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GB 2584904 B

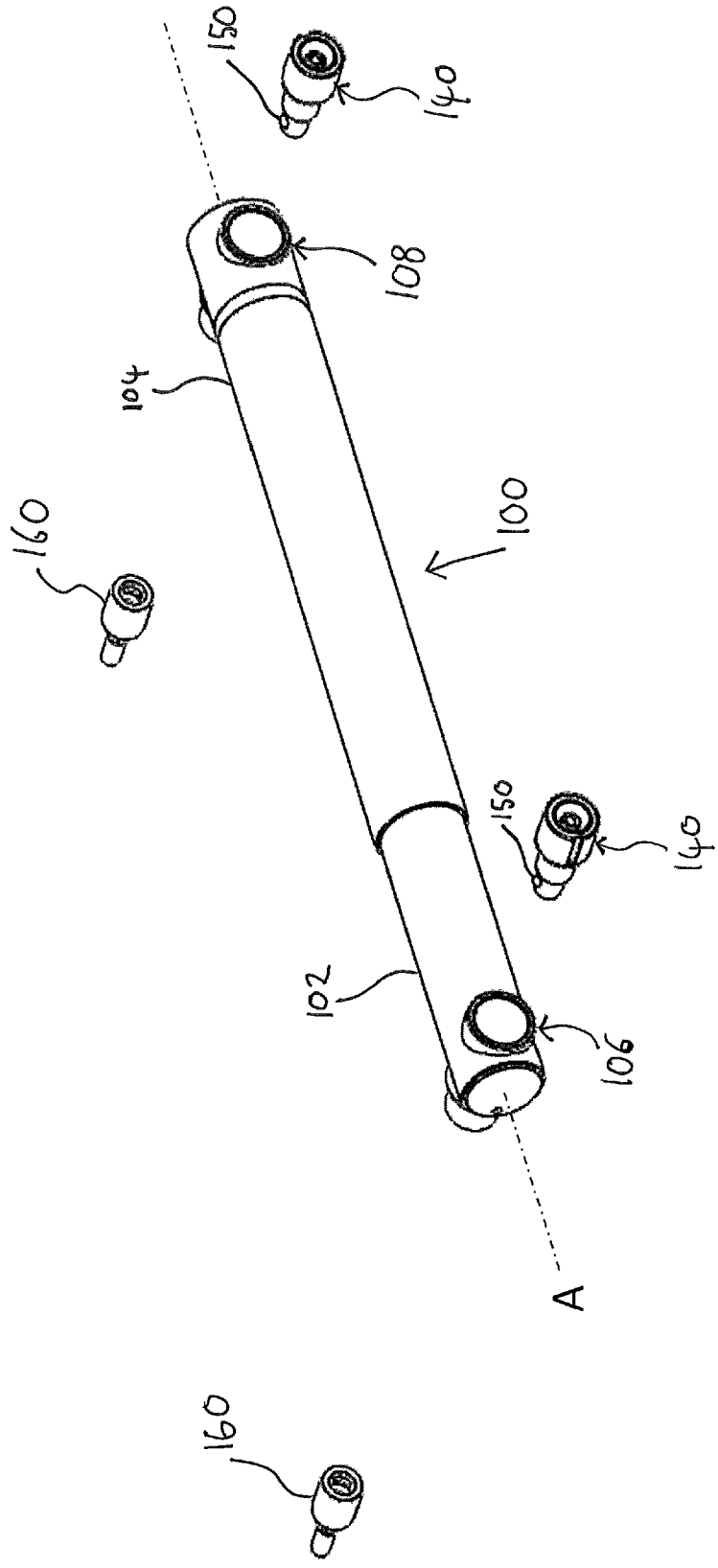
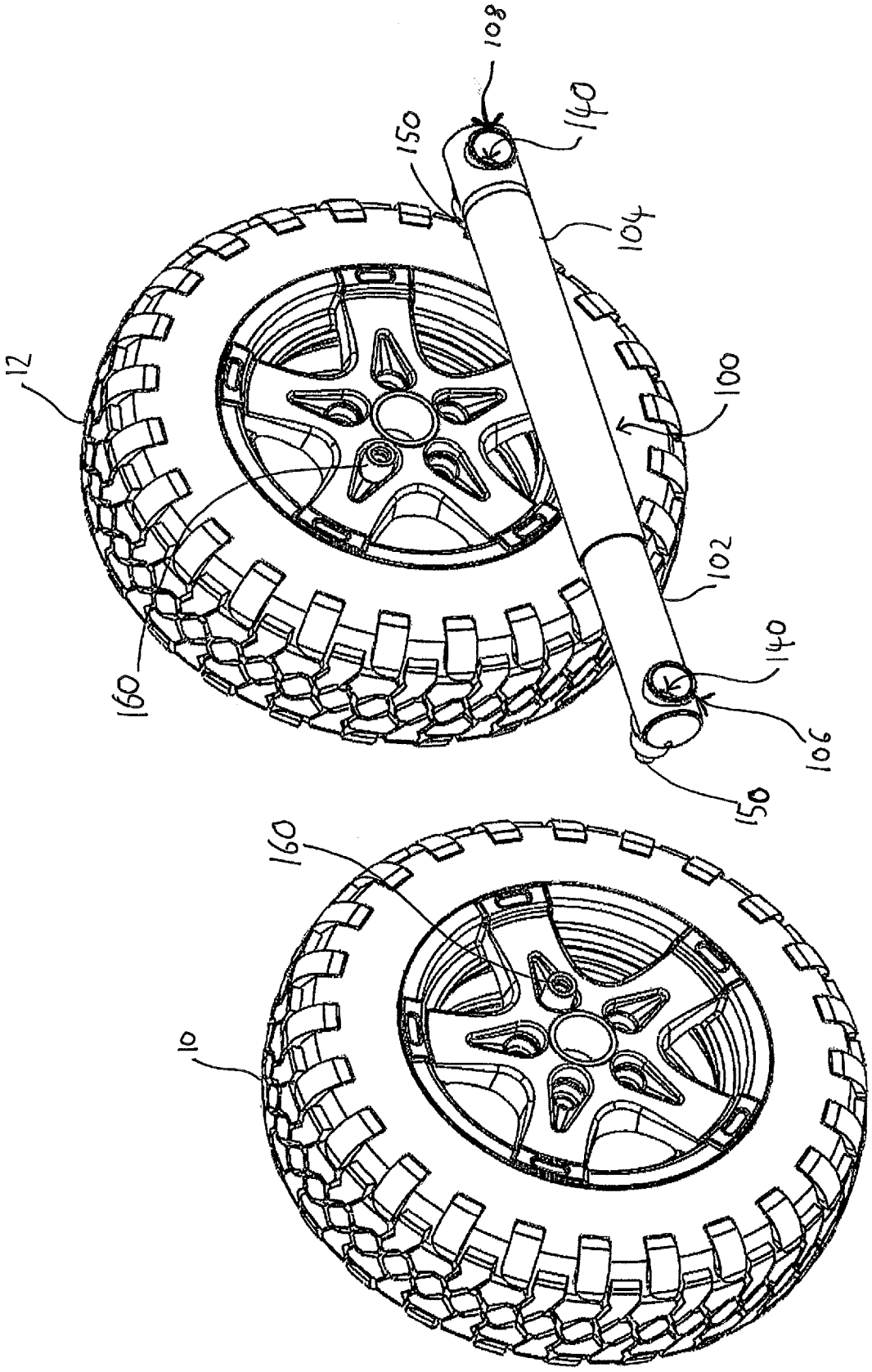


Figure 1



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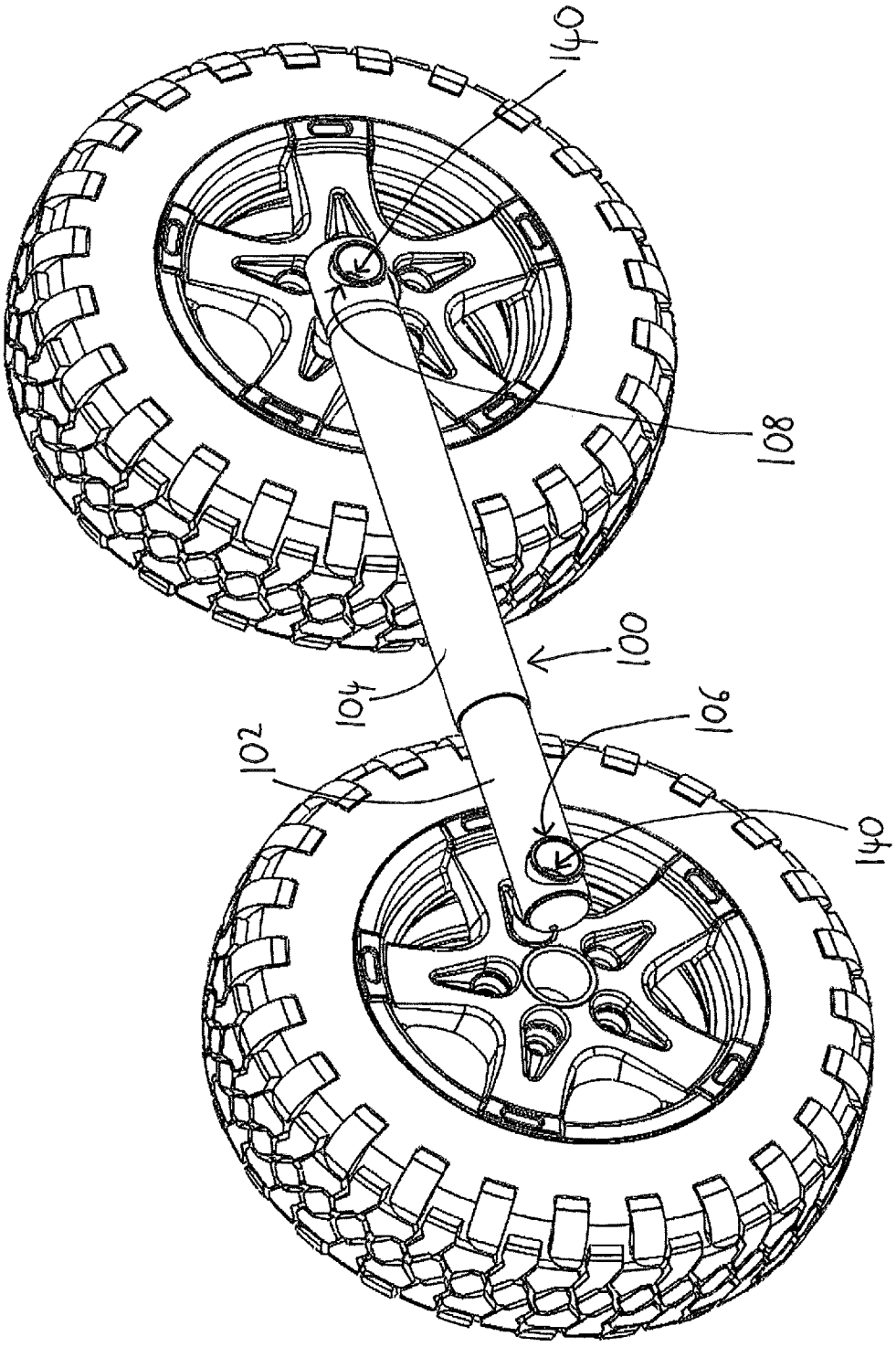


Figure 3

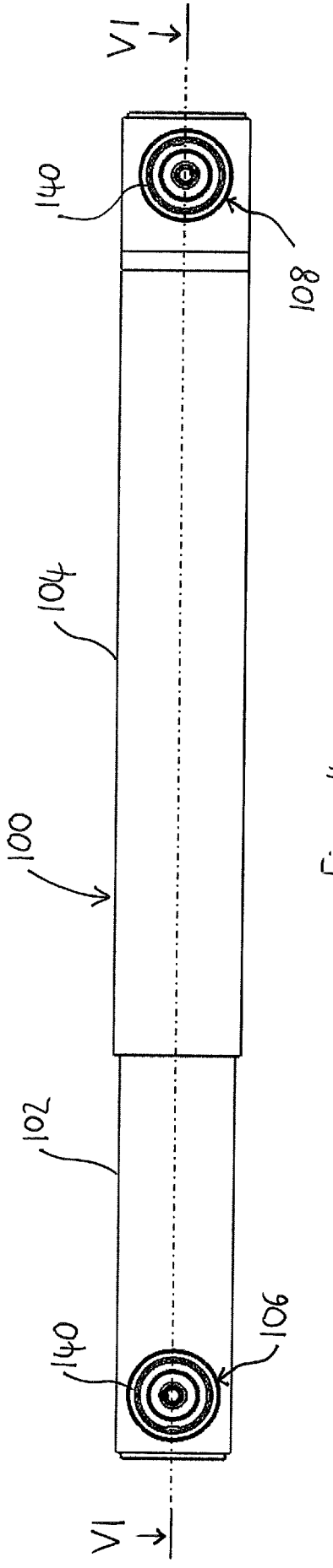


Figure 4

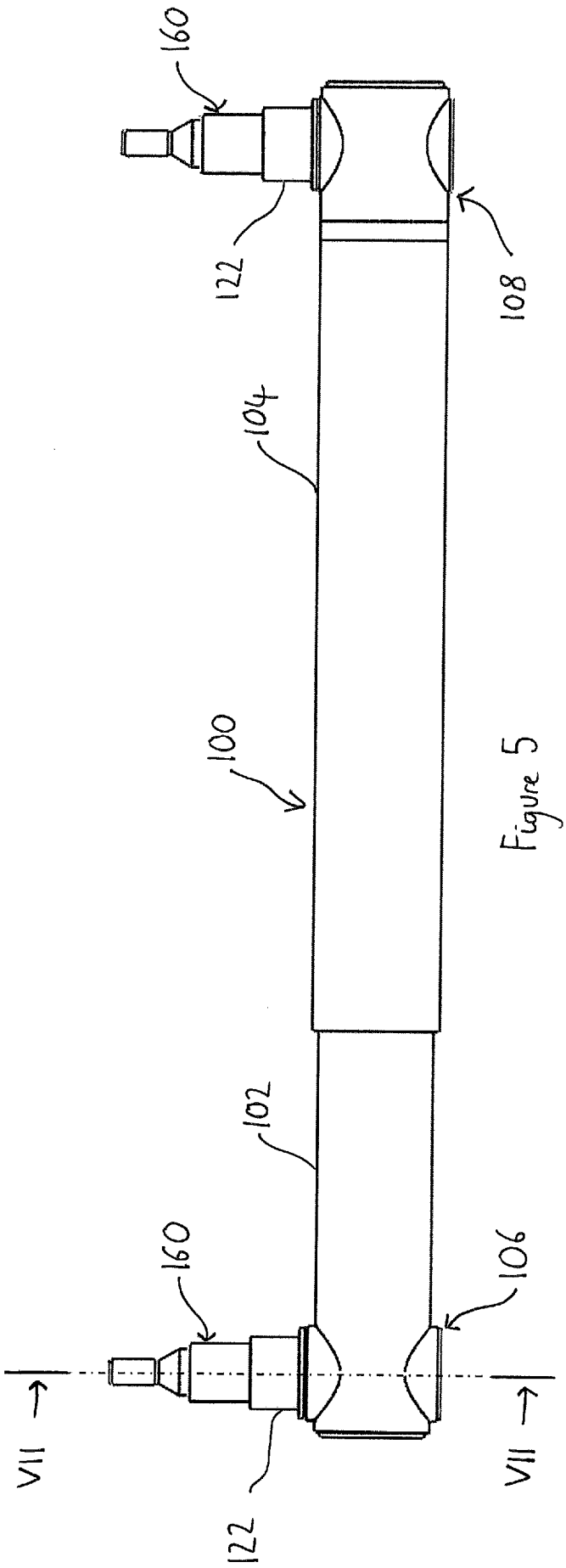


Figure 5

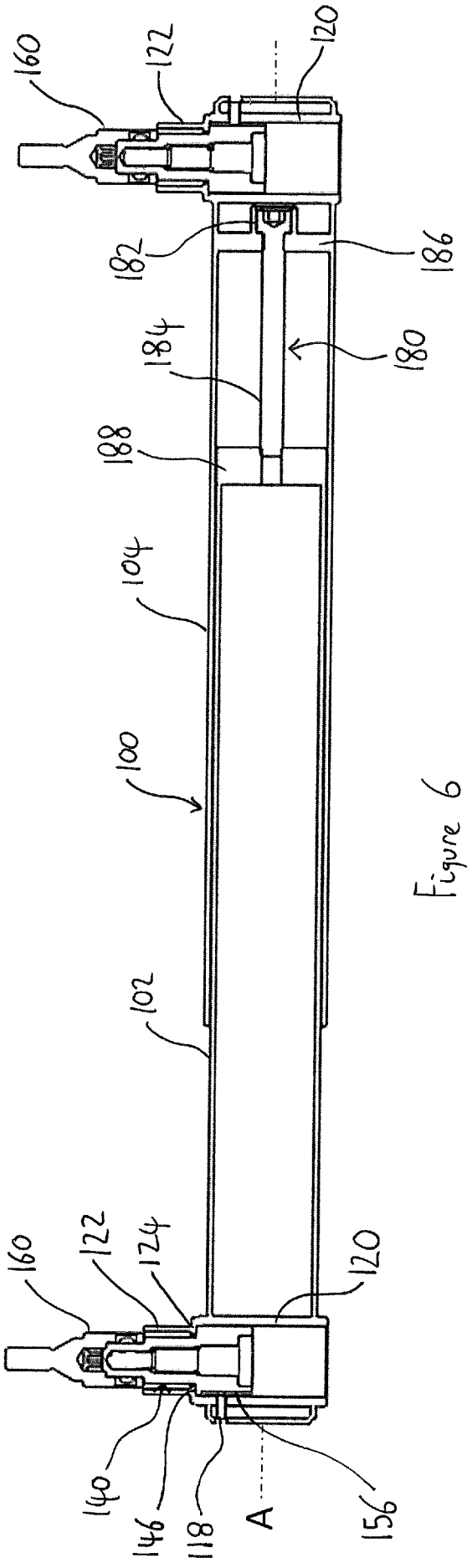
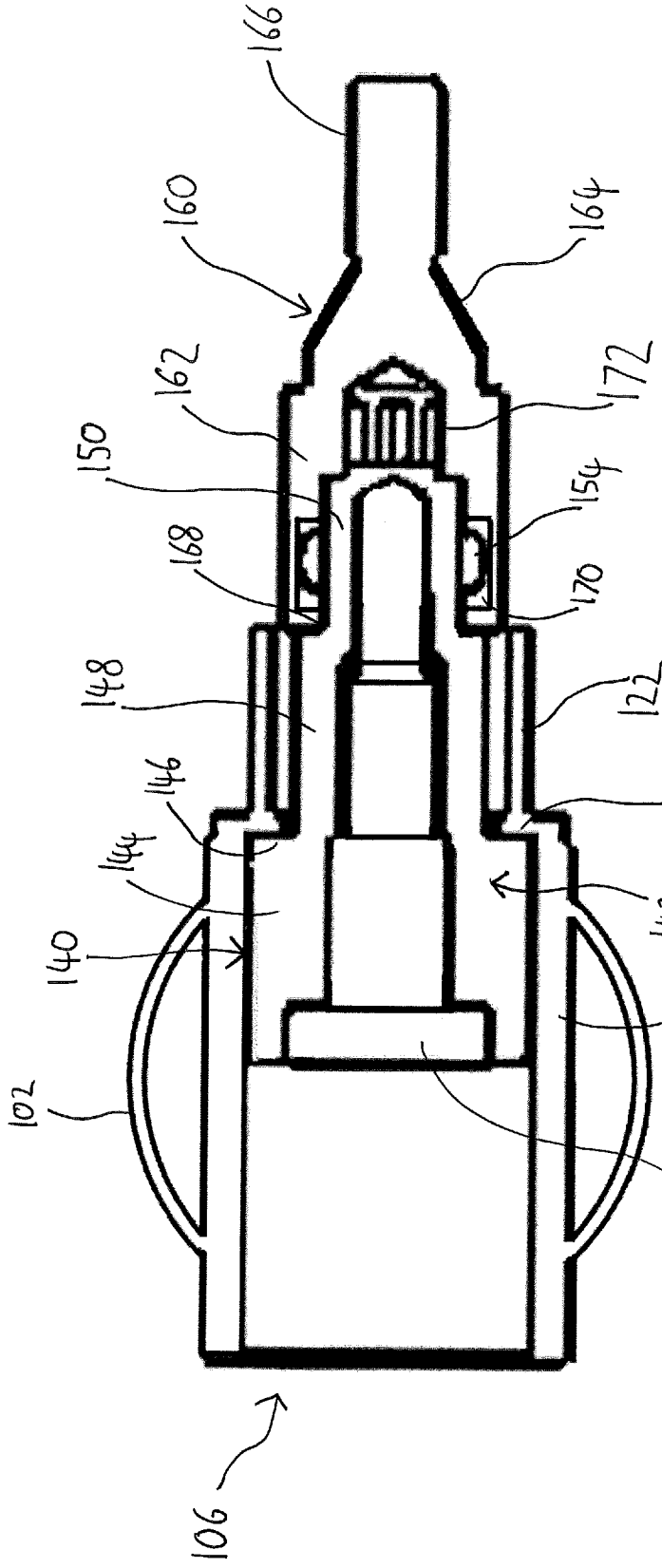

160
122
120
182
186
184
180
188
104
100
102
160
122
124
120
140
146
118
A
156

Figure 6


166
160
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142
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152
106

Figure 7

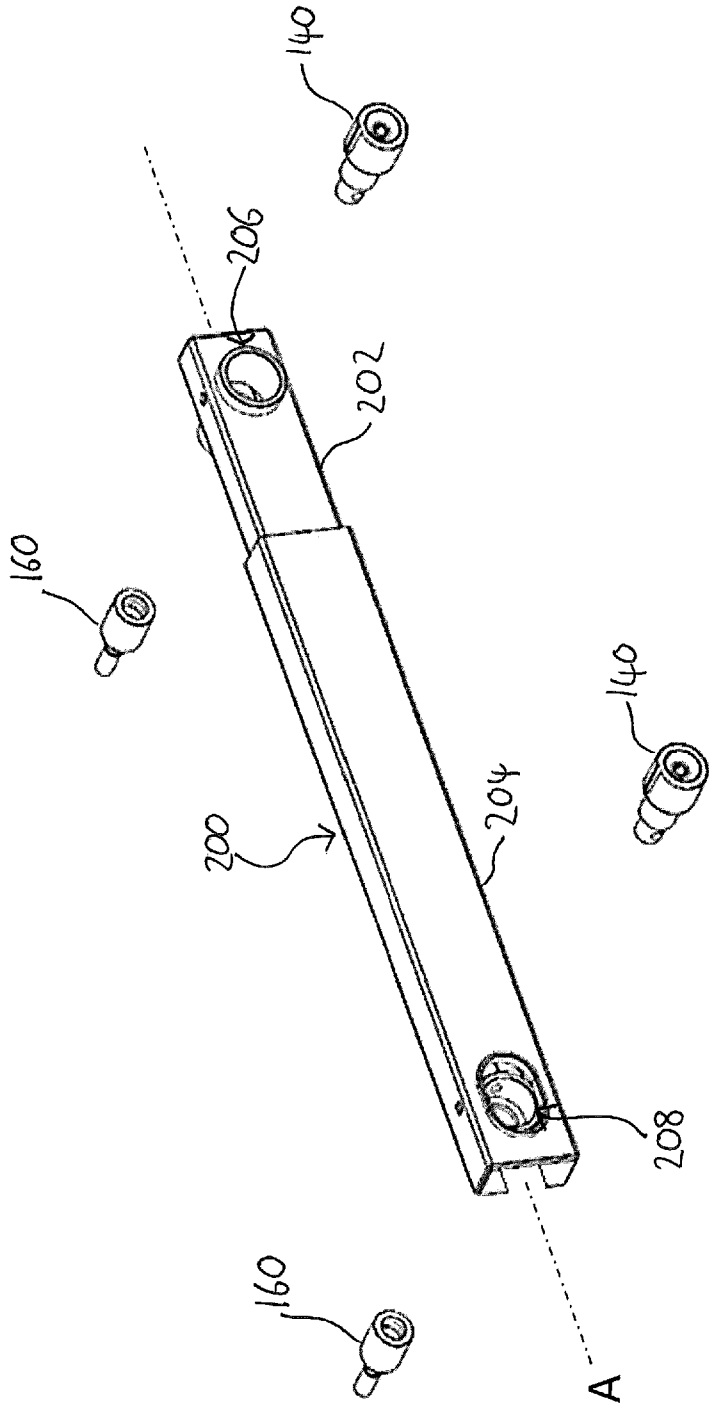


Figure 8

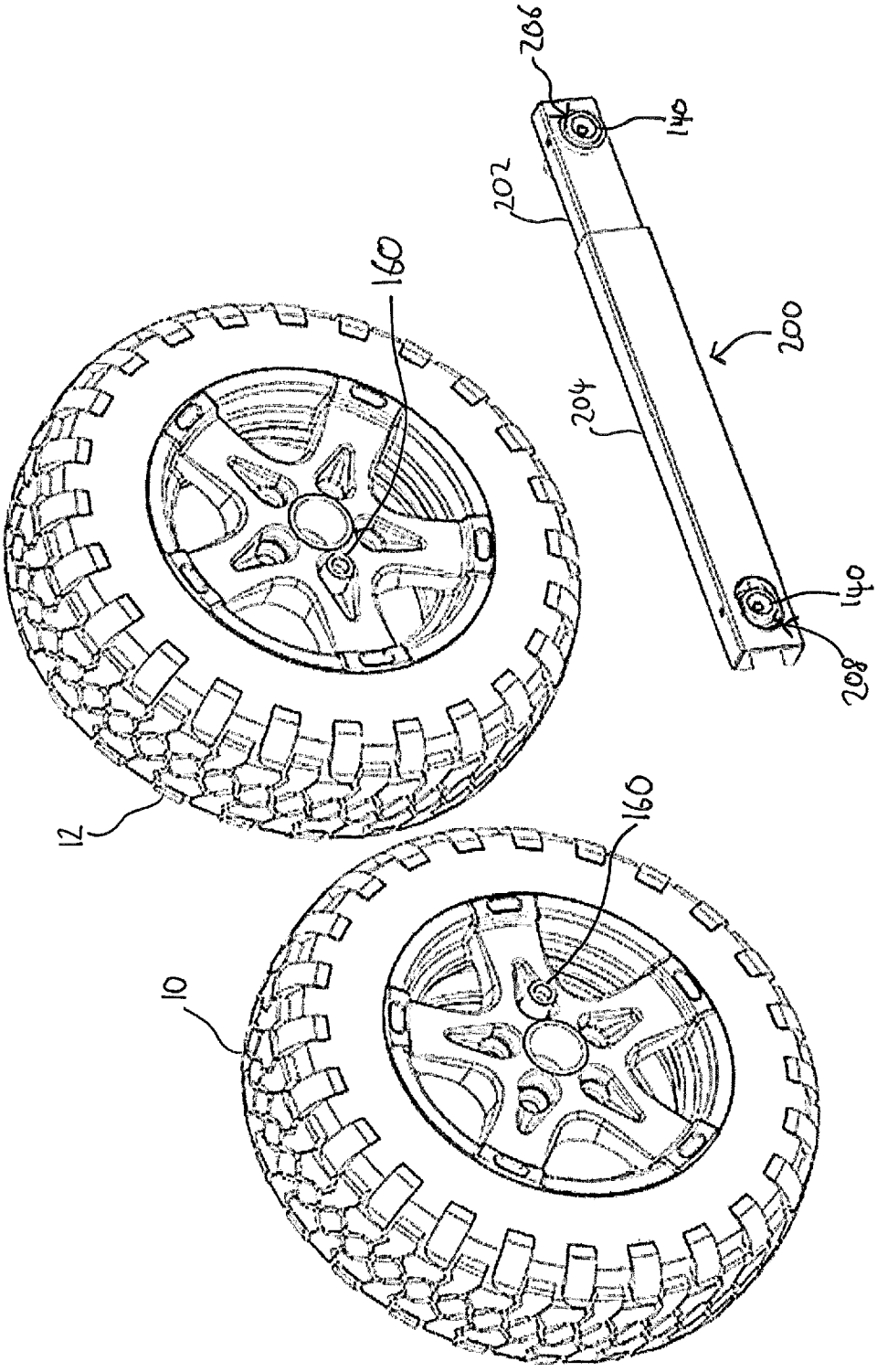


Figure 9

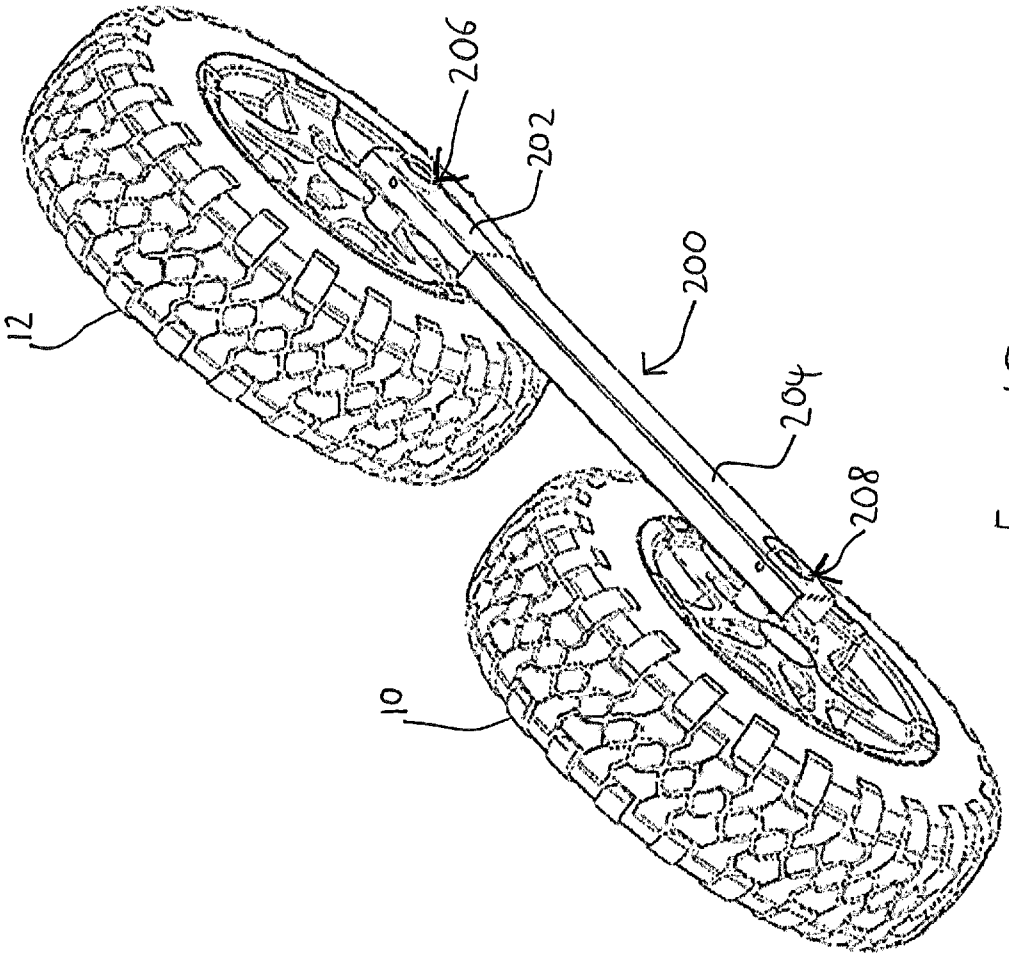


Figure 10

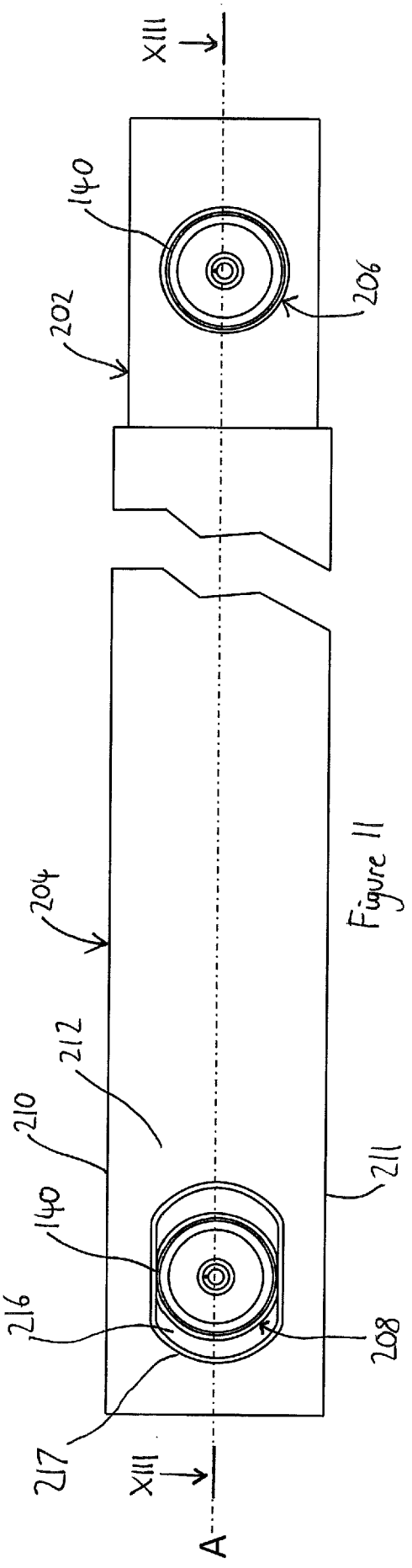


Figure 11

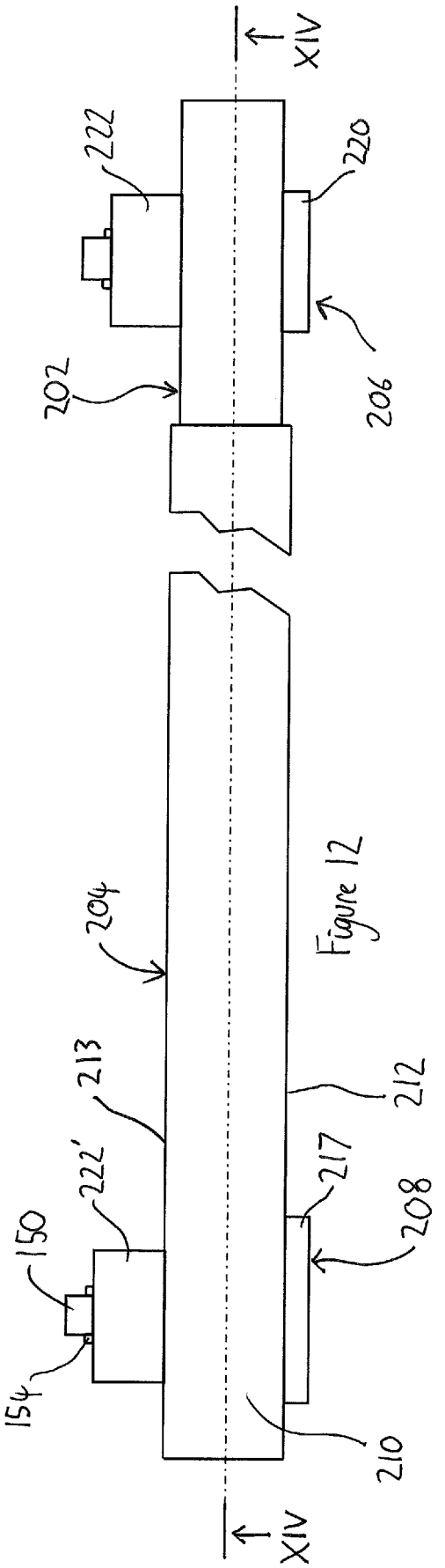


Figure 12

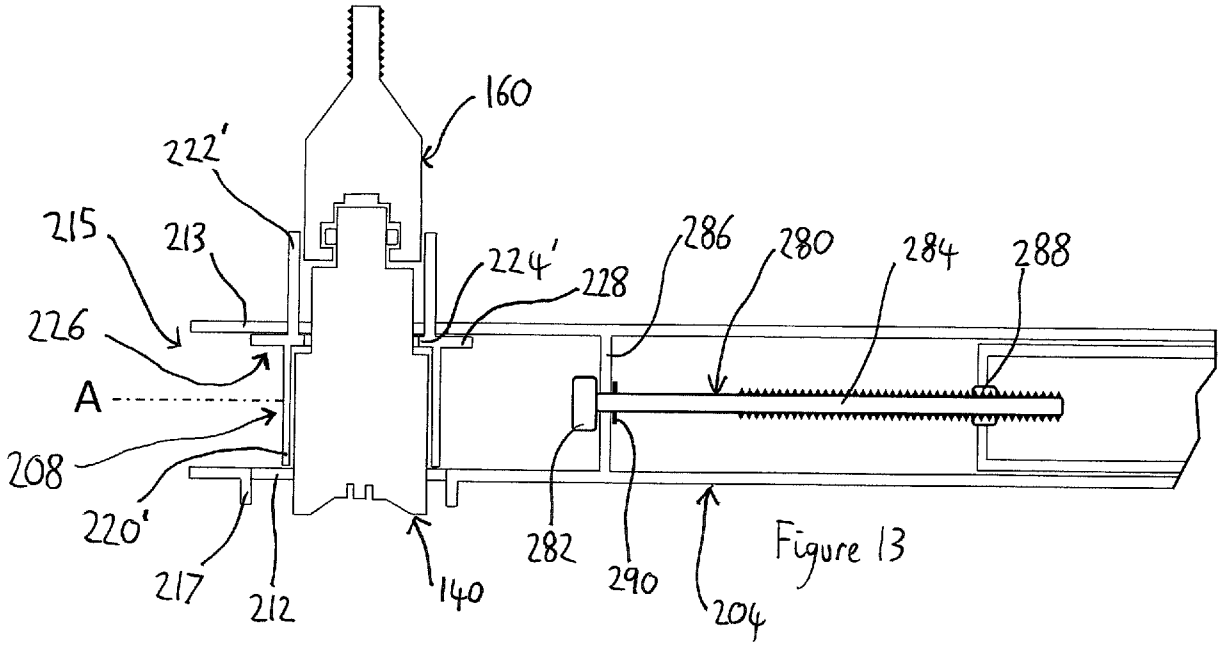
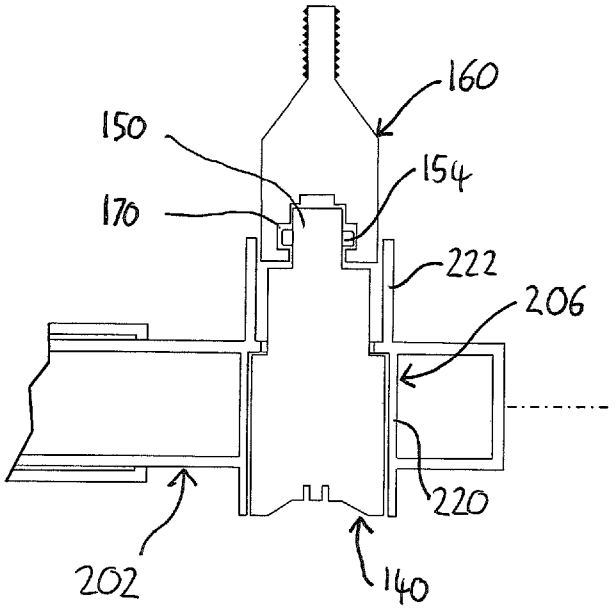


Figure 13



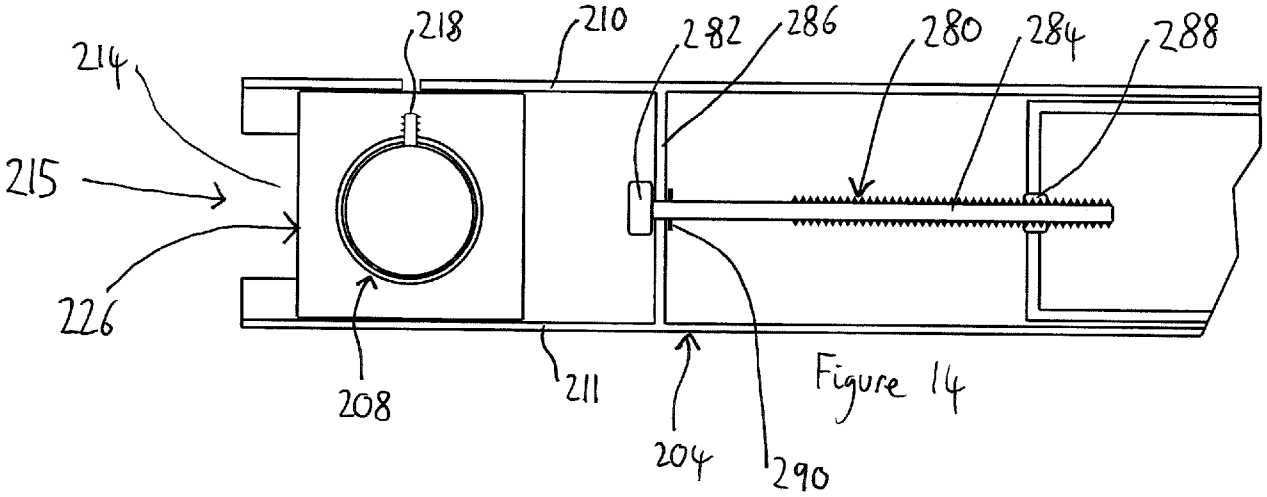
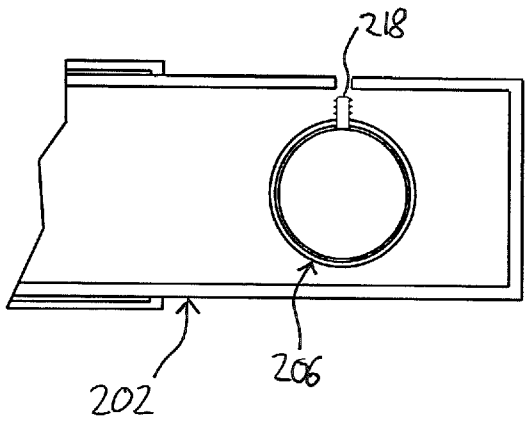


Figure 14



Apparatus for immobilising a vehicle

FIELD OF THE INVENTION

The present invention relates to an apparatus and a method for immobilising a wheeled vehicle. In particular, the present invention relates to vehicle immobilising apparatus for a wheeled vehicle having two or more wheels arranged in tandem, such as a twin-axle caravan or trailer.

BACKGROUND TO THE INVENTION

Unpowered trailers that can be hitched or coupled to a powered vehicle are available with several different axle and wheel configurations. Trailers with one wheel on each side of the trailer body are commonly described as single-axle trailers. Single-axle arrangements are typically suitable for relatively lightweight applications. Larger trailers may be of a twin-axle design, in which a pair of wheels is provided on each side of the trailer. The wheels of each pair are arranged in tandem and are mounted close to one another, typically with one wheel forward of and one wheel behind the centre of gravity of the trailer. Twin-axle arrangements are used in a variety of trailers, such as caravans or travel trailers, trailer tents, boat trailers, livestock trailers, plant trailers and so on.

Trailers may be vulnerable to theft, as they can be readily coupled to a powered vehicle and towed away. It is therefore common practice to immobilise a trailer to prevent theft, for example by using a wheel clamp to prevent free rotation of a wheel. An example of a wheel clamp device is found in the present applicant's granted UK patent GB 2483109 B, the contents of which are incorporated herein by reference.

While wheel clamp devices are effective for immobilising single-axle trailers, vehicles with wheels in tandem, such as a twin-axle caravan or trailer, may not be sufficiently immobilised using a single wheel clamp on one of the wheels. For example, with a clamp applied only to one wheel of a tandem pair, the tyre of the

clamped wheel could be deflated to allow movement of the vehicle with the clamp still secured, with the adjacent unclamped wheel supporting the load of the trailer.

When a greater degree of security is required for a twin-axle trailer, the conventional solution is to apply wheel clamps to both wheels on one side of the trailer. Fitting a separate clamp to each wheel, however, increases the time associated with securing the trailer, and effectively doubles the cost and weight compared with using a single wheel clamp.

It would therefore be desirable to provide apparatus for immobilising a twin-axle trailer that overcomes or mitigates some of these problems.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided apparatus for immobilising a vehicle having first and second wheels arranged in tandem, the wheels being mounted to first and second hubs respectively on a common side of the vehicle, and in which first and second removable wheel fasteners secure the first and second wheels to the first and second hubs, respectively, the apparatus comprising a body arranged to span between the hubs, and first and second locking devices, the body comprising first and second mountings for the first and second locking devices respectively, the first and second locking devices being operable to engage with the first and second wheel fasteners respectively to releasably secure the body to the first and second hubs such that the body locks the first and second wheels together, and the locking devices are operable to disengage from the wheel fasteners to release the body from the hubs without removing the wheel fasteners, and wherein the body is arranged such that a distance between the first and second locking devices is adjustable.

With this arrangement, a twin-axle trailer can be immobilised effectively, without the need to fit a separate device to each wheel, reducing the time and cost associated with immobilising the trailer. The apparatus locks both wheels on one side of the

trailer, preventing free rotation of the wheels and providing greater security than would be provided by clamping a single wheel. The removable wheel fasteners can remain in place in the wheels, and so need only be fitted to the vehicle once, further reducing the time needed to fit the apparatus. The body can shield the wheel fasteners when the apparatus is secured to the wheels.

In this way, the apparatus can be readily adjusted to allow for differences in the spacing of the wheel fasteners, for example due to movement of the vehicle.

The distance between the first and second mountings may be adjustable to vary the distance between the first and second locking devices. For example, the length of the body may be adjustable to vary the distance between the first and second mountings.

The body may comprise a first member that includes the first mounting and a second member that includes the second mounting. The first and second members may be moveable with respect to one another to vary the distance between the first and second mountings. The body may be arranged such that a part of the first member is received within a part of the second member, for example in a telescoping arrangement.

The apparatus may comprise an adjustment mechanism for setting the distance between the first and second mountings. Preferably, the adjustment mechanism cannot be operated when the body is secured to the hubs. In this way, the distance between the first and second mountings can be adjusted before the apparatus is fitted to the wheels, but once fitted, the distance between the first and second mountings cannot be adjusted, so that free rotation of the wheels can be prevented and so that the apparatus cannot readily be defeated.

The adjustment mechanism may comprise a first threaded element associated with the first member and arranged to engage with a second threaded element associated with the second member, such that relative rotation between the first and

second threaded elements causes the first and second members to move together or apart.

Conveniently, the apparatus may be arranged such that rotation of the first member with respect to the second member causes relative rotation between the first and second threaded elements. For instance, the first and/or second threaded elements could be formed on the first and second members. The apparatus may be arranged such that rotation of the first member with respect to the second member is prevented when the body is secured to the hubs. This arrangement can prevent adjustment of the distance between the mountings when the body is secured to the hubs.

The first and/or the second threaded element may be arranged to engage with a tool for rotating the first threaded element with respect to the second threaded element. Preferably, engagement of the tool with the first and/or the second threaded element is prevented when the body is secured to the hubs. For example, the first and/or the second mounting may comprise a carriage that is removable from the body to allow engagement of the tool with the threaded element, with the carriage blocking access for the tool when the carriage is in place. In another example, the tool may engage with the threaded element via an aperture in body, and the aperture may be blocked when the body is secured to the hubs.

The first threaded element or the second threaded element may comprise a bolt having a head that cooperates with the corresponding member, and the other threaded element may be internally-threaded and fixed with respect to the corresponding other member. For example, the internally-threaded element may be a captive nut or threaded aperture in an internal bracket. Preferably, the bolt is not accessible when the body is secured to the hubs. For instance, the bolt may be housed within the first and/or second member.

The apparatus may be arranged such that the position of at least one of the mountings is adjustable with respect to the body. For example, at least one of the

mountings may comprise a carriage arranged to slide with respect to the body. The sliding of the carriage with respect to the body may be limited such that free rotation of the wheels is still prevented when the apparatus is secured to the wheels, but sliding of the carriage can accommodate small changes in the distance between the locking devices.

In some embodiments, the distance between the mountings can be varied both by adjusting the relative position of two body members and by adjusting the position of one mounting with respect to the corresponding body member. In other embodiments, only one of these adjustment modes is possible.

Preferably, each mounting is arranged to orient the locking devices for engagement with the wheel fasteners in a direction generally perpendicular to a body axis extending between the mountings. The locking devices could be permanently fixed to the body. Preferably however, each mounting comprises a socket arranged to receive a respective one of the locking devices.

Each socket may comprise a generally tubular housing. Each socket may comprise an abutment surface for limiting relative movement of the respective locking device towards the wheel with respect to the body, or equivalently for limiting movement of the body away from the wheels when the device is secured. In this way, the body can be mounted as close as possible to the wheels.

Each mounting may comprise a collar that extends from the body towards the wheel to protect the respective locking device and/or the respective wheel fastener.

The apparatus may include the first and second removable wheel fasteners. Each wheel fastener may comprise a first part for cooperation with the respective wheel to secure the wheel to the hub and a second part for engagement with the locking device to releasably secure the body to the wheel fastener.

The wheel fasteners may comprise replacement wheel nuts or wheel bolts.

According to a second aspect of the invention, there is provided a method for reversibly immobilising a vehicle having first and second wheels arranged in tandem, the wheels being mounted to first and second hubs respectively on a common side of the vehicle using respective first and second wheel fasteners, the method comprising positioning an elongate body against an outside face of each wheel, adjusting a distance between first and second locking devices, engaging the first and second locking devices with the respective wheel fasteners to releasably secure the body to the first and second hubs such that the body locks the first and second wheels together, and disengaging the first and second locking devices from the respective wheel fasteners to release the body from the hubs without removing the wheel fasteners.

The method may comprise, before positioning the body against the outside face of each wheel, fitting to each wheel a wheel fastener comprising a first part arranged to cooperate with the wheel to secure the wheel to the hub, and a second part arranged to engage with the locking device.

The method may comprise, before engaging the locking devices with the wheel fasteners, adjusting the body to set a spacing between the locking devices that corresponds to a spacing between the wheel fasteners. In this way, the apparatus can be readily adjusted to allow for differences in the spacing of the wheel fasteners, for example due to movement of the vehicle.

The method may comprise engaging the locking devices with the body before engaging the locking devices with the wheel fasteners. For example, the method may comprise engaging the locking devices in sockets in the body.

In the present specification, the term “twin-axle” is used to refer to arrangements in which a pair of wheels is provided on each side of the body of the trailer in a tandem configuration. It will be understood that, in practice, each of the wheels may be mounted on its own stub axle, rather than on an axle that extends across the width of the trailer body.

While the present invention is particularly suitable for securing twin-axle trailers, such as caravans or travel trailers, it will be appreciated that the invention can be used to immobilise substantially any vehicle having two or more wheels arranged in tandem on each side of the vehicle. Thus the present invention can be used to immobilise both unpowered and powered vehicles, and vehicles with three or more axles.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which like reference signs are used for like features, and in which:

Figure 1 is a perspective view of an apparatus according to a first embodiment of the present invention;

Figure 2 is a perspective view of the apparatus of Figure 1, together with a pair of wheels to which the apparatus can be fitted;

Figure 3 is a perspective view of the apparatus of Figure 1 when secured to the pair of wheels;

Figure 4 is an outer side view of the apparatus of Figure 1;

Figure 5 is a top view of the apparatus of Figure 1;

Figure 6 is a cross-section on VI-VI of the apparatus of Figure 1;

Figure 7 is a cross-section on VII-VII of the apparatus of Figure 1.

Figure 8 is a perspective view of an apparatus according to a second embodiment

of the present invention;

Figure 9 is a perspective view of the apparatus of Figure 8, together with a pair of wheels to which the apparatus can be fitted;

Figure 10 is a perspective view of the apparatus of Figure 8 when secured to the pair of wheels;

Figure 11 is an outer side view of the apparatus of Figure 8;

Figure 12 is a top view of the apparatus of Figure 8;

Figure 13 is cross-section on XIII – XIII of the apparatus of Figure 8; and

Figure 14 is a cross-section on XIV – XIV of the apparatus of Figure 8.

DESCRIPTION OF THE EMBODIMENTS

Figure 1 shows an apparatus for immobilising a vehicle, such as a twin-axle trailer, according to a first embodiment of the invention. The apparatus comprises a body 100, a pair of locking devices 140, and a pair of adapted wheel fasteners 160.

The body 100 is generally tubular and extends between first and second ends along a body axis A. The body 100 includes first and second mounting sockets 106, 108, positioned adjacent to the first and second ends of the body 100 respectively. Each mounting socket 106, 108 is arranged to receive and retain one of the locking devices 140. The sockets 106, 108 therefore provide mountings for the locking devices 140. The sockets 106, 108 are oriented so that the locking devices 140 can be inserted into the sockets 106, 108 from an outer side of the body 100 in a direction perpendicular to the body axis A.

Each of the adapted wheel fasteners 160, referred to hereafter as receiver bolts,

replaces one of the wheel bolts (also known as lug bolts) used to affix a wheel of the trailer to a wheel hub. Figure 2 shows the receiver bolts 160 fitted to the wheels 10, 12. Each receiver bolt 160 extends through a wheel bolt hole in each wheel 10,12, to engage with the hub. The wheel hubs and remaining (standard) wheel bolts are not shown in Figures 2 and 3. Each of the locking devices 140 is arranged to cooperate with a corresponding one of the pair of receiver bolts 160, as will be described in more detail below. The term hub refers to a hub of the vehicle and not a hub of the wheel such that the hub is a part of the vehicle and not a part of the wheel itself.

When the locking devices 140 are inserted into the sockets 106, 108, a shaft 150 of each locking device 140 protrudes out of the body on the inner side of the body, to extend towards the wheels 10, 12 and the receiver bolts 160.

To immobilise the wheels 10, 12, the shaft 150 of each locking device 140 can be engaged with the corresponding receiver bolt 160 to secure each end of the body 100 to the hub of each respective wheel 10, 12. As shown in Figure 3, in this fitted configuration, the body 100 spans between the wheels 10, 12 and is locked to each hub (not shown) by the cooperation of the locking devices 140 with the receiver bolts 160. Attempted rotation of either or both wheels 10, 12 results in opposing forces being exerted on the body 100, preventing the wheels 10,12 from rotating.

The apparatus of Figures 1 to 3 will now be described in more detail, with reference to Figures 4 to 7. Figure 4 is an outer side view of the body 100 (i.e. looking towards the wheels), showing each of the locking devices 140 received in its respective socket 106, 108. Figure 5 shows a top view of the body 100 with the receiver bolts 160 engaged with the locking devices 140 (not visible in Figure 5), and Figure 6 is a corresponding cross-sectional view. Figure 7 is a cross-sectional view through the body 100, showing one of the locking devices 140 and an engaged receiver bolt 160 on a perpendicular plane. The apparatus is shown in Figures 4 to 7 in the configuration used to immobilise the wheels 10, 12, although the wheels and hubs are not shown in Figures 4 to 7.

Each socket 106, 108 comprises a generally tubular housing 120 that extends through the body 100 perpendicular to the body axis, and a generally tubular collar 122 that extends away from the inner side of the body 100 (towards the wheels in use). The collar 122 has a smaller diameter than the housing 120, so that an internal annular step 124 is formed in the socket where the collar 122 meets the housing 120, as shown in Figures 6 and 7.

Referring to Figure 7, each locking device 140 comprises a barrel 142 for engaging with the corresponding socket. The barrel 142 has a large-diameter portion 144 and reduced-diameter portion 148, defining a shoulder 146 therebetween. The shaft 150, which has a smaller diameter than the reduced-diameter portion 148 of the barrel 142, extends from the reduced-diameter portion 148 of the barrel 142.

When the locking device 140 is inserted into the corresponding socket 106, 108, the reduced-diameter portion 148 of the barrel 142 is received inside the collar 122 of the socket 106, 108 and the shaft 150 extends out of the collar 122 towards the wheels. The shoulder 146 of the barrel 142 abuts the annular step 124 of the socket 106, 108 and stops the locking device 140 from moving further towards the inner side of the body 100. The locking device 140 can be secured in the socket 106, 108 by a grub screw 118 (see Figure 6), which engages with a groove 156 in the large diameter portion 144 of the barrel 142. The groove 156 helps to prevent rotation of the locking device 140 in the socket 106, 108.

Referring particularly to Figure 7, each locking device 140 includes a locking mechanism (not shown), housed within a bore 152 that extends through the barrel 142 and into the shaft 150. A plurality of locking elements 154 are mounted in the shaft 150. The locking elements 154 are coupled to the locking mechanism so that operation of the locking mechanism causes the locking elements 154 to move radially between an unlocked position and a locked position. In the unlocked position, the locking elements 154 are retracted into the shaft 150. In the locked position, the locking elements protrude radially from the shaft 150 and cannot be

moved radially inwards. The locking mechanism is operated using a key (not shown), so that the key can be removed after setting the locking elements 154 to the locked position.

Each receiver bolt 160 comprises a head 162 and a shank 166. The shank 166 is externally threaded such that it can be engaged with a complementary thread in a wheel hub (not shown). The shank 166 meets the head 162 at a tapered surface 164 that engages with the corresponding wheel bolt hole. The threaded shank 166 and tapered surface 164 together act in the manner of a conventional wheel bolt to secure the wheel to the hub. The head 162 of the receiver bolt 160 includes an opening 168 having a hexagonal recess 172 at its inner end for receiving a hex key for screwing the receiver bolt 160 into the hub. Prior to use of the apparatus, one wheel bolt on each hub is removed and replaced with a receiver bolt 160, and once fitted the receiver bolts 160 can remain in place when the body 100 is not secured to the wheels.

An annular groove 170 is provided in the inner wall of the opening 168 in the head 162 of each receiver bolt 160. To secure the body 100 to the receiver bolts 160, the shaft 150 of each locking device is inserted into the opening 168 of the corresponding receiver bolt 160. The shaft 150 fits into the opening 168 in the receiver bolt 160 only when the locking elements 154 are recessed into the shaft 150 in the unlocked position. The locking elements 154 are then moved into the locked position to engage with the annular groove 170, preventing subsequent removal of the locking device 140 and thereby securing the locking device 140 and receiver bolt 160 together, until the locking mechanism is operated again to retract the locking elements 154.

As described above, with the body secured to the hubs by way of the locking devices, free rotation of the wheels is prevented. Several features are provided to guard against unauthorised removal of the apparatus. When the locking devices 140 are engaged with the respective receiver bolts 160, access to the recess 172 in the head 162 of each receiver bolt 160 is blocked by the corresponding locking device

140. Depending on the dimensions and relative positions of the receiver bolts 160, the wheels, the locking devices 140 and the mounting sockets 106, 108, the receiver bolt heads 162 can be made at least partly inaccessible by enveloping the heads 162 within the bolt holes of the wheels and/or by shrouding the heads 162 with the collars 122 of the mounting sockets 106, 108. To this end, the position of the locking devices 140 with respect to the sockets 106, 108 can be adjusted by providing one or more spacers (not shown) between the step 124 of the socket 106, 108 and the shoulder 146 of the locking device 140, for example by inserting washers during assembly. This allows the body 100 to be positioned as close as possible to the wheels. Furthermore, the receiver bolt head 162 has a smooth, cylindrical outer surface so that any exposed part of the receiver bolt head 162 cannot easily be gripped by a tool.

The distance between the receiver bolts 160 may change after they have been secured to each hub, for example as a result of rotation of the wheels during movement of the trailer. Accordingly, the body 100 is extendable, such that the distance between the sockets 106, 108 can be adjusted to correspond to the distance between the receiver bolts 160. In this way, the apparatus can be adjusted and secured to the hubs without the need to swap the positions of the receiver bolts 160 or rotate the wheels.

To this end, as shown in Figures 1 to 6, the body 100 comprises first and second generally tubular members 102, 104. The first socket 106 is provided in the first member 102, and the second socket 108 is provided in the second member 104.

Referring to Figure 6, the first member 102 has a smaller outside diameter than the inside diameter of the second member 104, and an inside end portion of the first member 102, opposite the first end of the body 100, is received within an end portion of the second member 104 opposite the second end of the body 100.

The first and second members 102, 104 are secured to one another by an adjustment mechanism. The adjustment mechanism comprises a threaded shaft

184 that extends parallel to the long axis A of the body 100. The shaft 184 is mounted inside and is fixed to the second member 104. In this example, the shaft 184 is part of a bolt 180, and the head 182 of the bolt 180 is mounted in an internal bracket 186 in the second member 104 so that the bolt 180 cannot rotate with respect to the second member 104. The threaded shaft 184 of the bolt 180 is engaged with a threaded aperture 188 in an end wall of the first member 102.

To adjust the length of the body 100, the first member 102 can be rotated with respect to the second member 104, so that the engagement between the threaded shaft 184 and the threaded aperture 188 of the second member 104 causes the first member 102 and the second member 104 to move together or apart depending on the direction of rotation. In this way, the distance between the first and second sockets 106, 108 can be set to the appropriate distance. In Figure 6, the adjustment mechanism is shown in the position that provides the greatest distance between the first and second sockets 106, 108.

To fit the apparatus to the wheels 10, 12, the receiver bolts 160 are first fitted to the wheels 10, 12, as shown in Figure 2. The length of the body 100 is then adjusted if necessary by rotating the first member 102 with respect to the second member 104, so that the distance between the sockets 106, 108 corresponds to the distance between the receiver bolts 160. The locking devices 140 are then mounted in the first and second sockets 106, 108 and secured with the grub screws 118. The body 100, with the locking devices 140 mounted in the sockets 106 108, can then be offered up to the wheels 10, 12 and the shafts 150 of the locking devices 140 inserted into the heads 162 of the receiver bolts 160. The locking devices 140 are then operated using the keys to engage the locking elements 154 with the receiver bolts 160.

To remove the apparatus from the wheels 10, 12, the locking devices 140 are operated to disengage the locking elements 154 from the receiver bolts 160. The locking devices 140 can then be withdrawn from the receiver bolts 160 and the body 100 detached from the wheels 10, 12, leaving the receiver bolts 160 fastened to the

wheels 10, 12.

It should be noted that, when the apparatus is secured to the hubs, the body members 102, 104 cannot be rotated with respect to one another and so the distance between the locking devices 140 cannot be adjusted.

A second embodiment of the invention will now be described with reference to Figures 8 to 14. The apparatus of the second embodiment is similar to that of the first embodiment, and only the differences will be described in detail. The locking devices 140 and receiver bolts 160 used in the second embodiment are identical to those used in the first embodiment. Other features of the second embodiment that correspond to features of the first embodiment are denoted by reference numerals incremented by 100.

In this second embodiment, the body 200 comprises a first member 202, and a second member 204. First and second mountings for the locking devices 140, comprising first and second sockets 206, 208, are provided in the first and second members 202, 204, respectively. As in the first embodiment, each of the first and second mounting sockets 206, 208 receives and retains one of the locking devices 140, and each of the locking devices 140 engages with a corresponding receiver bolt 160 to secure the body to the wheels 10, 12 as shown in Figures 8 to 10. Figures 11 and 12 show the body 200 with the locking devices 140 installed in the sockets 206, 208, and Figure 13 shows the body 200 with the locking devices 140 installed in the sockets 206, 208 and engaged with the receiver bolts 160. Figure 14 shows the body 200 without the locking devices 140 and the receiver bolts 160.

The first and second members 202, 204 are box sections with rectangular cross-sections, defining an upper wall 210, a lower wall 211, a front wall 212 and a back wall 213. As can be seen most clearly in Figures 13 and 14, the cross-section of the first member 202 is sized to fit inside the second member 204, in a telescoping arrangement. The first and second members 202, 204 are secured to one another by an adjustment mechanism, which in this case comprises a bolt 280 arranged

parallel to the body axis and mounted in an internal bracket 286 of the second member 204.

The bolt 280 is able to rotate with respect to the bracket 286, but axial movement of the bolt with respect to the bracket is limited by the head 282 of the bolt 280 on one side of the bracket 286 and a spring clip 290 disposed on the other side of the bracket 286. The threaded shaft 284 of the bolt 280 extends away from the bracket 286 to engage with a threaded aperture 288 in an end wall of the first member 202.

Rotation of the bolt 280 with respect to the body 200 causes the first member 202 and second member 204 to move together or apart depending on the direction of rotation, allowing adjustment of the length of the body 200 and therefore the distance between the sockets 206, 208.

It will be appreciated from Figures 13 and 14 that, when the apparatus is fitted to the wheels with the locking devices 140 engaged with the receiver bolts 160, access to the head 282 of the bolt 280 is blocked by the second socket 208. In this embodiment, therefore, the second socket 208 is removable from the body 200 as will be described below.

Referring to Figures 11 and 13, in this second embodiment the first socket 206 is substantially similar to that described in the first embodiment, and comprises a housing 220 that extends through the first member of the body and a reduced-diameter collar 222 that extends away from the inner side of the body 200 (towards the wheels in use). The first socket 206 is welded or otherwise affixed in apertures in the front wall 212 and back wall 213 of the first member 202 of the body 200.

However, in this second embodiment, the second socket 208 is not fixed to the second member 204, but instead forms a sliding carriage 226 that can slide with respect to the second member 204.

As can be seen most clearly in Figures 13 and 14, the second socket 208 carries a

generally square flange or plate 228 that is a sliding fit between the upper wall 210 and the lower wall 211 of the second member 204. The tubular housing 220' of the second socket 208 extends from the plate towards the front wall 212 of the second member and is dimensioned to bear against the front wall 212 to support the socket 208. The collar 222' extends away from the plate in a direction opposite to the housing 220'. A slot 214 is provided in the back wall 213 of the second member to accommodate the collar 222'. The slot 214 extends to meet an open outer end 215 of the second member 202 so that the second socket 208 can be removed from the open end 215. An internal annular step 224' is formed in the second socket 208 where the housing 220' meets the plate 228.

Referring again to Figures 11 and 13, an aperture 216 is disposed in the front wall 212 of the second member 204 to enable the locking device 140 to be inserted into the second socket 208. The aperture 216 is bordered by a projecting collar 217. The aperture 216 is dimensioned so that the housing 220' cannot pass through the aperture 216, but so that the locking device 140 can project through the aperture 216 when the locking device 140 is received in the second socket 208, as can be seen in Figure 13.

The aperture 216 is elongate parallel to the long axis A of the body 200, so that the locking device 140, and therefore the second socket 208, can slide with respect to the second member 204 over a distance corresponding to the length of the aperture 216 less the diameter of the locking device 140. At each limit of movement, the locking device 140 abuts the ends of the aperture 216 to prevent further sliding of the second socket 208. The height of the aperture 216 (i.e. perpendicular to the body axis A in the plane of the front wall 212) is close to the diameter of the locking device 140 so that the aperture 216 guides the sliding movement of the locking device 140.

As a result of the elongate aperture 216, the distance between the sockets 206, 208 can be adjusted independently of the length of the body 200 (i.e. the relative positions of the first and second members), thereby providing a tolerance to

accommodate small changes in the distance between the receiver bolts 160. In this way, the apparatus can be fitted to the wheels without the need to adjust the length of the body 200 precisely using the adjustment mechanism. The range of adjustment of the position of the second socket 208 with respect to the body 200 is limited so that free movement of the wheels is still restricted.

To fit the apparatus to the wheels 10, 12, the receiver bolts 160 are first fitted to the wheels 10, 12, as shown in Figure 9. The length of the body 200 is then adjusted if necessary by turning the bolt 280 with a suitable tool. The bolt 280 can be accessed by way of the open outer end 215 of the second member 204, by first removing the locking device 140 from the second socket 208 and sliding the second socket 208 out from the second member 204. The second socket 208 is then replaced and the locking devices 140 are mounted in the first and second sockets 206, 208 and secured with grub screws 218. The locking devices 140 can then be offered up to the receiver bolts 160 and the shafts 150 inserted into the heads 162 of the receiver bolts 160. The locking devices 140 are then operated to engage the locking elements 154 with the annular groove 170 in the receiver bolts 160.

In a variant of the second embodiment, the aperture in the front wall of the second member is circular, rather than elongate. In this case, the second socket is removable to allow access to the bolt, but the position of the second socket with respect to the second member is not adjustable.

In a further variant, the first socket is also provided as a slidable carriage, allowing adjustment of the position of the first socket with respect to the first member.

Various further modifications and variations of the above-described embodiments are possible.

For example, any suitable mechanism for adjusting the distance between the mountings for the locking devices could be provided. For example, where the first and second members are tubular, the first member could carry an externally

threaded end part for engagement with an internally threaded end part of the second member, such that relative rotation of the tubular members changes the distance between the openings. In this case, an internal bolt would not be required. In another example, the first and second members are slidable with respect to one another and are secured in position at the desired length by a concealed pin, bolt, screw or other fixing.

One or both of the mountings could comprise a plurality of sockets spaced apart along the body axis, so that the distance between the locking devices could be adjusted by engaging the first and/or the second locking device with a suitable one of the sockets.

In the above-described embodiments, the length of the body is fixed for any given setting of the adjustment mechanism. However, the adjustment mechanism could instead be arranged to prevent extension of the body beyond a maximum length, and/or to prevent retraction of the body beyond a minimum length. In this way, a degree of further adjustment of the positions of the locking devices would be possible during fitting of the apparatus. A spring or other biasing means could be provided to bias the body members towards the maximum or minimum length configurations.

It will be appreciated that, in use, the distance between the sockets preferably should not be equal to the distance between the axles of the wheels to avoid the body acting in the manner of a locomotive coupling rod. This can readily be avoided by providing suitable instructions to the user and/or by suitably sizing the body.

The length of the body need not be adjustable. For example, the body could be formed as a single member. In such cases, the positions of the first socket and/or the second socket could be adjustable with respect to the body, for example by using a carriage arrangement as in the second embodiment described above and/or by embodying each mounting as a plurality of sockets. Additionally, the receiver bolts could be repositioned as necessary during fitting of the device, by rotating the

wheels or by changing the position of the receiver bolts with respect to the wheels.

The body and the sockets are preferably constructed from a suitably strong, hard material such as steel, and are of sufficient thickness to prevent easy removal of the apparatus by cutting, grinding or otherwise breaking the body and/or sockets. The sockets could be formed integrally with the body, or could be attached mechanically, by welding or by other suitable fixing or joining methods.

In the illustrated examples, each removable wheel fastener is a receiver bolt that can replace a standard wheel bolt. It will be appreciated, however, that the removable wheel fastener could be in the form of a wheel nut to replace a standard wheel nut on a vehicle with hubs fitted with wheel studs.

It will be appreciated that further variations and modifications not explicitly described above are also possible without departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. Apparatus for immobilising a vehicle having first and second wheels arranged in tandem, the wheels being mounted to first and second hubs respectively on a common side of the vehicle, and in which first and second removable wheel fasteners secure the first and second wheels to the first and second hubs, respectively;

the apparatus comprising:

a body arranged to span between the hubs; and

first and second locking devices;

the body comprising first and second mountings for the first and second locking devices respectively;

the first and second locking devices being operable to engage with the first and second wheel fasteners respectively to releasably secure the body to the first and second hubs such that the body locks the first and second wheels together, and the locking devices being operable to disengage from the wheel fasteners to release the body from the hubs without removing the wheel fasteners; and

wherein the body is arranged such that a distance between the first and second locking devices is adjustable.

2. Apparatus according to Claim 1, wherein the length of the body is adjustable to vary a distance between the first and second mountings.

3. Apparatus according to Claim 1, wherein a distance between the first and second mountings is adjustable to vary the distance between the first and second locking devices.

4. Apparatus according to Claim 3, wherein the body comprises a first member that includes the first mounting and a second member that includes the second mounting, the first and second members being moveable with respect to one another to vary the distance between the first and second mountings.

5. Apparatus according to Claim 4, wherein a part of the first member is received within a part of the second member.

6. Apparatus according to Claim 4 or Claim 5, comprising an adjustment mechanism for setting the distance between the first and second mountings.

7. Apparatus according to Claim 6, wherein the adjustment mechanism comprises a first threaded element associated with the first member and arranged to engage with a second threaded element associated with the second member, such that relative rotation between the first and second threaded elements causes the first and second members to move together or apart.

8. Apparatus according to Claim 7, wherein rotation of the first member with respect to the second member causes relative rotation between the first and second threaded elements.

9. Apparatus according to Claim 8, wherein rotation of the first member with respect to the second member is prevented when the body is secured to the hubs.

10. Apparatus according to Claim 7, wherein the first and/or the second threaded element is arranged to engage with a tool for rotating the first threaded element with respect to the second threaded element, and wherein engagement of the tool with the first and/or the second threaded element is prevented when the body is secured to the hubs.

11. Apparatus according to any of Claims 7 to 10, wherein the first threaded element or the second threaded element comprises a bolt having a head that cooperates with the corresponding member, and wherein the other threaded element is internally-threaded and fixed with respect to the corresponding

other member.

12. Apparatus according to any of Claims 2 to 11, wherein the position of at least one of the mountings is adjustable with respect to the body.

13. Apparatus according to Claim 12, wherein at least one of the mountings comprises a carriage arranged to slide with respect to the body.

14. Apparatus according to any preceding claim, wherein the body defines a body axis extending between the mountings, and wherein each mounting is arranged to orient the locking devices for engagement with the wheel fasteners in a direction generally perpendicular to the body axis.

15. Apparatus according to any preceding claim, wherein each mounting comprises a socket arranged to receive a respective one of the locking devices.

16. Apparatus according to Claim 15, wherein each socket comprises a generally tubular housing.

17. Apparatus according to Claim 15 or Claim 16, wherein each socket comprises an abutment surface for limiting relative movement of the respective locking device towards the wheel with respect to the body.

18. Apparatus according to any preceding claim, wherein each mounting comprises a collar that extends from the body towards the wheel to protect the respective locking device and/or the respective wheel fastener.

19. Apparatus according to any preceding claim, wherein the apparatus comprises the first and second removable wheel fasteners, and wherein each wheel fastener comprises a first part for cooperation with the respective wheel to secure the wheel to the hub and a second part for engagement with

the locking device to releasably secure the body to the wheel fastener.

20. Apparatus according to any preceding claim, wherein the apparatus comprises the first and second removable wheel fasteners, and wherein each wheel fastener comprises a replacement wheel nut or wheel bolt.

21. A method for reversibly immobilising a vehicle having first and second wheels arranged in tandem, the wheels being mounted to first and second hubs respectively on a common side of the vehicle using respective first and second wheel fasteners;

the method comprising:

positioning an elongate body against an outside face of each wheel;

adjusting a distance between first and second locking devices;

engaging the first and second locking devices with the respective wheel fasteners to releasably secure the body to the first and second hubs such that the body locks the first and second wheels together; and

disengaging the first and second locking devices from the respective wheel fasteners to release the body from the hubs without removing the wheel fasteners.

22. A method according to Claim 21, comprising, before positioning the body against the outside face of each wheel, fitting to each wheel a wheel fastener comprising a first part arranged to cooperate with the wheel to secure the wheel to the hub, and a second part arranged to engage with the locking device.

23. A method according to Claim 21 or Claim 22, comprising, before engaging the locking devices with the wheel fasteners, adjusting the body to set a spacing between the locking devices that corresponds to a spacing between the wheel fasteners.

24. A method according to any of Claims 21 to 23, comprising engaging the

locking devices with the body before engaging the locking devices with the wheel fasteners.