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B62D 55/12 (2006.01)

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FR 002416825 A1 **US 20110036650 A1**
US 20100237574 A1 **US 20050061557 A1**
US 20040244231 A1 **US 20030047367 A1**

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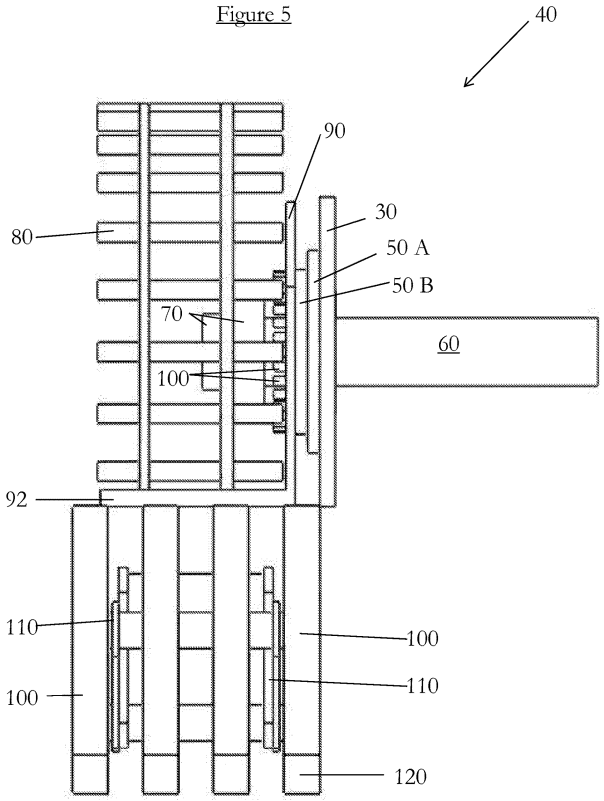
INT CL **B62D, F16C**
Other: **EPODOC, WPI, TXTE**

(54) Title of the Invention: **A Support Structure**
Abstract Title: **Support with slew ring for track unit of tracked vehicle**

(57) A support 90, 92 is mountable on a tracked vehicle 10 to support a continuous track unit 40 rotating a track 130 on track supports 100, 120 to move vehicle 10. Support 90, 92 comprises a slew ring 50A, 50B, which may support the weight of vehicle 100l, and attachment means 100 to attach slew ring 50A, 50B to a chassis 30 of vehicle 10, which may be unitary with the slew ring or positionable between the slew ring and the chassis. The slew ring may allow 360 degree rotation or may have a rotation limiter to limit rotation, for example to 120 degrees. Preferably attachment means 100 comprises a plate with an aperture for receiving a drive axle 70 to rotate a drive sprocket 80 for rotating track 130. Support 90, 92 allows track unit 40 to pivot to cope with uneven ground conditions.

Figure 5



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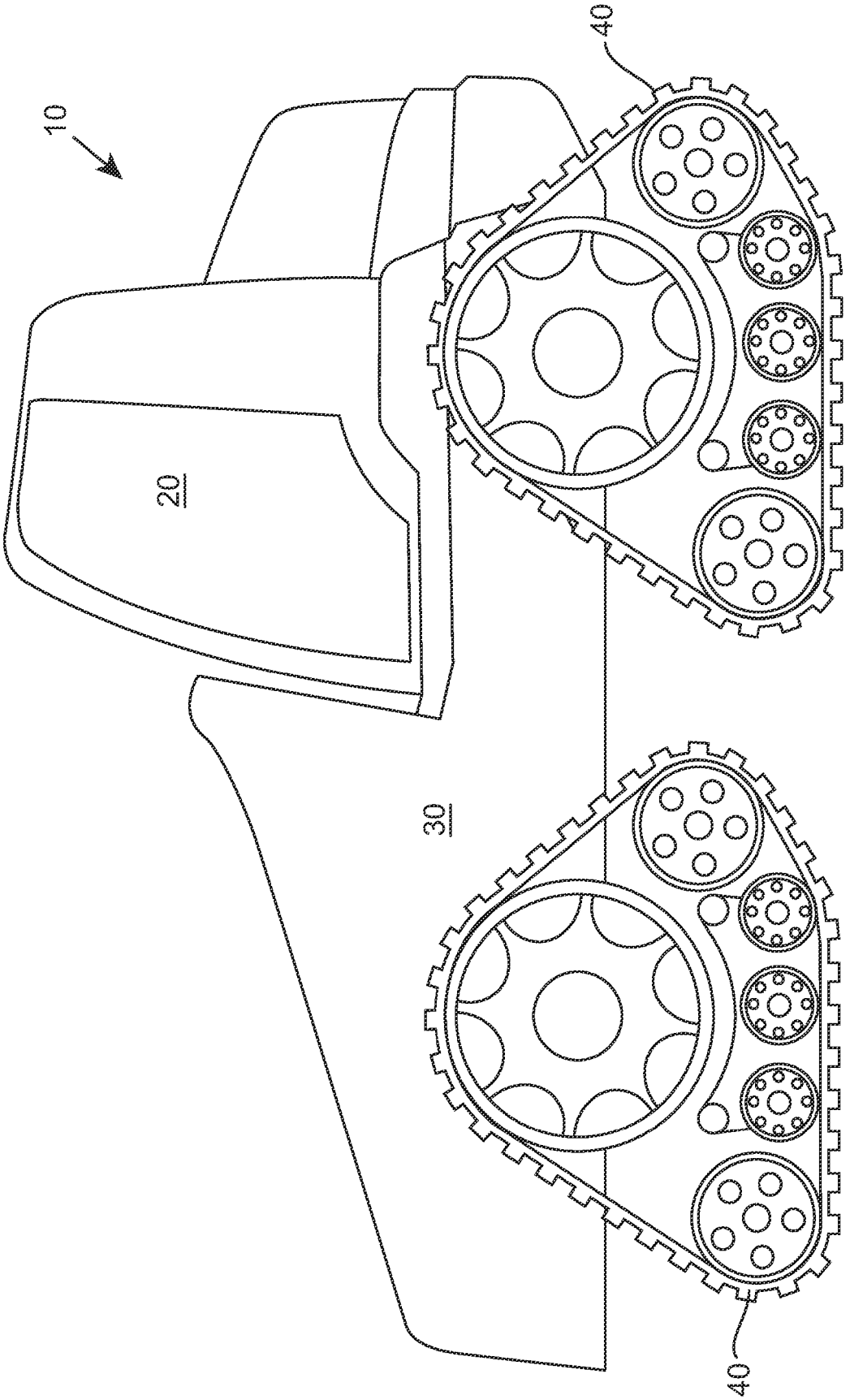

Figure 1

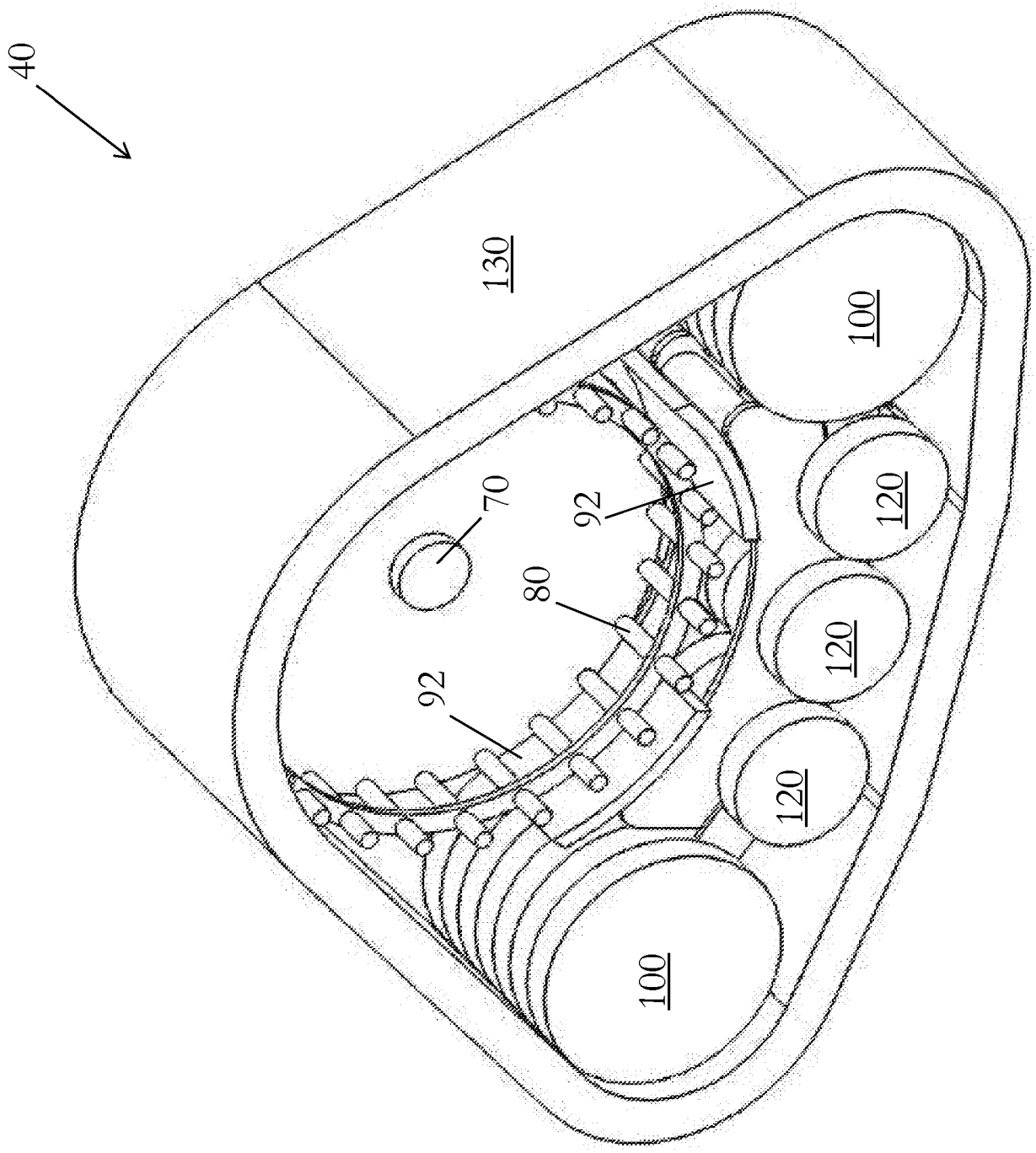

Figure 2

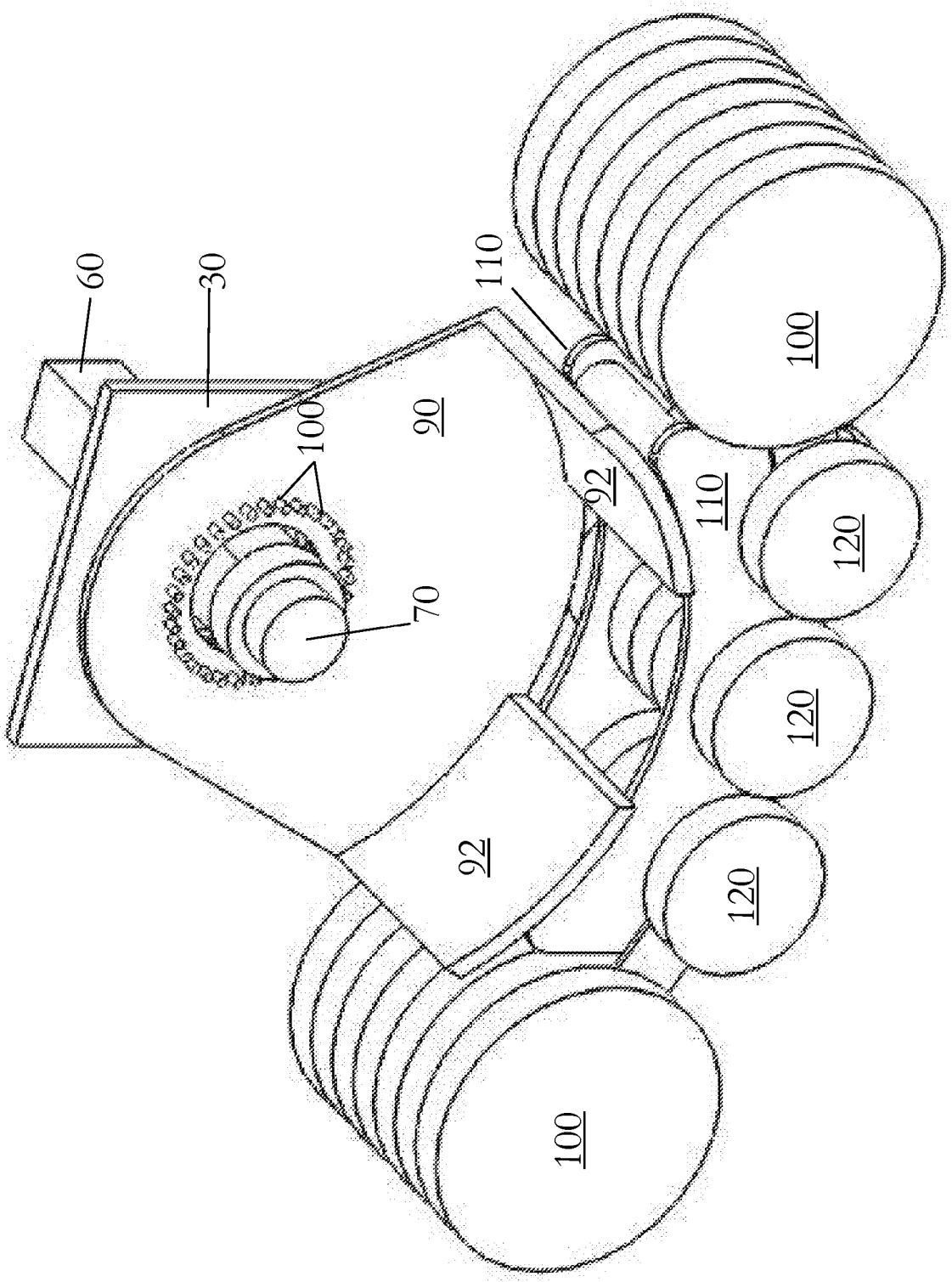

Figure 3

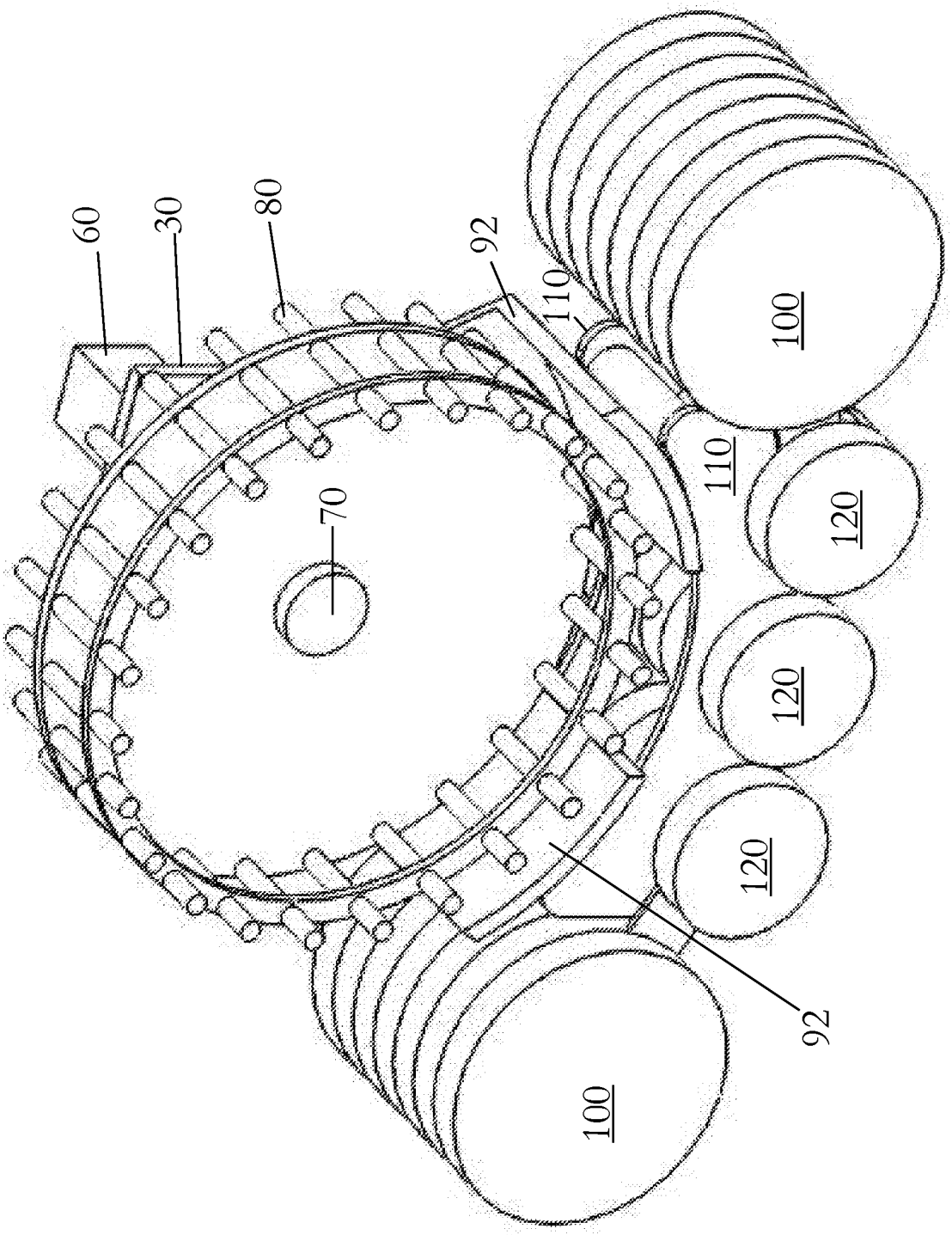

Figure 4

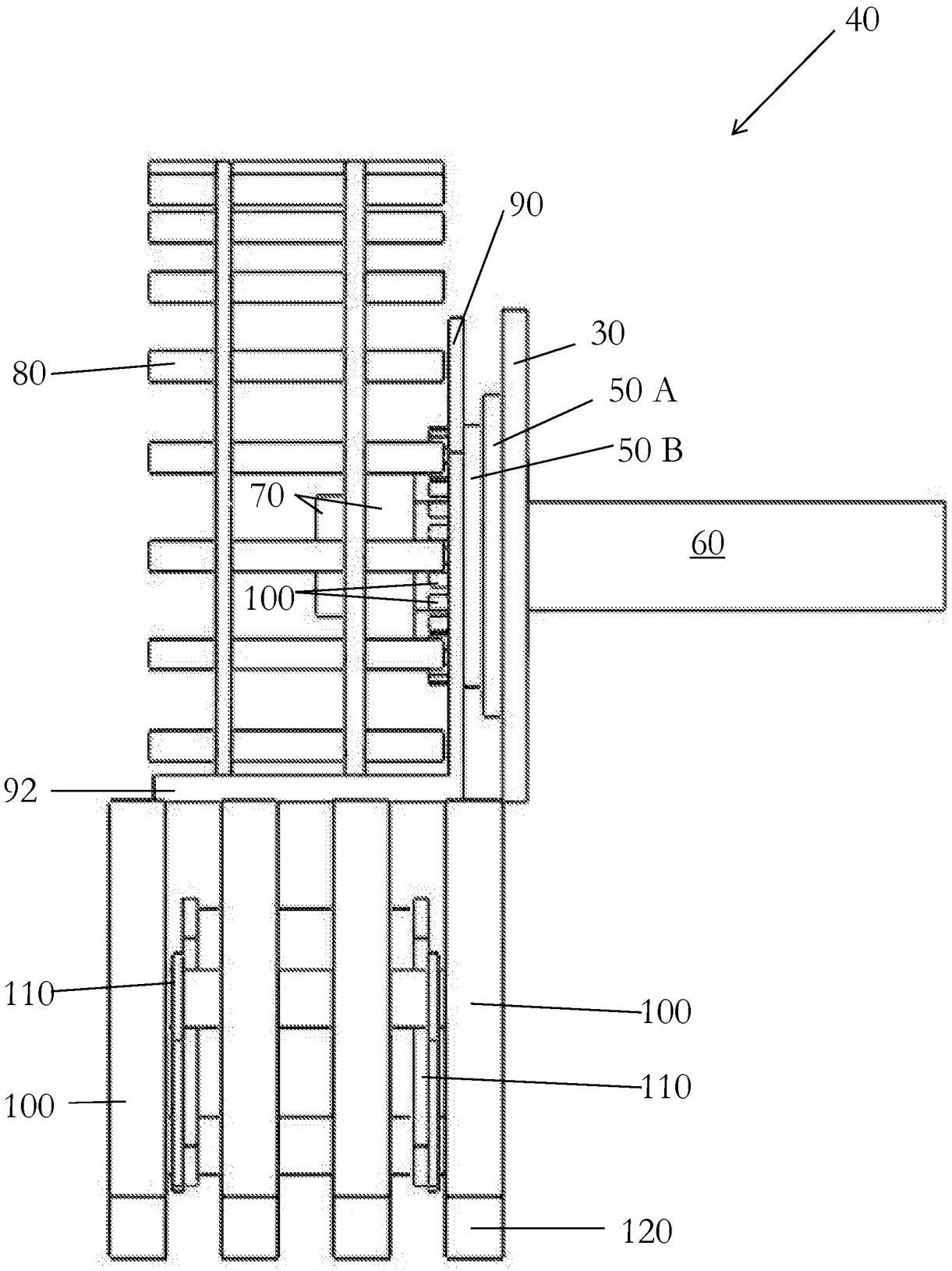

Figure 5

A support structure

The present invention relates generally to a support structure and finds particular, although not exclusive, utility with continuously tracked vehicles.

Continuous tracks have been known for many years. They are extremely useful in situations where the ground is uneven and/or soft. The purpose of a continuous track is to spread the weight of the vehicle over a large surface area. This reduces the pressure exerted on the ground to a fraction of what the equivalent pressure would be if the vehicle had tyres instead of tracks. By reducing the pressure exerted on the ground the vehicle is less likely to become immobilised by poor ground conditions. As a consequence of this, the types of vehicles fitted with continuous tracks are often found on construction sites, mines, forests and other such areas where hard-surfaced, such as "metalled", constructed roads are not present.

Continuous tracks are traditionally made up of several track segments connected together to allow, at least partial, relative movement therebetween. Alternatively, continuous tracks are known which are made from a continuous length of flexible material such as heavy-duty plastics and/or rubbers. These tracks may include gripping formations on their outer surface (these are sometimes known as “grousers” in the industry). These gripping formations may be chevron in shape, or be a series of ribs running perpendicular to the length of the track. Other patterns and shapes are also possible.

The tracks typically include engagement means on their inner surface for engaging with at least one drive wheel or sprocket. The continuous track runs partially around at least two wheels, at least one of which is a drive wheel or sprocket. Typically, for heavy-duty plant such as bulldozers or tippers, the track runs around three principal wheels such that the track forms an approximate triangular shape when viewed from the side. In this formation, the drive wheel is typically the upper most wheel with the two lower wheels serving to define the shape but not necessarily being driven to drive the track. These vehicles are often referred to as “high-drives”.

It is also typical to have idler or jockey wheels associated with the continuous track. These help prevent the track from being pushed inwardly by uneven ground. In other words, they help to maintain the shape of the continuous track, especially along the lower, ground contacting, portion of the continuous track. Idler wheels may also be

used at other points around the perimeter of the continuous track to maintain its shape for various reasons.

These known vehicles have a structure for supporting the tracks, the idler and jockey wheels. It is usually important to allow this structure to pivot relative to the vehicle body to allow for better manoeuvrability and to cope with uneven ground conditions. This structure is typically pivotably attached to the drive axle of the vehicle. This introduces stresses and strain on the axle which leads to premature wear and possible failure.

Accordingly, there is a need for an improved means for supporting a continuous track and its associated components.

In a first aspect, the invention provides a support structure mountable on a tracked vehicle for at least partially supporting a continuous track drive unit, the drive unit for rotating a continuous track to move the vehicle, and track support means, the support structure comprising a slew ring and attachment means for attaching the slew ring to a chassis of the vehicle.

In this regard, the term "slew ring" may mean a bearing including at least one rotational rolling-element bearing, often including two rows of rolling elements. These often use three race elements, such as an inner ring and two outer ring "halves" that clamp together. Slew rings are typically used to support relatively heavy but slow-turning objects or machinery such as cranes.

Compared to other rolling-element bearings, slew rings are comparably thin in section.

The attachment means may be unitary with the slew ring. For instance they may be holes through which bolts may be placed. In this case, the slew ring may be said to be directly attached to the chassis of the vehicle. However, the attachment means may be affixed to the slew ring and positionable, in use, between the slew ring and the chassis of the vehicle. In this case, the attachment means may be a separate, yet attachable, element as described below. For instance, the attachment means may comprise a plate with an aperture therethrough for receiving a drive axle of the vehicle, the drive axle for rotating a drive sprocket for rotation of a continuous track.

The slew ring is not supported by the drive axle of the vehicle.

The slew ring may be configured to allow 360 degree rotation of the support structure relative to the chassis of the vehicle. However, the support structure may

further comprise rotation limitation means for limiting the angle through which the support structure may rotate relative to the chassis of the vehicle. For instance, the rotation limitation means may limit the rotation of the support structure relative to the chassis of the vehicle to 20 degrees, more preferably 10-15 degrees, in either direction. The limiters may comprise bars attached to the support structure which extend underneath the chassis of the vehicle such that in use they may move a certain amount but are prevented from moving too much by the chassis.

The support structure may further comprise a first plate, attachable in use to the chassis of the vehicle, to which the slew ring may be attached, the first plate extending radially in a first plane parallel to the plane of the circumference of the slew ring.

The slew ring may be oriented such that the first plane is substantially vertical in use, such that rotation of the slew ring relative to the chassis of the vehicle occurs in a vertical plane.

The support structure may further comprise at least one second plate unitary with, and extending away from, the first plate in a second plane perpendicular to the first plane.

The at least one second plate may be curved having a radius centre substantially the same as the radius centre of the drive axle of the vehicle, in use.

The support structure may further comprise at least one ram affixed at one end to the support structure and at the other end configured to retain a jockey wheel axle for supporting at least one jockey wheel, the at least one jockey wheel for guiding a continuous track, in use. The phrase "jockey wheel" should be understood to mean an object which may guide and/or support a continuous track so as to maintain its shape. Typically, they are wheels but the phrase also encompasses the possibility of suitably shaped objects over which the track may slide. In this form the "wheels" may not rotate but may pivot. If the jockey wheels are truly wheels then they are typically not driven but are freely rotatable. However, in some circumstances it may be necessary to drive at least one jockey wheel.

All of the weight of the vehicle may be said to be carried by the support structure because the support structure is attached to the chassis by means of the slew rings, and the chassis is elevated above the ground on which it travels. In a similar manner, all of the weight of the vehicle may be said to be carried by the slew rings.

The support structure or slew rings may be said to support the weight of the vehicle.

In a second aspect, the invention provides a tracked vehicle comprising a support structure according to the first aspect.

The tracked vehicle may include a drive axle for driving the drive sprocket and a continuous track for being driven by the drive sprocket.

The above and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.

Figure 1 is a side elevational view of a vehicle including continuous track units;

Figure 2 is an elevational schematic view of part of a continuous track unit;

Figure 3 is a perspective view of part of a continuous track unit without the drive sprocket;

Figure 4 is a perspective view of part of a continuous track unit including the drive sprocket; and

Figure 5 is a perspective view of part of a continuous track unit including the continuous track.

The present invention will be described with respect to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. Each drawing may not include all of the features of the invention and therefore should not necessarily be considered to be an embodiment of the invention. In the drawings, the size of some of the elements may be exaggerated and not drawn to scale for illustrative purposes. The dimensions and the relative dimensions do not correspond to actual reductions to practice of the invention.

Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that operation is capable in other sequences than described or illustrated herein.

Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that operation is capable in other orientations than described or illustrated herein.

It is to be noticed that the term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising means A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the only relevant components of the device are A and B.

Similarly, it is to be noticed that the term "connected", used in the description, should not be interpreted as being restricted to direct connections only. Thus, the scope of the expression "a device A connected to a device B" should not be limited to devices or systems wherein an output of device A is directly connected to an input of device B. It means that there exists a path between an output of A and an input of B which may be a path including other devices or means. "Connected" may mean that two or more elements are either in direct physical or electrical contact, or that two or more elements are not in direct contact with each other but yet still co-operate or interact with each other.

Reference throughout this specification to "an embodiment" or "an aspect" means that a particular feature, structure or characteristic described in connection with the embodiment or aspect is included in at least one embodiment or aspect of the present invention. Thus, appearances of the phrases "in one embodiment", "in an embodiment", or "in an aspect" in various places throughout this specification are not necessarily all referring to the same embodiment or aspect, but may refer to different embodiments or aspects. Furthermore, the particular features, structures or characteristics of any embodiment or aspect of the invention may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments or aspects.

Similarly, it should be appreciated that in the description various features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Moreover, the description of any individual drawing or aspect should not necessarily be considered to be an embodiment of the invention. Rather, as the following claims reflect, inventive aspects lie in fewer than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

Furthermore, while some embodiments described herein include some features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form yet further embodiments, as will be understood by those skilled in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practised without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

In the discussion of the invention, unless stated to the contrary, the disclosure of alternative values for the upper or lower limit of the permitted range of a parameter, coupled with an indication that one of said values is more highly preferred than the other, is to be construed as an implied statement that each intermediate value of said parameter, lying between the more preferred and the less preferred of said alternatives, is itself preferred to said less preferred value and also to each value lying between said less preferred value and said intermediate value.

The use of the term "at least one" may mean only one in certain circumstances.

The principles of the invention will now be described by a detailed description of at least one drawing relating to exemplary features of the invention. It is clear that other arrangements can be configured according to the knowledge of persons skilled in

the art without departing from the underlying concept or technical teaching of the invention, the invention being limited only by the terms of the appended claims.

In Figure 1 an elevational side view of a simplified tracked vehicle 10 is shown. The vehicle 10 comprises an operator cab 20, a vehicle body 30 and two continuous track units 40 provided on each side (only the ones on the facing side are shown). The continuous track units will be described in more detail below, however, a general arrangement is shown in Figure 2.

In Figure 2, the unit 40 comprises a continuous track 130 extending around a drive sprocket 80, two jockey wheels 100 and three intermediate bottom rollers 120. The unit 40 is a high drive unit with the drive sprocket 80 provide towards the upper apex of the approximate triangular shape of the unit.

The drive sprocket 80 is mounted on, and rotated by, a drive bearing 70. The bottom rollers 120 are mounted on two parallel plates 110 located beneath the drive sprocket 80 and between the two jockey wheels 100. A jockey wheel 100 is located at each of the lower two apexes of the approximate triangular shape of the unit 40. There may be more than one jockey wheel 100 arranged in a row at each of the two lower apexes. There may be four at each apex. There may also be more than the three bottom rollers 120 shown. There may be three rows of bottom rollers 120, each row comprising four rollers. There may be more or less than three rows of bottom rollers 120.

The axles of the two outer most axial bottom rollers 120 in each of the rows nearest the jockey wheels 100 may be connected to the axles of the jockey wheels 100 by a linkage 105. This linkage may have a fixed length but allow the two connected axles to move relative to one another and to the unit 40 overall.

A support structure is partially shown in Figure 2. It comprises two plates 92 each having an arcuate shape located between the plates 110 and the drive sprocket 80.

Each of the axles of the two rows of jockey wheels 100 may be connected to one of these plates 110 with a hydraulic ram (not shown). In this manner, the distance between each of the axles of the two rows of jockey wheels 100 and the support structure plates 92 may be variable to adjust the tension in the continuous track.

The support structure is better understood from Figure 3 in which the same view as Figure 2 is shown but without the continuous track 130 and drive sprocket 80.

A back plate 90 is shown to which at the base the two plates 92 are connected. It is to be understood that the support structure may be a single piece of shaped metal (such as steel) or that it could comprise more than two pieces affixed to one another such as by welding or bolting.

In one possibility each of the two plates 92 are formed from curved steel and are then welded to the base of the back plate 90 such that there are only two lines of welds, one for each plate 92.

The support structure back plate 90 includes a hole through which the drive axle 60 of the vehicle (not shown) projects. The drive sprocket is attached to the drive axle 60 via drive bearing 70.

The back plate 90 is indirectly bolted to the body 30 of the vehicle (a portion only of which is shown) by the use of bolts 100, although other connection means are contemplated. In this regard, the term body 30 may also include the chassis of the vehicle.

The two plates 92 add strength to the support structure and may act to prevent stones and rocks from reaching the drive sprocket 80 in use.

Figure 4 shows the unit from the same direction as Figure 2 and 3 but include the drive sprocket 80 but not the continuous track 130. The other referenced features in Figure 4 are the same as has already been described with reference to Figures 2 and 3.

In Figure 5 the unit 40 is shown viewed in the direction of rotation of the drive sprocket 80.

The drive axle 60 of the vehicle (not shown) is visible to the right. The drive bearing 70 at its left hand end is shown together with the drive sprocket 80. The continuous track is omitted to improve the clarity.

Between the back plate 90 of the support structure and the chassis or vehicle body 30 a slew ring is arranged. This has a fixed outer ring 50A and a rotatable inner ring 50B. The outer ring 50A is bolted to the chassis 30. The inner ring 50B is bolted to the back plate 90. In one possibility (not shown), an intermediary plate is provided between the chassis 30 and the back plate 90. In this case, the outer fixed ring 50A would be affixed to this intermediary plate and the intermediary plate itself affixed to the chassis 30.

In the lower portion of Figure 5 the four jockey wheels 100 are visible and the one row of four bottom rollers 120 is partially visible behind these jockey wheels 100.

Furthermore, the two plates 110 to which the bottom rollers are affixed are visible. In this regard, the two plates 110 may comprise two bottom rollers 120 therebetween and one bottom roller on the axially outer side of each of the two plates 110, such that each plate 110 is sandwiched between two bottom rollers 120 on each of the three axles (corresponding to the three rows of bottom rollers 120).

In use the drive axle 60 drives the drive bearing 70 which in turn drives the drive sprocket 80 which rotates the continuous track 130 around the perimeter of the unit 40. The continuous track 130 is supported by the drive sprocket 130, the two jockey wheels 100 and the bottom rollers 120.

The unit 40 may pivot relative to the chassis or vehicle body 30 due to the slew ring 50A, 50B. The weight of the unit 40 is carried by the chassis or vehicle body 30 and not by the drive axle 60 or drive bearing 70.

Although not shown, it is possible to have other tensioners located within the perimeter of the continuous track 130 which are typically extended in normal operation but which may be retracted as necessary so as to introduce greater slack into the track which may be taken up by the front and rear jock wheels 100 so as to provide the track with as great an area of contact with the ground as possible.

The vehicle body 30 may be articulated such that there are two bodies (not shown) separated but connected by an articulation joint. Each body may have units 40 provided on each side.

CLAIMS

1. A support structure mountable on a tracked vehicle for at least partially supporting a continuous track drive unit, the drive unit for rotating a continuous track to move the vehicle, and track support means, the support structure comprising a slew ring and attachment means for attaching the slew ring to a chassis of the vehicle.

2. The support structure of claim 1, wherein the attachment means are unitary with the slew ring.

3. The support structure of claim 1, wherein the attachment means are affixed to the slew ring and positionable, in use, between the slew ring and the chassis of the vehicle.

4. The support structure of claim 3, wherein the attachment means comprises a plate with an aperture therethrough for receiving a drive axle of the vehicle, the drive axle for rotating a drive sprocket for rotation of a continuous track.

5. The support structure of any preceding claim, wherein the slew ring is configured to allow 360 degree rotation of the support structure relative to the chassis of the vehicle.

6. The support structure of any preceding claim, further comprising rotation limitation means for limiting the angle through which the support structure may rotate relative to the chassis of the vehicle.

7. The support structure of claim 6, wherein the rotation limitation means limit the rotation of the support structure relative to the chassis of the vehicle to 120 degrees.

8. The support structure of any preceding claim, further comprising a first plate, attachable in use to the chassis of the vehicle, to which the slew ring is attached, the first plate extending radially in a first plane parallel to the plane of the circumference of the slew ring.

9. The support structure of claim 8, further comprising at least one second plate unitary with, and extending away from, the first plate in a second plane perpendicular to the first plane.

10. The support structure of claim 9, wherein the at least one second plate is curved having a radius centre substantially the same as the radius centre of the drive axle of the vehicle, in use.

11. The support structure of any preceding claim, further comprising at least one ram affixed at one end to the support structure and at the other end configured to retain a jockey wheel axle for supporting at least one jockey wheel, the at least one jockey wheel for guiding a continuous track, in use.

12. A tracked vehicle comprising a support structure according to any preceding claim.

13. The tracked vehicle of claim 12, including a drive axle for driving the drive sprocket and a continuous track for being driven by the drive sprocket.

14. A support structure substantially as hereinbefore described with reference to the accompanying drawings.

15. A tracked vehicle substantially as hereinbefore described with reference to the accompanying drawings.

Amendments to the claims have been filed as follows

CLAIMS

1. A support structure mountable on a tracked vehicle for at least partially supporting a continuous track drive unit and track support means, the drive unit for rotating a continuous track to move the vehicle, the support structure comprising a slew ring and attachment means for attaching the slew ring to a chassis of the vehicle, and an aperture therethrough for receiving a drive axle of the vehicle, the drive axle for rotating a drive sprocket for rotation of the continuous track.

2. The support structure of claim 1, wherein the attachment means are unitary with the slew ring.

3. The support structure of claim 1, wherein the attachment means are affixed to the slew ring and positionable, in use, between the slew ring and the chassis of the vehicle.

4. The support structure of claim 3, wherein the attachment means comprises a plate with an aperture therethrough for receiving the drive axle of the vehicle, the drive axle for rotating a drive sprocket for rotation of the continuous track.

5. The support structure of any preceding claim, wherein the slew ring is configured to allow 360 degree rotation of the support structure relative to the chassis of the vehicle.

6. The support structure of any preceding claim, further comprising rotation limitation means for limiting the angle through which the support structure may rotate relative to the chassis of the vehicle.

7. The support structure of claim 6, wherein the rotation limitation means limit the rotation of the support structure relative to the chassis of the vehicle to 120 degrees.

15 10 14

8. The support structure of any preceding claim, further comprising a first plate, attachable in use to the chassis of the vehicle, to which the slew ring is attached, the first plate extending radially in a first plane parallel to the plane of the circumference of the slew ring.

9. The support structure of claim 8, further comprising at least one second plate unitary with, and extending away from, the first plate in a second plane perpendicular to the first plane.

10. The support structure of claim 9, wherein the at least one second plate is curved having a radius centre substantially the same as the radius centre of the drive axle of the vehicle, in use.

11. The support structure of any preceding claim, further comprising at least one ram affixed at one end to the support structure and at the other end configured to retain a jockey wheel axle for supporting at least one jockey wheel, the at least one jockey wheel for guiding a continuous track, in use.

12. A tracked vehicle comprising a support structure according to any preceding claim.

13. The tracked vehicle of claim 12, including a drive axle for driving the drive sprocket and a continuous track for being driven by the drive sprocket.

14. A support structure substantially as hereinbefore described with reference to the accompanying drawings.

15. A tracked vehicle substantially as hereinbefore described with reference to the accompanying drawings.

15 10 14

Application No: GB1320092.8 **Examiner:** Simon Rose

Claims searched: 1-15 **Date of search:** 10 June 2014

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-6, 8-9, 11-13	US 2003/0047367 A1 (VAILE) See particularly Figures 1-4, slew turntable 32, bearings 277a, 277b, and abstract
X	1-4, 6-9, 11-13	EP 1982904 A1 (TIDUE) See particularly Figures 1-3, rolling bearings 12, 13, rings 14, 17, and abstract
X	1-3, 6, 8-9, 11-13	US 2010/0237574 A1 (ALLAIRE) See particularly Figures 1-2 and 6, bearing support 780, locating member 786, and abstract
X	1-3, 5, 8-9, 11-13	US 2004/0244231 A1 (KUBO et al) See particularly Figures 1-3, attachment ring 7r, bearing J, and abstract
X	1-3, 6, 8-9, 12-13	FR 2416825 A1 (YUMBO) See particularly Figures 1-8, pivots 14, 16, tracks 6, 9, and WPI abstract accession number 1979-K8918B
A		DE 102010040739 A1 (ZAHNRADFABRIK) See particularly Figures 1-2, slew ring bearing 4, driving wheel 5, and WPI abstract accession number 2012-D15313
A		US 2005/0061557 A1 (BRAZIER) See particularly Figures 1-5 and abstract
A		US 2011/0036650 A1 (SIMULA et al) See particularly Figures 1-10 and abstract

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B62D; F16C

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI, TXTE

International Classification:

Subclass	Subgroup	Valid From
B62D	0055/084	01/01/2006
B62D	0055/116	01/01/2006
B62D	0055/12	01/01/2006