Articulated track link unit for a vehicle

TECHNICAL FIELD

The invention relates to the connection of track links of tracked vehicles, and in particular to a track link unit comprising a connector for connecting the track pin of one track link unit to a track pin of an adjacent track link unit.

BACKGROUND

Conventional cast steel track links typically comprise a link plate divided into two sections separated by a spine. Each section of the track link plate is bored through to allow the passage of elongate track pins. Connectors are clamped onto the ends of the pins such that they lie flush therewith. When a link is to be attached to an adjacent link to form an articulated track, the connectors clamp onto an adjacent pin of an adjacent link plate.

The connector typically consists of a metal body formed so as to provide a pair of apertures each of which is shaped to correspond with the end of the connecting pins of respective track link plates. Typically, the connecting pins have a flattened land at each end and each of the apertures in the connector has a corresponding flattened portion. This prevents rotation of the pin in the connector. A bolt passes through a bore in one side of the end connector and engages the other side of the connector, such as by means of a nut threadedly mounted on the end of the bolt, without contacting the pins. Tightening the nut tightens the connector so that one side of the connector is drawn towards the other thus clamping the pins in the apertures.

Problems have arisen in that despite the provision of a land on the pin and the corresponding flattened portion on the end connector, the end connectors can work loose under the load of the articulated track during use.

US 4,910,990 discloses a method of making end connectors for track link pins and describes one such connector having a connector body with through bores to accommodate the track pins. A bolt passes through the connector body perpendicular to and between the track pins and is retained in the connector body by means of a separate nut threadedly engaged with an end of the bolt and acting on an outer surface of the connector. The bolt includes a central wedge shaped portion the external surface of which contacts the external surface of the track pins.

GB 2,328,660 discloses another example of end connectors for track link pins. A stepped retaining bolt passes through a hole in one side of a connector and engages a threaded hole in an opposing side thereof. The bolt retains the track pins in the connector by the outer surface of the bolt cooperating with lands in the respective outer surfaces of the track pins.

An important consideration in the design of tracks and track components is the arduous conditions under which the tracks must operate. For example, in the case of military tanks, the vehicle and their track must operate effectively in conditions ranging from sub-zero Arctic temperatures to extremely hot desert temperatures and in mud, snow, rain, and water. Furthermore, it is important to be able to replace and repair components speedily and correctly under field conditions. It is apparent that in battlefield conditions, where an operative may have to repair a vehicle whilst under fire, possibly in sub-zero temperatures, with gloved hands, and/or in darkness, the relatively small parts can difficult to handle and align with one another. Parts must be as easy to handle/assemble as is reasonably possible.

Further, in providing reliable parts which are easily replaced, the ease and accuracy of production of the parts are important factors. In this respect it can be noted that tapered holes and nuts as described in US 4,910,990 are more difficult and more expensive to produce at the required close tolerance than round parallel (cylindrical) holes and bores and round parallel (cylindrical) turned components.

It is an object of embodiments of the invention to provide an improved articulated track link unit, in particular that improves ease of assembly, and/or at least mitigates one or more problems associated with known arrangements.

SUMMARY OF THE INVENTION

According to the invention, an articulated track link unit for a vehicle, the track link unit comprising: a track link including at least one track link plate and first and second track pins arranged to pass through the track link plate, each track link pin having a concave land formed at an end region of an outer circumferential surface thereof; and a connector for connecting the first track pin to a further track pin of an adjacent track link unit, the further track pin corresponding to the second track pin, the connector comprising: a body part in which the first and further track pins are receivable; a bush providing a substantially cylindrical retaining surface having a curvature complementary to that of the concave lands, and the bush receivable in the body part such that, with the track pins received in the body part, the retaining surface cooperates with the concave lands to prevent withdrawal of the track pins from the body part; and a bolt receivable through the bush to engage the body part and thereby secure the bush to the body part, with an annular gap being provided between the bush and the bolt. This arrangement may improve the ease of assembly of the connector, particularly under field conditions.

In certain embodiments, the bolt may be a threaded bolt and the body part may include a threaded bore for mating with the bolt to engage the body part. Additionally, or alternatively, the body part may include internal surfaces shaped substantially to conform to the respective outer circumferential surfaces of the track pins.

In certain embodiments, the body part may be in the form of a continuous loop. Additionally, the threaded bore may be formed in a first side of the continuous loop and a further bore, at least approximately axially aligned with the bore, may be formed in a second side of the continuous loop to receive the bush within the body part.

In certain embodiments, the bolt may mate with the threaded bore to draw the first and second sides of the body part toward one another and thereby clamp the track pins in the body part.

In certain embodiments, an inner diameter of the further bore may be substantially the same as an outer diameter of the cylindrical retaining surface of the bush. The bush may be a flanged bush having an annular flange at an end thereof, an outer diameter of the flange being greater than the inner diameter of the further bore.

In certain embodiments, the bolt may have a threaded portion and an enlarged head, the threaded portion having a diameter less than a diameter of a central bore of the bush and the enlarged head having a diameter greater than the central bore. More specifically, the threaded portion may have a diameter less than a diameter of the central bore of the bush so as to provide the annular gap therebetween, thereby providing a degree of lateral movement between the bush and the bore. This arrangement may further improve the ease of assembly of the connector, particularly under field conditions. The diameter of the enlarged head may be greater than an inner diameter of the further bore.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawing, Figure 1.

Figure 1 is an exploded perspective view of a link of a track link unit according to an embodiment of the invention, in which two connectors are shown.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

Referring to Figure 1, a track link unit 1 is shown with two track link plates 2 through which two bores are provided for mounting first and second track pins 3, 4. Typically, the components of the link unit 1 are made from cast steel, although other suitably

durable materials may be used. Beneath the plates 2, rubber pads (not shown) for engaging the road may be attached thereto. The first track pin 3 and a further track pin (not shown) of adjacent link plates are held in place within their respective bores and connected for articulation by a connector 5. As will be understood, the further track pin corresponds to the second track pin 4 of the illustrated track link unit 1.

The connector 5 comprises a body part 6, a flanged bush 7 and a bolt 8. The body part 6 is in the form of a continuous loop of metal having two side-by-side openings 9, through which the ends of the track pins 3, 4—from respective adjacent track link units 1—pass to be clamped therein. Internal surfaces of the body part 6 substantially conform to the outer circumferential surfaces of the track pins 3, 4. A threaded bore 10 is formed in a first side of the body part 6, and a further bore 11 is formed in a second, opposing side of the body part 6.

The track pins 3, 4 each have respective concave lands 12 that are correspondingly shaped and sized to have a curvature complementary to that of, i.e., have a close fit with, a peripheral circumferential surface of the bush 7. The bush 7 is received within the body part 4 by the further bore 11, and with the track pins 3, 4 received in the body part 6, the close geometric fit between the bush 7 and concave lands 12 causes the track pins 3, 4 to be retained within the body portion 6 by the periphery of the bush 7, i.e., the peripheral circumferential surface of the bush 7 provides a retaining surface that cooperates with the concave lands 12 to prevent withdrawal of the track pins 3, 4 from the body part.

Generally, in embodiments of the invention, the position of the bush 7 between pins 3, 4 of adjacent track links 1 interferes with lateral movement of each of the track pins 3, 4 with respect to the bush 7 to retain the connector 5 on the track pins 3, 4. Any movement of one of the pins 3, 4 towards the other causes the other to be more securely held by the bush 7.

The bush 7 is secured to the body part 6 by the bolt 8, the bolt 8 having a threaded portion 8a and an enlarged head 8b. The bolt 8 passes through a central bore of the bush 7 and engages with the threaded bore 10. A lower part of bolt 8 forms the enlarged head, which prevents the bolt 8 from passing completely through the central bore of the bush 7. The bush 7 comprises an annular flange 7a that, in turn, prevents the bush 7 from passing completely through further bore 11. Consequently, on tightening bolt 8 into the threaded bore 10, the bolt 8 mates with the body part 6 to exert a clamping force on the track pins 3, 4 sitting in the openings 9, as each side of the body part 6 is drawn towards the other by the bolt 8. The body part 6 may be clamped onto the pins 3, 4 such that the body part 6 generally lies flush with the respective ends of pins 3, 4.

The central bore of the bush 7 has an internal diameter that is greater than an external diameter of the bolt 8, thereby providing an annular gap between the bush 7 and the bolt 8. The gap provides a degree of play, i.e., freedom of movement, or lateral movement, such that the connector may be assembled as described above without the bush 7 and the bolt needing to be perfectly coaxially aligned. The inventors have found that this may help facilitate ease of assembling the connector 5, particularly when the threaded bore 10 and the further bore 11 are not in perfect coaxial alignment with one another, which may result from manufacture the body part 6 and/or deformation of the body part 6 in use. This improved ease of assembly can be particularly beneficial under field conditions.

The invention is not restricted to the details of any foregoing embodiments. For example, while a cylindrical shape for the peripheral surface of the bush 7 and correspondingly curved concave lands 12 is preferred, the peripheral surface may have a gently increasing diameter axially, such that on tightening the bolt 8 in the threaded bore 10, an increasingly firm resistance fit of bush 7 in the lands 12 can be obtained. Moreover, in certain embodiments, the combination of the clamping effect,

as the sides of body part 6 are drawn together by the bolt 8, and the interference of bush 7 with both pins 3, 4 increases the clamping efficacy of the end connector.

Throughout the description and claims of this specification, the words “comprise”, “contain”, “having” and variations of them mean “including but not limited to”, and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the singular encompasses the plural unless the context otherwise requires. In particular, where the indefinite article is used, the specification is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

Features, integers, characteristics, compounds, chemical moieties or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. In particular, the phrase “certain embodiments” is to be understood to mean any embodiment described, illustrated, or otherwise disclosed herein. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive. The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

CLAIMS

1. An articulated track link unit for a vehicle, the track link unit comprising:

a track link including at least one track link plate and first and second track pins arranged to pass through the track link plate, each track link pin having a concave land formed at an end region of an outer circumferential surface thereof; and

a connector for connecting the first track pin to a further track pin of an adjacent track link unit, the further track pin corresponding to the second track pin, the connector comprising:

a body part in which the first and further track pins are receivable;

a bush providing a substantially cylindrical retaining surface having a curvature complementary to that of the concave lands, and the bush receivable in the body part such that, with the track pins received in the body part, the retaining surface cooperates with the concave lands to prevent withdrawal of the track pins from the body part; and

a bolt receivable through the bush to engage the body part and thereby secure the bush to the body part, with an annular gap being provided between the bush and the bolt.

2. An articulated track link unit according to claim 1, wherein the bolt is a threaded bolt and the body part includes a threaded bore for mating with the bolt to engage the body part.

3. An articulated track link unit according to claim 1 or 2, wherein the body part includes internal surfaces shaped substantially to conform to the respective outer circumferential surfaces of the track pins.

4. An articulated track link unit according to any preceding claim, wherein the body part is in the form of a continuous loop.

5. An articulated track link unit according to claim 4 when dependent upon claim 2, wherein the threaded bore is formed in a first side of the continuous loop and a further bore, at least approximately axially aligned with the bore, is formed in a second side of the continuous loop to receive the bush within the body part.

6. An articulated track link unit according to claim 5, wherein the bolt mates with the threaded bore to draw the first and second sides of the body part toward one another and thereby clamp the track pins in the body part.

7. An articulated track link unit according to any of claims 2 to 6, wherein an inner diameter of the further bore is substantially the same as an outer diameter of the cylindrical retaining surface of the bush.

8. An articulated track link unit according to claim 7, wherein the bush is a flanged bush having an annular flange at an end thereof, an outer diameter of the flange being greater than the inner diameter of the further bore.

9. An articulated track link unit according to any preceding claim, wherein the bolt has a threaded portion and an enlarged head, the threaded portion having a diameter less than a diameter of a central bore of the bush and the enlarged head having a diameter greater than the central bore.

10. An articulated track link unit according to claim 9 when dependent upon claim 5, wherein the diameter of the enlarged head is greater than an inner diameter of the further bore.