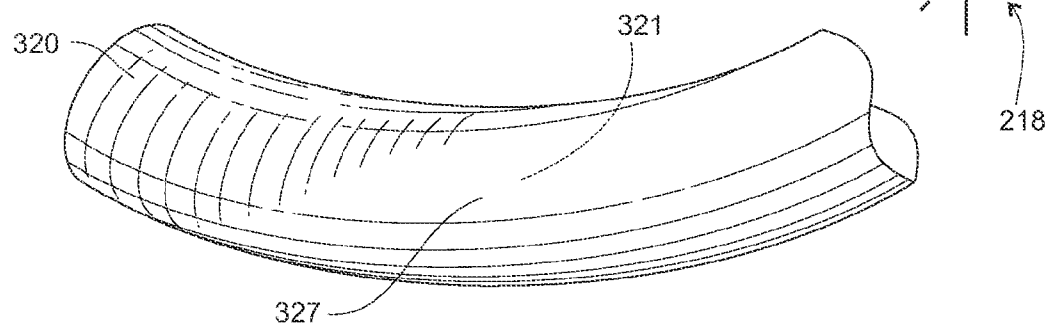
**Fig. 2C**  
**PRIOR ART**



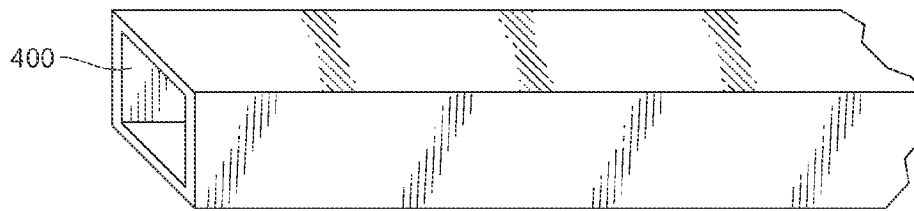
**Fig. 3A**  
**PRIOR ART**



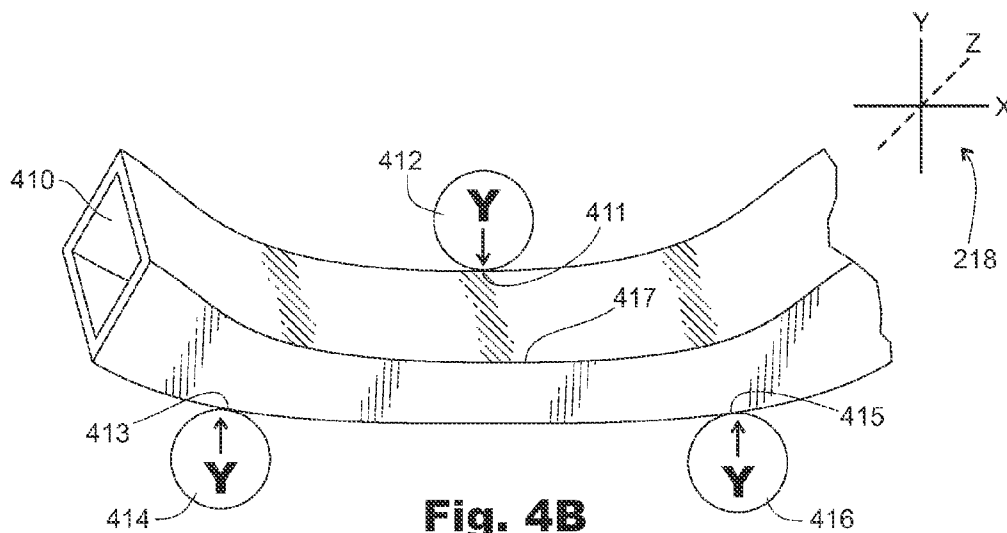
**Fig. 3B**  
**PRIOR ART**



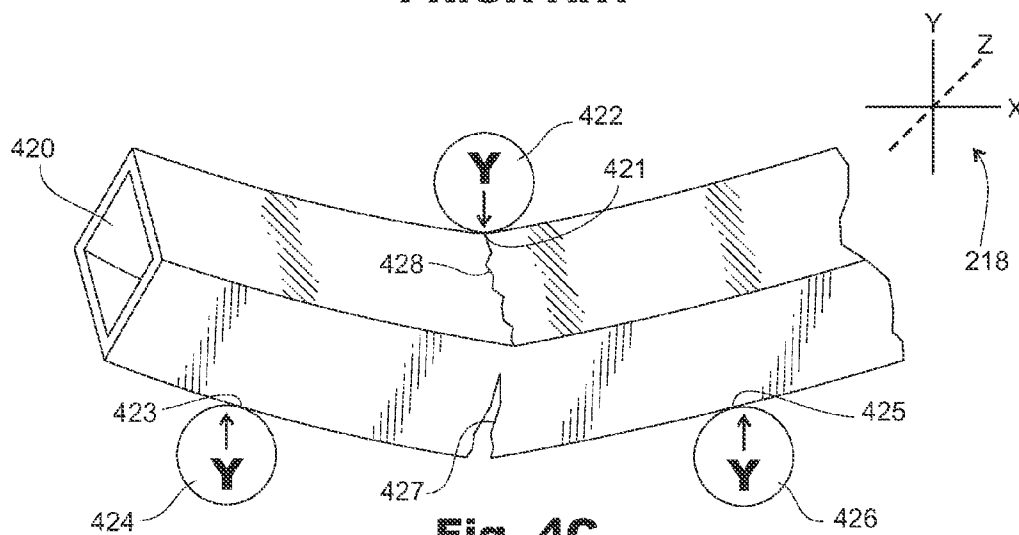
**Fig. 3C**  
**PRIOR ART**



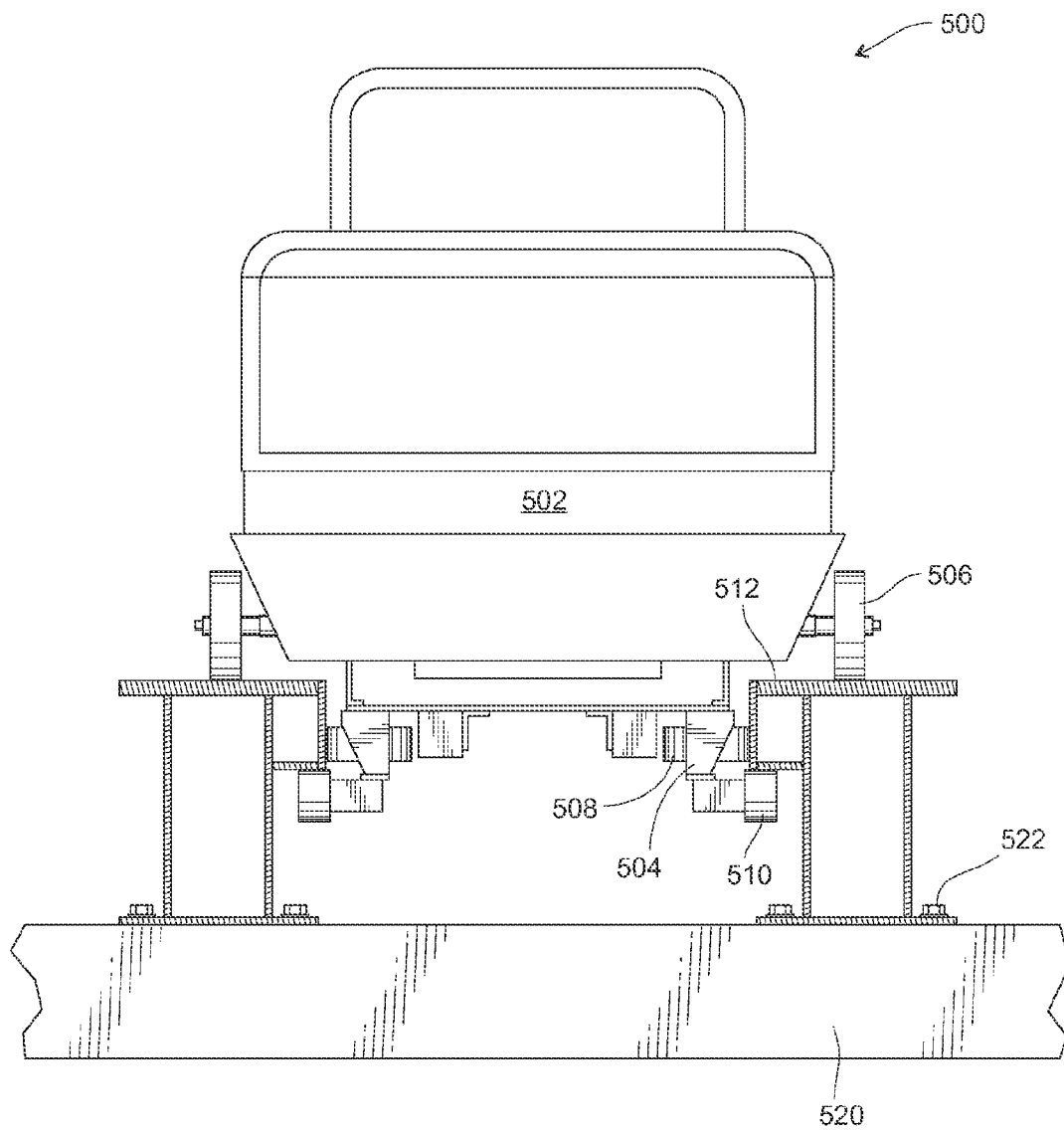
**Fig. 4A**  
**PRIOR ART**



**Fig. 4B**  
**PRIOR ART**

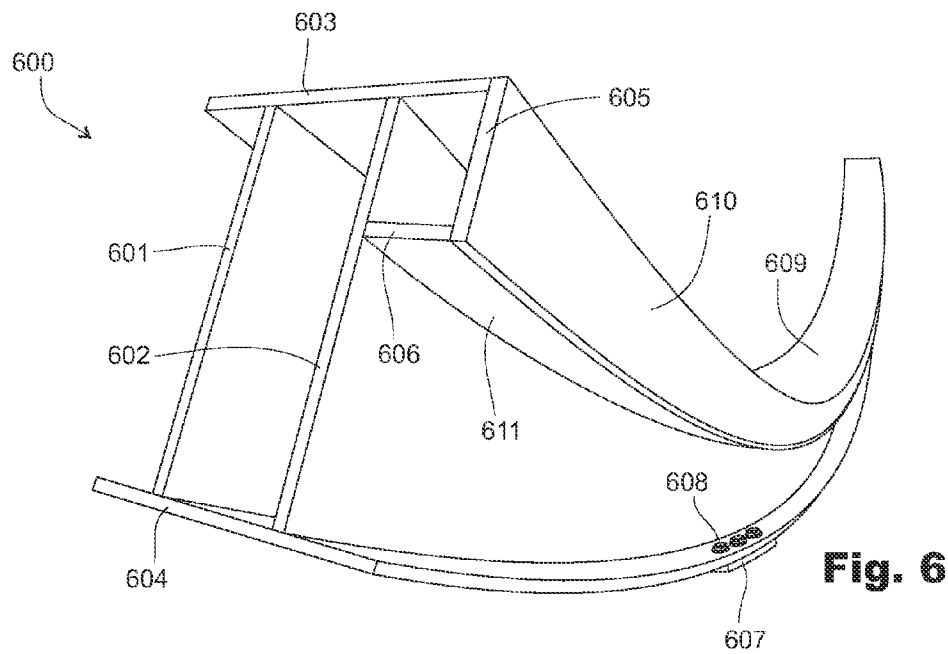


**Fig. 4C**  
**PRIOR ART**

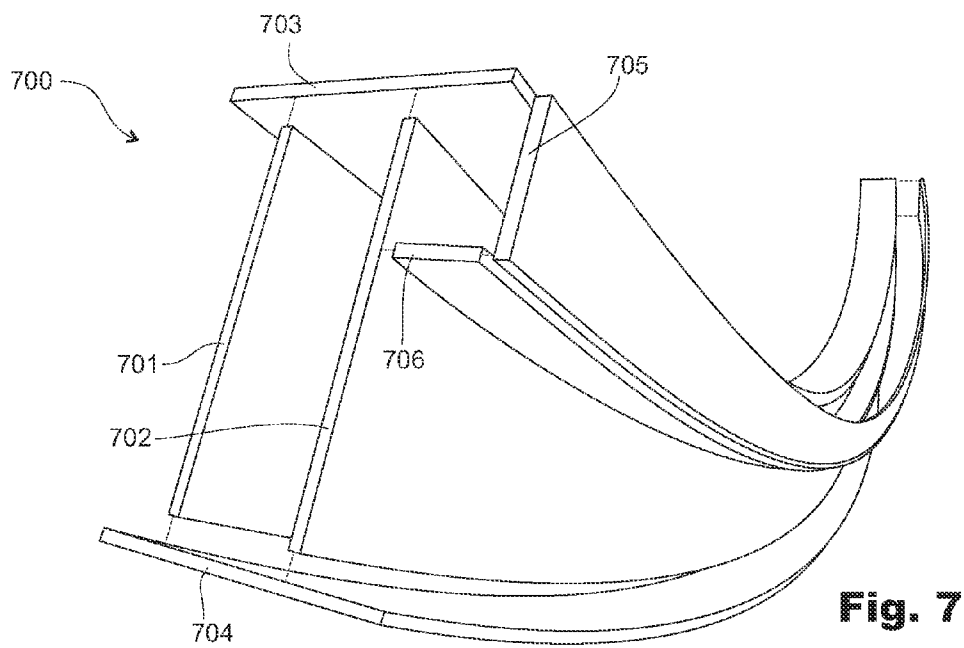


**Fig. 5**

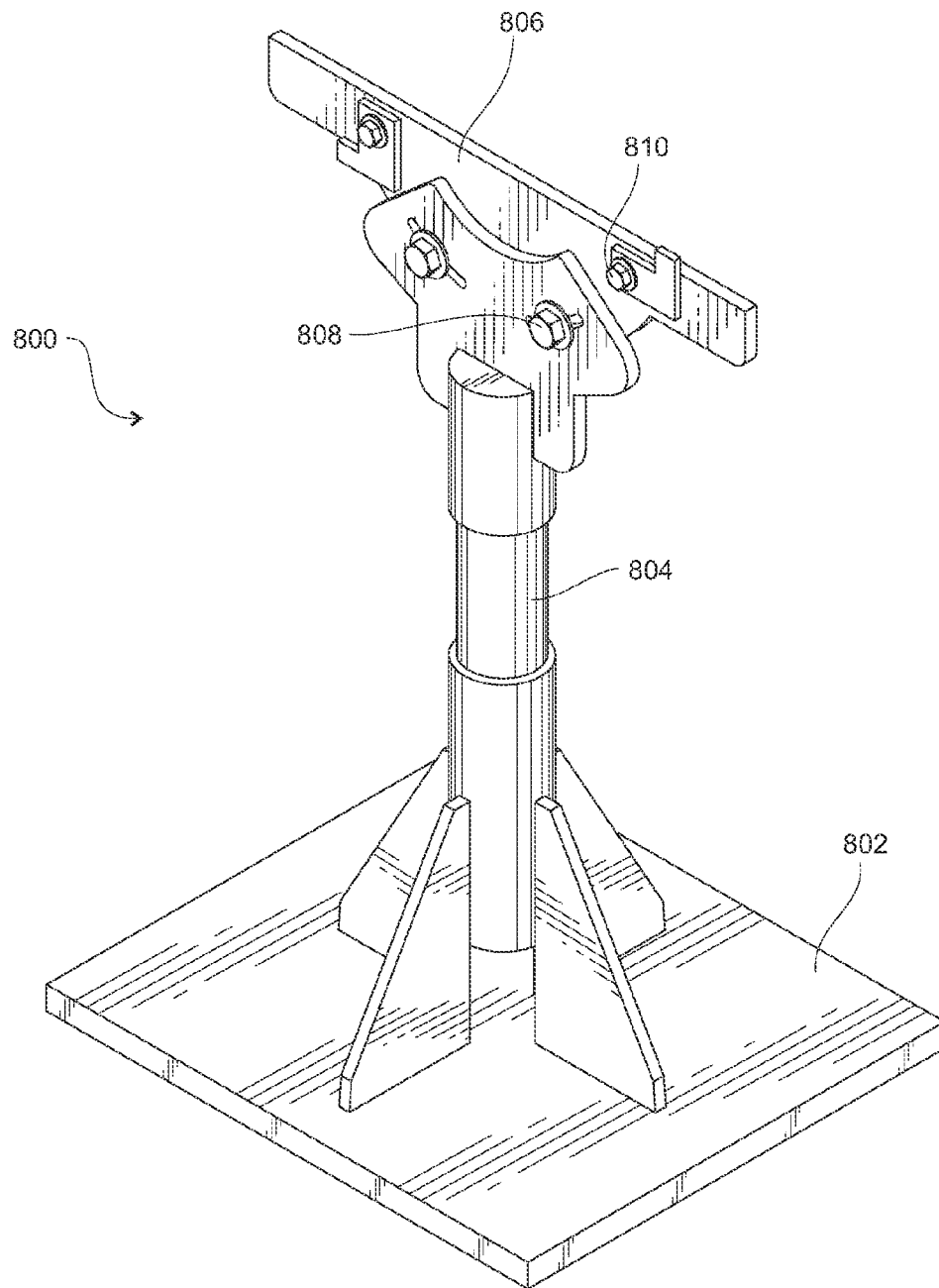


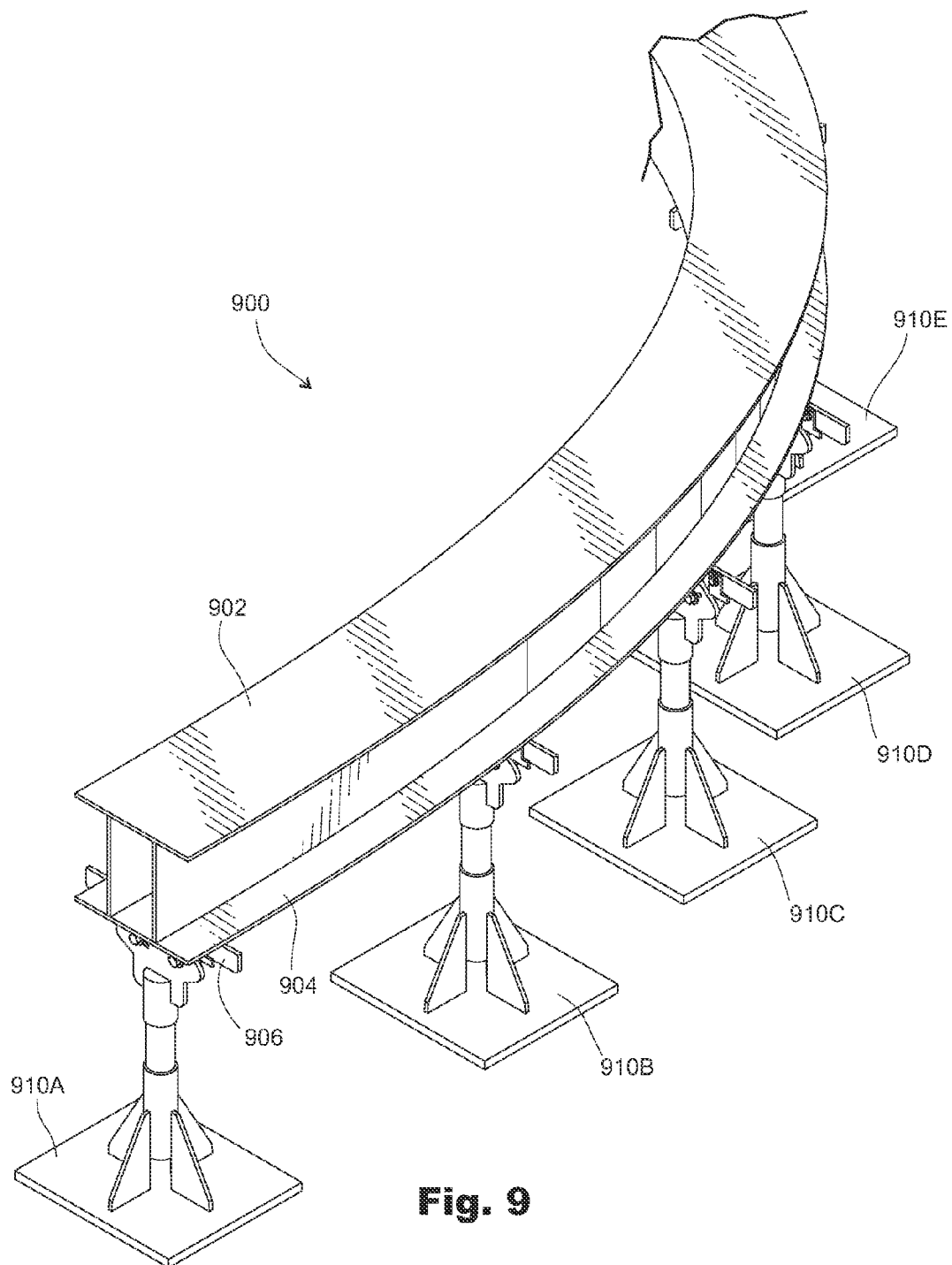


**Fig. 6**

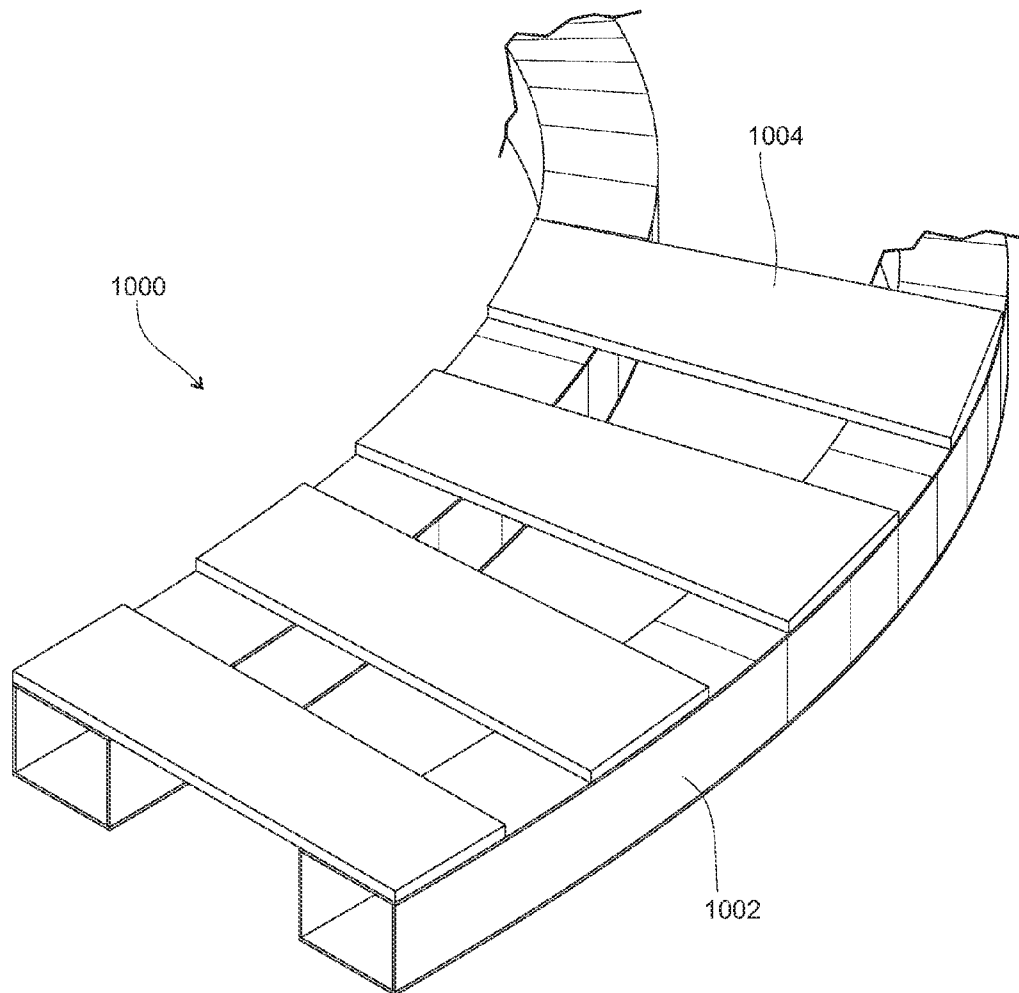


**Fig. 7**

**Fig. 8**



**Fig. 9**



**Fig. 10**

1

**ROLLING VEHICLE TRACK****CROSS REFERENCE TO RELATED APPLICATIONS**

This application claims priority to the earlier provisional application entitled "Improved Rolling Vehicle Track" filed Sep. 11, 2009 and having Ser. No. 61/241,785. The disclosures of the above related applications are hereby incorporated herein by reference in their entirety.

**TECHNICAL FIELD**

The present invention pertains to an improved rolling vehicle track and its manufacture. More particularly, preferred embodiments of the present invention pertain to an improved method of designing and manufacturing amusement park track that comprises affixing a plurality of planar materials to form a track rather than the conventional methods of bending straight track. Methods of use of the improved track are also included. Other alternate embodiments of the invention comprise other complex structures such as ski lifts, people movers and staircases.

**BACKGROUND**

Roller coasters, other amusement park rides, ski lifts and other rolling vehicle people moving devices frequently have a need for complicated tracks to either provide a dynamic experience or follow rugged terrain. As such, many of these tracks for such rolling vehicles are fabricated from steel pipe, which is traditionally heated and bent to acquire its desired shape.

Unfortunately, heating and manipulating steel rod or steel pipe in such a way, and permanently bending such material, causes significant fatigue in the material. This fatigue is then existent in the resultant structure before a stress or load is applied to such apparatus, such as inherent stresses in the installation of the track (static loads) and dynamic loads applied to the track (e.g. a passing roller coaster carriage). Over time, the culmination of the manufacturing stresses, static stresses and dynamic stresses require that the traditional pipe track be replaced frequently over time.

Further, when steel rod or steel pipe is heated and bent into complex designs, the rod or pipe does not necessarily bend as desired. Metal will typically seek to bend at its weakest point or where the most force is applied over a span. As such, the end result of a fabricated steel structure may not exactly match the desired design, which either results in repeated attempts of fabrication or settling for a less than optimal result. In particular, structural and material efficient designs such as triangular tubing, square or rectangular tubing, or other metal tubing that has airspace within the cross section of the steel structure can be vulnerable to both deformation and cracking.

At the present time, metal (namely steel) roller coasters are fabricated from round, straight steel rod or steel pipe which are bent into desired formations for the necessary roller coaster application.

Based on our knowledge of the industry, there are no roller coasters in existence where the tracks are fabricated from stock planar metal material that has been cut and welded together to form the desired curve track. Such an invention, if possible, would be a highly desirable benefit as the newly developed track, which has not been bent, deformed or heated, would retain its original strength without unnecessary fatigue placed on the material by traditional bending methods. With such superior material fitness in light of the absence

2

of fatigue during manufacture, the resulting structure or roller coaster track would be far stronger and last longer than traditional approaches. Such strength and durability, therefore, can effectively result in roller coasters and other structures being built on a larger scale or more efficient budget as compared to earlier traditional approaches.

Therefore, what is needed in the art of amusement park rides and other complex curved structures is a new approach to the fabrication and manufacture of an elongated, curved structure such as a roller coaster track. Preferably, such an improved track minimizes manufacturing stresses, creates a desired result, and further preferably reduces the costs of materials and manufacture when compared to traditional roller coaster, amusement ride, ski lift, staircase or other elongated structures.

**SUMMARY**

Embodiments of the present invention are generally directed toward a new method to fabricate an elongated, curved structure such as an amusement park roller coaster track or spiral staircase support. Once a three dimensional design of the elongated structure is determined, specialized software can be utilized to map out the various pieces of flat material to be cut out—pieces that will ultimately become the components of the elongated, curved structure. Such component pieces, in preferred embodiments, are cut into their respective designed shapes using a plasma cutter or other conventional device and are subsequently attached together (e.g. welded) to form a structurally sound elongated, curved structure.

In one aspect, embodiments of the present invention comprise a method of designing and fabricating such an elongated, curved structure.

In another aspect, such a process also creates a new product of the process, an apparatus which is a curved, elongated structure that comprises a plurality of planar components fixably in permanent communication with one another.

In yet another aspect, a roller coaster can be built upon such an elongated, curved structure. In still another aspect, a ski lift or other people mover can be built upon such an elongated structure that does not require conventional wires or round tracks. Lastly, though in no way limiting the scope of the present invention, a curved staircase or architectural structure can be built upon such an elongated, curved structure that does not require heating, bending or deformation of traditional metal beams.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Embodiments of the invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements.

FIG. 1 is a front view of a prior art roller coaster comprising of solid, round tracks.

FIG. 2A is an illustration of a straight section of prior art roller coaster track prior to bending.

FIG. 2B is an illustration of the section of prior art roller coaster track in FIG. 2A during a bending process in the Y dimension.

FIG. 2C is an illustration of a section of prior art roller coaster track in FIG. 2B following a bending process in the Y dimension.

FIG. 3A is an illustration of a section of prior art roller coaster track following a previous bending process in the Y dimension.

3

FIG. 3B is an illustration of the section of prior art roller coaster track in FIG. 3A during a bending process in a second Z dimension, thereby causing a compound bend in the track.

FIG. 3C is an illustration of a section of prior art roller coaster track in FIG. 3B following a bending process in a second Z dimension, thereby having caused a compound bend in the track.

FIG. 4A is an illustration of a section of prior art straight rectangular tubing.

FIG. 4B is an illustration of the section of prior art rectangular tubing in FIG. 4A during a bending process in the Y dimension, thereby causing a deformation in the shape of the tubing.

FIG. 4C is an illustration of the section of prior art rectangular tubing in FIG. 4A during a bending process in the Y dimension, thereby causing a failure in the integrity of the tubing.

FIG. 5 is a front view of a roller coaster according to an embodiment of the invention.

FIG. 6 is a perspective view of an elongated, curved structure according to an embodiment of the invention.

FIG. 7 is an exploded, perspective view of an elongated, curved structure according to an embodiment of the invention.

FIG. 8 is a perspective view of a jig according to an embodiment of the invention.

FIG. 9 is a perspective view of an elongated, curved structure being fabricated with a plurality of jigs according to an embodiment of the invention.

FIG. 10 is a perspective view of a staircase supported by a plurality of elongated, curved structures according to an embodiment of the invention.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In the following description, for the purposes of explanation, specific details are set forth in order to provide a thorough understanding of the invention. However, it will be apparent that the invention can be practiced without these specific details. In other instances, well-known structures and devices may be depicted in block diagram form in order to avoid unnecessary detail of the invention relating to the corresponding discussion; and similarly, steps in the disclosed method may be depicted in flow diagram form. Section titles and references appearing within the following paragraphs are intended for the convenience of the reader and should not be interpreted to restrict the scope of the information presented at any given location.

The unique elongated, curved structures and fabrication and use thereof described herein comprise a plurality of advancements within various scopes in the amusement park, people moving, architectural and fabrication arts. As such, various groupings of details, advancements and enhancements are described in more detail hereinafter in the following sections: Functional Overview, Limitations Of Prior Art, New Structures and Fabrication Thereof and Conclusion.

#### Functional Overview

Embodiments of the present invention are generally directed toward an apparatus comprising an elongated, curved structure adapted to be utilized for various applications. Such applications can include a roller coaster track or other amusement park ride, a people mover (e.g. a ski lift or other motion device whether motorized or non-motorized), a staircase or other architectural structure, or other applications

4

where an elongated, curved structure is required. In preferred embodiments, such an elongated, curved structure comprises many compound curves and is a custom design, such as a roller coaster track.

While a roller coaster track is an exemplary case study for the present disclosure, it is understood that various teachings of the present disclosure are applicable in other contexts such as transportation, architecture and other trades, without limitation. Therefore, an improved roller coaster will be discussed, although this is merely a preferred embodiment of the invention for purposes of the disclosure without limitation. When used herein, references to a "rolling vehicle" are considered equivalent, or broader, than that of a roller coaster, since a roller coaster is an exemplary case of a rolling vehicle upon a fixed track. The teachings herein disclosed can apply equally well to either retrofit or new coaster applications, whether the underlying structure is wood (commonly referred to as a "wood" coaster), or the underlying structure is a steel frame (commonly referred to as a "steel" coaster).

More particularly, preferred embodiments of the invention and present disclosure are configurable, three-dimensional I-box style track that can be fabricated from two-dimensional materials, such as but not limited to planar steel plate. In preferred embodiments of a roller coaster track, an I-box style track typically has a rectangular cross section that resembles the letter "I" in the alphabet (similar to I-beam steel which has only 1 longitudinal plane rather than 2 longitudinal planes in an I-box style design).

As it can be a complex process to determine the specific shape and dimensions necessary for various planar components of such an elongated, curved structure, we have found that specialized computer software developed specifically for this process achieves the best result.

In particular, a roller coaster track is laid out in a three-dimensional computer aided design (CAD) system. Thereby, the track cross-section, track geometry and other aspects are fully detailed in a computerized specification of the track. Various sections of the track are also configured, such that the track can be fabricated in portions of track. Typically such tracks are designed and fabricated as a 2-track system, but one, two, three or even more complex track systems are also contemplated by the present invention.

Once the track sections are fully designed and specified, the sections are mapped out on primarily two-dimensional raw materials such as standard steel plate or steel bar. The utilization of such standard materials is typically of significant advantage over traditional methods which utilize specialized and expensive steel (either in rod or pipe form).

According to embodiments of the present invention, the mapped out two-dimensional section pieces are then cut from the raw steel using conventional cutting or fabrication means such as a plasma cutter, mechanical cutter, water cutter or other conventional cutting means. The specific pieces preferably have hundreds or even thousands of minute specifications, such that complex curves can be accommodated with the cutting of the materials. Typical materials used are 1/4" or 3/8" plates of A-36 steel, although other materials can be desirable in alternate configurations or applications.

After the two-dimensional section pieces are cut or fabricated, these pieces are assembled and coupled to one another pursuant to the design and specifications, typically through conventional means such as welding. In the process of such fabrication of the three-dimensional object from primarily two-dimensional pieces, a special jig or mount may be necessary to hold the pieces in their proper position for affixing to other pieces, as discussed further below.

Lastly, the fabricated track sections are assembled together at the site of the amusement park ride, namely through conventional coupling means such as large bolts and nuts, or welding, or other conventional attachment means.

Typically, such a fabrication method of embodiments of the present invention result in an amusement park ride track that is more consistent and optimized pursuant to the original design. The improved track typically is stronger as the track itself is typically free of manufacturing stresses such as heating, bending and installation tweaking. Because the raw materials in the improved track are not stressed during their manufacture or installation, the improved track typically has a longer lifespan and thus does not need as frequent of replacement as traditional "bent pipe" track constructed of either round rod steel or round pipe steel that is heated, bent or both.

As noted above, the improved track can be used in amusement rides (e.g. roller coasters), alpine slides, water parks or other applications where a wheeled vehicle proceeds along a track having curves. It can, similarly in other contexts, be used as support structures for people movers (e.g. motorized or non-motorized walkways, trams, etc.), or for staircases, or other architectural applications requiring custom, elongated, curved structures.

Before a further discussion of the various features of embodiments of the present invention are presented, it is beneficial to understand more about the limitations of the prior art, namely "bent pipe" roller coaster track.

#### Limitations of Prior Art

FIG. 1 is a front view of a prior art roller coaster comprising of solid, round tracks. A coaster 100 comprises a chassis 102 having a wheel frame 104, the wheel frame 104 thereby coupled to a one or more main wheels 106, a one or more lateral wheels 108 and a one or more bottom wheels 110. The one or more main wheels 106, one or more lateral wheels 108 and one or more bottom wheels 110 roll along a solid, round track 112. Such a coaster 100 typically represents many modern but prior art coasters which require frequent maintenance of the expensive track 112 which must be re-certified, repaired or re-fabricated from new materials on a regular basis to maintain the safety of riders in the chassis 102.

Turning to FIG. 2A, a straight section of prior art round steel pipe 200 prior to fabrication or bending to become a roller coaster track is illustrated.

FIG. 2B is an illustration of the section of prior art roller coaster track 200 in FIG. 2A, which has been exposed to a bending process in the Y dimension. More particularly, a section of round steel pipe 210 has various forces applied to it in various locations, namely a downward Y force 212 is applied at a location 211, an upward force 214 is applied at a location 213, and an upward force 216 is applied at location 215. The resulting forces 212, 214 and 216, in combination, result in the pipe 210 being bent in an upward configuration at its ends with respect to the Y dimension. The Y dimension is more clarified in a dimensional representation 218.

When pipe 210 is bent in this fashion, which frequently requires substantial heat to be applied to the pipe 210, the material of the pipe 210 can become substantially stressed. In particular, due to the folding inward of the ends of the pipe 210, the material in the pipe 210 in close proximity to location 211 is subjected to a high degree of compression. On the other hand, due to the same folding of the ends of the pipe 210, the material in the pipe 210 in close proximity to locations 213 and 215 is subjected to a high degree of expansion or stretching. In combination, the compression and expansion of the

material in the pipe 210 inevitably leads to the pipe 210 having a much lower structural integrity and as such the pipe 210 cannot bear the same loads as a non-bent pipe 200 depicted in FIG. 2A.

FIG. 2C is an illustration of a section of prior art roller coaster track in FIG. 2B following a bending process in the Y dimension. More particularly, a pipe 220 is illustrated as having a slightly less bend than the pipe 210 of FIG. 2B. As is commonly known in the trade, generally a material such as steel must be bent further than the desired result, as even materials such as steel have a degree of elasticity. In this regard, the process of fabricating roller coaster tracks to a high degree of precision becomes very difficult as the amount of force and dynamics to bend the material in the pipe 200 cannot be exactly determined prior to the actual bending. The result, therefore, similar to pipe 220, is a result by "trial and error" rather than fabrication within precise measurements and standards.

It is a frequent occasion that such prior art roller coaster tracks must be bent into compound curves in order to accommodate the needs of the design. As such, many of the pipes used to create roller coaster tracks must be subjected to multiple bending processes, sometimes in the same location.

FIG. 3A is an illustration of such a section of prior art roller coaster track that must be subjected to a second bending process, following a previous bending process in the Y dimension in FIGS. 2A-2C. A pipe 300 represents a pipe 220 which was previously bent in FIGS. 2A-2C in the Y dimension.

Turning to the next figure, FIG. 3B is an illustration of the section of the previously bent pipe 300 of FIG. 3A, which is subjected to a bending process in a second Z dimension. This second bending process thereby causing a compound bend in the track, one bend in the Y dimension (FIGS. 2A-2C) and another bend in the Z direction, as represented in the dimension representation 218.

As one can appreciate, a pipe 310 has an outward (from the page) force 312 applied to it in the Z dimension at a location 311, an inward (into the page) force 314 applied to it in the Z dimension at a location 313, and an inward (into the page) force 316 applied to it in the Z dimension at a location 315. In combination, these forces 312, 314 and 316 bend the pipe 310 into a second bend in the Z dimension.

Similar to that described in FIGS. 2A-2C for the Y dimension, the pipe 310 in FIG. 3B is subjected to a second set of stresses, namely a compression at location 311 and an expansion or stretching at location 317. As such, being that the pipe 310 has been subjected to two bends with multiple compressions and expansions in the midsection of the pipe 310, its structural integrity is severely compromised.

FIG. 3C, similar to FIG. 2C, illustrates a pipe 320 which has been subjected to such bending to reach a desired shape and form. In particular, the pipe 320 can experience structural compression at a location 321 and a structural expansion or stretching at 327, resulting in a weakened roller coaster track when compared to the native, straight steel pipe which was originally not subjected to such forces.

FIG. 4A is an illustration of a section of prior art straight rectangular tubing 400, which is a suitable material for rigid, straight structural purposes but difficult to bend or manipulate for curved applications. While such a pipe could be advantageous over round pipe for roller coaster tracks, such rectangular tubing is difficult to bend or manipulate as further described.

Turning to the next figure, FIG. 4B is an illustration of the section of prior art rectangular tubing 400 in FIG. 4A during a bending process in the Y dimension, thereby causing a

deformation in the shape of the tubing. More particularly, a rectangular tubing **410** is subjected to a downward force **412** in the Y dimension at a location **411**, an upward force **414** in the Y dimension at a location **413**, and an upward force **416** in the Y dimension at a location **415**.

As depicted, the rectangular tubing has been crushed, flattened or otherwise deformed by the forces which have compromised the cross-sectional shape of the rectangular tubing **410**. More particularly, a compression force is felt at the location **411**, causing the top of the rectangular tubing **410** to be permanently deformed. Similarly, when visually observing an edge **417**, the structural integrity of the rectangular tubing **410** can be visually confirmed by the inconsistent profile of the edge **417**.

Similarly, FIG. **4C** is an illustration of the section of prior art rectangular tubing in FIG. **4A** during a bending process in the Y dimension, thereby causing a failure in the integrity of the tubing. More particularly, a rectangular tubing **420** is subjected to a downward force **422** in the Y dimension at a location **421**, an upward force **424** in the Y dimension at a location **423**, and an upward force **426** in the Y dimension at a location **425**. As can be appreciated at a location **428**, the compression forces acting upon the rectangular tubing **420** cause creases or ripples in the surface (and possibly interior) of the rectangular tubing **420**. Likewise, a crack **427** is observed in the location where expansion or stretching occurs in the material of the rectangular tubing **420**.

As can be fully appreciated by those skilled in the art, using round steel, either in the form of a solid rod or a hollow pipe is the most effective means to develop a roller coaster track under conventional prior art practices—but the process is wanting of several advancements. To name a few, without limitation, first, the material itself is expensive to utilize in round form. Second, the material is difficult to properly bend into the desired form, often resulting in a “trial and error” approach to fabricating the desired tracks. As shown in FIGS. **2A-2C** and FIGS. **3A-3C**, this process of manufacture also infuses stresses and ultimately weaknesses in the track material.

Third, the material (e.g. steel) is less structurally strong when placed in a round form such as a rod or a pipe, when compared to triangular, rectangular, I-beam or other forms. In particular, the round material is less rigid when subjected to lateral forces (forces lateral to the length of the material).

Unfortunately, as depicted in FIGS. **4A-4C**, utilizing rectangular (or other forms such as triangular or I-beam) tubing, while structurally more efficient than round rod or pipe in straight pieces, are far more complex to bend into curves. Much less, that often whatever material or tubing is used, it must be bent in multiple dimensions in compound curves as well as potentially in need of a twisting of the material itself to accommodate the proper desired configuration.

#### New Structures and Fabrication Thereof

FIG. **5** is a front view of a roller coaster according to an embodiment of the invention. A coaster **500** comprises a chassis **502** comprising a wheel frame **504**, the wheel frame **504** thereby coupled to a one or more main wheels **506**, a one or more lateral wheels **508** and a one or more bottom wheels **510**. The one or more main wheels **506**, one or more lateral wheels **508** and one or more bottom wheels **510** roll along a rectangular cross-section (or “I-beam”) track **512** as depicted according to an embodiment of the present invention. Such a coaster **500** is able to take advantage of a more rigid, durable and more easily manufactured track **512** which is constructed

from individual planar pieces of material and formed into the rectangular cross-section (or “I-beam”) profile.

Another notable advantage to such a track **512** is the ability to couple the track **512** to a ground or horizontal surface **520**, which is typically not advisable or utilized in conventional prior art roller coasters (not shown). Namely, such coupling can be accommodated with one or more large bolts coupled to the surface **520**.

Turning to the next figure, FIG. **6** is a perspective view of an elongated, curved structure according to an embodiment of the invention. A roller coaster track **600** according to an embodiment of the invention is illustrated, namely having a first vertical member **601**, a second vertical member **602**, a top horizontal member **603**, a bottom horizontal member **604**, an inside vertical member **605** and an inside horizontal member **606**. As noted by reference to the combination of FIGS. **5** and **6**, the one or more main wheels **506** roll along a top surface **609**, the one or more lateral wheels **508** roll along a lateral surface **610**, and the one or more bottom wheels **510** roll along a bottom surface **611**. The track **600** can be attached to a support **607** utilizing one or more bolts **608**.

Such a track is substantially more rigid than its round counterpart when a comparison of material versus rigidity is made. Further, such a track is inherently stronger and more durable if it is not subjected to stresses during manufacture such as heating or bending.

In order to fabricate such a track **600** in elongated, curved forms, the track **600** comprises a plurality of separate pieces of planar material (e.g. plate steel) which has been cut in a precise, specific desired size and shape.

Turning to the next figure, FIG. **7** is an exploded, perspective view of an elongated, curved structure according to an embodiment of the invention, which demonstrates how such a roller coaster track **700** can be fabricated from separate pieces of planar material such as plate steel. More particularly, a first vertical member **701**, a second vertical member **702**, a top horizontal member **703**, a bottom horizontal member **704**, an inside vertical member **705** and an inside horizontal member **706** are all cut, coupled together with conventional coupling means (e.g. welding, adhesive, bolts & nuts, etc.).

In preferred embodiments, such a permanent coupling of the individual pieces can be accommodated by automated welding machines. Depending upon the application and automated machines available, it is often desirable to utilize one or more specialized jigs to hold the plurality of track pieces in a given orientation for permanent coupling. Such a jig that has been successfully developed and utilized is discussed briefly next.

FIG. **8** is a perspective view of a jig according to an embodiment of the invention. A jig **800** comprises a base **802**, a vertical leg **804**, a horizontal crossbeam **806** and various adjustments. For example, the vertical leg **804** is preferably configurable and of suitable design to allow the crossbar **806** to be placed at any desired height where the track pieces (not shown) can be positioned. Similarly, a one or more bolts **808** are configurable to allow crossbar **806** to be oriented in a wide diversity of angles to accommodate the positioning of the track pieces. It is further preferable to utilize a one or more bolts **810** to provide a notch to hold the track pieces in a specific position upon the crossbar **806**.

Turning to FIG. **9**, a perspective view of an elongated, curved structure being fabricated with a plurality of jigs according to an embodiment of the invention is shown. In particular, a track assembly **900** comprises an elongated, curved structure **902** being assembled upon five jigs, namely a jig **910A**, a jig **910B**, a jig **910C**, a jig **910D** and a jig **910E**.



As illustrated, although only exemplary, a bottom member **904** of the structure **902** is in direct communication with a crossbar **906** of the jig **910A**, as similarly shown amongst the other jigs. In such a configuration, an automated welding machine (not shown) can couple the various pieces of the structure **902** together in one or more passes of the automated welding machine.

Turning to FIG. 10, a perspective view of a staircase supported by a plurality of elongated, curved structures **1002** forming a staircase **1000** according to an embodiment of the invention is illustrated. More particularly, the one or more elongated, curved structures **1002** support a plurality of steps **1004**. Using prior art or traditional methods, the one or more elongated, curved structures **1002** would be difficult to manufacture or fabricate, as the structures are comprised of rectangular cross-section shape and would not lend themselves to bending.

As such, the teachings above can also be used to create additional support structures found in ski lifts, people movers (e.g. walkways or trams, motorized or non-motorized), or other architectural features requiring an elongated, curved structure.

## CONCLUSION

Unless otherwise indicated, all numbers expressing quantities used in the specification and claims are to be understood as being modified in all instances by the term “about” or “approximately.” Accordingly, unless indicated to the contrary, the numerical parameters set forth in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the present invention. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claims, each numerical parameter should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques. Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. If specific results of any tests are reported in the technical disclosure, any numerical value inherently can contain certain errors necessarily resulting from the standard deviation found in the respective testing measurements.

The terms “a” and “an” and “the” and similar referents used in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. Recitation of ranges of values herein is merely intended to serve as a shorthand method of referring individually to each separate value falling within the range. Unless otherwise indicated herein, each individual value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g. “such as”, “in the case”, “by way of example”) provided herein is intended merely to better describe the invention and does not pose a limitation on the scope of the invention otherwise claimed. No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed as limitations. Each group member may be referred to and claimed individually or in any combination with other members of the group or other elements found herein. It is anticipated that one or more members of a group may be included in, or deleted from, a group for reasons of convenience and/or patentability.

Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. Of course, variations on those preferred embodiments will become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventor expects skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than specifically described herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.

Furthermore, if any references have been made to patents and printed publications in this specification, then each of the above cited references and printed publications, if any, are herein individually incorporated by reference in their entirety.

Of course, ongoing research and development of embodiments of the present invention will likely confer additional details of manufacture and use, as well as other advantages, which may be disclosed in subsequent patent filings though not necessary be outside the scope of the present invention. The existence of such details, advantages or other aspects are not disclaimed in the present disclosure and, notwithstanding the brevity of the present disclosure, are expressly contemplated and included in the present disclosure.

In closing, it is to be understood that the embodiments of the invention disclosed herein are illustrative of the principles of the present invention. Other modifications that may be employed are within the scope of the invention. Thus, by way of example, but not of limitation, alternative configurations of the present invention may be utilized in accordance with the teachings herein. Accordingly, the present invention is not limited to that precisely as shown and described.

What is claimed is:

1. A method of manufacturing a roller coaster track, the method comprising:
  - creating a design of a curve of a roller coaster track having a cross-section substantially comprising a first parallelogram and a second parallelogram, the first parallelogram comprising a first side, a second side, a third side and a fourth side, and the second parallelogram comprising an extension of the first side, a fifth side, a sixth side, and either the second side or the fourth side;
  - for each of the first side, second side, third side, fourth side, fifth side and sixth side:
    - determining a planar shape of the side, the planar shape of the side corresponding to the side as laid flat, and cutting planar material according to the planar shape of the side so as to form the side; and
    - assembling the cut planar material corresponding to each of the first side, second side, third side, fourth side, fifth side and sixth side to form the curve of the roller coaster track.



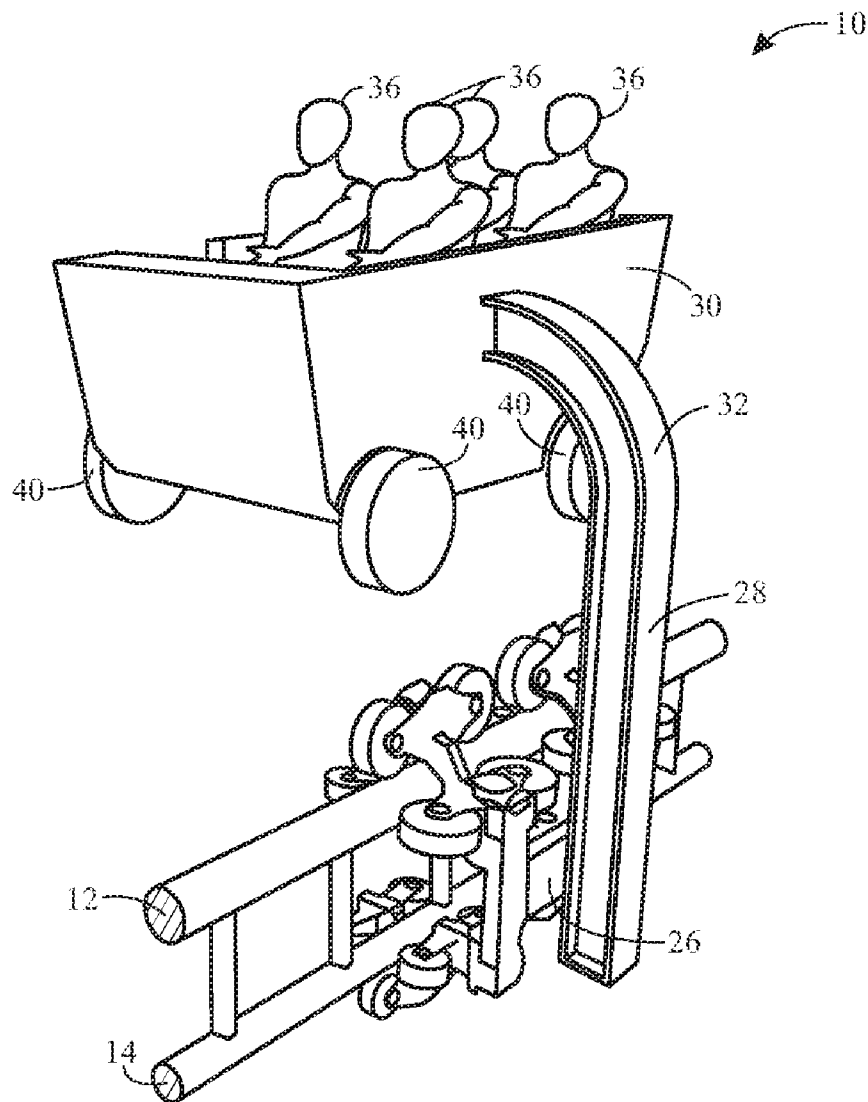
US 20160288000A1

(19) **United States**(12) **Patent Application Publication**  
**McVeen et al.**(10) **Pub. No.: US 2016/0288000 A1**(43) **Pub. Date: Oct. 6, 2016**(54) **BOOM COASTER****Publication Classification**(71) Applicant: **Universal City Studios LLC**, Universal City, CA (US)(51) **Int. Cl.**  
**A63G 21/12** (2006.01)(72) Inventors: **Keith Michael McVeen**, Orlando, FL (US); **Eric Parr**, Orlando, FL (US); **Thierry Coup**, Orlando, FL (US); **Eric A. Vance**, Orlando, FL (US)(52) **U.S. Cl.**  
CPC ..... **A63G 21/12** (2013.01)(21) Appl. No.: **15/085,898**(22) Filed: **Mar. 30, 2016****Related U.S. Application Data**

(60) Provisional application No. 62/141,044, filed on Mar. 31, 2015, provisional application No. 62/171,682, filed on Jun. 5, 2015.

(57) **ABSTRACT**

A boom coaster includes a passenger vehicle, a track, a bogie coupled to the passenger vehicle and the track and configured to move along the track, and a simulated ride surface positioned above the track and beneath the passenger vehicle. The simulated ride surface is configured to imitate a path of the passenger vehicle, the bogie is coupled to a surface of the passenger vehicle via a leg member extending around the simulated ride surface, and the leg member suspends the passenger vehicle above the simulated surface such that the bogie and the track are blocked from a passenger view perspective of the passenger vehicle.



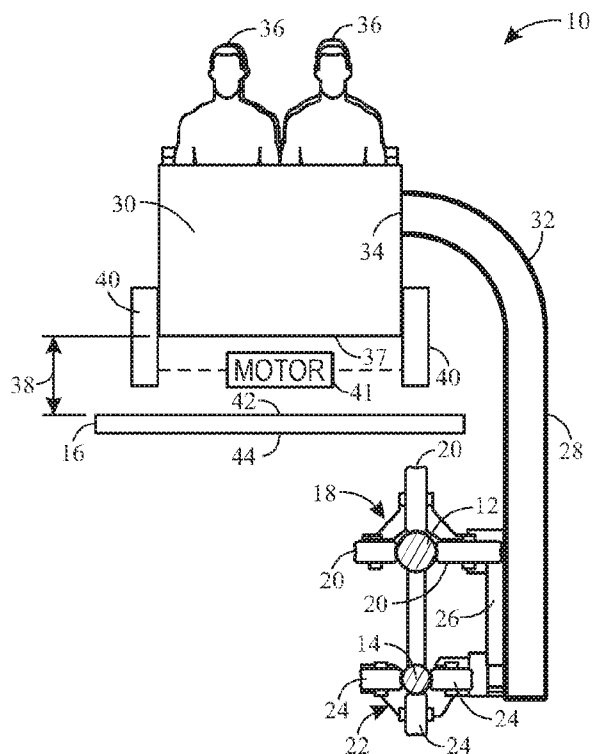


FIG. 1

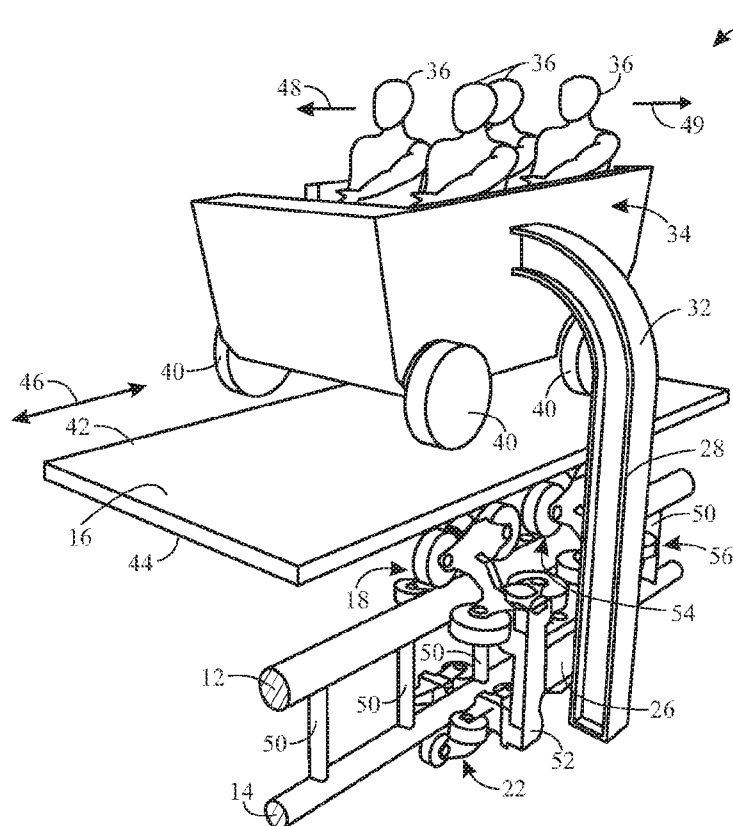
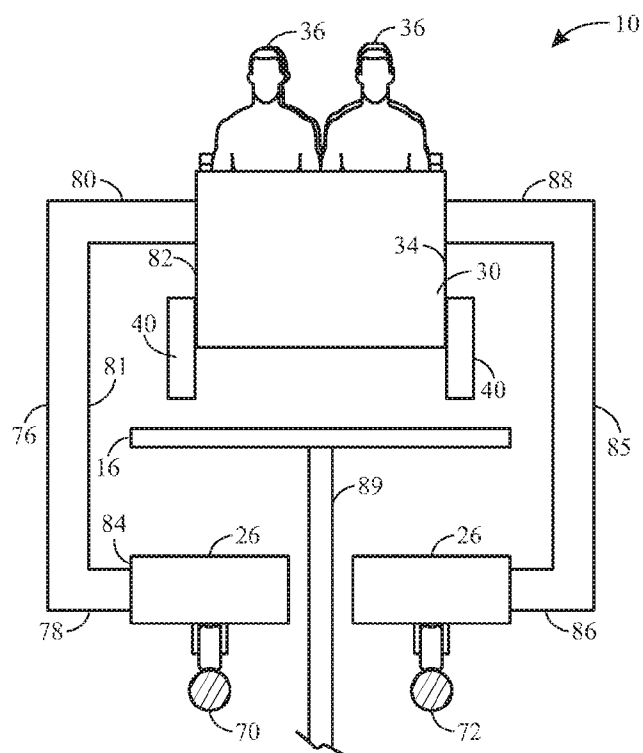
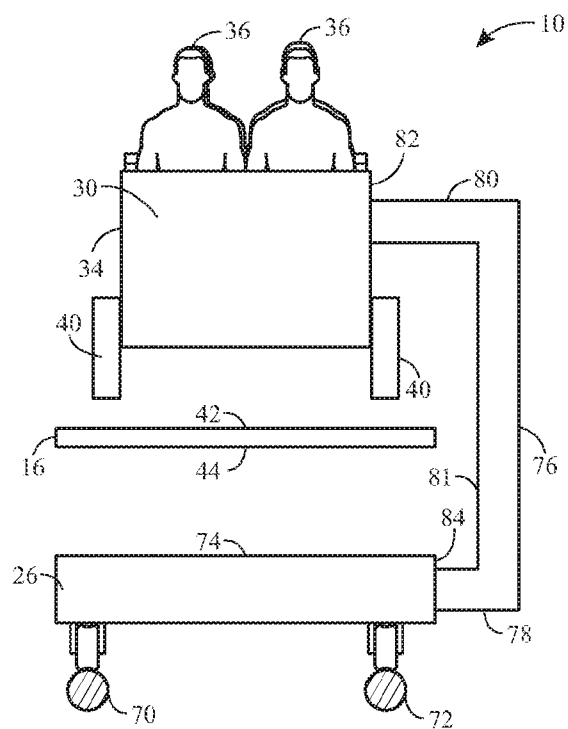


FIG. 2



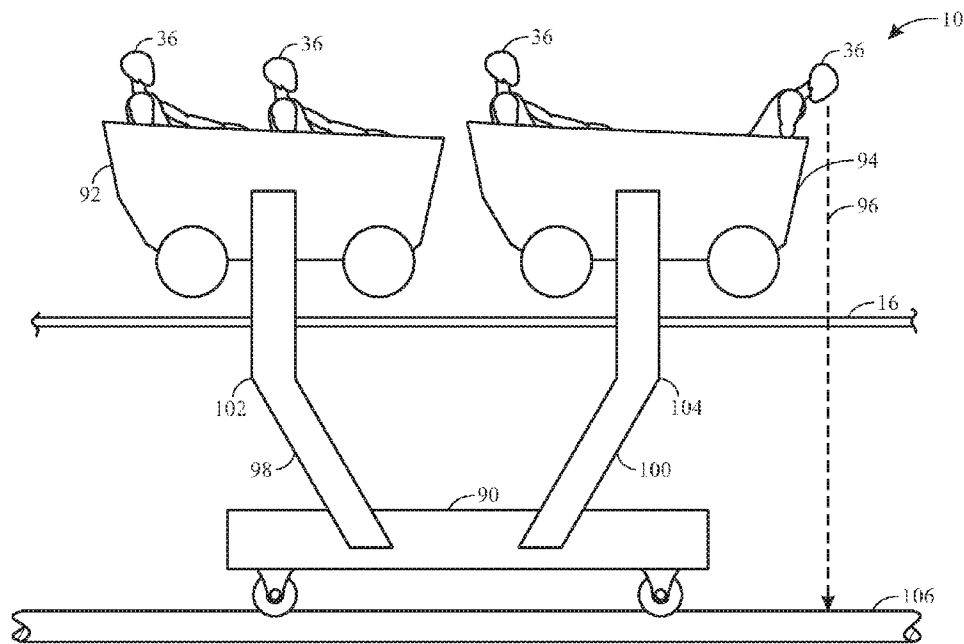


FIG. 5

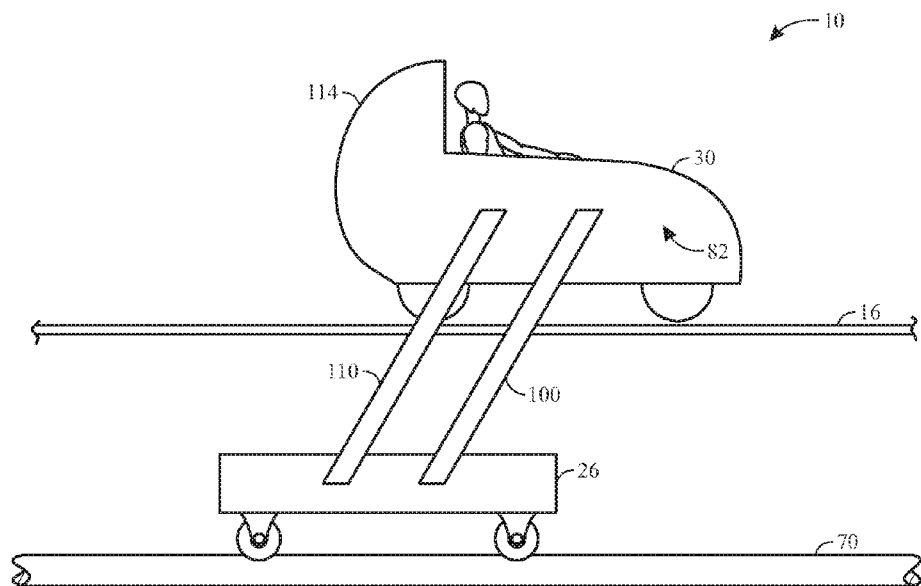


FIG. 6

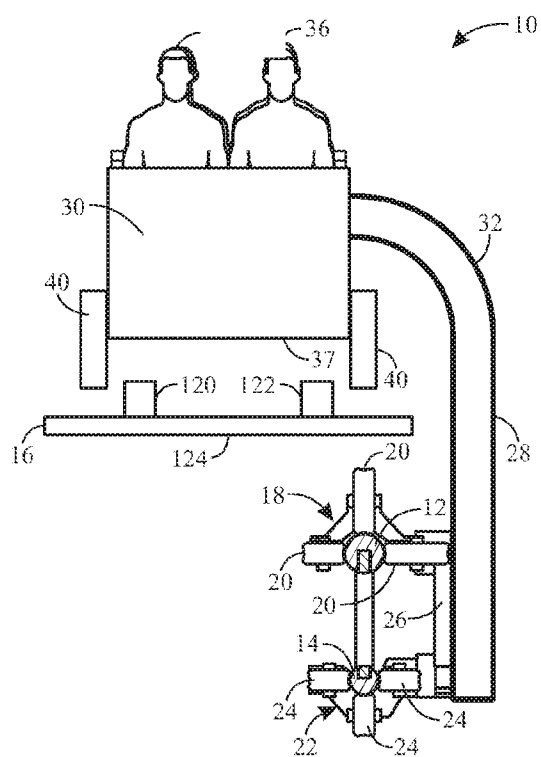


FIG. 7

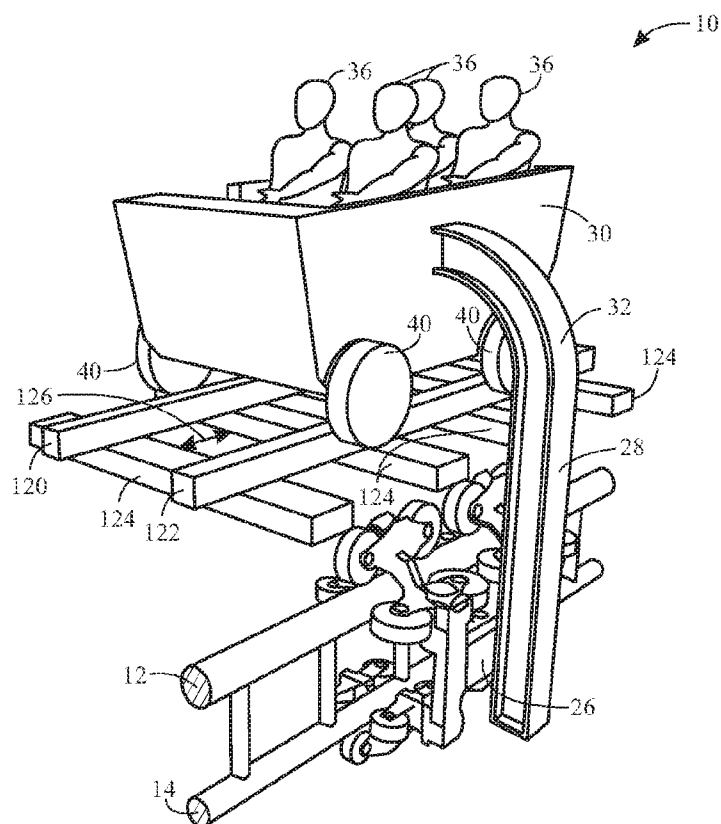


FIG. 8

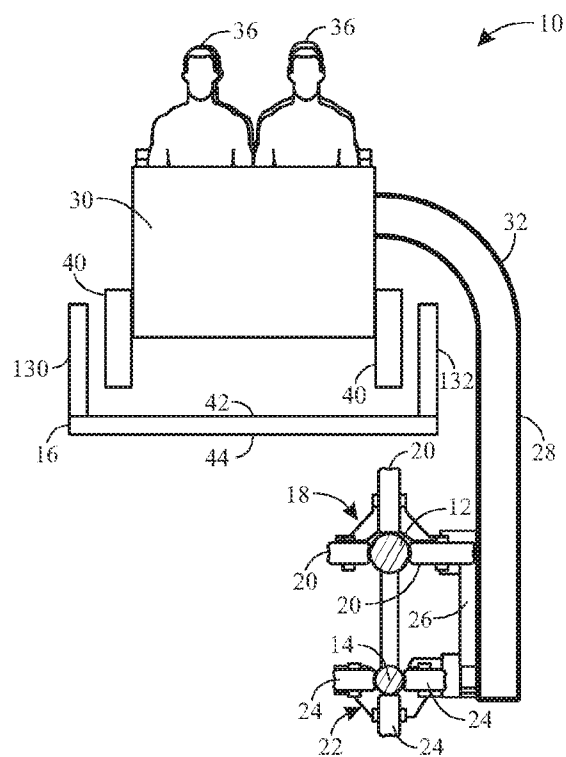


FIG. 9

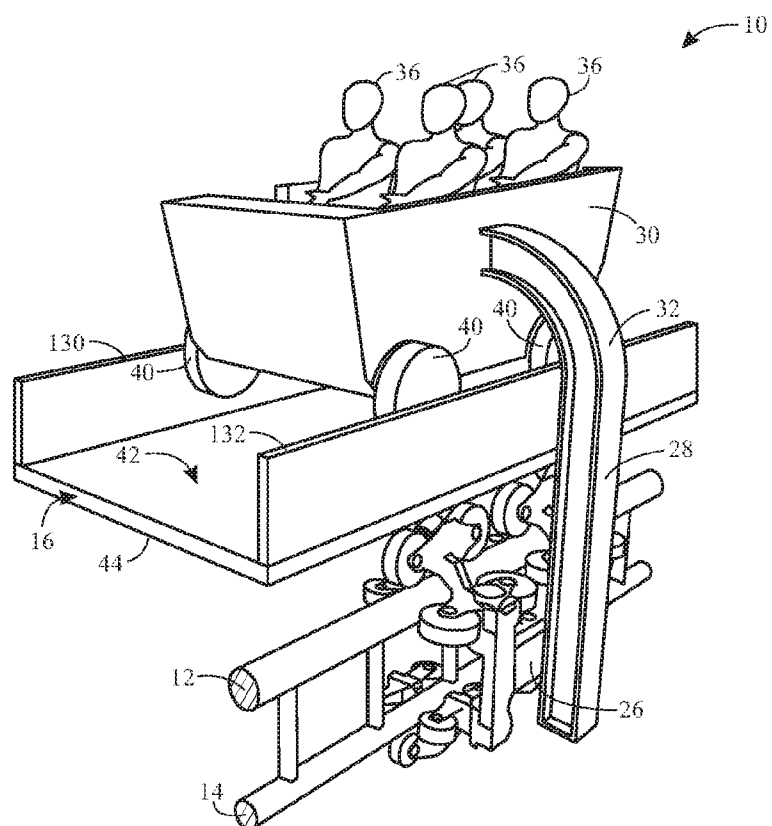


FIG. 10

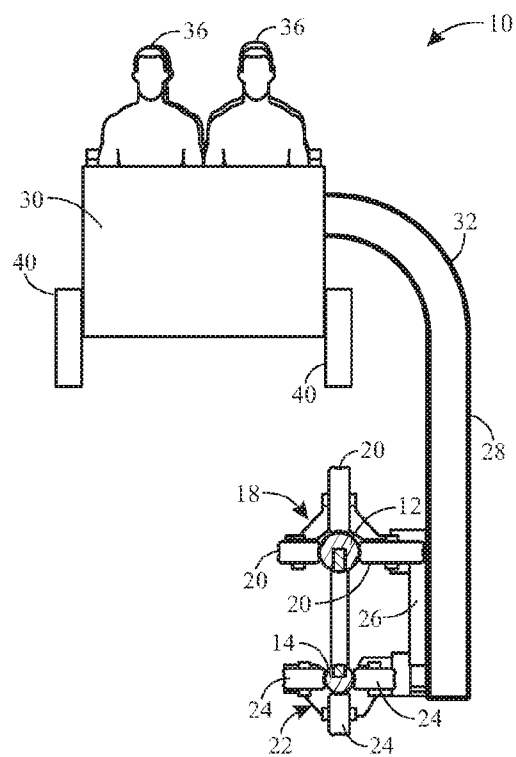


FIG. 11

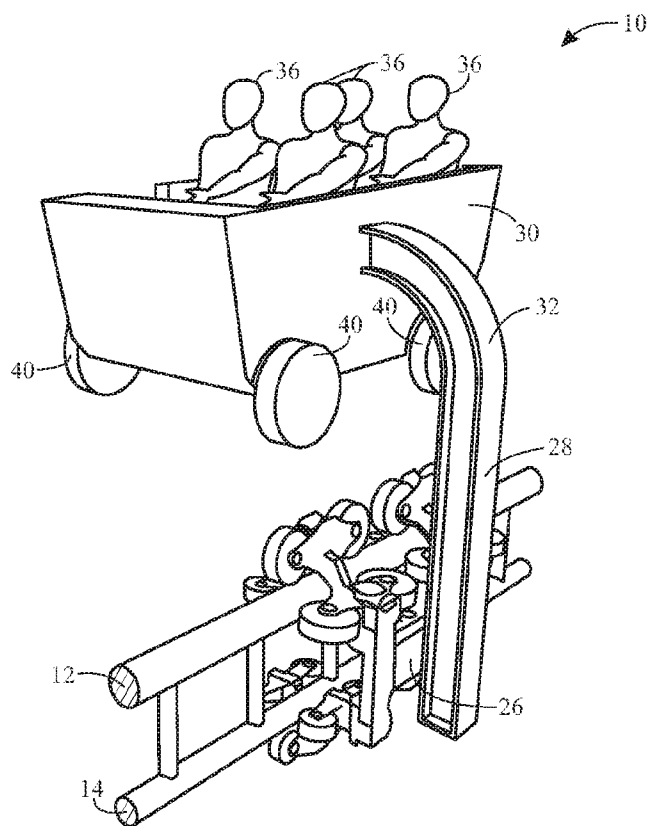


FIG. 12



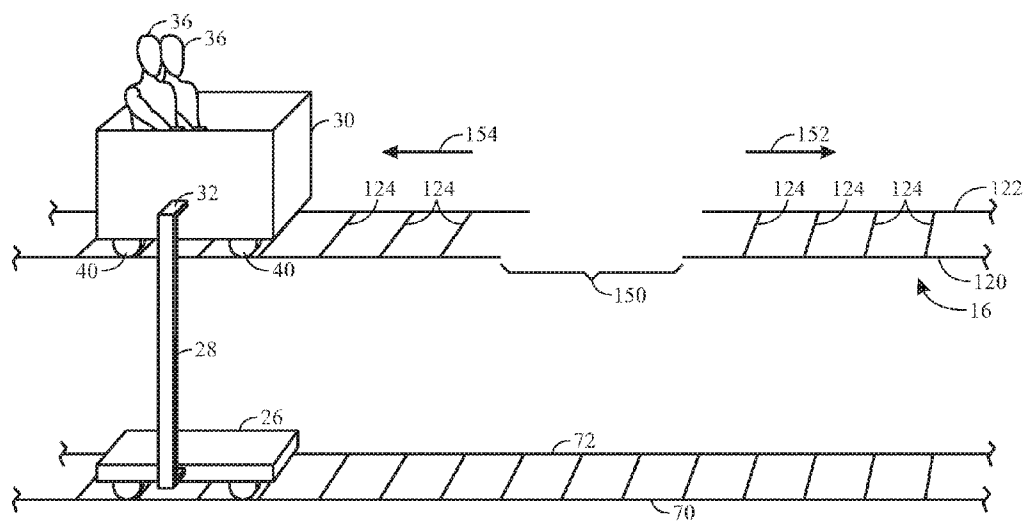


FIG. 13

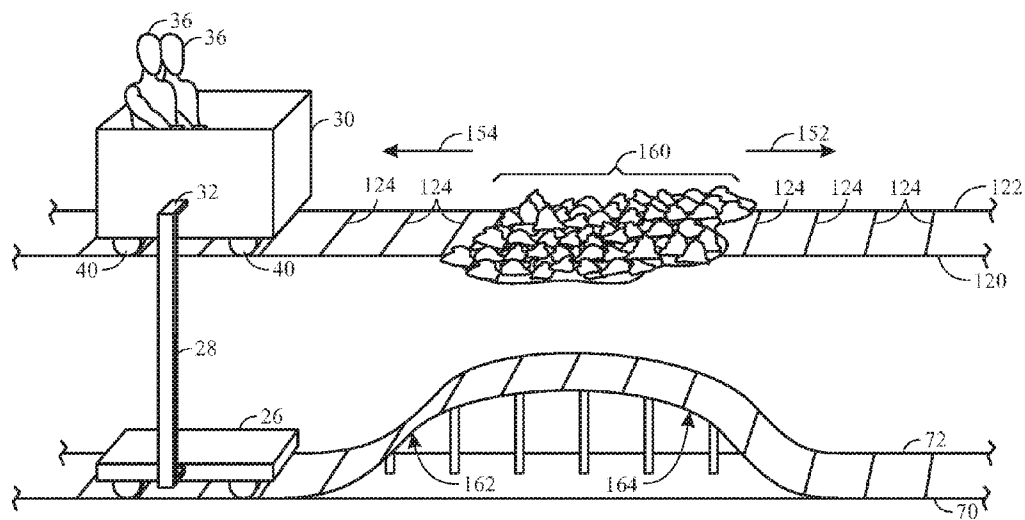
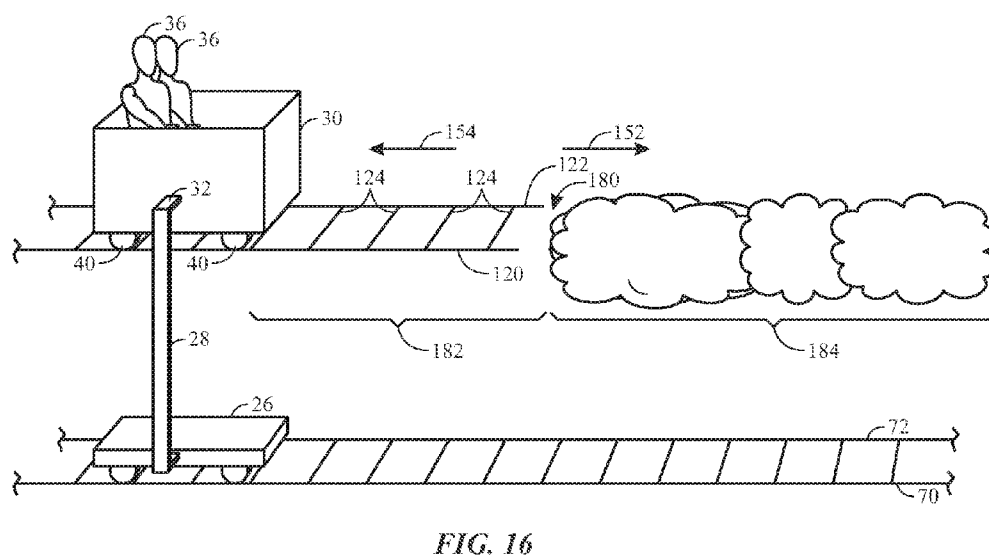
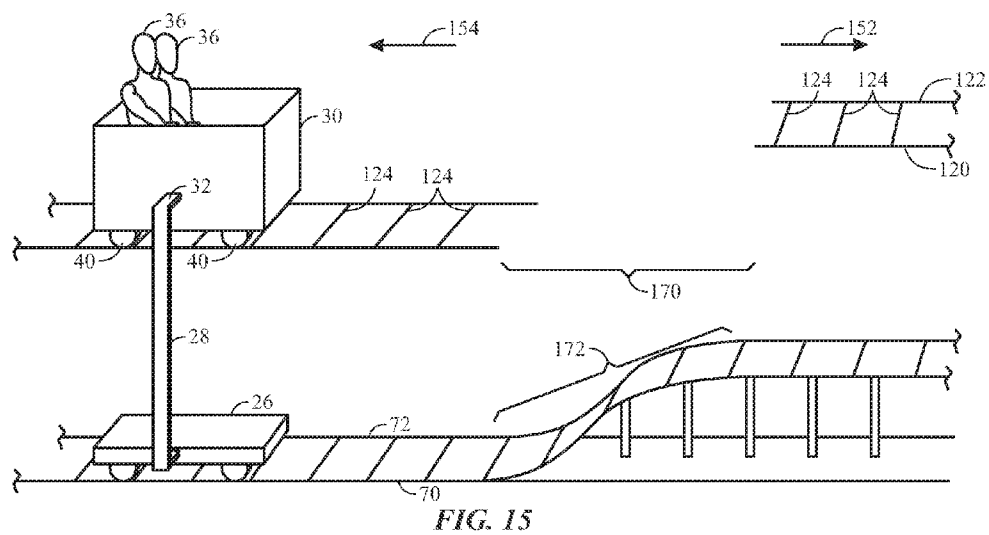


FIG. 14



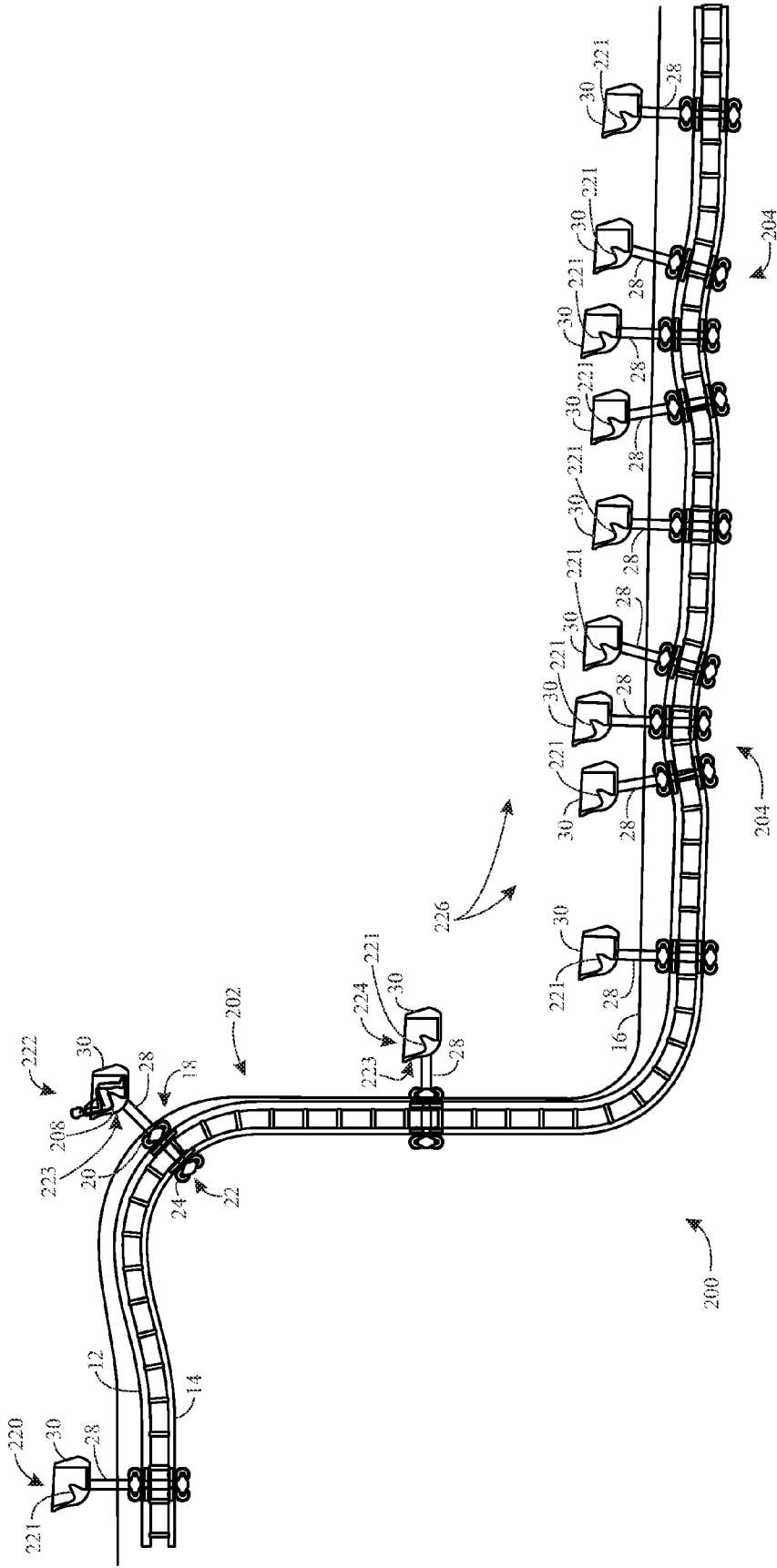


FIG. 17

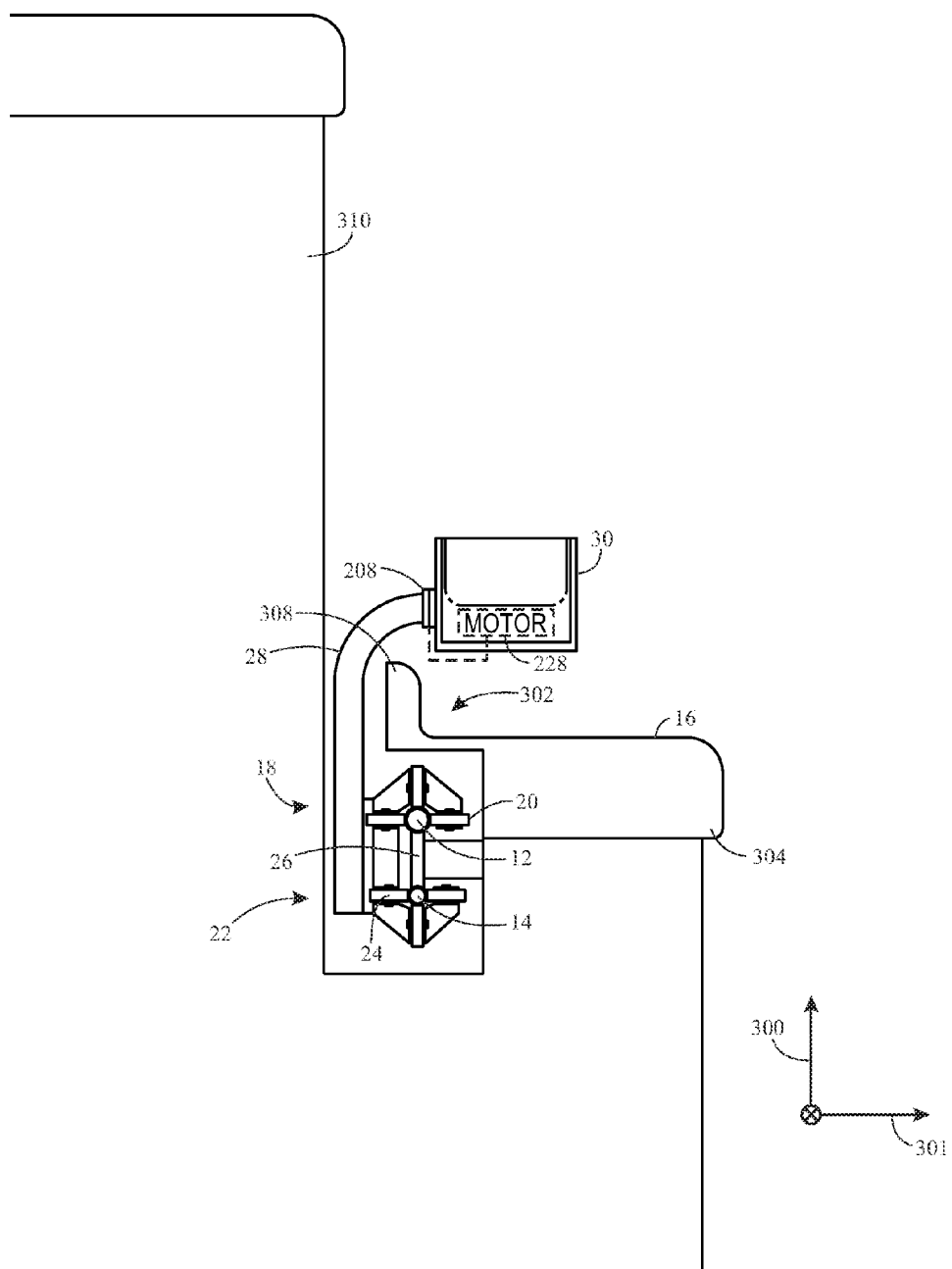


FIG. 18

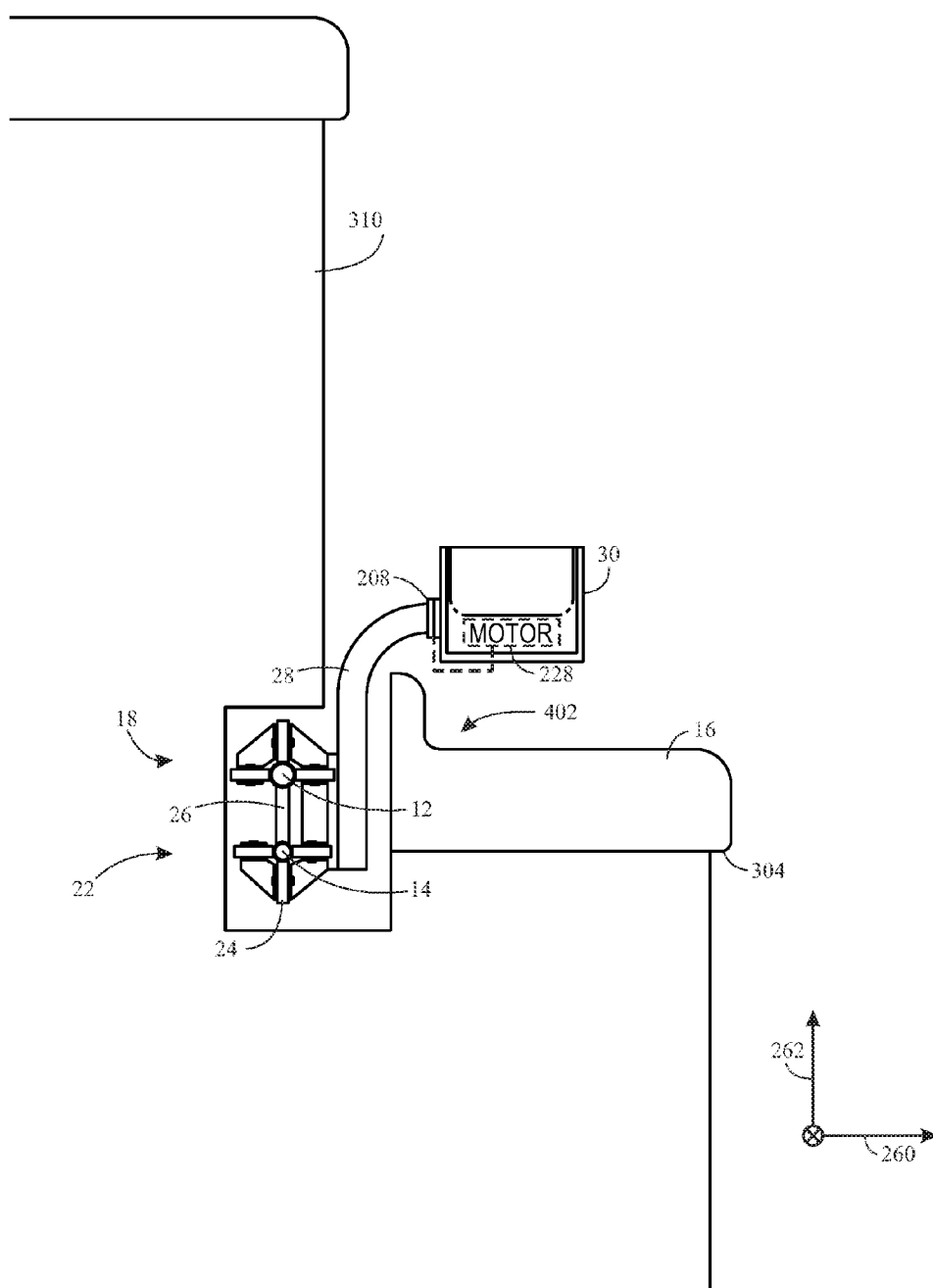
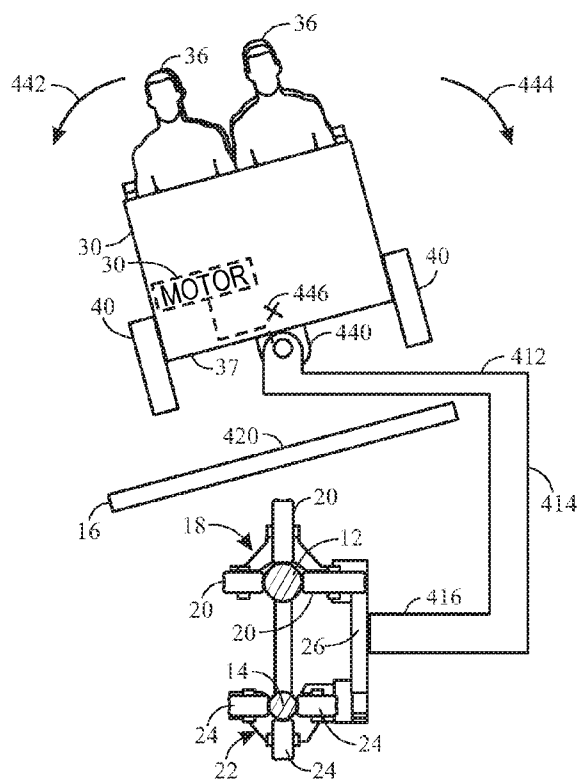
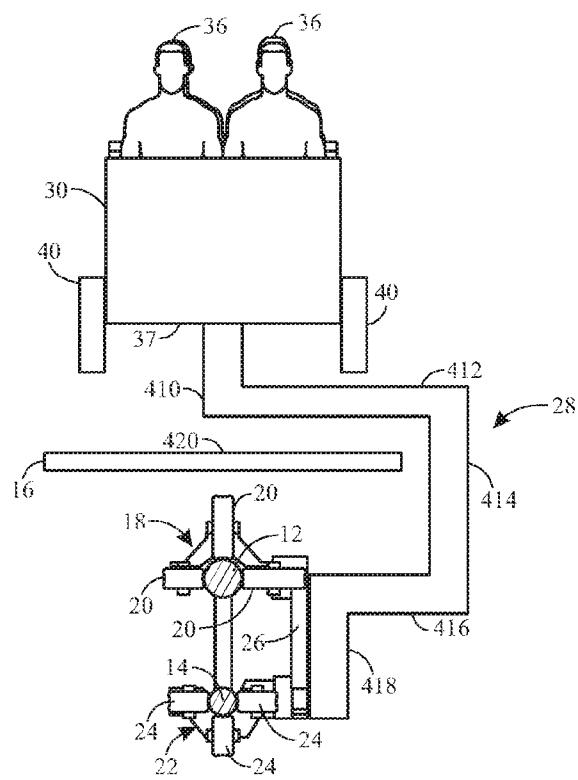


FIG. 19



## BOOM COASTER

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 62/141,044, entitled "CANTILEVERED COASTER," filed Mar. 31, 2015, and U.S. Provisional Application No. 62/171,682, entitled "CANTILEVERED COASTER," filed Jun. 5, 2015, which are hereby incorporated by reference in their entirety.

### FIELD OF DISCLOSURE

[0002] The present disclosure relates generally to the field of amusement parks. More specifically, embodiments of the present disclosure relate to systems and methods utilized to provide amusement park experiences.

### BACKGROUND

[0003] Various amusement rides have been created to provide passengers with unique motion and visual experiences. For example, roller coasters and theme rides can be implemented with multi-passenger vehicles that travel along a fixed path. In addition to the excitement created by the speed or change in direction of the vehicles as they move along the path, the vehicles themselves may generate special effects (e.g., sound and/or motion effects). Although a repeat rider may be familiar with the general path of the ride, the special effects may create interest during second and subsequent rides. In another example, certain rides may be implemented with projection elements to create varying scenery and movement as the passenger vehicles travel along the path. However, regardless of the enhancements to such passenger vehicle rides, the rider in the passenger vehicle may not feel immersed in the ride. For example, the rider generally is aware of being within a ride because of the presence of a ride surface (e.g., a track) as well as being aware of the confines of the vehicle itself. Such awareness of the ride may prevent the ride experience from being a more accurate simulation. Accordingly, there is a need for an improved amusement ride that simulates certain experiences.

### BRIEF DESCRIPTION

[0004] Certain embodiments commensurate in scope with the originally claimed subject matter are summarized below. These embodiments are not intended to limit the scope of the disclosure, but rather these embodiments are intended only to provide a brief summary of certain disclosed embodiments. 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 accordance with one embodiment, a boom coaster includes a passenger vehicle, a track, a bogie coupled to the passenger vehicle and the track and configured to move along the track, and a simulated ride surface positioned above the track and beneath the passenger vehicle. The simulated ride surface is configured to imitate a path of the passenger vehicle, the bogie is coupled to a surface of the passenger vehicle via a leg member extending around the simulated ride surface, and the leg member suspends the passenger vehicle above the simulated surface such that the bogie and the track are blocked from a passenger view perspective of the passenger vehicle.

[0006] In accordance with another embodiment, a boom coaster includes a passenger vehicle, a track, a bogie coupled to the passenger vehicle and the track and configured to move along the track, a simulated ride surface extending along a ride path defined by the track such that the simulated ride surface remains between the passenger vehicle and the track as the passenger vehicle moves along all or portions of the ride path, and a leg member extending around the simulated ride surface and coupling the bogie to the passenger vehicle to enable the passenger vehicle to move along the ride path.

[0007] In accordance with another embodiment, a boom coaster includes a passenger vehicle, a first track disposed below the passenger vehicle, a first bogie coupled to the first track and configured to move along the first track, a second track disposed below the passenger vehicle, a second bogie coupled to the second track and configured to move along the second track, a carrier coupled to the first bogie and the second bogie, where the carrier is configured to be directed along a ride path defined by the first and second tracks by the first bogie and the second bogie, a simulated ride surface extending along the ride path such that the simulated ride surface remains between the passenger vehicle and the first and second tracks as the passenger vehicle moves along portions of the ride path, and a leg member coupled to the carrier and the passenger vehicle, where the leg member is configured to extend around the simulated ride surface and couple to a surface of the passenger vehicle.

### 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 sectional view of an embodiment of a boom coaster having a passenger vehicle driven by a bogie attached to the passenger vehicle by a leg member or boom, in accordance with an aspect of the present disclosure;

[0010] FIG. 2 is perspective view of the boom coaster of FIG. 1, in accordance with an aspect of the present disclosure;

[0011] FIG. 3 is a sectional view of an embodiment of the boom coaster of FIG. 1 that includes a horizontal track, in accordance with an aspect of the present disclosure;

[0012] FIG. 4 is a sectional view of an embodiment of the boom coaster of FIG. 1 that includes two leg members attached to the passenger vehicle, in accordance with an aspect of the present disclosure;

[0013] FIG. 5 is an elevation view of an embodiment of the boom coaster of FIG. 1 that includes two leg members coupled to separate passenger vehicles, in accordance with an aspect of the present disclosure;

[0014] FIG. 6 is an elevational side view of an embodiment of the boom coaster of FIG. 1 that includes two leg members coupled to a surface of the passenger vehicle, in accordance with an aspect of the present disclosure;

[0015] FIG. 7 is a sectional view of an embodiment of the boom coaster of FIG. 1, in which a simulated ride surface includes rails and a tie, in accordance with an aspect of the present disclosure;

[0016] FIG. 8 is a perspective view of the boom coaster of FIG. 7, in accordance with an aspect of the present disclosure;

[0017] FIG. 9 is a sectional view of an embodiment of the boom coaster of FIG. 1, in which a the simulated ride surface includes a trough configuration, in accordance with an aspect of the present disclosure;

[0018] FIG. 10 is a perspective view of the boom coaster of FIG. 9, in accordance with an aspect of the present disclosure;

[0019] FIG. 11 is a sectional view of an embodiment of the boom coaster of FIG. 1 that includes no simulated ride surface, in accordance with an aspect of the present disclosure;

[0020] FIG. 12 is a perspective view of the boom coaster of FIG. 11, in accordance with an aspect of the present disclosure;

[0021] FIG. 13 is a perspective view of an embodiment of the boom coaster of FIG. 1, in which a simulated ride surface includes a gap, in accordance with an embodiment of the present disclosure;

[0022] FIG. 14 is a perspective view of an embodiment of the boom coaster of FIG. 1, in which a simulated ride surface includes an obstruction, in accordance with an embodiment of the present disclosure;

[0023] FIG. 15 is a perspective view of an embodiment of the boom coaster of FIG. 1, in which a simulated ride surface includes a jump, in accordance with an embodiment of the present disclosure;

[0024] FIG. 16 is a perspective view of an embodiment of the boom coaster of FIG. 1, in which a simulated ride surface includes a transition between a first surface to a second surface, in accordance with an embodiment of the present disclosure;

[0025] FIG. 17 is a side view of an embodiment of a ride in which a boom coaster proceeds on a ride path that includes a substantially vertical drop and various hops or bumps, in accordance with an aspect of the present disclosure;

[0026] FIG. 18 is a sectional view of an embodiment of a boom coaster, illustrating tracks located at least partially underneath a passenger vehicle, in accordance with an aspect of the present disclosure;

[0027] FIG. 19 is a sectional view of an embodiment of a boom coaster, illustrating tracks located below and to a side of a passenger vehicle, in accordance with an aspect of the present disclosure;

[0028] FIG. 20 is a sectional view of an embodiment of the boom coaster of FIG. 1, in which the leg member or boom is coupled to the passenger vehicle at a surface of the passenger vehicle facing a simulated ride surface, in accordance with an aspect of the present disclosure; and

[0029] FIG. 21 is a section view of an embodiment of the boom coaster of FIG. 1, in which a pivot joint couples the leg member to the passenger vehicle, in accordance with an aspect of the present disclosure.

#### DETAILED DESCRIPTION

[0030] 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 con-

straints, 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.

[0031] Present embodiments of the disclosure are directed to an amusement ride that creates a simulation of a vehicle travelling along a simulated ride surface (e.g., faux tracks or a scenic piece that blocks the view of certain system components), while a path of the vehicle actually is directed (e.g., controlled) by a carrier coupled to a track, offset from the simulated ride surface (e.g., hidden from a view of the passenger). Accordingly, the simulated ride surface may include transitions such as varying surfaces, debris, breaks, jumps, or the like, such that the passenger may experience an enhanced sense of thrill due to the impression that the vehicle is safely undergoing such transitions and/or moving across the simulated ride surface. An amusement ride that includes such features may be desirable to enhance the passenger's overall experience and enjoyment. While the present disclosure focuses on an amusement ride that utilizes tracks to direct the carrier and the vehicle along a ride path, it should be noted that embodiments of the present disclosure are suitable for use with any amusement ride (e.g., amusement rides that utilize gravitational forces to direct the vehicle along the ride path rather than power to drive the vehicle).

[0032] FIG. 1 is a sectional view of a boom coaster 10 in accordance with aspects of the present disclosure. In certain embodiments, the boom coaster 10 may include an upper track 12 (e.g., with respect to a ground surface 13), a lower track 14 (e.g., with respect to the ground surface 13), and a simulated ride surface 16 (e.g., a scenic surface). As illustrated in FIG. 1, the upper track 12 is positioned above the lower track 14. In other embodiments, the tracks 12 and 14 may be positioned horizontally relative to the ground surface 13 (see FIG. 3) rather than in the vertical configuration (e.g., with respect to the ground surface 13) of FIG. 1. Further, in some embodiments, different track orientations may be used (e.g., the tracks 12, 14 may be positioned above the simulated ride surface 16). In still further embodiments, the boom coaster 10 may include only one track, or the boom coaster 10 may include more than two tracks (e.g., 3, 4, 5, 6, 7, 8, 9, 10, or more).

[0033] The upper track 12 may include an upper bogie 18 configured to move along the upper track 12 via one or more wheels 20. Similarly, the lower track 14 may include a lower bogie 22 configured to move along the lower track 14 via one or more wheels 24. As shown in FIG. 1, the bogies 18 and 22 may each include 3 wheels 20, 24. In other embodiments, the bogies 18, 22 may each include one wheel, two wheels, or more than three wheels. The wheels 20, 24 may be pinch wheels or any other device configured to facilitate movement of the bogies 18, 22 along the tracks 12, 14.

[0034] In certain embodiments, the upper bogie 18 and the lower bogie 22 may be coupled to a carrier 26 that, in turn, is directed along the upper and lower tracks 12, 14 by the bogies 18 and 22. In other embodiments, the carrier 26 may include the upper bogie 18 and the lower bogie 22. In still further embodiments, the carrier 26, the upper bogie 18, and the lower bogie 22, may be integrated into a single component. An arm or leg member 28 (e.g., a boom) may be coupled to the carrier 26 and to a passenger vehicle 30 (e.g.,



a vessel that transports one or more passengers along the boom coaster 10). For example, the leg member 28 may be welded to the passenger vehicle 30 and/or the carrier 26, or the leg member 28 may be attached to the passenger vehicle 30 and/or the carrier 26 using any other suitable technique (e.g., via a rotational joint or another type of articulation mechanism as shown in FIG. 21). Further, the leg member 28 may be detachable from the passenger vehicle 30, such that the leg member 28 may be attached to multiple locations of the passenger vehicle 30. In certain embodiments the leg member 28 may be an "I-beam," or a pipe, that includes a curved portion 32 (or angled portion) enabling the leg member 28 to couple to the passenger vehicle 30, while hiding at least portion of the carrier 26 and/or the tracks 12, 14. For example, in the illustrated embodiment, the leg member 28 generally has a J-shape. In other embodiments, the leg member 28 may have an L-shape, a C-shape, an S-shape, or a shape including multiple curves (e.g., a question mark shape). In some embodiments, the leg member 28 (e.g., the boom) may include a single piece of material as opposed to having multiple segments coupled to one another. In other embodiments, the leg member 28 may be any other structural component configured to couple the carrier 26 to the passenger vehicle 30. In still further embodiments, the boom coaster 10 may include more than one leg member 28, as will be discussed in further detail herein with reference to FIGS. 4 and 6.

[0035] By coupling the leg member 28 to the passenger vehicle 30 and the carrier 26, the passenger vehicle 30 may move with the bogies 18, 22 along the upper and lower tracks 12, 14. In certain embodiments, the leg member 28 is coupled to a first lateral side 34 of the passenger vehicle 30. Accordingly, the leg member 28 extends around the simulated ride surface 16, thereby eliminating any slot, gap, or groove that would be included in the simulated ride surface 16 if the leg member 28 were coupled to the passenger vehicle 30 in a manner in which the leg member 28 extended through the simulated ride surface 16. It is now recognized that such a configuration may contribute to hiding the tracks 12, 14 from a passenger 36 in the passenger vehicle 30 because the passenger 36 may be blocked from viewing the tracks 12, 14 through the slot, gap, or groove. For example, each of the passengers 36 may represent a passenger view perspective of the passenger vehicle 30, and the configuration of the boom coaster 10 may generally block the tracks 12, 14 and/or the leg member 28 from the passenger view perspective. Additionally, manufacturing the simulated ride surface 16 may be simplified by utilizing the leg member 28 that extends around the simulated ride surface 16 because the slot, gap, or groove, may not be formed in the simulated ride surface 16. This configuration also provides a more immersive environment because passengers will not observe the slot, gap, or groove in the upcoming simulated ride surface 16 as they travel along the ride path.

[0036] It should be noted that while the leg member 28 is illustrated as being coupled to the first lateral side 34 of the passenger vehicle 30, the leg member may be coupled to any side or surface of the passenger vehicle 30. For example, in other embodiments (see, e.g., FIG. 20), the leg member 28 may extend around the simulated ride surface 16 and be coupled to a bottom side 37 (e.g., surface) of the passenger vehicle 30. In still further embodiments, the leg member 28 may extend around the simulated ride surface 16 and be coupled to any suitable surface of the passenger vehicle 30.

As discussed above, the leg member 28 may be detachable from the passenger vehicle 30, and thus, configured to couple to the passenger vehicle 30 at multiple locations (e.g., the leg member is not permanently fixed to a surface of the passenger vehicle 30). Additionally, the leg member 28 may be configured to move to different locations of the passenger vehicle 30 via a slot or groove depending on movement of the passenger vehicle (e.g., the leg member 28 may move along a slot or groove of the passenger vehicle 30 as a result of movement of the passenger vehicle 30).

[0037] In some embodiments, the tracks 12, 14 are overhead of the passenger vehicle 30 and the leg member 28 would extend downward to the passenger vehicle past the simulated ride surface 16 (e.g., a faux environmental piece or faux track). Further, in embodiments that will be discussed in further detail below, the orientation of the leg member 28 relative to the passenger vehicle 30 may change throughout a ride depending on the position of the passenger vehicle 30 along a ride path. For example, as the passenger vehicle 30 approaches a downturn along the ride path, the orientation of the tracks 12, 14 relative to the passenger vehicle 30 may change and the connection between the leg member 28 and the passenger vehicle 30 may allow for rotation (e.g., pendulous movement) such that the leg member 28 extends to engagement with the passenger vehicle 30 from behind the passenger vehicle 30 during the downturn of the ride path.

[0038] The passenger experience may be further enhanced by including features that may conceal the leg member 28. Concealing the leg member 28 may add to the passenger's perception that the path of passenger vehicle 30 is directed, or otherwise impacted, by the simulated ride surface 16. For example, the leg member 28 may be painted a certain color (e.g., black) that blends in with other features of the ride environment. As another example, the leg member 28 may be hidden from a passenger's view via a blocking component included on the passenger vehicle 30 (e.g., if the passenger vehicle were themed as a plane, a wing of the plane may substantially hide the leg member 28).

[0039] The passenger vehicle 30 may be coupled to the leg member 28 such that the passenger vehicle 30 is suspended a distance 38 above the simulated ride surface 16. For example, in certain embodiments, the distance 38 may be between 1 inch and 3 feet, between 0.5 inches and 1 foot, or between 0.1 and 6 inches. Moreover, the distance 38 between the passenger vehicle 30 and the simulated ride surface 16 may vary throughout the course of the boom coaster 10. For example, the passenger vehicle 30 may be closer to the simulated ride surface 16 at a loading/unloading zone of the boom coaster 10 such that a prospective passenger (e.g., someone waiting in line) may perceive the passenger vehicle 30 as being directed along the simulated ride surface 16 (e.g., the simulated ride surface 16 dictates movement and/or a path of the passenger vehicle 30) as it approaches the loading/unloading zone. The closer the passenger vehicle 10 is to the simulated ride surface 16, the more likely that the passenger 36, or a prospective passenger, may believe that the path of the passenger vehicle 16 is directed by the simulated ride surface 16. Additionally, the passenger vehicle 30 may include wheels 40 that spin upon contact with the simulated ride surface 16, thereby enhancing a perception that a path of the passenger vehicle 30 is indeed directed by, or otherwise impacted by, the simulated ride surface 16. The wheels 40 may also be configured to

spin via a separate driving mechanism (e.g., an on board motor 41 or magnets) or as a result of movement of the passenger vehicle 30 (e.g., air moving through a pinwheel causing it to spin). In such embodiments, the passenger vehicle 30 may be positioned slightly above the simulated ride surface 16, thereby enabling the wheels 40 to spin without contacting the simulated ride surface 16. In other embodiments, the distance 38 may be the same throughout the boom coaster 10.

[0040] The simulated ride surface 16 may be any surface or object configured to block the tracks 12, 14, the carrier 26, and/or the leg member 28 from the passenger view perspective, while creating a perception that a path of the passenger vehicle 30 is directed by, or otherwise impacted by, the simulated ride surface 16. FIG. 2 illustrates a perspective view of the boom coaster 10 of FIG. 1, where the simulated ride surface 16 is a flat surface. In the illustrated embodiment of FIG. 2, the simulated ride surface 16 is a flat surface having an upper face 42 and a lower face 44, opposite the upper face 42. The upper and lower faces 42, 44 may be substantially parallel to a direction 46 of movement of the passenger vehicle 30 along the tracks 12, 14. It should be noted that while the passengers 36 are illustrated as facing a first direction 48, the passenger vehicle may be configured to move in a second direction 49, opposite the first direction 48, such that the passengers 36 are facing backwards to the movement. In certain embodiments, the upper face 42 and/or the lower face 44 may include drawings, paintings, pictures, protrusions, gaps, rifts, ramps, or any other feature that may enhance the passenger's visual experience and/or perception that the simulated ride surface 16 directs, or otherwise impacts or influences, the path of the passenger vehicle 30. In other embodiments, the boom coaster 10 may not include a simulated ride surface 16. Embodiments of the simulated ride surface 16 are described in more detail herein with reference to FIGS. 7-16.

[0041] As shown in the illustrated embodiment of FIG. 2, the upper track 12 and the lower track 14 may be connected by a plurality of support members 50. The support members 50 may enhance a structural integrity of the boom coaster 10, for example. In certain embodiments, the plurality of support members 50 may have the same height, such that the distance between the upper track 12 and the lower track 14 remains constant throughout a length of the tracks 12, 14. Moreover, the bogies 18 and 22 may be coupled by an interconnecting component 52, such that the bogies 18 and 22 remain a constant distance between one another. In certain embodiments, the distance between the upper track 12 and the lower track 14 corresponds to the distance between the bogies 18 and 22. Additionally, FIG. 2 illustrates the upper track 12 having a third bogie 54 and the lower track 14 having a fourth bogie 56. In the illustrated embodiment, the third and fourth bogies 54 and 56 are coupled by a second interconnecting component. Moreover, the interconnecting component 52 and the second interconnecting component may be coupled via the carrier 26.

[0042] FIG. 2 also illustrates that the passenger vehicle 30 may include more than two wheels 40 (e.g., the passenger vehicle 30 of FIG. 2 has four wheels 40) as well as transport more than two passengers 36 (e.g., the passenger vehicle 30 of FIG. 2 transports 4 passengers 36). In other embodiments, the passenger vehicle 30 may have less than two wheels (e.g., 1 or none), or the passenger vehicle 30 may have more than two wheels (e.g., 3, 4, 5, 6, 7, 8, 9, 10, or more).

Additionally, the passenger vehicle 30 may transport less than two passengers 36 (e.g., 1), or the passenger vehicle 30 may transport more than two passengers (e.g., 3, 4, 5, 6, 7, 8, 9, 10, or more) along the length of the tracks 12 and 14. Although the tracks 12 and 14 illustrated in FIGS. 1 and 2 are in the vertical configuration, the boom coaster 10 may use tracks with other configurations (e.g., horizontal).

[0043] FIG. 3 is a sectional view of the boom coaster 10 with tracks 70, 72 positioned in a side-by-side (e.g., horizontal) arrangement. Therefore, a face 74 of the carrier 26 may be substantially parallel to the upper face 42 and the lower face 44 of the simulated ride surface 16. In certain embodiments, the carrier 26 may be wider than the simulated ride surface 16 such that the carrier 26 includes an increased center of gravity to support a weight of the passenger vehicle 30 (e.g., the passenger vehicle 30 itself and the passenger 36). In other embodiments, the carrier 26 may be narrower than the passenger vehicle 30 to facilitate hiding the carrier 26 from the passenger 36. In such embodiments, the carrier 26 may be constructed from relatively heavy materials to increase the center of gravity of the carrier 26. In other embodiments having a narrow carrier, weights may be attached to the carrier 26 to enhance the center of gravity of the carrier 26. In other embodiments, the carrier 26 and/or the bogies 18 and 22, may include wheels (e.g., the wheels 20, 24) on multiple sides of the tracks 70, 72, thereby securing (e.g., clamping) the carrier 26 to the tracks 70, 72 so that it may bear the weight of the passenger vehicle 30. It should be understood that the carrier 26 may include any suitable width, weight, or clamping engagement combination, such that the carrier 26 has an appropriate center of gravity to safely and securely support the weight of the passenger vehicle 30 and the passenger 36.

[0044] In certain embodiments, the boom coaster 10 may include a leg member 76 with a first curved portion 78, a second curved portion 80, and a straight portion 81 (e.g., a bracket shape or C-shape) to couple the carrier 26 to the passenger vehicle 30. However, it should be noted that the leg member 76 may include any other suitable configuration (e.g., a J-shape or an L-shape). As shown, the leg member 76 is coupled to a second lateral side 82 of the passenger vehicle 30. The first curved portion 78 and the second curved portion 80 may enable the first track 70 and the second track 72 to be completely hidden beneath the simulated ride surface 16 (e.g., the first curved portion 78 extends underneath the simulated ride surface 16). As discussed previously, the curved portions 78, 80 may enable the leg member 76 to extend around the simulated ride surface 16, thereby eliminating the need for any gaps, grooves, or holes in the simulated ride surface 16 for the leg member 76 to pass through. In other embodiments, the leg member 76 may include only the second curved portion 80 and be coupled to a side 84 of the carrier 26, such that the first curved portion 78 is not included and the leg member 76 is substantially parallel to the side 84 of the carrier 26.

[0045] FIG. 4 is a sectional view of the boom coaster 10 of FIG. 3 having a second leg member 85 coupled to the first lateral side 34 of the passenger vehicle 30 in addition to the leg member 76 coupled to the second lateral side 82 of the passenger vehicle 30. The first and second leg members 76, 84 may be coupled to the passenger vehicle 30 via a weld or any other suitable coupling technique. Additionally, the second leg member 84 may include a third curved portion 86 and a fourth curved portion 88 to enable the carrier 26 to be

fully hidden from view of the passenger 36 (e.g., the third curved portion 86 extends underneath the simulated ride surface 16). Having the leg member 76 and the second leg member 84 may increase a load capacity (e.g., weight) of the boom coaster 10 such that the passenger vehicle 30 may be suitable to transport an increased number of passengers. For example, the leg members 76, 84 may each bear a substantially equal portion of the weight of the passenger vehicle 30, such that the carrier 26 may support an increased weight of the passenger vehicle 30. It should be noted that while the carrier 26 and tracks of FIG. 4 are shown in the horizontal configuration, the carrier 26 and the tracks 12, 14 positioned in the vertical configuration (e.g., shown in FIGS. 1 and 2) may also be used in embodiments of the boom coaster 10 having more than one leg member.

[0046] In certain embodiments, a beam 89 may be employed to support the simulated ride surface 16. The beam 89 may be positioned between the track 70 and the track 72. Therefore, the carrier 26 may be divided into two different portions (e.g., one portion coupled to the track 70 and the other portion coupled to the track 72). Accordingly, the two portions may be configured to move along the tracks 70, 72 at the same speed so that the two portions remain substantially aligned with respect to the passenger vehicle 30.

[0047] FIG. 5 illustrates a side view of the boom coaster 10 that includes a single carrier 90 for a first passenger vehicle 92 and a second passenger vehicle 94. Accordingly, the carrier 90 may be easily hidden from a viewpoint 96 of the passenger 36 because the carrier 90 may be positioned between the first passenger vehicle 92 and the second passenger vehicle 94, such that no portion of the carrier 90 extends into the viewpoint 96 of the passenger 36. Therefore, when the simulated ride surface 16 includes openings such as breaks, gaps, or the like, the passenger 36 may be prevented from seeing the carrier 90 through the opening.

[0048] The illustrated embodiment of FIG. 5 shows a first leg member 98 coupling the carrier 90 to the first passenger vehicle 92 and a second leg member 100 coupling the carrier 90 to the second passenger vehicle 94. The first leg member 98, as illustrated, includes a bend portion 102 that may enhance a load capacity (e.g., weight) of the first leg member 98. Similarly, the second leg member 100 may also include a bend portion 104. In other embodiments, the first leg member 98 and the second leg member 100 may not include the bend portions 102 and 104, respectively, but may be substantially perpendicular to a track 106.

[0049] As mentioned previously, the first leg member 98 and the second leg member 100 may include curved portions (e.g., the first curved portion 78 and the second curved portion 80 of FIG. 3) that enable the first leg member 98 to couple the carrier 90 to the first passenger vehicle 92 and the second leg member 100 to couple the carrier 90 to the second passenger vehicle 94 without creating a gap, groove, or hole in the simulated ride surface 16. These curved portions may be desirable because they eliminate the need for the gap, groove, or hole in the simulated ride surface 16, and thus, eliminate the potential for the passenger 36 to see the track 106 and/or the carrier 90 through such openings. Additionally, manufacture of the simulated ride surface 16 may be facilitated because no gap, groove, or hole is formed in the simulated ride surface 16.

[0050] FIG. 6 is a side view of the boom coaster 10 having both a first leg member 110 and a second leg member 112

coupled to the second lateral side 82 of the passenger vehicle 30. Accordingly, the load capacity of the boom coaster 10 may increase because the weight of the passenger vehicle 30 is distributed amongst more leg members (e.g., the first leg member 110 and the second leg member 112 rather than a single leg member). Any suitable number of leg members may couple the carrier 26 to the first lateral side 34 and/or the second lateral side 82 of the passenger vehicle 30 while still hiding the carrier 26 and the tracks 70, 72 from the passenger 36.

[0051] FIG. 6 illustrates the passenger vehicle 30 offset from (e.g., positioned in front of) the carrier 26. Accordingly, the passenger 36 may not be able to see the carrier 26 when looking over the sides 34, 82 of the passenger vehicle 30. Moreover, when the simulated ride surface 16 includes openings (e.g., gaps, holes, or rifts that, for example, simulate jumps or flying), the passenger 36 may not see the carrier 26 through an upcoming opening because the carrier 26 is positioned behind the passenger 36. Additionally, the passenger vehicle 30 may include a back portion 114 that may be configured to create an additional barrier to the viewpoint of the passenger 36. It should be noted that the passenger vehicle 30 may include any configuration (e.g., any suitable number of protrusions, barriers, or blocking devices) that is suitable to block the passenger 36 from viewing the carrier 26, the tracks 70, 72, and/or the leg members 110, 112, while still providing an enhanced ride experience. The carrier 26, the tracks 70, 72, and/or the leg members 110, 112 may also be concealed from the passenger 36 by utilizing a dark environment (e.g., a room or building with few lights) in a surrounding setting of the boom coaster 10. For example, the passenger 36 may not be able to see the carrier 26, the tracks 70, 72, and/or the leg members 110, 112 because of the dark environment.

[0052] As mentioned previously, the passenger vehicle 30 itself may also include blocking components that hide the carrier 26, the tracks 70, 72, and/or the leg members 110, 112 from the passenger 36. In addition to including components configured to hide the carrier 26, the tracks 70, 72, and/or the leg members 110, 112, the passenger vehicle 30 may be shaped in accordance with an overall theme of the boom coaster. For example, the passenger vehicle 30 may be a train, a boat, a plane, a car, or any other device that may be consistent with a theme of the boom coaster 10. The simulated ride surface 16 may also be consistent with the overall theme of the boom coaster 10. Therefore, the simulated ride surface 16 may include a variety of configurations to enhance the passenger's 36 ride experience.

[0053] FIG. 7 is a sectional view of the boom coaster 10 having a simulated ride surface 16 that includes a first rail 120, a second rail 122, and a tie 124. Accordingly, the simulated ride surface 16 may be configured to imitate a roller coaster track (e.g., to further enhance the perception that the path of the passenger vehicle 30 is controlled by the simulated ride surface 16). In other embodiments, the simulated ride surface 16 may be imitating a railway track (e.g., when the passenger vehicle 30 imitates a train). Additionally, although the illustrated embodiment of FIG. 7 includes the upper track 12 and the lower track 14 in the vertical configuration, the first rail 120, the second rail 122, and the tie 124 may be utilized with the horizontal configuration of the tracks 70 and 72.

[0054] FIG. 8 is a perspective view of the boom coaster 10 with the simulated ride surface 16 of FIG. 7. The embodi-

ment of FIG. 8 illustrates a plurality of ties 124 coupled to the first rail 120 and the second rail 122. In certain embodiments, the ties 124 may be spaced such that gaps 126 are formed between each of the plurality of ties 124. For example, the gaps 126 may provide a perception that the simulated ride surface 16 is a roller coaster track or a railway track. In such embodiments, the wheels 40 of the passenger vehicle 30 may be aligned with the first rail 120 and the second rail 122, such that the wheels 40 are configured to spin on contact with the first and second rails 120 and 122. In other embodiments, the ties 124 may be spaced such that no gaps are created. In the embodiments without the gaps 126, the wheels 40 of the passenger vehicle 30 may be configured to spin upon contact with the ties 124 and/or the rails 120, 122.

[0055] FIG. 9 is a sectional view of the boom coaster 10 having a simulated ride surface 16 that includes a trough configuration. Therefore, the simulated ride surface 16 includes a first barrier 130 and a second barrier 132 in addition to the upper face 42 and the lower face 44. The trough configuration of the simulated ride surface 16 may be desirable when the simulated ride surface 16 includes water (e.g., when the passenger vehicle 30 is themed as a boat or other transportation device configured to float). Accordingly, the first and second barriers 130, 132 may be configured to hold water so that the simulated ride surface 16 may convey the water as if it were flowing in a stream or river, for example. The passenger vehicle 30 of FIG. 9 is illustrated as having the wheels 40, however, no wheels may be included (e.g., when the passenger vehicle imitates a boat).

[0056] FIG. 10 is a perspective view of the boom coaster 10 having the simulated ride surface 16 of FIG. 9 (e.g., the trough configuration having the first and second barriers 130, 132). Although the illustrated embodiments of FIGS. 9 and 10 include the upper track 12 and the lower track 14 in the vertical configuration, the trough configuration of the simulated ride surface 16 may be utilized with the horizontal configuration of the tracks 70 and 72. For example, in some embodiments, the tracks 70, 72 may be disposed within the trough (e.g., inside of the barriers 130, 132 and facing the upper face 42). In such embodiments, jets or other devices configured to convey water may be utilized to direct water over the tracks 70, 72. Accordingly, rather than the simulated ride surface 16 blocking the tracks 70, 72 from the view of the passengers 36, the water flowing over the tracks 70, 72 may act to conceal the tracks 70, 72.

[0057] FIG. 11 is a sectional view of the boom coaster 10 having no simulated ride surface 16. The passenger vehicle 30 of FIG. 11 is illustrated as having the wheels 40, however, no wheels may be included. The absence of the simulated ride surface 16 may create a perception to the passenger 36 that the passenger vehicle 30 is floating or otherwise suspended above (e.g., jumping over) another surface (e.g., the ground). Accordingly, the tracks 12 and 14 may be disposed substantially beneath the passenger vehicle 30 such that the tracks 12 and 14 are hidden from the viewpoint of the passenger 36. The illustrated embodiment of FIG. 11 may be desirable when the boom coaster 10 is constructed in a dark environment, such that the passenger 36 may not easily perceive the tracks 12 and 14 in front of, or behind, the passenger vehicle 30. Additionally, FIG. 12 shows a perspective view of the boom coaster 10 having no simulated ride surface 16. Although the illustrated embodiments of FIGS. 11 and 12 include the upper track 12 and the lower

track 14 in the vertical configuration, embodiments of the boom coaster 10 having no simulated ride surface 10 may be used with the horizontal configuration of the tracks 70 and 72.

[0058] A similar effect to that achieved in FIGS. 11 and 12 may be performed by lowering the simulated ride surface 16 relative to the passenger vehicle 30 along the ride path. For example, the simulated ride surface 16 may slope downwards from the passenger vehicle 30 towards the tracks 12, 14, thereby creating a perception that the passenger vehicle is floating or otherwise suspended above the simulated ride surface 16, while still hiding the carrier 26 and/or the tracks 12, 14 from the passenger 36. In other words, the simulated ride surface 16 is still between the passenger vehicle 30 and the tracks 12, 14, but it is simply a greater distance from the passenger vehicle 30 to create a floating effect. In certain embodiments, the simulated ride surface 16 may be painted (e.g., decorated) to blend in with the surrounding settings such that the passenger believes that the simulated ride surface 16 disappeared. In actuality, however, the simulated ride surface 16 may still be beneath the passenger vehicle hiding the tracks 12, 14 and/or the carrier 26. It should be noted that different heights of the leg member 28 may facilitate a wider range of distances that may be created between the simulated ride surface 16 and the passenger vehicle. For example, the larger the height of the leg member 28, the more enjoyment the passenger 36 may experience because of the thrill created by the perception that the passenger vehicle 36 is further from the simulated ride surface 16.

[0059] FIG. 13 is a perspective view of the tracks 70 and 72 and the simulated ride surface 16 (e.g., having the first rail 120, the second rail 122, and the plurality of ties 124) that includes a gap 150 (e.g., a jump, a hole, a break, or an opening). Because the passenger 36 may believe that the simulated ride surface 16 controls a path of the passenger vehicle 30, the passenger 36 may fear or anticipate that the passenger vehicle 30 may crash or otherwise incur damage as a result of the gap 150. Accordingly, the boom coaster 10 may be configured to provide an increased thrill to the passenger 36 by creating such fear or anticipation. Moreover, the passenger 36 may feel a sense of relief or excitement when the passenger vehicle 30 safely clears the gap 150. It should be noted that the passenger vehicle 30 may travel in either a direction 152 or a direction 154 when moving across the gap 150. Although the illustrated embodiment of FIG. 13 includes the tracks 70 and 72 in the horizontal configuration, the gap 150 may also be included in embodiments using the upper track 12 and the lower track 14 (e.g., the vertical configuration).

[0060] Similarly, FIG. 14 is a perspective view of the tracks 70 and 72 and the simulated ride surface 16 (e.g., having the first rail 120, the second rail 122, and the plurality of ties 124) that includes an obstruction 160 (e.g., a puddle of water, a pile of rocks) or other form of debris in the path of the passenger vehicle. Therefore, because the passenger 36 may believe that the simulated ride surface 16 controls a path of the passenger vehicle 30, the passenger 36 may fear or anticipate that the passenger vehicle 30 may crash or otherwise incur damage as a result of the obstruction 160. Accordingly, the boom coaster 10 may be configured to provide an increased thrill to the passenger 36 by creating such fear or anticipation. Moreover, the passenger 36 may

feel a sense of relief or excitement when the passenger vehicle 30 safely clears the obstruction 160.

[0061] As shown in FIG. 14, the tracks 70 and 72 may include a first sloped portion 162 and a second sloped portion 164 so that the passenger vehicle 30 may safely ascend over the obstruction 160 and subsequently descend back towards the simulated ride surface 16 (e.g., to create a jumping effect). In other embodiments, the obstruction 160 may not inhibit the path of the passenger vehicle 30, but only appear to the passenger 36 as debris that the passenger vehicle 30 may run over. In such embodiments, the upward sloping portion 162 and the downward sloping portion 164 may not be included. It should be noted that the passenger vehicle 30 may travel in either the direction 152 or the direction 154 when moving across the obstruction 160. Although the illustrated embodiment of FIG. 14 includes the tracks 70 and 72 in the horizontal configuration, the obstruction 160 may also be included in embodiments with the upper track 12 and the lower track 14 (e.g., the vertical configuration).

[0062] FIG. 15 is a perspective view of the tracks 70 and 72 and the simulated ride surface 16 (e.g., having the first rail 120, the second rail 122, and the plurality of ties 124) that includes an elevated gap 170 (e.g., a jump, an elevated opening) in the path of the passenger vehicle. Because the passenger 36 may believe that the simulated ride surface 16 controls a path of the passenger vehicle 30, the passenger 36 may fear or anticipate that the passenger vehicle 30 may crash or otherwise incur damage as a result of the elevated gap 170. Accordingly, the boom coaster 10 may be configured to provide an increased thrill to the passenger 36 by creating such fear or anticipation. Moreover, the passenger 36 may feel a sense of relief or excitement when the passenger vehicle 30 safely clears the elevated gap 170. As shown in FIG. 15, the tracks 70 and 72 may include a sloping portion 172 so that the passenger vehicle 30 may safely ascend/descend across the elevated gap 170. It should be noted that the passenger vehicle 30 may travel in either the direction 152 or the direction 154 when moving across the elevated gap 170. Although the illustrated embodiment of FIG. 15 includes the tracks 70 and 72 in the horizontal configuration, the elevated gap 170 may also be included in embodiments with the upper track 12 and the lower track 14 (e.g., the vertical configuration).

[0063] FIG. 16 is a perspective view of the tracks 70 and 72 and the simulated ride surface 16 including a surface transition 180 between a first surface 182 (e.g., the simulated ride surface 16 with the first rail 120, the second rail 122, and the plurality of ties 124) and a second surface 184 (e.g., clouds, or any surface consistent with a theme of the boom coaster 10). Because the passenger 36 may believe that the simulated ride surface 16 controls a path of the passenger vehicle 30, the passenger 36 may fear or anticipate that the passenger vehicle 30 may not be suitable to travel on the second surface 184 (e.g., clouds, water, grass, sky). Accordingly, the boom coaster 10 may be configured to provide an increased thrill to the passenger 36 by creating such fear or anticipation. Moreover, the passenger 36 may feel a sense of relief or excitement when the passenger vehicle 30 safely travels on the second surface 184. As discussed above, the passenger vehicle 30 may be configured to travel in either the direction 152 or the direction 154. Although the illustrated embodiment of FIG. 16 includes the tracks 70 and 72 in the horizontal configuration, the surface transition 180

may also be included in embodiments with the upper track 12 and the lower track 14 (e.g., the vertical configuration).

[0064] FIG. 17 is a side view of the boom coaster 10 proceeding on a ride path 200 that includes the tracks 12, 14 arranged to provide a substantially vertical drop 202 and various hops or bumps 204. As will be appreciated, the ride path 200 may include any number of different twists, turns, drops, bumps, and so forth. The illustrated drop 202 and bumps 204 are examples to facilitate explanation of certain operational features of the boom coaster 10. For example, FIG. 17 illustrates various orientations of the passenger vehicle 30 with respect to the tracks 12, 14 and the leg member 28 as the passenger vehicle 30 progresses along the ride path 200 and encounters different configurations of the tracks 12, 14. Further, while present embodiments include both gravity-based and powered configurations, FIG. 17 illustrates a powered configuration wherein the boom coaster 10 is capable of controlling descents and so forth. For example, when the passenger vehicle 30 is traversing the drop 202, it may be operated in a controlled descent by any of various mechanisms for such controlled operation.

[0065] Specifically, FIG. 17 illustrates operational results of a rotational joint 208 that couples the leg member 28 to the passenger vehicle 30 (e.g., a pivot attachment) and adds a degree of rotational freedom. The rotational joint 208 provides an ability to pivot where the leg member 28 connects to the passenger vehicle 30 such that the passenger vehicle 30 remains upright without regard to the track orientation. That is, the rotational joint 208 functions to essentially keep the passenger vehicle 30 level during transitions along the ride path 200. For example, in an initial position 220 (e.g., a loading configuration) of the illustrated embodiment, the leg member 28 is substantially vertical and extends essentially directly downward from the passenger vehicle 30 such that it can be described as extending under the passenger vehicle 30 to the tracks 12, 14. However, as the tracks 12, 14 transition to the drop 202, the rotational joint 208 allows the leg member 28 and the passenger vehicle 30 to change their orientation with respect to one another. Based on one or more of various techniques (e.g., controlled actuation or load balancing of the passenger vehicle 30), the passenger vehicle 30 may be arranged such that a seating surface 221 of the passenger vehicle maintains a substantially level orientation with respect to the Earth (e.g., transverse to gravity) by rotating with respect to the leg member 28. Accordingly, when the passenger vehicle 30 transitions into the drop 202 (position 222), the ride vehicle 30 stays essentially level relative to the Earth but the leg member 30 transitions to being underneath and toward a rear 223 of the ride vehicle 30. Similarly, when the passenger vehicle 30 is in the middle of the drop 202 (position 224), the leg member 28 is essentially directly behind the passenger vehicle 30.

[0066] Other positions 226 of the passenger vehicle 30 and leg member 28 are also shown to illustrate that changes in the ride path 200 can cause a wide variety of orientation changes. As an example, in some embodiments, the ride path 200 may turn abruptly upward and cause the leg member 28 to rotate relative to the passenger vehicle 30 such that it is directly in front of the passenger vehicle 30. It should be noted that the rotational joint 208 may include any of various mechanisms for facilitating such rotation. Further, the rotational joint 208 may include a braking mechanism, stabilization features (e.g., resistance features that slow rotation

and prevent sway), actuation features that communicate with and facilitate control from an automation controller (e.g., a programmable logic controller), additional articulation mechanisms that facilitate motion other than rotation, and so forth. In some embodiments, the rotational joint 208 may be positioned at a center of gravity of the passenger vehicle 30. In other embodiments, the rotational joint 208 may be positioned offset from the center of gravity of the passenger vehicle 30. In such embodiments where the rotational joint 208 is offset from the center of gravity, a motor (see, e.g., FIGS. 18 and 19) may be included to adjust the rotational joint 208 and maintain the passenger vehicle at a substantially level orientation with respect to the Earth. In still further embodiments, the rotational joint 208 may be configured to change positions with respect to the passenger vehicle 30 by moving along a groove or slot of the passenger vehicle 30.

[0067] In some embodiments, the rotational joint 208 may also enable the passenger vehicle 30 to pivot (e.g., swivel) about the leg member 28. For example, the passenger vehicle may rotate about the leg member 28 via the rotational joint 208 (e.g., driven by an on-board motor 228), thereby providing the boom coaster 10 with another degree of freedom. FIGS. 18 and 19 illustrate examples of such configurations.

[0068] In particular, FIG. 18 is a sectional view of the boom coaster 10 that illustrates an embodiment wherein the tracks 12, 14 are located at least partially underneath the passenger vehicle 30. However, in different positions along the ride path 200, the tracks 12, 14 may be in different positions relative to the passenger vehicle 30 (e.g., behind or in front of the passenger vehicle 30) due to the rotation about the rotational joint 208 discussed above. Accordingly, the arrangement illustrated in FIG. 18 may be referred to as having the tracks 12, 14 and the passenger vehicle 30 in alignment along an axis (e.g., axis 300) that is transverse to a rotational axis 301 (the axis about which rotation occurs) of the rotational joint 208, which may be transverse to the direction of gravity. In the illustrated embodiment of FIG. 18, the simulated ride surface 16 is located between the tracks 12, 14 and the passenger vehicle 30 along the axis 300. A portion 302 of the simulated ride surface 16 is cantilevered over the tracks 12, 14 from a main body 304 of the simulated ride surface to block viewing of the tracks 12, 14 and other system components. In the illustrated embodiment, the simulated ride surface 16 also includes an upturned piece 308 to further block viewing. It should be noted that, in the embodiment illustrated by FIG. 18, there is also a scenic backdrop 310 that facilitates concealment of the leg member 28. For example, the scenic backdrop 310 and the leg member 28 may be painted flat black or some other color and texture to blend in with each other (or provides something to view to distract the riders from looking down toward the leg member 28).

[0069] FIG. 19 is a sectional view of the boom coaster 10 that illustrates an embodiment wherein the tracks 12, 14 are located below and to a side of the passenger vehicle 30. However, in different positions along the ride path 200, the tracks 12, 14 may be in different positions relative to the passenger vehicle 30 (e.g., to the side and also behind or in front of the passenger vehicle 30) due to the rotation about the rotational joint 208 discussed above. Accordingly, the arrangement illustrated in FIG. 19 may be referred to as having the tracks 12, 14 and the passenger vehicle 30 offset

relative to one another along the axis (e.g., axis 300) that is transverse to the rotational axis 301 of the rotational joint 208. In the illustrated embodiment of FIG. 19, the simulated ride surface 16 is positioned to the side (a lateral side) of the tracks 12, 14 along the axis 301. A portion 402 of the simulated ride surface 16 is upturned to block viewing. In the embodiment illustrated by FIG. 19, the scenic backdrop 310 extends over the tracks 12, 14 to facilitate concealment of the tracks 12, 14 and related system components. Generally, there is a housing within the backdrop 310 for the tracks 12, 14 and related system components. As set forth above, the scenic backdrop 310 and the leg member 28 may be painted flat black or some other color and texture to blend in with each other. The particular color used may also account for lighting conditions present throughout the ride. It should be noted that the embodiment shown in FIG. 19, wherein the tracks 12, 14 are offset relative to axis 300, may facilitate shortening of the leg member 28 relative to the embodiment shown in FIG. 18 because the tracks 12, 14 can be positioned closer to the passenger vehicle 30 and because the simulated ride surface 16 is not sandwiched between the tracks 12, 14 and the passenger vehicle 30.

[0070] FIG. 20 is a sectional view of the boom coaster 10, illustrating the leg member 28 coupled to the bottom surface 37 of the passenger vehicle 30. As shown in the illustrated embodiment of FIG. 20, the leg member 28 may include a coupling member 410 (e.g., coupling the leg member 28 to the passenger vehicle 30), a first horizontal member 412, a first vertical member 414, a second horizontal member 416, and/or a second vertical member 418. The coupling member 410, the first horizontal member 412, the first vertical member 414, the second horizontal member 416, and/or the second vertical member 418 may enable the leg member 28 to include a configuration that wraps around the simulated ride surface 16 (e.g., overlaps at least a portion of three sides of the simulated ride surface 16) and couples to the bottom surface of the passenger vehicle 30. Accordingly, the leg member 28 may be substantially blocked from the view of the passengers 36. The second horizontal member 416 and the second vertical member 418 may enable the tracks 12, 14 to be positioned underneath the simulated ride surface 16 at a point 420 that is substantially at the center of the simulated ride surface 16. As such, the tracks 12, 14 may be further blocked from the view of the passengers 36. However, the point 420 of attachment may be located off-center in other embodiments.

[0071] As discussed above, it may be beneficial to configure the passenger vehicle 30 with additional degrees of freedom to provide enhanced enjoyment to the passengers 36 of the boom coaster 10. For example, FIG. 21 is a sectional view of the boom coaster 10, illustrating the leg member 28 coupled to the passenger vehicle 30 via a pivot joint 440. In certain embodiments, the pivot joint 440 may enable the passenger vehicle 30 to rotate in a first direction 442 and/or a second direction 444 about an axis 446 (e.g., a longitudinal axis of the passenger vehicle 30). Accordingly, the boom coaster 10 may provide the effect of the passenger vehicle 30 making a sharp curve and/or traveling over an uneven surface. As shown in the illustrated embodiment of FIG. 21, the simulated ride surface 16 is substantially parallel with the bottom surface 37 of the passenger vehicle 30 while the passenger vehicle 30 is tilted, thereby creating the effect that the ride path of the passenger vehicle 30 is controlled by the simulated ride surface 16. However, in

other embodiments, the simulated ride surface **16** may not be parallel to the bottom surface **37** of the passenger vehicle, thereby creating the effect that the passenger vehicle **30** is moving on one of the wheels **40**.

**[0072]** In certain embodiments, the passenger vehicle **30** may rotate in the first direction **442** and/or the second direction **444** by passively actuating the pivot joint **440** (e.g., using an gravitational forces and the weight of the passenger vehicle **30**), thereby rotating the passenger vehicle **30** about the axis **446**. In other embodiments, the pivot joint **440** may be positioned offset from a center of gravity of the passenger vehicle **30**. Accordingly, rotation of the passenger vehicle **30** may be actively controlled using an on-board motor **448**, for example, to rotate the passenger vehicle **30** about the axis **446** as the passenger vehicle **30** moves along the ride path. In such scenarios, the additional degree of freedom provided by the pivot joint **440** may provide enhanced amusement to the passengers **36**, thereby potentially encouraging the passengers **36** to ride the boom coaster **10** multiple times.

**[0073]** 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. While certain disclosed embodiments have been disclosed in the context of amusement or theme parks, it should be understood that certain embodiments may also relate to other uses. Further, it should be understood that certain elements of the disclosed embodiments may be combined or exchanged with one another.

1. A boom coaster, comprising:
  - a passenger vehicle;
  - a track;
  - a bogie coupled to the passenger vehicle and the track and configured to move along the track; and
  - a simulated ride surface positioned above the track and beneath the passenger vehicle;
 wherein the simulated ride surface is configured to imitate a path of the passenger vehicle, the bogie is coupled to a surface of the passenger vehicle via a leg member extending around the simulated ride surface, and the leg member suspends the passenger vehicle above the simulated surface such that the bogie and the track are blocked from a passenger view perspective of the passenger vehicle.
2. The boom coaster of claim 1, wherein the simulated ride surface is substantially flat region including a face disposed substantially parallel to a direction of movement of the passenger vehicle.
3. The boom coaster of claim 1, wherein the simulated ride surface comprises a trough configuration.
4. The boom coaster of claim 1, wherein the simulated ride surface comprises a gap, an elevated gap, an obstruction, or a surface transition.
5. The boom coaster of claim 1, comprising a carrier coupled to the bogie and the leg member.
6. The boom coaster of claim 5, comprising an additional leg member coupled to the carrier and an additional surface of the passenger vehicle.
7. The boom coaster of claim 5, comprising an additional leg member coupled to the carrier and the surface of the passenger vehicle.

8. The boom coaster of claim 1, wherein the surface of the passenger vehicle is a lateral side or a bottom side of the passenger vehicle.

9. The boom coaster of claim 1, comprising an additional passenger vehicle and an additional leg member, wherein the additional leg member extends around the simulated ride surface to couple the bogie to an additional surface of the additional passenger vehicle.

10. The boom coaster of claim 1, wherein the passenger vehicle comprises a wheel configured to spin when in contact with the simulated ride surface, to spin when the passenger vehicle moves along the ride path, or both.

11. The boom coaster of claim 1, wherein the passenger vehicle comprises a wheel that does not engage the simulated ride surface and is configured to spin via a motor.

12. A boom coaster, comprising:

- a passenger vehicle;
- a track;
- a bogie coupled to the passenger vehicle and the track and configured to move along the track;
- a simulated ride surface extending along a ride path defined by the track such that the simulated ride surface remains between the passenger vehicle and the track as the passenger vehicle moves along all or portions of the ride path; and
- a leg member extending around the simulated ride surface and coupling the bogie to the passenger vehicle to enable the passenger vehicle to move along the ride path.

13. The boom coaster of claim 12, wherein the leg member is coupled to a surface of the passenger vehicle via a rotational joint.

14. The boom coaster of claim 13, wherein the passenger vehicle and the rotational joint are configured to facilitate maintaining an orientation of the passenger vehicle relative to the Earth as the track configuration changes along a ride path.

15. The boom coaster of claim 13, wherein the track is offset from the passenger vehicle along an axis transverse to a rotational axis of the rotational joint.

16. The boom coaster of claim 13, wherein the rotational joint comprises an axis of rotation that is substantially transverse to gravity.

17. The boom coaster of claim 13, wherein the track comprises a drop, a bump, or both.

18. A boom coaster, comprising:

- a passenger vehicle;
- a first track disposed below the passenger vehicle;
- a first bogie coupled to the first track and configured to move along the first track;
- a second track disposed below the passenger vehicle;
- a second bogie coupled to the second track and configured to move along the second track;
- a carrier coupled to the first bogie and the second bogie, wherein the carrier is configured to be directed along a ride path by the first bogie and the second bogie;
- a simulated ride surface extending along a ride path defined by the first and second tracks such that the simulated ride surface remains between the passenger vehicle and the first and second tracks as the passenger vehicle moves along portions of the ride path; and
- a leg member coupled to the carrier and the passenger vehicle, wherein the leg member is configured to

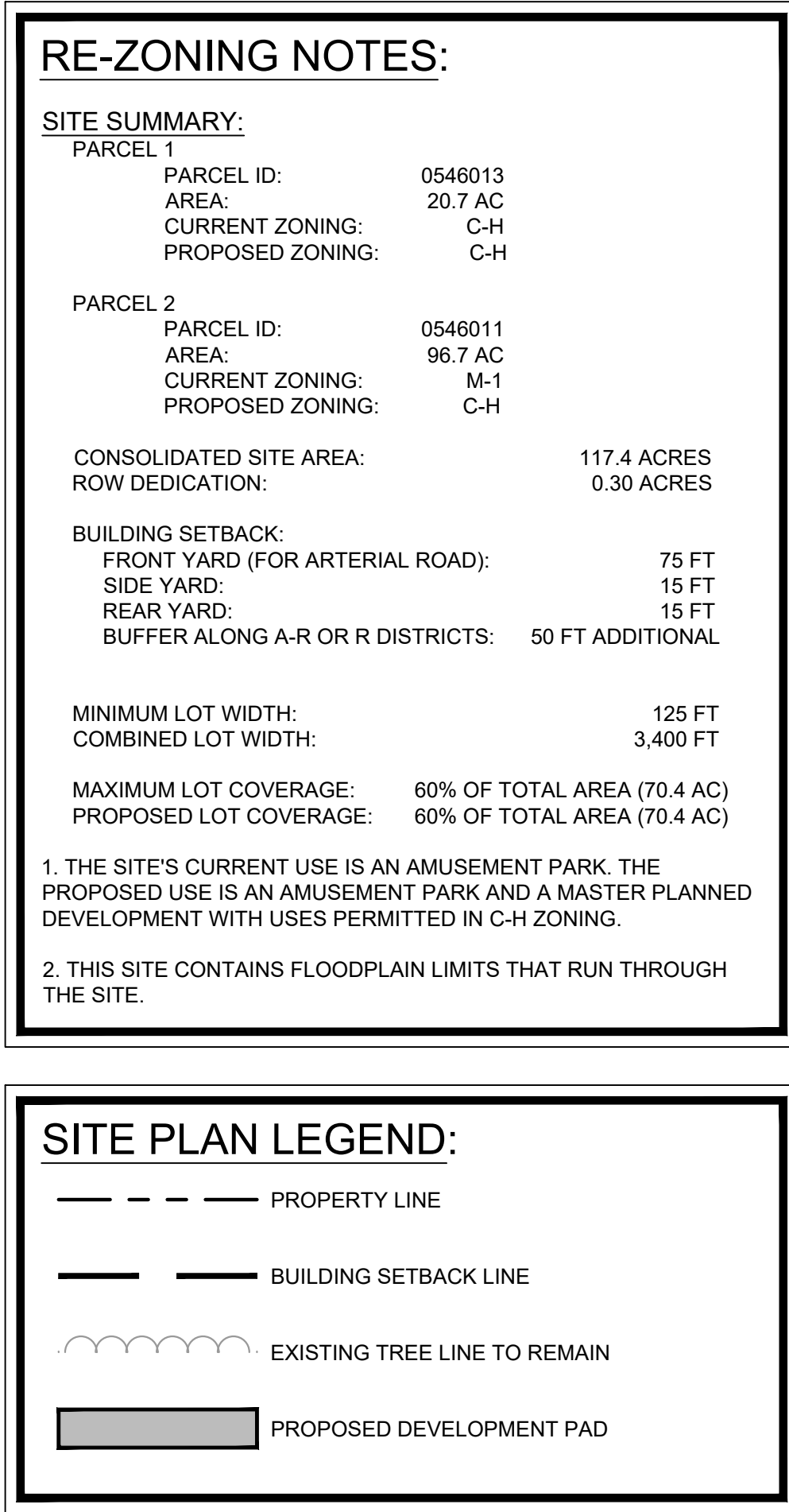
extend around the simulated ride surface and couple to a surface of the passenger vehicle.

**19.** The boom coaster of claim **18**, wherein the leg member is a substantially “J”-shaped boom.

**20.** The boom coaster of claim **18**, wherein the leg member is coupled to the passenger vehicle via a pivot joint, wherein the pivot joint is configured to provide the passenger vehicle an additional degree of freedom.

\* \* \* \* \*





SHEET NUMBER  
**C0-10**

