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United States Patent	12391322
Kind Code	B2
Date of Patent	August 19, 2025
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### Support structure for connecting at least one support wheel assembly to a frame of a track system and track system having the same

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#### Abstract

A support structure having an axle and a multi-linkage assembly including first and second linkages for connecting at least one support wheel assembly to a frame member of a track system is disclosed. The first and second linkages are connectable to the frame member and the axle, and cooperatively define an imaginary pivot, which defines a pivot axis about which the axle can pivot due to the multi-linkage assembly. A support structure having an axle, at least one resilient body, and frame and axle clamping assemblies is also disclosed. The at least one resilient body, connectable to the frame member and the axle by the frame and axle clamping assemblies, defines an imaginary pivot, which defines a pivot axis. The at least one resilient body is deformable such that the axle is pivotable about the pivot axis. Track systems having the support structures and resilient assemblies are also disclosed.

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**Appl. No.:** 17/477798

**Filed:** September 17, 2021

#### Prior Publication Data

<b>Document Identifier</b>	<b>Publication Date</b>
US 20220089231 A1	Mar. 24, 2022

#### Related U.S. Application Data

us-provisional-application US 63080135 20200918

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Publication Classification

Int. Cl.: B62D55/15 (20060101)

U.S. Cl.:

CPC B62D55/15 (20130101);

Field of Classification Search

CPC: B62D (55/10); B62D (55/14); B62D (55/15); B62D (55/104); B62D (55/1086)

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## Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) The present application claims priority to U.S. Provisional Patent Application Ser. No. 63/080,135, filed Sep. 18, 2020, entitled “Support Structure For Connecting At Least One Support Wheel Assembly To A Frame Of A Track System And Track System Having The Same”, which is incorporated by reference herein in its entirety.

### TECHNICAL FIELD

(1) The present technology relates to support structures for track systems and track systems having support structures.

### BACKGROUND

(2) Certain vehicles, such as, for example, agricultural vehicles (e.g., harvesters, combines, tractors, etc.), construction vehicles (e.g., trucks, front-end loaders, etc.) and recreational vehicles (e.g., all-terrain vehicles, utility-terrain vehicles, side-by-side vehicles, etc.) are used on ground surfaces that are soft, slippery and/or uneven (e.g., soil, mud, sand, ice, snow, etc.).

(3) Conventionally, such vehicles have had large wheels with tires on them to move the vehicle along the ground surface. Under certain conditions, such tires may have poor traction on some kinds of ground surfaces and, as these vehicles are generally heavy, the tires may compact the ground surface in an undesirable way owing to the weight of the vehicle. For example, when the vehicle is an agricultural vehicle, the tires may compact the soil in such a way as to undesirably inhibit the growth of crops. When the vehicle is a recreational vehicle, the tires may lack traction on certain terrain and in certain conditions.

(4) In order to reduce the aforementioned drawbacks, to increase traction and to distribute the weight of the vehicle over a larger area on the ground surface, track systems were developed to be used in place of at least some of the wheels and tires on the vehicles. For example, under certain conditions, track systems enable agricultural vehicles to be used in wet field conditions as opposed to its wheeled counterpart. In other conditions, track systems enable recreational vehicles to be used in low traction terrains such as snowy roads.

(5) Conventional track systems do, however, present some inconveniences.

(6) When conventional track systems travel over laterally uneven surfaces, drive lugs can come into contact with wheels, which can result in premature wear of the drive lugs of the track, and/or sometimes result in detracking of the track system. Travelling over laterally uneven surface with conventional track systems can also lead to uneven load distribution across the endless track, which can result in premature wear of the endless track of the track system.

(7) Therefore, there is a desire for a track system that could mitigate the above-mentioned issues.

### SUMMARY

(8) It is therefore an object of the present technology to ameliorate the situation with respect to at least one of the inconveniences present in the prior art.

(9) It is also an object of the present technology to provide a support structure for connecting support wheel assemblies to a frame of the track system, and to a track system having such support

structure that are improved at least in some instances as compared with some of the prior art.

(10) The present technology relates to a support structure for a track system having support wheel assemblies including laterally spaced support wheels. The support structure has a pivoting mechanism that pivots about a relatively stationary imaginary pivot. The support structure of the present technology increases the pivotal range of motion of the support wheels without interfering with the drive lugs of the track system provided on the inner surface of the endless track. As such, the support structure aids the track system to better conform to ground irregularities, reduce wear of the endless track of the track system, improve load distribution on the track and reduce risks of detracking.

(11) In the context of the following description, “outwardly” or “outward” means away from a longitudinal center plane of the track system, and “inwardly” or “inward” means toward the longitudinal center plane. In addition, in the context of the following description, “longitudinally” means in a direction parallel to the longitudinal center plane of the track system in a plane parallel to flat level ground, “laterally” means in a direction perpendicular to the longitudinal center plane in a plane parallel to flat level ground, and “generally vertically” means in a direction contained in the longitudinal center plane along a height direction of the track system generally perpendicular to flat level ground. Note that in the Figures, a “+” symbol is used to indicate an axis of rotation. In the context of the present technology, the term “axis” may be used to indicate an axis of rotation. Also, the terms “pivot assembly” and “wheel assemblies” include all the necessary structure (bearing structures, pins, axles and other components) to permit a structure/wheel to pivot/rotate about an axis, as the case may be. Moreover, the direction of forward travel of the track system is indicated by an arrow in FIG. 1. In the present description, the “leading” components are components located towards the front of the vehicle defined consistently with the vehicle's forward direction of travel, and the “trailing” components are components located towards the rear of the vehicle defined consistently with the vehicle's forward direction of travel. In the following description and accompanying Figures, the track system is configured to be attached to a right side of the chassis of the vehicle.

(12) According to an aspect of the present technology, there is provided a support structure for connecting at least one support wheel assembly to a frame of a track system. The frame of the track system includes a frame member, and the track system has a longitudinal center plane. The support structure includes an axle and a multi-linkage assembly. The axle is adapted to support the at least one support wheel assembly. The axle is spaced from the frame member, and has an axle axis extending transversally to the longitudinal center plane. The multi-linkage assembly has a first linkage and a second linkage. The first linkage is connectable between the frame member and the axle, and extends on a first side of the longitudinal center plane. The second linkage is connectable between the frame member and the axle, and extends on a second side of the longitudinal center plane. The first and second linkages are adapted for allowing movement between the frame member and the axle, and for connecting the axle to the frame member of the track system such that an imaginary pivot is cooperatively defined by the first and second linkages. The imaginary pivot defines a pivot axis extending below the axle axis.

(13) In some embodiments, the pivot axis is vertically spaced from an inner surface of an endless track of the track system within about 25% of a distance between the axle axis and the inner surface.

(14) In some embodiments, the pivot axis is vertically aligned with the inner surface of the endless track of the track system.

(15) In some embodiments, the pivot axis is movable laterally relative to the longitudinal center plane by less than about three millimeters.

(16) In some embodiments, the axle is pivotable about the pivot axis within a range of motion of between about -15 and about +15 degrees.

(17) In some embodiments, the multi-linkage assembly further includes a frame linkage

connectable to the frame member. The frame linkage extends transversally to the longitudinal center plane, and the first and second linkages are pivotally connectable to the frame linkage.

(18) In some embodiments, the first linkage has a first frame connecting portion that extends between the frame member and the axle and that is disposed on the first side of the longitudinal center plane. The second linkage has a second frame connecting portion that extends between the frame member and the axle and that is disposed on the second side of the longitudinal center plane. The first and second frame connecting portions are formed from a resilient material.

(19) In some embodiments, the first linkage further has a first axle connecting portion extending parallel to the axle axis, and in front of the axle. The second linkage further has a second axle connecting portion extending parallel to the axle axis, and at the rear of the axle. The first and second axle connecting portions cover at least partially the axle.

(20) In some embodiments, the first and second linkages, and the first and second axle connecting portions are formed from a resilient material.

(21) In some embodiments, at least one of the first linkage, the first frame connecting portion and the first axle connecting portion are integral, and the second linkage, the second frame connecting portion and the second axle connecting portion are integral.

(22) In some embodiments, the first and second linkages, the first and second frame connecting portions, and the first and second axle connecting portions are integral.

(23) In some embodiments, the pivot axis extends parallel to the longitudinal center plane.

(24) In another aspect of the present technology, there is provided a track system including the support structure according to the above aspect or according to the above aspect and one or more of the above embodiments.

(25) According to another aspect of the present technology, there is provided a support structure for connecting at least one support wheel assembly to a frame of a track system. The frame of the track system includes a frame member, and the track system has a longitudinal center plane. The support structure includes an axle, a resilient assembly that includes least one resilient body, a frame clamping assembly and an axle clamping assembly. The axle is adapted for supporting the at least one support wheel assembly. The axle is vertically spaced from the frame member, and has an axle axis that extends transversally to the longitudinal center plane. The axle also has an axle plane that extends vertically and contains the axle axis. The at least one resilient body has at least one frame connecting portion, at least one axle connecting portion and at least one intermediate portion. The at least one frame connecting portion is connectable to the frame member. The at least one axle connecting portion is spaced from the at least one frame connecting portion, and is connectable to the axle. The at least one intermediate portion extends between the at least one frame connecting portion and the at least one axle connecting portion. The frame clamping assembly is adapted for clamping the frame connecting portion to the frame member. The axle clamping assembly is adapted for clamping the axle connecting portion to the axle. The resilient assembly defines an imaginary pivot. The imaginary pivot defines a pivot axis that is positioned below the axle axis, and the resilient assembly is deformable such that the axle is pivotable about the pivot axis.

(26) In some embodiments, the pivot axis extends parallel to the longitudinal center plane.

(27) In some embodiments, the pivot axis is vertically aligned with an inner surface of an endless track of the track system.

(28) In some embodiments, the pivot axis is vertically spaced from the inner surface of the endless track within about 25% of a distance between the axle axis and the inner surface.

(29) In some embodiments, the pivot axis is movable laterally relative to the longitudinal center plane by less than about three millimeters.

(30) In some embodiments, the axle is pivotable about the pivot axis within a range of motion of between about  $-15$  and about  $+15$  degrees.

(31) In some embodiments, the resilient assembly includes a first resilient body and a second resilient body.

- (32) In some embodiments, the at least one frame connecting portion includes a first frame connecting portion and a second frame connecting portion. The frame clamping assembly includes a first frame clamping member adapted to clamp the first frame connecting portion to the frame member on a first side of the longitudinal center plane, and the frame clamping assembly further includes a second frame clamping member adapted to clamp the second frame connecting portion to the frame member on a second side of the longitudinal center plane.
- (33) In some embodiments, at least one of the first frame clamping member covers at least a portion of the first frame connecting portion, and the second frame clamping member covers at least a portion of the second frame connecting portion.
- (34) In some embodiments, the at least one axle connecting portion includes a first axle connecting portion and a second axle connecting portion. The axle clamping assembly includes a first axle clamping member adapted to clamp the first axle connecting portion to the axle on a first side of the axle plane, and the axle clamping assembly further includes a second axle clamping member adapted to clamp the second axle connecting portion to the axle on a second side of the axle plane.
- (35) In some embodiments, at least one of the first axle clamping member covers at least a portion of the first axle connecting portion, and the second axle clamping member covers at least a portion of the second axle connecting portion.
- (36) In some embodiments, the at least one frame connecting portion, the at least one intermediate portion and the at least one axle connecting portion are integral.
- (37) In some embodiments, the at least one axle connecting portion covers at least partially the axle.
- (38) In another aspect of the present technology, there is provided a track system including the support structure according to the above aspect or according to the above aspect and one or more of the above embodiments.
- (39) In another aspect of the present technology, there is provided a resilient assembly comprising at least one resilient body for connecting an axle having an axle axis and a support wheel assembly to a frame member of a frame of a track system. The at least one resilient body includes at least one frame connecting portion being connectable to the frame member. The at least one resilient body further includes at least one axle connecting portion being spaced from the at least one frame connecting portion, the at least one axle connecting portion being connectable to the axle. The at least one resilient body further includes at least one intermediate portion extending between the at least one frame connecting portion and the at least one axle connecting portion. The resilient assembly defines an imaginary pivot, the imaginary pivot defining a pivot axis being positioned below the axle axis, and the resilient assembly is deformable such that the axle is pivotable about the pivot axis.
- (40) In some embodiments, the resilient assembly includes a first resilient body and a second resilient body.
- (41) In some embodiments, the at least one frame connecting portion includes a first frame connecting portion and a second frame connecting portion.
- (42) In some embodiments, the at least one axle connecting portion includes a first axle connecting portion and a second axle connecting portion.
- (43) In some embodiments, the at least one frame connecting portion, the at least one intermediate portion and the at least one axle connecting portion are integral.
- (44) In some embodiments, the at least one axle connecting portion covers at least partially the axle.
- (45) Embodiments of the present technology each have at least one of the above-mentioned object and/or aspects, but do not necessarily have all of them. It should be understood that some aspects of the present technology that have resulted from attempting to attain the above-mentioned object may not satisfy this object and/or may satisfy other objects not specifically recited herein.
- (46) Additional and/or alternative features, aspects, and advantages of embodiments of the present

technology will become apparent from the following description, the accompanying drawings, and the appended claims.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

- (1) For a better understanding of the present technology, as well as other aspects and further features thereof, reference is made to the following description which is to be used in conjunction with the accompanying drawings, where:
- (2) FIG. 1 is a close-up, right side elevation view of an all-terrain vehicle equipped with a rear, right track system having support structures in accordance with a first embodiment of the present technology;
- (3) FIG. 2 is a perspective view taken from a top, front, left side of the track system of FIG. 1;
- (4) FIG. 3 is a front elevation view of one of the support structures of the track system of FIG. 1, with a support wheel assembly connected thereto;
- (5) FIG. 4 is a perspective view taken from a top, front, right side of the support structure of FIG. 3;
- (6) FIG. 5 is a perspective view taken from a top, front, right side of an axle, an axle linkage and linkages of the support structure of FIG. 3;
- (7) FIG. 6 is a partially exploded perspective view taken from a front, top, left side of the support structure of FIG. 3, with the support wheel assembly and a portion of the frame member;
- (8) FIG. 7a is a schematic illustration of the support structure of FIG. 3 being at an initial position;
- (9) FIG. 7b is a schematic illustration of the support structure of FIG. 3 being pivoted at five degrees in a clockwise direction;
- (10) FIG. 7c is a schematic illustration of the support structure of FIG. 3 being pivoted at ten degrees in the clockwise direction;
- (11) FIG. 7d is a schematic illustration of the support structure of FIG. 3 being pivoted at fifteen degrees in the clockwise direction;
- (12) FIG. 8 is perspective view taken from a top, front, left side of the track system of FIG. 1, with an endless track being omitted, and the support structures of the track system of FIG. 1 overcoming obstacles;
- (13) FIG. 9 is a perspective view taken from a top, rear, left side of a rear left track system having support structures in accordance with a second embodiment of the present technology;
- (14) FIG. 10 is a front elevation view of one of the support structures of the track system of FIG. 9 connected to a portion of a frame member, and parts of a support wheel assembly connected to the support structure;
- (15) FIG. 11 is a perspective view taken from a top, front, left side of the support structure of FIG. 10;
- (16) FIG. 12a is a perspective view taken from a top, front, left side of a resilient body of the support structure of FIG. 10;
- (17) FIG. 12b is a front view of the resilient body of FIG. 12a;
- (18) FIG. 13 is a partially exploded perspective view taken from a top, front, left side of the support structure of FIG. 10;
- (19) FIG. 14a is a schematic illustration of the support structure of FIG. 10 being at an initial position;
- (20) FIG. 14b is a schematic illustration of the support structure of FIG. 10 being pivoted at five degrees in a clockwise direction;
- (21) FIG. 14c is a schematic illustration of the support structure of FIG. 10 being pivoted at ten degrees in the clockwise direction;

- (22) FIG. 14d is a schematic illustration of the support structure of FIG. 10 being pivoted at fifteen degrees in the clockwise direction;
- (23) FIG. 15a is a perspective view taken from a top, front, left side of the track system of FIG. 9, with an endless track being omitted and the support structures being at an initial position;
- (24) FIG. 15b is a perspective view taken from a top, front, left side of the track system of FIG. 9, with the endless track being omitted and the support structures being pivoted at ten degrees;
- (25) FIG. 15c is a perspective view taken from a top, front, left side of the track system of FIG. 9, with the endless track being omitted and the support structures being pivoted at fifteen degrees;
- (26) FIG. 16 is a perspective view taken from a top, rear, left side of a rear left track system having support structures in accordance with a third embodiment of the present technology;
- (27) FIG. 17 is a partially exploded perspective view taken from a top, front, left side of one of the support structures of the track system of FIG. 16 connected to a portion of a frame member, and a support wheel assembly connected to the support structure;
- (28) FIG. 18 is a front elevation view of left and right resilient bodies, an axle linkage, an axle and an axle clamping assembly of the support structure of FIG. 17, with the support wheel assembly being connected to the axle;
- (29) FIG. 19 is a perspective view taken from a top, front, left side of the right resilient body, the left reinforcing member, the axle linkage, the axle and the axle clamping assembly of FIG. 18;
- (30) FIG. 20 is a perspective view taken from a top, front, left side of the left and right resilient bodies, the axle linkage, the axle and the axle clamping assembly of FIG. 18, with the left and right resilient bodies being shown in transparency;
- (31) FIG. 21 is a perspective view taken from a top, front, left side of the left and right resilient bodies, the axle linkage, the axle and the axle clamping assembly of FIG. 18;
- (32) FIG. 22 is a perspective view taken from a top, front, left side of a right reinforcing member, the left resilient member and the axle linkage of the support structure of FIG. 17;
- (33) FIG. 23a is a schematic illustration of the support structure of FIG. 17 being at an initial position;
- (34) FIG. 23b is a schematic illustration of the support structure of FIG. 17 being pivoted at five degrees in a clockwise direction;
- (35) FIG. 23c is a schematic illustration of the support structure of FIG. 17 being pivoted at ten degrees in the clockwise direction;
- (36) FIG. 23d is a schematic illustration of the support structure of FIG. 17 being pivoted at fifteen degrees in the clockwise direction;
- (37) FIG. 24a is a perspective view taken from a top, front, left side of the track system of FIG. 16, with an endless track being omitted and the support structures of FIG. 17 being at an initial position;
- (38) FIG. 24b is a perspective view taken from a top, front, left side of the track system of FIG. 16, with an endless track being omitted and the support structures of FIG. 17 being pivoted at ten degrees;
- (39) FIG. 24c is a perspective view taken from a top, front, left side of the track system of FIG. 16, with an endless track being omitted and the support structures of FIG. 17 being pivoted at fifteen degrees; and
- (40) FIG. 25 is a schematic, front elevation view of a support structure for connecting a support wheel assembly to a frame of a track system in accordance with a technology being part of the prior art.

## DETAILED DESCRIPTION

### Introduction

- (41) As used herein, the singular form “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise.
- (42) The recitation herein of numerical ranges by endpoints is intended to include all numbers



subsumed within that range (e.g., a recitation of 1 to 5 includes 1, 1.25, 1.5, 1.75, 2, 2.45, 2.75, 3, 3.80, 4, 4.32, and 5).

(43) The term “about” is used herein explicitly or not. Every quantity given herein is meant to refer to the actual given value, and it is also meant to refer to the approximation to such given value that would reasonably be inferred based on the ordinary skill in the art, including equivalents and approximations due to the experimental and/or measurement conditions for such given value. For example, the term “about” in the context of a given value or range refers to a value or range that is within 20%, preferably within 15%, more preferably within 10%, more preferably within 9%, more preferably within 8%, more preferably within 7%, more preferably within 6%, and more preferably within 5% of the given value or range.

(44) The expression “and/or” where used herein is to be taken as specific disclosure of each of the two specified features or components with or without the other. For example, “A and/or B” is to be taken as specific disclosure of each of (i) A, (ii) B and (iii) A and B, just as if each is set out individually herein. The term “or” as used herein should in general be construed non-exclusively. For example, an embodiment of “a composition comprising A or B” would typically present an aspect with a composition comprising both A and B. “Or” should, however, be construed to exclude those aspects presented that cannot be combined without contradiction.

(45) As used herein, the term “comprise” is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded.

(46) The description of the present technology, which relates to various embodiments of a support structure **100**, is intended to be a description of illustrative examples of the present technology.

(47) It is to be expressly understood that the various embodiments of the support structure **100** are merely embodiments of the present technology. Thus, the description thereof that follows is intended to be only a description of illustrative examples of the present technology. This description is not intended to define the scope or set forth the bounds of the present technology. In some cases, what are believed to be helpful examples of modifications or alternatives to support structure **100** may also be set forth below. This is done merely as an aid to understanding, and, again, not to define the scope or set forth the bounds of the present technology. These modifications are not an exhaustive list, and, as a person skilled in the art would understand, other modifications are likely possible. Further, where this has not been done (i.e. where no examples of modifications have been set forth), it should not be interpreted that no modifications are possible and/or that what is described is the sole manner of implementing or embodying that element of the present technology. As a person skilled in the art would understand, this is likely not the case. In addition, it is to be understood that the support structure **100** may provide in certain aspects a simple embodiment of the present technology, and that where such is the case it has been presented in this manner as an aid to understanding. As persons skilled in the art would understand, various embodiments of the present technology may be of a greater complexity than what is described herein.

(48) General Description

(49) Referring to FIG. **1**, the present technology relates to a support structure **100** that is connectable to a track system **50**. The support structure **100**, which is connected to a frame member **78** of a frame **70** of the track system **50**, has an axle **112** adapted for supporting a support wheel assembly **110**. The support structure **100** is configured such that the axle **112** is pivotable with respect to the frame member **78** about a longitudinally extending pivot axis **182**.

(50) Different embodiments of the support structure **100** will be presented herein with reference to an all-terrain vehicle **40** shown partially in FIG. **1**. As will become apparent from the description below, the support structure **100** may aid the track system **50** to improve load distribution thereof, at least in some conditions.

(51) All-Terrain-Vehicle

(52) Referring to FIG. **1**, the track system **50** is operatively connected to the vehicle **40**. The vehicle

**40** is an all-terrain vehicle (ATV). It is contemplated that in alternate embodiments, the vehicle **40** could be a snowmobile, a side-by-side vehicle, a utility-terrain vehicle or another recreational vehicle. It is also contemplated that the vehicle **40** could be a harvester, a tractor, or another agricultural vehicle. Other vehicles are contemplated, and the track system **50** including the present technology is structured and configured to be used on such vehicles. Though only the rear right track system **50** is shown and described herein, the vehicle **40** includes front right, front left and rear left track systems configured to be operatively connected to their respective corners of the vehicle **40**. It is contemplated that in some embodiments, the vehicle **40** could be adapted to receive more or less than four track systems **50**.

(53) Track System

(54) Referring to FIGS. **1** and **2**, the track system **50** has a longitudinal center plane **56** that extends through a center of the track system **50**. The longitudinal center plane **56** defines a left longitudinal side and a right longitudinal side. For the purpose of the following description, components that are qualified as “left” or “right” are positioned on the corresponding left longitudinal side and right longitudinal side of the track system **50**, unless mentioned otherwise.

(55) The track system **50** has a sprocket wheel assembly **60** which is operatively connected to a driving axle **44** (schematically shown in FIG. **1**) of the vehicle **40**. It is contemplated that in some embodiments, the sprocket wheel assembly **60** could be connected to a non-driving axle. The driving axle **44** drives the sprocket wheel assembly **60**. The sprocket wheel assembly **60** can rotate about a sprocket axis **62**. The sprocket axis **62** is generally perpendicular to the longitudinal center plane **56**. The sprocket wheel assembly **60** defines two sets of laterally spaced recesses **64** that are spaced on the circumference of the sprocket wheel assembly **60**. The two sets of laterally spaced recesses **64** are adapted, as will be described in greater detail below, to receive left and right sets of laterally spaced lugs **94** provided on an endless track **90**.

(56) The track system **50** has a frame **70**. The frame **70** is positioned laterally outwardly from the sprocket wheel assembly **60**. In the present embodiment, the frame **70** has a leading frame member **72**, a trailing frame member **74**, an intermediate frame member **76**, and a frame member **78** (best seen in FIG. **6**). The leading and trailing frame members **72**, **74** are jointly connected around the driving axle **44**. The leading frame member **72** extends longitudinally from the driving axle **44** in the forward and downward directions, and connects to a forward portion of the intermediate frame member **76**. The trailing frame member **74** extends longitudinally from the driving axle **44** in the rearward and downward directions, and connects to a rearward portion of the intermediate frame member **76**. In the present embodiment, the intermediate frame member **76** is generally parallel to the longitudinal center plane **56**. The frame member **78** is connected to a bottom side of the intermediate frame member **76** (best seen in FIG. **6**).

(57) Still referring to FIGS. **1** and **2**, the track system **50** has a leading idler linkage **80** connected to the forward portion of the intermediate frame member **76**. A leading idler wheel assembly **82** is rotatably connected to the leading idler linkage **80**. The track system **50** also has a trailing idler linkage **84**. The trailing idler linkage **84** is connected to the rearward portion of the intermediate frame member **76**. A trailing idler wheel assembly **86** is rotatably connected to the trailing idler linkage **84**.

(58) It is contemplated that in some embodiments, the leading and trailing idler linkages **80**, **84** could be omitted, and that the leading and trailing idler wheel assemblies **82**, **86** could be connected to the frame **70** differently. It is also contemplated that in some embodiments, the leading idler linkage **80** and/or the trailing idler linkage **84** could include a tensioner being operable to adjust tension in the endless track **90**.

(59) The track system **50** also includes five support structures **100**. It is contemplated that in other embodiments, there could be more or less than five support structures **100**. Each of the support structures **100** is adapted to connect a support wheel assembly **110** to the frame **70**. The support structures **100** will be described in greater detail below.

(60) The track system **50** also has the endless track **90** that extends around components of the track system **50**, including the frame **70** and the leading and trailing idler and support wheel assemblies **82, 86, 110**. The endless track **90** has an inner surface **92** and an outer surface **96** (FIG. 2). The inner surface **92** includes the wheel engagement surface, and has the left and right sets of laterally spaced lugs **94**. The lugs **94** project from a central portion of the inner surface **92** and are engageable by the sprocket wheel assembly **60**. The outer surface **96** has a tread defined thereon. It is contemplated that the tread could vary from one embodiment to another. In some embodiments, the tread could depend on the type of vehicle **40** on which the track system **50** is to be used and/or the type of ground surface on which the vehicle **40** is destined to travel. The endless track **90** is an endless polymeric track. It is contemplated that within the scope of the present technology, the endless track **90** may be constructed of a wide variety of materials and structures including metallic components known in track systems.

#### First Embodiment

(61) Referring now to FIGS. 3 to 8, a first embodiment of the support structure **100**, support structure **105**, will be described. As previously mentioned, in the present embodiment, the track system **50** has five support structures **105**. As the five support structures **105** are the same, only one support structure **105** will be described in detail.

(62) Referring to FIG. 3, the support structure **105** has the axle **112** that is adapted to support the support wheel assembly **110**. The axle **112** is positioned below the frame member **78** (FIG. 6). Thus, the axle **112** is spaced from the frame member **78**. The axle **112** has an axle axis **116** that extends generally transversally to the longitudinal center plane **56**. Therefore, the axle **112** also extends generally transversally to the longitudinal center plane **56**.

(63) The support wheel assembly **110** connected to the axle **112** includes the left and right support wheels **114, 115**. The left and right support wheels **114, 115** are rotatably connected to the axle **112**. In the present embodiment, the left and right support wheels **114, 115** each have a diameter of 144 millimetres (5.67 in). It is contemplated that in other embodiments, the left and right support wheels **114, 115** could be sized differently. For instance, the diameter of the support wheels **114, 115** could range from 129 millimetres (5.08 in) to 159 millimetres (6.26 in). It is contemplated that in some embodiments, there could be a support wheel bogie or a tandem support wheel assembly connected to the axle **112**. It is contemplated that in such embodiments, the support wheel bogie or the tandem support wheel assembly could have two or more wheels connected thereto. It is also contemplated that in some embodiments, the support wheel bogie or the tandem support wheel assembly could be rotatable about the axle **112**.

(64) Referring now to FIGS. 4 and 5, the support structure **105** has a multi-linkage assembly **108**. The multi-linkage assembly **108** includes an axle linkage **120**, two leading left linkages **132**, two trailing left linkages **134**, two leading right linkages **142**, two trailing right linkages **144**, a leading frame linkage **162** and a trailing frame linkage **163**. As will be described below, in the present embodiment, the leading and trailing left and right linkages **132, 134, 142, 144** are indirectly connectable to the frame member **78** and the axle **112**. In the present embodiment, the leading left and right linkages **132, 142** are pivotally connected to the axle linkage **120** and to the leading frame linkage **162**, and the trailing left and right linkages **134, 144** are pivotally connected to the axle linkage **120** and to the trailing frame linkage **163**.

(65) The axle linkage **120** is connected to the axle **112**. In the present embodiment, the axle linkage **120** is connected to the axle **112** such that the axle **112** is rotatably fixed relative to the axle linkage **120**. It is contemplated that in some embodiments, the axle linkage **120** could be rotatably connected to the axle **112**. The axle linkage **120** has a leading axle linkage member **122** and a trailing axle linkage member **123**. The leading and trailing axle linkage members **122, 123** are generally parallel to the axle axis **116**, and thus, are generally transversal to the longitudinal center plane **56**. The leading and trailing axle linkage members **122, 123** each define a left aperture **124** and a right aperture **125**. As will be described below, the leading and trailing left and right linkages

**132, 134, 142, 144** are connected to the axle **112** by the leading and trailing axle linkage members **122, 123**. It is contemplated that in some embodiments, the axle linkage **120** could be omitted. In such embodiments, the leading and trailing left and right linkages **132, 134, 142, 144** could directly be connected to the axle **112**.

(66) Referring to FIG. 6, as mentioned above, the multi-linkage assembly **108** also includes the leading and trailing left and right linkages **132, 134, 142, 144**. It is contemplated that in some embodiments, there could be more or less than two leading and trailing left and right linkages **132, 134, 142, 144**. It is also contemplated that in some embodiments, there could be only two linkages: a left linkage and a right linkage. As the leading and trailing left and right linkages **132, 134, 142, 144** are similar, only the leading left and right linkages **132, 142** will be described.

(67) Referring to FIGS. 5 and 6, as mentioned above, there are two leading left linkages **132**: linkage **136** and linkage **138**. As previously mentioned, it is contemplated that there could be only one leading left linkage **132**. The linkages **136, 138** extend on the left side of the longitudinal center plane **56**. There are also two leading right linkages **142**: linkage **146** and linkage **148**. As previously mentioned, it is contemplated that there could be only one leading right linkage **142**. The linkages **146, 148** extend on the right side of the longitudinal center plane **56**. Each of the linkages **136, 138, 146, 148** defines an upper aperture **150** and a lower aperture **156** on the upper and lower ends, respectively, of the linkages **136, 148, 146, 148**.

(68) In the present embodiment, the multi-linkage assembly **108** also has the leading and trailing frame linkages **162, 163** (best seen in FIG. 4) that are connectable to the frame member **78**. It is contemplated that in some embodiments, there could be more or less than two frame linkages **162, 163**. In the present embodiment, the leading and trailing frame linkages **162, 163** extend generally transversally to the longitudinal center plane **56**. The leading and trailing frame linkages **162, 163** each define a left aperture **164** and a right aperture **165**. It is contemplated that in some embodiments, the leading and trailing frame linkages **162, 163** could be omitted. In such embodiments, the leading and trailing left and right linkages **132, 134, 142, 144** could directly be connected to the frame member **78**.

(69) The connection of the multi-linkage assembly **108** will now be described. In the present embodiment, the leading frame linkage **162** is longitudinally aligned with the leading axle linkage member **122**. The left and right apertures **164, 165** of the leading frame linkage **162** are, respectively, laterally offset from the left and right apertures **124, 125** of the leading axle linkage member **122**. More precisely, the left and right apertures **164, 165** are laterally further from the longitudinal center plane **56** than the left and right apertures **124, 125**. Likewise, the trailing frame linkage **163** is longitudinally aligned with the trailing axle linkage member **123**. The left and right apertures **164, 165** of the trailing frame linkage **163** are, respectively, laterally offset from the left and right apertures **124, 125** of the trailing axle linkage member **123**. More precisely, the left and right apertures **164, 165** are laterally further from the longitudinal center plane **56** than the left and right apertures **124, 125**.

(70) As the leading and trailing left and right linkages **132, 134, 142, 144** are connected similarly, only the connection of the leading left and right linkages **132, 142** will be described.

(71) The left aperture **124** of the leading axle linkage member **122** is coaxial to the lower apertures **156** of the linkages **136, 138**. Together, the left aperture **124** and the lower apertures **156** define a lower left axis **190a**. A bolt **170a** is received in the lower aperture **156** of the linkage **136**, in the left aperture **124** of the leading axle linkage member **122**, and in the lower aperture **156** of the linkage **138**. A nut **172a** is fastened to a part of the bolt **170a** extending through the left aperture **124** and the lower apertures **156**, thereby pivotally connecting the linkages **136, 138** to the axle linkage **120**.

(72) Likewise, the left aperture **164** of the leading frame linkage **162** is coaxial to the upper apertures **150** of the linkages **136, 138**. Together, the left aperture **164** and the upper apertures **150** define an upper left axis **192a**. A bolt **171a** is received in the upper aperture **150** of the linkage **136**, in the left aperture **164** of the leading frame linkage **162**, and in the upper aperture **150** of the

linkage **138**. A nut **173a** is fastened to a part of the bolt **171a** extending through the left aperture **164** and the upper apertures **150**, thereby pivotally connecting the linkages **136**, **138** to the leading frame linkage **162**.

(73) Due to the lateral offset between the left aperture **124** and the left aperture **164**, the linkages **136**, **138** are oriented at an angle from the longitudinal center plane **56**, such that the lower end of each of the linkages **136**, **138** are closer to the longitudinal center plane **56** than the upper end of each of the linkages **136**, **138**.

(74) In a similar fashion, the right aperture **125** of the leading axle linkage member **122** is coaxial to the lower apertures **156** of the linkages **146**, **148**. Together, the right aperture **125** and the lower apertures **156** define a lower right axis **190b**. A bolt **170b** is received in the lower aperture **156** of the linkage **146**, in the right aperture **125** of the leading axle linkage member **122**, and in the lower aperture **156** of the linkage **148**. A nut **172b** is fastened to a part of the bolt **170b** extending through the right aperture **125** and the lower apertures **156**, thereby pivotally connecting the linkages **146**, **148** to the axle linkage **120**.

(75) Likewise, the right aperture **165** of the leading frame linkage **162** is coaxial to the upper apertures **150** of the linkages **146**, **148**. Together, the right aperture **165** and the upper apertures **150** define an upper right axis **192b**. A bolt **171b** is received in the upper aperture **150** of the linkage **146**, in the right aperture **165** of the leading frame linkage **162**, and the upper aperture **150** of the linkage **148**. A nut **173b** is fastened to a part of the bolt **171b** extending through the right aperture **165** and the upper apertures **150**, thereby pivotally connecting linkages **146**, **148** to the leading frame linkage **162**.

(76) Due to the lateral offset between the right aperture **125** and the right aperture **165**, the linkages **146**, **148** are oriented at an angle from the longitudinal center plane **56**, such that the lower end of each of the linkages **146**, **148** are closer to the longitudinal center plane **56** than the upper end of each of the linkages **146**, **148**.

(77) The trailing left and right linkages **134**, **144** are connected to the trailing axle linkage member **123** similarly, and therefore their connection will not be described.

(78) Referring to FIGS. 3 and 7a to 7d, the leading left and right linkages **132**, **142** (together with the linkages **134**, **144**, **136**, **146**, **138**, **148**) are positioned to cooperatively define an imaginary pivot **180**. More specifically, as the leading left and right linkages **132**, **142** are found at an angle with respect to the longitudinal center plane **56**, left and right imaginary projections **195a**, **195b** eventually intersect at the imaginary pivot **180** when the support structure **105** is in an initial position (FIG. 7a). The left projection **195a** passes through the upper and lower left axes **190a**, **192a**, and the right projection **195b** passes through the upper and lower right axes **190b**, **192b**. The point of intersection between the left and right projections **195a**, **195b** is the imaginary pivot **180** when the support structure **105** is in the initial position (FIG. 7a). The imaginary pivot **180** is the lower apex of an imaginary triangle **181** (FIG. 7a) defined by the left projection **195a**, the right projection **195b**, and an imaginary line **181a** passing through the lower axes **190a**, **190b** when the support structure **105** is in the initial position. The imaginary pivot **180** is said to be “cooperatively defined” by the left and right linkages **132**, **142** because the imaginary pivot **180** corresponds to the pivot that results from the cooperation of the left and right linkages **132**, **142** being pivotally connected as described above, and being found at an angle with respect to the longitudinal center plane **56**. In other words, the imaginary pivot **180** corresponds to the pivot that would be defined by a real pivoting structure supporting the axle **112** located below the axle axis **116**, which cannot be the case in the present track system **50** due to the presence of the lugs **94** on the inner surface **92** of the endless track **90**.

(79) As shown in FIG. 3, when the support structure **105** is in the initial position, the imaginary pivot **180** defines a pivot axis **182** that is laterally aligned with the longitudinal center plane **56**. The pivot axis **182** extends below the axle axis **116**, parallel to the longitudinal center plane **56**. As briefly described above, and described in more detail below, maintaining the imaginary pivot **180**,

and thus, the pivot axis **182**, within the disclosed vertical range could help reduce wear of the endless track **90** at least in some conditions. Maintaining the imaginary pivot **180** and the pivot axis **182** within a certain lateral range, as described in greater detail below, could also help reduce wear of the endless track **90**.

(80) The multi-linkage assembly **108** is configured such that the imaginary pivot **180**, and thus the pivot axis **182**, is relatively stationary relative to the longitudinal center plane **56**. In typical conditions, the imaginary pivot **180**, and thus the pivot axis **182**, is contained in the longitudinal center plane **56**. However, it is contemplated that in some embodiments, the imaginary pivot **180** could be displaced laterally.

(81) In the present embodiment, the imaginary pivot **180** and the pivot axis **182** is vertically aligned with the bottommost portion of the left and right support wheels **114**, **115**, which engage the inner surface **92** of the endless track **90**. In other words, the pivot axis **182** is contained in a plane **184** (FIG. 3) defined by the bottommost portion of the left and right support wheels **114**, **115**. It is contemplated that in some embodiments, the imaginary pivot **180** and the pivot axis **182** could be vertically spaced upwardly from the plane **184** within about 25% of a distance between the axle axis **116** and the plane **184**. As the vertical position of the imaginary pivot **180** increases, the support structure **105** becomes more unstable. In yet other embodiments, the imaginary pivot **180** and the pivot axis **182** could be vertically spaced downwardly from the plane **184** within about 25% of the distance between the axle axis **116** and the plane **184**. As the vertical position of the imaginary pivot **180** decreases, imaginary pivot **180** is more likely to move laterally.

(82) Similarly, the trailing left and right linkages **134**, **144** also define an imaginary pivot and a pivot axis that is laterally and vertically aligned with the imaginary pivot **180** and the pivot axis **182**.

(83) The multi-linkage assembly **108**, and the leading left and right linkages **132**, **142** are adapted to allow movement between the axle **112** and the frame member **78**. More precisely, the multi-linkage assembly **108**, and the leading left and right linkages **132**, **142** are configured such that the axle **112** is pivotable about the pivot axis **182** within a range of motion of about fifteen degrees in clockwise or counter-clockwise directions. It is contemplated that in some embodiments, the range of motion could be less than fifteen degrees.

(84) In the present embodiment, when the leading left and right linkages **132**, **142** move such that the axle **112** pivots about the pivot axis **182**, the pivot axis **182** remains stationary relative to the longitudinal center plane **56**. In some embodiments, the imaginary pivot **180** could move laterally relative to the longitudinal center plane **56** as the leading left and right linkages **132**, **142** move. In such embodiments, it is contemplated that the imaginary pivot **180** could move laterally by up to about three millimetres (0.12 in), when the axle **112** pivots about fifteen degrees about the pivot axis **182**. As can be seen in FIGS. 7b to 7d, when the imaginary triangle **181** moves together with the linkages **132**, **142**, the imaginary pivot **180** remains in close proximity with the longitudinal center plane **56**, i.e. the imaginary pivot **180** moves laterally by up to about three millimetres (0.12 in), when the axle **112** pivots about fifteen degrees about the pivot axis **182**. In some track systems known in the prior art, the lateral displacement of a support structure of track system that pivots fifteen degrees could reach about twelve millimetres (0.47 in). The larger the lateral displacement is, the more likely it is that the support wheels **114**, **115** could come into contact with the lugs **94**, thereby increasing wear.

(85) Therefore, when a track system **50** encounters an obstacle, or uneven terrain, on either of its left and right sides, the support structure **105** is adapted to allow the support wheels **114**, **115** and the endless track **90** to better conform to the obstacle or the uneven terrain. More precisely, the leading and trailing left and right linkages **132**, **134**, **142**, **144** pivot such that the axle **112** can pivot, allowing the left and right support wheels **114**, **115** to pivot, while reducing the interference of the left and right support wheels **114**, **115** with the lugs **94**, and thus reducing wear of the endless track **90**.

(86) Description of the Pivoting Mechanism

(87) Referring now to FIGS. **7a** to **8**, the track system **50** and the support structure **105** will be described as the track system **50** and the support structure **105** overcome obstacles of varying sizes.

(88) Referring to FIG. **7a**, the support structure **105** is shown on a flat, level surface. The support structure **105** is in the initial position. As mentioned above, when the support structure **105** is positioned on a flat surface, the pivot axis **182** is vertically aligned with the inner surface **92** of the endless track **90**, and laterally aligned with the longitudinal center plane **56**. When the support structure **105** is in the initial position, the axle **112** is not pivoted about the pivot axis **182**.

(89) Referring to FIG. **8**, support structure **105b** and support structure **105d** are shown positioned on a flat, level surface.

(90) Referring to FIG. **7b**, the support structure **105** has encountered an obstacle such that the right support wheel **115** is elevated with respect to the left support wheel **114**. The leading and trailing left and right linkages **132**, **134**, **142**, **144** have pivoted with respect to the leading and trailing frame linkage **162**, **163** and the axle linkage **120** such that the axle **112** has pivoted about the pivot axis **182** by five degrees (in the clockwise direction in FIG. **7b**), thereby allowing the right support wheel **115** and the corresponding portion of the endless track **90** to better conform to the obstacle. The imaginary pivot **180**, and thus the pivot axis **182**, is still laterally aligned with the longitudinal center plane **56**. In other words, the pivot axis **182** is still contained in the longitudinal center plane **56**.

(91) Referring to FIG. **7c**, the support structure **105** has encountered an obstacle such that the right support wheel **115** is elevated with respect to the left support wheel **114**. The leading and trailing left and right linkages **132**, **134**, **142**, **144** have pivoted with respect to the leading and trailing frame linkage **162**, **163** and the axle linkage **120** such that the axle **112** has pivoted about the pivot axis **182** by ten degrees (in the clockwise direction in FIG. **7c**). The pivot axis **182** has moved laterally to the right by one millimetre (0.039 in), such that the pivot axis **182** is no longer laterally aligned with the longitudinal center plane **56**. It is contemplated that in some embodiments, the imaginary pivot **180**, and thus the pivot axis **182**, could move less than one millimetre (0.039 in). It is also contemplated that in some embodiments, the imaginary pivot **180**, and thus the pivot axis **182**, could still be laterally aligned with the longitudinal center plane **56**. In the present embodiment, the lateral movement does not cause the left and/or right support wheels **114**, **115** to interfere with the lugs **94**.

(92) Referring to FIG. **7d**, the support structure **105** has encountered an obstacle such that the right support wheel **115** is elevated with respect to the left support wheel **114**. The leading and trailing left and right linkages **132**, **134**, **142**, **144** have pivoted with respect to the leading and trailing frame linkage **162**, **163** and the axle linkage **120** such that the axle **112** has pivoted about the pivot axis **182** by fifteen degrees (in the clockwise direction in FIG. **7d**). The pivot axis **182** has moved laterally to the right by three millimetres (0.12 inch). It is contemplated that in some embodiments, the imaginary pivot **180**, and thus the pivot axis **182**, could move less than three millimetres (0.12 inch). It is also contemplated that in some embodiments, the imaginary pivot **180**, and thus the pivot axis **182**, could still be laterally aligned with the longitudinal center plane **56**. In the present embodiment, the lateral movement does not cause the left and/or right support wheels **114**, **115** to interfere with the lugs **94**.

(93) Referring to FIG. **8**, support structure **105a** and support structure **105e** have pivoted about the pivot axis **182** by fifteen degrees in the clockwise direction, while support structure **105c** has pivoted about the pivot axis **182** by fifteen degrees in the counter-clockwise direction.

(94) As indicated above, reducing the lateral movement of the pivot axis **182** with respect to the longitudinal center plane **56** may assist in reducing wear of the lugs **94** in some conditions. Indeed, as shown in FIG. **25**, in track systems having a support structure known as prior art, when the support structure **100'** pivots about the pivot axis **182'**, the inner side of the left support wheel **114'** could come into contact with the drive lug **94'**. The left support wheel **114'** applies lateral forces to

the drive lug **94'**, and thus friction occurs in the region identified by a dotted oval in FIG. 25. Friction causes premature wear of the lugs **94'**. The lateral forces applied by the support wheel **114'** can also induce detracking of the left and right support wheels **114'**, **115'** from the endless track **90'**. (95) As described hereinabove, the present technology aids the track system **50** to better conform to uneven surfaces, which allows for better load distribution across the endless track **90**, reduces wear on the lugs **94** and reduces chances of detracking.

#### Second Embodiment

(96) Referring now to FIGS. **9** to **15**, a second embodiment of the support structure **100**, support structure **205**, will be described with reference to a track system **51**. The track system **51** is a rear left track system, and is adapted to be operatively connected to the rear left corner of the vehicle **40**. Features of the track system **51** and the support structure **205** that are similar to those of the track system **50** and the support structure **105** described above have been labelled with the same reference numerals, and will not be described again in detail unless a significant difference is noted. In the present embodiment, there are four support structures **205** connected to the track system **51**. As the four support structures **205** are similar, only one support structure **205** will be described in detail herein.

(97) Referring to FIGS. **10**, **11** and **13**, in the present embodiment, the frame member **78** of the track system **51** has a tubular shape, and extends along the longitudinal center plane **56** of the track system **51**. It is contemplated that in other embodiments, the frame member **78** could have a prismatic shape or another shape. The frame member **78** defines eight apertures along its length, but referring to the section of the frame member **78** connected to the support structure **205** currently being described, the frame member **78** defines a leading aperture **202**, and a trailing aperture **203** (FIG. **13**). The leading and trailing apertures **202**, **203** extend throughout the entirety of the frame member **78**, from the left side to the right side.

(98) The support structure **205** includes an axle **212**, a resilient assembly **207** including a resilient body **208**, a frame clamping assembly **270**, and an axle clamping assembly **290**, all of which are described in greater detail below.

(99) Referring to FIGS. **10** and **11**, the support structure **205** has the axle **212** that is adapted to support a support wheel assembly **210**. The axle **212** is positioned below the frame member **78** such that the axle **212** is vertically spaced from the frame member **78**. The axle **212** has an axle axis **216** that extends generally transversally to the longitudinal center plane **56**. Thus, the axle **212** also extends generally transversally to the longitudinal center plane **56**. The axle **212** also has an axle plane **217**. The axle plane **217** extends vertically, and contains the axle axis **216**. The axle plane **217**, which passes through the middle of the axle **212**, defines a forward side and a rearward side of the axle **212**. Given the resilient nature of the resilient assembly **207**, it is contemplated that some range of motion in yaw (i.e. motion of the axle **212** about a vertically extending axis **211** shown in FIG. **13**) could be allowed such that it is possible that the axle **212**, the axle axis **216** and the axle plane **217** could be skewed from the longitudinal center plane **56**. In the present embodiment, the axle **212** defines a left aperture **218**, and a right aperture **219**. The left and right apertures **218**, **219** extend throughout the axle **212**, from the forward side to the rearward side.

(100) The support wheel assembly **210** includes a left support wheel **214** and a right support wheel **215**, that are rotatably connected to the axle **212**. In the present embodiment, the left and right support wheels **214**, **215** each have a diameter of 144 millimetres (5.67 in). It is contemplated that in other embodiments, the left and right support wheels **214**, **215** could be sized differently. For instance, the diameters could range from 129 millimetres (5.08 in) to 159 millimetres (6.26 in). It is contemplated that in some embodiments, there could be a support wheel bogie and a tandem support wheel assembly connected to the axle **212**. It is contemplated that in such embodiments, the support wheel bogie and the tandem support wheel assembly could have two or more wheels connected thereto. It is also contemplated that in some embodiments, the support wheel bogie and the tandem support wheel assembly could be rotatable about the axle **212**.



(101) Referring to FIGS. 12 and 13, the support structure 205 also has the resilient assembly 207 that includes the resilient body 208. The resilient body 208 is connectable to the axle 212 and connectable to the frame member 78. In the present embodiment, the resilient body 208 has a left frame connecting portion 220, a right frame connecting portion 221, an intermediate portion 230, a leading axle connecting portion 240 and a trailing axle connecting portion 241. In the present embodiment, the left and right frame connecting portions 220, 221, the intermediate portion 230, the leading and trailing axle connecting portions 240, 241 are one integral body. It is contemplated that in some embodiments, the left frame connecting portion 220 and the axle connecting portion 240 could be integral and/or the right frame connecting portion 221 and the axle connecting portion 241 could be integral. It is also contemplated that in some embodiments, the left and right frame connecting portions 220, 221, the intermediate portion 230, the leading and trailing axle connecting portions 240, 241 could be distinct parts connected together. As will be described in greater detail below, the resilient body 208 is substantially rigid, such that the resilient body 208 is capable of withstanding compressive forces. The resilient body 208 is also flexible such that the resilient body 208 can resiliently deform. However, the resilient body 208 does not significantly extend when in tension. In the present embodiment, the resilient body 208 is made from a polymeric material. It is contemplated that the resilient body 208 could be made from another suitable resilient material. It is also contemplated that in some embodiments, the resilient body 208 could include reinforcing members such as steel cords, fabrics, fibers, various layers, etc. incorporated thereto to modify the mechanical properties of the resilient body 208.

(102) Referring to FIG. 12a, the left and right frame connecting portions 220, 221, which are connectable to the frame member 78, will now be described in greater detail. The left frame connecting portion 220 extends between the frame member 78 and the axle 212, and is disposed on the left side of the frame member 78. The right frame connecting portion 221 extends between the frame member 78 and the axle 212, and is disposed on the right side of the frame member 78. It is contemplated that in some embodiments, the left and right frame connecting portions 220, 221 could surround the frame member 78, such that there could be a single frame connecting portion. In the present embodiment, each one of the left and right frame connecting portions 220, 221 has a leading member 222, an intermediate member 223 and a trailing member 224. Each of the leading members 222 has a protuberance 232, each of the intermediate members 223 has a protuberance 233 and each of the trailing members 224 has a protuberance 234. As will be described in greater detail below, the protuberances 232, 233, 234 are adapted for engaging with the frame clamping assembly 270. In the present embodiment, the left and right frame connecting portions 220, 221 each define a recess 226 between the leading and intermediate members 222, 223, and a recess 227 between the intermediate and trailing members 223, 224. It is contemplated that in some embodiments, the recesses 226, 227 could be omitted, such that the leading, intermediate and trailing members 222, 223, 224 could be one member. It is also contemplated that there could be more or less than two recesses 226, 227. In the present embodiment, as best seen in FIG. 12b, the left and right frame connecting portions 220, 221 are formed from a resilient material. The left frame connecting portion 220 has a left connecting portion 228 extending from the left frame connecting portion 220 toward the intermediate portion 230, and the right frame connecting portion 221 has a right connecting portion 229 extending from the right frame connecting portion 221 toward the intermediate portion 230. In the present embodiment, the left and right connecting portions 228, 229 are more flexible than the rest of the left and right frame connecting portions 220, 221.

(103) The resilient body 208 also has the intermediate portion 230. In the present embodiment, there is one intermediate portion 230. It is contemplated that there could be more than one intermediate portion 230. For instance, in embodiments with more than one resilient body 208, there could be more than one intermediate portion 230. The intermediate portion 230 extends between the left and right frame connecting portions 220, 221 and the leading and trailing axle

connecting portions **240, 241**. The intermediate portion **230** connects the left and right frame connecting portions **220, 221** to the axle connecting portions **240, 241**. In the present embodiment, the intermediate portion **230** is more rigid than the left and right frame connecting portions **220, 221** and than the leading and trailing axle connecting portions **240, 241**. The rigidity of the intermediate portion **230** can be selected depending on the requirements and objectives set by the designer of the support structure **205**, and can be selected for example by changing the cross-sectional area between the frame and axle connecting portions **220, 221, 240, 241** and the intermediate portion **230**.

(104) The leading and trailing axle connecting portions **240, 241**, which are connectable to the axle **212**, will now be described in greater detail. The leading and trailing axle connecting portions **240, 241** are spaced from the left and right frame connecting portions **220, 221**. The leading axle connecting portion **240** extends parallel to the axle axis **216**, along the leading side of the axle **212**. The trailing axle connecting portion **241** extends parallel to the axle axis **216**, along the trailing side of the axle **212**. It is contemplated that in some embodiments, the leading and trailing axle connecting portions **240, 241** could cover the axle **212**, such that there could be only one axle connecting portion. The leading and trailing connecting portions **240, 241** define a recess **246** therebetween. As will be described in greater detail below, the recess **246** is adapted to receive the axle **212** therein. The leading axle connecting portion **240** defines a left aperture **242** and right aperture **243**, and the trailing axle connecting portion **241** defines a left aperture **244** and a right aperture **245**. The left and right apertures **242, 243** are, respectively, coaxial to the left and right apertures **244, 245**. As will be described below, the left apertures **242, 244** are coaxial to the left aperture **218** of the axle **212**, and the right apertures **243, 245** are coaxial to the right aperture **219** of the axle **212**. In the present embodiment, as best seen in FIG. **12b**, the leading and trailing axle connecting portions **240, 241** are formed from a resilient material. The leading axle connecting portion **240** has a leading connecting portion **248** extending from the leading axle connecting portion **240** toward the intermediate portion **230**, and the trailing axle connecting portion **241** has a trailing connecting portion **249** extending from the trailing axle connecting portion **241** toward the intermediate portion **230**. In the present embodiment, the leading and trailing connecting portions **248, 249** are more flexible than the rest of the leading and trailing axle connecting portions **240, 241**.

(105) Referring to FIG. **12b**, as will be described in greater detail below, when the resilient assembly **207**, and thus when the resilient body **208** deforms, it is primarily the left and right connecting portions **228, 229** and the leading and trailing connecting portions **248, 249**, which as mentioned above are more flexible than the rest of the resilient body **208**, that deform.

(106) Referring to FIGS. **11** and **13**, the frame clamping assembly **270**, which is adapted for clamping the left and right frame connecting portions **220, 221** to the frame member **78** will now be described. In the present embodiment, the frame clamping assembly **270** includes a left clamping member **272** and a right clamping member **273**. It is contemplated that in some embodiments, there could be more or less than two clamping members **272, 273**. As the left and right frame clamping members **272, 273** are similar, only the left frame clamping member **272** will be described in detail.

(107) The left frame clamping member **272** extends longitudinally along the left side of the frame member **78**, and in the present embodiment, generally has the same longitudinal length as the left frame connecting portion **220**. The frame clamping member **272** has a leading receiving portion **282**, an intermediate receiving portion **283** and a trailing receiving portion **284**. The leading, intermediate and trailing receiving portions **282, 283, 284** are adapted to receive the leading, intermediate and trailing members **222, 223, 224**. The frame clamping member **272** also defines an aperture **286** between the leading and intermediate receiving portions **282, 283**, and an aperture **287** between the intermediate and trailing portions **283, 284**.

(108) The frame clamping assembly **270** further includes four bolts **288a, 288b, 288c, 288d**. It is

contemplated that in some embodiments, there could be more or less than four bolts **288a**, **288b**, **288c**, **288d**. The bolts **288a**, **288b**, **288c**, **288d** connect the left and right frame clamping members **272**, **273** and the left and right frame connecting portions **220**, **221** to the frame member **78**. It is contemplated that in some embodiments, the left and right frame clamping members **272**, **273** could be omitted such that the bolts **288a**, **288b**, **288c**, **288d** could directly clamp the left and right frame connecting portions **220**, **221** to the frame member **78**. It is also contemplated that in some embodiments, the left and right frame clamping members **272**, **273** could clamp the left and right frame connecting portions **220**, **221** to the frame member **78** without the bolts **288a**, **288b**, **288c**, **288d**. It is contemplated that in some embodiments, the frame clamping assembly **270** could connect the left and right frame connecting portions **220**, **221** to the frame member **78** differently, such as by using an adhesive, bonding or snapping.

(109) Still referring to FIGS. **11** and **13**, the axle clamping assembly **290**, which is adapted for clamping the leading and trailing axle connecting portions **240**, **241** to the axle **212** will now be described. In the present embodiment, the axle clamping assembly **290** includes a leading clamping member **292** and a trailing clamping member **293**. It is contemplated that in some embodiments, there could be more or less than two clamping members **292**, **293**. As the leading and trailing axle clamping members **292**, **293** are similar, only the leading axle clamping member **292** will be described in detail.

(110) The axle clamping member **292** extends along the length of the axle **112** and in the present embodiment, generally has the same lateral length as the leading axle connecting portion **240**. The leading axle clamping member **292** defines a left aperture **296** and a right aperture **297**. As will be described in greater detail below, the leading axle clamping member **292** is adapted to be connected to the axle connecting portion **240**.

(111) The axle clamping assembly **290** also includes two bolts **300a**, **300b** and two nuts **302a**, **302b**. As will be described in greater detail below, in the present embodiment, the bolts **300a**, **300b** and the nuts **302a**, **302b** clamp the leading and trailing axle clamping members **292**, **293** and the leading and trailing axle connecting portions **240**, **241** to the axle **212**. It is contemplated that in some embodiments, the leading and trailing axle clamping members **292**, **293** could be omitted such that the bolts **300a**, **300b** could directly clamp the leading and trailing axle connecting portions **240**, **241** to the axle **212**. It is also contemplated that in some embodiments, the leading and trailing axle clamping members **292**, **293** could clamp the left and right axle connecting portions **240**, **241** to the axle **212** without the bolts **300a**, **300b**. It is contemplated that in some embodiments, the axle clamping assembly **290** could connect the leading and trailing axle connecting portions **240**, **241** to the axle **212** differently, such as by using an adhesive, bonding or snapping.

(112) Referring to FIGS. **10** to **13**, the support structure **205**, as assembled, will now be described.

(113) The resilient body **208** is connected to the frame member **78** by the frame clamping assembly **270**. More precisely, the left frame connecting portion **220** engages the left frame clamping member **272**, such that the protuberance **232** of the leading member **222** is received in the leading receiving portion **282**, the protuberance **233** of the intermediate member **223** is received in the intermediate receiving portion **283**, and the protuberance **234** of the trailing member **224** is received in the trailing receiving portion **284**. The bolt **288a** is received in the leading aperture **286** of the left frame clamping member **272** and the leading aperture **202** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **288a** extending through the leading apertures **202**, **286**, inside the frame member **78**. The bolt **288b** is received in the trailing aperture **287** of the left frame clamping member **272** and the trailing aperture **203** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **288b** extending through the trailing apertures **203**, **287**, inside the frame member **78**.

(114) Likewise, the right frame connecting portion **221** engages the right frame clamping member **273**, such that the protuberance **232** of the leading member **222** is received in the leading receiving

portion **282**, the protuberance **233** of the intermediate member **223** is received in the intermediate receiving portion **283**, and the protuberance **234** of the trailing member **224** is received in the trailing receiving portion **284**. The bolt **288c** is received in the leading aperture **286** of the right frame clamping member **273** and the leading aperture **202** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **288c** extending through the leading apertures **202**, **286**, inside the frame member **78**. The bolt **288d** is received in the trailing aperture **287** of the right frame clamping member **273** and the trailing aperture **203** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **288d** extending through the trailing apertures **203**, **287**, inside the frame member **78**.

(115) In the present embodiment, the left and right frame clamping members **272**, **273** fully cover the area of, respectively, the left and right frame connecting portions **220**, **221**. It is contemplated that in some embodiments, the left and right frame clamping members **272**, **273** could cover only partially the left and right frame connecting portions **220**, **221**. As will be described in more detail below, when the left and right frame connecting portions **220**, **221** undergo stress, the left and right frame clamping members **272**, **273** could help spread stress throughout the left and right frame connecting portions **220**, **221**. When the nuts are tightened, the resilient body **208** is connected to the frame member **78**.

(116) The resilient body **208** is connected to the axle **212** by the axle clamping assembly **290**. The axle **212** is received in the recess **246**. It is to be appreciated that the axle **212** can be received in the recess **246** from below, which can facilitate the servicing of the track system **51** when needed. More precisely, the bolt **300a** is received in the left aperture **296** of the leading axle clamping member **292**, in the left aperture **242** of the leading axle connecting portion **240**, in the left aperture **218** of the axle **212**, in the left aperture **244** of the trailing axle connecting portion **241** and the left aperture **296** of the trailing axle clamping member **293**. The nut **302a** is fastened to a portion of the bolt **300a** extending through the left apertures **218**, **244**, **296**. The right side of the axle connecting portions **240**, **241** is connected likewise.

(117) In the present embodiment, the leading and trailing axle clamping members **292**, **293** fully cover the area of, respectively, the leading and trailing axle connecting portions **240**, **241**. It is contemplated that in some embodiments, the leading and trailing axle clamping members **292**, **293** could only partially cover the leading and trailing axle connecting portions **240**, **241**. As will be described in more detail below, when the leading and trailing axle connecting portions **240**, **241** undergo stress, the leading and trailing axle clamping members **292**, **293** could help spread stress throughout the leading and trailing axle connecting portions **240**, **241**. When the nuts **302** are tightened, the resilient body **208** is connected to the axle **212**.

(118) In the present embodiment, the left and right frame connecting portions **220**, **221** are laterally further from the longitudinal center plane **56** than the leading and trailing axle connecting portions **240**, **241**.

(119) Referring to FIG. **10**, the resilient assembly **207** defines an imaginary pivot **320**. More precisely, as the left and right frame connecting portions **220**, **221** are laterally further from the longitudinal center plane **56** than the leading and trailing axle connecting portions **240**, **241**, left and right projections **350a**, **350b**, that, respectively, pass through the left and right sides of the resilient body **208**, intersect. The point of intersection between the left and right projections **350a**, **350b** is the imaginary pivot **320**.

(120) As shown in FIG. **10**, when the support structure **205** is in an initial position, the imaginary pivot **320** defines a pivot axis **322** that is laterally aligned with the longitudinal center plane **56**. The pivot axis **322** is positioned below the axle axis **216**, and extends generally parallel to the longitudinal center plane **56**. Given the resilient nature of the resilient body **208**, it is contemplated that the pivot axis **322** could be laterally offset from the longitudinal center plane **56**. As briefly described above, and described in more detail below, maintaining the imaginary pivot **320** and the pivot axis **322** within the disclosed vertical range could help reduce wear of the endless track **90**.

Maintaining the imaginary pivot **320** and the pivot axis **322** within a certain lateral range, as described below, could also help reduce wear of the endless track **90**.

(121) As will be described below, the resilient body **208** is configured such that the imaginary pivot **320**, and thus the pivot axis **322**, is relatively stationary relative to the longitudinal center plane **56**. However, it is contemplated that in some embodiments, the imaginary pivot **320**, and thus the pivot axis **322**, could move laterally.

(122) Referring to FIG. **10**, in the present embodiment, the imaginary pivot **320** and the pivot axis **322** are vertically aligned with the bottommost portion of the left and right support wheels **214**, **215**, which engage the inner surface **92** of the endless track **90**. In other words, the pivot axis **322** is contained in a plane **324** defined by the bottommost portion of the left and right support wheels **214**, **215**. It is contemplated that in some embodiments, the imaginary pivot **320** and the pivot axis **322** could be vertically spaced upwardly from the plane **324** within about 25% of a distance between the axle axis **216** and the plane **324**. As the vertical position of the imaginary pivot **320** increases, the support structure **205** becomes more unstable. In yet other embodiments, the imaginary pivot **320** and the pivot axis **322** could be vertically spaced downwardly from the plane **324** within about 25% of the distance between the axle axis **216** and the plane **324**. As the vertical position of the imaginary pivot **320** decreases, the imaginary pivot **320** is more likely to move laterally.

(123) As will be elaborated below, the resilient body **208** is deformable such that the axle **212** is pivotable about the pivot axis **322** within a range of motion of fifteen degrees in the clockwise or counter-clockwise directions. It is contemplated that in some embodiments, the range of motion could be less than fifteen degrees.

(124) Though the resilient body **208** is flexible, the resilient body **208** is also sufficiently rigid such that the resilient body **208** can withstand some of the weight of the track system **51** and the vehicle **40**. In the present embodiment, the left and right connecting portions **228**, **229** and the leading and trailing connecting portion **248**, **249** are more flexible than the intermediate portion **230**. It is contemplated that in some embodiments, the left and right connecting portions **228**, **229** could be more or less flexible than the leading and trailing connecting portions **248**, **249**. In the present embodiment, the left and right frame connecting portions **220**, **221** and the leading and trailing axle connecting portions **240**, **241** are equally flexible. It is contemplated that in some embodiments, the left and right frame connecting portions **220**, **221** and the leading and trailing axle connecting portions **240**, **241** could be more or less flexible than one another. In the present embodiment, when the resilient assembly **207**, and thus the resilient body **208** deforms, it is primarily the left and right connecting portions **228**, **229** and the leading and trailing connecting portions **248**, **249** that deform.

(125) In the present embodiment, when the resilient body **208** deforms so that the axle **212** can pivot about the pivot axis **322**, the pivot axis **322** remains stationary relative to the longitudinal center plane **56** of the track system **51**. In some embodiments, however, given that the imaginary pivot **320** is defined by the resilient body **208**, the imaginary pivot **320** and the pivot axis **322** could move laterally relative to the longitudinal center plane **56**, as the resilient body **208** deforms. In such embodiments, it is contemplated that the imaginary pivot **320** and the pivot axis **322** could move laterally by up to about three millimetres (0.12 in), when the axle **212** pivots about fifteen degrees about the pivot axis **322**. In some track systems known in the prior art, the lateral displacement of a support structure that pivots fifteen degrees could reach about twelve millimetres (0.47 in). The larger the lateral displacement is, the more likely it is that the support wheels **214**, **215** could come into contact with the lugs **94**, thereby increasing wear.

(126) Therefore, when the track system **51** encounters an obstacle, or uneven terrain on either of its left and right sides, the support structure **205** is adapted to allow the support wheels **214**, **215** and the endless track **90** to better conform to the obstacle or the uneven terrain. More precisely, the resilient body **208** deforms such that the axle **212** can pivot about the pivot axis **322**, allowing the left and right support wheels **214**, **215** to pivot, while reducing the interference of the left and right

support wheels **214**, **215** with the lugs **94** and thus reducing wear of the endless track **90**.

(127) Description of the Pivoting Mechanism

(128) Referring now to FIGS. **14a** to **15c**, the track system **51** and the support structure **205** will be described, as the track system **51** and the support structure **205** overcome obstacles of varying sizes.

(129) Referring to FIG. **14a**, the support structure **205** is shown on a flat, level surface. The support structure **205** is in the initial position. As mentioned above, when the support structure **205** are positioned on a flat, level surface, the pivot axis **322** is vertically aligned with the inner surface **92** of the endless track **90**, and laterally aligned with the longitudinal center plane **56**. When the support structure **205** is in the initial position, the axle **212** is not pivoted about the pivot axis **322**.

(130) Referring to FIG. **15a**, the support structures **205** are shown positioned on a flat, level surface.

(131) Referring to FIG. **14b**, the support structure **205** has encountered an obstacle such that the right support wheel **215** is elevated with respect to the left support wheel **214**. The resilient body **208** has deformed such that the axle **212** has pivoted about the pivot axis **322** by five degrees (in the clockwise direction in FIG. **14b**), thereby allowing the right support wheel **215** and the corresponding portion of the endless track **90** to better conform to the obstacle. The resilient body **208** deforming induces stress therein. The frame and axle clamping members **272**, **273**, **292**, **293** aid in distributing stress throughout the frame and axle connecting portions **220**, **221**, **240**, **241**. The imaginary pivot **320**, and thus the pivot axis **322**, is still laterally aligned with the longitudinal center plane **56**. In other words, the pivot axis **322** is still contained in the longitudinal center plane **56**.

(132) Referring to FIG. **14c**, the support structure **205** has encountered an obstacle such that the right support wheel **215** is elevated with respect to the left support wheel **214**. The resilient body **208** has deformed such that the axle **212** has pivoted about the pivot axis **322** by ten degrees (in the clockwise direction in FIG. **14c**), thereby allowing the right support wheel **215** and the corresponding portion of the endless track **90** to better conform to the obstacle. The resilient body **208** deforming induces stress therein. The frame and axle clamping members **272**, **273**, **292**, **293** aid in distributing stress throughout the frame and axle connecting portions **220**, **221**, **240**, **241**. The imaginary pivot **320**, and thus the pivot axis **322**, has moved laterally to the right by one millimetre (0.039 in), such that the imaginary pivot **320** is no longer laterally aligned with the longitudinal center plane **56**. It is contemplated that in some embodiments, the imaginary pivot **320**, and thus the pivot axis **322**, could move less than one millimetre (0.039 in). It is also contemplated that in some embodiments, the imaginary pivot **320**, and thus the pivot axis **322**, could still be aligned with the longitudinal center plane **56**. In the present embodiment, the lateral movement does not cause the left and/or right support wheels **214**, **215** to interfere with the lugs **94**.

(133) Referring to FIG. **15b**, the support structures **205** have pivoted about the pivot axis **322** by ten degrees, in the counter-clockwise direction, shown by angle  $\alpha$ .

(134) Referring to FIG. **14d**, the support structure **205** has encountered an obstacle such that the right support wheel **215** is elevated with respect to the left support wheel **214**. The resilient body **208** has deformed such that the axle **212** has pivoted about the pivot axis **322** by fifteen degrees (in the clockwise direction in FIG. **14d**), thereby allowing the right support wheel **215** and the corresponding portion of the endless track **90** to better conform to the obstacle. The resilient body **208** deforming induces stress therein. The frame and axle clamping members **272**, **273**, **292**, **293** aid in distributing stress throughout the frame and axle connecting portions **220**, **221**, **240**, **241**. The imaginary pivot **320**, and thus the pivot axis **322**, has moved laterally to the right by three millimetres (0.12 in), such that the imaginary pivot **320** is no longer aligned with the longitudinal center plane **56**. It is contemplated that in some embodiments, the imaginary pivot **320**, and thus the pivot axis **322**, could also move less than three millimetres (0.12 in). It is also contemplated that in some embodiments, the imaginary pivot **320**, and thus the pivot axis **322**, could still be

laterally aligned with the longitudinal center plane **56**. In the present embodiment, the lateral movement still does not cause the left and/or right support wheels **214**, **215** to interfere with the lugs **94**.

(135) Referring to FIG. **15c**, the support structures **205** have pivoted about the pivot axis **322** by fifteen degrees, in the counter-clockwise direction, shown by angle  $\alpha$ .

(136) As indicated above, reducing the lateral movement of the pivot axis **322** with respect to the longitudinal center plane **56** may assist in reducing wear of the lugs **94** in some conditions.

(137) As described hereinabove, the present technology aids the track system **51** to better conform to uneven surfaces, which allows for better load distribution across the endless track **90**, reduces wear on the lugs **94** and reduces chances of detracking.

(138) In addition, when travelling over uneven terrain, the track system **51** is subject to vibrations and shocks. Due to the resilient nature of the resilient body **208**, the support structure **205** acts as a damper. The support structure **205** can thus further improve the overall durability of the track system **51** by absorbing some vibrations.

### Third Embodiment

(139) Referring now to FIGS. **16** to **24**, a third embodiment of the support structure **100**, support structure **405**, will be described with reference to a track system **52**. The track system **52** is a rear left track system, and is adapted to be operatively connected to the rear left corner of the vehicle **40**. Features of the track system **52** and the support structure **405** that are similar to those of the support structure **105**, the support structure **205**, the track systems **50** and the track system **51** described above have been labelled with the same reference numerals, and will not be described again in detail, unless a significant difference is noted. In the present embodiment, there are four support structures **405** connected to the track system **52**. As the four support structures **405** are similar, only one support structure **405** will be described in detail herein.

(140) Referring to FIG. **17**, in the present embodiment, the frame member **78** of the track system **52** has a tubular shape, and extends along the longitudinal center plane **56** of the track system **52**. It is contemplated that in other embodiments, the frame member **78** could have a prismatic shape or another shape. The frame member **78** defines eight apertures along its length, but referring to the section of the frame member **78** connected to the support structure **405** currently being described, the frame member **78** defines a leading aperture **402**, and a trailing aperture **403**. The leading and trailing apertures **402**, **403** extend throughout the frame member **78**, from the left side to the right side.

(141) The support structure **405** includes an axle **412**, a resilient assembly **406** including a left resilient body **407** and a right resilient body **408**, a frame clamping assembly **470** and an axle clamping assembly **490**.

(142) Referring to FIGS. **18** and **19**, the support structure **405** has the axle **412**. The axle **412** is positioned below the frame member **78** such that the axle **412** is spaced from the frame member **78**. The axle **412** has an axle axis **416** that extends generally transversally to the longitudinal center plane **56**. Thus, the axle **412** also extends generally transversally to the longitudinal center plane **56**. The axle **412** also has an axle plane **417**. The axle plane **417** extends vertically, and contains the axle axis **416**. The axle plane **417**, which passes through the middle of the axle **412**, defines a forward side and a rearward side of the axle **412**. Given the resilient nature of the resilient assembly **406**, it is contemplated that some range of motion in yaw (i.e. motion of the axle **412** about a vertically extending axis **411** shown in FIG. **17**) could be allowed such that it is possible that the axle **412**, the axle axis **416** and the axle plane **417** could be skewed from the longitudinal center plane **56**.

(143) The axle **412** has an axle linkage **415** connected at the center thereof. The axle linkage **415** extends in the longitudinal direction, and defines two leading apertures **418** and two trailing apertures **419**.

(144) A left support wheel **413** and a right support wheel **414** are rotatably connected to the axle

**412**. In the present embodiment, the left and right support wheels **413**, **414** each have a diameter of 144 millimetres (5.67 in). It is contemplated that in other embodiments, the left and right support wheels **413m**, **414** could be sized differently. For instance, the diameters could range from 129 millimetres (5.08 in) to 159 millimetres (6.26 in). It is contemplated that in some embodiments, there could be a support wheel bogie or a tandem support wheel assembly connected to the axle **412**. It is contemplated that in such embodiments, the support wheel bogie or the tandem support wheel assembly could have two or more wheels connected thereto. It is also contemplated that in some embodiments, the support wheel bogie or the tandem support wheel assembly could be rotatable about the axle **412**.

(145) Referring now to FIGS. **19** to **22**, the resilient assembly **406** has the left and right resilient bodies **407**, **408**. It is contemplated that in some embodiments, there could be more than two resilient bodies **407**, **408**. The left and right resilient bodies **407**, **408** are connectable to the axle **412** and connectable to the frame member **78**. In the present embodiment, as will be described below, the left and right resilient bodies **407**, **408** are indirectly connected to the axle **412**. In the present embodiment, the left resilient body **407** has a frame connecting portion **420**, an intermediate portion **430** and an axle connecting portion **440**, and the right resilient body **408** has a frame connecting portion **421**, an intermediate portion **431** and an axle connecting portion **441**. The left frame connecting portion **420**, the intermediate portion **430** and the left axle connecting portion **440** are one integral body. Likewise, the frame connecting portion **421**, the intermediate portion **431** and the axle connecting portion **441** are one integral body. As will be described in greater detail below, the left and right resilient bodies **407**, **408** are substantially rigid, such that each of the left and right resilient bodies **407**, **408** is capable of withstanding compressive forces. The left and right resilient bodies **407**, **408** are also flexible, such that each of the left and right resilient bodies **407**, **408** can resiliently deform. However, the left and right resilient bodies **407**, **408** do not significantly extend when in tension. In the present embodiment, the left and right resilient bodies **407**, **408** are made from a polymeric material. It is contemplated that the left and right resilient bodies **407**, **408** could be made from another suitable resilient material. As will be described below, the left and right resilient bodies each have a reinforcing member **409**, **410** (best seen in FIGS. **19** and **22**). It is contemplated that in some embodiments, the left and right resilient bodies **407**, **408** could have additional reinforcing members such as steel cords, fabrics, fibers, various layers, etc. incorporated thereto to modify the mechanical properties of the resilient bodies **407**, **408**.

(146) Referring to FIGS. **17** to **22**, the left and right resilient bodies **407**, **408** will now be described in greater detail. The left resilient body **407** extends on the left side of the frame member **78**, and the right resilient body **408** extends on the right side of the frame member **78**. As the left and right resilient bodies **407**, **408** are similar, only the left resilient body **407** will be described in detail herein.

(147) The left resilient body **407** has the frame connecting portion **420**, which is connectable to the frame member **78**. The frame connecting portion **420** has a leading member **422**, an intermediate member **423** and a trailing member **424**. The leading member **422** has a protuberance **432**, the intermediate member **423** has a protuberance **433** and the trailing member **424** has a protuberance **434**. The protuberances **432**, **433**, **434** are adapted for engaging with the frame clamping assembly **470**. The frame connecting portion **420** defines a recess **426** between the leading and intermediate members **422**, **423**, and a recess **427** between the intermediate and trailing members **423**, **424**. It is contemplated that in some embodiments, the recesses **426**, **427** could be omitted, such that the leading, intermediate and trailing members **422**, **423**, **424** could be one member. It is also contemplated that there could be more or less than two recesses **426**, **427**. The frame connecting portion **420** has a connecting portion **428**, extending from the frame connecting portion **420** toward the intermediate portion **430**. In the present embodiment, the connecting portion **428** is more flexible than the rest of the frame connecting portion **420**.

(148) The left resilient body **407** also has the intermediate portion **430**. The intermediate portion



**430** extends between, and connects, the frame connecting portion **420** to the axle connecting portion **440**. In the present embodiment, the intermediate portion **430** is more rigid than the frame and axle connecting portions **420**, **440**. The rigidity of the intermediate portion **430** can be selected depending on the requirements and objectives set by the designer of the support structure **405**, and can be selected for example by changing the cross-sectional area between the frame and axle connecting portions **420**, **430** and the intermediate portion **430**.

(149) The left resilient body **407** also has the axle connecting portion **440** which is connectable to the axle **412**, and which includes a leading axle connecting member **442** and a trailing axle connecting member **443**. The leading and trailing axle connecting portions **442**, **443** are adapted to connect to the axle clamping assembly **490**. The leading axle connecting member **442** defines an aperture **444** at a center thereof, and the trailing axle connecting member **443** defines an aperture **445** at a center thereof. The leading and trailing axle connecting members **443**, **444** define a recess **446** therebetween. As will be described in greater detail below, the recess **446** is adapted to receive the axle **412** therein. The axle connecting portion **440** has a connecting portion **448** extending from the axle connecting portion **440** toward the intermediate portion **430**. In the present embodiment, the connecting portion **448** is more flexible than the rest of the axle connecting portion **440**. As will be described below, in the present embodiment, the apertures **444**, **445** are configured to be coaxial to the leading and trailing apertures **418**, **419** of the axle linkage **415**.

(150) The left resilient member **407** has the reinforcing member **409** embedded therein (best seen in FIGS. **19** and **20**). The reinforcing member **409** increases the rigidity of the left resilient member **407**. The increased rigidity assists in reducing the amount of undesirable deformation of the left resilient member **407**. For instance, the reinforcing member **409** reduces the deformation occurring between the forward and rearward ends of the left resilient member **407** due to torsional forces. In the present embodiment, the reinforcing member **409** is formed from fiberglass. It is contemplated that in other embodiments, the reinforcing member **409** could be formed from another suitable material.

(151) Referring to FIG. **17**, the frame clamping assembly **470**, which is adapted to clamp the frame connecting portions **420**, **421** to the frame member **78**, will now be described. In the present embodiment, the frame clamping assembly **470** includes a left clamping member **472** and a right clamping member **473**. It is contemplated that in some embodiments, there could be more or less than two clamping members **472**, **473**. As the left and right frame clamping members **472**, **473** are similar, only the left frame clamping member **472** will be described in detail.

(152) The frame clamping member **472** extends longitudinally along the left side of the frame member **78**, and in the present embodiment, generally has the same longitudinal length as the frame connecting portion **420**. The frame clamping member **472** has a leading receiving portion **482**, an intermediate receiving portion **483** and a trailing receiving portion **484**. The leading, intermediate and trailing receiving portions **482**, **483**, **484** are adapted to receive the leading, intermediate and trailing members **422**, **423**, **424**. The frame clamping member **472** defines an aperture **486** between the leading and intermediate receiving portions **482**, **483**, and an aperture **487** between the intermediate and trailing portions **483**, **484**.

(153) The frame clamping assembly **470** further includes four bolts **488a**, **488b**, **488c**, **488d**. It is contemplated that in some embodiments, there could be more or less than four bolts **488a**, **488b**, **488c**, **488d**. The bolts **488a**, **488b**, **488c**, **488d** connect the left and right frame clamping members **472**, **473** and the frame connecting portions **420**, **421** to the frame member **78**. It is contemplated that in some embodiments, the left and right frame clamping members **472**, **473** could be omitted such that the bolts **488a**, **488b**, **488c**, **488d** could directly clamp the frame connecting portions **420**, **421** to the frame member **78**. It is also contemplated that in some embodiments, the left and right frame clamping members **472**, **473** could clamp the left and right frame connecting portions **420**, **421** to the frame member **78** without the bolts **488a**, **488b**, **488c**, **488d**. It is contemplated that in some embodiments, the frame clamping assembly **470** could connect the frame connecting portions

**420, 421** to the frame member **78** differently, such as by using an adhesive, bonding or snapping. (154) Still referring to FIG. **17**, the axle clamping assembly **490**, which is adapted for clamping the axle connecting portions **440, 441** to the axle **412**, will now be described. In the present embodiment, the axle clamping assembly **490** includes a leading left clamping member **491**, a trailing left clamping member **492**, a leading right clamping member **493** and a trailing right clamping member **494**. It is contemplated that in some embodiments, there could be more or less than four clamping members **491, 492, 493, 494**. As the leading and trailing left and right axle clamping members **491, 492, 493, 494** are similar, only the leading and trailing left axle clamping members **491, 492** will be described in detail.

(155) The leading left axle clamping member **491** generally has the same longitudinal length as the leading axle connecting member **442**, and is adapted to be connected thereto. The leading left axle clamping member **491** defines an aperture **496** in a center thereof. Likewise, the trailing left axle clamping member **492** generally has the same longitudinal length as the trailing axle connecting member **443**, and is adapted to be connected thereto. The trailing left axle clamping member **492** defines an aperture **497** in a center thereof.

(156) The axle clamping assembly **490** also includes four bolts **500a, 500b, 500c, 500d** and four nuts. The bolts **500a, 500b, 500c, 500d** and the nuts connect the leading and trailing left and right axle clamping members **491, 492, 493, 494** and the axle connecting portions **440, 441** to the frame member **78**. It is contemplated that in some embodiments, the leading and trailing left and right axle clamping members **491, 492, 493, 494** could be omitted such that the bolts **500a, 500b, 500c, 500d** could directly clamp the axle connecting portions **440, 441** to the axle **412**. It is also contemplated that in some embodiments, the leading and trailing axle clamping members **491, 492, 493, 494** could clamp the axle connecting portions **440, 441** to the axle **412** without the bolts **500a, 500b, 500c, 500d**. It is contemplated that in some embodiments, the axle clamping assembly **490** could connect the axle connecting portions **440, 441** to the axle **412** differently, such as by using an adhesive, bonding or snapping.

(157) The support structure **405**, as assembled, will now be described. The left and right resilient bodies **407, 408** are connected to the frame member **78** by the frame clamping assembly **470**. More precisely, the left frame connecting portion **420** engages the left frame clamping member **472**, such that the protuberance **432** of the leading member **422** is received in the leading receiving portion **482**, the protuberance **433** of the intermediate member **423** is received in the intermediate receiving portion **483**, and the protuberance **434** of the trailing member **424** is received in the trailing receiving portion **484**. The bolt **488a** is received in the leading aperture **486** of the left frame clamping member **472** and the leading aperture **402** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **488** extending through the leading apertures **402, 486**, inside the frame member **78**. The bolt **488b** is received in the trailing aperture **487** of the left frame clamping member **472** and the trailing aperture **403** of the frame member **78**. A nut (not seen) is fastened to a portion of the bolt **488** extending through the leading apertures **403, 487**, inside the frame member **78**.

(158) The right resilient body **408** is connected to the frame member **78** likewise.

(159) In the present embodiment, the left and right frame clamping members **472, 473** fully cover the area of the frame connecting portions **420, 421**. It is contemplated that in some embodiments, the left and right frame clamping members **472, 473** could cover only partially the frame connecting portions **420, 421**. As will be described in more detail below, when the left and right frame connecting portions **420, 421** undergo stress, the left and right frame clamping members **472, 473** could help spread stress throughout the frame connecting portions **420, 421**. When the nuts are tightened, the left and right resilient bodies **407, 408** are connected to the frame member **78**.

(160) The left and right resilient bodies **407, 408** are connected to the axle **412** by the axle clamping assembly **490** and the axle linkage **415**. The axle **412** is received in the recess **446**, such that the axle linkage **415** is connectable to the left and right resilient bodies **407, 408**. The leading

and trailing left and right axle clamping members **491, 492, 493, 494** are connected to the axle connecting portions **440, 441** by the bolts **500a, 500b, 500c, 500d** and the nuts.

(161) More precisely, referring to the left resilient body **407**, the bolt **500a** is received in the aperture **496** of the leading left axle clamping member **491**, in the leading aperture **444** of the leading axle connecting member **442** and in the leading aperture **418** of the axle linkage **415**. A nut is fastened to a portion of the bolt **500a** extending through the apertures **418, 444, 496**. Likewise, the bolt **500b** is received in the aperture **497** of the trailing left axle clamping member **492**, in the trailing aperture **445** of the trailing axle connecting member **443** and in the trailing aperture **419** of the axle linkage **415**. A nut is fastened to a portion of the bolt **500b** extending through the apertures **419, 445, 497**.

(162) The right resilient body **408** is connected to the axle **412** likewise.

(163) In the present embodiment, the leading and trailing left and right axle clamping members **491, 492, 493, 494** fully cover the area of the axle connecting portions **440, 441**. It is contemplated that in some embodiments, the leading and trailing axle clamping members **492, 493** could only partially cover the axle connecting portions **440, 441**. As will be described in more detail below, when the axle connecting portions **440, 441** undergo stress, the leading and trailing axle connecting portions **240, 241** could help spread stress throughout the leading and trailing axle connecting portions **240, 241**. When the nuts are tightened, the left and right resilient bodies **407, 408** are connected to the axle **412**.

(164) Best seen in FIG. **18**, the frame connecting portions **420, 421** of the left and right resilient bodies **407, 408** are laterally further from the longitudinal center plane **56** than the axle connecting **440, 441**. As such, the left and right resilient bodies **407, 408** are at an angle to the longitudinal center plane **56**.

(165) Referring to FIG. **18**, the resilient assembly **406** defines an imaginary pivot **520**. More precisely, as the left and right resilient bodies **407, 408** are found at an angle with respect to the longitudinal center plane **56**, left and right projections **550a, 550b** of the left and right resilient bodies **407, 408** intersect. The point of intersection between the left and right projections **550a, 550b** is the imaginary pivot **520**.

(166) As shown in FIG. **18**, when the support structure **405** is in an initial position, the imaginary pivot **520** defines a pivot axis **522** that is laterally aligned with the longitudinal center plane **56**. The pivot axis **522** is positioned below the axle axis **416**, and extends generally parallel to the longitudinal center plane **56**. Given the resilient nature of the left and right resilient bodies **407, 408**, it is contemplated that the pivot axis **522** could be laterally offset from the longitudinal center plane **56**. As briefly described above, and described in more detail below, maintaining the imaginary pivot **520** and the pivot axis **522** within the disclosed vertical range could help reduce wear of the endless track **90**. Maintaining the imaginary pivot **520** and the pivot axis **522** within a certain lateral range, as described below, could also help reduce wear of the endless track **90**.

(167) As will be described below, the left and right resilient bodies **407, 408** are configured such that the imaginary pivot **520** and the pivot axis **522** are relatively stationary relative to the longitudinal center plane **56**. However, it is contemplated that in some embodiments, the imaginary pivot **520** could move laterally.

(168) Referring to FIG. **18**, in the present embodiment, the imaginary pivot **520** and the pivot axis **522** are vertically aligned with the bottommost portion of the left and right support wheels **413, 414**, which engage the inner surface **92** of the endless track **90**. In other words, the pivot axis **522** is contained in a plane **524** defined by the bottommost portion of the left and right support wheels **413, 414**. It is contemplated that in some embodiments, the imaginary pivot **520** and the pivot axis **522** could be vertically spaced upwardly from the plane **524** within about 25% of a distance between the axle axis **416** and the plane **524**. As the vertical position of the imaginary pivot **520** increases, the support structure **405** becomes more unstable. In yet other embodiments, the imaginary pivot **520** and the pivot axis **522** could be vertically spaced downwardly from the plane

**524**, within 25% of the distance between the axle axis **416** and the plane **524**. As the vertical position of the imaginary pivot **520** decreases, the imaginary pivot **520** is more likely to move laterally.

(169) As will be elaborated below, the support structure **405** and the left and right resilient bodies **407**, **408** are configured such that the axle **412** is pivotable about the pivot axis **522** within a range of motion of fifteen degrees in the clockwise or counter-clockwise directions. It is contemplated that in some embodiments, the range of motion could be less than fifteen degrees.

(170) Though the left and right resilient bodies **407**, **408** are flexible, the left and right resilient bodies **407**, **408** are also sufficiently rigid such that the left and right resilient bodies **407**, **408** can withstand some of the weight of the track system **52** and the vehicle **40**. In the present embodiment, the connecting portions **428** are equally flexible to the connecting portions **448**. It is contemplated that in some embodiments, the connecting portions **428** could be more or less flexible than the connecting portions **448**. In the present embodiment, the connecting portions **428** and the connecting portions **448** are more flexible than the intermediate portions **430** of the left and right resilient bodies **407**, **408**. In the present embodiment, the frame connecting portions **420**, **421** and the axle connecting portions **440**, **441** are equally flexible. It is contemplated that in some embodiments, the frame connecting portions **420**, **421** and the axle connecting portions **440**, **441** could be more or less flexible than one another. In the present embodiment, when the resilient assembly **406**, and thus the left and right resilient bodies **407**, **408** deform, it is primarily the connecting portions **428** and the connecting portions **448** that deform.

(171) In the present embodiment, when the left and right resilient bodies **407**, **408** deform so that the axle **412** can pivot about the pivot axis **522**, the pivot axis **522** remains stationary relative to the longitudinal center plane **56** of the track system **52**. In some embodiments, however, given that the imaginary pivot **520** is defined by the left and right resilient bodies **407**, **408**, the imaginary pivot **520** and the pivot axis **522** could move laterally relative to the longitudinal center plane **56**, as the left and right resilient bodies **407**, **408** deform. In such embodiments, it is contemplated that the imaginary pivot **520** and the pivot axis **522** could move laterally by up to about three millimetres (0.12 in), when the axle **412** pivots about fifteen degrees about the pivot axis **522**. In some track systems known in the prior art, the lateral displacement of a support structure that pivots fifteen degrees could reach about twelve millimetres (0.47 in). The larger the lateral displacement is, the more likely it is that the support wheels **413**, **414** could come in contact with the lugs **94**, thereby increasing wear.

(172) Therefore, when the track system **52** encounters an obstacle, or uneven terrain, on either of its left and right sides, the support structure **405** is adapted to allow the support wheels **413**, **414** and the endless track **90** to better conform to the obstacle or the uneven terrain. More precisely, the left and right resilient bodies **407**, **408** deform such that the axle **412** can pivot about the pivot axis **522**, allowing the left and right support wheels **413**, **414** to pivot, while reducing the interference of the left and right support wheels **214**, **215** with the lugs **94** and thus reducing wear of the endless track **90**.

(173) Description of the Pivoting Mechanism

(174) Referring now to FIGS. **23a** to **24c**, the track system **52** and the support structure **405** will be described, as the track system **52** and the support structure **405** overcome obstacles of varying sizes.

(175) Referring to FIG. **23a**, the support structure **405** is shown on a flat, level surface. As mentioned above, when the support structure **405** is positioned on a flat, level surface, the pivot axis **522** is vertically aligned with the inner surface **92** of the endless track **90**, and laterally aligned with the longitudinal center plane **56**. The support structure **405** is also in an initial position where the axle **412** is not pivoted about the pivot axis **522**.

(176) Referring to FIG. **24a**, the support structures **405** are shown positioned on a flat, level surface.

(177) Referring to FIG. 23b, the support structure 405 has encountered an obstacle such that the right support wheel 414 is elevated with respect to the left support wheel 413. The left and right resilient bodies 407, 408 have deformed such that the axle 412 has pivoted about the pivot axis 522 by five degrees (in the clockwise direction in FIG. 23b), thereby allowing the right support wheel 414 and the corresponding portion of the endless track 90 to better conform to the obstacle. The left and right resilient bodies 407, 408 deforming induces stress therein. The frame and axle clamping members 472, 473, 491, 492, 493, 494 aid in distributing stress throughout the frame and axle connecting portions 420, 421, 440, 441. The imaginary pivot 520, and thus the pivot axis 522, is still laterally aligned with the longitudinal center plane 56. In other words, the pivot axis 522 is still contained in the longitudinal center plane 56.

(178) Referring to FIG. 23c, the support structure 405 has encountered an obstacle such that the right support wheel 414 is elevated with respect to the left support wheel 413. The left and right resilient bodies 407, 408 have deformed such that the axle 412 has pivoted about the pivot axis 522 by ten degrees (in the clockwise direction in FIG. 23c), thereby allowing the right support wheel 414 and the corresponding portion of the endless track 90 to better conform to the obstacle. The left and right resilient bodies 407, 408 deforming induces stress therein. The frame and axle clamping members 472, 473, 491, 492, 493, 494 aid in distributing stress throughout the frame and axle connecting portions 420, 421, 440, 441. The imaginary pivot 520, and thus the pivot axis 522, has moved laterally to the right by one millimetre (0.039 in), such that the pivot axis 522 is no longer laterally aligned with the longitudinal center plane 56. It is contemplated that in some embodiments, the imaginary pivot 520, and thus the pivot axis 522, could move less than one millimetre (0.039 in). It is also contemplated that in some embodiments, the imaginary pivot 520, and thus the pivot axis 522, could still be aligned with the longitudinal center plane 56. In the present embodiment, the lateral movement does not cause the left and/or right support wheels 413, 414 to interfere with the lugs 94.

(179) Referring to FIG. 24b, the support structures 405 have pivoted about the pivot axis 522 by ten degrees, in the counter-clockwise direction, shown by angle  $\alpha$ .

(180) Referring to FIG. 23d, the support structure 405 has encountered an obstacle such that the right support wheel 414 is elevated with respect to the left support wheel 413. The left and right resilient bodies 407, 408 have deformed such that the axle 412 has pivoted about the pivot axis 522 by fifteen degrees (in the clockwise direction in FIG. 23d), thereby allowing the right support wheel 414 and the corresponding portion of the endless track 90 to better conform to the obstacle. The left and right resilient bodies 407, 408 deforming induces stress therein. The frame and axle clamping members 472, 473, 491, 492, 493, 494 aid in distributing stress throughout the frame and axle connecting portions 420, 421, 440, 441. The imaginary pivot 520, and thus pivot axis 522, has moved laterally to the right by three millimetres (0.12 in), such that the imaginary pivot 520 is no longer aligned with the longitudinal center plane 56. It is contemplated that in some embodiments, the imaginary pivot 520, and thus the pivot axis 522, could move less than three millimetres (0.12 in). It is also contemplated that in some embodiments, the imaginary pivot 520, and thus the pivot axis 522, could still be laterally aligned with the longitudinal center plane 56. In the present embodiment, the lateral movement does not cause the left and/or right support wheels 413, 414 to interfere with the lugs 94.

(181) Referring to FIG. 24c, the support structures 405 have pivoted about the pivot axis 522 by fifteen degrees, in the counter-clockwise direction, shown by angle  $\alpha$ .

(182) As indicated above, reducing the lateral movement of the pivot axis 522 with respect to the longitudinal center plane 56 may assist in reducing wear of the lugs 94 in some conditions.

(183) As described hereinabove, the present technology aids the track system 52 to better conform to uneven surfaces, which allows for better load distribution across the endless track 90, reduces wear on the lugs 94 and reduces chances of detracking.

(184) In addition, when travelling over uneven terrain, the track system 52 is subject to vibrations

and shocks. Due to the resilient nature of the left and right resilient bodies 407, 408, the support structure 405 acts as a damper. The support structure 405 can thus further improve the overall durability of the track system 52 by absorbing some vibrations.

(185) Materials and Manufacturing

(186) The various components of the track systems 50, 51, 52 are made of conventional materials (e.g. metals and metal alloys in most cases, such as steel) via conventional manufacturing processes (e.g. casting, molding, etc.). The present technology does not require any specific materials nor methods of manufacture. The present technology merely requires that each component be suitable for the purpose for which it is intended and the use to which it is to be put. Any material(s) or method(s) of manufacture which produce such components may be used in the present technology.

(187) Modifications and improvements to the above-described embodiments of the present technology may become apparent to those skilled in the art. The foregoing description is intended to be exemplary rather than limiting. The scope of the present technology is therefore intended to be limited solely by the scope of the appended claims.

## Claims

1. A support structure for connecting at least one support wheel assembly to a frame of a track system, the frame of the track system including a frame member, and the track system having a longitudinal center plane, the support structure comprising: an axle adapted for supporting the at least one support wheel assembly, the axle being vertically spaced from the frame member, the axle having an axle axis extending transversally to the longitudinal center plane, and having an axle plane extending vertically and containing the axle axis; a resilient assembly including at least one resilient body having: at least one frame connecting portion being configured to at least partially surround the frame member; at least one axle connecting portion being spaced from the at least one frame connecting portion, the at least one axle connecting portion being connectable to the axle; and at least one intermediate portion extending between the at least one frame connecting portion and the at least one axle connecting portion, a frame clamping assembly adapted for clamping the frame connecting portion to the frame member; and an axle clamping assembly adapted for clamping the axle connecting portion to the axle, the resilient assembly defining an imaginary pivot, the imaginary pivot defining a pivot axis being positioned below the axle axis, and the resilient assembly being deformable such that the axle is pivotable about the pivot axis.
2. The support structure of claim 1, wherein the pivot axis extends parallel to the longitudinal center plane.
3. The support structure of claim 1, wherein the pivot axis is vertically aligned with an inner surface of an endless track of the track system.
4. The support structure of claim 3, wherein the pivot axis is vertically spaced from the inner surface of the endless track within about 25% of a distance between the axle axis and the inner surface.
5. The support structure of claim 1, wherein the pivot axis is movable laterally relative to the longitudinal center plane by less than three millimeters.
6. The support structure of claim 1, wherein the axle is pivotable about the pivot axis within a range of motion ranging between about -15 and about +15 degrees.
7. The support structure of claim 1, wherein the resilient assembly includes a first resilient body and a second resilient body.
8. The support structure of claim 1, wherein the at least one frame connecting portion includes a first frame connecting portion and a second frame connecting portion, the frame clamping assembly includes a first frame clamping member adapted to clamp the first frame connecting portion to the frame member on a first side of the longitudinal center plane, and the frame clamping assembly further includes a second frame clamping member adapted to clamp the second frame

connecting portion to the frame member on a second side of the longitudinal center plane.

9. The support structure of claim 8, wherein at least one of: the first frame clamping member covers at least a portion of the first frame connecting portion, and the second frame clamping member covers at least a portion of the second frame connecting portion.

10. The support structure of claim 1, wherein the at least one axle connecting portion includes a first axle connecting portion and a second axle connecting portion, the axle clamping assembly includes a first axle clamping member adapted to clamp the first axle connecting portion to the axle on a first side of the axle plane, and the axle clamping assembly further includes a second axle clamping member adapted to clamp the second axle connecting portion to the axle on a second side of the axle plane.

11. The support structure of claim 10, wherein at least one of: the first axle clamping member covers at least a portion of the first axle connecting portion, and the second axle clamping member covers at least a portion of the second axle connecting portion.

12. The support structure of claim 1, wherein the at least one frame connecting portion, the at least one intermediate portion and the at least one axle connecting portion are integral.

13. The support structure of claim 1, wherein the at least one axle connecting portion covers at least partially the axle.

14. A resilient assembly comprising: at least one resilient body for connecting an axle having an axle axis and a support wheel assembly to a frame member of a frame of a track system, the at least one resilient body comprising: at least one frame connecting portion being configured to at least partially surround the frame member; at least one axle connecting portion being spaced from the at least one frame connecting portion, the at least one axle connecting portion being connectable to the axle; and at least one intermediate portion extending between the at least one frame connecting portion and the at least one axle connecting portion, the resilient assembly defining an imaginary pivot, the imaginary pivot defining a pivot axis being positioned below the axle axis, and the resilient assembly being deformable such that the axle is pivotable about the pivot axis.

15. The resilient assembly of claim 14, wherein the at least one frame connecting portion includes a first frame connecting portion and a second frame connecting portion.

16. The resilient assembly of claim 14, wherein the at least one axle connecting portion includes a first axle connecting portion and a second axle connecting portion.

17. The resilient assembly of claim 14, wherein the at least one frame connecting portion, the at least one intermediate portion and the at least one axle connecting portion are integral.

18. The resilient assembly of claim 14, wherein the at least one axle connecting portion covers at least partially the axle.

19. The resilient assembly of claim 18, wherein the at least one resilient body includes a first resilient body and a second resilient body.

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